

How to Use This Guide

This *Quick Reference Dust Control Guide* has been designed by the Blue Skies Campaign for use by persons responsible for the prevention and control of airborne dust caused by earthmoving, vehicle operation, and other construction related activities, as well as subcontractors performing earthmoving, excavation, site watering, and other activities.

The guide is divided into thirteen short subjects, each of which may be suitable for discussion with workers at construction sites.

What is Particulate Matter?

Particulate matter is a mixture of dirt, soil dust, pollens, molds, ashes, soot, and aerosols that remain suspended in the air that we breathe.

Coarse particulate matter, between 2.5 and 10 microns in diameter (PM₁₀), is usually caused by construction and earthmoving operations, vehicles moving on paved and unpaved roads, and agricultural activities. Fine particulate matter, measuring less than 2.5 microns, is produced primarily by the exhaust from diesel and gasoline engines.



Earthmoving operations in dry soil can generate significant amounts of airborne dust.

The Dangers of Dust

Particulate matter can be harmful to your health. When inhaled, the coarse particles are deposited in the upper respiratory tract of the body. The fine particles can reach the lower pulmonary tissues and invade the alveoli of the lungs.

Persons at greatest risk from exposure to particulates are the very young, the elderly, and persons with pre-existing heart disease or lung ailments, such as asthma, bronchitis, or emphysema.

In 1995, the Arizona Comparative Environmental Risk Project reported that nearly 700 people die prematurely each year in Maricopa County due to particulates, and concluded that particulate pollution represents one of the highest environmental risks to this State. Fine particulate matter also contributes to the ugly brown cloud that hangs over the Valley and obscures our blue skies.

What Is Being Done?

A 3,000 square-mile area of Maricopa and Pinal Counties has been designated a nonattainment area, because it does not meet the federal air quality standards for particulates smaller than ten microns in diameter (PM₁₀).

In addition to negative health effects, being a nonattainment area is a stigma that can slow economic growth and development. Tourists may not visit the Valley, because they perceive it to be too polluted. Persons may avoid moving to the Phoenix area because of the perception of unhealthy air, resulting in lower demand for new housing and office buildings.

A PM₁₀ Plan for Maricopa County was approved by the U.S. Environmental Protection Agency on July 25, 2002. The Plan shows how Maricopa County will attain the federal PM₁₀ standards by 2006. The Plan has 77 measures to reduce particulate pollution from all significant sources including agriculture, woodburning, driving on paved and unpaved roads, vacant lots, gasoline and diesel exhaust, and earthmoving activities.

Maricopa County Rule 310

The most effective measure in reducing particulates is Maricopa County's Fugitive Dust Control Rule 310. By 2006, Rule 310 is expected to reduce fugitive dust from construction sites and other earthmoving sources by 72 percent.

Compliance with Rule 310 is essential for the Valley to meet the federal standards. If we do not, there will be serious consequences, such as the loss of Federal dollars needed to build highways and light rail. So it is important for every construction worker to do his part to comply with Rule 310 and "bust the dust."



Monitoring sites such as this one measure the concentrations of particulates and other air pollutants.

Site Planning

Take time to consider dust control issues before beginning your project in order to save time, money, and project resources. Identify site-specific air quality and dust control issues up front and develop a consensus for addressing these issues. Phase your project and plan your site layout to minimize disturbance of the soil. Include the following action items:

- Make sure everyone working on the job knows who's in charge and all the requirements for dust control. Encourage a proactive and continuous focus on air quality issues on the job site.
- Evaluate dust control procedures periodically to identify additional issues that develop as the job progresses.
- Limit the amount of area graded at any one time. Lessening the amount of surface being disturbed at any one time reduces the amount of control required and the amount of water or dust suppressant needed.

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- Install wind fences or barriers (less than 50 percent porosity). Place barriers around storage piles, parking, and equipment staging areas.
 - Develop semi-permanent staging areas to cut down on the amount of disturbed area.
 - Restrict access on unpaved areas to vehicles and equipment that are necessary that day. Limit unnecessary travel and keep the speed under 15 mph on unpaved surface areas.
 - Restabilize disturbed surfaces by paving permanent roads and restoring vegetation as soon as possible.

What is Trackout?

Trackout is:

- Dirt, mud, or other debris tracked onto a paved public road by a vehicle leaving a construction site
- Dirt and mud adhering to the exterior or undercarriage of a vehicle leaving a construction site that falls onto a paved public road
- Traces of dirt or other bulk material that spill onto a paved public road from an improperly loaded haul truck leaving a construction site



Trackout carried from a job site onto a paved road can be disturbed by vehicles driving over it and become airborne dust.

Why Trackout Must Be Prevented

Particulate matter (PM₁₀) is caused when the material deposited on the pavement is lifted back into the atmosphere—or “re-entrained”—by the tires of vehicles passing over it. A large portion of the PM₁₀ in the Valley’s air is caused by vehicle re-entrainment.

Under Maricopa County Rule 310, control of trackout is required for all work sites having a disturbed surface area of at least five acres or from which 100 cubic yards of materials are hauled each day.



Trackout can be removed from paved roads using a wet broom or street sweeper, or by manually sweeping up the deposits.

Ways of Controlling Trackout

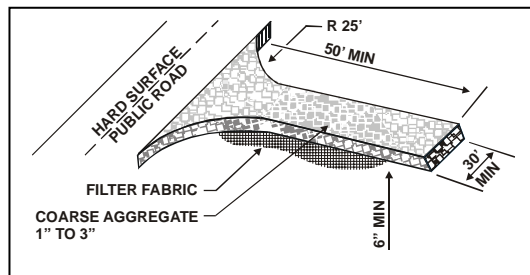
Trackout can be controlled at all exits onto paved public roads using any of the following:

Gravel Pad - A gravel pad is a stabilized construction entrance, designed to remove the mud and dirt from the tires of vehicles leaving a construction site.

Using gravel pads reduces fugitive dust caused by trackout onto paved roads and surfaces. The use of such pads may also reduce the need for street sweepers or laborers to remove trackout from paved surfaces, as well as help prevent storm water pollution.

Dust Control Plans require that stabilized construction entrances be installed at all access points if any material is to be hauled on or off the site, or if the site is larger than 5 acres.

Gravel Pad Design: Use one inch (1”) to three inches (3”) in diameter, washed, well graded gravel or crushed rock. The gravel pad should be at least 30’ wide by 50’ long, and a minimum of 6” deep. When installing the gravel pad, make sure that it is properly graded.



Grizzly - A device using rails, pipes or grates to dislodge mud, dirt and debris from the tires and undercarriage of vehicles prior to leaving the work site. An example of a grizzly is the “shaker” invented by Jeff Lange for Kitchell Contracting. This device is reusable, transportable by pick-up truck, easy to assemble, and can be expanded to accommodate various sizes of haul vehicles.



More information about the shaker device used by Kitchell Contracting can be obtained at www.trackoutcontrol.com.

Paving - The paved surface must extend from the point of intersection with a paved public roadway at least 100 feet back onto the site and have a width of at least 20 feet.

In addition, cleanup of trackout must be done immediately, if it extends 50 linear feet or more onto the paved public road. Otherwise, the trackout must be cleaned up by the end of the workday. Cleanup may be performed with a street sweeper or wet broom or by manually sweeping up the deposits.

Effective Watering

Watering is a very effective dust suppressant. When applied regularly, water provides temporary stabilization to disturbed surface areas and reduces fugitive dust caused by earthmoving and driving on non-stabilized surface areas. Water also aids in compaction.

Maricopa County Earthmoving Permits require that fugitive dust generated from all earthmoving activities be controlled. Watering is one way to control fugitive dust.

How much watering is enough?

- Roads and disturbed surfaces visibly appear moist with minimal silt
- Soil has a crusted surface and is not easily crumbled between your fingers
- Soil moisture content is optimum for compaction
- Visible emissions are less than 20 percent opacity



Proper site watering is an effective means of controlling dust.

Some Techniques That May Work

Prior to Any Activity on Site -

- Wet the area to depth of cuts or equipment penetration

For Active Operations -

- Apply water 15-30 minutes before starting operations
- Apply water at the end of the day (e.g. soak overnight the next day's work area)
- Before and after grading, water using a water truck

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- During trenching, water using a fine spray or mist
 - During screening, mist material after it drops from the screen

After Clearing an Area -

- Apply water in sufficient frequency to prevent visible emissions (at least every 2 hours)
- Automatic sprinkler/spray bar systems are optimal in cleared areas

For Unpaved Haul Roads/ Access Roads/Equipment Paths -

- Apply water in sufficient quantity to maintain a moist surface
- Do not over-water - muddy conditions increase track-out

Water Penetration

- Surfactants or palliatives added to water increase penetration, especially in high clay soils



If the area is inaccessible to water trucks due to slope conditions or other safety factors, watering should be conducted with water hoses or sprinkler systems. Remember that many cities have restrictions for construction on sloped areas—be sure you comply with those as well.

Dust Palliatives

Dust palliatives are products that are applied to soil surfaces in order to limit the creation of fugitive dust emissions. For many projects, dust palliatives can be an effective and economical alternative to watering.

A variety of products are available, and finding one that fits your project's activities can reduce the need for regular, frequent watering, resulting in significant cost savings over the long term. In some instances, the soil stabilization from dust palliative application can last from 1 to 12 months.

Some dust palliatives are not designed for areas subject to daily disturbances, high volume traffic, or heavy equipment traffic—check with the product vendor if these conditions exist at your site.

Be sure to ask the product vendor for the recommended dilution, application rate, and application frequency of the product you choose because these vary significantly by product. Before a weekend, holiday, or other inactive period of less than 5 days, a dust palliative that is diluted to not less than 1/20 of the concentration required to stabilize a surface for 6 months is recommended.

Maricopa County recommends the use of non-toxic, non-corrosive products. A contractor is responsible for assuring that its use of dust palliatives is in compliance with all applicable environmental laws.



Use of dust suppressants may be more cost effective than watering for areas of exposed soil that experience little or no traffic.

Wind Barriers

Dust blown by wind from a construction site is considered fugitive dust and subject to the provisions of Maricopa County Rule 310.

Wind barriers are placed along one or more sides of a job site to reduce the amount of wind blown dust leaving the site. Creating a wind barrier could involve installing wind fences, constructing berms, or parking on-site equipment so that it blocks the wind. Alone, these barriers are not adequate for controlling dust. Wind barriers must be implemented together with the application of water or dust palliatives. These barriers increase the dust control effectiveness of water or palliative application.

Effective wind barriers/fences on the job site are:

- 3 to 5 feet high adjacent to roads and urban areas
- Made of material with a porosity of 50 percent or less

Effective wind barriers / temporary enclosures for storage piles are:

- A three-sided structure as high as the pile
- Made of material with a porosity of 50 percent or less



Effective wind barriers must have a porosity of 50 percent or less.

Material Handling

Material handling refers to many types of earthmoving activities on construction sites, including loading and hauling. These types of activities can be significant sources of fugitive dust. However, dust control during loading and hauling can be easily achieved through careful planning and proper implementation of controls.

Loading:

- Mist material with water while stacking.
- Mix excavated material with water prior to loading.
- Empty loader slowly and keep bucket close to the truck while dumping.

Hauling:

- Tarps are required on haul trucks to prevent wind blown dust.
- Do not overload the truck! Keep your load 3 to 6 inches below the freeboard to minimize spillage.

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- Check belly-dump truck seals regularly and remove any trapped rocks to prevent spillage

Track-out:

- Daily vacuuming or wet broom cleaning is required to control track-out.
- Install a gravel pad at the access point to your site.
- Use grizzlies to remove excess dirt from trucks.



Loaded haul trucks must be covered with tarps to prevent wind blown dust during transport.

Visible Emissions and Opacity

What is Opacity?

Opacity is the reduction in visibility caused by a cloud of dust. The standard limitation for Visible Emissions within Maricopa County is 20 percent opacity.

How Much is 20 Percent Opacity?

County inspectors are trained to read opacity, but there are ways that you can estimate opacity on the job. Twenty percent (20%) opacity is a faint cloud of dust through which you can readily see background details.

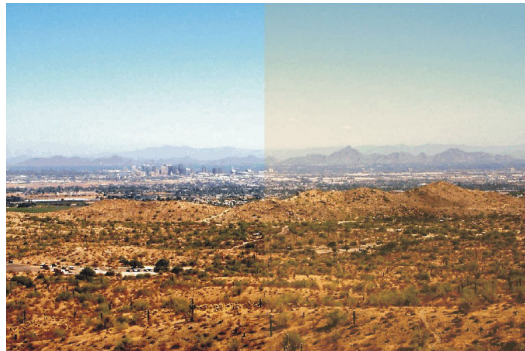


Photo shows barely discernable difference between clear conditions (left) and 20 percent opacity (right).

When are Controls of Visible Emissions Required?

Measures controlling visible emissions must be implemented during all periods of dust generating operations. The specific dust control measures, including contingency measures, are contained in the Dust Control Plan which is part of each regulated site's earthmoving permit.

A regulated site should implement contingency measures as necessary to prevent visible emissions from reaching 20 percent opacity, rather than waiting until emissions reach that level. Additional precautions should be taken to prevent the dust cloud from crossing the property line.

When Does the Opacity Limitation Apply?

The 20 percent opacity limitation applies at all times except when the average wind speed is greater than 25 miles per hour (25 mph) provided that all reasonable available control measures contained in the approved Dust Control Plan are in place.

Visible Emissions Testing

Twice a year classes are held for certification in reading Visible Emissions. All superintendents, project managers, and foremen are encouraged to attend these classes. Becoming certified enables you to determine opacity and your project's level of compliance with this requirement. Contact Maricopa County at 506-6700 for details on class times and locations.



Participants in "Smoke School" learn to accurately estimate the level of opacity of dust plumes such as this one caused by field plowing .

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¿Cómo Usar Esta Guía

Esta Guía de Referencia para el Control del Polvo ha sido diseñada por la organización Campaña Cielos Azules y está dirigida a personas a cargo de la prevención y el control del polvo causado por el movimiento de tierras, manejo de vehículos y otras actividades relacionadas a la construcción. También está dirigida a los sub-contratistas de la construcción que realizan trabajos de movimiento de tierras y excavación, riego de terrenos y otras actividades afines.

La guía está dividida en trece capítulos cortos que pueden ser discutidos con el personal directamente en el lugar de la obra.

¿Qué es el Material Particulado?

El material particulado es una mezcla de tierra, polvo, polen, moho, cenizas, hollín y aerosoles que permanecen suspendidos en el aire que respiramos.

Por lo general, el material particulado grueso, midiendo entre 2.5 y 10 micrómetros (PM10), es el resultado de las actividades de movimiento de tierras, vehículos que circulan en vías pavimentadas, sin pavimentar y actividades de producción agrícola. El material particulado fino, midiendo menos de 2.5 micrómetros es producido principalmente por el escape de los motores a gasolina y diesel.



Las operaciones de movimiento de tierras en terrenos secos pueden levantar grandes cantidades de polvo.
amounts of airborne dust.

Los Peligros del Polvo

El material particulado puede ser muy dañino para la salud. Al inhalarse, las partículas gruesas se depositan en la parte superior del sistema respiratorio. Las partículas finas pueden llegar hasta los tejidos pulmonares profundos e invadir los alveolos de los pulmones.

Al exponerse a las partículas de polvo, los individuos con mayores riesgos son los niños, los ancianos y las personas con enfermedades cardíacas o respiratorias tales como: asma, bronquitis o enfisema pulmonar.

En 1995, El Proyecto De Riesgos Ambientales Comparativos informó que debido al material particulado, cerca de 700 personas mueren prematuramente cada año en el Condado de Maricopa. El estudio concluyó que la polución de partículas representa el riesgo ambiental más alto en el estado. El material particulado fino también contribuye a la formación de la “nube café” que se suspende sobre nuestro Valle de Sol y oscurece nuestros cielos.

¿Qué se Está Haciendo?

Un área de 3,000 millas cuadradas en los condados de Maricopa y Pinal, ha sido identificada como “Area de no Conformidad” debido a que se exceden las normas federales de calidad de aire para partículas menores de 10 micrómetros de diámetro (PM10).

Cuando una región se identifica como “Area de no Conformidad”, no sólo se vé afectada por los efectos negativos a la salud sino que también se crea un estigma que puede retrasar el crecimiento y desarrollo económico. Por ejemplo, el turismo en el Valle del Sol se puede ver reducido por la percepción de ser un área muy polucionada. Cuando se percibe que una región tiene aire contaminado, hay menos influjo de población y por lo tanto menor demanda de viviendas y oficinas.

El 25 de Julio del 2002, la oficina Federal de Protección del Medio Ambiente para el Condado de Maricopa aprobó un Plan de PM10. El Plan demuestra cómo se logrará calificar dentro de los niveles Federales estándares de PM10 en el año 2006. El Plan cuenta con 77 medidas para reducir la polución de partículas de las fuentes principales incluyendo: actividades agrícolas, incendio de maderas, circulación de vehículos en vías pavimentadas y sin pavimentar, terrenos vacíos, escape de gasolina, diesel y movimiento de tierras.

Reglamento 310 del Condado de Maricopa

La medida más efectiva para reducir las partículas es el Reglamento 310 de Control del Polvo Fugitivo establecido por el Condado de Maricopa. Se espera que al aplicar este reglamento, el polvo fugitivo se reducirá en un 72% en los terrenos en construcción y otras fuentes relacionadas con el movimiento de tierras.

Para poder calificar dentro de los límites del estándar Federal, es esencial que se cumpla el Reglamento 310. Si este reglamento no se llega a cumplir, se esperan serias consecuencias, como por ejemplo: eliminación de fondos Federales para trenes ligeros y para construir carreteras. Por lo tanto, es importante que todo trabajador de la construcción contribuya en el cumplimiento del Reglamento 310 y así poder controlar polvo fugitivo.



Estaciones de monitoreo como ésta, miden la concentración de partículas y otras sustancias tóxicas.

Planificación de Terrenos

Tómese el tiempo necesario antes de de empezar la obra y considere todos los factores relacionados con el control del polvo, ésto le ahorrará tiempo, dinero y recursos. Antes de empezar, estudie el terreno e identifique los aspectos específicamente relacionados con la calidad del aire y el control de polvo. Llegue a un acuerdo general y establezca una estrategia de acción. Divida el proyecto en etapas y planifique el trazado y localización sobre el terreno de manera que se reduzca el movimiento de tierra. Se recomienda lo siguiente:

- Asegúrese de que todos los trabajadores estén enterados de todos los requisitos para controlar el polvo en el sitio de la obra y que sepan quién está a cargo. En el sitio de la obra, debe haber un enfoque continuo y activo sobre los aspectos de calidad de aire.
- Periódicamente, evalúe los procedimientos de control de polvo que se estén utilizando para poder identificar nuevas técnicas que se requieran durante el desarrollo de la obra.

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- Cuando esté nivelando terreno, límite el área de cada nivelación. Al reducir la cantidad de superficie perturbada, en cada nivelación se reduce la necesidad de controlar el polvo, se ahorran agua y supresores de polvo.
- Instale barreras contra viento (con menos de 50 por ciento de porosidad). Ponga las barreras alrededor de áreas de almacenaje, lugares de estacionamiento de vehículos, y lugares donde se prepara el equipo y maquinaria pesada.
- Defina áreas semi-permanentes para las actividades de preparación de equipo y maquinaria pesada para así reducir el area perturbada.
- En áreas no pavimentadas, el acceso de vehículos y maquinaria pesada se debe limitar a lo necesario durante el día en transcurso. Limite los viajes innecesarios y también controle la velocidad de los vehículos a 15 millas por hora.
- Las superficies que han sido perturbadas deben ser re-estabilizadas lo antes posible, ya sea aplicando pavimento sobre las vías o sembrando vegetación.

¿Qué es el Residuo o “Trackout”?

- Residuos de tierra, lodo u otros desechos que son depositados en las vías públicas pavimentadas por las llantas de los vehículos que salen del lugar de la obra.
- La tierra u lodo que se adhiere a la parte exterior o inferior de los vehículos que salen de la obra y cae a la vía pública.
- Rastros de tierra o cualquier otro material a granel que cae a la vía pública de los compartimentos traseros de las camionetas cuando el material ha sido cargado de forma impropia.



El *residuo* de una obra que se deposita en las vías pavimentadas se levanta cuando circulan vehículos, formándose una nube de polvo.

Razones Para Prevenir el Residuo

El material particulado grueso (PM10) se genera cuando el *residuo* que se ha depositado sobre el pavimento, se vuelve a levantar hacia la atmósfera debido al paso de las llantas de vehículos. Este fenómeno también se denomina: re-suspensión.

De acuerdo al reglamento 310 del Condado de Maricopa, todas la obras de construcción civil que ocupen un area de trabajo total de 5 acres o más, o que produzcan 100 yardas cúbicas de material transportable al día, deben de utilizar medidas par controlar el *residuo*.



El residuo se puede eliminar de las vías públicas pavimentadas utilizando una hidro-barredora o hidro-aspiradora o barriendo la calle manualmente para eliminar los depósitos.

Maneras de Controlar el Residuo

El *residuo* se puede controlar aplicando las siguientes medidas en todos los puntos de salida hacia las vías públicas pavimentadas:

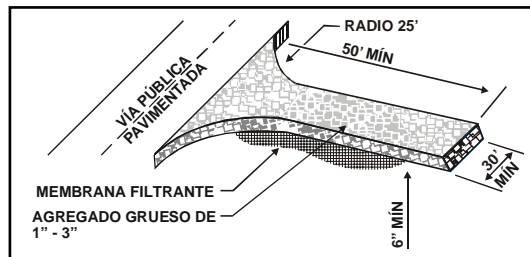
Capas de gravilla - Una capa de gravilla estabilizada constituye una entrada apropiada para la obra. Las capas de gravilla están diseñadas para separar el lodo y la tierra de las llantas de los vehículos que salen del lugar de la obra.

El uso de las capas de gravilla reduce el polvo fugitivo o re-suspendido que se produce por el *residuo* depositado en las calles y superficies pavimentadas. A su vez, el uso de las capas de gravilla puede reducir la necesidad de utilizar barredoras de calles o personal de limpieza para eliminar el *residuo* y también puede reducir la contaminación de las aguas del alcantarillado de lluvias.

Los requisitos del Plan de Control de Polvo señalan que éste tipo de capa estabilizada se debe instalar en todas las entradas y salidas, por donde cualquier material sea transportado dentro o fuera de la obra, o si el tamaño del terreno sobrepasa los 5 acres.

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Diseño de la Capa de Gravilla: Utilice gravilla o roca molida de una (1") a tres (3") pulgadas de diámetro, que sea de tamaño uniforme y esté lavada. Como mínimo, la capa de gravilla debe ser de 30 pies de ancho por 50 pies de largo y tener un mínimo de 6 pulgadas de espesor. Al instalar la capa, asegúrese de que esté nivelada adecuadamente.



Parrilla "Grizzly" - Es un aparato hecho de rieles, tubos o rejillas para separar el elodo, tierra y desperdicios de las llantas y de la parte inferior del chasis de los vehículos que salen de las obras. Un buen ejemplo de parrilla grizzly es la llamada "shaker" inventada por Jeff Lange para la Constructora Kitchell. Este aparato se puede recuperar y volver a utilizar, se puede transportar en una camioneta, es muy fácil de ensamblar y se puede instalar en varios tamaños según las dimensiones de los vehículos de carga.

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Para mas información acerca de la parrilla "shaker" de Consultores Kitchell se puede visitar www.trackoutcontrol.com.

Area Pavimentada – Otra medida para controlar el *residuo* es colocar un area pavimentada que debe extenderse desde el punto de cruce con una vía pública pavimentada hasta un mínimo de 100 pies dentro de la obra. El ancho mínimo debe ser de 20 pies.

Además, si el área pavimentada se extiende 50 pies o más dentro de la vía pública, la limpieza de cualquier *residuo* ocasionado, debe ser inmediata. Si el area pavimentada se extiende menos de 50 pies, la limpieza debe efectuarse ése mismo día dentro de las horas de trabajo. La limpieza se puede realizar con una barredora de calles, con una hidro-barredora o barriendo a mano para deshacerse de los depósitos.

Riego Efectivo

El riego es una técnica muy efectiva para suprimir el polvo. Al aplicarse regularmente sobre las áreas de terreno perturbado, el agua estabiliza la superficie temporalmente y reduce el polvo fugitivo causado por el movimiento de tierras y el movimiento de vehículos en áreas no estabilizadas. El agua también ayuda a compactar los terrenos.

Los permisos de Movimiento de Tierras que expide el Condado de Maricopa requieren que se controle el polvo fugitivo generado por todas las actividades de movimiento de tierras. El riego es una de las formas de controlar el polvo fugitivo.

¿Cuánto riego es suficiente?

- Cuando la vía y las áreas perturbadas se ven húmedas, con mínimo sedimento.
- Cuando el suelo presenta una corteza que no se quiebra al presionar con los dedos.
- Cuando la humedad del suelo se presta para la compactación.
- Cuando las emisiones del polvo visible presentan una opacidad menor del 20%.

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El riego adecuado es una técnica efectiva para el control del polvo.

Algunas Técnicas Efectivas

Antes de Iniciar Cualquier Actividad en la Obra -

- Humedezca el terreno en las áreas de excavación y en las zonas donde se traslada la maquinaria.

Para las Zonas de Actividad -

- Aplique el agua 15 – 30 minutos antes de empezar las actividades de obra.
- Aplique el agua al final del día de trabajo (por ejemplo, sature el área de trabajo desde la noche anterior).
- Riegue antes y después de la nivelación del terreno, con una camioneta de riego.

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- Cuando se esté abriendo trincheras, riegue con un rociador o aerosol.
- Cuando se esté tamizando, rocíe el material que cae del tamiz.

Después de Terminar las Actividades en un Área -

- Aplique agua con frecuencia (mínimo cada dos horas) para evitar las emisiones visibles.
- Para áreas despejadas, los sistemas de barras de riego/rocío automático dan los mejores resultados.
- Para las vías de acceso y descarga no pavimentadas y caminos para equipo pesado:
- Aplique el agua en cantidades suficientes, manteniendo la superficie húmeda.
- No riegue en exceso, el lodo aumenta el *residuo*.

Penetración de Agua -

- Los surfactantes o paliativos añadidos al agua aumentan la penetración del agua, especialmente en suelos arcillosos.

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Durante la apertura de trincheras, aplique el agua utilizando un rociador fino.

Si las camionetas-cisterna no pueden acercarse al área de trabajo debido a la inclinación del terreno u otros factores de seguridad, el riego se debe efectuar con mangueras o sistemas de aspersores. Tenga en cuenta que muchas ciudades no permiten la construcción en terrenos muy inclinados, asegúrese de cumplir con los reglamentos en vigor.

Paliativos de Polvo

Los paliativos de polvo son productos que se aplican a las superficies del terreno para reducir la formación de emisiones de polvo fugitivo. En muchos casos, los paliativos de polvo pueden utilizarse en vez de agua, como una alternativa económica y efectiva.

Hay una variedad de productos disponibles en el mercado. Encontrar un producto que se adapte a las actividades de su obra, puede reducir la necesidad de riego frecuente y ahorrarle gastos a largo plazo. En ciertos casos, la estabilización del terreno que se logra utilizando paliativos de polvo puede durar de 1 a 12 meses.

Algunos paliativos de polvo no están diseñados para áreas que experimentan perturbaciones diarias, tráfico pesado o tráfico de maquinaria pesada – consulte con el vendedor o fabricante del producto si su terreno presenta éstas condiciones.

ESPAÑOL

Asegúrese de obtener la información del vendedor acerca de las especificaciones para diluir el producto, la frecuencia y cantidad de aplicación, debido a que éstas varían mucho dependiendo del tipo de paliativo. Antes de un fin de semana, un día festivo o cualquier otro período de inactividad menor de 5 días, se recomienda utilizar un paliativo que esté diluído no menos de 1/20 de la concentración que se requiere para estabilizar una superficie por 6 meses.

El Condado de Maricopa recomienda el uso de productos no tóxicos y no corrosivos. El contratista es el responsable de asegurar que el uso de paliativos está en cumplimiento con todos los reglamentos ambientales.



El uso de sufactantes puede llegar a ser más económico que el riego para las áreas que experimenten poco o ningún tráfico.

Barreras Contra Vientos

El polvo que se levanta al viento desde una obra de construcción, se denomina polvo fugitivo y está sujeto al Reglamento 310 del Condado de Maricopa.

Las barreras contra vientos se colocan a lo largo de uno o más lados del sitio de la construcción para reducir la cantidad de polvo que vuela fuera de la obra. Para crear una barrera de viento se necesita instalar cercas y construir bermas, o estacionar la maquinaria de manera que bloquee el viento.

Independientemente, éstas barreras no son suficientes para controlar el polvo. Las barreras se deben utilizar conjuntamente con el riego y los productos paliativos. Estas barreras, aumentan la efectividad de las técnicas de riego y aplicación de paliativos.

Las barreras contra viento más efectivas en la obra son:

- De 3 a 5 pies de altura a lo largo de calles y zonas urbanas.
- Fabricadas de un material con porosidad de 50 por ciento o menos.

ESPAÑOL

Las barreras contra viento y las cercas temporales más efectivas para cerramiento de áreas de depósito de materiales son:

- Una estructura de tres lados, con una altura similar al montón de material almacenado.
- Fabricada de un material con porosidad de 50 por ciento o menos.



Las más efectivas deben tener una porosidad de 50 por ciento o menos.

Manejo de Materiales

El manejo de materiales se refiere a varias actividades de movimiento de tierras en las obras de construcción, incluyendo la carga y descarga de materiales. Este tipo de actividades generan importantes cantidades de polvo fugitivo. Sin embargo, el control del polvo durante la carga y descarga se puede lograr si se implementa un plan efectivo y se aplican adecuadamente los controles.

Carga:

- Rocíe el material con agua durante la colocación en montones.
- Mezcle el material excavado con agua antes de cargarlo.
- Vacíe el cargador de la volqueta lentamente y mantenga las cubetas cerca al vehículo durante la descarga.

Transporte:

- Se requieren cubrimientos de lona en los cargadores de las volquetas para evitar que el viento levante polvo.
- No sobrecargue la volqueta! Mantenga la carga 3 a 6 pulgadas por debajo de la caja para reducir los derrames.

ESPAÑOL

Compruebe que los sellos de las volquetas de descarge inferior estén en buen estado y elimine todas las rocas que puedan estar atrapadas en los sellos, causando derrames.

Residuos:

- El aspirado diario o el hidro-barrido es necesario para controlar el *residuo*.
- Instale una capa de gravilla en la entrada de la obra.
- Utilice parrillas “grizzlies” para extraer el exceso de tierra en las llantas de las camionetas o volquetas.



wind blows dust during transport

Los cargadores de las volquetas deben de ser cubiertos con lonas para evitar que el viento levante polvo durante el transporte.

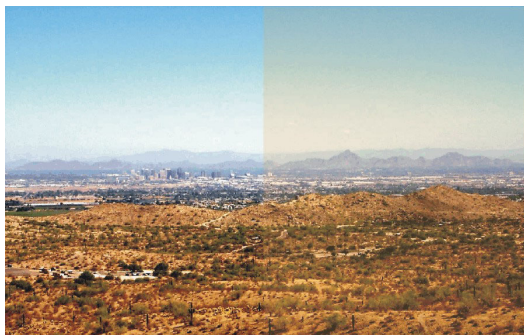
Emisiones Visibles y Opacidad

¿Qué es Opacidad?

Opacidad es la reducción de visibilidad causada por una nube de polvo. El límite estándar de Emisiones Visibles dentro de el Condado de Maricopa es de 20 por ciento de Opacidad.

¿Cuánto es 20 Por Ciento de Opacidad?

Los inspectores del Condado estan entrenados para leer los índices de opacidad, pero hay maneras de estimarlos en el lugar de la obra. Veinte por ciento (20%) de opacidad se presenta como una nube ténue de polvo a traves de la cual Ud. puede observar detalles de fondo fácilmente.



En ésta foto se puede apreciar la marcada diferencia entre la parte izquierda - condiciones del aire limpio, y la derecha - opacidad de 20 por ciento.

¿Cuándo se Necesitan Controles de Emisión Visible?

Las medidas de control de emisiones visibles se deben implementar a lo largo de la duración de las actividades que generen polvo. Tanto las medidas específicas para control de polvo, como las medidas eventuales están incluidas en el Plan de Control de Polvo, que forma parte del permiso regulador de movimiento de tierras de cada obra.

Una obra con permiso debe implementar medidas de contingencia necesarias para evitar que las emisiones visibles lleguen a sobrepasar el límite de un 20 por ciento de opacidad. No debe esperarse hasta que las emisiones lleguen a ese nivel. Se deben tomar precauciones adicionales para prevenir que la nube de polvo cruce el límite de la propiedad.

¿Cuándo se Necesita Aplicar el Límite de Opacidad?

El límite de 20 por ciento de opacidad se aplica en todo momento, excepto cuando el promedio de la velocidad del viento es mayor a 25 millas por hora (24 mph), siempre y cuando todas las demás medidas razonables del Plan de Control de Polvo hayan sido ejercidas.

Las Pruebas de Emisiones Visibles

Los cursos de certificación en lectura de Emisiones Visibles se ofrecen dos veces al año. Se recomienda que todos los superintendentes, administradores de obras y capataces asistan a estos cursos. El personal certificado puede determinar la opacidad y el nivel de cumplimiento con el reglamento de cualquier proyecto. Comuníquese con el Condado de Maricopa, al número (602) 506-6700 para mayor información acerca de las fechas y localidades donde se ofrecen los cursos.



Los participantes de la “Escuela de Humo” aprenden a estimar con precisión el nivel de opacidad de los nubarrones de polvo como éste, causado por el arado de la tierra.



FACT SHEET #1:

Health Impacts of Particulate Air Pollution

Particulate air pollution is a mixture of dirt, soil dust, pollens, molds, ashes, soot and aerosols that remain suspended in the air that we breathe. Coarse particles such as soil dust under 10 microns in diameter (PM_{10}) are caused by human activities such as construction and earthmoving, vehicles driving on paved and unpaved roads, and agricultural tilling and harvesting. Fine particles, measuring less than 2.5 microns ($PM_{2.5}$), are produced primarily by the exhaust from diesel and gasoline engines and other combustion processes.

Particulate air pollution can be harmful to your health. When inhaled, the coarse particles are deposited in the upper respiratory tract of the body. The fine particles can reach the lower pulmonary tissues and invade the alveoli of the lungs. Those at greatest risk from exposure to particulate air pollution are the very young, the elderly, and those with pre-existing heart disease or lung ailments, such as asthma, bronchitis, or emphysema.

In 1995 the Arizona Comparative Environmental Risk Project reported that nearly 1,000 Arizonans die prematurely each year due to particulate air pollution. The Project concluded that particulate air pollution represents one of the highest environmental risks to this State. Fine particulates also contribute to the ugly brown cloud that hangs over the Valley and obscures our blue skies.



FACT SHEET #2:

What Causes Particulate Air Pollution?

Human activities generate most of the airborne particles that we breathe. Some of the activities that create particulate air pollution are:

- Construction and earthmoving operations
- Dust kicked-up by vehicles traveling on paved roads
- Vehicles driving on dirt roads, unpaved shoulders, and vacant lots
- Tilling and other farming activities

The highest levels of particulate air pollution in Arizona are found near highly-populated areas in the desert.

Some particulate air pollution is caused by natural sources. For example, dry conditions are conducive to higher airborne particulates, especially when accompanied by high winds (i.e., 25 mph gusts). But excessive rainfall can also lead to higher particulate pollution, because mud tracked onto the pavement dries and is ejected into the air by moving vehicles.

The undisturbed natural desert produces some particulate air pollution, but the amounts are not high enough to cause health problems. In Arizona, particulate air pollution does not occur during a particular month or season; high levels can occur at any time of the year in the human-disturbed desert.



FACT SHEET #3:

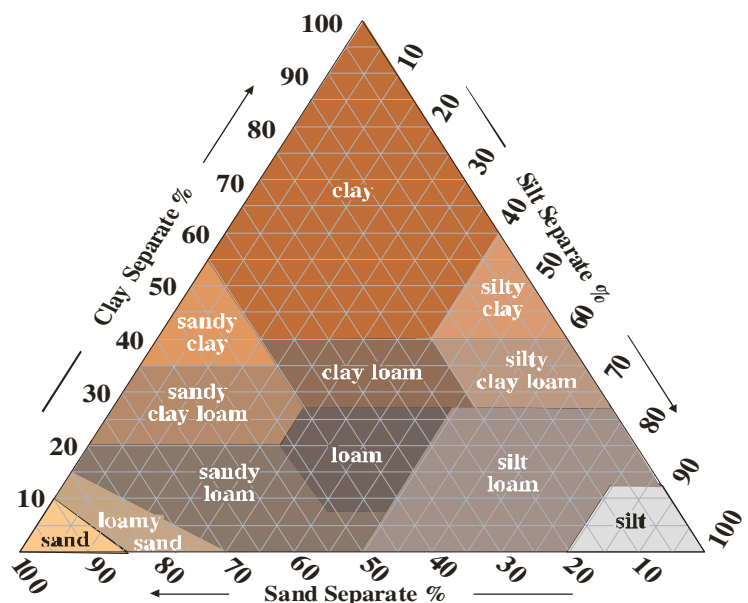
Soil Characteristics

Some soils have the potential to create more particulate air pollution, when disturbed by human activities.

- Clay or clay/silt mixture soils create much smaller particles that stay suspended in the air
- Sandy soils create heavier particles that are more quickly re-deposited on the ground

Before starting construction, a geotechnical analysis should determine the soil texture and the shrink/swell potential of soils that will be disturbed on the site and imported to the site

- If the soils have a high or moderate potential (as shown in the soil texture triangle below) to create PM-10, then water and dust suppressants need to be applied before and during construction
- Similarly, if the soils have a high or moderate shrink/swell potential, then water and a dust suppressants need to be applied before and during construction





FACT SHEET #4:

Standards for Particulate Air Pollution

Federal air quality standards for particulate air pollution have been established to protect public health. There are two federal standards; one for PM-10 (particles smaller than 10 microns) and one for PM-2.5 (particles smaller than 2.5 microns). Neither of these tiny particles would be visible to the naked eye; a PM-10 particle is about one-seventh the diameter of a human hair. Most of the PM-10 particles are produced by rocks and soils. The soil particles in PM-10 are usually silt and clay. PM-2.5 particles are usually emitted by combustion sources and are formed from gases.

Ten areas in Arizona have violated the federal air quality standards for particulate air pollution (PM-10). These are called PM-10 nonattainment or maintenance areas. No area in Arizona has exceeded the federal standards for the smaller particles (PM-2.5).

The Phoenix metropolitan area is the only **serious** nonattainment area for PM-10 in the state. Other PM-10 nonattainment or maintenance areas in Arizona include Ajo, Bullhead City, Douglas, Miami-Hayden, Nogales, Paul Spur, Payson, Rillito, and Yuma.



FACT SHEET #5:

Site Planning

Take time to consider dust control issues before beginning your project in order to save time, money, and project resources. Identify site-specific air quality and dust control issues up front and develop a consensus for addressing these issues. Phase your project and plan your site layout to minimize disturbance of the soil. Action items include:

- Make sure everyone working on the job knows who's in charge and all the requirements for dust control. Encourage a proactive and continuous focus on air quality issues on the job site.
- Evaluate dust control procedures periodically to identify additional issues that develop as the job progresses.
- Limit the amount of area graded at any one time. Lessening the amount of surface being disturbed at any one time reduces the amount of control required and the amount of water or dust suppressant needed.
- Install wind fences or barriers (less than 50 percent porosity). Place barriers around storage piles, parking, and equipment staging areas.
- Develop semipermanent staging areas to cut down on the amount of disturbed area.
- Restrict access on unpaved areas to vehicles and equipment that are necessary that day. Limit unnecessary travel on unpaved surface areas.
- Restabilize disturbed surfaces by paving permanent roads and restoring vegetation as soon as possible.



FACT SHEET #6:

Bulk Material Handling

Material handling refers to many types of earthmoving activities on construction sites, including loading and hauling. These types of activities can be significant sources of fugitive dust. However, dust control during loading and hauling can be easily achieved through careful planning and proper implementation of controls.

Loading:

- Mist material with water while stacking.
- Mix excavated material with water prior to loading.
- Empty loader slowly and keep bucket close to the truck while dumping.

Hauling:

- Tarps are required on haul trucks to prevent windblown dust.
- Do not overload the truck! Keep your load 3 to 6 in. below the freeboard to minimize spillage.
- Check belly-dump truck seals regularly and remove any trapped rocks to prevent spillage.

Trackout:

- Daily vacuuming or wet broom cleaning is required to control trackout.
- Install a gravel pad at the access point to your site.
- Use grizzlies to remove excess dirt from trucks.



FACT SHEET #7:

Vehicles and Motorized Equipment

Vehicles and motorized equipment traveling on unpaved surfaces create particulate air pollution. To minimize the creation of dust from unpaved haul and construction site access roads, limit vehicle speeds to 15 mph and the number of vehicle trips to 20 per day. If this is not possible,

- Water should be applied so the surface is kept visibly moist,
- Gravel or recycled asphalt should be applied and maintained,
- A suitable dust suppressant should be applied and maintained, or
- The haul or access road should be paved

To control dust from unpaved parking lots and staging areas on construction sites

- Apply and maintain surface gravel, recycled asphalt, or other suitable material,
- Apply and maintain a dust suppressant, or
- Pave the lot/staging area

To keep vehicles off of vacant areas not intended for travel

- Install no-trespassing signs or
- Install other physical barriers such as curbs, fences, gates, posts, shrubs or trees to prevent access



FACT SHEET #8:

Wind Barriers

Wind barriers are placed along one or more sides of a job site to reduce the amount of windblown dust leaving the site. Creating a wind barrier could involve installing wind fences, constructing berms, or parking onsite equipment so that it blocks the wind. Alone, these barriers are not adequate for controlling dust. Wind barriers must be implemented together with the application of water or dust palliatives. These barriers increase the dust control effectiveness of water or palliative application.

Maricopa County Earthmoving Permits require that fugitive dust generated from all earthmoving activities be controlled.

Effective wind barriers/fences on the job site are:

- 3 to 5 feet high adjacent to roads and urban areas
- Made of material with a porosity of 50 percent or less.

Effective wind barriers / temporary enclosures for storage piles are:

- A three-sided structure as high as the pile
- Made of material with a porosity of 50 percent or less.



FACT SHEET #9:

What is Trackout?

Trackout is:

- Dirt, mud, or other debris tracked onto a paved public road by a vehicle leaving a construction site.
- Dirt and mud adhering to the exterior or undercarriage of a vehicle leaving a construction site that falls onto a paved public road.
- Traces of dirt or other bulk material that spill onto a paved public road from an improperly loaded haul truck leaving a construction site.

Particulate matter (PM₁₀) is caused when the material deposited on the pavement is lifted back into the atmosphere—or “reentrained”—by the tires of vehicles passing over it. A large portion of the PM₁₀ in the Valley’s air is caused by vehicle reentrainment.

Under Maricopa County Rule 310, control of trackout is required for all work sites having a disturbed surface area of at least five acres or from which 100 cubic yards of materials are hauled each day. Trackout can be controlled using any of the following at all exits onto paved public roads:

Gravel Pad - A stabilized construction entrance, designed to remove mud and

dirt from the tires of vehicles as they leave the construction site. The gravel

pad should be at least 30 feet wide by 50 ft. long, and a minimum of 6 in. deep. One to 3-in. diameter, washed gravel or crushed rock should be used. It is important that the gravel pad be properly graded.

Grizzly - A device using rails, pipes or grates to dislodge mud, dirt and debris from the tires and undercarriage of vehicles prior to leaving the work site. An example of a grizzly is the “shaker” invented by Jeff Lange for Kitchell Contracting. This device is reusable, transportable by pickup truck, easy to assemble, and can be expanded to accommodate various sizes of haul vehicles. More information about the shaker device can be obtained at www.trackoutcontrol.com.

Paving - The paved surface must extend from the point of intersection with a paved public roadway at least 100 ft. back onto the site and have a width of at least 20 ft.

In addition, cleanup of trackout must be done immediately if it extends 50 linear feet or more onto the paved public road. Otherwise, the trackout must be cleaned up by the end of the workday. Cleanup may be performed with a street sweeper or wet broom or by manually sweeping up the deposits.



FACT SHEET #10:

Gravel Pads

A gravel pad is a stabilized construction entrance, designed to remove the mud and dirt from the tires of vehicles leaving a construction site.

Using gravel pads reduces fugitive dust caused by trackout onto paved roads and surfaces. The use of such pads may also reduce the need for street sweepers or laborers to remove trackout from paved surfaces, as well as help prevent storm water pollution.

Dust Control Plans require that stabilized construction entrances be installed at all access points if any material is to be hauled on or off the site, or if the site is larger than 5 acres.

GRAVEL PAD DESIGN:

Use one inch (1") to three inches (3") in diameter, washed, well-graded gravel or crushed rock. The gravel pad should be at least 30 ft. wide by 50 ft. long, and a minimum of 6 in. deep. When installing the gravel pad, make sure that it is properly graded.



FACT SHEET #11:

Erosion Control

Measures to Reduce Erosion

The following temporary measures are useful for controlling soil erosion during construction:

- Vegetative Cover
- Mulch
- Surface Roughening
- Irrigation
- Spray-On Adhesives
- Calcium Chloride
- Stone
- Barriers

These same measures are also effective in reducing airborne dust particles that contribute to particulate air pollution.

Planting **vegetative cover** re-stabilizes disturbed surface areas that will not be brought to final grade for more than 30 days. Examples include trees, shrubs, vines or ground covers. Seeding reduces erosion and decreases sediment yield. These techniques also provide wildlife habitat and enhance the natural beauty of the area.

Mulch is applied to the soil surface to conserve a desirable soil property or to promote plant growth. A surface mulch is one of the most effective means of controlling runoff and erosion on disturbed land. Some organic mulches include straw, hay, corn stalks, bark chips, and fiber mulch.

Surface roughening during tillage reduces runoff, increases infiltration, and traps sediment. This practice is designed to roughen and bring clods to the surface. Plowing is done on the windward side of the site with chisel-type plows spaced 12 inches apart. This is generally done as an emergency measure before wind erosion starts.

Irrigation is the most commonly used erosion and dust control practice. The site is sprinkled with water until the surface is wet and this is repeated, as needed. This offers fast protection for haul roads and other heavy traffic routes.

Spray-on adhesives are most effective in controlling erosion of mineral soils. Many are able to withstand heavy traffic loads. Some examples are asphalt emulsion, latex emulsion, resin in water, and acrylic emulsion.

Calcium chloride may be applied with a mechanical spreader as loose, dry granules or flakes at a rate that keeps the surface moist, but not so high as to cause water pollution or plant damage.

Stone applied to entrances and exits of a construction site will prevent tracking or flow of mud onto paved public rights-of-way. This may require periodic top dressing with additional stone, the washing and reworking of stone, and repair of any structures used to trap sediment as conditions demand. Generally, 2-3 inch stone is applied.

Barriers that decrease erosion and dust include board, wind, and sediment fences. If placed perpendicular to prevailing air currents, these help to control blowing soil.



FACT SHEET #12:

Effective Watering

Watering is a very effective dust suppressant. When applied regularly, water provides temporary stabilization to disturbed surface areas and reduces fugitive dust caused by earthmoving and driving on nonstabilized surface areas. Water also aids in compaction.

Maricopa County Earthmoving Permits require that fugitive dust generated from all earthmoving activities be controlled. Watering is one way to control fugitive dust (see your Dust Control Plan).

How much watering is enough?

- Roads and disturbed surfaces visibly appear moist with minimal silt.
- Soil has a crusted surface and is not easily crumbled between your fingers.
- Soil moisture content is optimum for compaction.
- Visible emissions are less than 20 percent opacity.

SOME TECHNIQUES THAT MAY WORK

Prior to Any Activity on Site:

- Wet the area to depth of cuts or equipment penetration.

For Active Operations:

- Apply water 15-30 minutes before starting operations.
- Apply water at the end of the day (e.g. soak overnight the next day's work area).
- During grading, water using a water truck.

- During trenching, water using a fine spray or mist.
- During screening, mist material after it drops from the screen.

After Clearing an Area:

- Apply water in sufficient frequency to prevent visible emissions (at least every 2 hours).
- Automatic sprinkler/spray bar systems are optimal in these areas.

For Unpaved Haul Roads/Access Roads/Equipment Paths:

- Apply water in sufficient quantity to maintain a moist surface.
- Don't over water—muddy conditions increase trackout.

Water Penetration

- Surfactants or palliatives added to water increase penetration.

If the area is inaccessible to water trucks due to slope conditions or other safety factors, watering should be conducted with water hoses or sprinkler systems. Remember: many cities have restrictions for construction on sloped areas—be sure you comply with those as well.



FACT SHEET #13:

Dust Suppressants

Dust suppressants are products that are applied to soil surfaces in order to limit the creation of fugitive dust emissions. A variety of products are available, and finding one that fits your project's activities can reduce the amount of watering needed for dust control. Over the long term, using dust suppressants can result in significant cost savings compared to regular, frequent watering. In some instances, the resulting soil stabilization can last from 1 to 12 months.

Some dust suppressants are not designed for areas subject to daily disturbances, high volume traffic, or heavy equipment traffic—check with the product vendor if these conditions exist at your site.

Maricopa County Earthmoving Permits require that fugitive dust generated from all earthmoving activities be controlled. For many projects, dust palliatives can be an effective and economical alternative to watering.

Be sure to ask the product vendor for the recommended dilution, application rate, and application frequency of the product you choose because these vary significantly by product. Before a weekend, holiday, or other inactive period of less than five days, a dust palliative that is diluted to not less than 1/20 of the concentration required to stabilize a surface for six months is recommended.

Maricopa County recommends the use of non-toxic, non-corrosive products. A contractor is responsible for assuring that its use of dust suppressants is in compliance with all applicable environmental laws.



FACT SHEET #14:

Visible Emissions and Opacity

What is Opacity?

Opacity is the reduction in visibility caused by a cloud of dust. The standard limitation for visible emissions within Maricopa County is 20 percent opacity.

How Much is 20 Percent Opacity?

County inspectors are trained to read opacity, but there are ways that you can estimate opacity on the job. Twenty percent (20%) opacity is a faint cloud of dust through which you can readily see background details.

When Are Controls of Visible Emissions Required?

Measures controlling visible emissions must be implemented during all periods of dust generating operations. The specific dust control measures, including contingency measures, are contained in the Dust Control Plan which is part of each regulated site's earthmoving permit.

A regulated site should implement contingency measures as necessary to prevent visible emissions from reaching 20% opacity, rather than waiting until emissions reach that level. Additional precautions should be taken to prevent the dust cloud from crossing the property line.

When Does the Opacity Limitation Apply?

The 20 percent opacity limitation applies at all times except when the average wind speed is greater than 25 miles per hour, provided that all reasonably available control measures contained in the approved Dust Control Plan are in place.

Visible Emissions Testing

The Arizona Department of Environmental Quality (ADEQ) holds classes twice a year in various locations throughout the state to train and certify individuals in reading opacity. While not mandatory, all construction superintendents, project managers, and foremen are encouraged to attend. Becoming certified enables you to determine your project's level of compliance with opacity guidelines or requirements. Contact ADEQ at (602) 506-6700 for details on class times and locations.



FACT SHEET #15:

What's Being Done to Control Dust in Maricopa County?

A 3,000 square-mile area including the urbanized areas of Maricopa and Pinal Counties has been designated a “Serious” nonattainment area, because it does not meet the federal health standards for particulate air pollution (PM₁₀). In addition to the negative health effects, being a nonattainment area is a stigma that can slow economic growth and development.

A PM₁₀ Plan for Maricopa County was approved by the U.S. Environmental Protection Agency on July 25, 2002. The plan shows that the area will attain the Federal PM₁₀ standards by the end of 2006. The Plan has 77 measures to reduce particulate air pollution from significant sources such as agriculture, wood burning, driving on paved and unpaved roads, vacant lots, gasoline and diesel exhaust, and fast-food restaurants. The measure that is most effective in reducing particulate air pollution is Maricopa County’s Dust Control Rule 310. By 2006, Rule 310 is expected to reduce airborne particulates produced by construction sites and other earthmoving sources by 72 percent.

Compliance with Rule 310 is essential for the Valley to meet the federal air quality standards. If we don’t, there will be serious consequences, such as the loss of Federal dollars needed to build highways and light rail. And Maricopa County residents and visitors will continue to breathe particulate air pollution. So it is important for every construction site to do its part to comply with Rule 310 and “bust the dust.”

Part I.

Why Do We Need
to Control Dust?



I-1. DUST CAN CREATE PARTICULATE AIR POLLUTION

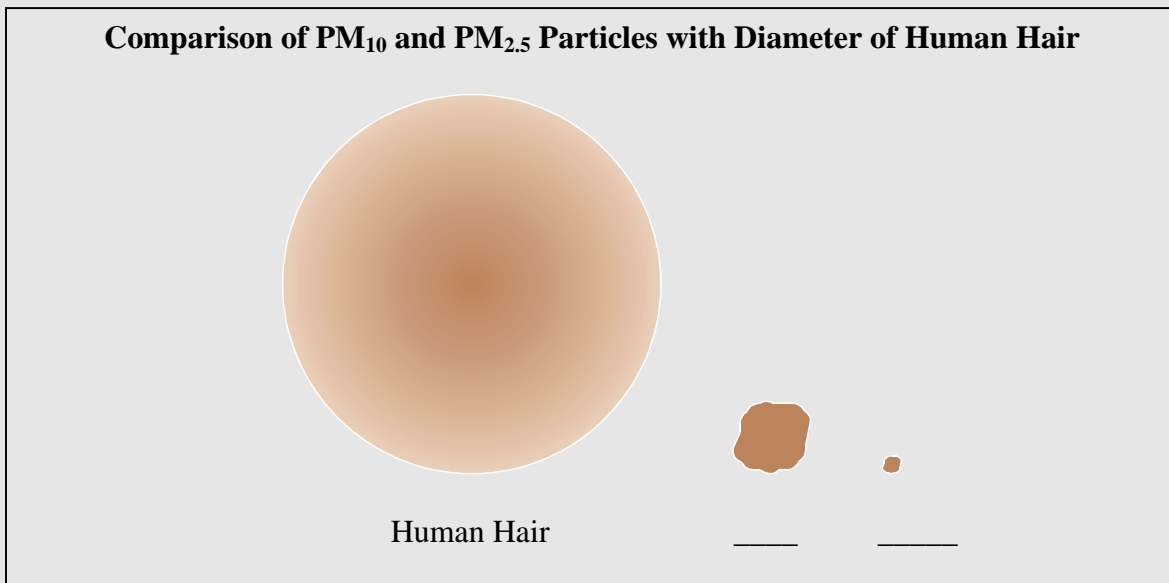
Fine particulates are invisible solids or liquid droplets that remain suspended in the air. In addition to dust, fine particulates can be formed from pollen, mold, ash, soot, and gases. The federal government has set standards for fine particulates to protect public health: Particulate matter smaller than 10 microns in diameter are referred to as PM_{10} , and those smaller than 2.5 microns in diameter are referred to as $PM_{2.5}$.

PM_{10} is primarily geologic materials such as rock and soils. Soil particles from 4 to 10 microns in diameter are typically silt, and those less than 4 microns in diameter are clay particles. The even smaller $PM_{2.5}$ particles are usually emitted by combustion sources and formed by gases. In addition, some clay soil particles are smaller than 2.5 microns in diameter.

EXERCISE I-1. PARTICULATE AIR POLLUTION

Fine particulates are _____ that remain suspended in the air.

Besides dust, fine particulates can be formed from _____



PM_{10} is primarily composed of _____

$PM_{2.5}$ is usually emitted by _____

I-2. PARTICULATE AIR POLLUTION CAN BE HARMFUL TO YOUR HEALTH

When inhaled, coarse particles (between 2.5 and 10 microns) are deposited in the upper respiratory tract. The smaller particles (less than 2.5 microns) can be deposited lower, in the pulmonary tissues, and invade the alveoli of the lungs. These more invasive particles can bond with toxins and other airborne chemicals before they are inhaled. It is difficult for the human body to eject the fine particles, once they are deposited in the lower lungs.

In the lungs, PM decreases breathing efficiency and alters the body's natural defense systems. Highly sensitive groups include the elderly, asthmatics and children. Epidemiological studies have shown causal relationships between high particulate concentrations and increased mortality and morbidity.

Medical studies have shown that higher PM₁₀ concentrations can be linked to an increased number of premature deaths, asthma attacks, hospital admissions, and emergency room visits, and an overall decrease in lung functioning efficiency.

In 1995, the Arizona Comparative Environmental Risk Project ranked particulate pollution as one of the highest environmental risks in the state. This conclusion was based on increased hospital admissions for respiratory problems, asthma, and lower and upper respiratory symptoms, due to high annual PM₁₀ concentrations. In the same study, premature deaths due to PM₁₀ were estimated to approach 700 per year in Maricopa County and 1,000 per year statewide.

Construction Activities Can Create Crystalline Silica Dust

One particularly dangerous form of particulates found on construction sites is crystalline silica dust. Crystalline silica is found in common materials such as concrete, masonry, sand, quartz and granite rock. Inhaling dust produced from these materials can cause permanent lung damage, called silicosis. Silicosis is responsible for about 300 deaths per year in the U.S. OSHA and the Arizona Division of Occupational Safety and Health are so concerned about the non-reversible health effects of silicosis that they are providing local training on how to control silica dust at construction sites.



Other Impacts of Particulate Air Pollution

In addition to the health impacts, the smallest particulates (PM_{2.5}) are a constituent of the “brown cloud” that hangs over the Valley and obscures our blue skies on many mornings of the year. Scientific measurements by the Arizona Department of Environmental Quality indicate that visibility has not improved in the Phoenix metro area since 1994. PM_{2.5} also contributes to the regional haze that reduces visibility at wilderness areas, parks, and other pristine areas located downwind of Maricopa County. On a more localized level, particulates from construction sites, vacant lots and fields, blowing across public or private roads can reduce visibility. As a secondary impact, high levels of dust are also responsible for soiling clothes, vehicles, buildings, and other public and personal property and the resultant cleaning and repair costs.

EXERCISE I-2. IMPACTS OF PARTICULATE AIR POLLUTION

When inhaled, particulates _____

Groups at greatest risk to health impacts of particulate air pollution are _____

For every 10 $\mu\text{g}/\text{m}^3$ increase in PM_{10}

- Premature deaths increase by _____%
- Asthma cases increase by _____%
- Hospital admissions for respiratory disease increase by _____%
- Emergency room visits increase by _____%
- Lung function decreases by _____%

Every year, about _____ deaths in Arizona are caused by high concentrations of fine particulates in the air

Exposure to _____ can result in irreversible lung damage – called silicosis.

Silicosis is responsible for about _____ deaths in the U.S. annually.

What are some other impacts of Particulate Air Pollution?

I-3. WHAT CAUSES PARTICULATE AIR POLLUTION?

Particulates are emitted into the air by both natural events and human activities, including

- Construction and earthmoving operations
- Reentrainment of dust by vehicles traveling on paved roads
- Vehicles driving on unpaved roads, unpaved parking lots and vacant lots
- Agricultural activities
- Sustained winds greater than 15 mph
- Gusting winds greater than 25 mph
- Drought
- Excessive rainfall

Human Sources of Particulate Air Pollution

People are responsible for most of the particulates present in the air that we breathe; in urban areas, humans contribute at least 60 percent of the PM₁₀ air pollution problem.

Engine exhaust from on-road vehicles and off-road equipment emits a large proportion of the smallest particles (PM_{2.5}). About one-half of the PM_{2.5} is emitted in gasoline exhaust; another 15% comes from diesel exhaust. Emissions from older, poorly tuned vehicles and engines starting up in the colder fall and winter mornings are the major sources of PM_{2.5} in Maricopa County.

The major sources of the slightly larger, although still invisible, PM₁₀ particles in the Valley are construction and earthmoving operations, re-entrainment of fugitive dust by vehicles driving on paved roads (large trucks, in particular, can create a sizable “wake”), vehicles driving on unpaved roads (especially at high speeds), agricultural activities, and vacant lots. Winds greater than 15 mph can whip-up the human-disturbed dust and cause exceedances of the 24-hour PM₁₀ standard. Activities that cause persistently high PM₁₀ in the same location can cause violations of the annual PM₁₀ standard. Agricultural tilling and vehicles on paved and unpaved roadways can contribute to high PM₁₀ concentrations.

Natural Sources of Particulate Air Pollution

Winds sweeping over the natural desert around us contribute some of the airborne particulates, although not as much as you might think. The vegetation in the desert and the crust that forms after rains tends to put a natural “lid” on fugitive dust. In addition, sustained high winds exceeding 15 mph only occur on a few days each year. PM measurements taken at the relatively pristine Organ Pipe Cactus National Monument in southeastern Arizona indicate that natural conditions represent about 20% of the standards. That is, about 10 µg/m³ of the 50 µg/m³ annual standard for PM₁₀ is prevalent in the atmosphere as a result of natural desert terrain. PM₁₀ emitted by natural sources (i.e. dust devils, pollen from plants) is generally higher in an urban environment, usually in the range of 30-40 percent of the standard. The remaining concentrations can be attributed to human activities that have disturbed the soil or re-suspended the dust back into the air.

EXERCISE I-3. SOURCES OF PARTICULATE AIR POLLUTION

Particulates are emitted into the air by _____ sources.

IDENTIFY THE SOURCES OF PARTICULATE AIR POLLUTION

Source	Human-Caused	Natural
Reentrainment of dust by vehicles traveling on paved roads		
Sustained winds greater than 15 mph		
Vehicles driving on unpaved roads, unpaved parking lots and vacant lots		
Agricultural activities		
Gusting winds greater than 25 mph		
Construction and earthmoving operations		
Drought years		
Salt River Basin		
Excessive rainfall		

I-4. SOIL CHARACTERISTICS THAT PRODUCE PARTICULATE AIR POLLUTION

Some soil types are more conducive to the creation of particulate air pollution than others. When disturbed by human activities, for example, clay or clay/silt mixture soils create much smaller particles that stay suspended in the air. On the other hand, sandy soils create heavier particles that are more quickly re-deposited on the ground.

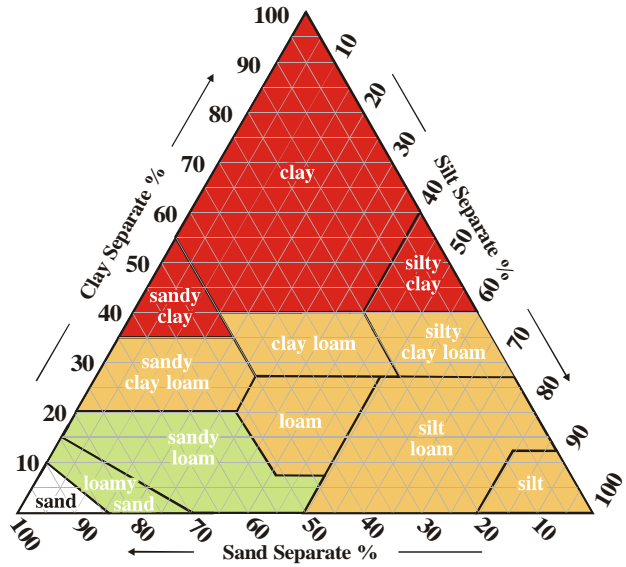
Before beginning any demolition or earthmoving activities, a geotechnical analysis should be performed to determine both the texture and the shrink/swell potential of the soil onsite. Such an analysis applies to both soils existing onsite that will be disturbed and soils being imported to the site.

Soil Texture and Shrink/Swell Potential

Soil texture refers to the relative amounts of sand, silt, and clay particles contained in the soil. These particles are defined as follows: Particles less than 2 microns in diameter are considered clay. Those between 2 and 50 microns in diameter are defined as silt, and those between 50 and 2,000 microns in diameter are sand. Anything over 2,000 microns (2 millimeters) in size is considered gravel.

The extent to which soil shrinks as it dries or swells when wet is affected by the amount of clay in the soil. Shrink/swell potential is defined as the relative change in volume anticipated in the soil material with changes in the moisture content. Clay soils retain more water, while sandy soils drain water more easily.

For particulate air pollution control purposes, soils are divided into four shrink/swell potential categories: severe, moderate, slight, and very slight. On shrink/swell potential maps and other graphics, severe soils are shown in red, moderate soils in gold, slight soils in green, and very slight soils in tan. This soil textural triangle depicts the different types of soils having the four different shrink/swell characteristics.

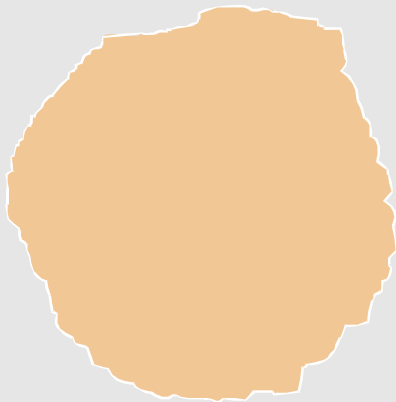


Source: Nebraska Earth Science Education Network (NESEN), University of Nebraska-Lincoln

EXERCISE I-4. SOIL CHARACTERISTICS

- Clay or clay/silt mixture soils create _____ particles that stay suspended in the air
- Sandy soils create _____ particles that are more quickly re-deposited on the ground

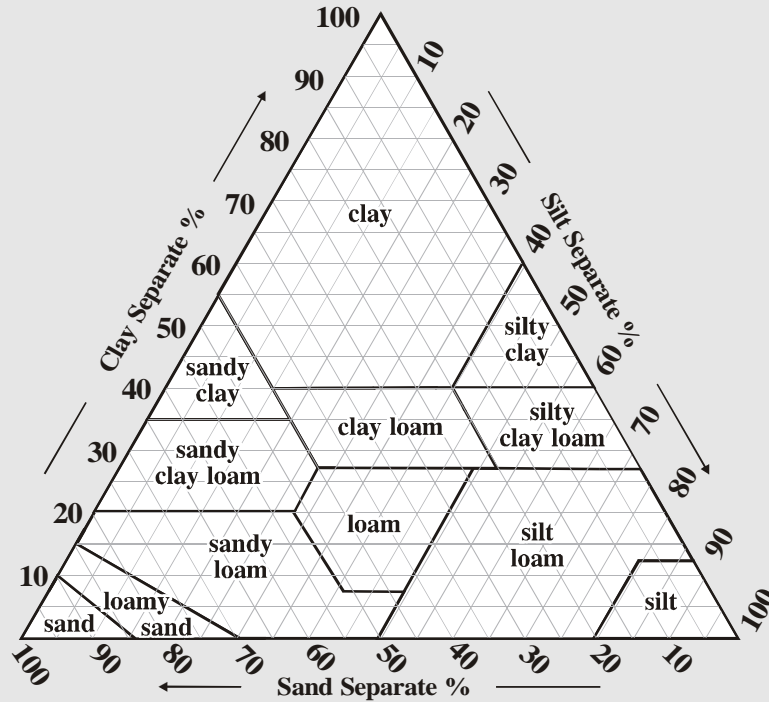
List the Relative Sizes of Sand, Silt, and Clay Particles



Before starting construction, a geotechnical analysis should be performed to determine:

And _____.

Shade the types of soils that are “moderate” or “severe” in terms of producing particulate air pollution in the Soil Textural Triangle below. These soils may require the use of dust palliatives and water to control fugitive dust adequately.



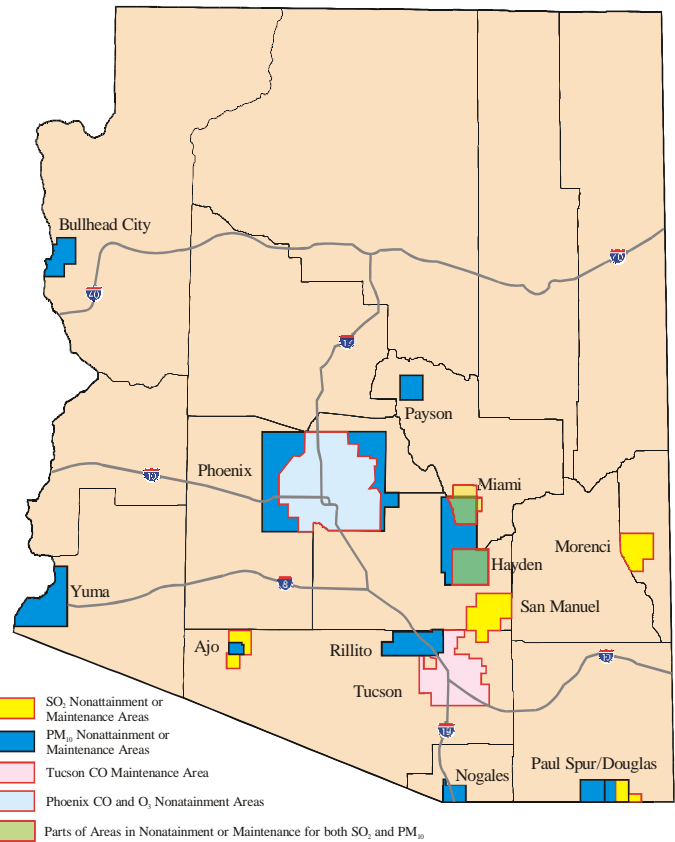
I-5. NATIONAL AMBIENT AIR QUALITY STANDARDS FOR PARTICULATE AIR POLLUTION

There are two federal standards for PM₁₀ and PM_{2.5}: an annual and a 24-hour standard. Maricopa County does not violate either of the PM_{2.5} standards, but violates both the annual and daily standards for PM₁₀.

The Arizona Department of Environmental Quality (ADEQ), in cooperation with county and local agencies, prepares air quality plans for most areas of the state, except Phoenix and Tucson. The ADEQ submits nonattainment and maintenance plans to EPA for approval. If a required plan is disapproved or is not complied with, EPA may impose sanctions on the development of new industries likely to be sources of air pollution and on federal transportation funding.

Nonattainment and Maintenance Areas in Arizona

An area is designated “nonattainment” if it violates the National Ambient Air Quality Standards (NAAQS) for one or more pollutants. The EPA makes this designation on the basis of multiple years of air quality monitoring data that show a standard is consistently violated. Nonattainment areas boundaries sometimes follow political boundaries (i.e. counties) or may be delineated on the basis of other factors (i.e. census urbanized areas), agreed upon by the Governor and EPA. Fourteen areas in Arizona have been designated by EPA as nonattainment or maintenance areas for carbon monoxide, ozone (one-hour standard), PM₁₀, or sulfur dioxide. No areas in Arizona violate the federal standards for PM_{2.5}.



A nonattainment area may be classified as marginal, moderate, serious, severe, or extreme, depending upon the pollutant and the severity of the NAAQS violations.

Benefits of Controlling Construction Dust

Controlling construction dust

- Protects health of construction workers
- Improves health of the young, elderly and asthmatics
- Reduces dust complaints
- Enhances community “good will”

EXERCISE I-5

The two federal standards for PM₁₀ and PM_{2.5} are _____ and _____.

EPA has designated _____ areas in Arizona as “nonattainment” because they have violated the federal standards for PM₁₀

_____ areas in Arizona violate the federal standards for PM_{2.5}

List two of the four benefits of controlling construction dust:

1. _____

2. _____



What is Particulate Matter?

- **Tiny solids or liquid droplets that remain suspended in the air**
- **Dust, pollen, mold, ash, soot, aerosols**
- **PM₁₀ = particulates smaller than 10 microns**
- **PM_{2.5} = particulates smaller than 2.5 microns**
- **A human hair is about 70 microns**

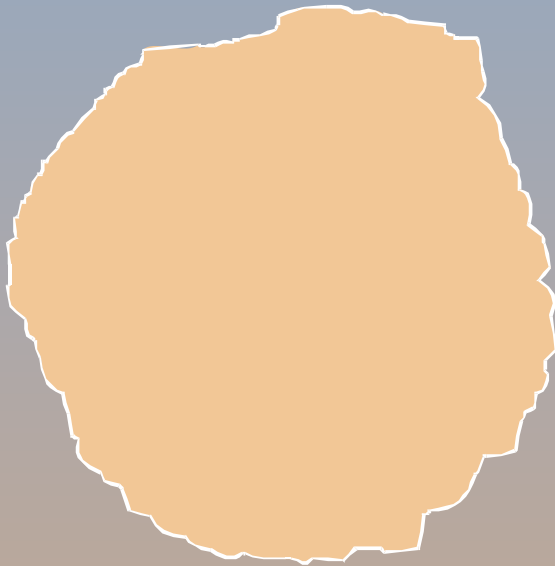
PM₁₀

- Primarily geologic materials; rock and soils
- Soil particles are typically silt (4-10 microns) and clay particles (<4 microns)
- Smaller PM_{2.5} particles represent about 25 - 30 percent of PM₁₀ in urban areas

PM_{2.5}

- Usually emitted by combustion sources and formed by gases
- Small fraction made up of clay soil particles smaller than 2.5 microns in diameter

Soil Particle Sizes



Sand (2000 - 50) μm



Silt (50 - 2) μm



Clay <2 μm

National Ambient Air Quality Standards for PM_{10} and $PM_{2.5}$

- Two federal standards for PM_{10} and $PM_{2.5}$
 - Annual
 - 24-hour or daily
- Maricopa County does not violate either of these standards for $PM_{2.5}$
- But Maricopa County violates both the annual and 24-hour standards for PM_{10}

How PM Is Monitored

- PM_{10} and $PM_{2.5}$ are monitored using samplers sited near major sources
- In Maricopa County in 2000
 - Seven $PM_{2.5}$ monitors
 - Nineteen PM_{10} monitors
- Collect PM over a 24-hour period, typically every 6 days
- Daily measurements are averaged over a calendar year to calculate annual concentrations

How Violations Are Measured

- **Annual Standard**

- The three-year average of annual means at a monitor must be greater than the standard

- 15 ug/m³ for PM_{2.5}
 - 50 ug/m³ for PM₁₀

- **24-Hour Standard**

- Expected number of exceedances of the standard when averaged over a three-year period is greater than 1.0

- 35 ug/m³ for PM_{2.5}
 - 150 ug/m³ for PM₁₀

Central Phoenix Air Monitoring Site



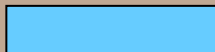
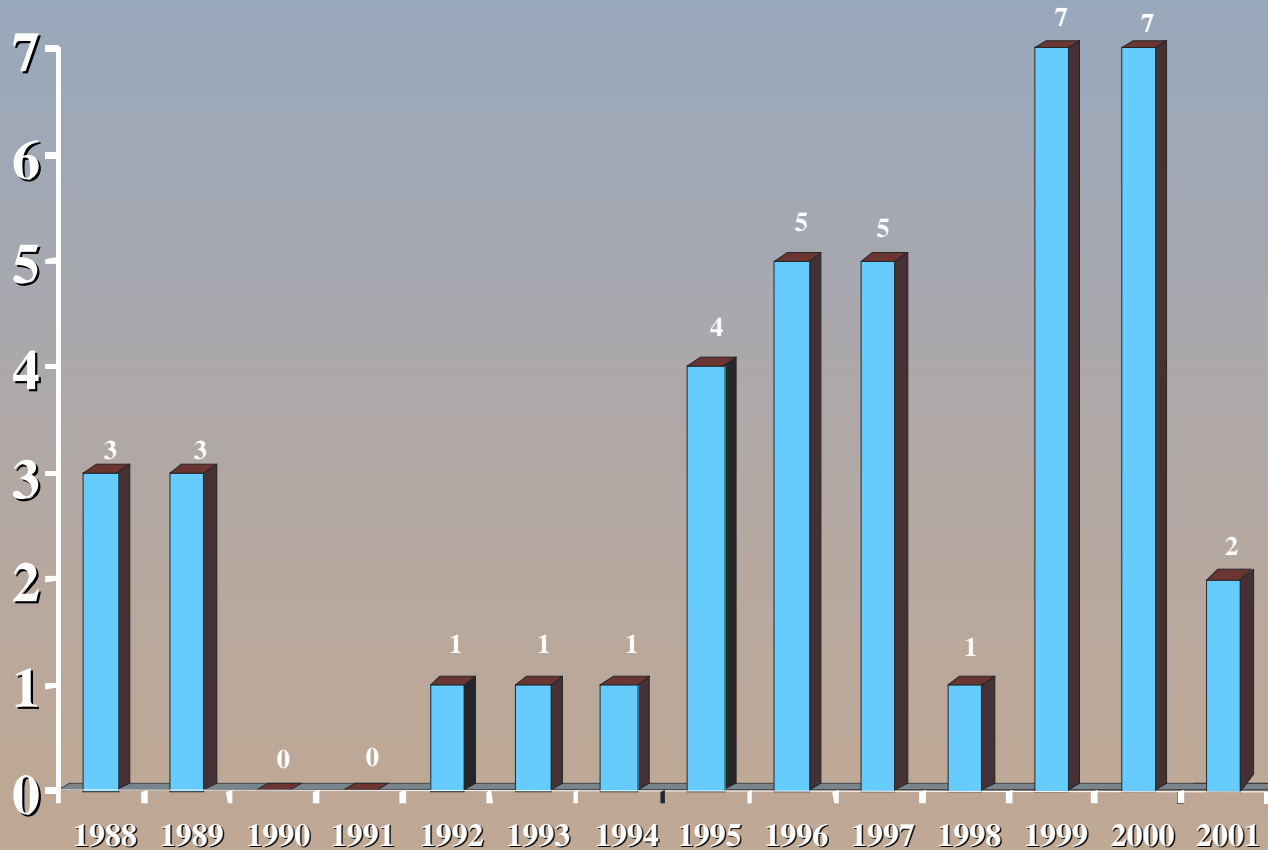
Source: Maricopa County Environmental Services Department

Trends in PM Concentrations

- $PM_{2.5}$
 - No violations of the $PM_{2.5}$ standards have ever been recorded in Maricopa County
 - Trend is likely to continue
- PM_{10}
 - The number of sites exceeding the annual standard and days exceeding the 24-hour standard have not declined in recent years

PM₁₀ Trends

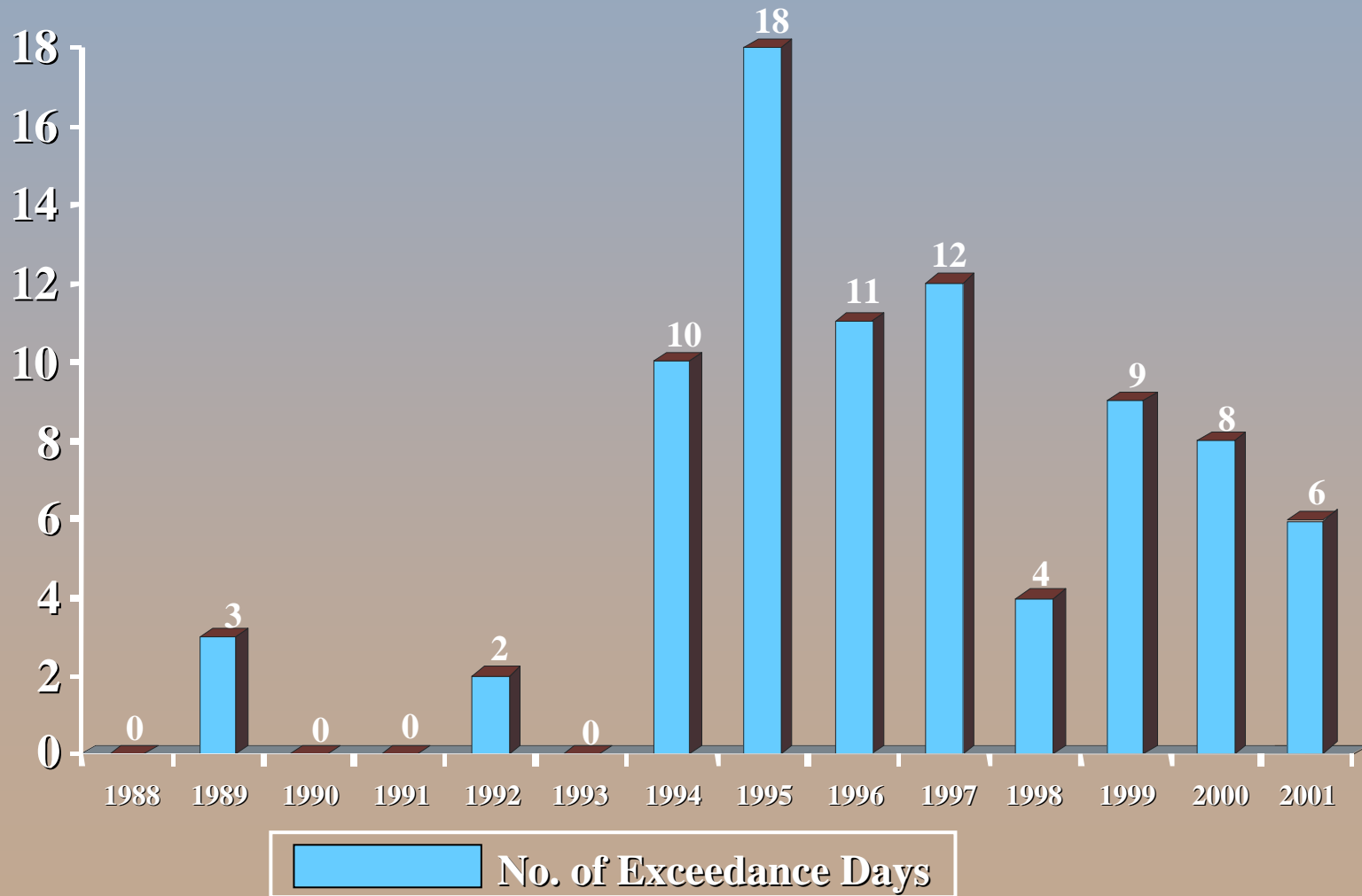
Sites Exceeding the Annual Standard



No. of Sites Exceeding the Annual Standard of 50 ug/m³

PM₁₀ Trends

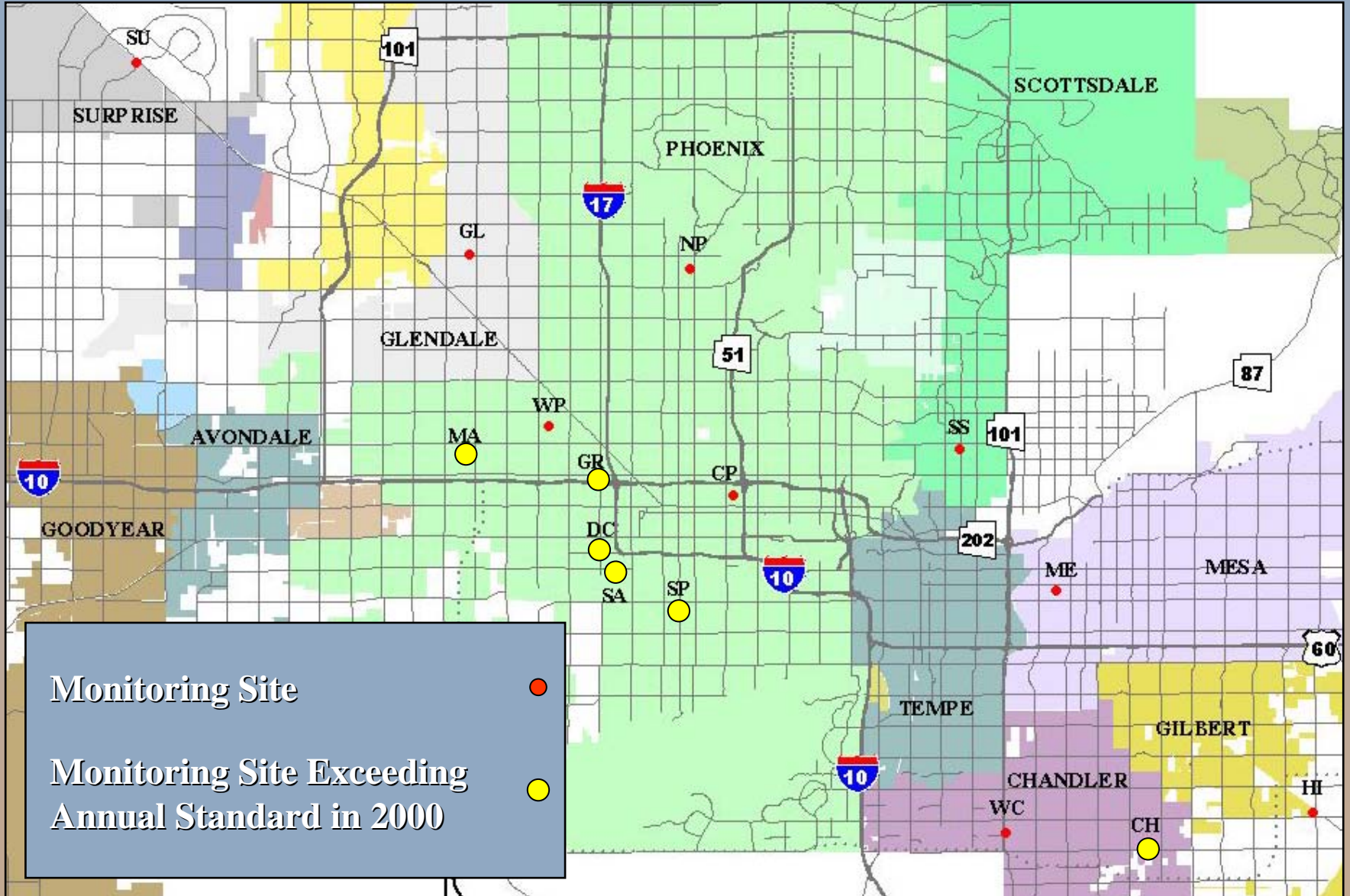
Days Exceeding the 24-Hour Standard



Where Do Violations Occur?

- Based on 1999-2001 data, five monitors violated the annual standard for PM_{10}
 - Chandler
 - Durango Complex
 - Greenwood
 - Salt River Service Center
 - South Phoenix
- These sites, as well as the Maryvale monitor, also violated the 24-hour standard for PM_{10}
- Maricopa County will not achieve attainment until ALL monitors consistently meet both the annual and 24-hour PM_{10} standards

PM₁₀ Monitoring Sites



Health Impacts of PM

- **When inhaled, PM particles are deposited in the lungs**
 - Coarse particles (between 2.5 and 10 microns) stay in upper respiratory tract
 - Fine particles (less than 2.5 microns) invade pulmonary tissues
- **Once in the lungs, the particles decrease breathing efficiency and alter the body's natural defense mechanisms**
- **High risk groups**
 - Elderly
 - Asthmatics
 - Young children

Medical Data for PM₁₀

- **Health Effects – For every 10 µg/m³ increase on a daily or multi-day basis**
 - Mortality - +1.0%
 - Morbidity
 - Asthma - +3.0%
 - Hospital admissions for respiratory disease - +1.2%
 - Emergency room visits - +1.0%
 - FEV-1 (lung function) - -0.3%
- **Premature deaths in Arizona due to PM₁₀ approached 1,000 in 1995**

Source: Pope, Dockery & Schwartz (1994)

Arizona Comparative Environmental Risk Project, 1995

Quality of Life Impacts of PM

- **Contributes to the Valley's "Brown Cloud"**
- **The Arizona Dept. of Environmental Quality has taken measurements indicating that visibility has been declining in Maricopa County since 1994**
- **Contributes to regional haze at wilderness areas & national parks (i.e. Grand Canyon)**
- **Dust blowing across roads can reduce visibility and cause traffic accidents**
- **Soils clothes, vehicles, buildings, other property**

What Causes PM?

- **Particulates are emitted into the air by both natural and human sources**
 - **Natural Sources**
 - Winds >15 mph; especially, wind gusts >25 mph
 - Pollen (PM_{2.5})
 - Natural desert with undisturbed vegetation and soil
 - Measurements at Organ Pipe Cactus National Monument = 20% of standard
 - **Human Sources**
 - Human activities cause most of the PM that we breathe
 - In urban areas, humans are responsible for at least 60% of the PM₁₀ problems

Dust Storm Development

1.



2.



3.



4.



Source: Arizona Department of Environmental Quality

Four photos © Jeff Jacobson, 1999

Organ Pipe Cactus National Monument



Copyright © 2001 Arizona State University College of Public Programs

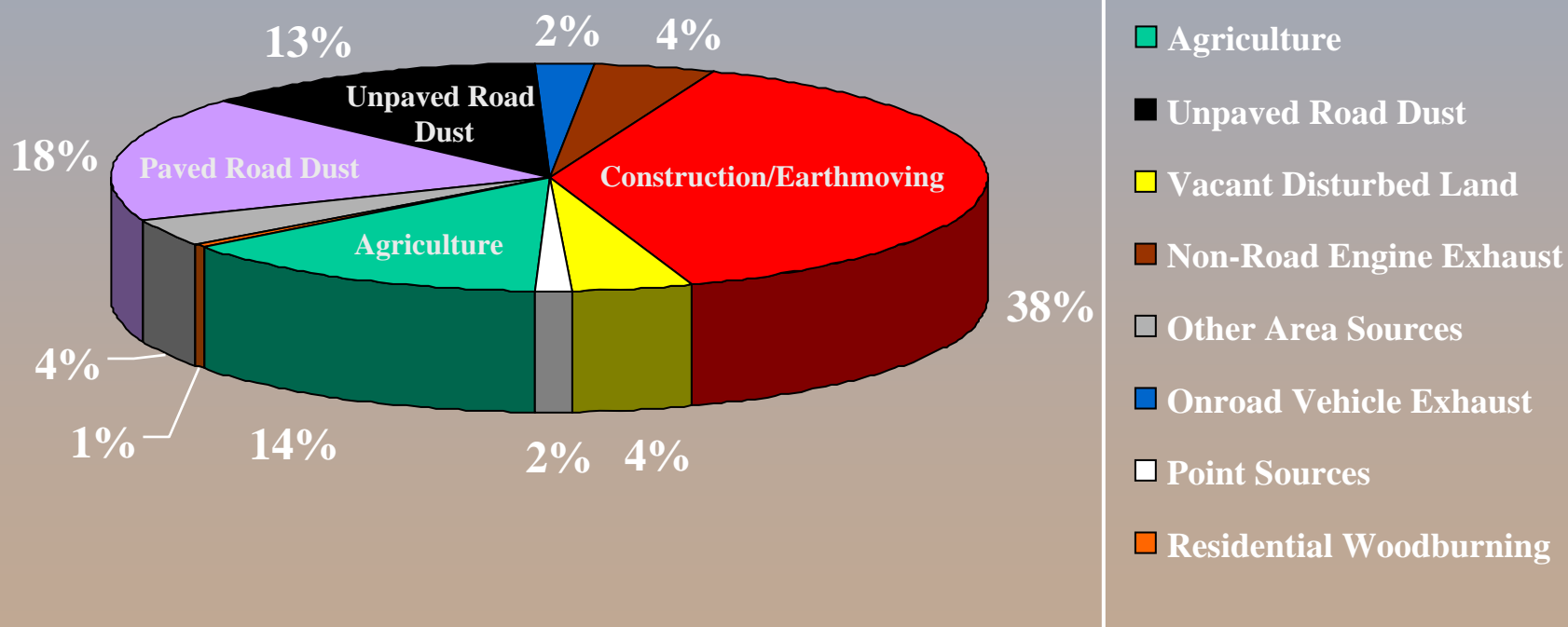
Sources of PM_{2.5}

- Engine exhaust from vehicles and equipment
- About one-half comes from gasoline exhaust
- Another 15%, from diesel exhaust
- Older, poorly-tuned vehicles and vehicles/engines starting up on colder mornings are the major sources of PM_{2.5} in Maricopa County

Major Sources of Coarse PM₁₀ Particles

- Construction and earthmoving operations
- Reentrainment of dust by vehicles traveling on paved roads
- Vehicles driving on unpaved roads
- Agricultural activities
- Vacant lots

Sources of PM₁₀ 1995 Regional Emissions



Source: *MAG 1999 Serious Area Particulate Plan for PM-10 for the Maricopa County Nonattainment Area, February 2000*

Sources of PM₁₀

- In Maricopa County, exceedances of the PM₁₀ standards have been recorded near:
 - An elevated freeway (Greenwood)
 - Shopping center and freeway construction (West Chandler)
 - Industrial sources and unpaved haul roads (Salt River)
 - Agricultural fields (Higley)



Some Sources of PM₁₀

Source: Guide to Agricultural PM₁₀ Best Management Practices

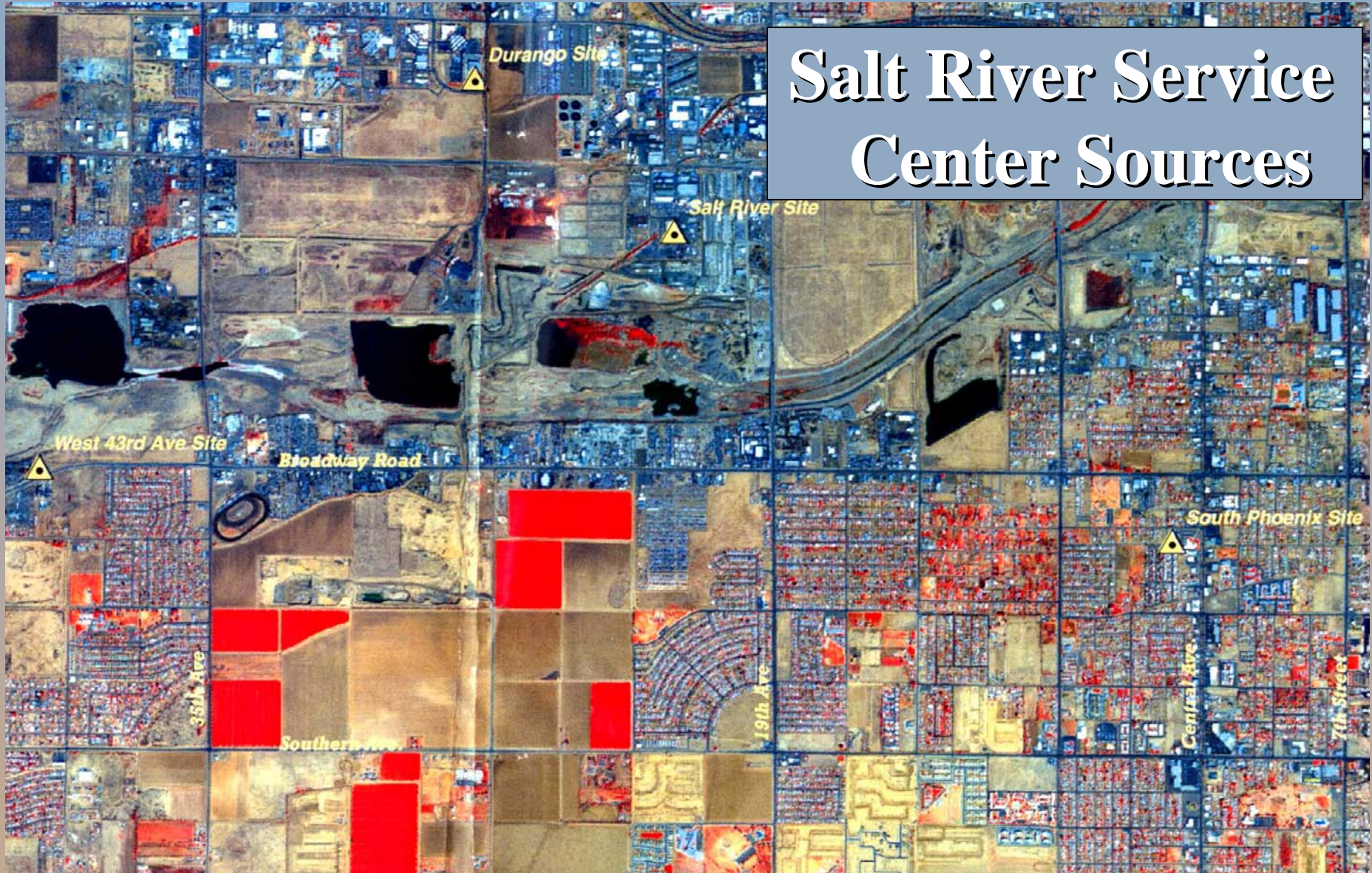


Source: Maricopa County Environmental Services Department

PM₁₀ “Hot Spot”

- Highest concentrations in the Valley occur at the Salt River Service Center monitor near 22nd Ave and Lower Buckeye Rd
- Large number of potential sources
 - Two landfills (one EPA Superfund site)
 - Sand and gravel operations
 - Pre-stressed concrete manufacturing yard
 - Bus storage depot
 - Unpaved haul roads and shoulders
 - Vacant lots
- ADEQ & County are conducting study to determine sources of persistently high PM at Salt River site

Salt River Service Center Sources



▲ PM₁₀ Monitoring Site

Source: Maricopa County
Environmental Services Department

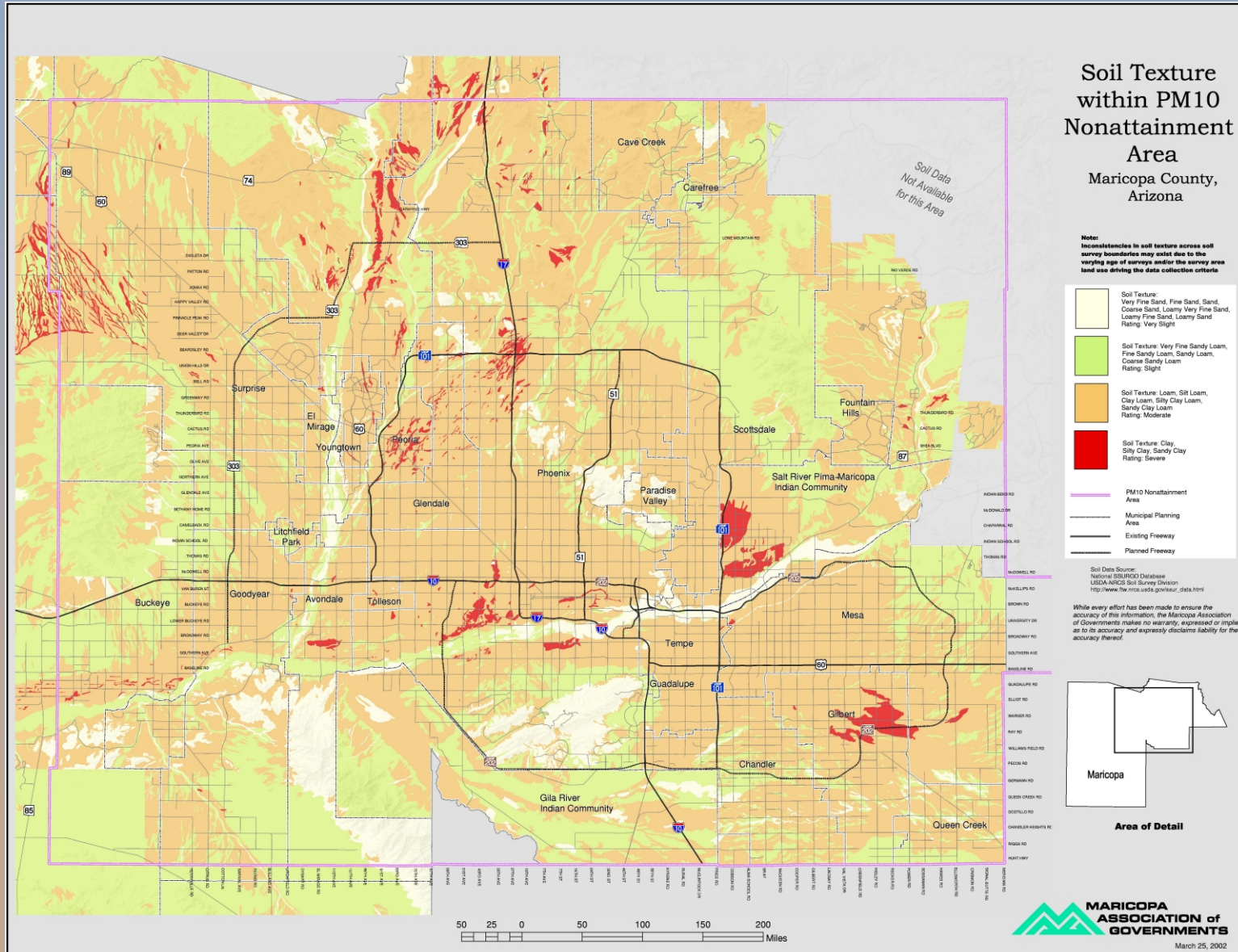
Natural Conditions Contributing to PM₁₀

- Lower annual rainfall usually leads to higher annual PM₁₀ concentrations
- Wet years can also contribute to elevated PM₁₀
 - Mud tracked onto pavement dries and is subsequently ejected into the air by moving vehicles
- High winds, especially >25 mph, can cause exceedances of the 24-hour standard
 - On August 22, 2000, six monitors exceeded standard
- However, most exceedances of the 24-hour standard happen on days that are not windy
- Elevated PM₁₀ can occur at any time of year

Natural Conditions Contributing to PM₁₀

- Some soil types can create more PM₁₀ than others
 - Sandy soils create heavier particles that are quickly re-deposited
 - Soils that are clay or a clay mixture
 - Tend to create much smaller particles, when disturbed
 - Particles are more likely to stay suspended in the air
- PM₁₀ soils map based on NRCS survey data
 - Shows general areas in Maricopa County that have soils most and least likely to generate PM₁₀, if disturbed

PM₁₀ Soils Map



What is Being Done to Reduce PM₁₀?

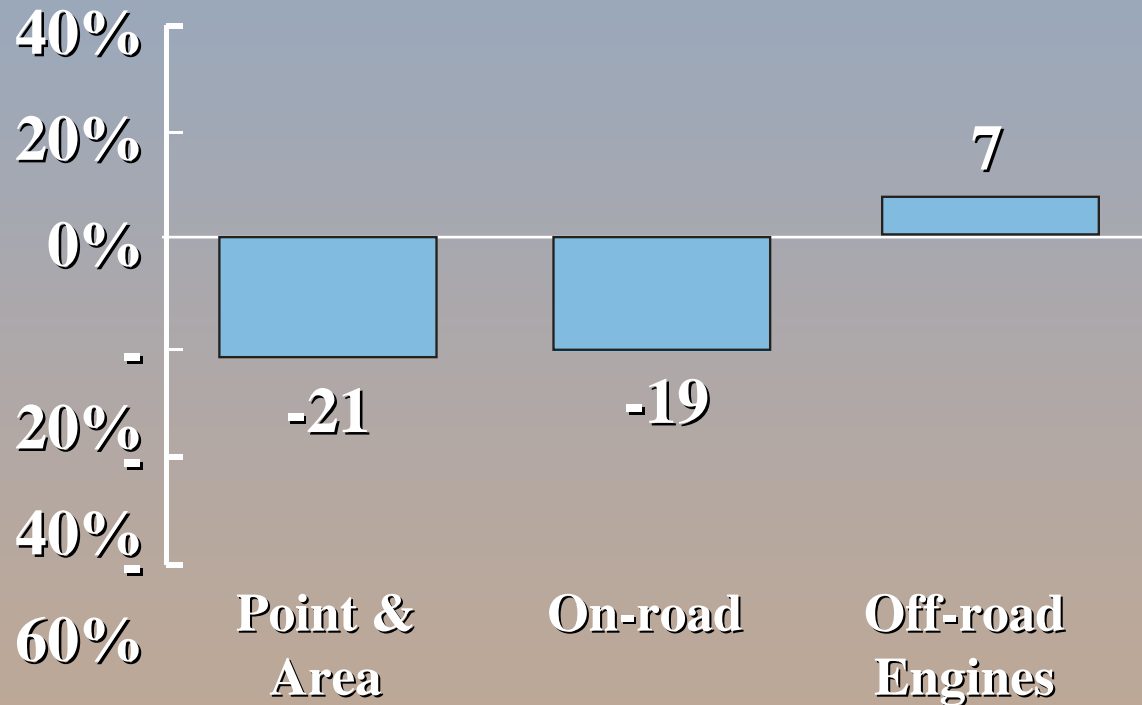
- EPA sets National Ambient Air Quality Standards (NAAQS)
 - PM₁₀, PM_{2.5}, carbon monoxide, nitrogen dioxide, sulfur dioxide, lead, and ozone
 - Fuel, vehicle tailpipe, and engine emission standards
- Federal emission control programs have been most effective in reducing air pollution in urban areas
- New standards announced in 1999 & 2000
 - Will cut PM and NO_x emissions by 90%
 - Tier 2 light duty car and truck standards (2004)
 - Low sulfur fuels (mid-2006)
 - Heavy-duty vehicle and engine standards (2007)

National Air Quality Trends

Pollutant	Total Emissions Percent Change 1981-2000	Air Pollutant Concentration Percent Change 1981-2000
Ozone	-32% (VOC) +4% (NO _x)	-21%
PM ₁₀ (1985-1999 only)	-19%	-19%
Carbon Monoxide	-18%	-61%
Lead	-94%	-93%

Source: Federal Highway Administration, 2002

National Trends in PM₁₀ Emissions - 1985-1999

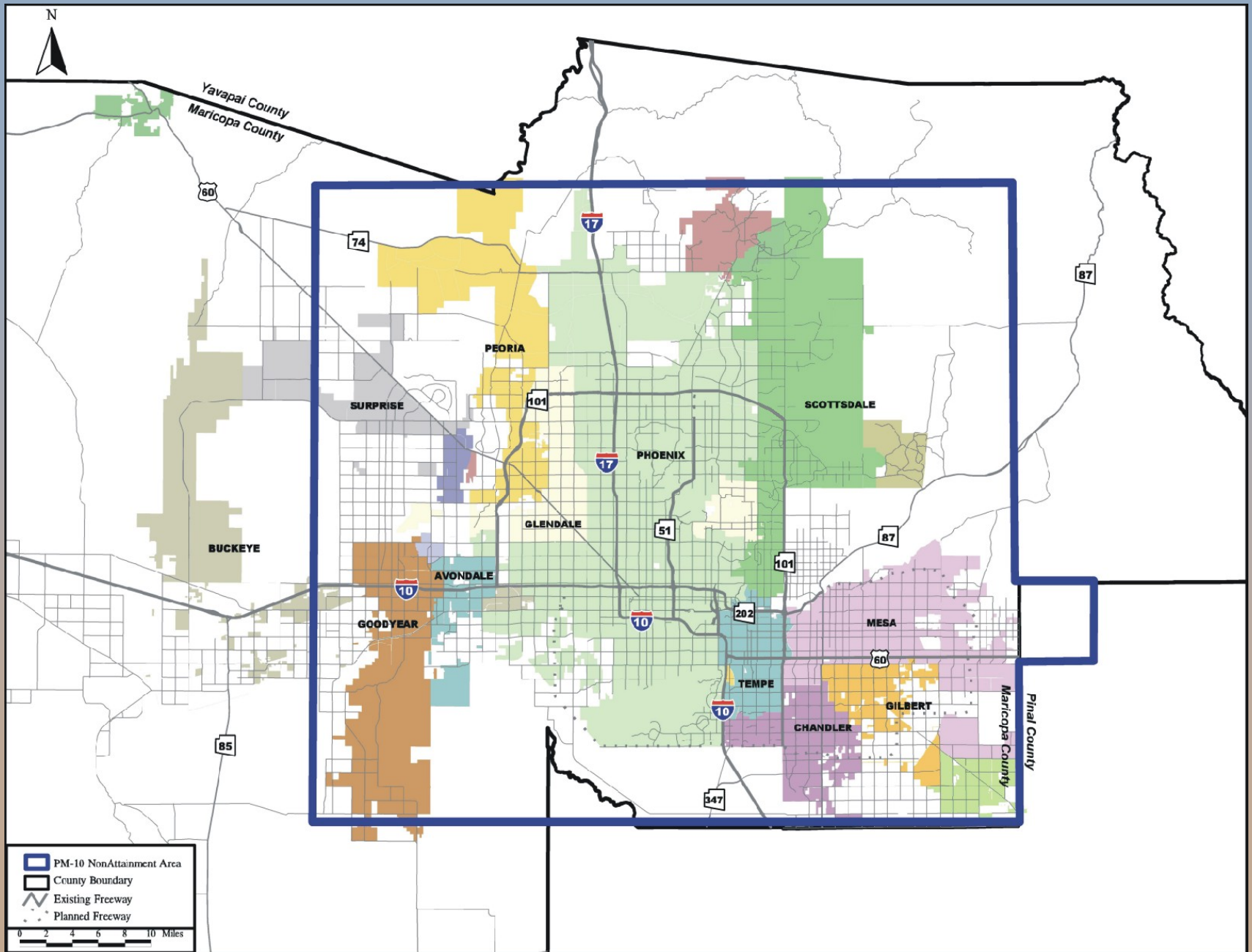


Source: Federal Highway Administration

What is Being Done to Reduce PM₁₀?

- Under the Clean Air Act, an area that does not meet the national air quality standards is designated a nonattainment area
- Nonattainment areas
 - Receive classifications (i.e., Moderate, Serious) based on the severity of the problem
 - Must submit plans showing that the standards will be attained & maintained
- If a plan is not submitted on time or is found to be inadequate, EPA can impose sanctions
 - 2-for-1 offsets on new & modified major industrial sources
 - Highway sanctions - millions of federal \$ in jeopardy

PM₁₀ NonAttainment Area



**Designated
Moderate
Nonattainment
Area for PM₁₀**

**MAG 1991
PM₁₀ Plan
submitted to
EPA**

**Revisions to
1991 Plan
submitted**

**Additional
revisions to
1991 Plan
submitted**

**Dec.
1989**

**Dec.
1990**

**Dec.
1991**

**Dec.
1992**

**Dec.
1993**

**Dec.
1994**

**Dec.
1995**

**Dec.
1996**

**EPA
approves
MAG 1991
PM₁₀ Plan**

**Suit filed
challenging EPA
approval of the
PM₁₀ Plan**

**Ninth Circuit
Court vacates
EPA's approval
of the 1991 Plan**

**Area
reclassified
from
Moderate to
Serious**

ADEQ submits Moderate Area Microscale Plan to EPA

EPA disapproves part of the ADEQ Microscale Plan

EPA publishes Moderate Area PM₁₀ Federal Implementation Plan

EPA finding of failure to submit the Serious Area PM₁₀ Plan goes into effect

Dec. 1996

Dec. 1997

Dec. 1998

Dec. 1999

EPA approves Arizona Best Management Practices to replace agricultural component of FIP

MAG 1999 Serious Area PM₁₀ Plan submitted to EPA

EPA advises that there are approvability problems with the Serious Area Plan

EPA issues completeness finding on Revised MAG 1999 Serious Area PM₁₀ Plan

EPA stops sanctions clock after receiving all remaining pieces of Serious Area PM₁₀ Plan

Dec.
1999

Dec.
2000

Dec.
2001

Dec.
2002

EPA publishes final approval of Revised MAG 1999 Serious Area PM₁₀ Plan

Suit filed challenging EPA's approval of the Serious Area PM₁₀ Plan

MAG PM₁₀ Plan (7,000 pages high)



PM₁₀ Control Measures in Maricopa County

- EPA-approved Plan contains 77 control measures
 - Legally-binding commitments by the State, County, cities, towns, MAG and ADOT to reduce PM₁₀
- To obtain a five-year extension to 2006, the Plan must include the most stringent control measures in the Country that could be feasibly implemented in Maricopa County
 - Purchase PM₁₀ efficient street sweepers
 - Recognize PM₁₀ episodes
 - Require catalytic converters on chain-driven restaurant charbroilers

A PM-10 Efficient Street Sweeper.

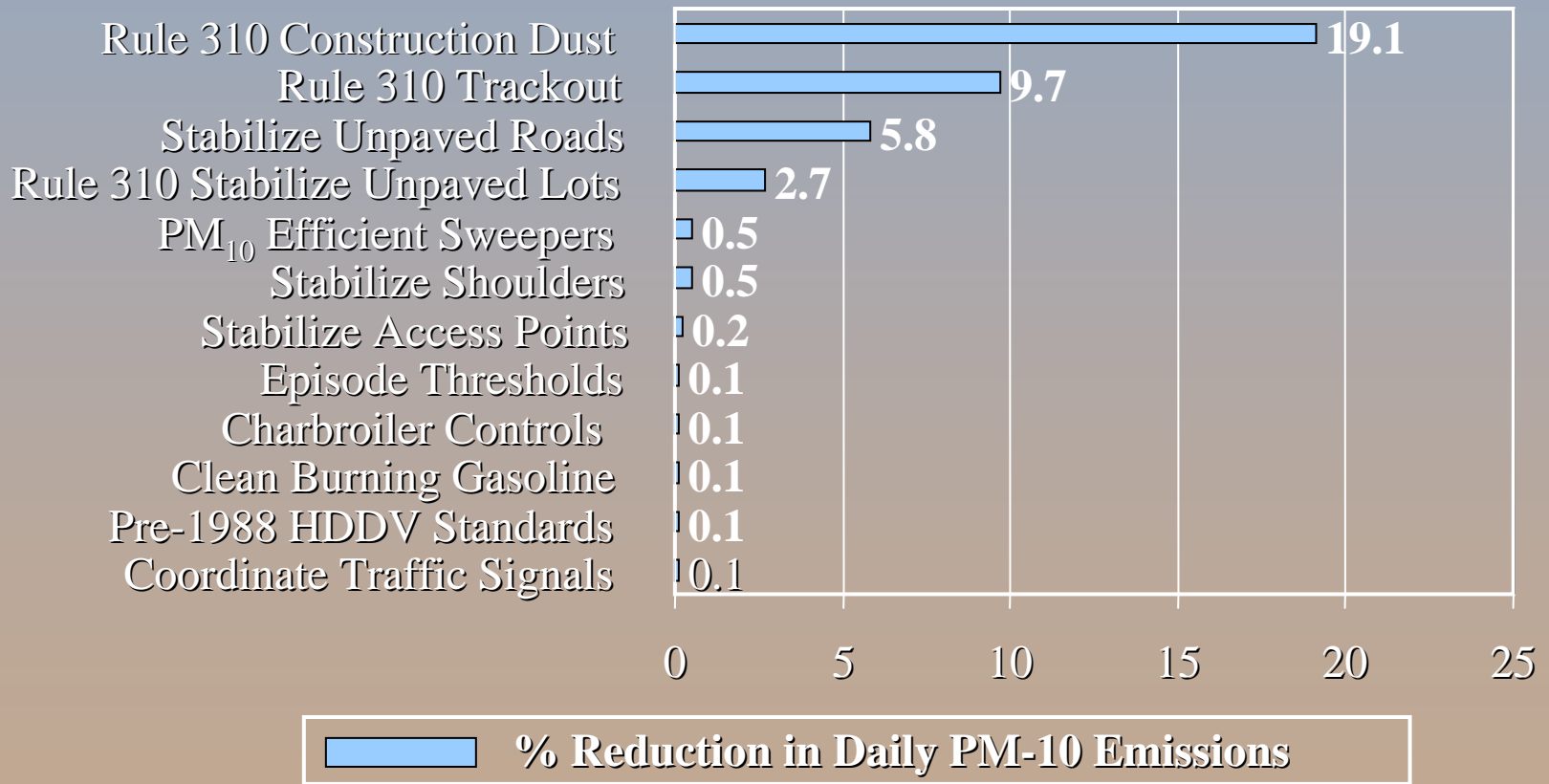


Source: Kitchell Contracting

PM₁₀ Control Measures in Maricopa County

- In the Plan EPA approved in January 2002, numeric emission reduction credit was taken for twelve of the 77 control measures
- Combined impact of 12 quantified measures was 39% reduction in 2006
- The most effective control measure in the Plan, by far, is the strengthening/better enforcement of Maricopa County's Rule 310: Fugitive Dust Controls

2006 PM₁₀ Emission Reductions from Committed Control Measures



Effectiveness of Rule 310

- Rule 310 reduces PM_{10} emissions from construction, vehicle track-out, and unpaved lots
- Rule 310 reductions represent 80% of the numeric credit assumed for all control measures in the Plan
- Impact of strengthening and better enforcement of Rule 310 on construction and earthmoving activities alone accounts for 19%, or nearly half, of the total emission reductions

Other Efforts to Reduce PM₁₀ Clark County, Nevada (Las Vegas)

- Serious PM₁₀ nonattainment area, like Maricopa Co.
- Submitted Serious Area PM₁₀ Plan to EPA in July 2001
- Requested a five-year extension (to Dec 31, 2006) to attain the 24-hour PM₁₀ standard
- Unlike Maricopa Co., attained the annual PM₁₀ standard in 2001
- Has implemented a construction dust control program, called Section 94

Clark County Section 94

- **Contracts**

- Requirements & conditions of dust control permit must be included in all construction contracts
- A monetary allowance for dust control must be provided in all contracts for primes and subcontractors

- **Dust Monitor**

- Projects having ≥ 50 acres of actively disturbed soil must have a dust control monitor on site at all times
- Monitor must have authority to implement dust control measures; be able to shut down operations, if necessary
- Must successfully complete a Dust Control Class and a Dust Monitor Class every three years and have at least two years of experience in the construction industry

Clark County Section 94

- Dust Control Card

- Awarded upon successful completion of a Dust Control Class every three years (must pass an exam)
- The construction site superintendent, foreman ,or other designated representative of the project developer must carry a current Dust Control Card
- All water truck/pull drivers must have a current Dust Control Card
- Half-day Dust Control Classes are offered by Clark County twice a week (\$35 fee)

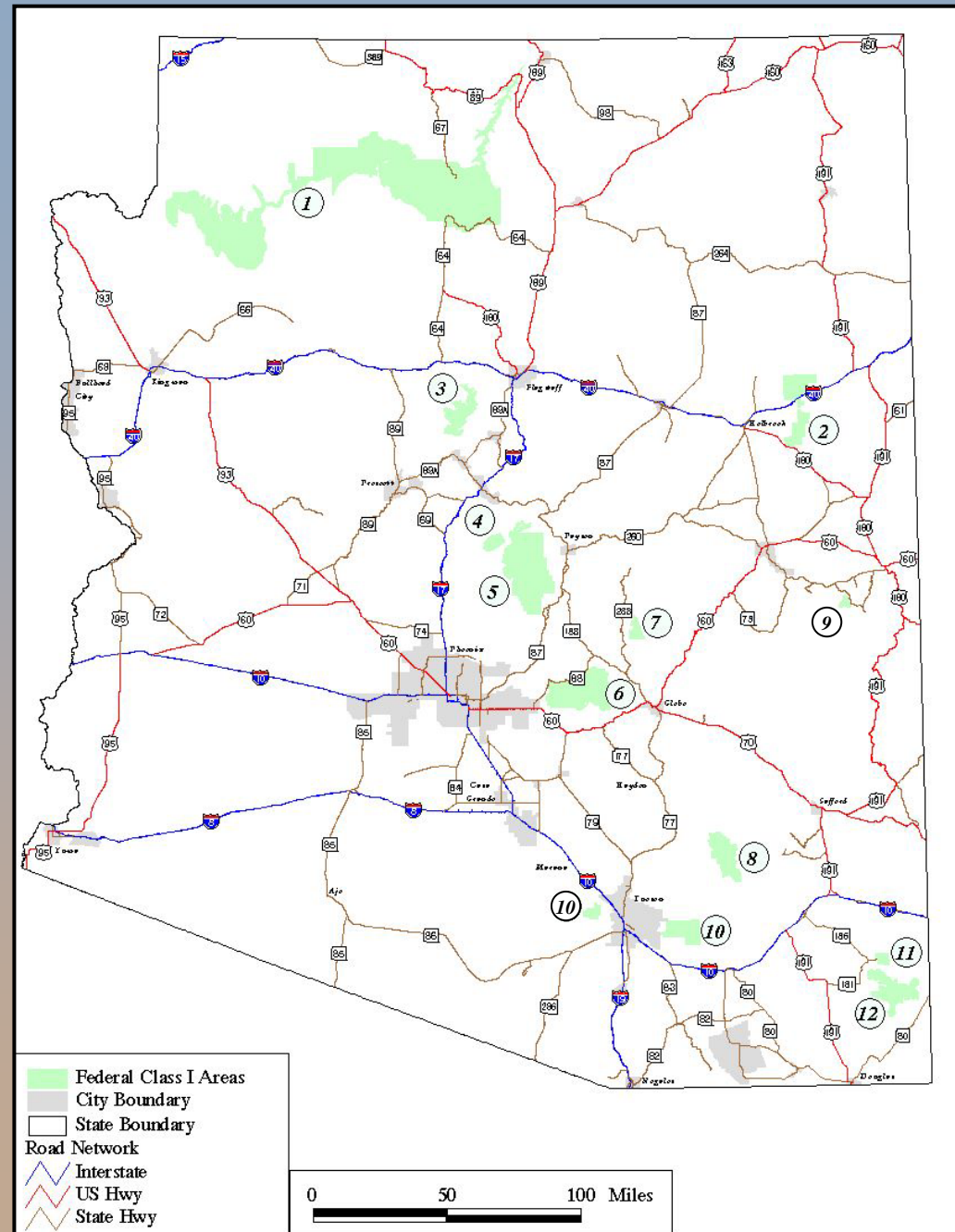


Regional Haze Planning

- EPA's Regional Haze Rule requires states to restore visibility in 156 wilderness areas and national parks to natural conditions by 2064
 - AZ has 12 Class I Areas, including the Grand Canyon
- Arizona and some other western states are preparing plans to submit to EPA by December 31, 2003
- Regional haze is made up of hydrocarbons, elemental and organic carbon, sulfur dioxides, nitrogen oxides, PM₁₀ and PM_{2.5}
- New controls implemented to improve visibility may also reduce PM in Maricopa County

Regional Haze Class I Areas in Arizona

1. Grand Canyon NP
2. Petrified Forest NP
3. Sycamore Canyon
4. Pine Mountain Wilderness
5. Mazatzal Wilderness
6. Superstition Wilderness
7. Sierra Ancha Wilderness
8. Galiuro Wilderness
9. Mount Baldy Wilderness
10. Saguaro NP
11. Chiricahua NM
12. Chiricahua Wilderness



Governor's Brown Cloud Summit

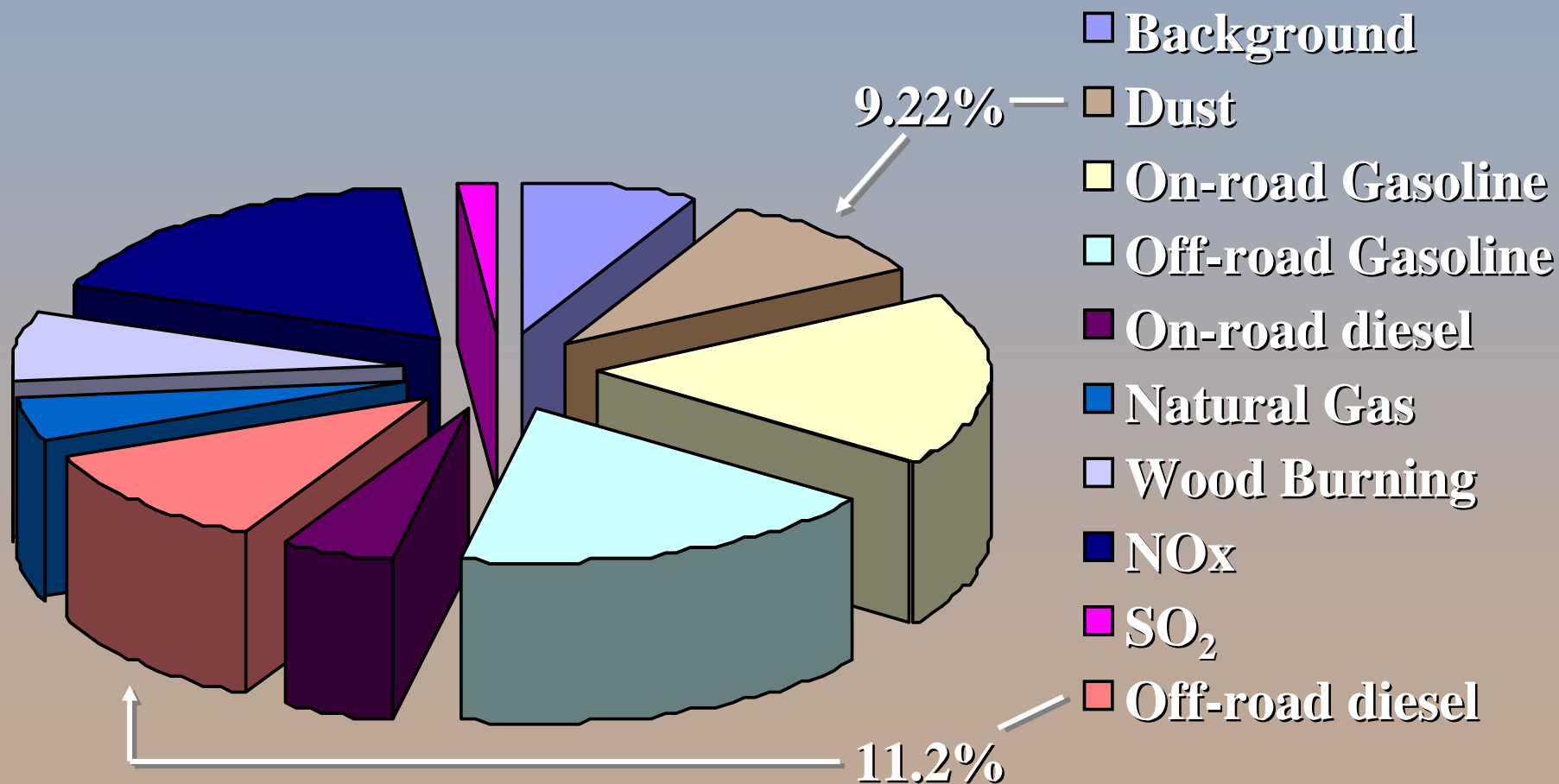
- Recommended ways to improve visibility in the Valley
- "Blue Sky Days" \geq 6 hours with 25+ mile visibility
 - 250 Blue Sky Days by 2001
 - 260 Blue Sky Days by 2002
 - 275 Blue Sky Days by 2003

Blue Sky Day versus non-Blue Sky Day



Source: Arizona Department of Environmental Quality

Source Contributions to Fall and Winter Visibility Impairment in Phoenix



Source: Arizona Department of Environmental Quality, *Visibility Impairment in Phoenix*, ENSR Document 0493-018-23, March 2002

Measures Implemented by HB 2538

- **Voluntary Measures**
 - On-road diesel vehicle repair / retrofit
 - Ultra-low sulfur diesel fuel with oxidation catalysts and particulate filters for vehicle fleets
 - Encourage use of truck bypass routes on poor visibility days
- **Mandatory Measures**
 - Vehicle idling restrictions
 - Expansion of Area A (area in which I/M, reformulated fuels, clean burning fireplaces, and other air pollution controls apply)
 - Roadside diesel testing
 - Electric powered generators at construction sites

Dust Control Training for Contractors

- The following Brown Cloud Summit recommendation was not included in H.B. 2538:
 - Develop a standardized dust control certification program for construction companies
 - Require participation in training and certification program in order to obtain a county permit
- Encourage construction superintendents, water truck/pull drivers, and subcontractors to attend a dust control course and receive certification
 - This training course and a certification program for Maricopa County have been developed to address the Brown Cloud Summit recommendation
 - Voluntary approach may be as effective as mandatory participation (i.e. Clark County, Nevada)

ADOT Initiatives to Reduce Construction Dust

- **ADOT has funded a research project to develop:**
 - Outreach materials
 - Training course
 - Voluntary certification program
- **Principal products**
 - Training course slide show and script
 - Toolkit of materials that can be used at work sites
 - Dust control guide for construction managers
 - Brochure informing public of ongoing efforts by construction industry to reduce dust
- **Goal - Make dust suppression a standard operating practice at all construction sites in Arizona**

Why We Need to Control Dust

End of Training Module #1

- Questions?

Part II

How Can Construction Dust Be Controlled?



II-1. SITE PLANNING

Designing and Implementing a Construction Project to Minimize Dust

Addressing dust control issues before beginning a project can save time, money, and project resources. Site-specific air quality and dust control issues—and appropriate ways to tackle them—should be identified before work begins. Strategies for trackout prevention, the handling, storage, and transportation of bulk materials on and off-site, dust-minimizing procedures during construction, and site maintenance should all be discussed.

Disturbed surface area - pre-activity

To minimize dust generation from disturbed areas before beginning construction, plan ahead, pre-water work site to the depth of cuts, and proceed in stages to minimize amount of disturbed surface area present at any given time.

Phasing the project and planning site layout carefully will result in minimized soil disturbance. Lessening the amount of surface being disturbed at any one time reduces the amount of control required and the amount of water or dust suppressant needed. Evaluate dust control procedures periodically to identify additional issues that develop as the job progresses.

Install wind fences or barriers (less than 50 percent porosity). Place barriers around storage piles, parking, and equipment staging areas. Develop semi-permanent staging areas to cut down on the amount of disturbed area. Restrict access on unpaved areas to vehicles and equipment that are necessary that day. Limit unnecessary travel on unpaved surface areas. Restabilize disturbed surfaces by paving permanent roads and restoring vegetation as soon as possible. Allow time for pre-wetting areas where excavation or trenching will occur.

Make sure everyone working on the job knows all the requirements for dust control and who is in charge. Encourage a proactive and continuous focus on air quality issues on the job site.

EXERCISE II-1. SITE PLANNING

What types of issues should be identified before work begins? _____

Wind barriers or fences should be installed that have less than _____ percent porosity.

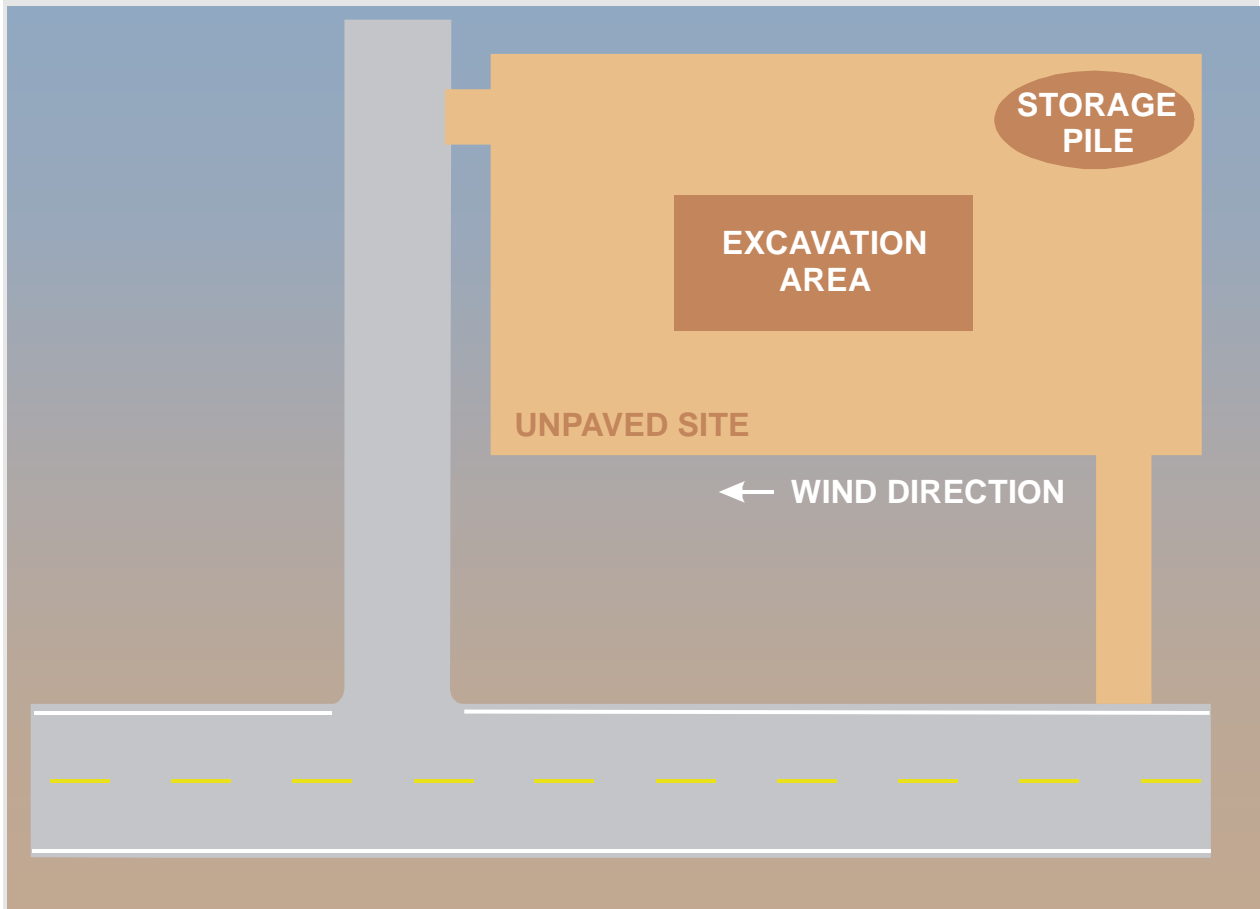
What two steps can be taken to control dust from unpaved areas of a site?

1. _____

2. _____

You have been asked to develop a dust control plan for the job site depicted below. Locate the following elements of your plan:

- Traffic control signage
- Wind barriers
- Where pre-watering should occur



Name 3 strategies for controlling erosion from disturbed areas of the site:

1. _____
2. _____
3. _____

II-2. BULK MATERIAL HANDLING, STORAGE AND TRANSPORTATION

Material handling refers to many types of earthmoving activities on construction sites, including loading and hauling. These types of activities can be significant sources of fugitive dust. However, dust control during loading and hauling can be easily achieved through careful planning and proper implementation of controls. When planning a construction project involving earthmoving activity, strategies for bulk material handling, storage, and transportation

that minimize dust generation must be developed. Strategies are needed for handling or hauling material off-site onto paved public roadways, completely within the boundaries of the work site, or when crossing a public roadway that is open during construction. Strategies for preventing open storage piles from creating dust are also needed.

Hauling On the Work Site

To control dust generated by hauling bulk material within the boundaries of the work site:

- Load all haul trucks so that the freeboard is 3 inches or more
- Prevent spillage or loss of material from holes or other openings in the cargo compartment floor, sides and tailgate
- Install a trackout control device that removes dirt from tires and exterior surfaces of haul trucks and motor vehicles that traverse the work site
- Empty loader bucket slowly and keep loader bucket close to the truck while dumping
- If soils are sand or loam, mix with water prior to loading and spray material with water while loading
- If soils are clay or silt, mix with water and surfactant mixture prior to loading and spray with water/surfactant mixture while loading
- Limit vehicle speeds to 15 mph on site
- Apply water to the top of the load so that 20 percent opacity is not exceeded
- Cover haul trucks with a tarp or other suitable closure

Hauling Off the Work Site

When hauling bulk material off-site, the loads on haul trucks should be covered with tarps to keep dust from escaping. Allow for a freeboard of 3 inches or more. Spillage or loss of material from holes or other openings in the cargo compartment floor, sides and tailgate should be prevented. Daily vacuuming, wet broom cleaning, or covering the cargo compartment interiors of empty trucks is important to prevent trackout.

Open Storage Piles (when not stacking, loading or unloading)

- Cover Open Storage piles with tarps, plastic or other material and secure so that the coverings will not be dislodged by wind
- Apply water as necessary to keep the soil moist
- Keep the soil stabilized
- Construct and maintain wind barriers, storage silos, or a three-sided enclosure with walls, at least as wide and tall as the pile, no farther away than twice the height of the pile, and no more than 50 percent porosity

EXERCISE II-2. BULK MATERIAL HANDLING

Load all haul trucks so that the freeboard is _____ inches or more.

What types of soils should be mixed with water only prior to loading and sprayed with water while loading?

What types of soils should be mixed with water and dust suppressant mixture prior to loading and sprayed with water/surfactant mixture while loading?

What 2 practices should be observed when emptying material into a truck from a loader bucket?

1. _____

2. _____

II-3. CONSTRUCTION OPERATIONS

Five areas that typically generate dust during construction work are:

- Demolition and blasting
- Disturbed surface area - during construction
- Earthmoving operations on disturbed surface areas 1/2 acre or larger
- Unpaved haul and access roads
- Unpaved parking areas

Demolition and Blasting

Stabilize demolition debris and surrounding area through watering immediately following demolition activity. Water all disturbed soil surfaces to establish a crust and prevent wind erosion of soil. Thoroughly clean blast debris from paved and other surfaces following demolition activity. If the wind gusts above 25 mph, discontinue blasting.

Disturbed surface area - during construction

During construction, apply water or dust suppressant to work area and construct fences or 3 to 5 foot high wind barriers adjacent to roadways or urban areas. During grading, water using a water truck; during trenching, water using a fine spray or mist; and during screening, mist material after it drops from the screen.

Earthmoving operations on disturbed surface areas 1/2 acre or larger

When the area under construction is 1/2 acre or more, water should be applied during all earthmoving operations.

Unpaved haul and access roads

Vehicle speeds on unpaved haul and access roads should not exceed 15 mph. Also, the number of trips should not exceed 20 per day. If the number of trips exceeds 20 per day, then one of the following additional measures should be implemented:

- Apply water in sufficient quantity to maintain a moist surface
- Apply and maintain gravel, recycled asphalt, or other suitable material
- Use a dust suppressant as directed by the manufacturer, or
- Pave the access roads

Be sure not to over-water—muddy conditions will increase trackout.

Unpaved Parking Areas

Unpaved areas of a site that are going to be used for parking construction equipment, work trucks, or employee vehicles should be treated as follows:

- Apply and maintain surface gravel, recycled asphalt, or other suitable material
- Apply and maintain a suitable dust suppressant
- Pave the lot



Vehicles should not be allowed on unpaved areas of the work site unless they have been treated to reduce dust. Moreover, vehicle speeds over these areas should be limited to 15 mph or less and the number of daily trips kept to a minimum. “No Trespassing” signs or barriers such as curbs, fences, gates, posts, signs, shrubs or trees should be installed or planted to prevent access to non-treated work areas.

EXERCISE II-3. CONSTRUCTION OPERATIONS

Stabilize demolition debris and surrounding area by means of _____ immediately following demolition activity.

Watering of disturbed soil surfaces establishes a crust and prevents _____ of soil. When the area under construction is _____ acre or more in size, water should be applied during all earthmoving operations.

Vehicle speeds on unpaved haul and access roads should not exceed _____ mph, and the number of trips should not exceed _____ per day.

Name one strategy for controlling dust generation from an unpaved parking area

II-4. SITE MAINTENANCE DURING CONSTRUCTION

Proper maintenance of the job site will reduce fugitive dust from unpaved parking lots, open areas and vacant lots, and disturbed surface areas. Surface areas that will be disturbed again during the current project should be temporarily stabilized during non-work days and after hours.

During non-work days, after hours, and on weekends, surface areas that have been disturbed during construction activity should be temporarily stabilized by treatments that will keep dust from exceeding 20 percent opacity. Effective treatments include establishing a vegetative ground cover, paving, graveling, or applying a dust suppressant. Motorized vehicles should also be prevented from entering, driving across, or parking within the areas.

Appendix A of this Workbook includes methods of testing the soil type and characterizing the ground cover prior to determining the means of stabilization to be used.

EXERCISE II-4. SITE MAINTENANCE DURING CONSTRUCTION

After hours, _____ that have been disturbed should be temporarily stabilized by treatments that will keep dust from exceeding 20 percent opacity.

Name two effective temporary stabilization treatments:

1. _____ 2. _____

II-5. SITE MAINTENANCE AFTER CONSTRUCTION

Those areas that will not be disturbed again must be permanently stabilized within eight months after dust-generating operations have ended. Within a reasonable time after dust-generating operations have been completed, construction areas that were disturbed should be permanently stabilized so that dust emitted from the site does not exceed 20 percent opacity. Efforts should be made to restore these areas so that the vegetative ground cover and soil characteristics are similar to those of adjacent or nearby undisturbed native conditions. Alternatively, the areas could be graveled, paved, or treated with a dust suppressant.

Vehicular access to areas of the site that are not paved or otherwise made suitable for vehicles should be prevented through posting of signs and construction of fencing or barriers. If necessary, silt fences should be installed downstream from disturbed surfaces to prevent erosion or trackout until surface has crusted over or vegetative cover has taken hold. The site should be inspected periodically to ensure that it has not been disturbed or trespassed upon in ways that would destabilize the surface.

EXERCISE II-5. SITE MAINTENANCE AFTER CONSTRUCTION

After dust generating operations have been completed, the areas should be restored so that the _____ are similar to those of adjacent property.

If one or more disturbed areas of a site will not be brought to final grade for a period of more than 30 days, what might be an appropriate means of controlling erosion?

Name two effective permanent site stabilization treatments:

1. _____ 2. _____

II-6. DUST CONTROL MEASURES

Dust control measures used at construction sites include trackout control, erosion control, effective watering, and dust suppressants

Trackout Control

Control of trackout is required for all sites with disturbed area of 5 acres or more, or sites from which 100 yards or more of bulk materials are hauled on-site or off-site per day. Trackout is controlled through the use of gravel pads, grizzlies, paving, and appropriate watering.

Trackout that extends 50 linear feet or more onto a paved public road must be cleaned up immediately. Otherwise, the trackout must be cleaned up by the end of the workday. Cleanup may be performed with a street sweeper or wet broom with sufficient water, if applicable, at the speed recommended by the manufacturer or by manually sweeping up the deposits.

Trackout Control Devices

Dust Control Plans require that stabilized construction entrances be installed at all access points if 100 yards or more of bulk material per day is to be hauled on or off the site, or if the site is larger than 5 acres. A gravel pad is a stabilized construction entrance, designed to remove the

mud and dirt from the tires of vehicles leaving a construction site. Using gravel pads reduce fugitive dust caused by trackout onto paved roads and surfaces. The use of such pads may also reduce the need for street sweepers or laborers to remove trackout from paved surfaces, as well as help prevent storm water pollution.

Gravel pads are typically made from one inch to three inches in diameter, washed, well graded gravel or crushed rock. The gravel pad should be at least 30 feet wide by 50 feet long, and a minimum of 6 inches deep. When installing the gravel pad, make sure that it is properly graded.

A Grizzly is a device using rails, pipes or grates to dislodge mud, dirt and debris from the tires and undercarriage of vehicles that drive over it prior to leaving the work site. An example of a grizzly is the “shaker” invented by Jeff Lange for Kitchell Contracting. This device is reusable, transportable by pick-up truck, easy to assemble, and can be expanded to accommodate various sizes of haul vehicles. More information about the shaker device can be obtained at www.trackoutcontrol.com.



Erosion Control

Temporary measures used to control erosion during construction include:

- Vegetative Cover
- Tillage
- Spray-On Adhesives
- Barriers
- Mulch
- Irrigation
- Stone
- Calcium Chloride

Erosion and sedimentation of soils from disturbed areas that will not be brought to final grade for a period of more than 30 days can be reduced by temporarily seeding these areas with appropriate rapidly growing annual plants. This seeding will also improve the natural attractiveness of the area awaiting construction activity. The area should be tilled immediately prior to seeding to promote the establishment of the vegetative cover and reduce water runoff.

Erosion can also be controlled by effective watering or by the application of a dust suppressant. Wind barriers such as board fences, wind fences, or sediment fences help to control air currents and blowing soil. These barriers should be placed perpendicular to the prevailing air currents. Fences also discourage trespassing and unauthorized vehicular use of erosion-prone areas.

Soil erosion onto paved public streets creates dust-generating conditions equivalent to trackout and must be cleaned up accordingly.

Effective Watering Strategies

Watering prior to excavation or earthmoving is an effective means of suppressing dust. When applied regularly, water provides temporary stabilization to disturbed surface areas and reduces fugitive dust caused by earthmoving and driving on non-stabilized surface areas.

Watering makes roads and disturbed surfaces appear moist with minimal silt, creates a crusted surface on the soil, provides soil moisture content optimal for compaction, and prevents visible emissions from exceeding 20 percent opacity. Adequately watered soil should have a crusted surface that is not easily crumbled between your fingers. The soil moisture content should be optimal for compaction.

Wet the area to the depth of cuts or equipment penetration 15 to 30 minutes prior to start of work. Apply water at the end of the day to soak the next day's work area overnight. During grading, apply water in sufficient quantity to maintain a moist surface using a water truck.

Dust Suppressants

Dust Suppressants are products that are applied to soil surfaces in order to keep dust from being emitted into the air. Chemical dust suppressants can reduce the need for watering and remain effective for up to 12 months in some cases. Some suppressants are not suitable for areas subject to high traffic volume or heavy equipment traffic. The product vendor should be consulted if these conditions exist at a particular site. The recommended dilution, application rate, and application frequency vary significantly by product. Before a weekend, holiday, or other inactive period of less than 5 days, a dust palliative that is diluted to not less than 1/20 of the concentration required to stabilize a surface for 6 months is recommended.

Many counties require the use of environmentally compliant dust suppressants. Be sure to check with local authorities before choosing a dust suppressant. A contractor is responsible for assuring that its use of dust suppressants is in compliance with all applicable environmental laws.

Water mixed with dust suppressants can increase the penetration of moisture into the soil. It is especially important to use a water/suppressant mixture if the soils being disturbed are predominately silt or clay. Use of dust suppressants can reduce the amount of water needed to keep the surface moist. Tackifiers and surfactants increase moisture penetration:

- Use water/tackifier mixture if soils are silt
- Use water/surfactant mixture if soils are clay

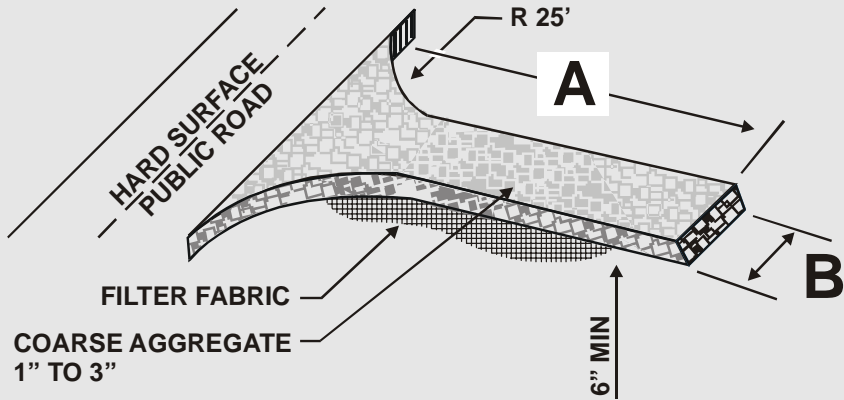
Use of chemical dust suppressants can reduce the amount of water needed

EXERCISE II-6. DUST CONTROL MEASURES

One method of controlling trackout onto paved public roadways from construction sites is to install gravel pads at the entrances to the job site. Referring to the gravel pad depicted below:

The minimum length of
Dimension "A" is _____.

The minimum width of
Dimension "B" is _____.



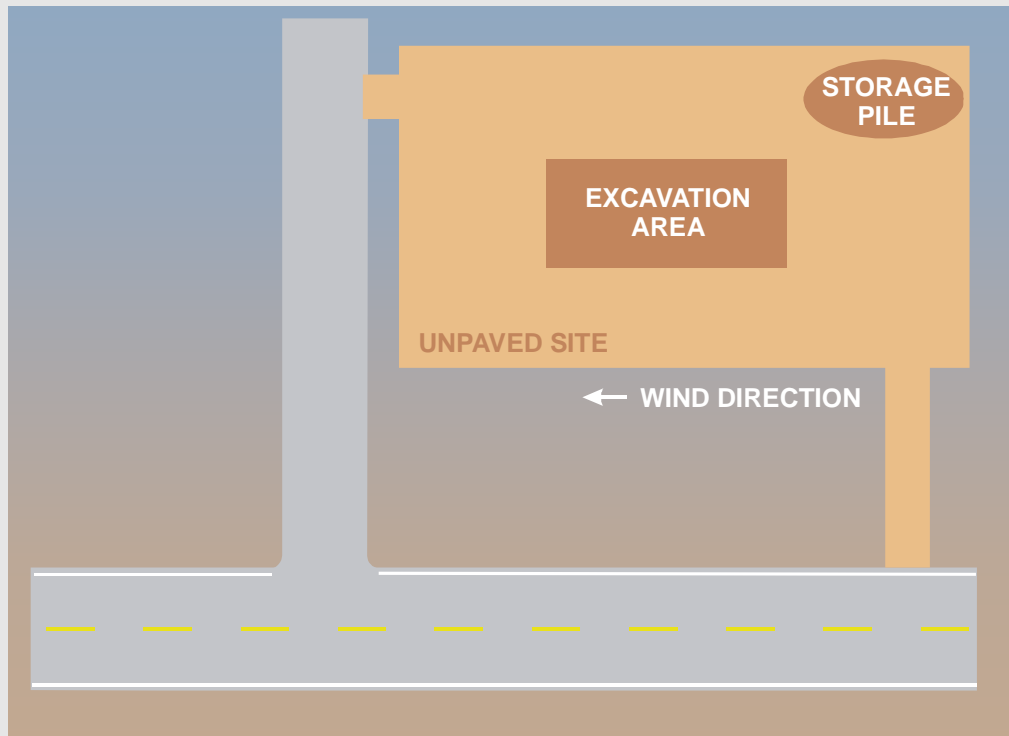
Erosion Control

Name three temporary measures that can be used to control erosion during construction:

1. _____
2. _____
3. _____

Erosion and sedimentation of soils from disturbed areas that will not be brought to final grade for a period of more than 30 days can be reduced by _____

Referring again to the sketch of the jobsite, show where you would locate trackout control devices:



Where is trackout most likely to occur? _____

When should trackout be cleaned up? _____

Watering and Dust Suppressants

Adequately watered soil should have a _____ that is not easily crumbled between your fingers.

Wet the area to the depth of _____ 15 to 30 minutes prior to start of work.

Use a mixture of water and a _____ type of dust suppressant if soils are silt.

Use a mixture of water and a _____ type of dust suppressant if soils are clay.

Requirements for Construction Activities in Maricopa County

- Firms or individuals planning activities involving 0.1 acre or more must
 - Obtain an Earthmoving Permit
 - Submit a Dust Control Plan
 - Comply with specific record-keeping, site maintenance, site signage, and other requirements

Earthmoving Permit

- Who must apply for a permit
- How to complete a permit form

Maricopa County
Environmental Services Department
Air Quality Division



1001 North Central Avenue
Phoenix, AZ 85004
(602) 506-6700 FAX (602) 506-6862

PLEASE SUBMIT IN TRIPLICATE

Application For An Earthmoving Permit

In order for Maricopa County to process an application for an Earthmoving Permit, all questions must be answered and the appropriate fee must be submitted.

FOR OFFICE USE ONLY	
Dist #	_____
NOV #	_____
Permit #	_____
Date issued	_____
Fee Paid	_____
Approved By	_____
PL#	_____ Mail _____

Section 1 – Applicant Information

1. Applicant Must Be One Of The Following.

Check All That Apply:

Property Owner _____ Developer _____ General/Prime Contractor _____ Lessee _____

2. Legal Business Name: _____

Applicant Address: _____

City/State/Zip: _____

Phone: _____ Fax #: _____

E-Mail Address: _____

3. Property Owner/Developer, If Not Applicant: _____

Address: _____

Phone: _____ Fax #: _____

Contact Person: _____

4. Primary Project Contact: _____

Title: _____ Company Name: _____

Pager #: _____ Mobile #: _____ On-Site #: _____

5. Signature of a Responsible Official of the Applicant:

I hereby certify that, based on information and belief formed after reasonable inquiry, the statements and information in the Application For An Earthmoving Permit, including Section 1-Applicant Information, Section 2-Project Information-Drawing, and Section 3-Dust Control Plan, are true, accurate, and complete.

A Responsible Official of the Applicant is the person who will be contacted or named in any enforcement action initiated by the Maricopa County Environmental Services Department or the Office of the Maricopa County Attorney.

Signature: _____

Printed Name: _____ Title: _____

Who Must Apply for a Permit

- An official responsible for any earthmoving operation that will disturb a total surface area of 0.10 acre or more
- Responsible Official
 - Corporation - Corporate officer or decision-maker
 - Partnership or sole proprietorship - partner or owner
 - Public sector agency - principal executive officer or ranking elected official

How to Complete a Permit Form

- **Section 1 – Applicant Information**
 - **Submit the Appropriate Fee**
 - 0.1 acre to less than 1 acre = \$75.
 - 1 acre or more = \$36/acre plus \$110 per site
- **Section 2 – Project Information - Drawing**
 - Type of project
 - Address & legal description
 - Size of area, in acres, to be disturbed
 - Project start date
 - 8 1/2” x 11” or larger drawing
- **Section 3 – Dust Control Plan**

Elements of Earthmoving Permit Drawing

- Entire project site boundaries
- Acres to be disturbed with linear dimensions
- Nearest public roads
- North arrow
- Planned exit locations onto paved public roadways

Dust Control Plan

- Requirements
- How to prepare a Dust Control Plan

Section 3 – Dust Control Plan

- Put a check (✓) in the box in front of all the following sources of fugitive dust that you anticipate from your project.
- Write the letters "NA" in the box in front of all the following sources of fugitive dust that you do not anticipate implementing during your project.
- Unless already pre-designated, write the letter "P" for primary control measures that you will implement during your project, on the line in front of at least one of the listed control measures or work practices, under each checked box/source of fugitive dust. The control measures pre-designated with the letter "P" are required to be implemented.
- Write the letter "C", for contingency control measures that you will implement during your project, on the line in front of at least one of the listed control measures or work practices, under each checked box/source of fugitive dust.

Unpaved Haul/Access Roads:

- ___ Limit vehicle speed to 15 miles per hour or less and limit vehicular trips to no more than 20 per day. If this is chosen as the primary control measure, indicate number of vehicles traveled on haul roads: _____
- ___ Apply water at a frequency and intensity to comply with Subsection 302.2 in Rule 310 (See Guidance-"Water")
Water Availability: _____
Water Application: _____
- ___ Pave
- ___ Apply and maintain surface gravel, recycled asphalt, or other suitable material so that the area meets the silt loading and silt content limits of Subsection 302.2 in Rule 310 (See Guidance-"Surface Gravel, Recycled Asphalt, Or Other Suitable Material")
- ___ Apply and maintain dust suppressant(s) other than water using _____ at a frequency of _____ and an intensity of _____ (See Guidance-"Dust Suppressants")
- ___ Other: _____

Disturbed Surface Areas – Before Dust Generating Operations Occur:

- ___ Pre-water site to the depth of cuts (See Guidance-"Water")
Water Availability: _____
Water Application: _____
- ___ Phase work to reduce the amount of disturbed surface area at any one time. Describe major project phases (See Guidance-"Describing Major Project Phases")

- ___ Other: _____

Disturbed Surface Areas – During Dust Generating Operations:

- ___ Apply water (See Guidance-"Water")
Water Availability: _____
Water Application: _____
- ___ Apply and maintain dust suppressant(s) other than water using _____ at a frequency of _____ and an intensity of _____ (See Guidance-"Dust Suppressants")
- ___ Construct fences or 3 foot - 5 foot high wind barriers with 50% or less porosity (in combination with one of the above)
Show locations on drawing in Section 2.
- ___ Cease operations (as a contingency control measure only)
- ___ Other: _____

Dust Control Plan Requirements

- **Control Measures**
 - One primary measure and one contingency measure
 - Stabilization plan for any unpaved haul or access roads
- **Dust suppressants to be applied**
 - Method, frequency, and intensity of application
 - Type, number and capacity of application equipment
- **Plan to control trackout where unpaved or access points join paved public roadways**

How to Prepare a Dust Control Plan

- Put a check (\checkmark) in the box in front of all the sources of fugitive dust that you anticipate
- Write the letters “NA” in the box in front of all the sources of fugitive dust that you do not anticipate implementing
- Write the letter “P” next to primary control measures that you will implement
- Write the letter “C” next to contingency control measures that you will implement

Example Fugitive Dust Source

Unpaved Haul/Access Roads:

- C** Limit vehicle speed to 15 miles per hour or less and limit vehicular trips to no more than 20 per day. If this is chosen as the primary control measure, indicate number of vehicles traveled on haul roads:
_____ **SIX** _____
- P** Apply water at a frequency and intensity to comply with Subsection 302.2 in Rule 310 (See Guidance-"Water")
Water Availability: on-site
Water Application: Every 2 hours or as needed
- Pave
- Apply and maintain surface gravel, recycled asphalt, or other suitable material so that the area meets the silt loading and silt content limits of Subsection 302.2 in Rule 310 (See Guidance-"Surface Gravel, Recycled Asphalt, Or Other Suitable Material")
- Apply and maintain dust suppressant(s) other than water using _____ at a frequency of _____ and an intensity of _____ (See Guidance-"Dust Suppressants")
- Other: _____

Record-keeping Requirements

- Keep daily written log detailing use of control measures agreed to
- Keep copies of approved Dust Control Plans
 - At least 6 months from end of operations
 - At least 1 year total

How to Fill Out a Dust Control Log

SAMPLE DAILY RECORDKEEPING LOG FOR RULE 310

Project Name: _____ Project Location: _____ Date: _____

Maricopa County's Rule 310 (Fugitive Dust Sources) requires that you keep a daily log – recording the actual implementation of control measures identified in your Dust Control Plan.

Each time you visually check an area for dust control measure implementation, write the time in the shaded boxes at the top of the log and write a "Y", "N", or "NA", in all of the boxes below your recorded time.

Use the "Comments" column to record other pertinent information. For example, document the opacity of the fugitive dust or describe the corrective actions taken, such as placement of gravel for road cover or trackout control.

Time (Indicate a.m. or p.m.)

--	--	--	--	--	--	--	--	--	--	--

1. Before Dust Generating Operations Occur

A. Pre-watering to depth of cuts?												Comments
B. Pre-watering stockpiled material?												
C. Work phased/Disturbance minimized?												
D. Water truck being operated?												
E. Water truck being filled?												
F. Other (specify in Comments column)												

2. During Dust Generating Operations

A. Is visible dust present?												Comments
B. Applying water?												
C. Applying dust suppressant(s) other than water?												
D. Fences or 3' – 5' high wind barriers with 50% porosity intact?												
E. Shut down operations?												
F. Checked control measures before leaving the work site for the day?												

SAMPLE DAILY RECORDKEEPING LOG FOR RULE 310

Project Name: _____ Project Location: _____ Date: _____

Maricopa County's Rule 310 (Fugitive Dust Sources) requires that you keep a daily log – recording the actual implementation of control measures identified in your Dust Control Plan.

Each time you visually check an area for dust control measure implementation, write the time in the shaded boxes at the top of the log and write a "Y", "N", or "NA", in all of the boxes below your recorded time.

Use the "Comments" column to record other pertinent information. For example, document the opacity of the fugitive dust or describe the corrective actions taken, such as placement of gravel for road cover or trackout control.

A. Is trackout control device intact?												Comments
B. Cleaned-up trackout?												
C. Other (specify in Comments column)												

6. Temporary Site Stabilization

A. Applying water?												Comments
B. Applying dust suppressant(s) other than water?												
C. Other (specify in Comments column)												

Total Number Of Gallons Applied: _____ Responsible Person's Signature And Title: _____

How to Fill Out a Dust Control Log

Time (indicate a.m. or p.m.)

7 ⁰⁰ _a	9 ⁰⁰ _a							
------------------------------	------------------------------	--	--	--	--	--	--	--

1. Before Dust Generating Operations Occur

A. Pre-watering to depth of cuts?	Y	NA							Comments
B. Pre-watering stockpiled material?	Y	NA							
C. Work phased/Disturbance minimized?	Y	Y							
D. Water truck being operated?	N	Y							
E. Water truck being filled?	Y	NA							
F. Other (specify in Comments column)	NA	NA							

2. During Dust Generating Operations

A. Is visible dust present?	N	N							Comments
B. Applying water?	NA	Y							
C. Applying dust suppressant(s) other than water?	NA	NA							
D. Fences or 3' – 5' high wind barriers with 50% porosity intact?	NA	Y							
E. Shut down operations?	NA	NA							
F. Checked control measures before leaving the work site for the day?	NA	NA							
G. Other (specify in Comments column)	NA	NA							

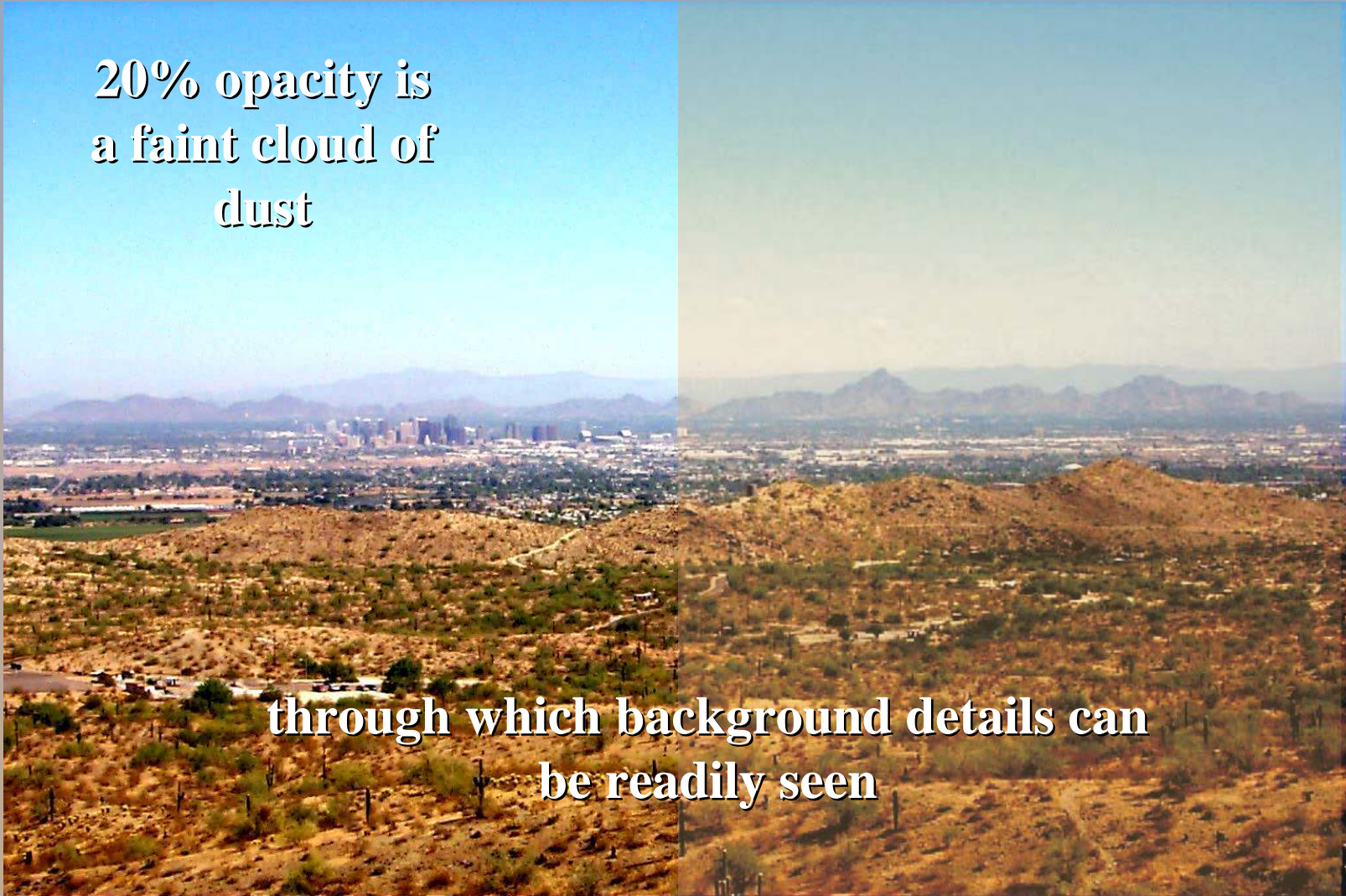
General Standards

- 20% opacity limit
- Methods of testing for opacity

20% Opacity Limit

20% opacity is
a faint cloud of
dust

through which background details can
be readily seen



20% Opacity Limit

- Prevent visible emissions from reaching 20% opacity
- Prevent the dust cloud from crossing the property line
- 20% opacity limitation applies at all times except when the average wind speed is greater than 25 mph provided that all reasonably available control measures are in place
- Consider attending “Smoke School” to become certified in reading opacity levels
Call (602) 506-6700 for details

Sign Requirements

For Sites of 5 Acres or Larger in Size

Minimum
Dimensions



Block letters
at least 4''
high

Control Measures Required for Construction Activities in Maricopa County

- Vehicle use
- Disturbed surface areas
- Material hauling
- Spillage and Trackout

Vehicle Use

- On open areas and vacant lots
 - Restrict trespassing with signs
 - Block access with barriers
- On unpaved parking lots
 - Water
 - Apply and maintain gravel, recycled asphalt, or other suitable material
 - Pave
 - Use dust suppressant

Vehicle Use

- On unpaved haul and access roads
 - Limit speed to 15 mph
 - Apply water, so that surface is visibly moist
 - Pave road
 - Apply and maintain gravel, recycled asphalt, or other suitable material
 - Apply dust suppressant

Disturbed Surface Areas

- **Before earthmoving operations**
 - Pre-water site to the depth of cuts
 - Phase work to reduce the amount of disturbed surface area at any one time
- **During earthmoving operations**
 - Apply water or dust suppressants
 - Construct fences or wind barriers
 - Cease operations as a contingency

Disturbed Surface Areas

- **Temporary stabilization**
 - Apply water or dust suppressants
 - Establish vegetative ground cover
 - Restrict vehicular access
- **After earthmoving operations**
 - Restore area to resemble undisturbed conditions
 - Establish vegetative ground cover
 - Apply and maintain dust suppressants

Material Hauling - On-site

- Load trucks so that freeboard is at least three inches
- Prevent spillage from holes or other openings in the floor, sides, or tailgate of the cargo compartment
- Exit site over suitable trackout control device such as a gravel pad or a grizzly

Material Hauling - Off-site

- Load trucks so that freeboard is at least three inches
- Prevent spillage from holes or other openings in the floor, sides, or tailgate of the cargo compartment
- Cover load with tarp
- Cover or clean the interior of empty cargo compartment before leaving site
- Drive across gravel pad or grizzly when leaving site

Spillage and Trackout

- At all access points, install a gravel pad at least 30 feet wide, 50 feet long, and 6 inches deep
- Install a grizzly or wheel wash system at all access points
- Pave for a distance of at least 100 feet and a width of at least 20 feet
- Sweep up deposits

Part III

Opacity And Other Test Methods At Construction Sites



III-1. OPACITY LIMITS FOR CONSTRUCTION DUST

In order to minimize the negative impact of dust on your health and that of the public, dust generated by construction activities should not exceed 20 percent opacity. What is opacity? Opacity is a measure of the density of dust—or smoke—that is emitted into the air. Opacity is not measured with scientific instruments; rather, people go through training and become certified to “read” opacity levels. The individuals are trained to take opacity measurements at a certain distance from the source emitting the plume of dust—or smoke, with the sun at his/her back. It is important that someone on each construction site know how to read opacities, so that the harmful health effects of dust can be avoided.

Opacity Measurement

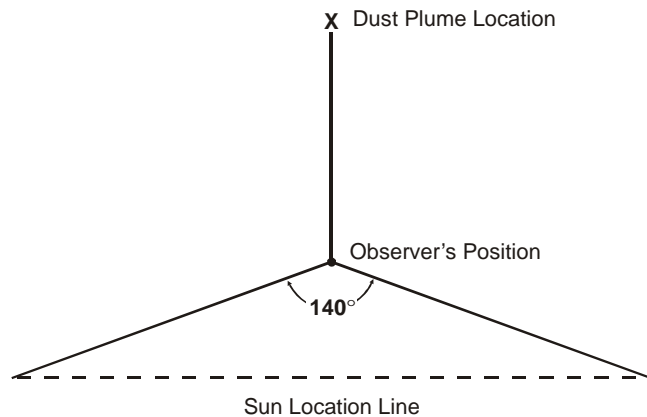
Persons wishing to learn how to read opacities should attend “Smoke School,” a free two-day course offered by the Arizona Department of Environmental Quality in the fall and spring in various parts of the state. ADEQ can provide additional information and current class schedules.

Opacity can be estimated on the job. Twenty percent opacity is a faint cloud of dust through which background details can be readily seen. Measures controlling visible emissions must be implemented during all periods of dust generating operations. The specific dust control measures, including contingency measures, are contained in the Dust Control Plan that is part of each regulated site’s earthmoving permit. Maricopa County Rule 310 defines more specific procedures for measuring opacity from dust generating operations and soil stability for disturbed surface areas

Observations

In order to accurately estimate opacity the observer should stand at least 25 feet from the dust generating operation so that the sun lies within an angle of 140 degrees behind the observer.

The observer’s line-of-vision should be perpendicular to the plume and wind direction.



The observer should identify the initial fallout zone - where the heaviest particles drop out—and take readings at the densest point outside of the initial fallout zone. If possible, the observer should use a contrasting background perpendicular to the line of sight.

For non-continuous dust plumes such as bulk material loading or unloading, the plume should be observed briefly every 5 seconds, and a minimum of 12 consecutive reading should be taken. For continuous dust plumes such as those caused by graders, trenchers, and clearing operations,

the plume should be observed briefly every 10 seconds, and at least 12 readings should be taken. The average of 12 readings is calculated to estimate the opacity of the plume.

Note that reading opacity levels accurately requires that the observer's eyes be "calibrated" or conditioned to recognize the levels. Smoke school can provide this conditioning.

III-2. OTHER TEST METHODS

In addition to testing for the opacity of dust plumes, several other tests are performed at construction sites. These tests are designed primarily to determine the likelihood that an area to be disturbed at the site will generate dust when being disturbed, or as the result of wind occurring prior to or during earthmoving activities. Characteristics of the site such as the existence of vegetation or a visible soil crust will significantly reduce the amount of dust that is generated.

To ensure that work sites under construction or temporarily or permanently inactive do not emit dust during high winds, the disturbed surface should be stable. To be stable, the disturbed surface should have a:

- Visible crust,
- Threshold friction velocity (TFV) of 100 centimeters per second (cm/s) or higher,
- Flat vegetative cover of at least 50 percent,
- Standing vegetative cover of at least 30 percent, or
- Cover of non-erodible elements greater than or equal to 10 percent.

The presence of sufficient visible crust is determined by performing the drop-ball test. If sufficient visible crust is not present, then a threshold friction velocity test should be performed. The TFV for a particular surface is the wind speed above which wind erosion of that surface will occur. A line transect test method is used to determine the percentage of flat vegetative cover, and a rock test method is used to determine the percentage of non-erodible elements (such as rocks). Summaries of these testing procedures are contained in Appendix A.

More Information on Opacity and Other Test Methods

Additional Information on opacity and other test methods for construction sites can be obtained from the ADEQ. The ADEQ Smoke School Information number is (602) 771-4851.

Or visit their Smoke School Web page at:

<http://www.adeq.state.az.us/environ/air/compliance/smoke.html>

EXERCISE III. OPACITY AND OTHER TEST METHODS

Opacity

Opacity is a measure of the _____ of dust—or smoke—that is emitted into the air.

Twenty percent opacity can be described as _____

In order to accurately estimate opacity the observer should stand at least _____ feet from the dust generating operation so that the sun lies within an angle of _____ degrees behind the observer.

The observer's line-of-vision should be _____ to the plume and wind direction.



Other Test Methods

Match the method you would use to test each of the following for soil stability:

Soil Condition	Test Method
Presence of visible crust	Threshold friction velocity
Presence of flat vegetative cover	Drop ball test
Lack of visible crust	Rock test method
Predominance of non-erodible elements	Line transect test method

APPENDIX A – ADDITIONAL TEST METHODS

TEST METHOD FOR VISIBLE CRUST

The presence of sufficient visible crust is determined by performing the drop-ball test. For this purpose, a metallic ball 5/8 of an inch in diameter and weighing 16.33 grams is used. To perform the test, follow these steps:

1. Clear away any blowsand (thin soil deposits, not originating on the site)
2. Drop the ball vertically from one-foot above the ground
3. Drop 3 times within a randomly-selected 1 foot by 1 foot area representative of disturbed conditions on the site
4. If the ball does not sink into the surface and when the ball is removed, the surface upon which it fell has not been pulverized, then there is sufficient crust
5. This must occur in two of the three drops

Repeat steps 1 through 5 in at least two other locations on the site. If sufficient crust is evident in all tests, site passes the Visible Crust Determination Test.

TEST METHOD FOR THRESHOLD FRICTION VELOCITY

The threshold friction velocity (TFV) for a particular surface is the wind speed above which wind erosion of that surface will occur. Factors that affect the TFV of a site include the existence of a visible crust, the average diameter of the surface particles, and the amount of non-erodible elements such as rocks present. Wherever a visible crust does not exist, testing should be conducted to estimate the TFV for the site.

The TFV tests are conducted using a set of sieves having openings of 4 mm, 2 mm, 1 mm, 0.5 mm, and 0.25 mm. The sieves should be stacked in order of opening sizes, with the sieve having the largest openings (4 mm) on the top and that having the smallest (0.25 mm) on the bottom. The TFV test consists of the following steps:

1. Place a collector pan below the stacked sieves
2. Collect a sample of loose material from a 1 foot by 1 foot area
 - 1 cm in depth
 - Use a broom and dustpan
 - Collect dry material only
 - Remove rocks greater than 1 cm
3. Place the loose material in the first stacked sieve (4 mm) and put a tight lid on the sieve/collector unit
4. With broad, circular, horizontal movements, shake the unit clockwise ten times, then counter-clockwise ten times
5. Remove the lid and estimate which sieve has the greatest volume
 - If most material is in the 4 mm or 2 mm sieve, TFV is 100+ cm/s
6. Perform test at least three times on the site; average the resultant TFVs

7. Apply a correction factor based on the percent of non-erodible elements
 - Larger than 1 cm, remain firmly in place, and inhibit soil loss during high winds
 - Stones and bulk material, but not plants
 - Sample a 1 meter by 1 meter representative area
8. If TFV corrected for non-erodibles is 100 cm/sec or higher, the area is considered to be stable

FLAT VEGETATIVE COVER

Flat vegetative cover is defined as both rooted vegetation and unattached vegetative debris lying on the surface in a predominantly horizontal position and not subject to movement by wind.

Line Transect Test Method for Flat Vegetative Cover

A line transect test method is used to determine the percentage of flat vegetative cover. The steps of this method are:

1. Stretch 100 foot measuring tape across random representative area
2. Anchor tape at both ends; should be taut and close to the ground
3. View the vegetation below the 3/32 inch area from directly above
4. Count the number of times vegetation lies directly beneath a 3/32 inch diameter area spaced at one foot intervals on one side of the tape
5. To be counted, the vegetation should completely fill the 3/32 inch area
6. Conduct the test at least three times and average the results

If the percent of the area covered by flat vegetation is 50 percent or more, the area is considered to be stable.

STANDING VEGETATIVE COVER

Standing cover is defined as rooted vegetation in a predominantly vertical position and not subject to movement (re-location) by wind.

Test Method for Standing Vegetative Cover

The percentage of an area covered by standing vegetation is estimated by conducting the following steps:

1. For larger vegetation (shrubs or sagebrush), select a representative square area that is at least 10 times the average height of the vegetation
2. For smaller vegetation, chose an area 3 feet by 3 feet
3. Count the number of vegetative units

4. Select a unit that represents the average height and width of the vegetation
5. For larger vegetation, calculate the frontal silhouette area (height times width) and multiply by the number of vegetative units
6. For smaller vegetation, a vegetative density factor is derived by measuring the frontal silhouette relative to grids of 1 or ½ inch on paper
7. Divide by the survey area to determine the percent vegetative cover

If 30 percent of the area or more is covered by standing vegetation, the area is considered to be stable

NON-ERODIBLE ELEMENTS

Non-Erodible Elements are objects larger than 1 cm in diameter that remain firmly in place on windy days. Such elements include rocks, stones, glass fragments, and hard packed clumps of soil. Vegetation is not considered a non-erodible element.

Rock Test Method for Non-Erodible Elements

A rock test method is used to estimate the wind-resistance of non-erodible elements on disturbed surfaces. The steps of this method are:

1. Mark off a 1 meter by 1 meter area
2. Mentally group the elements greater than 1 cm (3/8 inch) into small, medium and large categories
3. Count the number of elements in the area in each group
4. Measure the length and width of an average element in each group
5. Multiply by the number of elements in each group and add groups results
6. Divide by two to get frontal area and then divide by the survey area.

If the percent of non-erodible elements in an area is at least 10 percent, the area is considered to be stable.

Enforcement Objectives

- **Maricopa County Air Quality Violation Reporting and Enforcement Policy and Procedure**
 - Provide consistent & reasonable process
 - Document potential air quality violations
 - Notify violators
 - Initiate enforcement action
- **Ensure that violations are addressed in a timely and appropriate manner**

Enforcement Resources

- Maricopa County Environmental Services Department (MCESD) – persons working on fugitive dust control
 - Air Compliance Section
 - Includes dust control inspectors
 - Air Enforcement Section
 - County Attorney's Office has employees assigned to dust control matters including enforcement officers and attorneys
- Maricopa County Attorney's Office
 - Prosecutes civil and criminal dust control cases referred by MCESD

How Violations Are Discovered and Documented

- County inspectors and enforcement officers may encounter potential violations of Rule 310
 - While conducting an inspection
 - While investigating a complaint
 - By other means including spot inspections by Special Unit teams
- A written report is prepared, documenting
 - Where, when, how the potential violation occurred
 - Name, affiliation, title, and statements of interviewees
 - Photos and analytical tests supporting failure to comply

How Violators are Notified

- Notification is provided in writing to an owner, operator, or other responsible official
- Most common
 - Compliance Status Notification, or
 - Notice of Violation
- Less common, for more severe violations
 - Notice to Appear and Complaint or “Citation” – Class I Misdemeanor

Rule 310 Violations

- **Knowingly failing to obtain an earthmoving permit**
- **Unpaved parking lots**
 - Opacity >20% and
 - Silt loading and silt content limitations exceeded
- **Unpaved haul/access roads**
 - More than 20 vehicle trips per day or
 - Vehicles exceeding 15 mph

Rule 310 Violations

- **Disturbed surface areas on which no activity is occurring and none of the following standards can be met**
 - Visible crust
 - Threshold friction velocity of at least 100 cm/sec
 - Flat vegetation covering at least 50 percent
 - Standing vegetation covering at least 30 percent
 - Standing vegetation covering at least 10 percent and erodible elements that can resist a light breeze
 - More than 10 percent non-erodible elements
- **Test Methods for these standards:
Rule 310, Appendix C, Sections 2.2 - 2.6**

Rule 310 Violations

- **Hauling**
 - Freeboard on a truck is less than three inches or
 - Load of bulk material leaving site is not covered or
 - Material is being lost from holes or other openings in the cargo space or
 - Vehicles traversing a paved public road fail to pass over a trackout control device

Rule 310 Violations

- Trackout
 - For sites with disturbed surface area \geq five acres, vehicles are observed exiting onto a paved road without passing over a trackout control device
 - Deposits extending 50 feet or more from a work site exit are observed on a paved public road
 - Particulates are spilled or deposited from the cargo compartment, tires, or other exterior surfaces of a vehicle, extending 50 feet or more from the work site exit

Rule 310 Violations

- **Earthmoving, when one acre or more is being disturbed**
 - The Dust Control Plan designates water as the control measure, but none is being applied during operation
- **Weed abatement**
 - Discing or blading without application of water

Rule 310 Violations

- **Unpaved parking lots with more than 100 vehicles**
 - **Opacity exceeds 20 percent, and**
 - **Silt loading exceeds 0.33 oz/ft² or**
 - **Silt content exceeds eight percent**
- **Commercial feedlots and livestock areas**
 - **Opacity exceeds 20 percent, and**
 - **No evidence of dust suppressants or gravel, and**
 - **No trees within 100 feet of animal pens**

After a Notice of a Rule 310 Violation is Issued

↓
Investigation

NOV or Other
Written Warning
Issued

File a
Notice to
Appeal
and Complaint

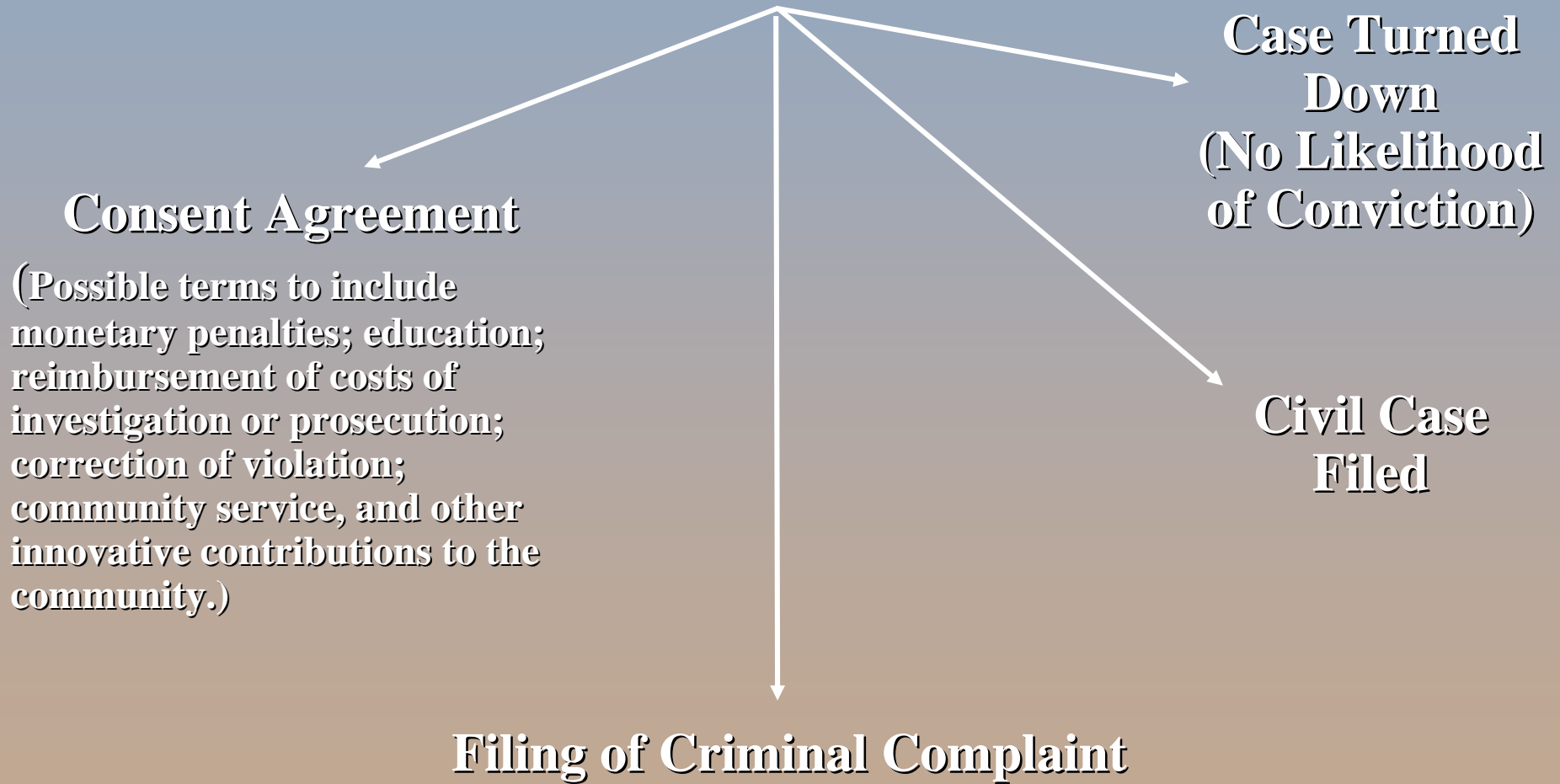
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Further
Information
Requested

Order of
Abatement or
Conditional Order

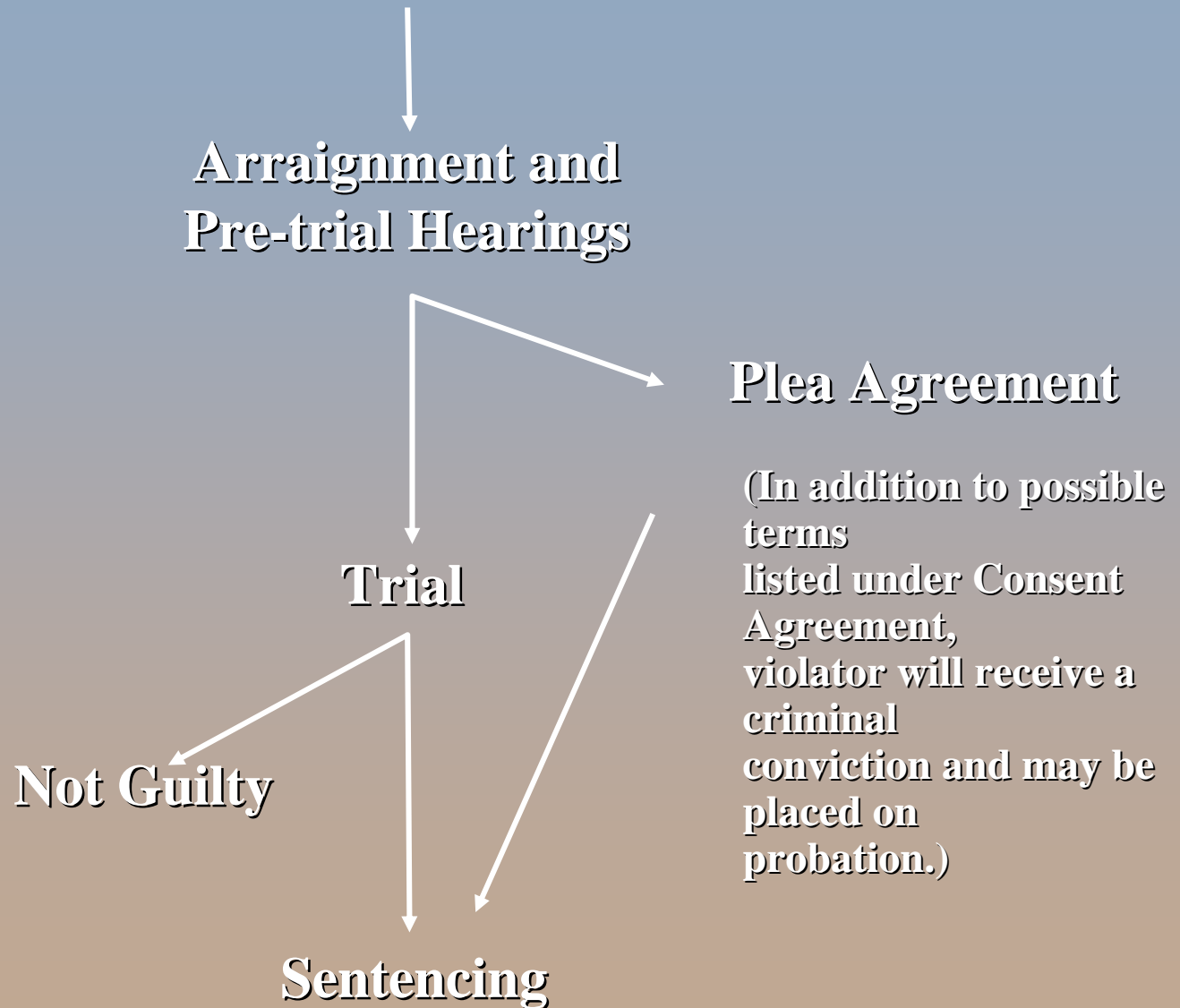
↓
Appeal to
Maricopa County
Hearing Board

↓
Case Referred to
County Attorney's Office
(Community Action Bureau)

**Case Referred to
County Attorney's Office
(Community Action Bureau)**



Filing of Criminal Complaint



Penalties

•Maricopa County Air Quality Violation Penalty Policy, July 2000

“The penalty must be high enough that it clearly convinces the violator and the regulated community that violators will be in a significantly worse position than those who comply with the law.”

- The penalty is calculated on the basis of the
 - Gravity of the Violation
 - Economic Benefit of Noncompliance
 - Cost Recovery of Enforcement Efforts
 - Other Mitigating Factors

Gravity of the Violation

- **Potential for Harm**
 - Level of violation
 - Toxicity of pollutant
 - Risk to environment
 - Risk to population
 - Size of the violator
 - Each of the above is rated on a 0-4 scale
 - Sum to determine “Potential for Harm” score:
Major = 14-20, Moderate = 7-13, Minor = 0-6
- **Extent of Deviation**
 - Major – Failure to comply
 - Moderate – Incomplete or incorrect compliance
 - Minor – Late compliance

Gravity Penalty Matrix

<u>Potential For Harm</u>	<u>Extent of Deviation</u>		
	Major	Moderate	Minor
Major	\$8-10K	\$6-8K	\$4.4-6K
Moderate	\$3.2-4.4K	\$2-3.2K	\$1.2-2K
Minor	\$600-1.2K	\$200-600	\$0-200

Example: If the “Potential for Harm” is Moderate (score = 10) and the “Extent of Deviation” is Moderate, the gravity penalty would be \$2,600

Gravity Penalty Adjustments

- **Multiple Days**
 - Penalty is applied for each violation day with discounts for multiple days:
 - 2-15 days = -15%
 - 16-30 days = -30%
 - >30 days = -50%
- **Degree of Willfulness or Negligence (max +25%)**
- **Degree of Coordination & Good Faith (max -15%)**
- **History of Noncompliance**
 - Previous violations were same or similar (+5%)
 - Most recent previous violation was within a year (+10%)
 - For *each* prior violation (+5%)
- **Response to Violations (max +10%)**

Economic Consequences of Noncompliance

- Put those violating the law at a competitive economic disadvantage
- Delayed costs + avoided costs + illegal profits
- Delayed costs - 5% x capital cost of compliance (interest earned on money not spent on compliance)
- Avoided costs – permanent expenditures avoided because of failure to comply
- Illegal profits – any made during time of non-compliance

Cost Recovery & Mitigating Factors

- **Cost Recovery of Enforcement Efforts**
 - Recoup special costs incurred in investigating, researching or analysis related to the violation
 - Costs must be “above the norm”
- **Mitigating Factors**
 - Ability to pay
 - Litigation risks
 - ARS 49-513 – Total penalty can not exceed \$10,000 per violation per day

Rule 310 Compliance Status

- In 2001, site compliance estimated to be 77%
 - 3,608 earthmoving permits
 - 7,941 earthmoving inspections
 - 1,346 complaints about earthmoving dust
 - 919 Notices of Violation
 - 523 Compliance Status Notifications
 - 402 cases referred to the Air Enforcement Section
 - 251 referred to the County Attorney's Office
 - 186 cases settled
- \$680K in penalties collected between May 2000 and December 31, 2001

Common Rule 310 Violations

- Soil not stabilized on non-working days or hours
- No earthmoving permit pulled or available on-site
- Failure to implement the Dust Control Plan
- No gravel pad at construction site exits
- Failure to pre-wet work areas and haul routes
- Insufficient number of water trucks
- Haul roads not stabilized or watered
- Trackout or deposits on paved public roads
- No tarps on haul trucks
- Failure to keep records on dust control measures

Frequently-Encountered Excuses

- The water truck or street sweeper...is on the way, broke down, got lost, etc.
- The soil at this site makes dust control impossible
- Give me a break, don't we live in a desert?
- How could I know it would be windy today?
- I left my permit on my desk at the office
- What a coincidence, I was going to get my permit today!
- One of the subs has the permit and you know how *they* are...

Part IV

Maricopa County Overview



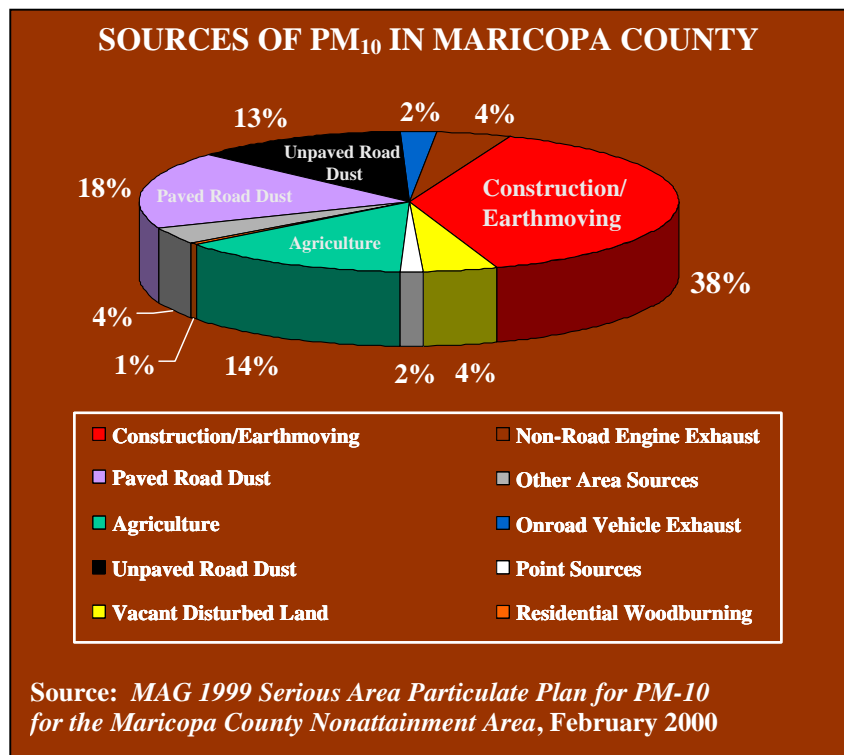
IV-1. MARICOPA COUNTY NONATTAINMENT AREA

In the Phoenix and Tucson urban areas, lead responsibility for preparing air quality plans is vested in the metropolitan planning organizations (MPOs). The MPOs work closely with ADEQ, counties, and local jurisdictions in developing nonattainment and maintenance plans. As is done with plans for other areas, the ADEQ submits nonattainment and maintenance plans to EPA for approval. If a required plan is disapproved or is not complied with, EPA may impose sanctions on the development of new industries likely to be sources of air pollution and on federal transportation funding.

Maricopa County is classified as a “Serious” nonattainment area for carbon monoxide, ozone and PM₁₀. This classification impacts the complexity of the planning requirements, the attainment dates, and stringency of the control measures required to attain the standards. Once air quality monitoring data over a number of consecutive years indicates that the standards are no longer violated and nonattainment and maintenance plans for the area have been approved by EPA, a nonattainment area can be redesignated to a “maintenance area.” EPA has recently designated Maricopa County as a nonattainment area based on the new eight-hour ozone standard.

Sources of PM₁₀ in Maricopa County

The major sources of PM₁₀ particles in the Valley are construction and earthmoving operations, re-entrainment of fugitive dust by vehicles driving on paved roads (large trucks, in particular, can create a sizable “wake”), vehicles driving on unpaved roads (especially at high speeds), agricultural activities, and vacant lots. Winds greater than 15 mph can whip-up the human-disturbed dust and cause exceedances of the 24-hour PM₁₀ standard. Activities that cause persistently high PM₁₀ in the same location can cause violations of the annual PM₁₀ standard.



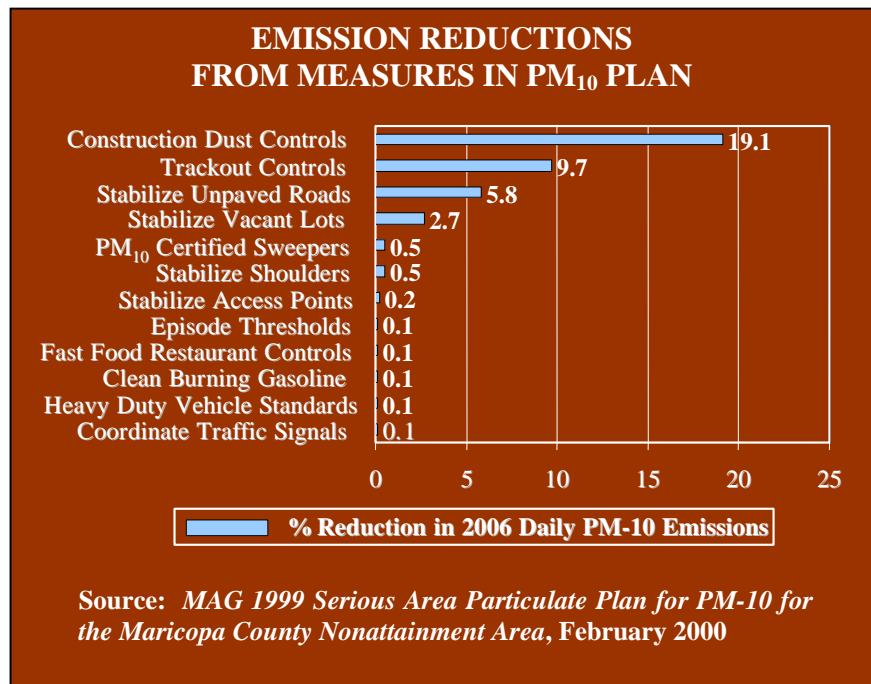
IV-2. MARICOPA COUNTY PM₁₀ PLAN

According to the EPA-approved Serious Area PM₁₀ Plan for Maricopa County, construction and earthmoving operations contribute the largest share of the annual PM₁₀ emissions in the Maricopa County nonattainment area (38%), followed by contributions from paved roads (18%), agriculture (14%), and unpaved roads (13%). Other minor sources of PM₁₀ include vacant disturbed land, residential woodburning, and industrial operations.

Rule 310 was enacted by the County to limit the emission of particulate matter from construction or earthmoving activities that may serve as a source of fugitive dust. Adherence to the provisions of Rule 310 results in reduced emissions from construction, vehicle track-out, and unpaved lots. The strengthening and better enforcement of Rule 310 is expected to decrease PM₁₀ emissions from construction and earthmoving activities by 19 percent, nearly half of the total reduction required to show attainment of the annual standard by 2006. Since reductions in dust generated by construction and earthmoving operations represent such a large share of control measure efficacy in the PM₁₀ Plan, it is essential for these reductions to be realized, so that the PM₁₀ standards can be attained by 2006. If the standards are not met by this date, EPA could impose a Federal Implementation Plan that is likely to be far more onerous than the current Serious Area PM₁₀ Plan.

Measures to Reduce PM₁₀ in Maricopa County

The PM₁₀ Plan for the Maricopa County nonattainment area was approved by EPA in 2002. It contains 77 control measures that include PM₁₀ efficient street sweepers, PM₁₀ pollution alerts, and catalytic converters on charbroilers in fast food restaurants like Wendy's and Burger King. - PM₁₀ emission reductions for twelve of the 77 measures were quantified in the Plan. The combined effect of these twelve measures is a 39 percent reduction in annual emissions by 2006.



IV-3. CONSTRUCTION DUST CONTROL REQUIREMENTS IN MARICOPA COUNTY

Rule 310 requires firms or individuals planning earthmoving activities involving 0.1 acre or more to obtain an Earthmoving Permit, submit a Dust Control Plan, and comply with specific record-keeping, site maintenance, site signage, and other requirements.

Who Must Apply for a Permit

The person responsible for any earthmoving operation that will disturb a total surface area of 0.10 acre or more must submit an Earthmoving Permit application. This “Responsible Official” could be an officer or decision-maker of a corporation, a partner of a partnership, the owner of a sole proprietorship, or the principal executive officer or ranking elected official of a public sector agency.

The Earthmoving Permit Application Form

The Earthmoving Permit application form consists of three sections, Applicant Information, Project Information, and Dust Control Plan. Three copies of the application must be submitted with the appropriate fee attached. For projects of between 0.1 acre and an acre in size, the fee is \$75. For projects of greater than one acre, the fee is \$36.00 per acre plus \$110.00 per site.

Section 2 covers the project information including the type of project, the address and legal description, the size of area, in acres, to be disturbed, and a project start date. A schematic drawing of the project with dimensions of at least 8 1/2 inches by 11 inches must be included.

Section 3 contains the Dust Control Plan.

Dust Control Plan Requirements

The Dust Control Plan application contains a section for each of the activities that take place during a typical construction project that has the potential for generating fugitive dust. Included with each activity are several control measures; the applicant must identify which measure will be employed as the primary measure during the conduct of that activity, and which measures will be employed as contingency measures. For some activities, Rule 310 mandates the employment of a specific primary measure. In these cases, a pre-printed “P” appears next to the measure. Note that the control measures must be employed so as to be effective at all times during the conduct of the project—on non-work days and after hours, as well as when construction activity is taking place.

Control measures to be identified by the applicant include a stabilization plan for any unpaved haul or access roads. Dust suppressants to be applied, if any, must be specified, including the method, frequency, and intensity of application, the type, number and capacity of application equipment. A plan to control trackout where unpaved or access points join paved public roadways must also be included.

Sign Requirements

Sites of 5 acres or larger in size must have a sign placed at or near the entrance to the job site where it can be clearly seen. The sign must be a minimum of 4 ft. high by 4 ft. wide and show the following information:

- Name of project
- Name and phone number of general contractor
- Include the phrase: “Dust Complaints? Call Maricopa County Environmental Services Department (602) 506-6616”

The information must be printed in block letters at least 4 in. high.

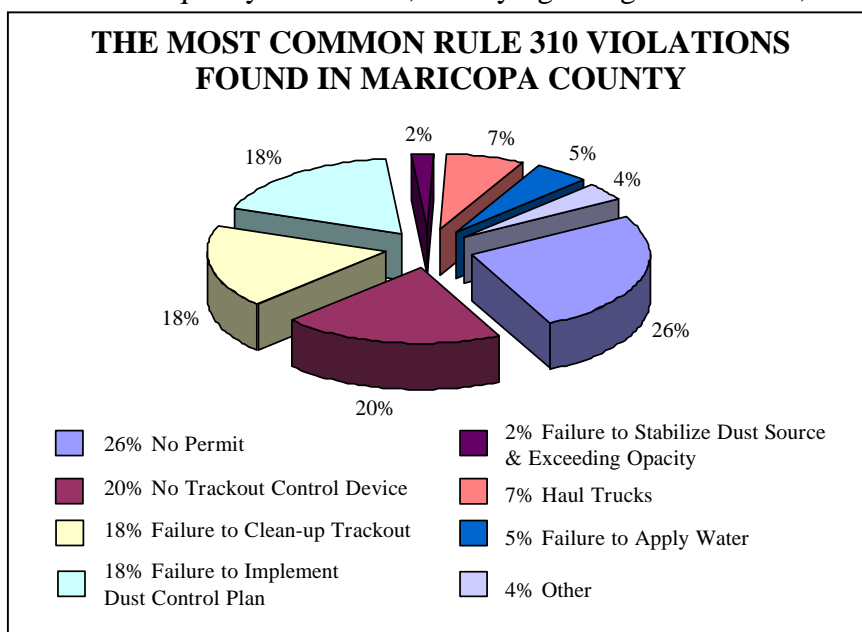
How Rule 310 Dust Control is Enforced in Maricopa County

The purpose of Maricopa County’s Enforcement Policies are to “provide a consistent reasonable process for documenting potential air quality violations, notifying alleged violators, and initiating enforcement action to ensure that violations are addressed in a timely and appropriate manner.” By state law, the maximum fine per violation per day is \$10,000.

The most common violation in recent years has been a failure to have an earthmoving permit located on site.

Frequently-Encountered Excuses

- The water truck or the street sweeper...is on the way, broke down, got lost, etc.
- The soil at this site makes dust control impossible.
- Give me a break – we live in the desert!
- How could I know it would be windy today?
- I left my permit on my desk at the office.
- What a coincidence, I was going to get my permit today!
- One of the subs has the permit; you know how they are!



EXERCISE IV. SOURCES OF PM10 IN MARICOPA COUNTY

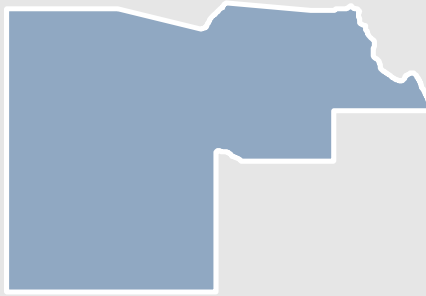
Maricopa County is a _____ PM₁₀ nonattainment area and violates both the _____ and _____ standards for PM₁₀.

The greatest percentage of PM₁₀ in Maricopa County is caused by _____

Name two other significant sources of PM₁₀:

1. _____

2. _____



By what date does the Maricopa County PM₁₀ Plan show attainment of the federal PM₁₀ standards? _____

Name two of the most stringent control measures contained in the Plan: _____

Designing and Implementing a Construction Project to Minimize Dust

- Site planning
- Trackout
- Bulk material handling, storage and transportation
- Construction operations
- Site maintenance

Site Planning

- **Phase project**
 - Minimize soil disturbance
 - Limit area graded at any one time
- **Install wind fences or barriers**
- **Develop staging areas**
- **Restrict access to unpaved areas**
- **Re-stabilize disturbed surfaces as soon as possible**
- **Allow sufficient time for pre-wetting site**
- **Make sure site workers**
 - Understand basic dust control strategies
 - Know who is responsible for dust control

Trackout

- **Control of trackout required**
 - For all sites with disturbed area of 5 acres or more
 - Sites from which 100 yards or more of bulk materials are hauled on-site and/or off-site per day
- **Control trackout through use of**
 - Gravel pads
 - Grizzlies
 - Paving
 - Effective Watering
- **Clean up trackout**
 - If extends 50 feet or more - immediately
 - Otherwise, at end of work day

Strategies for Bulk Material Handling, Storage and Transportation

- Off-site onto paved public roadways
- Within the boundaries of the work site or when crossing a public roadway open during construction
- On site, completely within site boundaries
- Open storage piles

Bulk Material Hauling Off-site

Onto Paved Public Roadways



Source: Dust Devil Academy

- Allow for a freeboard of not less than 3 inches when loading haul trucks
- Prevent spillage from any openings—floor, sides, or tailgates of cargo compartment

Bulk Material Hauling Off-site

Onto Paved Public Roadways

- Cover all haul trucks with tarps
- Clean or cover cargo compartment interiors of empty trucks
- Control trackout



Courtesy Kitchell Contracting

Bulk Material Hauling

- Within the boundaries of the work site
- Or when crossing a public roadway open during construction
 - Allow for a freeboard of not less than 3 inches when loading haul trucks
 - Prevent spillage from any openings—floor, sides, or tailgates of cargo compartment
 - Control trackout

Bulk Material Hauling On site, Completely Within Site Boundaries

- **Limit vehicular speeds to 15 mph**
- **Apply water to top of load to keep dust emissions from exceeding 20 % opacity limit**

Open Storage Pile

- Any accumulation of bulk material with a 5% or greater silt content 3 or more feet in height at any point with total surface area of 150 square feet or more
 - During loading and unloading operations, apply water as needed
 - When not working pile
 - Cover with secured tarp
 - Apply water to maintain soil moisture at 12% or more
 - Apply water to soil surface until crust forms that will prevent wind erosion

Construction Operations

- **Disturbed surface area - pre-activity**
- **Disturbed surface area - during construction**
- **Earthmoving operations on disturbed surface areas 1 acre or larger**
- **Unpaved haul and access roads**

Disturbed Surface Area - Pre-activity

- Use advance planning to minimize likelihood of generating excessive fugitive dust
- Pre-water work site to the depth of cuts
- Proceed in stages to minimize amount of disturbed surface area present at any given time

Disturbed Surface Area

During Construction



Source: Dust Devil Academy

- Apply water or dust suppressant to work area
- Construct fences or 3 to 5 foot high wind barriers adjacent to roadways or urban areas
- Water during grading, mist during trenching

Earthmoving Operations on Disturbed Surface Areas 1 Acre or Larger



Source: Dust Devil Academy

- When the area under construction is 1 acre or larger, water must be applied during earthmoving operations, if water is chosen control measure

Unpaved Haul and Access Roads

- Vehicle speed must not exceed 15 mph and the number of trips must not exceed 20 per day unless
 - Water is applied so surface is visibly moist
 - Gravel or recycled asphalt is applied and maintained
 - Dust suppressant is used per manufacturer's directions
 - Roadways are paved

Site Maintenance

- **Unpaved parking lots**
- **Open areas and vacant lots**
- **Disturbed surface areas - temporary stabilization during non-work days and after hours**
- **Disturbed surface areas - permanent stabilization required within 8 months after cessation of dust generating operations**

Unpaved Parking Lots

Rule 310 requires for unpaved parking lots

- Apply and maintain surface gravel, recycled asphalt, or other suitable material
- Apply and maintain a dust suppressant
- Pave

Open Areas and Vacant Lots

- Apply water to form crusted surface
- Prevent motor vehicle and/or off-road vehicle trespassing, parking, or access
- Uniformly apply and maintain surface gravel or soil stabilizers to all areas that have been disturbed by motor vehicles or off-road vehicles
- Pave the area
- Restore area so that vegetative ground cover and soil characteristics are similar to adjacent or nearby undisturbed native conditions

Disturbed Surface Areas Temporary Stabilization

During Non-work Days and After Hours

- **Apply and maintain a dust suppressant**
- **Prevent motor vehicle and/or off-road vehicle trespassing, parking, or access**

Disturbed Surface Areas

Permanent Stabilization

- **Required within 8 months after cessation of dust generating operations**
- **Restore area so that vegetative ground cover and soil characteristics are similar to adjacent or nearby undisturbed native conditions**
- **Pave, apply surface gravel, or apply a dust suppressant**
- **Establish vegetative ground cover in sufficient quantity**

Resources Available to Reduce Dust Before, During, and After Construction

- Trackout control devices
- Effective watering
- Chemical stabilizers (dust suppressants)
- Wind barriers

Trackout Control Devices

Gravel Pad



Source: Dust Devil Academy

- Removes mud and dirt from the tires of vehicles driving across it
- 1- to 3-inch diameter washed gravel or crushed rock
- At least 30 feet wide by 50 feet long, 6 inches deep

Trackout Control Devices

Grizzly



Courtesy Kitchell Contracting

- A device constructed of rails, pipes, or grates
- Dislodges mud, dirt, and debris from the tires and undercarriages of motor vehicles driving over it
- More information at www.trackoutcontrol.com

Effective Watering

- Makes roads and disturbed surfaces appear moist with minimal silt
- Creates a crusted surface on the soil
- Provides soil moisture content optimal for compaction
- Prevents visible emissions from exceeding 20% opacity

Effective Watering Strategies



Source: Dust Devil Academy

- Wet the area to depth of cuts or equipment penetration 15 to 30 minutes prior to start of work
- Apply water at the end of the day to soak the next day's work area overnight
- During grading, apply water in sufficient quantity to maintain a moist surface using a water truck
- Apply to cleared areas at least every 2 hours
- Surfactants added to water increase penetration
- Use sprinklers where trucks can't reach

Chemical Stabilizers

- Can reduce need for watering
- Last between 1 and 12 months
- Not suitable for
 - Areas subject to high traffic volume
 - Areas subject to heavy equipment traffic
- Obtain dilution, application rates from vendor
- County recommends non-toxic, non-corrosive products



Source: Dust Devil Academy

Wind Barriers

- Use wind barriers in conjunction with watering or application of dust suppressants

- In addition
 - Install wind fences
 - Construct berms
 - Park equipment to block wind



Source: Dust Devil Academy

- Effective wind barriers are 3-sided structures made of material with a porosity of 50% or less

Additional Benefits of Controlling Dust

- **Public and community “good will”**
- **Employee health considerations**
- **Potential competitive advantage for early adopters**

Example Problem Slide

The following slide represents a schematic of a job site larger than one acre. As the person responsible for dust control during an upcoming project on this site, list some measures you would implement concerning the following:

- Site planning
- Trackout
- Bulk material handling, storage and transportation
- Construction operations
- Site maintenance

Example Problem Slide Planning Ahead

Control Traffic with Signage

Pre-Water to Depth of Cuts

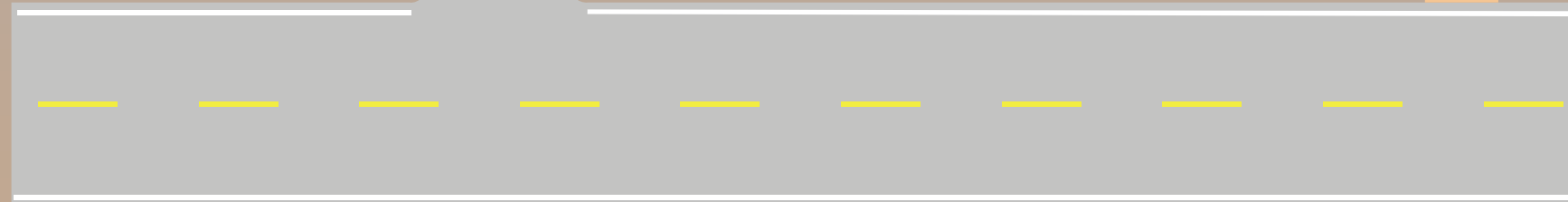
STORAGE PILE

EXCAVATION AREA

UNPAVED SITE

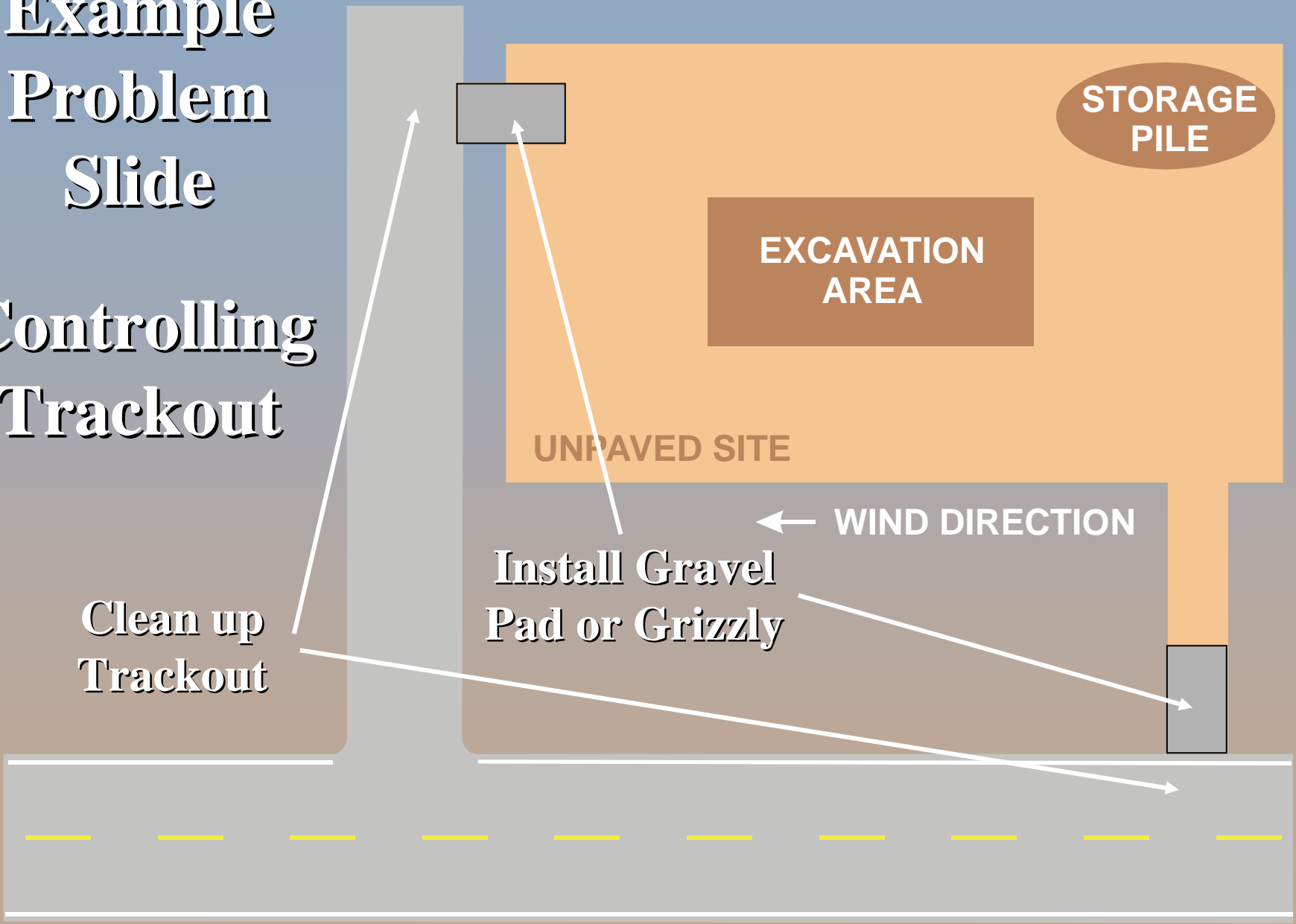
← WIND DIRECTION

Construct Wind Barrier

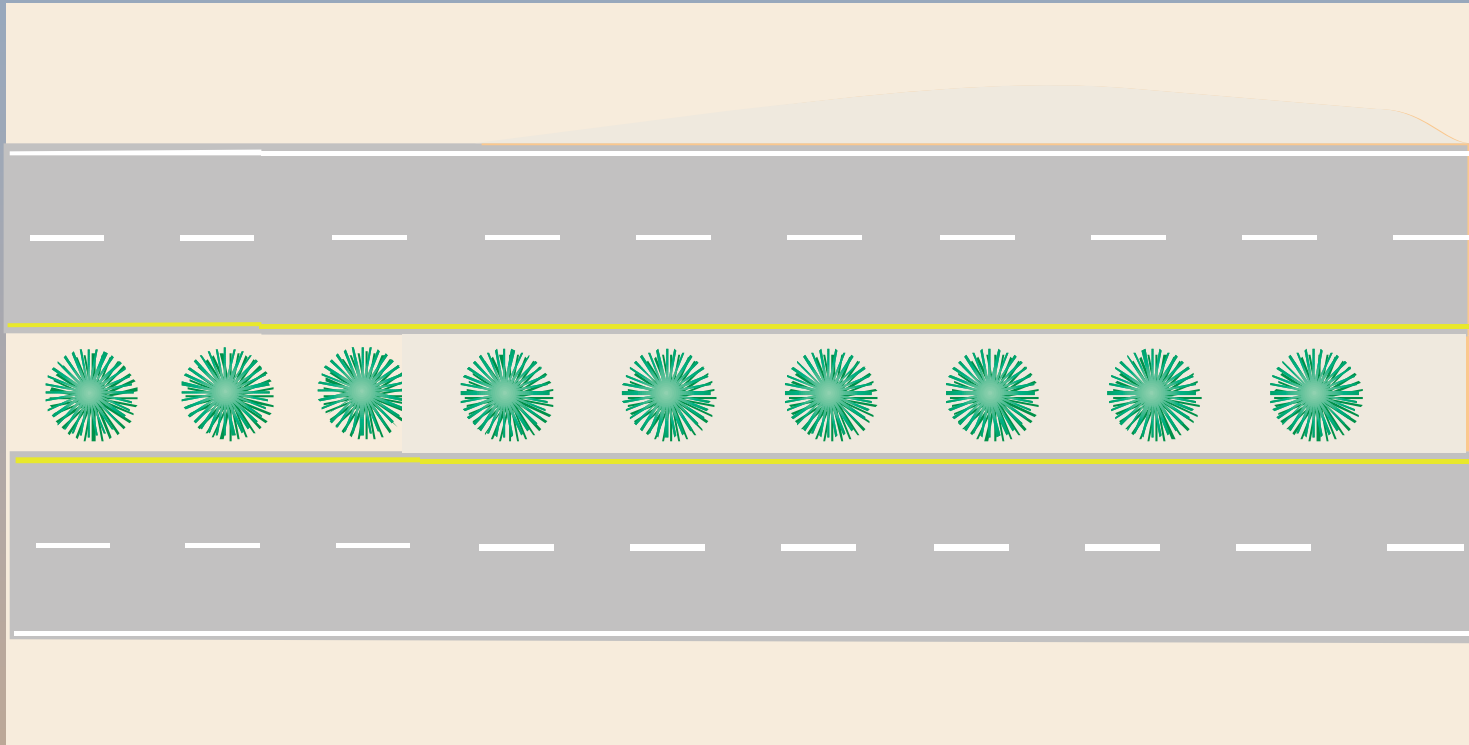


Example Problem Slide

Controlling Trackout



**Restore ground cover
and soil characteristics
when work is completed**



**Example Problem Slide
Roadway Construction**

How can we better integrate dust control considerations into the entire construction process?

- Discussion

Dust Control Course Trainer's Guide



Prepared for
Arizona Department of Transportation

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INTRODUCTION TO THE TRAINING AND CERTIFICATION PROGRAM

As part of the Blue Skies campaign, a Dust Control Training Course and voluntary Certification Program have been developed. The goal of the training course is to familiarize construction personnel with common dust control problems and solutions. The course is designed for anyone working in the construction field, although site superintendents, water truck and water pull drivers, and subcontractors are highly encouraged to attend. In addition to lectures, the course includes class discussion and review of actual field case studies.

At the completion of the course, the attendee will have a basic understanding of dust problems and measures to control dust during construction related activities, will be able to identify dust problems, and will be able to implement actions to reduce dust generation.

Modular Lesson Plan

This basic dust control course is designed to be presented in a half-day format. Prior to beginning Module 1, the class should be shown the 10-minute video developed by the Maricopa County Environmental Services Department, entitled “Effective Dust Control and Overview of Rule 310.” The course can be tailored to the needs of specific groups by eliminating modules or part of modules. The five training modules are:

Module 1 - Background (1 hour) will cover the reasons that dust control is needed, and the causes of PM₁₀. Both natural and man-made sources of fugitive dust will be identified, and actions that have already been taken to reduce PM₁₀ emissions will be explained. Control measures such as those in Rule 310 for Maricopa County will be discussed.

Module 2 - Construction Dust Control Requirements under Maricopa County Rule 310 (30 min.) will explore in detail the construction dust control requirements in effect for the jurisdiction in which the course is being presented. Control measures for construction-related activities will be explained.

Module 3 - Enforcement of Maricopa County Rule 310 for Construction Activities (20 min.) will cover jurisdictional enforcement, including the characteristics of the dust control enforcement program, inspection criteria, enforcement procedures, and penalties for violations.

Module 4 - Strategies to Assist Construction Activities in Controlling Dust (45 min.) will examine dust control strategies including project design and site planning, and available resources. A case study of an actual construction project will be included.

Module 5 - Information Resources and Reinforcements (30 min.) will discuss additional information resources and reinforcements available to the class including certification opportunities. Participants will be given a final quiz that can be used for certification purposes.

Certification Program

The goal of the Certification Program is to train construction personnel and supervisors to identify dust problems and implement effective dust control measures. This voluntary program is designed for construction industry management and job supervisory personnel. Two levels of certification are offered:

Certified Dust Control Specialist - An individual who successfully completes Dust Control Training and Visible Emissions Evaluation Training (Smoke School), a minimum of every three years, may receive designation as a Certified Dust Control Specialist. To receive certification, an individual must pass a quiz covering the subject matter presented in all five Dust Control Training modules with a grade of 75 percent or better. Smoke School is offered in Maricopa and Pima Counties twice a year. Smoke School is a two-day event comprising two elements. A classroom session held the morning of the first day beginning at 8 a.m., is followed by a testing session lasting the remainder of the event. During the testing session, participants evaluate several sets of black and white smoke readings.

Certified Dust Control Instructor - An individual who successfully completes Dust Control Training and Smoke School a minimum of every 18 months, and who has taught at least one Dust Control Course under the supervision of a Certified Instructor, may be designated a Certified Dust Control Instructor.

Upon certification, each individual will receive a Dust Control Specialist (Instructor) Certificate and Card.

Additional information on the availability of training classes and requirements for certification may be obtained by contacting the Blue Skies Campaign Coordinator at (602) xxx-xxxx.

The Module Scripts

This *Trainer’s Guide* contains example scripts for each of the five modules, keyed to the slides in the accompanying PowerPoint™ files. In a few cases, script sections are numbered “2-10 A”, “2-10 B”, and so on. This numbering convention is used when the accompanying slide—such as slide No. 2-10—makes use of the PowerPoint™ animation feature. The scripts are intended as examples only and provide the minimum supporting information that should be conveyed to the class at the time each slide is shown.

MODULE 1 - BACKGROUND

Slide No.	Notes
1-1	Module 1 - Why Do We Need to Control Dust?
1-2	What is Particulate Matter – Tiny solid particles or liquid droplets that remain suspended in the air, including soil dust, pollens, molds, ashes, soot and aerosols. PM ₁₀ is particulate matter smaller than 10 microns in diameter and PM _{2.5} is smaller than 2.5 microns. (For comparison, a human hair is approximately 70 microns.)
1-3	PM₁₀ is predominately geologic materials such as rock and soil particles; the soil particles are typically silt (4-10 microns in diameter), and clay (larger than 4 microns in diameter). In urban areas, PM _{2.5} particles generally represent between 25 and 30 percent of the PM ₁₀ based on volume. PM_{2.5} is usually emitted by combustion sources and formed by gases; a smaller fraction is made up of clay soil particles.
1-4	Soil Particle Sizes - Relative soil particle sizes are shown here. Sand particles typically exceed ten microns in diameter and, therefore, are too big to be PM ₁₀ . These particles are so large that they return to the ground quickly after being airborne. Silt tends to be the predominant soil type of particles that are smaller than 10 microns (PM ₁₀) but larger than 2.5 microns (PM _{2.5}). The smaller clay particles are usually the soil type found in PM _{2.5} .
1-5	National Ambient Air Quality Standards for PM₁₀ and PM_{2.5} – There are two federal standards for PM ₁₀ and PM _{2.5} : an annual and a 24-hour standard. Maricopa County does not violate either of the PM _{2.5} standards, but violates both the annual and daily standards for PM ₁₀ .
1-6	How PM is Monitored – Particulate concentrations are usually measured by pulling ambient air through a filter for twenty-four hours every sixth day, weighing the filter before and after, and measuring the volume of air sampled. Regular checks of the stability, reproducibility, precision, and accuracy of the samplers and laboratory procedures are conducted using statistical tests required by EPA. In 2000, there were seven PM _{2.5} monitors and nineteen PM ₁₀ monitors operating in Maricopa County. The 24-hour concentrations are averaged over a calendar year to determine annual concentrations.
1-7	How Violations are Measured - In order to violate the annual standard, the three-year average of annual means at a monitor must be greater than the standard. A violation of the 24-hour standard occurs at a monitor when the expected exceedance rate, averaged over a three-year period, is greater than one.
1-8	Central Phoenix Air Monitoring Site - This site has been measuring air pollution for over three decades. Equipment at this site measures PM ₁₀ continuously so that episodes (back-to-back high concentration days) can be predicted and counter-measures can be implemented in a timely manner.
1-9	Trends in PM Concentrations – No monitor in Maricopa County has recorded a violation of the PM _{2.5} standards and this trend is expected to continue in the future, due to increasingly stringent federal controls on tailpipe emissions from new cars

Slide No.	Notes
1-9 (continued)	and trucks. However, for PM ₁₀ , the number of monitoring sites exceeding the annual standard and number of days exceeding the 24-hour standard have not shown a consistent downward trend.
1-10	PM₁₀ Trends - This chart shows that 1998 and 2001 were relatively good years for PM ₁₀ in the Valley, but 1999 and 2000 were not.
1-11	PM₁₀ Trends - This graph indicates that the daily standard was exceeded on six days during 2001.
1-12	<p>Where Do Violations Occur? - Based on monitoring data collected in 1999-2001, five monitors in Maricopa County violated the annual PM₁₀ standard (that is, their three-year average concentrations were greater than 50 ug/m³):</p> <ul style="list-style-type: none"> • Chandler (1475 E. Pecos; on site of City's Wastewater Treatment Plant) • Durango Complex (1 mile NW of the Salt River Site in the Maricopa County Flood Control District storage yard.) • Greenwood (27th Ave, just south of the I-10 freeway) • Salt River Service Center (near 22nd Ave & Lower Buckeye Rd) • South Phoenix (4732 S. Central Ave) <p>All of these sites—plus the Maryvale monitor at 6180 West Encanto—also violated the 24-hour standard (with a three-year exceedence rate greater than one). The region will not be in attainment of the national ambient air quality standards for PM₁₀ until all monitors consistently meet the 24-hour and annual standards.</p>
1-13 A	PM₁₀ Monitoring Sites - Maricopa County operates 15 PM ₁₀ monitoring sites in Maricopa County, while the State Department of Environmental Quality (ADEQ) operates four additional PM ₁₀ monitors in Central Phoenix, Tempe, Goodyear, and at Palo Verde. ADEQ also conducts its own PM ₁₀ monitoring at several of the County's sites.
1-13 B	The monitoring sites that violated the 24-Hour PM ₁₀ standard in 2000 are highlighted in yellow. With the exception of Maryvale (site #6), all of these sites also violated the annual PM ₁₀ standard. They are clustered generally in South and West Phoenix, with the exception of the Chandler site.
1-14	<p>Health Effects of PM - When inhaled, coarse particles (between 2.5 and 10 microns) are deposited in the upper respiratory tract. The smaller particles (less than 2.5 microns) can be deposited lower, in the pulmonary tissues, and invade the alveoli of the lungs. These more invasive particles can bond with toxins and other airborne chemicals before they are inhaled. It is difficult for the human body to eject the fine particles, once they are deposited in the lower lungs.</p> <p>In the lungs, PM decreases breathing efficiency and alters the body's natural defense systems. Highly sensitive groups include the elderly, asthmatics and children. Epidemiological studies have shown causal relationships between high particulate concentrations and increased mortality and morbidity.</p>
1-15	Medical Data for PM₁₀ - Medical studies have shown that higher PM ₁₀ concentrations can be linked to an increased number of premature deaths, asthma attacks, hospital admissions, and emergency room visits, and an overall decrease in lung functioning efficiency.
Slide No.	Notes

1-15 (continued)	<p>In 1995, the Arizona Comparative Environmental Risk Project ranked particulate pollution as one of the highest environmental risks in the state. This conclusion was based on increased hospital admissions for respiratory problems, asthma, and lower and upper respiratory symptoms, due to high annual PM₁₀ concentrations. In the same study, premature deaths due to PM₁₀ were estimated to approach 700 per year in Maricopa County and 1,000 per year statewide.</p>
1-16	<p>Quality of Life impacts of PM – In addition to the health impacts, PM pollution is part of the highly visible “brown cloud” that hangs over the Valley and obscures our blue skies on many mornings of the year. Scientific measurements by the Arizona Department of Environmental Quality indicate that visibility has been declining in the Phoenix metropolitan area since 1994. Particulates also contribute to the regional haze that reduces visibility at wilderness areas, parks, and other pristine areas located downwind of Maricopa County. On a more localized level, PM from construction sites, vacant lots and fields, blowing across public or private roads, can reduce visibility and increase the risk of traffic accidents. As a secondary impact, high levels of dust are also responsible for soiling clothes, vehicles, buildings, and other public and personal property and the resultant cleaning and repair costs.</p>
1-17	<p>What Causes Particulate Matter? Particulates are emitted into the air by both natural events and human activities.</p> <p>Natural Sources - Winds sweeping over the natural desert around us contribute some of the airborne particulates, although not as much as you might think. The vegetation in the desert and the crust that forms after rains tends to put a natural “lid” on fugitive dust. In addition, sustained high winds exceeding 15 mph only occur on a few days each year. PM measurements taken at the relatively pristine Organ Pipe Cactus National Monument in southeastern Arizona indicate that natural conditions represent about 20% of the standards. That is, about 10 ug/m³ of the 50 ug/m³ annual standard for PM₁₀ is prevalent in the atmosphere as a result of natural desert terrain. PM₁₀ emitted by natural sources (i.e. dust devils, pollen from plants) is generally higher in an urban environment, usually in the range of 30-40 percent of the standard. The remaining concentrations can be attributed to human activities that have disturbed the soil or re-suspended the dust back into the air.</p> <p>Human Sources – People are responsible for most of the particulates present in the air that we breathe; in urban areas, humans contribute at least 60 percent of the PM₁₀ air pollution problem.</p>
1-18	<p>Dust Storm Development - This slide shows time-series photos of a dust storm developing over Phoenix. Dust storms can contribute to violations of the 24-hour PM₁₀ standard, but do not have a significant influence on violations of the annual PM₁₀ standard.</p>
1-19	<p>Organ Pipe Cactus National Monument - Natural desert conditions, such as those at Organ Pipe, produce PM₁₀ levels that are about 20% of the national ambient air quality standards.</p>
1-20	<p>Major Sources of Coarse PM₁₀ Particles - Engine exhaust from on-road vehicles and off-road equipment emits a large proportion of the smallest particles (PM_{2.5}). About one-half of the PM_{2.5} is emitted in gasoline exhaust; another 15% comes from diesel exhaust.</p>
Slide No.	Notes

1-20	The major sources of the slightly larger, although still invisible, coarse particulate matter (2.5 to 10 microns in diameter) are emissions from older, poorly tuned vehicles and engines starting up in the colder fall and winter mornings are the major sources of PM _{2.5} in Maricopa County.
1-21	Sources of PM₁₀ - The major sources of the slightly larger, although still invisible, PM ₁₀ particles in the Valley are construction and earthmoving operations, re-entrainment of fugitive dust by vehicles driving on paved roads (large trucks, in particular, can create a sizable “wake”), vehicles driving on unpaved roads (especially at high speeds), agricultural activities, and vacant lots. Winds greater than 15 mph can whip-up the human-disturbed dust and cause exceedances of the 24-hour PM ₁₀ standard. Activities that cause persistently high PM ₁₀ in the same location can cause violations of the annual PM ₁₀ standard.
1-22	Sources of PM₁₀ - Construction and earthmoving operations contribute the largest share (38%) of the average annual PM ₁₀ emissions in the Maricopa County nonattainment area, followed by contributions from paved roads (18%), agriculture (14%), and unpaved roads (13%). Interestingly, on-road vehicle and non-road engine exhaust contributes only 6% of the PM ₁₀ , while producing two-thirds of the smaller PM _{2.5} particles. Other minor sources of PM ₁₀ include vacant disturbed land, residential woodburning, and industrial operations.
1-23	Sources of PM₁₀ - In Maricopa County, monitors located near an elevated freeway (Greenwood), industrial sources and unpaved haul roads (Salt River and Durango), and agricultural fields (Higley) have repeatedly exceeded the annual PM ₁₀ standard.
1-24	Some Sources of PM₁₀ - Agricultural tilling and vehicles on freeways can contribute to high PM ₁₀ concentrations.
1-25	PM₁₀ Hot Spot - The highest 24-hour and annual PM ₁₀ concentrations have typically been measured at the Salt River Service Center monitor located near 22 nd Avenue and Lower Buckeye Road. This area is characterized by a large number of potential PM ₁₀ sources, including two landfills, one of which is an EPA Superfund site, a sand and gravel operation, a pre-stressed concrete manufacturing yard, a bus storage depot, unpaved roads and shoulders, and vacant disturbed lots. Since this monitor has continued to violate the federal standards, despite implementation of a large number of control measures, the Arizona Department of Environmental Quality and Maricopa County initiated a study in mid-2002 to re-assess the sources of PM ₁₀ surrounding this monitor. This study should shed additional light on the relative contribution of various sources to PM ₁₀ pollution, since so many potential sources are located near the site.
1-26	Salt River Service Center Sources - This is an aerial photo of the 32-square mile area surrounding the Salt River Service Center site. The Salt River site is located in the upper middle portion of the photo. This is the area being studied by the County and State in 2002-2003 to identify the sources that produce the Valley’s highest concentrations of PM ₁₀ .
1-27	Natural Conditions Contributing to PM₁₀ – Years in which the annual rainfall is lower than average typically record higher annual levels of PM ₁₀ . However, extremely wet years are not always associated with the lowest annual PM ₁₀ concentrations, because more mud is tracked onto pavement, dried in the sun, and
Slide No.	Notes
1-27 (continued)	subsequently re-entrained by moving vehicles. High winds are a more reliable predictor of high concentrations of daily PM ₁₀ . For example, on August 22, 2000, six

	<p>monitors located throughout the Valley exceeded the standard, due to wind gusts in excess of 25 mph. Other exceedances of the 24-hour standard during 2000 occurred during the months of January, June, July, September, and November. These high PM₁₀ readings were measured at seven different monitors on days that were not windy. High levels of PM₁₀ can occur on any day of the year and at any location.</p>
1-28	<p>Natural Conditions Contributing to PM₁₀- Another natural condition contributing to PM₁₀ is the type of soil that is being turned into fugitive dust by construction, earthmoving, or agricultural activities. Sandy soils create heavier particles that, when suspended in the air, are more quickly re-deposited on the ground. Soils that are predominantly clay, when disturbed, create much smaller particles that are more likely to stay suspended in the air as PM₁₀.</p>
1-29	<p>PM₁₀ Soils Map - The Natural Resources Conservation Service and the Maricopa Association of Governments have created a map that shows generally the location of soils in the Valley that are most likely to produce PM₁₀, if disturbed by human activities. The dark red on this map indicates the areas in the PM₁₀ nonattainment area where clay soils predominate. As we have learned earlier, these are the most likely to produce PM₁₀ when disturbed by human activities such as motor vehicle operation, construction, or agriculture. This soils map may be viewed at [INSERT WEB ADDRESS].</p>
	<p>What is Being Done To Reduce PM? - In addition to setting ambient air quality standards, the U.S. Environmental Protection Agency (EPA) also sets emissions standards for fuels, vehicles, and engines. Over the years, the federal motor vehicle emission control programs have proved to be the most effective way to reduce air pollution. Since the late 1980's, carbon monoxide, hydrocarbons, nitrogen oxides, lead, and PM₁₀ concentrations have declined dramatically in all major U.S. urban areas, due largely to more stringent vehicle emissions standards set by EPA. This decline in vehicle pollution has occurred at the same time that vehicle travel in the country has more than doubled.</p>
1-30	<p>In 1999 and 2000 EPA finalized rules setting even more stringent standards for fuels, gasoline-powered vehicles, and diesel-powered vehicles and engines. The new gasoline vehicle standards, called Tier 2, will be implemented on 2004 and later model year vehicles. Low-sulfur gasoline and diesel fuels must be offered in gas stations by mid-2006. The new heavy-duty diesel vehicle and engine standards will begin phasing-in with the 2007 model year. These new standards will reduce PM_{2.5} and other pollutants such as nitrogen oxides by as much as 90%. Although the impact of these new standards will not be fully realized until there is a complete turnover of existing fleets, reductions in PM_{2.5} should be detectable at Valley monitors by the end of the decade. EPA is also working on establishing more stringent standards for non-road engines, although these have not been finalized and are not likely to go into effect before the end of this decade.</p>
1-31	<p>National Air Quality Trends - Emissions and concentrations of all pollutants (except nitrogen oxides) have declined over the last twenty years. As a result of the</p>
Slide No.	Notes
1-31 (continued)	<p>federal requirement for lead-free fuels, concentrations of lead in the atmosphere have declined by 93 percent, to nearly undetectable levels. Due in part to federal emission controls on new vehicles, PM₁₀ emissions and concentrations on a national scale have declined by 19 percent since 1985.</p>

1-32	<p>"National Trends in PM10 Emissions - PM₁₀ emissions from on-road vehicles declined by 19 percent between 1985 and 1999, while point and area source emissions fell by 21 percent. Point sources include industrial activities such as sand and gravel operations; area sources include residential woodburning. During this same period, PM₁₀ emissions from non-road sources such as construction equipment, airplanes, and trains grew by 7 percent</p>
1-33	<p>What is Being Done To Reduce PM₁₀? - In addition to setting standards, EPA is responsible for enforcing requirements of the Clean Air Act. According to the Clean Air Act, areas that have not attained the national ambient air quality standards are designated as nonattainment areas. Nonattainment areas may be further classified (i.e. moderate or serious) according to the severity of the pollution problem. A nonattainment area must submit plans to EPA within three years of designation or re-classification showing how and when the standards for a pollutant will be met. If the plan is not submitted on time or is found to be inadequate in demonstrating attainment, EPA has the authority to impose two-for-one offsets and highway sanctions. Two-for-one offsets require that an industrial source reduce emissions from an existing source before receiving a permit to operate a new or modified facility; the emissions reduced must be twice the emissions to be produced by the new or modified facility. Highway sanctions stop most transportation project approvals and grants from the U.S. Department of Transportation. This can put millions of dollars in federal highway and transit funding at risk in a nonattainment area. In addition, if the plan is disapproved, many transportation projects being funded locally may also be halted until the plan's deficiencies are corrected.</p>
1-34	<p>PM₁₀ Nonattainment Area - This 3,000 square mile area represents the Maricopa County PM₁₀ Nonattainment Area. Note that there is a small portion of Pinal County (Apache Junction) in the designated area.</p>
1-35	<p>Timeline</p> <ul style="list-style-type: none"> • A 3,000 square mile area in Maricopa County (and Apache Junction in Pinal County) was designated a moderate nonattainment area for PM₁₀ on November 15, 1990 • Exactly one year later, MAG submitted a Moderate Area Plan to EPA • In August of 1993 and March of 1994, revisions to the 1991 Plan were submitted. • The EPA approved the MAG 1991 PM₁₀ Plan (with revisions) on April 10, 1995. • On April 27, 1995, the Center for Law in the Public Interest filed a law suit challenging EPA approval of the PM₁₀ Plan • In May 1996, the Ninth Circuit Court of Appeals, in <i>Ober vs. EPA</i>, vacated EPA's 1995 approval of the Moderate Area Plan for the Maricopa County nonattainment area, due, in part, to the plan's failure to address the 24-hour standard • On June 10, 1996, the Nonattainment Area was reclassified from Moderate to Serious due to violation of standards in 1992-1994.
Slide No.	Notes
1-36	<p>Timeline</p> <ul style="list-style-type: none"> • ADEQ submitted a Moderate Area Microscale Plan for the 24-hour PM₁₀ standard to EPA on May 7, 1997. Unfortunately, this plan was unable to show that all monitors in the nonattainment area would attain the 24-hour standard by

2001.

- EPA disapproved part of the ADEQ Microscale Plan on August 4, 1997, (due to failure to demonstrate attainment at the Gilbert and West Chandler monitors)
- On August 3, 1998, EPA published a Moderate Area PM₁₀ Federal Implementation Plan (FIP) for unpaved roads, unpaved shoulders, vacant disturbed lots and agriculture
- EPA's finding of failure to submit the Serious Area plan became effective on September 2, 1998. Arizona had 18 months from this date to submit the Plan before the first EPA sanction, two-for-one offsets, would go into effect, and six months later, highway sanctions would be imposed.
- EPA approved the Arizona Best Management Practices to replace the agricultural component of the FIP on June 29, 1999.
- MAG 1999 Serious Area PM₁₀ Plan was submitted to EPA on July 9, 1999. This plan requested a five-year extension of the attainment date to December 31, 2006, as allowed in the Clean Air Act.
- On November 9, 1999, EPA advised that there are approvability problems with the Serious Area Plan

Timeline -

- On February 25, 2000, EPA issued a completeness finding on the Revised MAG 1999 Serious Area PM₁₀ Plan.
- More than 19 months after starting the sanctions clock, the EPA stopped it on April 13, 2000, after receiving all remaining pieces of the Serious Area PM₁₀ Plan. The two-for-one offsets sanction had been in effect for 1½ months.
- EPA published final approval of the Revised MAG 1999 Serious Area PM₁₀ Plan on July 25, 2002. This is the first Serious Area PM₁₀ Plan in the country to be approved by EPA.
- Five days later, on July 30, 2002, the Center for Law in the Public Interest filed another law suit challenging EPA's approval of the Serious Area PM₁₀ Plan. If the courts vacate any part of EPA's approval of the Plan, two-for-one offsets on stationary sources would be imposed immediately and highway sanctions, would follow within five months

1-37

1-38

MAG PM₁₀ Plan - This 7,000-page document is the one that was approved by EPA on July 25, 2002.

1-39

PM₁₀ Control Measures in Maricopa County - The Serious Area PM₁₀ Plan for Maricopa County that was approved by EPA contains 77 control measures. These measures are legally-binding commitments by the state, county, cities, towns, MAG, and the Arizona Department of Transportation to reduce PM₁₀ emissions. One of the Clean Air Act requirements for obtaining a five-year extension is to implement the most stringent control measures contained in any state air quality plan or achieved in

Slide No.

Notes

1-39

(continued)

practice in any state, that can be feasibly implemented. The Serious Area PM₁₀ Plan contains commitments to implement the most stringent measures feasible for implementation in Maricopa County. These include PM₁₀ efficient street sweepers (48 units by 2006), PM₁₀ episode thresholds (pollution alerts are triggered for high PM₁₀, as well as high CO), and controls that requires catalytic converters on charbroilers in restaurants like Wendy's and Burger King.

1-40	<p>A PM₁₀ Efficient Street Sweeper - This is one of the types of street sweepers that is being used in the Valley to reduce PM₁₀ on paved streets and shoulders. A number of models of vacuum and water-assisted sweepers have been certified by the South Coast Air Quality Management District (LA Basin) as being PM₁₀ efficient, because they do a good job of picking up dirt and do not kick-up dust during the sweeping operation (thus avoiding the pig-pen effect).</p>
1-41	<p>PM₁₀ Control Measures in Maricopa County - PM₁₀ emission reductions for twelve of the 77 measures were quantified in the Plan. The combined effect of these twelve measures is a 39% reduction in annual emissions by 2006. The single most effective measure in the Plan is the strengthening and better enforcement of fugitive dust controls in Maricopa County Rule 310 and 310.01.</p>
1-42	<p>2006 PM₁₀ Emission Reductions from Committed Control Measures - The combined effectiveness of Rule 310 in controlling dust from construction, trackout and unpaved lots, (the first, second and fourth bars at the top of this graph) is more than 30 percent. This illustrates that Rule 310 reduces emissions more effectively than all other control measures combined. In comparison, stabilizing unpaved roads only reduces PM₁₀ by six percent and each of the other measures reduces emissions by less than one percent.</p>
1-43	<p>Effectiveness of Rule 310 - Rule 310 reduces emissions from construction, vehicle track-out, and unpaved lots. Together these Rule 310 reductions represent 80 percent of the total reductions claimed in the Plan. The strengthening and better enforcement of Rule 310 is expected to decrease PM₁₀ emissions from construction and earthmoving activities by 19 percent, which is nearly half of the total reduction required to show attainment of the annual standard by 2006. Since reductions in dust generated by construction and earthmoving operations represent such a large share of control measure efficacy in the PM₁₀ Plan, it is essential for these reductions to be realized, so that the PM₁₀ standards can be attained by 2006. If the standards are not met by this date, EPA could impose a Federal Implementation Plan that is likely to be far more onerous than the current Serious Area PM₁₀ Plan.</p>
1-44	<p>Other Efforts to Reduce PM₁₀ - Clark County, Nevada (Las Vegas) – Like Maricopa County, Clark County is also classified as a Serious PM₁₀ nonattainment area. Clark County submitted a Serious Area PM₁₀ Plan to EPA in July 2001. The Plan requests a five-year extension of the attainment date to 2006 for the 24-hour standard. Unlike Maricopa County, PM₁₀ monitors in Clark County measured attainment of the annual standard in 2001.</p>
1-45	<p>Clark County Section 94 - As one important element of the PM₁₀ Plan, Clark County has implemented a construction dust control program, called Section 94. While similar to Maricopa County Rule 310 in many ways, Section 94 has several unique requirements:</p>
Slide No.	Notes
1-45 (continued)	<p><u>Contracts</u> - Requirements and conditions of the dust control permit must be included in all construction contracts and a monetary allowance for dust control must be provided in all contracts for primes and subcontractors.</p> <p><u>Dust Monitor</u> - Projects having 50 acres or more of actively disturbed soil must have a dust control monitor on site at all times. The dust control monitor must have the authority to ensure that dust control measures are implemented, including inspections, record keeping, deployment of resources and shutdown or modification of construction</p>

	activities, as needed. The monitor must successfully complete a Dust Control Class and a Dust Monitor Class every three years and have two years of experience in the construction industry
1-46	Clark County Section 94 - Dust Control Card - Construction site superintendent(s), foremen, or other designated on-site representative(s) of the project developer, as well as all water truck/pull drivers for each construction site, must successfully complete a Dust Control Class and possess a current Dust Control Card. This Card must be renewed every three years. The Dust Control Classes last 3-4 hours and are offered by Clark County about twice a week. Clark County charges a \$35 fee to attend the course and receive a Dust Control Card.
1-47	Regional Haze Planning – The 1999 Federal Regional Haze Rule requires states to prepare plans showing how visibility in the Grand Canyon and 155 other Class I wilderness areas and national parks will be returned to natural conditions by 2064. Arizona is planning to submit its first regional haze plan for the 4 Class I areas on the Colorado Plateau, including the Grand Canyon, by December 31, 2003. This first plan will address the period 2003 through 2018. Similar plans to reduce regional haze at the eight other Class I areas in Arizona will be developed and submitted to EPA in 2004. Regional haze is caused by hydrocarbons, nitrogen oxides, sulfur dioxides, organic and elemental carbon, and particulates (PM ₁₀ and PM _{2.5}). Any new control strategies contained in these regional haze plans may also reduce PM ₁₀ and PM _{2.5} concentrations in Maricopa County.
1-48	Regional Haze Class I Areas in Arizona - This map illustrates the location of the 12 Regional Haze Class I areas in Arizona. There are monitors collecting visibility data, including PM ₁₀ and PM _{2.5} , at most of these locations. There are 156 Class I areas in the U.S. These are wilderness areas or national parks with more than 5,000 acres that have been targeted for long-term improvements in visibility.
1-49	Governor’s Brown Cloud Summit – In 2000, Governor Hull issued Executive Order 2000-3 establishing a group to study the brown cloud problems in the Valley and formulate recommendations for improving visibility. The Summit of community, industry, and public leaders met from March 15, 2000, through January 16, 2001. The Summit devised a metric called “Blue Sky Days” to be used until a more formal visibility index could be developed. A “Blue Sky Day” is one in which there are at least six hours with at least 25-mile visibility. Implementation of the measures recommended by the Summit was expected to increase the number of Blue Sky Days from 250 in 2001 to 275 in 2003.
1-50	Blue Sky Day versus non-Blue Sky Day - The left side of this photo shows downtown Phoenix with at least a 25-mile visibility range; the right side is a picture of the same area when there is less than 25-miles of visibility.
Slide No.	Notes
1-51	Source Contributions to Fall and Winter Visibility Impairment in Phoenix In the Phoenix urban area, the Brown Cloud is most visible on fall and winter days. The Brown Cloud is composed primarily of gases and fine particles emitted from combustion sources, rather than coarser particulates created by moving geologic material. The pie chart shows that 9 percent of the brown cloud is caused by dust. About 40% of this Dust comes from construction and earthmoving activities; the remainder is due to agricultural activities and cars traveling on paved and unpaved roads. This chart also

shows that exhaust from diesel construction equipment (called Off-road Diesel) is responsible for another 11% of the Brown Cloud. In 2001, the Arizona Legislature passed House Bill 2538 that included measures to control emissions from sources contributing to the Brown Cloud.

Measures Implemented by HB 2538 - Eight voluntary and nine mandatory measures were recommended by the Governor’s Brown Cloud Summit. Ten of these measures were subsequently implemented by H.B. 2538, passed by the Arizona legislature in 2001.

Voluntary "brown cloud" reduction measures passed by the Arizona Legislature in 2001 include encouraging early implementation of ultra-low sulfur fuel and emissions controls in diesel truck fleets (these are federally mandated in 2006-2007), and use of truck bypass routes on "brown cloud" days.

1-52

Mandatory measures implemented by HB 2538 also target reduction of the "brown cloud." Maricopa County now has an ordinance restricting idling of heavy-duty vehicles, including buses to no more than five minutes. The area in which Valley emissions controls (i.e. vehicle emissions inspection and maintenance, reformulated and oxygenated fuels, clean burning fireplaces, employer trip reduction programs) apply has been expanded west to include all of Buckeye and Surprise. ADEQ is developing a roadside tailpipe-testing program for diesel vehicles and there is a requirement to increase use of electric-powered generators at construction sites.

Dust Control Training for Contractors –One of the measures recommended by the Summit, but not included in the law, was “Dust Control Training for Contractors.” The recommendation of the Summit was that a standardized dust control certification program be developed and implemented for construction companies and other stakeholders in Maricopa County to enhance compliance with Rule 310. Participation in the training and certification would be required for a construction company to obtain a county permit. This measure was removed from H.B. 2538 because it mandated training and certification as a prerequisite for obtaining a construction permit. However, this construction dust control training course and a set of certification standards have been developed in response to the Summit recommendation and are now being offered to the construction industry on a voluntary basis. Construction site superintendents and workers are encouraged to attend the course and receive certification. This course and other outreach components have been developed as a direct consequence of the “Dust Control Training for Contractors” recommendation by the Governor’s Brown Cloud Summit.

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ADOT Initiatives to Reduce Construction Dust – During 2001-2003 the Arizona Department of Transportation sponsored a project to research, develop and implement education tools and outreach programs for reducing construction dust in Maricopa County and other parts of Arizona. This project has identified practical and cost-effective methods to control fugitive dust at work sites and has developed materials to ensure that information, training, and certification programs are readily available to managers, site superintendents, subcontractors and other construction personnel. The slides and script for this Construction Dust Control Course is one product of the ADOT-sponsored research. Additional outreach and educational materials have been developed to provide follow-up information to construction personnel. A bi-lingual

1-54

	<p>flipbook is available for use at construction sites, during tailgate sessions. A Construction Dust Guide, targeted at construction managers, provides an overview of Maricopa County Rule 310. A brochure is also being distributed to inform the public of the effort that the construction industry is making to reduce PM₁₀. ADOT's overall objective is to make dust suppression a standard operating practice at its own and all other construction sites in Arizona.</p>
1-55	<p>Outreach Products - These are the major outreach products of the research that ADOT funded to make dust suppression a standard operating practice on ADOT projects, as well as all other construction sites in Maricopa County and Arizona.</p>
1-56	<p>Questions? - Does anyone have any questions about the material that has been presented?</p>

MODULE 2 - CONSTRUCTION DUST CONTROL REQUIREMENTS UNDER MARICOPA COUNTY RULE 310

Slide No.	Notes
2-1	<p>Construction Dust Control Requirements under Maricopa County Rule 310 - Previous Module 1 provided background information on air quality issues affecting Maricopa County. That module covered the reasons that dust control is needed, and detailed the causes of PM10 and the natural and man-made sources of fugitive dust. Module 1 discussed the actions already taken to reduce PM10 emissions, including control measures that have been implemented.</p> <p>This Module covers construction dust control requirements and explains dust control measures for construction-related activities. Subsequent modules will cover the enforcement of Rule 310 requirements and the associated penalties for non-compliance, and will also examine dust control techniques for different dust generating activities.</p>
2-2	<p>Requirements for Construction Activities in Maricopa County - Rule 310 requires firms or individuals planning earthmoving activities involving 0.1 acre or more to obtain an Earthmoving Permit, submit a Dust Control Plan, and comply with specific record-keeping, site maintenance, site signage, and other requirements.</p>
2-3	<p>Earthmoving Permit - Now, we'll discuss who is required to apply for an Earthmoving Permit, and how to complete a permit application form. Refer to the sample Earthmoving Permit application form that was handed out to you.</p>
2-4	<p>Who Must Apply for a Permit - The person responsible for any earthmoving operation that will disturb a total surface area of 0.10 acre or more must submit an Earthmoving Permit application. This "Responsible Official" could be an officer or decision-maker of a corporation, a partner of a partnership, the owner of a sole proprietorship, or the principal executive officer or ranking elected official of a public sector agency.</p>
2-5	<p>How to Complete a Permit Form - The Earthmoving Permit application form consists of three sections, Applicant Information, Project Information, and Dust Control Plan. Three copies of the application must be submitted with the appropriate fee attached. For projects of between 0.1 acre and an acre in size, the fee is \$75. For projects of greater than one acre, the fee is \$36.00 per acre plus \$110.00 per site. Be sure to fill in all the applicant information blanks.</p> <p>Section 2 covers the project information including the type of project, the address and legal description, the size of area, in acres, to be disturbed, and a project start date. A schematic drawing of the project with dimensions of at least 8 1/2 inches by 11 inches must be included.</p> <p>Section 3 contains the Dust Control Plan, which we will cover in detail.</p>
2-6	<p>Elements of Earthmoving Permit Drawing - The Permit drawing must contain the following elements:</p> <ul style="list-style-type: none"> ● Entire project site boundaries ● Acres to be disturbed with linear dimensions ● Nearest public roads
Slide No.	Notes

2-6 (continued)	<ul style="list-style-type: none"> • North arrow • Planned exit locations onto paved public roadways
2-7	<p>Dust Control Plan - The Dust Control Plan is the third section of the Earthmoving Permit application. Any project that is required to obtain an Earthmoving Permit must submit a Dust Control Plan. We will discuss the requirements of a Dust Control Plan as well as the preparation of a Plan. Refer to Section 3 of your Earthmoving Permit handout.</p>
2-8	<p>Dust Control Plan Requirements - The Dust Control Plan application contains a section for each of the activities that take place during a typical construction project that has the potential for generating fugitive dust. Included with each activity are several control measures; the applicant must identify which measure will be employed as the primary measure during the conduct of that activity, and which measures will be employed as contingency measures. For some activities, Rule 310 mandates the employment of a specific primary measure. In these cases, a pre-printed “<u>P</u>” appears next to the measure. Note that the control measures must be employed so as to be effective at all times during the conduct of the project—on non-work days and after hours, as well as when construction activity is taking place.</p> <p>Control measures to be identified by the applicant include a stabilization plan for any unpaved haul or access roads. Dust suppressants to be applied, if any, must be specified, including the method, frequency, and intensity of application, the type, number and capacity of application equipment. A plan to control trackout where unpaved or access points join paved public roadways must also be included.</p>
2-9	<p>How to Prepare a Dust Control Plan - How to Prepare a Dust Control Plan:</p> <ul style="list-style-type: none"> • Put a check (✓) in the box in front of all the sources of fugitive dust that you anticipate • Write the letters “NA” in the box in front of all the sources of fugitive dust that you do not anticipate implementing • Write the letter “P” next to primary control measures that you will implement • Write the letter “C” next to contingency control measures that you will implement in cases where the primary measures are unavailable or inadequate <p>Be sure to fill in the details for each control measure that you intend to use.</p>
2-10-A	<p>Example Fugitive Dust Source - The first source category listed in the Dust Control Plan form is “Unpaved Haul/Access Roads.” If you think unpaved haul or access roads are a potential source of fugitive dust for your project, first...</p>
2-10-B	<ul style="list-style-type: none"> • Check-mark source
2-10-C	<ul style="list-style-type: none"> • Next, write a “P” next to primary control measure and fill in details
2-10-D	<ul style="list-style-type: none"> • Finally, write a “C” next to contingency control measure(s) and fill in details
2-11	<p>Record-keeping Requirements - Rule 310 requires that the recipient of an Earthmoving Permit keep daily written log detailing use of control measures agreed to and keep copies of approved Dust Control Plans. Documents must be kept for at least 6 months from end of operations, or at least 1 year total.</p>
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2-12-A	<p>How to Fill Out a Dust Control Log - How to Fill Out a Dust Control Log: A log page must be kept for each week of the project. Each page must list all the potential dust generating activities that you have included in the Dust Control Plan. A number of formats for a Dust Control Log exist. However, the form shown here is the one EPA prefers.</p>
2-12-B	<p>At the top of the form, fill-in project and contractor information, and the date for each daily sheet. Note that each time you check for dust control throughout the day, you will be entering a “Y” for control measures active at that time, an “N” for those not being used at the time of the check, or an “NA” for those not applicable.</p>
2-13-A	<p>How to Fill Out a Dust Control Log - Here is a close-up of a portion of the form chown on the preceding slide.</p>
2-13-B	<p>Each time you check for dust control, you must fill in the time of the check, and a “Y”, “N”, or “NA” next to every measure in the column under the time you entered.</p>
2-13-C	<p>Note that the measures in use for controlling dust may change during the day. Use the “comments” space to record any pertinent action, such as the implementation of a contingency measure in response to observed increase in area opacity levels.</p>
2-14	<p>General Standards - Rule 310 provides general standards both for the level of opacity that is acceptable and the means of measuring the opacity. Opacity is the reduction in visibility caused by a cloud of dust. The standard limitation for Visible Emissions within Maricopa County is 20 percent opacity.</p>
2-15	<p>20 percent Opacity Limit - County inspectors are trained to read opacity, but there are ways that you can estimate opacity on the job. Twenty percent opacity is a faint cloud of dust through which you can readily see background details. Measures controlling visible emissions must be implemented during all periods of dust generating operations. The specific dust control measures, including contingency measures, are contained in the Dust Control Plan that is part of each regulated site’s earthmoving permit.</p>
2-16	<p>20 percent Opacity Limit - A regulated site should implement contingency measures as necessary to prevent visible emissions from reaching 20 percent opacity, rather than waiting until emissions reach that level. Additional precautions should be taken to prevent the dust cloud from crossing the property line.</p> <p>The 20 percent opacity limitation applies at all times except when the average wind speed is greater than 25 miles per hour provided that all reasonably available control measures contained in the approved Dust Control Plan are in place.</p> <p>Twice a year classes are held for certification in reading Visible Emissions. While not mandatory, all superintendents, project managers, and foremen are encouraged to attend. Becoming certified enables you to determine opacity and your project’s level of compliance with this requirement. Contact Maricopa County at (602) 506-6700 for details on class times and locations.</p>
2-17-A	<p>Sign Requirements - Rule 310 contains regulations that govern the signage that appears on a job site of five acres in size or larger. While these signs facilitate compliance and enforcement, they also help to market the positive efforts of a project to control fugitive dust.</p>
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2-17-B	<ul style="list-style-type: none"> • The minimum dimensions of the sign are 4 feet wide by 4 feet high

2-17-C	<ul style="list-style-type: none"> The name of the project, the name of the contractor, and the County complaint number must be provided in block letters at least 4 inches high
2-18	<p>Control Measures Required for Construction Activities in Maricopa County - Now, we'll discuss other control measures provided for the Dust Control Plan application. These activities fall into the four general areas of vehicle use, disturbed surface areas, material hauling, and spillage and trackout. In Module 4, we will discuss in more detail some of the techniques that have proved successful in controlling dust generated by these activities.</p>
2-19	<p>Vehicle Use - To hold down dust on open area and vacant lots, motorized vehicle operation should be discouraged or prevented. Restrict trespassing with signs or block access with barriers. Apply water to unpaved parking lots. If possible, apply and maintain gravel, recycled asphalt, or other suitable material, or pave the lot. Use dust suppressant on unpaved lots.</p>
2-20	<p>Vehicle Use - Limit vehicle speeds on unpaved haul and access roads to 15 mph. Apply water, so that surface is visibly moist. If possible, pave the road, or apply and maintain gravel, recycled asphalt, or other suitable material. Apply dust suppressant to unpaved roads.</p>
2-21	<p>Disturbed Surface Areas - Before beginning earthmoving operations in a specific area, pre-water the area to the planned depth of cuts. Phase work to reduce the amount of disturbed surface area at any one time. During earthmoving operations, apply water or dust suppressants, construct fences or wind barriers, and be prepared to cease operations as a contingency—such as during high wind events, for example.</p>
2-22	<p>Disturbed Surface Areas - To temporarily stabilize a disturbed surface area during a project, apply water or dust suppressants, establish a vegetative ground cover, restrict vehicular access. After earthmoving operations have ended, attempt to restore area to resemble undisturbed conditions, establish vegetative ground cover, and apply and maintain dust suppressants as needed.</p>
2-23	<p>Material Hauling - On-site - When hauling material on the job site, leave a freeboard of at least three inches when loading trucks. Prevent spillage from holes or other openings in the floor, sides, or tailgate of the cargo compartment. If you do exit the site, be sure to drive over a suitable trackout control device such as a gravel pad or a grizzly.</p>
2-24	<p>Material Hauling - Off-site - When hauling material off the job site, leave a freeboard of at least three inches when loading trucks. Prevent spillage from holes or other openings in the floor, sides, or tailgate of the cargo compartment as before. In addition, cover the load with a tarp. Clean the interior of empty cargo compartment before leaving the site. Always drive over a suitable trackout control device such as a gravel pad or a grizzly.</p>
2-25	<p>Spillage and Trackout - To control spillage and trackout, Rule 310 requires that you install a gravel pad at least 30 feet wide, 50 feet long, and 6 inches deep at all access points. Consider installing a grizzly or wheel wash system at all access points, as well, or pave access roads for a distance of at least 100 feet and a width of at least 20 feet. Sweep up any trackout deposits that end up on paved public roads.</p>

MODULE 3

HOW DUST CONTROL IS ENFORCED IN MARICOPA COUNTY

Slide No.	Notes
3-1	How Construction Dust Control is Enforced in Maricopa County - Modules 1 and 2 explained why dust control is needed and summarized the requirements of the Maricopa County Dust Control Rule 310. This third module discusses how Rule 310 is enforced in Maricopa County
3-2	Enforcement Objectives – The purpose of Maricopa County’s Air Quality Violation Reporting and Enforcement Policy and Procedure is to “provide a consistent reasonable process for documenting potential air quality violations, notifying alleged violators, and initiating enforcement action to ensure that violations are addressed in a timely and appropriate manner.”
3-3	Enforcement Resources – The Maricopa County Environmental Services Department has personnel assigned to fugitive dust control. These include inspectors, enforcement officers, supervision, and support staff. The County Attorney’s Office has attorneys who are dedicated solely to Dust enforcement.
3-4	How Violations Are Discovered and Documented County inspectors and “Special Unit” enforcement officers may encounter violations of Rule 310 while conducting an inspection or investigating a complaint or by random field reviews. When a potential violation of Rule 310 is observed, County personnel fill out a report. The report documents where, when, and how events occurred that resulted in the violation and the name, affiliation, title, and statements of people interviewed. Reports typically include evidence such as photos and analytical tests that support the failure to comply.
3-5	How Violators Are Notified Notification of a violation is provided in writing to an owner, operator or other responsible official. For most Rule 310 violations, the most common methods of notification are a Compliance Status Notification or a Notice of Violation. A less common method issued for more severe violations is a Notice to Appear and Complaint, also called a “citation,” which is a Class I Misdemeanor.
3-6	Rule 310 Violations – The following violations are specifically identified in the County’s Enforcement Policy. Although they do not all apply to construction sites, they are all violations of Rule 310. <ul style="list-style-type: none"> a) Knowingly or willfully failing to obtain a County earthmoving permit. b) For unpaved parking lots – Opacity exceeds 20 percent and both the silt loading and silt content limitations are exceeded. c) For unpaved haul/access roads – More than 20 vehicle trips per day are observed passing a particular point or vehicles are exceeding 15 mph.
3-7	d) For disturbed surface areas on which no activity is occurring - None of the following standards can be met. (Note: The detailed Test Methods for these standards are described in Appendix C of Rule 310, Sections 2.2-2.6.) <ul style="list-style-type: none"> 1. Visible crust 2. Particles will not become airborne in light breeze (about 2.3 mph) 3. Flat vegetative cover of at least 50 percent 4. Standing vegetative cover of at least 30 percent 5. Standing vegetative cover of at least 10 percent and threshold friction velocity of at least 43 cm/sec
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3-7	6. More than 10 percent cover of non-erodible elements
3-8	e) For hauling - The freeboard on a truck is measured and determined to be less than three inches <i>or</i> a load of bulk material leaving a site is not covered <i>or</i> loss of material occurs from holes or other openings in the cargo space, <i>or</i> vehicles traversing a paved public road fail to pass over a trackout control device.
3-9	f) For trackout - 1. For work sites with a disturbed surface area of at least five acres, vehicles are observed exiting a work site onto a paved road without passing over a trackout control device. 2. Deposits extending 50 feet or more along the road are observed on a paved public road originating from a work site exit. 3. Particulate matter is observed being spilled or deposited at least 50 feet from the work site exit onto a road from the cargo compartment, tires, or other exterior surfaces of a vehicle exiting the work site.
3-10	g. For earthmoving operations – One acre or more is being disturbed, the site’s Dust Control Plan designates water as the control measure, and no water is being applied while the earthmoving operation is being conducted.
3-11	h. For weed abatement – Discing or blading is being conducted for weed control and no water is being applied. i. For unpaved parking lots – More than 100 vehicles are present and the (1) opacity exceeds 20 percent and the silt loading exceeds 0.33 oz/ft ² or (2) the silt content exceeds 8 percent. j. For commercial feedlots and livestock areas – Opacity exceeds 20 percent and there is no evidence of the application of dust suppressants or gravel and no trees are present within 100 feet of the animal pens.
3-12	<p>After a Notice of a Rule 310 Violation is Issued - After the Air Enforcement Section reviews documentation of the violation supporting evidence, the Section may</p> <ul style="list-style-type: none"> ● Issue a Notice of Violation ● Issue an Order of Abatement ● Refer the violation to the County Attorney’s Office ● File a Notice to Appear and Complaint, or ● Send the case back to the Air Compliance Section with a written request for additional information. <p>An inspector or enforcement officer conducts follow-up investigations to determine whether the Order of Abatement has been complied with. Additional enforcement actions may be taken if compliance is not achieved. Recipients of an Order of Abatement can request a hearing before the Air Pollution Control Hearing Board. Hearing notices are sent to the County Attorney’s Office.</p> <p>Inspectors and enforcement officers may also issue a Notice to Appear and Complaint, also called a “citation” (Class I Misdemeanor), for a serious violation</p>
Slide No.	Notes
3-12 (continued)	other than the ones cited previously. Citations are only issued if there is sufficient evidence to prove beyond a reasonable doubt in Justice Court that a violation has occurred. The County personnel issuing the citation must explain to the defendant the nature of the violation and why a citation is being issued, obtain the defendant’s

	signature, notify the defendant of the requirement to appear in Justice Court on the arraignment date, and represent the Department during all Court proceedings, arraignments, pre-trials and meetings with defendants.
3-13	<p>Violations Referred to the County Attorney's Office - Cases referred to the County Attorney's Office include a description of the violation and supporting evidence. Also included is a recommendation from the Enforcement Officer on the action that should be taken and the monetary penalty that should be imposed.</p> <p>The County Attorney reviews the referral to determine if there is sufficient evidence to support a complaint. If not, the Attorney may send it back for additional information or turn the case down. If there appears to be sufficient evidence, the Attorney's Office may pursue one of three options:</p> <ol style="list-style-type: none"> 1. <u>Settlement Conference with Consent Agreement</u> – The Attorney may request a conference with the violator/responsible party prior to filing a complaint. If an agreement is reached, the parties will enter into a written agreement that may include monetary penalties, reimbursement of costs for the investigation and prosecution, violator education, community service, and other sanctions. 2. <u>Filing of Civil Complaint</u> – The County Attorney may file a civil complaint seeking monetary penalties and injunctive relief. 3. <u>Filing of Criminal Complaint</u> – A criminal complaint may be filed if there is a reasonable likelihood of conviction.
3-14	<p>Filing of Criminal Complaint – The matter may proceed to trial or parties may enter into a plea agreement that may include monetary penalties, reimbursement of costs for the investigation and prosecution, violator education, and other sanctions. Under the plea agreement, the violator would receive a criminal conviction and may be placed on probation.</p>
3-15	<p>Penalties - The calculation of penalties for violations of Rule 310 is described in the Maricopa County Air Quality Violation Penalty Policy, last revised in July 2000. The purpose of the penalties is to serve as a disincentive for the regulated community to commit violations of Rule 310. The amounts must be set high enough that it is more attractive to implement dust control measures than pay the fines. The penalty is quantified on the basis of four major factors: the gravity of the violation (how severe it is), the economic benefit of noncompliance (take back any economic gain the violator may have earned by not complying), cost recovery of enforcement efforts (did this case require out-of-the-ordinary staff time), and other mitigating factors (will this penalty bankrupt the company).</p>
3-16	<p>Gravity of the Violation - The first component evaluated in determining the appropriate penalty is the severity of the violation. This is judged in two ways: the potential for harm and the extent of the deviation. The potential for harm is based on five factors, such as the risk to the environment and the size of the violator's company. Each of these is rated on a scale of 0-4. The ratings are summed to produce the total score (between 0 and 20) and a rating of Minor,</p>
Slide No.	Notes
3-16 (continued)	Moderate, or Major, based on the score. The extent of deviation is a qualitative assessment resulting in a Minor, Moderate, or Major rating, depending upon the type of violation.
3-17	Gravity Penalty Matrix - The potential for harm and extent of deviation ratings

(Minor, Moderate or Major) are used in this matrix to determine the range of penalties for each violation. The potential for harm score is used to identify the exact amount. For example, if a violation is rated Moderate for both potential for harm and extent of deviation it would have a penalty range of \$2,000 - \$3,200. If the potential for harm score were "10", since "10" falls halfway between the Moderate scores of "7" and "13", the penalty for this violation would be $(\$2,000 + \$3,200) / 2$ or \$2,600. This becomes the base penalty against which additional adjustments are made.

3-18

Gravity Penalty Adjustments - The penalty amount obtained from the gravity penalty table may be adjusted up or down based on a number of factors. If the violation persisted over a number of days, the penalty is multiplied by the number of days, except that discounts are applied for every day after the first, as shown in the slide. A "degree of willfulness or negligence" adjustment is applied (up to a 25 percent increase) if the violation was avoidable. A "degree of coordination and good faith" adjustment may be awarded (up to a 15 percent decrease) if the violation was reported by the source before it was discovered by inspectors or if there were extraordinary efforts to achieve compliance after discovery by inspectors. A "history of noncompliance" can add significant amounts to the penalty. For example, 5 percent is added if there has been at least one previous violation of a similar nature, 10 percent is added if the violation occurred within the past year (5 percent within five years). In addition, the number of prior violations are multiplied by 5 percent and added to the penalty. A "response to violations" adjustment of up to 10 percent can be applied if the source did not immediately remedy the problem. All of these adjustments are combined to determine the total gravity component of the penalty.

3-19

Economic Consequences of Noncompliance - The objective of this component of the penalty is to penalize those violating Rule 310 by putting them at an economic disadvantage, relative to their competition. To calculate "delayed costs", the capital cost of compliance is estimated and this is multiplied by 5 percent to represent the interest earned on money not spent on timely compliance. "Avoided costs" are an estimate of the expenditures that will never be made as a result of the violation. (For example, watering was required, but was not done at any time during a construction project and the project is complete.) "Illegal profits" represents an estimate of financial gains that were made illegally during the violation period.

3-20

Cost Recovery and Mitigating Factors - Besides the "gravity of the violation" and the "economic benefit of noncompliance", there are two additional factors considered in developing the value of the penalty for a Rule 310 violation. "Cost recovery of enforcement efforts" attempts to recover the costs of investigating and enforcing a case, but only when it requires more than the normal amount of staff effort. Mitigating factors" may be exercised if a violator is unable to pay the penalty. In most cases, this would result in a delayed payment schedule or installment plan with interest. Only in extreme cases would this result in a penalty reduction.

Slide No.

Notes

3-20
(continued)

An example of a "litigation risk" might be if the penalty appeared to be too high from a case precedent standpoint. However, by state law, the total penalty assessed can not exceed \$10,000 per day per violation.

3-21

Compliance Status – In 2001, Maricopa County issued 3,608 earthmoving permits, conducted 7,941 earthmoving inspections, and responded to 1,346 complaints about dust generation from earthmoving activities. During the same year, the County issued 919 Notices of Violation, about one-third of which were for sites not having the

required permit. Another 523 Compliance Status Notifications were issued. Of these actions, 402 cases were referred to enforcement, 251 cases were referred to the County Attorney's Office, and 186 cases were settled. About \$680,000 in penalties were collected between May 2000 and December 31, 2001. The County estimates that approximately 77 percent of the sources were in compliance with Rule 310 during 2001.

3-22

What are the Most Common Rule 310 Violations?

The most common Rule 310 violations found in Maricopa County are:

- Soil stabilization not maintained during non-working days or hours
- Failure to obtain required permits or have them available on site
- Failure to follow the Dust Control Plan
- No gravel pad at construction site exits
- Lack of pre-wetting of work areas and haul routes
- Insufficient number of water trucks
- Haul roads not stabilized or watered
- Failure to clean up trackout or deposits on paved public roads
- No tarps on haul trucks
- Lack of recordkeeping showing implementation of the Dust Control Plan

3-23

Frequently-Encountered Excuses –

- The water truck or the street sweeper...is on the way, broke down, got lost, etc.
- The soil at this site makes dust control impossible.
- Give me a break – we live in the desert!
- How could I know it would be windy today?
- I left my permit on my desk at the office.
- What a coincidence, I was going to get my permit today!
- One of the subs has the permit; you know how they are!

MODULE 4 - STRATEGIES TO ASSIST CONSTRUCTION ACTIVITIES IN CONTROLLING DUST

Slide No.	Notes
4-1	<p>Strategies to Assist Construction Activities in Controlling Dust - The previous modules of the Course provided background - explained why dust control is needed, outlined the requirements of Rule 310, and discussed enforcement of Rule 310. This Module will examine dust control strategies, including project design, site planning, and available resources.</p>
4-2	<p>Designing and Implementing a Construction Project to Minimize Dust - Addressing dust control issues before beginning a project can save time, money, and project resources. Site-specific air quality and dust control issues—and appropriate ways to tackle them—should be identified before work begins. Strategies for trackout prevention, the handling, storage, and transportation of bulk materials on and off-site, dust-minimizing procedures during construction, and site maintenance should all be discussed.</p>
4-3	<p>Site Planning - Phasing the project and planning site layout carefully will result in minimized soil disturbance. Lessening the amount of surface being disturbed at any one time reduces the amount of control required and the amount of water or dust suppressant needed. Evaluate dust control procedures periodically to identify additional issues that develop as the job progresses.</p> <p>Install wind fences or barriers (less than 50 percent porosity). Place barriers around storage piles, parking, and equipment staging areas. Develop semi-permanent staging areas to cut down on the amount of disturbed area. Restrict access on unpaved areas to vehicles and equipment that are necessary that day. Limit unnecessary travel on unpaved surface areas. Restabilize disturbed surfaces by paving permanent roads and restoring vegetation as soon as possible. Allow time for pre-wetting areas where excavation or trenching will occur.</p> <p>Make sure everyone working on the job knows all the requirements for dust control and who is in charge. Encourage a proactive and continuous focus on air quality issues on the job site.</p>
4-4	<p>Trackout - Control of trackout is required for all sites with disturbed area of 5 acres or more, or sites from which 100 yards or more of bulk materials are hauled on-site or off-site per day. Trackout is controlled through the use of gravel pads, grizzlies, paving, and appropriate watering.</p> <p>Trackout that extends 50 linear feet or more onto a paved public road must be cleaned up immediately. Otherwise, the trackout must be cleaned up by the end of the workday. Cleanup may be performed with a street sweeper or wet broom with sufficient water, if applicable, at the speed recommended by the manufacturer or by manually sweeping up the deposits.</p>
4-5	<p>Strategies for Bulk Material Handling, Storage and Transportation - Material handling refers to many types of earthmoving activities on construction sites, including loading and hauling. These types of activities can be significant sources of fugitive dust. However, dust control during loading and hauling can be easily achieved through careful planning and proper implementation of controls. When</p>
Slide No.	Notes

4-5 (continued)	<p>planning a construction project involving earthmoving activity, strategies for bulk material handling, storage, and transportation that minimize dust generation must be developed. Strategies are needed for handling or hauling material off-site onto paved public roadways, completely within the boundaries of the work site, or when crossing a public roadway that is open during construction. Strategies for preventing open storage piles from creating dust are also needed.</p>
4-6	<p>Bulk Material Hauling Off-site Onto Paved Public Roadways - Allow for a freeboard of at least three inches when loading haul trucks. Prevent spillage from any openings: floor, sides, or tailgates of cargo compartment. Mist material with water while stacking. Mix excavated material with water prior to loading. Empty loader slowly and keep bucket close to the truck while dumping.</p>
4-7	<p>Bulk Material Hauling Off-site Onto Paved Public Roadways - Tarps are required on haul trucks to prevent wind blown dust. Do not overload the truck! Keep your load 3 to 6 inches below the freeboard to minimize spillage. Check belly-dump truck seals regularly and remove any trapped rocks to prevent spillage. Daily vacuuming, wet broom cleaning, or covering of cargo compartment interiors of empty trucks is required to control trackout. Have all trucks drive over a gravel pad or grizzly when leaving the site.</p>
4-8	<p>Bulk Material Hauling - When hauling bulk material within the boundaries of the work site or when crossing a public roadway open during construction, be sure to allow for a freeboard of at least three inches when loading haul trucks. Prevent material from spilling from any openings in the floor, sides, or tailgates of cargo compartment and control trackout.</p>
4-9	<p>Bulk Material Hauling On site, Completely Within Site Boundaries - When hauling bulk material completely within the site boundaries, limit vehicular speeds to 15 mph, and apply water to top of load to keep dust emissions from exceeding 20 percent opacity limit.</p>
4-10	<p>Open Storage Pile - Applicable regulations define an “open storage pile” as any accumulation of bulk material with a 5 percent or greater silt content that is 3 or more feet in height at any point and has a total surface area of 150 square feet or more. Suppliers of rock products used in construction include silt content in the specifications. The silt content of excavated soil always exceeds five percent.</p> <p>When adding material to the pile or removing material from the pile, apply water as needed to suppress dust. When not working with the pile, cover it with a secured tarp, water the pile to keep the moisture content of the soil at 12 percent or higher, or water until a surface crust forms that will prevent wind erosion.</p>
4-11	<p>Construction Operations - We will now discuss four areas that typically generate dust during construction work:</p> <ul style="list-style-type: none"> ● Disturbed surface area - pre-activity ● Disturbed surface area - during construction ● Earthmoving operations on disturbed surface areas 1 acre or larger ● Unpaved haul and access roads
Slide No.	Notes
4-12	<p>Disturbed Surface Area -Pre-activity - To minimize dust generation from disturbed</p>

	<p>areas before beginning construction, plan ahead, pre-water work site to the depth of cuts, and proceed in stages to minimize amount of disturbed surface area present at any given time.</p>
4-13	<p>Disturbed Surface Area During Construction - During construction, apply water or dust suppressant to work area and construct fences or 3 to 5 foot high wind barriers adjacent to roadways or urban areas. During grading, water using a water truck; during trenching, water using a fine spray or mist; and during screening, mist material after it drops from the screen.</p>
4-14	<p>Earthmoving Operations on Disturbed Surface Areas 1 Acre or Larger - When the area under construction is 1 acre or larger, water must be applied during earthmoving operations, if water is the chosen control measure.</p>
4-15	<p>Unpaved Haul and Access Roads - Rule 310 requires that vehicle speed over unpaved haul and access roads must not exceed 15 mph and the number of trips must not exceed 20 per day unless</p> <ul style="list-style-type: none"> • Water is applied in sufficient quantity to maintain a moist surface • Gravel, recycled asphalt, or other suitable material is applied and maintained • A dust suppressant is used as directed by the manufacturer, or • The access roads are paved <p>Be sure not to over-water—muddy conditions will increase trackout.</p>
4-16	<p>Site Maintenance - Proper maintenance of the job site will reduce fugitive dust from unpaved parking lots, open areas and vacant lots, and disturbed surface areas. Surface areas that will be disturbed again during the current project should be temporarily stabilized during non-work days and after hours. Those areas that will not be disturbed again must be permanently stabilized within eight months after dust-generating operations have ended.</p>
4-17	<p>Unpaved Parking Lots - Dust from an unpaved parking lot must be limited by applying and maintaining a gravel, recycled asphalt, or other suitable surface, by watering or using a dust suppressant, or, of course, by paving the lot.</p>
4-18	<p>Open Areas and Vacant Lots - To reduce fugitive dust from open areas and vacant lots, water the areas to form a crusted surface. Prevent motorized vehicles from entering, driving across, or parking within the areas. Uniformly apply and maintain surface gravel or soil stabilizers to all areas that have been disturbed by motor vehicles or off-road vehicles.</p> <p>If the area cannot be paved, Rule 310 requires that these areas be restored so that the vegetative ground cover and soil characteristics are similar to those of adjacent or nearby undisturbed native conditions.</p>
4-19	<p>Disturbed Surface Areas - Temporary Stabilization - During non-work days and after hours, surface areas that have been disturbed during construction activity must be temporarily stabilized by treating with a dust suppressant. Motorized vehicles must be prevented from entering, driving across, or parking within the areas.</p>
Slide No.	Notes
4-20	<p>Disturbed Surface Areas - Permanent Stabilization - Within eight months after dust-generating operations have been completed, site areas that were disturbed must be</p>

	<p>permanently stabilized. Efforts should be made to restore these areas so that the vegetative ground cover and soil characteristics are similar to those of adjacent or nearby undisturbed native conditions. Alternatively, the areas should be graveled, paved, or treated with a dust suppressant. Establish sufficient ground cover.</p>
4-21	<p>Resources Available to Reduce Dust Before, During, and After Construction - Let's review means of reducing dust before, during, and after construction. These include trackout control devices, effective watering, chemical stabilizers or dust suppressants, and wind barriers.</p>
4-22	<p>Trackout Control Devices - Gravel Pad. Dust Control Plans require that stabilized construction entrances be installed at all access points if 100 yards or more of bulk material per day is to be hauled on or off the site, or if the site is larger than 5 acres. A gravel pad is a stabilized construction entrance, designed to remove the mud and dirt from the tires of vehicles leaving a construction site. Using gravel pads reduce fugitive dust caused by trackout onto paved roads and surfaces. The use of such pads may also reduce the need for street sweepers or laborers to remove trackout from paved surfaces, as well as help prevent storm water pollution.</p> <p>Gravel pads are typically made from one inch to three inches in diameter, washed, well graded gravel or crushed rock. The gravel pad should be at least 30 feet wide by 50 feet long, and a minimum of 6 inches deep. When installing the gravel pad, make sure that it is properly graded.</p>
4-23	<p>Trackout Control Devices - Grizzly - A Grizzly is a device using rails, pipes or grates to dislodge mud, dirt and debris from the tires and undercarriage of vehicles that drive over it prior to leaving the work site. An example of a grizzly is the "shaker" invented by Jeff Lange for Kitchell Contracting. This device is reusable, transportable by pick-up truck, easy to assemble, and can be expanded to accommodate various sizes of haul vehicles. More information about the shaker device can be obtained at www.trackoutcontrol.com.</p>
4-24	<p>Effective Watering - Watering prior to excavation or earthmoving is an effective means of suppressing dust. When applied regularly, water provides temporary stabilization to disturbed surface areas and reduces fugitive dust caused by earthmoving and driving on non-stabilized surface areas.</p> <p>Watering makes roads and disturbed surfaces appear moist with minimal silt, creates a crusted surface on the soil, provides soil moisture content optimal for compaction, and prevents visible emissions from exceeding 20 percent opacity. Adequately watered soil should have a crusted surface that is not easily crumbled between your fingers. The soil moisture content should be optimal for compaction.</p>
4-25	<p>Effective Watering Strategies - Wet the area to the depth of cuts or equipment penetration 15 to 30 minutes prior to start of work. Apply water at the end of the day to soak the next day's work area overnight. During grading, apply water in sufficient quantity to maintain a moist surface using a water truck.</p> <p>After clearing an area, apply water frequently enough to prevent visible emissions (at least every 2 hours). Consider setting up automatic sprinkler/spray bar systems in these areas. Surfactants or palliatives added to water increase penetration.</p>
Slide No.	Notes
4-25 (continued)	If the area is inaccessible to water trucks due to slope conditions or other safety factors, watering should be conducted with water hoses or sprinkler systems. Remember: many cities have restrictions for construction on sloped areas -- be sure you comply with

those as well.

Chemical Stabilizers - or dust palliatives - are products that are applied to soil surfaces in order to limit the creation of fugitive dust emissions. A variety of products are available, and finding one that fits your project's activities can reduce the need for watering, which is desirable in our desert environment. Over the long term, using dust palliatives can result in significant cost savings over regular, frequent watering. In some instances, the resulting soil stabilization can last from 1 to 12 months.

Some dust palliatives are not designed for areas subject to daily disturbances, high volume traffic, or heavy equipment traffic—check with the product vendor if these conditions exist at your site.

4-26

Be sure to ask the product vendor for the recommended dilution, application rate, and application frequency of the product you choose because these vary significantly by product. Before a weekend, holiday, or other inactive period of less than 5 days, a dust palliative that is diluted to not less than 1/20 of the concentration required to stabilize a surface for 6 months is recommended.

Maricopa County requires the use of environmentally compliant dust palliatives. Be sure to check with local authorities before choosing a dust suppressant. A contractor is responsible for assuring that its use of dust palliatives is in compliance with all applicable environmental laws.

Wind Barriers - Wind barriers are placed along one or more sides of a job site to reduce the amount of wind blown dust leaving the site. Creating a wind barrier could involve installing wind fences, constructing berms, or parking on-site equipment so that it blocks the wind. Alone, these barriers are not adequate for controlling dust. Wind barriers must be implemented together with the application of water or dust palliatives. These barriers increase the dust control effectiveness of water or palliative application.

4-27

Effective wind barriers are 3-sided structures made of material 3 to 5 feet high with a porosity of 50 percent or less. A wind barrier for a storage pile should be as high as the top of the pile.

Additional Benefits of Controlling Dust - Besides avoiding violations of Rule 310, do construction companies derive any additional value by controlling dust?

4-28

- Public and community “good will”
- Employee health considerations
- Competitive advantage for early adopters

Slide No.	Notes
4-29	<p>Example Problem Slide. The following slide represents a schematic of a job site larger than one acre. As the person responsible for dust control during an upcoming project on this site, list some measures you would implement concerning the following:</p> <ul style="list-style-type: none"> • Site planning • Trackout • Bulk material handling, storage and transportation • Construction operations • Site maintenance
4-30-A	<p>Example Problem Slide - Planning Ahead.</p>
4-30-B	<p>When planning your job site dust control procedures, identify appropriate locations for wind barriers. Install signs or fencing to restrict traffic and trespassing. Pre-water excavation areas to depth of cuts.</p>
4-31-A	<p>Example Problem Slide - Controlling Trackout.</p>
4-31-B	<p>Control trackout by installing gravel pads or grizzlies at entrances to job site, and sign to make sure all vehicles exit site by driving over these devices. Promptly clean up any trackout that does occur in accordance with the provisions of Rule 310.</p>
4-32-A	<p>Example Problem Slide - Roadway Construction.</p>
4-32-B	<p>Water disturbed areas during construction to suppress dust.</p>
4-32-C	<p>Efforts must be made to restore the construction areasso that the vegetative ground cover and soil characteristics are similar to those of adjacent or nearby undisturbed native conditions.</p>
4-30	<p>Discussion</p>

MODULE 5 - ADDITIONAL INFORMATION ON CONSTRUCTION DUST CONTROL

Slide No.	Notes
5-1	<p>Opportunities for Continuing Education on Construction Dust Control - We have reviewed the reasons for fugitive dust suppression, the requirements of Rule 310, the ways in which the rule is enforced, and strategies for compliance. The purpose of this module is to briefly introduce you to resources that supplement the training you have received.</p>
5-2	<p>What resources are available to supplement and reinforce this training? - Supplemental resources include the Construction Dust Control Toolkit, the <i>Guide to Construction Dust Control Measures in Maricopa County</i>, Dust Control Certification, and additional sources of information.</p>
5-3	<p>Construction Dust Control Toolkit – Before leaving today, you will be provided with a toolkit that has been developed to be useful in presenting dust control concepts to other individuals in your organization, both in a classroom setting and at on-site meetings with construction workers. The contents of the toolkit are as follows:</p> <ul style="list-style-type: none"> • MCESD Video – “Effective Dust Control & Overview of Rule 310,” a 10-minute VCR tape • Training Modules – A CD containing the PowerPoint presentation and script for this course can be used in a classroom setting to train others in your organization and can be tailored to the audience by removing and/or rearranging modules. • Quick Reference Dust Control Guide - This water-resistant flipbook in English and Spanish provides 5-minute topics on dust control that can be introduced at construction site tailgate meetings. • Calendars and other reinforcement items – These items are provided to be constant reminders of the need to control dust at work sites.
5-4	<p>Photo of Toolkit and Contents</p>
5-5	<p>Guide to Construction Dust Control Measures in Maricopa County – In addition to the toolkit, a construction dust control measures guide has been developed. The target audience for this guide is construction company managers and employees impacted by Rule 310 as well as industry trade associations.</p>
5-6	<p>Guide to Construction Dust Control Measures in Maricopa County – The Construction Dust Control Measures Guide discusses who must comply with Rule 310 and the consequences of noncompliance. It describes how PM₁₀ is produced and can be controlled on and near construction sites. Topics covered include:</p> <ul style="list-style-type: none"> • Who must comply with County dust control rules • What happens if a contractor does not comply • How PM-10 is created and measured • Dust control measures for vehicle use, disturbed surface areas, material hauling, spillage and trackout <p>Local training and certification opportunities are discussed. The guide also contains a sample earthmoving permit and dust control log.</p>
Slide No.	Notes

5-6	<p>To obtain a copy of the Guide, contact the Blue Skies Campaign Coordinator or the Small Business Environmental Assistance Program at the Maricopa County Environmental Services Department.</p>
5-7	<p>Voluntary Dust Control Certification Program - A voluntary certification program has been established to encourage managers, superintendents and other personnel to learn about and practice effective dust control at construction sites. The certification program is part of the Blue Skies Campaign and is being administered by the Blue Skies Coordinator. Two levels of voluntary certification are being offered: certified dust control specialist and certified dust control instructor. Certificates and cards will be issued to individuals meeting the requirements for either a specialist or instructor.</p> <p>Dust Control Specialists are required to attend the dust control course and pass a quiz on the material presented in Training Modules 1-5 with a grade of 75 percent or better. In addition, specialists must successfully complete Visible Emission Evaluation Training or Smoke School. As you may recall from Training Module 2, smoke school is taught every six months in Maricopa County and teaches observers how to judge opacities. To maintain dust control certification, a specialist must meet the above requirements every three years.</p> <p>Dust Control Instructors must meet the same requirements as specialists. However, to maintain certification, an instructor must attend the dust control course, pass the quiz, and attend smoke school every 18 months. In addition, before being certified as an instructor for the first time, an individual must co-teach a dust control course (Modules 1-5) with a certified instructor.</p>
5-8	<p>Additional Sources of Information include:</p> <ul style="list-style-type: none"> • Dust Devil Academy • Arizona Air Aware Initiatives • “Reducing Air Pollution from Construction” Course
5-9	<p>Dust Devil Academy - The Maricopa County Small Business Environmental Assistance Program maintains a website www.maricopa.gov/sbeap/basepage.htm that provides valuable and up-to-date information on Rule 310 and dust control for construction sites, together with testimonials and success stories.</p>
5-10	<p>Arizona Air Aware Initiatives - The Arizona Department of Transportation maintains a website www.dot.state.az.us/ABOUT/air/index.htm devoted to air quality issues affecting the State of Arizona. Innovative programs sponsored by ADOT include an air quality outreach program in Central Yavapai County (Prescott area), a construction dust educational and outreach program for Maricopa County, and an air quality sustainability program in Coconino County.</p>
5-11	<p>“Reducing Air Pollution From Construction” Course - A course entitled, “Reducing air Pollution from Construction” is offered by Paradise Valley Community College and taught by Robert R. Treloar. Contact PVCC for a course schedule. The course is co-sponsored by the Maricopa County Small Business Environmental Assistance Program.</p>
5-12	<p>Dust Control Quiz - A multiple-choice quiz will now be administered. This quiz will reinforce the material presented to you today. If you are interested in becoming certified as a dust control specialist or instructor, you will need to pass this quiz with a grade of 75 percent or better. Put your name and address (e-mail or other) in the space</p>

at the bottom of the quiz, if you want to be considered for certification. We will keep a record of whether you passed or failed and will notify you of the results. After you have turned in the quiz, I will go over the questions and provide you with the correct answers.

EARTHMOVING PERMIT APPLICATION

GUIDANCE FOR FILLING-OUT AN APPLICATION FOR AN EARTHMOVING PERMIT

Section 1 – Applicant Information

Submit the Appropriate Fee for your Earthmoving Permit application, according to the following:

- If total surface area disturbed is 0.1 acre to less than 1 acre, submit \$75.
- If total surface area disturbed is 1 acre or more, submit \$36/acre plus \$110 per site

Make checks payable to “Maricopa County Environmental Services Department” or “M.C.E.S.D.”

A Responsible Official is one of the following:

- For a corporation, a corporate officer or any other person who performs similar policy or decision making functions for the corporation, or a duly authorized representative of such person, if the representative is responsible for the earthmoving operations in the subject application. Delegation of authority to such representative shall be approved in advance by the permitting authority.
- For a partnership or sole proprietorship, a general partner or the proprietor, respectively.
- For a municipality, state, federal, or other public agency, the principle executive officer or ranking elected official of that entity.

Section 2 – Project Information - Drawing

Section 2 – Project Information – Drawing is self-explanatory. However, please remember, when calculating the amount of disturbed area for trenching, include the dimensions of the trench, stockpiling areas, and staging areas.

Section 3 – Dust Control Plan

An Earthmoving Permit must contain a Dust Control Plan. You may fill-out Section 3 of the Application For An Earthmoving Permit and submit it as your Dust Control Plan or you may write your own Dust Control Plan describing all control measures to be used during the project and submit it as your Dust Control Plan.

Water: Sources of fugitive dust, listed in Section 3, that include “Apply water” as a control measure require specifics about water availability and water application. If you choose to apply water as a control measure, you must fill-in the blanks, under both Water Availability and Water Application. For Water Availability, indicate which of the

following will be utilized: water storage tank on-site; metered hydrant on-site; water not on-site, describe water source and state the distance from site to water source; water provided through irrigation; other – specify source. For Water Application, indicate which of the following will be utilized: apply water using a water truck – state number of trucks and number of gallons per truck; apply water using hoses; apply water using sprinklers.

Dust Suppressants: If you choose the control measure “dust suppressant(s) other than water”, you must describe the method of dust suppressant(s) application. Express frequency in terms of how often the surface will receive a complete application of dust suppressant(s) (i.e., the frequency may be three applications per day). Express intensity in units such as gallons per minute. Also, include as an attachment:

- Product specifications or label instructions for approved usage
- Information on environmental impacts and approvals or certifications related to appropriate and safe use for ground application

Describing Major Project Phases: You may use the Project Information Drawing in Section 2 to show the various project phases, along with a time line depicting relative start and stop times. Indicate on the line provided for describing major project phases that you have shown the various project phases on the Project Information Drawing.

Bulk Material Handling And Hauling: Rule 310 defines “bulk material handling, storage, and/or transporting operation” as the use of equipment, haul trucks, and/or motor vehicles, such as but not limited to the loading, unloading, conveying, transporting, piling, stacking, screening, grading, or moving of bulk materials, which are capable of producing fugitive dust at an industrial, institutional, commercial, governmental, construction, and/or demolition site. When designing your Dust Control Plan, you must choose control measures for all bulk material handling and bulk material hauling that you will do onsite within the boundaries of the work site and that you will do off-site onto paved public roadways.

Open Storage Piles: The control measure options for open storage piles are included with bulk material handling control measure options, because an open storage pile is any accumulation (by stacking, loading, and unloading) of bulk material with a five percent or greater silt content that in any one point attains a height of three feet and covers a total surface area of 150 square feet or more. If you choose to construct wind barriers around open storage piles, as a control measure, you must construct the wind barriers around three sides of the open storage pile. The sides’ length must be no less than equal to the length of the pile; the sides’ distance from the pile must be no more than twice the height of the pile; the sides’ height must be equal to the pile

height, and the material of which the sides are made must be no more than 50 percent porous.

Spillage, Carry-Out, Erosion, And/Or Trackout: Rule 310, Subsection 308.3(b) requires spillage, carry-out, erosion, and/or trackout to be cleaned up at least at the end of the work day and immediately, if it extends more than 50 feet along a paved public roadway. You must specify, on the Dust Control Plan for any site that exits onto a paved public road, the control measures that you will use for both immediate clean-up and after-the-work-day clean-up.

Weed Abatement By Discing Or Blading: Watering, both prior to and during weed abatement by discing or blading, has been pre-designated as the primary control measure, since both are required by Rule 310, Subsection 308.8. You must choose a contingency control measure and at least one control measure to be implemented following weed abatement by discing or blading.

Vegetative Ground Cover: If you choose to “Establish vegetative ground cover” as a control measure, you must comply with the standards in Rule 310, Subsection 302.3:

- Maintain a flat vegetative cover (i.e., attached (rooted) vegetation or unattached vegetative debris lying on the surface with a predominant horizontal orientation that is not subject to movement by wind) that is equal to at least 50 percent; or

- Maintain a standing vegetative cover (i.e., vegetation that is attached (rooted) with a predominant vertical orientation) that is equal to or greater than 30 percent; or
- Maintain a standing vegetative cover (i.e., vegetation that is attached (rooted) with a predominant vertical orientation) that is equal to or greater than 10 percent and where the threshold friction velocity is equal to or greater than 43 cm/second when corrected for non-erodible elements; or
- Maintain a percent cover that is equal to or greater than 10 percent for non-erodible elements.

Surface Gravel, Recycled Asphalt, Or Other Suitable Material: If you choose to “apply and maintain surface gravel, recycled asphalt, or other suitable material” as a control measure for unpaved haul/access roads, you must comply with the standards in Rule 310, Subsection 302.2:

- Do not allow visible dust emissions to exceed 20 percent opacity and either do not allow silt loading to be equal to or greater than 0.33 oz/ft² or do not allow silt content to exceed 6 percent.

If you choose to “Apply and maintain surface gravel, recycled asphalt, or other suitable material” as a control measure for unpaved parking lots, you must comply with the standards in Rule 310, Subsection 302.1:

Do not allow visible fugitive dust emissions to exceed 20 percent opacity and either do not allow silt loading to be equal to or greater than 0.33 oz/ft² or do not allow silt content to exceed 8 percent.

An approved Application for an Earthmoving Permit is reproduced on the following pages.



PLEASE SUBMIT IN TRIPLICATE

Application for an Earthmoving Permit

In order for Maricopa County to process an application for an Earthmoving Permit, all questions must be answered and the appropriate fee must be submitted.

FOR OFFICE USE ONLY	
Dist #	_____
NOV #	_____
Permit #	_____
Date Issued	_____
Fee Paid	_____
Approved By	_____
PU	_____ Mail _____

Section 1 – Applicant Information

1. Applicant Must Be One Of The Following.

Check All That Apply:

Property Owner ___ Developer ___ General/Prime Contractor ___ Lessee ___

2. Legal Business Name: _____

Applicant Address: _____

City/State/Zip: _____

Phone: _____ Fax #: _____

E-Mail Address: _____

3. Property Owner/Developer, If Not Applicant: _____

Address: _____

Phone: _____ Fax #: _____

Contact Person: _____

4. Primary Project Contact: _____

Title: _____ Company Name: _____

Pager #: _____ Mobile #: _____ On-Site #: _____

5. Signature of a Responsible Official of the Applicant:

I hereby certify that, based on information and belief formed after reasonable inquiry, the statements and information in the Application For An Earthmoving Permit, including Section 1-Applicant Information, Section 2-Project Information-Drawing, and Section 3-Dust Control Plan, are true, accurate, and complete.

A Responsible Official of the Applicant is the person who will be contacted or named in any enforcement action initiated by the Maricopa County Environmental Services Department or the Office of the Maricopa County Attorney.

Signature: _____

Printed Name: _____ Title: _____

Section 2 – Project Information-Drawing

6. Type Of Project. Check All That Apply.

Residential _____ Commercial/Industrial _____ Road Work _____ Temporary Storage/Yard _____
Trenching _____ Site Preparation/Land Development _____ Weed Control _____ Demolition _____

7. Project Street Address: _____ **City:** _____

8. Nearest Major Intersection: _____

9. Legal Description (From Phoenix Metropolitan Map Book):

Township: _____ Range: _____ Section: _____

10. Size Of Area, In Acres, That Will Be Disturbed During The Duration Of This Permit, Including Staging And Stockpile Areas: _____

11. Project Start Date: _____

12. Does The Project Include Renovation Or Demolition Activities? Yes _____ No _____

Renovation Or Demolition Activities: All facilities scheduled for renovation or demolition must be inspected by a certified Asbestos Hazard Emergency Response Act (AHERA) accredited asbestos building inspector. You must keep a copy of any reports of inspections, including laboratory test results of samples collected, for 2 years.

NESHAP stands for national emission standards for hazardous air pollutants. National emission standards for hazardous air pollutants are described in 40 Code Of Federal Regulations (CFR) Part 61 and Part 63 (1998). If your facility is scheduled for renovation or demolition and is subject to the requirements of these Federal regulations, you must attach, to your Application For An Earthmoving Permt, a copy of the 10-day NESHAP notification.

Is Asbestos Present? _____

AHERA Determination Made By: _____ Date: _____

10-Day NESHAP Notification Submittal Date (Attach Copy Of 10-Day NESHAP Notification): _____

Renovation Or Demolition Start Date: _____

An Earthmoving Permit will not be issued, unless a drawing is submitted. Attach a separate page (at least 8 ½” x 11”) with a drawing showing all of the following elements:

- Entire project site boundaries
- Acres to be disturbed with linear dimensions
- Nearest public roads
- North arrow
- Planned exit locations onto paved public roadways

Section 3 – Dust Control Plan

- Put a check () in the box in front of all the following sources of fugitive dust that you anticipate from your project.
- Write the letters “NA” in the box in front of all the following sources of fugitive dust that you do not anticipate implementing during your project.
- Unless already pre-designated, write the letter “P”, for primary control measures that you will implement during your project, on the line in front of at least one of the listed control measures or work practices, under each checked box/source of fugitive dust. The control measures pre-designated with the letter “P” are required to be implemented.
- Write the letter “C”, for contingency control measures that you will implement during your project, on the line in front of at least one of the listed control measures or work practices, under each checked box/source of fugitive dust.

Unpaved Haul/Access Roads:

- Limit vehicle speed to 15 miles per hour or less and limit vehicular trips to no more than 20 per day. If this is chosen as the primary control measure, indicate number of vehicles traveled on haul roads:

- Apply water at a frequency and intensity to comply with Subsection 302.2 in Rule 310 (See Guidance-“Water”) Water Availability: _____
Water Application: _____
- Pave
- Apply and maintain surface gravel, recycled asphalt, or other suitable material so that the area meets the silt loading and silt content limits of Subsection 302.2 in Rule 310 (See Guidance-“Surface Gravel, Recycled Asphalt, Or Other SuitableMaterial”)
- Apply and maintain dust suppressant(s) other than water using _____ at a frequency of _____ and an intensity of _____ (See Guidance-“Dust Suppressants”)
- Other: _____

Disturbed Surface Areas – Before Dust Generating Operations Occur:

- Pre-water site to the depth of cuts (See Guidance-“Water”) Water Availability: _____
Water Application: _____
- Phase work to reduce the amount of disturbed surface area at any one time. Describe major project phases (See Guidance-“Describing Major Project Phases”)

- Other: _____

Disturbed Surface Areas – During Dust Generating Operations:

- Apply water (See Guidance-“Water”) Water Availability: _____
Water Application: _____
- Apply and maintain dust suppressant(s) other than water using _____ at a frequency of _____ and an intensity of _____ (See Guidance-“Dust Suppressants”)
- Construct fences or 3 foot - 5 foot high wind barriers with 50% or less porosity (in combination with one of the above) Show locations on drawing in Section 2.
- Cease operations (as a contingency control measure only)
- Other: _____

Disturbed Surface Areas – Temporary Stabilization
Including Weekends, After Work Hours, Holidays, And Periods Up-To 8
Months:

- Apply water (See Guidance-“Water”) or other dust suppressant (See Guidance-“Dust Suppressants”) in sufficient quantity and frequency to establish and maintain a visible crust.
Water Availability: _____
Water Application: _____
- Establish vegetative ground cover that complies with Subsection 302.3 in Rule 310 (See Guidance-“Vegetative Ground Cover”)
Describe vegetative ground cover: _____
- Restrict vehicular access in combination with one of the above
- Other: _____

Disturbed Surface Areas – Permanent Stabilization
Required Within 8 Months Of Ceasing Dust Generating Operations:

- Restore area such that the vegetative ground cover and soil characteristics are similar to adjacent or nearby undisturbed native conditions
- Establish vegetative ground cover that complies with Subsection 302.3 in Rule 310 (See Guidance-“Vegetative Ground Cover”)
Describe vegetative ground cover: _____
- Pave or apply gravel
- Apply and maintain dust suppressant(s) other than water using _____ at a frequency of _____ and intensity of _____ (See Guidance-“Dust Suppressants”)
- Other: _____

Trackout From Work Sites
With 5 Acres Or More Of Disturbed Surface Area Or With 100 Cubic Yards Or
More Of Bulk Material Hauled On Or Off Site Per Day:

- Install a grizzly or wheel wash system at all access points
- At all access points, install a gravel pad at least 30 feet wide, 50 feet long, and 6 inches deep
- Pave starting from the point of intersection with a paved public roadway and extending for a centerline distance of at least 100 feet and a width of at least 20 feet
- Other: _____

Spillage, Carry-Out, Erosion, And/Or Trackout:

If Extending More Than 50 Feet Along A Paved Public Roadway,
Implement IMMEDIATELY:

- Operate a street sweeper or wet broom with sufficient water, if applicable, at the speed recommended by the manufacturer
- Manually sweep-up deposits
- Other (describe in detail): _____

**If Extending Less Than 50 Feet Along A Paved Public Roadway,
Implement NO LATER THAN THE END OF THE WORK DAY:**

- Operate a street sweeper or wet broom with sufficient water, if applicable, at the speed recommended by the manufacturer
- Manually sweep-up deposits
- Other (describe in detail): _____

Vehicle Use In Open Areas:

- Restrict trespass by installing signs
- Install physical barriers such as curbs, fences, gates, posts, signs, shrubs or trees to prevent access
- Other: _____

Unpaved Parking Lots:

- Apply water at a frequency and intensity to comply with Subsection 302.1 in Rule 310 (See Guidance-"Water")
Water Availability: _____
Water Application: _____
- Apply and maintain gravel, recycled asphalt, or other suitable material such that the area meets the silt loading and silt content limits of Subsection 302.1 in Rule 310 (See Guidance-"Surface Gravel, Recycled Asphalt, Or Other Suitable Material")
- Pave
- Apply and maintain dust suppressant(s) other than water using _____ at a frequency of _____ and an intensity of _____ (See Guidance-"Dust Suppressants")
- Other: _____

Bulk Material Handling And Open Storage Piles:
(Choose Primary Control Measure And Secondary Control Measure
For Each Of The Following 2 Situations):

During Stacking, Loading, And Unloading Operations:

- Apply water at a frequency and intensity so as not to exceed 20% opacity (See Guidance-"Water")
Water Availability: _____
Water Application: _____
- Other (describe in detail): _____

When Not Conducting Stacking, Loading, And Unloading Operations:

- Cover open storage piles with tarps, plastic, or other material
- Apply water to maintain a soil moisture content at a minimum of 12% or 70% of the optimum moisture content for compaction (See Guidance-"Water")
Water Availability: _____
Water Application: _____
- Apply water as needed to establish and maintain a visible crust (See Guidance-"Water")
Water Availability: _____
Water Application: _____
- Maintain a threshold friction velocity of at least 100 cm/sec
- Maintain vegetative cover meeting one of the requirements of Subsection 302.3 in Rule 310 (See Guidance-"VegetativeGround Cover")
- Construct wind barriers (See Guidance-"Open Storage Piles"). This control measure must be used in combination with at least one of the above control measures, except covering.
- Other: _____

Bulk Material Hauling On-Site Within The Boundaries Of The Work Site:

- P** Load all haul trucks such that the freeboard is not less than 3 inches; and
Prevent spillage or loss of bulk material from holes or other openings in the cargo compartment's floor, sides, and/or tailgates; and
Install a trackout control device that removes particulate matter from tires and the exterior surfaces of haul trucks and/or motor vehicles that traverse the work site
- Limit vehicular speeds to 15 miles per hour or less while traveling on the work site
- Apply water to the top of the load (See Guidance-"Water")
Water Availability: _____
Water Application: _____
- Cover haul trucks with a tarp or other suitable closure
- Other: _____

Bulk Material Hauling Off-Site Onto Paved Public Roadways:

- P** Cover haul trucks with a tarp or other suitable closure; and
Load all haul trucks such that the freeboard is not less than 3 inches; and
Prevent spillage or loss of bulk material from holes or other openings in the cargo compartment's floor, sides, and/or tailgate(s); and
Before the empty haul truck leaves the site, clean the interior of the cargo compartment or cover the cargo compartment
- Other: _____

Earthmoving Operations On Disturbed Surface Areas 1 Acre Or Larger:

- Apply water, while conducting earthmoving operations (See Guidance-"Water")
Water Availability: _____
Water Application: _____
- Other: _____

Weed Abatement By Discing Or Blading:

- P** Pre-water site and apply water, while weed abatement by discing or blading is occurring (See Guidance-"Water")
Water Availability: _____
Water Application: _____
- Other: _____

Choose At Least One of The Following, As A Primary Control Measure, To Be Implemented Following Weed Abatement By Discing Or Blading:

- Pave
- Apply gravel to establish and maintain either a threshold friction velocity of at least 100 cm/sec or a cover of at least 10% non-erodible elements
- Apply water (See Guidance-"Water") or other dust suppressant (See Guidance-"Dust Suppressants") to establish and maintain a visible crust
Water Availability: _____
Water Application: _____
- Establish vegetative ground cover meeting one of the requirements of Subsection 302.3 of Rule 310 (See Guidance-"Vegetative Ground Cover")
- Other: _____

SAMPLE DAILY RECORDKEEPING LOG FOR RULE 310

Project Name: _____ **Project Location:** _____ **Date:** _____

Maricopa County's Rule 310 (Fugitive Dust Sources) requires that you keep a daily log – recording the actual implementation of control measures identified in your Dust Control Plan.

Each time you visually check an area for dust control measure implementation, write the time in the shaded boxes at the top of the log and write a "Y", "N", or "NA", in all of the boxes below your recorded time.

Use the "Comments" column to record other pertinent information. For example, document the opacity of the fugitive dust or describe the corrective actions taken, such as placement of gravel for road cover or trackout control.

Time (indicate a.m. or p.m.)

--	--	--	--	--	--	--	--	--	--

1. Before Dust Generating Operations Occur

A. Pre-watering to depth of cuts?										Comments
B. Pre-watering stockpiled material?										
C. Work phased/Disturbance minimized?										
D. Water truck being operated?										
E. Water truck being filled?										
F. Other (specify in Comments column)										

2. During Dust Generating Operations

A. Is visible dust present?										Comments
B. Applying water?										
C. Applying dust suppressant(s) other than water?										
D. Fences or 3' – 5' high wind barriers with 50% porosity intact?										
E. Shut down operations?										
F. Checked control measures before leaving the work site for the day?										
G. Other (specify in Comments column)										

3. Unpaved Haul/Access Roads

A. Is visible dust present?										Comments
B. Observed less than 20 vehicles travelling less than 15 miles per hour?										
C. Is road visibly moist?										
D. Is road covered with gravel, recycled asphalt, or other suitable material?										
E. Applying dust suppressant(s) other than water?										
F. Other (specify in Comments column)										

4. Loading, Unloading, And Storage Piles

A. Is visible dust present?										Comments
B. Pre-watering material?										
C. Water being applied during loading and unloading?										
D. Other (specify in Comments column)										

5. Trackout/Access Points

A. Is trackout control device intact?										Comments
B. Cleaned-up trackout?										
C. Other (specify in Comments column)										

6. Temporary Site Stabilization

A. Applying water?										Comments
B. Applying dust suppressant(s) other than water?										
C. Other (specify in Comments column)										

Total Number Of Gallons Applied: _____ **Responsible Person's Signature And Title:** _____

SOURCES OF ADDITIONAL INFORMATION

Maric
opa

BLUE SKIES CAMPAIGN COORDINATOR

The Arizona Blue Skies Campaign coordinator can be reached at (602) XXX-XXXX. The Campaign Coordinator responds to inquiries from members of the construction industry and others concerning the availability of Dust Classes and Smoke School sessions, and disseminates information regarding dust control training and certification.

Certified Dust Control Trainers who have completed the Blue Skies training and certification program may obtain copies of toolkits and instructional materials for use in conducting additional dust control classes from the Coordinator.

The Campaign Coordinator also has dust control resources available for use by schools and by volunteer organizations including copies of this Guide, program brochures, and videos.

County Environmental Services Department

602-506-6623

<http://www.maricopa.gov/envsvc/Default.asp>

Dust Devil Academy

<http://www.maricopa.gov/sbeap/basepage.htm>

Pima County Department of Environmental Quality

<http://www.airinfnow.org/index.asp>

BLUE SKIES WEB SITE

Be sure to visit our campaign Web site at www.azblueskies.com. The Web site contains updated information about dust control, including documents that can be downloaded and reproduced. Training materials may also be ordered on-line.

OTHER SOURCES OF INFORMATION

Environmental Protection Agency

1200 Pennsylvania Avenue, NW

Washington, DC, 20460.

<http://www.epa.gov/>

Arizona Department of Environmental Quality

Phoenix Main Office

3033 N. Central Ave.

Phoenix, AZ 85012

(602) 207-2300

Toll Free in Arizona:

(800) 234-5677

Northern Regional Office

1515 E. Cedar Ave., Suite F

Flagstaff, AZ 86004

(928) 779-0313

Southern Regional Office

400 W. Congress, Suite 433

Tucson, AZ 85701

(520) 628-6733

