June 1996

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URBAN FUGITIVE DUST POLICY

BENTON CLEAN AIR AGENCY
URBAN FUGITIVE DUST POLICY

BACKGROUND/PURPOSE

Since 1986, the small particulate matter (PM_{10}) monitor in Kennewick, Washington has recorded exceedances of the National Ambient Air Quality Standards (NAAQS) for PM_{10} in the Tri-Cities area. Preliminary analyses of these events indicate that most of the exceedances were caused by wind-blown dust from fields in the surrounding area. Urban sources may contribute to the fugitive dust problem. For these reasons, in 1994 the United States Environmental Protection Agency (EPA) decided not to pursue designation of the Benton, Franklin, Walla Walla tri-county area as a PM_{10} non-attainment area, as originally proposed in 1992. Instead, EPA asked the Washington State Department of Ecology (Ecology) and the Benton/Franklin Counties Clean Air Authority (BFCCAA) to study the air quality problem in the Tri-Cities urban area, develop controls over urban fugitive dust sources and any other urban sources that contribute significantly to recorded exceedances of the NAAQS for PM_{10}, and participate in studies of the wind-blown dust problem in the Columbia Plateau region.

In August of 1994, the EPA, Ecology, and BFCCAA finalized a Memorandum of Agreement (MOA) with a major focus on controlling urban area sources of small particulate matter (PM_{10}) in the Tri-Cities area. Task 4 of the MOA states, in part, that "BFCCAA will develop a dust regulation and enforcement policy to regulate fugitive dust within the urban area."

In January of 1995, Franklin County withdrew from the BFCCAA but agreed to participate in carrying out the purposes of the MOA. BFCCAA then became the Benton County Clean Air Authority (BCCAA). In April of 1995, all three parties to the MOA determined that the BCAA could satisfy its obligations under Task 4 of the MOA by developing an enforcement policy for implementing the existing state regulations in Washington Administrative Code (WAC) 173-400-040 (8)(a), pertaining to fugitive dust sources. According to this regulation, "the owner or operator of a source of fugitive dust shall take reasonable precautions to prevent fugitive dust from becoming airborne and shall maintain and operate the source to minimize emissions."

The purpose of this policy, therefore, is to comply with Task 4 of the MOA by describing how (WAC) 173-400-040(8)(a) is interpreted and will be enforced in the Tri-Cities urban area. Specifically, this policy provides the BCAA and owners and operators of urban fugitive dust sources with guidelines for interpreting the phrase "reasonable precautions to prevent fugitive dust from becoming airborne."

In March 1998, the BCAA became the Benton Clean Air Authority (BCAA).

APPLICABILITY/EXCEPTIONS

This policy applies to all urban fugitive dust sources located within the Tri-Cities urban area, except any urban fugitive dust sources where:

1. Active operations are being conducted during emergency life-threatening situations, or in conjunction with any officially declared disaster or state of emergency; or
2. Active operations are being conducted by public service utilities to provide electricity, natural gas, telephone, water or sewer during emergency service outages.

DEFINITIONS

The definitions of terms contained in Chapter 70.94 of the Revised Code of Washington (RCW) and WAC 173-400 are incorporated by reference, unless otherwise defined here. Unless a different meaning is clearly required by the context, the following words and phrases, as used in this policy, shall have the following meanings:

"Active operations" means any activity capable of generating fugitive dust, including but not limited to earth-moving activities, construction/demolition activities, and vehicular movement.

"Agricultural fields" are agricultural lands where soil preparation, soil maintenance, and crop harvesting activities, which include but are not limited to: plowing, disking, burning, fertilizing, applying herbicides and insecticides, bedding, flattening and firming beds, planting, cultivating, and harvesting, are conducted.

"Chemical stabilizer" means any chemical approved for use as a dust suppressant by the EPA, Ecology or other applicable authority.

"Construction/demolition sites" are any sites where mechanical activities in preparation for or related to the building, alteration, rehabilitation, demolition, or improvement of property, including, but not limited to: land clearing, grading, excavation, loading, crushing, cutting, blasting, planing, shaping, or ground breaking, are or will be taking place.

"Control measures" means methods, techniques, equipment, processes, systems, or actions used to reduce air pollution.

"Control officer" means the air pollution control officer of the Benton Clean Air Agency, or his or her designee.

"Disturbed surface area" means a portion of the earth's surface which has been physically moved, uncovered, de-stabilized, or otherwise modified from its undisturbed natural soil condition, thereby increasing the potential for emission of fugitive dust. This definition excludes those areas that have been restored to a natural state such that the vegetative ground cover is similar to any adjacent natural conditions, or which have been paved or covered by a permanent structure.

"Dust storm" means a situation where sustained high winds have caused fugitive dust emissions in and around the Tri-Cities area and the wind speed exceeds 20 miles per hour (averaged on the quarter hour over the previous 2 hours). The recorded wind speed will be taken as the average of the measurements from the five BCAA meteorological stations, which are part of the Public Agricultural Weather System (PAWS).

"Earth moving" is digging, scraping, hauling, loading, pushing and other material moving activities.

"Fugitive dust" and "fugitive dust emission" means a particulate emission made airborne by forces of wind, man's activity, or both. Unpaved roads, construction sites, and tilled land are examples of areas that originate fugitive dust. Fugitive dust is a type of fugitive emission.

"Fugitive dust source" means any source of fugitive dust. Such sources include but are not limited to: construction/demolition sites, paved and unpaved roads, open storage piles, open areas, hauled material, and agricultural fields.

"Hauled material" means material that is transported over land by vehicles.

"Material" means any organic or inorganic substance that has the potential to emit fugitive dust. Material includes but is not limited to soil, sand, gravel, aggregate, rock, grain, manure, and compost.

"Natural crust" means the crust on the soil surface that is the result of a meteorological occurrence such as rainfall, snow, or ice.

"Open areas" are any unsealed or unpaved motor vehicle parking areas, truck stops, vacant lots, or other disturbed surface areas located on public or private property, which are subject to wind erosion, and are a source of fugitive dust emissions.

"Open storage pile" means an accumulation of material that is greater than 3 feet in height or greater than 150 square feet total surface area that is not fully enclosed within a structure.

"Owner or operator" means any person with an ownership interest in, or who is an agent of the owner, and exercises control over the fugitive dust source.

"Particulate matter" means any airborne finely divided solid or liquid material with an aerodynamic diameter smaller than 100 micrometers.

"Paved roads" are improved, hard, smooth-surfaced public and private streets or thoroughfares for vehicular travel.

"Precaution" means a measure used in advance.

"Qualified BCAA staff" means BCAA employees who have been hired and trained to conduct air

quality inspections.

"Reasonable" means using or showing reason or sound judgement, sensible and/or economical.

"Reasonably available control measures (RACM)" or "RACM" means methods, techniques, equipment, processes, systems, or actions used to reduce air pollution that are technologically sound and economically feasible.

"Small particulate matter (PM_{10})" or "PM_{10}" refers to particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers. Particulate matter can consist of dust, soot, unburned material, and other particles.

"Track-out" means any material that adheres to wheels and tires and falls onto paved roads.

"Unpaved roads" are unimproved oiled or un-oiled native, dirt, or gravel public and private passageways for vehicular travel, including driveways.

"Urban area" and "Tri-Cities urban area" means the area within the urban growth boundaries of the cities of Richland, West Richland, and Kennewick, as those boundaries exist for purposes of the Washington State Growth Management Act on the effective date of this policy.

"Urban fugitive dust source" means any fugitive dust source located within the Tri-Cities urban area.

GENERAL POLICY

WAC 173-400-040 (8)(a) states, "The owner or operator of a source of fugitive dust shall take reasonable precautions to prevent fugitive dust from becoming airborne and shall maintain and operate the source to minimize emissions." The Agency will ensure compliance with current state and administrative codes applicable to all emission sources of particulate matter.

BCAA will enforce the requirements of WAC 173-400-040 (8)(a) by:

1. Informing the general public (including the owners or operators of fugitive dust sources) of this policy;
2. Helping such owners or operators identify RACM that should effectively prevent fugitive dust from becoming airborne;
3. Encouraging owners or operators to act to minimize fugitive dust emissions that occur, except that an owner or operator who was using RACM effectively or acting to minimize fugitive dust emissions prior to a dust storm shall not be required to institute additional control measures during a dust storm. The expense of additional actions under dust storm conditions would be considered unreasonable for the purposes of this policy.
4. Notifying owners or operators of complaints or violations observed by qualified BCAA staff in a timely manner, provided the owners or operators can be readily identified. Such notices may

be provided by letter, telephone call, or personal contact, or in the case of violations observed by qualified BCAA staff, by issuing a correction notice. Correction notices will:

1. Identify any violations observed by qualified BCAA staff;
2. State options available to achieve compliance.
3. Establish a reasonable compliance date;
4. Identify means to obtain technical assistance services; and
5. Identify when, where, and to whom requests for extending compliance times may be filed; and/or

5. Issuing notices of violation and penalties when necessary to bring about compliance, but only if one or more of the following situations apply:
   a) the owner or operator has previously been subject to an enforcement action for, or been notified of, the same or a similar type of violation through the process described above;
   b) the violation has a probability of placing a person in danger of death or bodily harm;
   c) the violation has a probability of causing more than minor environmental harm; or
   d) the violation has a probability of causing more than minor physical damage to the property of another;

Notices of violation may include an order directing that necessary corrective action be taken within a reasonable time. The control officer will use the Fugitive Dust Civil Penalty Worksheet and Recommendation, form shown in Appendix A to this policy, to assess penalties for violations.

While conducting inspections the control officer will only use evidence of fugitive dust emissions or failure to act to minimize fugitive dust emissions that occur to determine compliance with WAC 173-400-040 (8)(a), as interpreted in this policy.

Owners or operators of urban fugitive dust sources should select appropriate control measures from the list of control measures applicable to the types of sources involved, as shown in Appendix B to this policy. Owners or operators should also use such control measures in the manner recommended to effectively prevent fugitive dust from becoming airborne.

In order to ensure that the control measures selected are appropriate, will be effective, and will constitute reasonably available control measures (RACM), owners or operators are encouraged to consult with the control officer and/or use EPA's Control of Open Fugitive Dust Sources (Cowherd, Muleski, and Kinsey; September 1988) or Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures (September 1992), and any guidance materials prepared by the BCAA regarding appropriate control measures and their use. Owners or operators are also encouraged to prepare a dust control plan that will identify the appropriate control measures to use and state when and how such control measures will be used.

The opinion of the control officer shall not relieve the owner or operator of the responsibility to comply with WAC 173-400-040(8)(a) and all other applicable local, county, state, and federal requirements. Owners or operators of fugitive dust sources should keep records and receipts as evidence of control measure application.

Appendix A

FUGITIVE DUST
CIVIL PENALTY WORKSHEET AND RECOMMENDATION

Violator: _____

Case No: _____

The following procedure shall be employed in making a recommendation for assessment of civil penalties for violations of Agency regulations pertaining to fugitive dust. Guidance for answering the questions in Table I are found on the back of this sheet. Civil penalties involving demonstrable economic benefit to the violator shall include both a gravity and a benefit component and shall be determined by adding the dollar amount from Table II below and the economic benefit calculated using reasonable dust control costs. Civil penalties for other violations shall consist of a gravity component only and shall be determined from Table II.

Table I
Gravity Criteria

	No (0)	Possibly (2)	Probably (2)	Definitely(3)
1. Did the violation result in a public health risk or property damage?	_____	_____	_____	_____
2. Was it a willful or knowing violation?	_____	_____	_____	_____
3. Was the violator unresponsive in correcting the violation?	_____	_____	_____	_____
4. Did the violator have a history of similar violations? When? _____	_____	_____	_____	_____
5. Did they benefit economically from the noncompliance?	_____	_____	_____	_____
6. Did the violation adversely affect enjoyment of property?	_____	_____	_____	_____

Total Gravity Criteria Rating: _____

Table II
Gravity Component Penalty

Gravity Rating	1-5	6-9	10-11	12	13	14	15	16	17	18
Penalty	$0-$1000	$1000-$2000	$2000-$3000	$3000-$4000	$4000-$5000	$5000-$6000	$6000-$7000	$7000-$8000	$8000-$9000	$9000-$10000

If the answer to question #5 in Table I is "Definitely", calculate the estimated economic benefit using available and reasonable dust control costs here $_____.

Was the wind speed unusually high on the day the violation occurred? _____ If so were any preventative measures taken at the site before the wind picked up? _____

Comments: _____

_____

_____

Evaluator: _____ Date: _____ Civil Penalty Recommendation: $ _____

Control Officer: _____ Date: _____ Consent Order Recommendation: $ _____

ILLEGAL FUGITIVE DUST CIVIL PENALTY GRAVITY CRITERIA

1. Did the violation result in a public health risk or property damage?

Answer "no" if the violation did not produce a dangerous emission. Answer "possibly" if there was an emission that was not identified. Answer "probably" if the emission was verified and identified. Answer "definitely" if the emission was verified to be the direct cause of an adverse health effect or damage to property.

2. Was it a willful or knowing violation?

Answer "no" if the violator obviously did not know that the action or inaction constituted a violation. Answer "possibly" if it is likely the violator knew. Answer "probably" if the violator should have known. Answer "definitely" if the violator clearly knew.

3. Was the violator unresponsive in correcting the violation?

Answer "no" if the violation was corrected as soon as the violator learned of it. Answer "possibly" if the violation was corrected in a less timely and cooperative fashion. Answer "probably" if the violator attempted to correct the problem, but did not correct it. Answer "definitely" if the violator did not attempt to correct the problem.

4. Did the violator have a history of similar violations?

Answer "no" if the violation did not occur previously. Answer "possibly" if the violation may have occurred before, but has not been previously cited. Answer "probably" if the violation occurred previously, but had not been previously cited. Answer "definitely" if the violation had been previously cited.

5. Did the violator benefit economically from noncompliance?

Answer "no" if the violator clearly did not obtain any economic benefit. Answer "possibly" if the violator may have benefited. Answer "probably" if the violator benefited, but the benefit is not quantifiable. Answer "definitely" if the economic benefit to the violator is quantifiable (e.g., costs of renting water trucks, installing sprinklers, planting ground cover, etc.).

6. Did the violation adversely affect enjoyment of property?

Answer "no" if the enjoyment of surrounding property was not affected. Answer "possibly" if there could have been some adverse affect on the surrounding property, but none was reported. Answer "probably" if there was a reported and verifiable adverse affect of the enjoyment of surrounding property. Answer "definitely" if there was clearly an adverse affect of the enjoyment of the surrounding property.

Appendix B

CONTROL MEASURES APPLICABLE TO PARTICULAR FUGITIVE DUST SOURCES

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CONTROL MEASURES APPLICABLE TO PARTICULAR FUGITIVE DUST SOURCES

A. CONSTRUCTION/DEMOLITION SITES

Control Measures/Objective

1. Watering to stabilize soil using water as a binder either by maintaining soil moisture or establishing a crust which prevents soil movement under windy conditions.

   Comments/Recommendations on watering

   a. Pre-water areas being disturbed and continue to water during activity that produces fugitive dust.
   b. Appropriately match water application equipment size and rates to soil and site characteristics including area.
   c. Water can be applied by any suitable means such as trucks, hoses, and/or sprinklers appropriate for site characteristics.
   d. Decreased need when natural crust present

2. Chemical Stabilizers (Temporary) that are commercially available and approved chemical soil binding agents to artificially crust soil and prevent soil movement during windy conditions for a temporary period. Chemical Stabilizers (Extended action) are similar to temporary but different application rates and/or materials may be used that extend the durability and longevity of the artificial soil crust.

   Comments/Recommendations on chemical stabilization

   a. Best suited to areas not subject to daily disturbance.
   b. Apply according to manufacturers/vendor recommendations
   c. Manage to protect stabilized area.
   d. Extended action applications may stand up to moderate traffic.

3. Physical Barriers use objects or barriers perpendicular to prevailing wind across a fugitive dust source or to cover source to prevent generation of fugitive dust from winds or activities.

   Comment/Recommendations on physical barriers

   a. Vertical barriers are effective downwind for only approximately 10 times their height.

      Wind fencing of 50% or less porosity at or near property line serve as a down wind catchment mostly for trapping larger (50-100 micrometer) wind blown particles. Smaller particle will tend to be deposited more heavily immediately downwind from the fence.
   b. Other downwind barriers such as hay or straw bales can serve as downwind catchment for larger windblown particles.
   c. Windbreaks should be placed upwind of the target control area according to the "10 times height rule for maximum effectiveness.
   d. Set-back from downwind property lines of barriers intended primarily as downwind catchments will allow these barriers to function also as wind breaks.
   e. See also "Physical Stabilization" in this section.

4. Vegetative Stabilization uses established cover to temporarily or permanently stabilize soil against wind erosion and emission of fugitive dust.

Comment/Recommendations on vegetative stabilization

a. Either temporary or permanent cover can be established using standard agricultural methods, hydroseeding, or hand seeding.
b. Maintenance of original vegetative cover is an option
c. Permanent restoration that approximates native cover can be achieved using locally recommended varieties and seeding rates as appropriate for the site.
d. Temporary cover is for areas that will be disturbed again after a short period and is best established by using rapidly emerging varieties with rapid initial growth. Various varieties of wheat, barley, and triticale are preferred.
e. Opportunistic vegetation such as weeds can also be an option but may require at some watering to establish.

5. Limit Cleared Area to limit fugitive dust generation by exposing only areas where immediate activity will take place, leaving the remaining area(s) in original condition, if stable.

Comment/Recommendation on limiting cleared area

a. Sequence operations
b. Maintain original vegetative ground cover as long as practical.
c. For balanced cut and fill operations seek other methods.

6. Site Traffic Control to decrease disturbance of soil and fugitive dust generated from unnecessary vehicle traffic.

Comment/Recommendation on site traffic control

a. Post signs, erect fencing, and/or place barriers to direct traffic.
b. Designate specific haul and/or access roads.
c. Designate off-site or limited access special on-site parking for workers.
d. Limit public vehicle access.
e. Limit necessary vehicle speeds to less than 10 mph.

7. Earth Moving Management to limit fugitive dust emissions from earth moving activities.

Comments/Recommendations on earth moving management

a. Reduce off-site hauling via balanced cut and fill
b. Pre water, to extent practical, disturbed areas and material to be moved.

8. Physical Stabilization to provide physical mulches or covers for soil surface to prevent fugitive dust emission during windy conditions.

Comments/Recommendations on physical stabilization

a. Includes hydromulch (without seed), tarps, mulch blankets.
b. Also includes surface application and/or mechanical incorporation of vegetative material.

9. Compaction of Cover Material with heavy equipment to stabilize the surface and decrease soil particle detachment by wind or mechanical disturbance.

Comments/Recommendations on compaction of cover material

a. Requires proper particle size distribution and moisture content to achieve optimum soil density.

b. Best suited for areas requiring compaction to meet construction engineering specifications.

B. PAVED ROAD TRACKOUT

Control Measures /Objectives

1. Wheel Washing (preventative) to remove track-out material before exiting a site to prevent paved road deposition of a potential source of fugitive dust.
   Comments/Recommendation on wheel washing
   a. Manual or automated sprayers are an option.
   b. Drive-through wheel washing basins are an option.

2. Limit Site Access (preventative) to reduce track-out from a decreased number of exits from the site.
   Comments/Recommendation on limit site access
   a. Designate separate ingress and egress points on the site.
   b. Limit traffic flow to and from property to those vehicles that are necessary.

3. Site Access Approach Improvements (preventative) to remove track-out material before exiting a site to prevent paved road deposition of a potential source of fugitive dust.
   Comments/Recommendations on site access approach improvements.
   Pave or permanently gravel at least 50 feet from connection with paved area or in accordance with Department of Transportation and County guidelines and regulations.

4. Compactions of Cover Material (preventative) with heavy equipment to stabilize surfaces and decrease soil attachment and pick-up on wheels.
   Comments/Recommendations on cover material
   a. Requires proper particle size distribution and moisture content to achieve optimum soil density.
   b. Will require periodic surface watering to protect surface from mechanical grinding of heavy traffic.

The following control measures are mitigative actions that can be used after track-out material has been deposited on paved road surfaces. These measures should only be used when preventatives have been exhausted.

5. Sweeping and Cleaning (mitigative) to remove material with potential to become fugitive dust that is deposited on paved roads as a result of track-out.
   Comment/Recommendation on sweeping and cleaning.
   a. Use equipment, methods, and management that minimize generation of fugitive dust from sweeping and/or cleaning operation itself.
   b. Water flushing must reduce or eliminate potential of sediment from becoming a fugitive dust source upon drying.

6. Off Site Traffic Control (mitigative) to minimize fugitive dust emissions from traffic over material deposited on paved roads as a result of track-out.

Comments/Recommendation on off-site traffic control

a. Post reduced speed limits.
b. Designate detours.

C. PAVED ROAD TRACTION CONTROL

Control Measure/Objective

1. Material Specifications are utilized to minimize break down of the traction material under heavy traffic, which is a source of fugitive dust.

2. Chemical Deicers are used to replace conventional mineral materials, which eliminates fugitive dust from mechanical breakdown.

   Comment/Recommendations on chemical deicers

   a. Apply according to manufacturer's recommendations
   b. Consider secondary effects on environment such as soil, vegetation, water, and generation of chemical particulates.

3. Timely Clean up of excess traction material from roadway and roadside as soon as it is no longer necessary for traction control to prevent generation of fugitive dust from traffic-caused mechanical breakdown.

   Comment/Recommendations on timely clean-up

   See control measures outlined in the section **"PAVED ROAD TRACKOUT"** under the mitigative measures of "sweeping and cleaning" and "Off-site traffic control".

4. Limit Application to Critical Areas such as Intersections, High Traffic Areas, and Curves to reduce amounts and area of exposure of traction material thereby reducing attendant fugitive dust generation.

   Comment/Recommendations on critical-area applications

   a. Prepare and follow a "critical" area plan
   b. Apply "timely clean-up" to critical areas

5. Traffic Control to limit the amount and speed of traffic on treated areas, until other control measures can be taken, to decrease the release of fugitive dust emissions.

   Comment/Recommendations on traffic control

   a. Provide detours or close affected lanes to through traffic
   b. Reduce speeds in affected areas

D. OTHER OFF-SITE PAVED ROAD DEPOSITION

Other than track-out and haul-vehicle spillage there are other causes for deposition of materials, principally soil, on the surface of paved roads. The causes are deposition from water erosion, wind erosion, and direct spillage across property lines from activities on a site. When dry, these deposited materials become direct sources of fugitive dust.

Water Erosion Sedimentation

Control Measure/Objective

1. Vegetative Stabilization (preventative) uses established cover to temporarily or permanently stabilize soil against water erosion that deposits sediment off-site which can then become a source of fugitive dust.
   Comment/Recommendations on vegetative stabilization
   See "Vegetative stabilization" under CONSTRUCTION/DEMOLITION SITES

2. Physical Barriers (preventative) slow water velocity and serve as catchments for sediment.
   Comment/Recommendations on physical barriers
   Curbing, hay bales, silt fences, sandbags, and other similar barriers can be used.

3. Water-use management (preventative) prevents water erosion and attendant sediment deposition.
   Comment/Recommendations on water use management
   a. Water at proper application rates to prevent water run-off via scheduling and proper rotation of fixed application devices.
   b. Route and otherwise operate water trucks to prevent water run-off from excess applications.

4. Run-off and drainage structures (preventative) designed to catch and contain sediment to prevent off-site deposition.
   Comment/Recommendations on run-off and drainage structures
   a. Temporarily route water runoff to collection structures or catchment basins.
   b. Permanent design structures for storm water or other runoff.

If run-off deposition has already occurred then the control measures required are mitigative rather than preventative. Large amounts of spillage would require removal by appropriate equipment. For smaller spillage amounts control measures are outlined in the section **"PAVED ROAD TRACKOUT"** under the mitigative measures of "sweeping and cleaning" and "Off-site traffic control".

Wind Erosion Deposition

Deposition may occur from wind erosion and fugitive dust emissions from uncontrolled areas or as a result of failed preventative control measures. This deposition becomes a source of fugitive dust by action of paved road traffic. Preventative control measures are embodied in the other sections that describe measures for various fugitive dust sources. Once off-site deposition has occurred then the control measures required are mitigative rather than preventative. Large amounts of spillage would require removal by appropriate equipment. For smaller spillage amounts control measures are outlined in the section **"PAVED ROAD TRACKOUT"** under the mitigative measures of "sweeping and cleaning" and "Off-site traffic control".

Direct Off-site Spillage

This deposition occurs when activities such as earth moving, trenching, or placement of storage piles directly spills material across property lines onto paved surfaces. Another cause is when soil

material is deliberately placed over a curb to serve as an access ramp. These depositions become sources of fugitive dust by action of paved road traffic. The single control measure is to eliminate the off-site spillage. Once off-site deposition has occurred then the control measures required are mitigative rather than preventative. Large amounts of spillage would require removal by appropriate equipment. For smaller spillage amounts control measures are outlined in the section **"PAVED ROAD TRACKOUT"** under the mitigative measures of "sweeping and cleaning" and "Off-site traffic control".

E. UNPAVED ROADS

Control Measure/Objective

1. Watering to suppress fugitive dust emissions from unpaved roads due to wind and/or traffic.

   Comment/Recommendations on watering

   a. Apply with sprinklers, water truck, and/or any other suitable means.
   b. Most suitable for short distances or on a temporary basis

2. Chemical Stabilizer/Suppressant to bind and/or suppress fugitive dust emissions from unpaved roads due to wind conditions and/or traffic.

   Comment/Recommendations on chemical stabilizers/suppressants

   a. Includes materials such as oil, sugarbeet process by-product, lignosulfate or any similar product.
   b. Apply according to manufacturer's recommendations.

3. Pave or Gravel to stabilize surface to reduce potential for fugitive dust emissions.

   Comment/Recommendations on paving or gravel

   a. Paving is permanent solution that can be limited to trouble spots.
   b. Apply gravel according to DOT guidelines or county regulations
   c. Gravel will require some maintenance and gravel dust suppression
   d. Reduce speeds on gravel road for less wear and fugitive dust generation

4. Traffic Control to control release of fugitive dust emissions from unpaved roads by reducing the speed and flow of traffic.

   Comment/Recommendations on traffic control

   a. Limit speed to maximum of 20 mph
   b. Re-routing and/or temporary detours
   c. Allow local traffic only

5. Adjacent Land Controls to prevent deposition from water erosion, wind erosion, and direct carryout. When dry, these deposited materials become additional sources of fugitive dust from an unpaved road.

   Comment/Recommendations on adjacent land controls

   See **"OTHER OFF-SITE PAVED ROAD DEPOSITION"** control measures

F. OPEN STORAGE PILES-GENERAL MATERIAL STORAGE

Control Measure/Objective

1. Watering to keep piles of material wet and stable during pile use, storage activity, and windy conditions.

   Comment/Recommendations on watering

   a. Apply, if compatible with stored material, using any suitable means including sprinklers, hoses, and/or water truck
   b. Do in accordance with site conditions.
   c. Decreased need when natural crust present

2. Chemical Stabilizers (Temporary) that are commercially available and approved chemical binding agents to artificially crust the material and prevent particle movement during windy conditions for a temporary period. Chemical Stabilizers (Extended action) are similar to temporary but different application rates and/or materials may be used that extend the durability and longevity of the artificial crust.

   Comment/Recommendations on chemical stabilizers

   a. Stabilizing material must be compatible with stored material.
   b. Apply chemical according to manufacturer's recommendations.
   c. Preferable for use when disturbances are infrequent.

3. Physical Barrier to surround, cover, or strategically place a physical barrier to prevent emission of fugitive dust from material piles.

   Comment/Recommendations on physical barriers

   a. A variety of methods include tarps, hay/straw bales, wind fencing, specialty barriers.
   b. Enclose pile within a structure.
   c. Utilize natural topographical or tree wind breaks on upwind side (see subsection "Pile Configuration" in this section).

4. Vegetative Stabilization uses established cover to temporarily or permanently stabilize material against wind erosion and emission of fugitive dust from piles.

   Comment/Recommendations on vegetative stabilization

   a. Useful only for compatible materials and piles that will support vegetative growth.
   b. Best for long term storage and dust control.
   c. See "Construction/Demolition Sites, Vegetative Stabilization".

5. Mulching to cover pile with mulching product to prevent emission of fugitive dust from material piles.

   Comment/Recommendations on mulching

   a. Must be compatible with stored material.
   b. Mulching materials include vegetative residue or commercially manufactured mulch product.

6. Pile Configuration to shape, size, locate, and orient with respect to prevailing wind direction and adjacent structures to prevent emission of fugitive dust from material piles.

   Comment/Recommendations on pile configuration

   a. Methods include limiting pile size, locating piles in sheltered areas, minimizing

slope of upwind face, and/or orienting the long axis to prevailing wind direction.

b. In locating consider other control measure access such as water trucks and adjacent structures.

7. Minimize Disturbance to limit the number and magnitude of disturbances of the pile to reduce emission of fugitive dust from the material.

Comment/Recommendations on minimizing disturbance

a. Confine activity to downwind side of the pile.
b. Minimize upwind face of pile.
c. Use LIFO (last in - first out) system for pile usage.
d. Maintain other control measures on majority of pile.

8. Trench Management to coordinate timely and efficient trenching activity to minimize the potential for fugitive dust emissions from trenches and trench fill piles.

Comment/Recommendations on trench management

a. Pre-water soil, if practical, to depth of trench.
b. Be timely in back filling and stabilizing disturbed back-filled area over trenches.
c. Coordinate and plan trench activity to minimize disturbance of surrounding stabilized surfaces

G. HAULED MATERIAL

Control Measure/Objective

1. Cover Hauled Material to physically prevent hauled material from spilling or blowing from haul vehicle.

Comment/Recommendations on covering hauled material

a. Methods include tarps, plastic, or other suitable covers
b. Cover entire surface of material

2. Limit Load Size to keep material within the protective confines of the haul vehicle to prevent fine material from becoming fugitive.

Comment/Recommendations on limiting load size

a. Keep material sufficiently below freeboard of sidewalls
b. Avoid "peaks" of material above top of vehicle box that intersect air stream

3. Bedliners - to prevent settling and spillage from bottom dumping vehicles onto paved roads.

Comment/Recommendations on bedliners

Use when feasible.

4. Driving Practices to minimize fugitive dust emissions during actual transport of material.

Comment/Recommendations on traffic control

a. If possible, use lesser-traveled and consistent routes
b. Reduce speed especially on extremely rough areas that may cause spillage and load shifting

5. Watering to stabilize hauled material during loading operations to limit fugitive dust emissions.

Comment/Recommendations on watering

a. Water must be compatible with hauled material
b. Water before loading activity to allow distribution of moisture within material.
c. Suppress fugitive dust during loading

6. Clean or Cover haul trucks to remove any residual material that may become a source of fugitive dust when running empty.

H. OPEN AREAS-UNSEALED OR UNPAVED PARKING

Control Measure/Objectives and Comment/Recommendations

For control measures and recommendations see "UNPAVED ROADS"

I. OPEN AREAS-TRUCK STOPS AND PARKING AREAS

Control Measure/Objectives and Comment/Recommendations

For control measures and recommendations see "PAVED ROADS TRACK-OUT", "OTHER OFF-SITE PAVED ROAD DEPOSITIONS", "PAVED ROAD TRACTION CONTROL" and "UNPAVED ROADS"

J. OPEN AREAS-VACANT LOTS

Control Measure/Objective

1. Vegetative Stabilization uses established cover to temporarily or permanently stabilize soil against wind erosion and emission of fugitive dust.
   Comment/Recommendations on vegetative stabilization
   See " Vegetative Stabilization" under "CONSTRUCTION/DEMOLITION SITES"

2. Fire Prevention Measures are taken to protect vegetative cover from fire.
   Comment/Recommendations on fire prevention
   a. Follow recommendations of local fire protection agencies
   b. Generally establish fire breaks, cut vegetation when overgrown, keep other debris off of lot, and limit access to public.

3. Watering stabilizes soil by using water as a binder either by maintaining soil moisture or establishing a crust that prevents soil movement under windy conditions.
   Comment/Recommendations on watering
   a. Not recommended for extended periods.
   b. See "Watering" under "CONSTRUCTION/DEMOLITION SITES"
   c. Decreased need when natural crust present

4. Restrict Access to prevent otherwise undisturbed areas from becoming disturbed by "dune buggies," dirt bikes, four-wheel drive vehicles and other off-road motorized vehicles.
   Comment/Recommendations on restricting access
   a. Install curb but no driveway ramp.
   b. Other methods include posting signs, physical barriers such as fences, tape and hay bales.

5. Gravel or pave. See "UNPAVED ROADS"

K. OPEN AREAS--OFF-ROAD TRAFFIC

Control Measure/Objective

1. Control Off-site Soil Depositions from track-out and other on-site processes to minimize off-site fugitive dust generation

   Comment/Recommendations on control of off-site soil deposition

   a. See "PAVED ROAD TRACK-OUT"
   b. See "OTHER OFF-SITE PAVED ROAD DEPOSITIONS"

2. Restrict Access to prevent otherwise undisturbed areas from becoming disturbed by "dune buggies," dirt bikes, four-wheel drive vehicles and other off-road motorized vehicles.

   Comment/Recommendations on restricting access

   See "OPEN AREAS-VACANT LOTS"

L. OPEN AREAS-BURNED AREAS

Control Measure/Objective

1. Watering stabilizes soil by using water as a binder either by maintaining soil moisture or establishing a crust that prevents soil movement under windy conditions.

   Comment/Recommendations on watering

   This method is highly dependent on water availability and the size of the burned area and is feasible only for relatively small burned areas. There is a decreased need when natural crust is present.

2. Vegetative Stabilization to reestablish ground cover, which will temporarily or permanently stabilize soil against wind erosion and emission of fugitive dust.

   Comment/Recommendations on vegetative stabilization

   a. See "Vegetative Stabilization" under "CONSTRUCTION/DEMOLITION SITES".
   b. Allow vegetation to naturally re-establish.
   c. When planting make allowances for fire protection measures (See "OPEN AREAS-VACANT LOTS".
   d. Time seeding for time of year with optimum soil temperature and precipitation to promote rapid emergence and stand establishment.
   e. Use temporary ground cover while natural vegetation is establishing (See "Physical Stabilization" under "CONSTRUCTION/DEMOLITION SITES").

3. Restrict Access to prevent further disturbance of burned areas by off-road vehicles and other human activity.

   Comment/Recommendations on restricting access

   See "OPEN AREAS--OFF-ROAD TRAFFIC"

M. AGRICULTURAL FIELDS-SURFACE RESIDUE MANAGEMENT

Control Measure/Objective

1. Reduce Tillage to maintain a maximum amount of residue or vegetative cover on agricultural fields to control wind erosion and potential for fugitive dust emissions.

   Comment/Recommendations on reduced tillage

   a. Methods include such systems as no-till and reduced-till.
   b. May work on any size field
   c. Need to consider cropping system/rotation, insect, disease and weed control, irrigation or water management.

2. Vegetative Stabilization with a cover crop that may or may not produce an economic product previous to, during, or after a main cash crop which controls wind erosion and limits potential for fugitive dust emissions.

   Comment/Recommendations on cover cropping

   a. Sequential cover cropping within normal crop rotation.
   b. Simultaneous interplanting of main/cash crop with cover crop in same season
   c. Weeds could act as cover crop with proper weed control
   d. Disease, weeds, and insects in cover crop could damage main cash crop

3. Crop Rotation adopted to maximize residue on agricultural fields to control wind erosion and to limit potential for fugitive dust emissions.

   Comment/Recommendations on crop rotation adaptations

   a. Minimize or eliminate low residue crops from rotation
   b. Change rotation to allow use of residue-producing cover crop

4. Limiting or Eliminating Agricultural Burning in urban growth areas to eliminate or reduce the amount of particulate matter from ash that may become fugitive dust and to maintain greater crop residue levels on agricultural fields to control wind erosion.

   Comment/Recommendations on limiting agricultural burning

   a. Maintains soil vegetative cover and longer term organic matter content
   b. Use alternative methods of crop residue removal and/or pest control.

5. Mulching to apply additional vegetative residue, manufactured mulching product, or organic residues to agricultural fields to control wind erosion to limit the potential for fugitive dust emissions.

   Comment/Recommendations on mulching

   a. Mulching is most feasible in smaller areas.
   b. Could require special equipment and additional costs.
   c. Transportation costs and value of crop should be considered.

N. AGRICULTURAL FIELDS-SURFACE CONFIGURATION/PHYSICAL BARRIERS

Control Measure/Objective

1. Strip-Cropping to establish alternate strips of different crops with different vulnerability periods to limit the distance across an area which decreases the susceptibility to wind erosion and the potential for fugitive dust emissions.

Comment/Recommendations on strip cropping

a. Consists of alternate strips of different crops across slopes and generally across prevailing wind direction.
b. Width of strip is related to wind erosion susceptibility.
c. Could be limited by different irrigation and other management requirements for different crops

2. Surface Roughness to dissipate wind energy at the soil surface thereby decreasing the entrainment and movement of the soil and limiting the potential for fugitive dust emissions.

Comment/Recommendations on surface roughness

a. Most suited to soils with higher aggregate stability
b. Limiting tillage may maintain greater roughness
c. Surface residue or vegetative cover also serve this purpose

3. Windbreaks to establish upwind vegetative or other barriers perpendicular to prevailing wind speeds to limit the potential for fugitive dust emissions.

Comment/Recommendations on wind breaks

a. Principle is to shelter downwind areas from high wind energy with the effective downwind distance of approximately ten times the height of barriers
b. May create special management problems in such areas as pest control, irrigation, tillage, and others.
c. Possible types of windbreaks include trees or artificial barriers.

4. Plant Crops Perpendicular to Prevailing Wind Direction to increase the effective soil roughness and other effects similar to interplanted cover crops in order to control wind erosion and to limit the potential for fugitive dust emissions.

Comment/Recommendations on planting across wind direction

Effects similar in principle to strip cropping and surface roughness control measures.

5. Cover Crop - See "Vegetative Stabilization" under "AGRICULTURAL FIELDS-SURFACE RESIDUE MANAGEMENT"

O. AGRICULTURAL FIELDS-OTHER

Control Measure/Objective

1. Chemical Stabilizers (Temporary) that are commercially available and approved chemical soil binding agents to artificially crust soil and prevent soil movement during windy conditions for a temporary period. Chemical Stabilizers (Extended action) are similar to temporary but different application rates and/or materials may be used that extend the durability and longevity of the artificial soil crust.

Comments/Recommendations on chemical stabilization

a. Best suited to areas not subject to subsequent disturbance.
b. Apply according to manufacturers/vendor recommendations
c. Manage to protect stabilized area.
d. May include materials such as oil, sugarbeet process by-product, lignosulfate or any similar product.

2. Physical Stabilization to provide physical mulch or cover for soil surface to prevent fugitive dust emission during windy conditions.

   Comments/Recommendations on physical stabilization

   a. Includes surface application and/or mechanical incorporation of vegetative material.
   b. May also include hydromulch (without seed), tarps, mulch blankets, which are suitable only for acute problems on small areas.

3. Watering to apply water to help maintain soil surface residue and moisture and serve as a soil binder for wind erosion control and limit the potential for fugitive dust emissions.

   Comment/Recommendations on watering

   a. This is a special case for vulnerable periods in which bare disturbed soil surfaces are exposed following operations such as seeding or harvesting
   b. Irrigation is required because of need for repeated application and even then larger areas are difficult to adequately cover in a timely fashion
   c. Unless extremely well managed, watering can be largely ineffective especially under high wind situations.

4. Operations Timing to schedule agricultural operations so that vulnerable periods are limited in order to control wind erosion and to limit the potential for fugitive dust emissions.

   Comment/Recommendations on operations timing

   a. Sequence operations to limit open soil
   b. Size of field will dictate necessary lead times
   c. Highly dependent on crop and crop rotation in which other management considerations may override.