

DUST MANAGEMENT BEST PRACTICES CENTRAL OKANAGAN



Regional Air Quality Program

2022



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Impacts of Fugitive Dust

What is Fugitive Dust?

"Dust" is Particulate Matter (PM), solid particles which come primarily from the soil. "Fugitive" dust is PM suspended in the air by wind action and human activities. It has not come out of a vent or a stack, and is usually not a by-product of burning. Fugitive dust particles are composed mainly of soil minerals (e.g. oxides of silicon, aluminum, calcium, and iron), but can also contain sea salt, pollen, spores, tire particles, etc. (California Environmental Protection Agency, U.S, 2007).

Dust and your health

About half of fugitive dust particles (by weight) are big particles, larger than 10 microns in diameter (the average human hair is 70 microns in diameter). These larger particles settle out more quickly on the ground and in your upper airways. However, the other half are particles 10 microns or smaller, or PM₁₀. Due to their very small size and weight, **PM_{2.5} particles can remain airborne for weeks** and can travel further distances, as shown in

Table 1. When inhaled, PM_{2.5-10} particles can travel easily to the deep parts of the lungs and may remain there, causing respiratory illness, lung damage, and even premature death in sensitive individuals. Dispersion is affected by the size of the particles emitted, wind speed, their shape and density. (Office of the Deputy Prime Minister, UK, 2005)

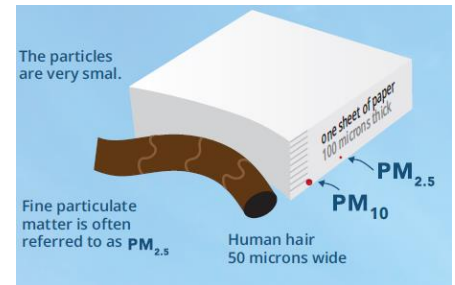


Figure 1. Particulate size comparison

Table 1. Dust concerns and typical travel distances by physical particle size

Dust Categories	Size μm	Concerns	Distance Traveled
Large Dust	30 – 75 μm	Nuisance	100 m
Large Dust	10 – 30 μm	Nuisance	200 – 500 m
PM10 (2.5 to 10 μm)	2.5 – 10 μm	Health (inhalable coarse particles)	1000 m

Dust in the Okanagan

Environment Canada commissioned a forecast emissions inventory for the Okanagan for the year 2030 (RWDI, 2011). Coarse particulate matter (PM₁₀) is expected to increase by 18% all largely due to a projected increase in industrial specified sources. Particulate matter due to road dust and forest fires are not included in the graphs due to highly localized and unpredictable nature of these impacts. Road dust is predicted to decrease by over 6,000 tonnes per year, while open sources (primarily forest fires) are expected to increase by over 40,000 tonnes per year (Pinna Sustainability, 2014). As 80% of health effects come from **long term** exposure, the Central Okanagan Clean Air Strategy 2015 identified the necessity to develop, implement and share best management practices for road dust and commercial operations.

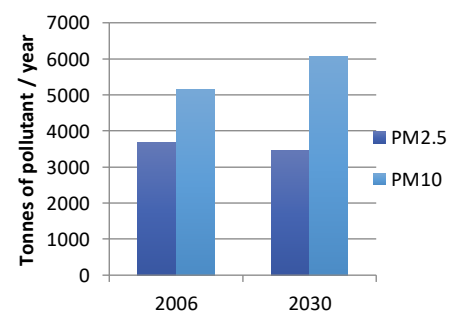


Figure 2. Forecast of particulate matter emissions for the Central Okanagan in 2030

This Guide is intended to assist any person, local governments or corporations which would like to improve its dust management. This is a compilation of several best practices from various companies and local governments in Canada and other countries to support current or help initiate efforts to **prevent or control fugitive dust**. With the collaboration of all stakeholders we can **help clear the air of fugitive dust. Doing your part, can make the difference!**

Sources of Fugitive Dust¹

All activities have the potential to generate fugitive dust, although frequent and high levels of dust particles often originate from activities in the following industrial sectors: agricultural, mining, construction, manufacturing, transportation and utilities, wholesale/retail trade, and service (Michigan Department of Environmental Quality, 2016):

Table 2. Fugitive dust generating activities

Industrial sector	Source	Activity
Agricultural	Grain Storage and Distribution	Loading and unloading grain in storage bins and silos, site maintenance, and track out
Mining	Mining and Quarries	Blasting, conveying and storage; site maintenance, and track out from truck and loading traffic
Construction	Industrial & Commercial Building	Equipment and truck use, soil disturbances, site and equipment maintenance, and track out
	Roadway Building, Paving	Equipment and truck use, soil disturbances, site and equipment maintenance, and track out
Manufacturing	Hot Mix Asphalt Processing and Application	Material crushing, screening operations, aggregate storage, baghouse collectors, recycling, and track out from truck and loading traffic
	Concrete Batch Processing and Application	Material crushing, front-end/hopper/bin loading, transfer conveying, aggregate storage piles, recycling, and track out from truck and loading traffic
	Foundries	Storage and transfer of coke used for process, fly ash
	Food & Agricultural Processing	Storage, transfer, conveying and track out
	Paper & Wood Products	Storage and track out
	Crushing Operations (Rock, Glass, Concrete, Demolition Material, etc.)	Loading, off-loading, crushing, conveying and storage, site maintenance, and track out
Transportation and Utilities	Road/Bridge Maintenance and Repair	Patching, clipping, sealing, shoulder repair, sweeping, concrete sawing and surface preparation for painting, rock salt storage, and site maintenance
	Rail Freight Yards	Loading and off-loading of rail cars, lot maintenance, and track out
	Truck Freight Haulers/Off-Loading Yards	Loading and off-loading, lot maintenance, and track out
	Utilities	Storage and transfer of materials used for process
	Unpaved parking lots	Vehicle traffic, lot maintenance, and track out
Wholesale/Retail Trade	Mineral Storage and Distribution	Transfers on-site and bulk storage, site maintenance, and track out
	General Material Storage (Glass, Concrete, Gravel, Sinter, Cement, Stone, Clay, Gypsum, Wood Chips)	Transfers on-site and bulk storage, site maintenance, and track out
Services	Landfill Yards	Transfers on-site; vehicle traffic; site maintenance; and track out
	Masonry & Equipment Abrasive Blasting	Hydro or compressed air blasting, site maintenance, and track out
	Building Demolition	Loading, off-loading, crushing, conveying, storage, transportation, and site maintenance
	Salvage Yards	Loading, off-loading, crushing, conveying, storage, transportation, and site maintenance

Dusty emissions escaping the work area may cause nuisance or health concerns through, for example, surface soiling, loss of visibility due to deposition and effects on flora and fauna. Since it is difficult to suppress dust once it is airborne **it is preferable, where possible, to prevent dust from being generated in the first place.**

¹ [Fugitive Dust Control Self-Inspection Handbook](#)

In addition, vehicular movements associated with daily operations or construction projects can also increase particulate emissions and other pollutants such as carbon dioxide and nitrogen oxide, which can reduce the air quality in the surrounding area. The potential receptors include: local residents, site workers, office workers, street going public (including tourists).



Figure 3. Examples of vehicle track out

Legal requirements

Ministry of Transportation has set some legal requirements for gravel pit and quarry operations (Ministry of Energy, Mines and Petroleum Resources, BC, 2010). The government of British Columbia developed Best Management Practices to Mitigate Road Dust from Winter Traction Materials (Ministry of Water, Land and Air Protection, 2005), a Code of Practice exists for the Concrete and concrete products industry², Developing a Fugitive Dust Management Plan for Industrial Projects (2018)^{3,4} and also produced an Aggregate Operators Best Management Practices Handbook since 2002. Provincial environmental objectives include air quality criteria for the 10-micrometer particulate fraction (PM₁₀) generated by aggregate dust – a 24-hour average PM₁₀ less than 50 µg/m³ (BC Ambient Air Quality Objectives).

There are 59 gravel pits and quarries on the Ministry of Energy and Mines (MEM) list for the Regional District of the Central Okanagan (Regional District of Central Okanagan, 2013), twelve concrete and ready-mix companies and at least four abrasive blasting firms. Sand and gravel operations and rock quarries must be permitted by MEM under the requirements outlined in the *Mines Act*. A mine permit is required for both sand and gravel operations and rock quarries whether on private or Crown Land. There are many considerations with respect to aggregate operations; regarding environment, groundwater, greenhouse gas generation, land use, noise, dust, visual impacts and road and traffic.



Dust management is also an area of responsibility of local governments and developing best practices for road dust and some commercial operations will greatly help to reduce PM₁₀ emissions. Local governments in the Central Okanagan have bylaws to regulate the removal or deposit of soil. City of Kelowna⁵, City of West Kelowna⁶ and Peachland⁷ **require Dust control measures** to get a permit to operate, Lake Country requires methods **to control the erosion**.

A proposal to include dust prevention and control clauses in the Regional District Bylaw 773 is under discussion; it could require the application of water or use appropriate dust suppressing liquids while performing activities or operations susceptible to produce fugitive dust and during an **air quality advisory**, among others.

A summary of dust emissions and control measures by industry are included in Table 3.

² [Code of Practice for The Concrete and Concrete Products Industry](#)

³ [Developing a Fugitive Dust Management Plan for Industrial Projects](#)

⁴ [gui-tec-031_fugitive_dust_mgmt_plan_guidance.pdf\(gov.bc.ca\)](#)

⁵ [Soil Removal and Deposit Regulation Bylaw No. 9612.pdf\(kelowna.ca\)](#)

⁶ [0127-Soil-Removal-and-Deposit.pdf\(westkelownacity.ca\)](#)

⁷ [7363 Peachland\(civicweb.net\)](#)

Table 3. Dust emission and control by industry

Industry	Emissions and Control
Concrete Batching⁸	Particulate matter, consisting primarily of cement and pozzolan dust but including some aggregate and sand dust emissions, is the primary pollutant of concern. In addition, there are emissions of metals that are associated with this particulate matter. All but one of the emission points are fugitive in nature. The only point sources are the transfer of cement and pozzolan material to silos, and these are usually vented to a fabric filter or “sock”. Fugitive sources include the transfer of sand and aggregate, truck loading, mixer loading, vehicle traffic, and wind erosion from sand and aggregate storage piles. The amount of fugitive emissions generated during the transfer of sand and aggregate depends primarily on the surface moisture content of these materials. The extent of fugitive emission control varies widely from plant to plant.
Sand and Gravel Processing⁹	With the exception of drying, emissions from sand and gravel operations primarily are in the form of fugitive dust, and control techniques applicable to fugitive dust sources are appropriate. Some successful control techniques used for haul roads are application of dust suppressants, paving, route modifications, and soil stabilization; for conveyors, covering and wet suppression; for storage piles, wet suppression, windbreaks, enclosure, and soil stabilizers; and for conveyor and batch transfer points, wet suppression and various methods to reduce freefall distances (e.g., telescopic chutes, stone ladders, and hinged boom stacker conveyors); and for screening and other size classification processes, covering and wet suppression. Wet suppression techniques include application of water, chemicals, and/or foam, usually at crusher or conveyor feed and/or discharge points. Such spray systems at transfer points and on material handling operations have been estimated to reduce emissions 70 to 95 percent. Spray systems can also reduce loading and wind erosion emissions from storage piles of various materials 80 to 90 percent.
Abrasive Blasting¹⁰	A number of different methods have been used to control the emissions from abrasive blasting. These methods include: blast enclosures; vacuum blasters; drapes; water curtains; wet blasting; and reclaim systems. Wet blasting controls include not only traditional wet blasting processes but also high-pressure water blasting, high pressure water and abrasive blasting, and air and water abrasive blasting. For wet blasting, control efficiencies between 50 and 93 percent have been reported. Fabric filters are used to control emissions from enclosed abrasive blasting operations.
Hot Mix Asphalt Plants (HMA)¹¹	Emissions from HMA plants may be divided into ducted production emissions, pre-production fugitive dust emissions, and other production-related fugitive emissions. Pre-production fugitive dust sources associated with HMA plants include vehicular traffic generating fugitive dust on paved and unpaved roads, aggregate material handling, and other aggregate processing operations.
Agricultural Operations¹²	<p>Dust can result from many farm practices and could be a source of complaint concerning farm activities. Sources can include, tillage, planting, and harvest; crop production (including hay); and, non-cropland areas. To reduce dust: Avoid climatic conditions, when carrying out farm operations, which are conducive to the generation of dust.</p> <ul style="list-style-type: none"> • Avoid cultivation in situations where the soil will become excessively dry. • Choose irrigation equipment which increases droplet size. • Choose manure application methods which place manure on the soil surface rather than in the air. • Choose cropping, crop residue and cover crop management practices which hold soil in place. • Design fans, fan shrouds, chimneys and other ventilation structures to deliver emissions either to the ground or to the air in such a fashion as not to create drift of emission off the property. • Choose spray equipment which places product on the target rather than into the air where it is subject to drift. • Avoid burning or burn only under ideal ventilation condition or under ventilation conditions defined in regional by-laws. • Develop wind screens, breaks or strategies to reduce dust movement off the property. • Build new barns with fans facing inward away from neighbours • Site new buildings sufficient distance from neighbors to avoid property
Heavy Construction operation¹³	Because of the relatively short-term nature of construction activities, some control measures are more cost effective than others. Wet suppression and wind speed reduction are two common methods used to control open dust sources at construction sites, because a source of water and material for wind barriers tend to be readily available on a construction site.

⁸ [Concrete Batching-\(EPA\)](#)

⁹ [Sand and Gravel Processing-\(EPA, 1995\)](#)

¹⁰ [Abrasive Blasting-\(EPA\)](#)

¹¹ [Hot Mix Asphalt Plants-\(EPA\)](#)

¹² [Dust-Farm Nuisance-\(Ministry of Agriculture, BC, 2014\)](#)

¹³ [Heavy Construction Operations-EPA-\(EPA\)](#)

When to apply Dust Control Measures?

Dust control measures are only effective when implemented **with regularity**. It is important that facilities design realistic dust control programs incorporating both methods and best practices that are feasible for their work site activities. Meteorological conditions may have an impact on the amount of dust released and the implementation of additional measures could be needed to prevent fugitive dust. Predicting dust and aerosol emission and transport would be helpful to reduce harmful impacts but, despite numerous studies, prediction of dust events and contaminant transport in dust remains challenging. Wind speeds, temperature, and relative humidity can affect dust concentrations. For example, dust emissions may be generated by wind erosion of open aggregate storage piles and exposed areas within an industrial facility; field testing has shown that wind erosion events happen at wind speed threshold of 10m/s (U.S. EPA, 1992). In a recent study (Csavina, et al.), it was found that wind speeds of 7m/s with relative humidity of 35% could create PM₁₀ concentrations of 50µg/m³.

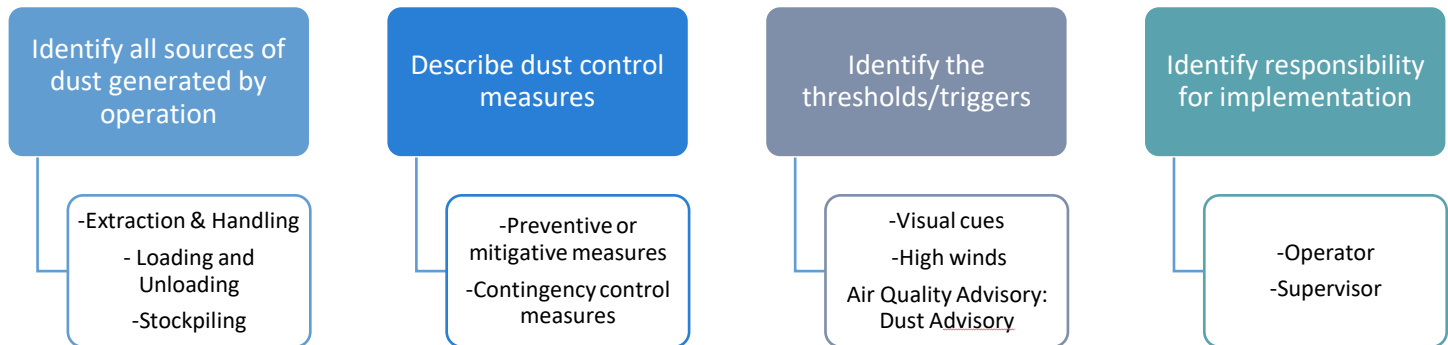
As a guideline, when [winds](#) are 10m/s or higher, it is expected owners and operators implement and follow the recommended measures to prevent or control that dust escape their properties. Residents or operators can get the latest forecast information directly from Canada's official weather source by downloading the [WeatherCan app](#).

Air Quality Dust Advisory

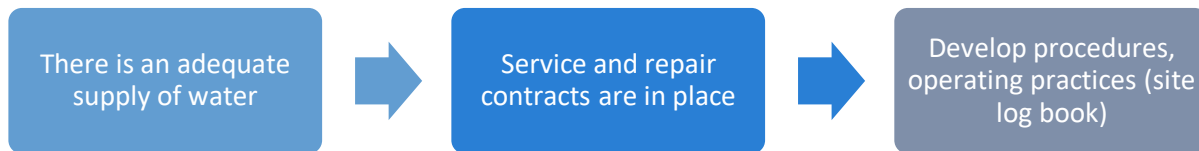
[Air quality advisories](#) (smoky skies bulletin, dust advisory, etc.) in BC are issued by Ministry of the Environment & Climate Change Strategy (ENV) when levels exceed and are expected to continue exceeding the BC ambient air quality objective of 25µg/m³ or 50µg/m³ (based on a 24-hour rolling average) for PM_{2.5} and PM₁₀ respectively. An example of a Dust Advisory, issued by Ministry of Environment is included in Appendix 1.

Dust Management Plan

It is the responsibility of owners and operators to **ensure dust emissions are managed effectively at all times**. Implement the dust control measures and best practices described in Table 4 to create your own Dust Management Plan (Yukon Environment, 2014):



In general, preventive measures are usually more cost effective than mitigative controls. The cost-effectiveness of mitigative controls falls off dramatically as the size of an area to be treated increases. Site managers need to ensure that dust suppression measures are applied promptly and effectively as required. For example, by ensuring:



The following Dust Control measures and best practices were compiled, by source, for six industries as shown in Table 4: **Sand gravel, Concrete and Asphalt, Agricultural, Abrasive Blasting and Heavy Construction operations**, and can be applicable to **any other commercial operations** handling, loading, storage or stockpiling materials that are susceptible to release dust. Best management practices to mitigate **Road Dust** are also included. For more information on control measures by Industry, please review the source documents (footnotes).

Templates to produce your own Dust Management Plan and Checklist are available in Appendix 2. A list of BC approved Dust suppressant products and a selection chart can be found in Appendix 3.

DUST CONTROL MEASURES

Table 4. Preventive and mitigative dust control measures by source

Source Description	Preventive and Mitigative Dust Control Measures	Thresholds / Triggers for Management	Contingency Dust Control Measures
General Sources			
Haul Trucks and Vehicle Traffic,	<ol style="list-style-type: none"> Implement a speed limit of at least 32 km/h for surfaced roads and 8 km/h for unmaked surfaces to slow vehicles and therefore reduce fugitive dust emissions: <ul style="list-style-type: none"> Speed control: 50 km/h- efficiency 25% Speed control: 32 km/h- efficiency 65% Speed control: 16 km/h- efficiency 80% Where access roads adjoin public highways, there is the potential for material to be tracked onto the paved public highway. If material is tracked onto public highways, and is creating dust, the road will be cleaned (ie. tracked material will be removed from the paved road surface using a wet vacuum sweep). Signage and barriers to reduce movement on off pavement travel. Do not overload Sheet or tarp loads Wheel or body wash at an appropriate distance from site entrance Load and unload in areas protected by wind Use water sprays Shake dirt off of trucks with rumble bars Provide a surfaced road between vehicle washing facilities and site exit Add water or calcium chloride to unpaved road surfaces <ul style="list-style-type: none"> Chemical surface treatment - efficiency 80% 	<ol style="list-style-type: none"> If haul or vehicle traffic emissions are occurring that may impact air quality beyond the property boundary: <ul style="list-style-type: none"> If visible dust is being generated from haul trucks or vehicle traffic; and/or If the weather forecast indicates dry conditions and strong winds are likely. Visual cues would be the primary trigger for mitigative action to be taken with respect to fugitive dust emissions. If an Air Quality Advisory is issued, recommended mitigative or contingency dust management actions should be taken. Complaints by nearby residents Visual monitoring during site activities will be conducted by Authorized person to determine if contingency control measures should be implemented 	<ol style="list-style-type: none"> Apply water to roadways that are being used and producing dust. Apply gravel to roadways approaching access points. Cover haul trucks on windy days if dust control measures are not sufficiently preventing dust movement. Cease activities during high wind events or when dust emissions cannot be adequately controlled.
Vehicle Fleet Operation	<ol style="list-style-type: none"> Avoid engine idling. If you are going to stop for more than 60 seconds- turn the engine off. The best way to warm the vehicle is to drive it. Consult user Manual to reach operational conditions (usually no longer than 3 minutes) Ensure construction fleet vehicles are maintained according to manufacturers' guidelines. Wheel washer-Its purpose is to: Reduce the amount of dirt and rock carried by aggregate vehicles onto public roads, this lessening the need for street sweeping and preventing windshield damage. 	Periodic maintenance of construction vehicles. In addition, excessive or consistently black exhaust is a signal that an engine is not operating optimally.	<ol style="list-style-type: none"> Replace worn or malfunctioning equipment. Consider different scheduling and routing options

Unpaved Roads ¹⁴	1. Implement a speed limit of at least 32 km/h for surfaced roads and 8 km/h for unmade surfaces to slow vehicles and therefore reduce fugitive dust emissions.	1. Visual cues will be the primary trigger for mitigative action to be taken with respect to fugitive dust emissions.	Apply water to roadways that are being used and producing dust.
Paved Roads ¹⁵	2. Apply water, spray-on adhesives, or synthetic/organic treatments to potential dust area. ¹⁶	2. If the weather forecast indicates dry conditions and strong winds are likely.	
Scrap Yards	3. Establish a truck and wheel wash at the entrance/exit to the road. 4. Trackout Pad-Provide an area of crushed stone or gravel at the entrance/exit of the property to assist in removing debris from the tires as vehicles leave a construction site. Requirements for the constructing an effective track pad ¹⁷ : <ul style="list-style-type: none"> •15 feet /4.5m wide minimum •100 feet/ 30.5m long •4-8 inch/ 10-30cm quarry spalls •12 inches/30.5cm thick 5. Trackout Plate/Grizzly's- a device using rails, pipes, or grates to dislodge debris from the tires and undercarriage prior to leaving 6. Cover loads 7. Turn unpaved areas into paved areas where feasible. 8. Clean up trackage and spillage from unpaved roads onto paved roads immediately. 9. Vacuum sweeping, water flushing, and broom sweeping and flushing.	3. If an Air Quality Advisory is issued, recommended mitigative or contingency dust management actions should be taken.	
Debris/Land Clearing & Earth Moving	1. Minimize agitation or disturbance activities where possible. 2. Conduct activity on less windy days. 3. Reduce wind effects with windbreaks where practicable. 4. Apply water, spray-on adhesives, or synthetic/organic treatments to potential dust area. 5. Establish a truck and wheel wash at the entrance/exit to the area. 6. Provide an area of crushed stone or gravel at the entrance/exit of the property to assist in dislodging PM. 7. Clean up trackage and spillage on roads immediately. 8. Require tarpaulins for all haul vehicles. 9. Develop procedures & operating practices for timely review of housekeeping activities to exposed or active surfaces.		

¹⁴ [Unpaved Roads-](#) (EPA)

¹⁵ [Paved Roads-EPA](#) (EPA)

¹⁶ [Dust Control for unpaved Roads](#) (Federation of Canadian Municipalities and National Research Council, 2005)

¹⁷ [Construction Trackout Sediment Control](#) (Yakima County Public Services, WA, U.S)

Entrance/onsite /outside areas	Street cleaning -sweeping or cleaning the site entrance, the public roadway, and onsite paved roads on a regular or as needed basis. Its purpose is to: Reduce dust and storm water sediment loading and maintain a clean appearance at the site entrance and adjacent public roads.	Visual cues will be the primary trigger for mitigative action to be taken with respect to fugitive dust emissions	<ol style="list-style-type: none"> 1. Regular watering- 2. Apply water to roadways that are being used and producing dust. 3. Apply gravel to roadways approaching access points.
Perimeter	<ol style="list-style-type: none"> 1. Use treed berms near dust generators, receptors or at the perimeter of the site 2. Use sprinklers, sprayers or mist 		
Applicable to asphalt, quarrying, concrete, aggregate handling related activities¹⁸			
Site Layout	<ol style="list-style-type: none"> 1. Locate haul roads and stock piles down-wind from neighbours 2. Reduce stock pile height and use gentle slopes 3. Use conveyors instead of haul roads 4. Restrict dust generating activities to sheltered areas 5. Create 'sensitive zones' where dusty activities are limited 6. Remove vegetation progressively, only when the area is ready for extraction 7. Retain vegetation at the perimeter, especially down-wind of operations 8. Surface roads with dust free material 9. Use wind-breaks, netting screens, semi-permeable fences 10. Use treed berms near dust generators, receptors or at the perimeter of the site 11. Vegetation Cover 	Visual cues will be the primary trigger for mitigative action to be taken with respect to fugitive dust emissions	
Topsoil & Overburden Handling	<ol style="list-style-type: none"> 1. Remove vegetation progressively, only when the area is ready for extraction 2. Seal and seed surfaces as soon as practicable 3. Protect exposed material with tarps, within voids or by topographical features 4. Spray exposed surfaces regularly to maintain surface moisture 5. Minimize handling 6. Tarp 7. Restrict grubbing 8. Vegetative Cover 9. Seal surfaces 10. Wind Protection 11. Seed / Hydroseeding 		
Drilling &	<ol style="list-style-type: none"> 1. Use dust extraction equipment, filters & collectors, on drilling rigs 		

¹⁸ (Ministry of ENergy & Mines, BC, 2002)

Blasting	<ol style="list-style-type: none"> 2. Use mats when blasting 3. Drill using water 		
Extraction & Handling	<ol style="list-style-type: none"> 1. Reduce drop heights 2. Keep working faces as small as possible 3. Orient face to reduce impact of prevailing wind 4. Use sprays and mists at dust sources 5. Fit wind-boards / hoods at conveyors & transport points 6. Maintain equipment 		
Loading and Unloading from Front-end Loader and Haul Trucks	<ol style="list-style-type: none"> 1. Keep drop height of front-end loaders onto stockpiles and haul trucks to a minimum. 2. Empty loader bucket and haul trucks (end dump) at rate to limit dust emissions. 3. Haul trucks will not be loaded above the sides of the trucks. 4. Material removed from downwind side of stockpiles. 	<ol style="list-style-type: none"> 1. If crushing, screening or conveying emissions are occurring that may impact air quality beyond the property boundary: <ul style="list-style-type: none"> • If visible dust is being generated from crushing, screening or conveying activities; and/or • If the weather forecast indicates dry conditions and strong winds are likely. 1. Visual cues would be the primary trigger for mitigative action to be taken with respect to fugitive dust emissions. As guideline, consider <u>Wind threshold is 10m/s</u>. 2. If an Air Quality Advisory is issued, recommended mitigative or contingency dust management actions should be taken. 3. Complaints by nearby residents 4. Visual monitoring during site activities will be conducted by Authorized person to determine if contingency control measures should be implemented 	<ol style="list-style-type: none"> 1. Increase frequency of water spray usage. 2. Installation of engineered controls such as dust covers or collection mechanisms. 3. Cease activities during high wind events during high wind events or when dust emissions cannot be adequately controlled. 4. Enclose or cover the crusher, screen and conveyor.
Stockpiling	<ol style="list-style-type: none"> 1. Dampen material 2. Protect from wind or store under cover 3. Screen material to remove dusty particles prior to external storage 		Cease activities at the stockpiles during high wind events or when dust emissions cannot be adequately controlled.

Loading Stockpile ¹⁹	<ol style="list-style-type: none"> 1. Consider prevailing wind direction(s) and onsite wind patterns; Orient piles to be parallel with the predominant wind direction. 2. Placement of berms, stockpiles and tree buffers to create or enhance wind shadows- An elongated, raised barrier constructed of overburden, topsoil, or aggregate by product, commonly seeded with grasses and topped with larger vegetation. Its purpose is to: Intercept noise, dust, and the views of an operation, as well as act as a storage option for overburden material 3. Screen material to remove dusty particles prior to external storage 4. Keep stockpile height to a minimum 5. Reducing drop height-efficiency 25% 6. Telescopic chutes- efficiency 75% 7. Conveyor sprays- efficiency 75% 	<ol style="list-style-type: none"> 1. If crushing, screening or conveying emissions are occurring that may impact air quality beyond the property boundary: 2. If visible dust is being generated from crushing, screening or conveying activities; and/or 3. If the weather forecast indicates dry conditions and strong winds are likely. 4. Visual cues would be the primary trigger for mitigative action to be taken with respect to fugitive dust emissions. As guideline, consider Wind threshold is 10m/s. 5. If an Air Quality Advisory is issued, recommended mitigative or contingency dust management actions should be taken. 6. Complaints by nearby residents 7. Visual monitoring during site activities will be conducted by Authorized person to determine if contingency control measures should be implemented 	Cover the temporary stockpiles. Construct a wind barrier (berm)
Wind Erosion from Stockpile	<ol style="list-style-type: none"> 1. Regular watering- efficiency 80% 2. Surface crusting agent-up to 99% 3. Vegetative wind break-efficiency 30% 4. Lower pile height- efficiency 30% 5. Wind protection- Any structure or method to block or reduce wind flow. This reduces the exposure of dust-generating material to wind, which maintains air quality 6. Erosion Control Blanket- A temporary protective blanket laid on top of exposed soil vulnerable to erosion. Its purpose is to: Prevent washing away of planted seed and erosion of the prepared seedbed until the area becomes established providing permanent erosion control 7. Tarps- A piece of woven fabric or plastic sheeting material used to temporarily cover soil, raw materials, or equipment to provide protection from wind and rain 	<ol style="list-style-type: none"> 1. Visual cues will be the primary trigger for mitigative action to be taken with respect to fugitive dust emissions. As guideline, consider Wind threshold is 10m/s. 2. If the weather forecast indicates dry conditions and strong winds are likely. 3. If an Air Quality Advisory is issued, recommended mitigative or contingency dust management actions should be taken 	

¹⁹ [Aggregate supply and demand](#) (Regional District of Central Okanagan, 2013)

	8. Vegetation cover- Establish ground cover with via trees, shrubs, or perennial plants. Its purpose is to: Minimize or control dust and erosion, enhance water quality, and facilitate reclamation		
Crushing & Screening	1. Enclose crushers and use bag house 2. Use backstops for wind protection 4. Use water sprays		
Drag conveyor start up (asphalt)	1. Conveyor releases contained in drop chute and ground enclosure.	Visual cues will be the primary trigger for mitigative action to be taken with respect to fugitive dust emissions	Service components as per manufacturer's specifications.
Baghouse fines (asphalt)	1. Contain fines and re-introduce into mix. 2. Baghouse components are maintained as per manufacturers specifications, company policy and in accordance with codes and regulations.		
Debris on returning belts (asphalt)	1. Contain and recycle debris.		Use Belt scrapers are used regularly.
Leaking drum components	1. Drum seals are monitored regularly. 2. Drum components are maintained as		Service components as per manufacturer's specifications.
Abrasive Dry Blasting ²⁰			
Abrasive Dry Blasting	1. Conduct activity when wind velocities do not exceed 32 Km per hour. 2. When practical, utilize wind screens, tarpaulins, hoods, vacuum blasting, or other emission reduction/containment techniques. 3. Abrasives should be clean, light-weight, and contain no more than 5% (by weight) of quartz. 3. Wet down spent, abrasive material and periodically remove from job site.	1. Visual cues will be the primary trigger for mitigative action to be taken with respect to fugitive dust emissions. Higher wind speeds increase emissions by enhanced ventilation of the process and by retardation of coarse particle deposition. 2. If an Air Quality Advisory is issued, recommended mitigative or contingency dust management actions should be taken.	Cease activities during high wind events or when dust emissions cannot be adequately controlled.

²⁰ [Managing Fugitive Dust](#)- (Michigan Department of Environmental Quality, 2016)

Agricultural Operations ²¹			
Tillage, Planting and Harvest	<ol style="list-style-type: none"> 1. Chemical irrigation 2. Combining tractor operations 3. Equipment modification 4. Limited activity during a high wind event 5. Planting based on soil moisture 6. Reduced tillage system 7. Surface roughening 8. Tillage based on soil moisture 	<ol style="list-style-type: none"> 1. Visual cues will be the primary trigger for mitigative action to be taken with respect to fugitive dust emissions. <u>Higher wind</u> speeds increase emissions by enhanced ventilation of the process and by retardation of coarse particle deposition 2. If an Air Quality Advisory is issued, recommended mitigative or contingency dust management actions should be taken. 	<ol style="list-style-type: none"> 1. Cease or limited activities during high wind events or when dust emissions cannot be adequately controlled.
Crop Production	<ol style="list-style-type: none"> 1. Artificial wind barrier 2. Cover crop 3. Cross-wind ridges 4. Cross-wind strip-cropping 5. Cross-wind vegetative strips 6. Manure application 7. Mulching 8. Multi-year crop 9. Permanent cover 10. Residue management 11. Sequential cropping 12. Tree, shrub, or windbreak planting 		<p>"Limited activity during a high-wind event" means performing no tillage or soil preparation activity during harvest time when the measured wind speed at 6-feet above the ground is more than 25-mph (11m/s) at the farm site.</p>
Non-Cropland Areas	<ol style="list-style-type: none"> 1. Access restriction 2. Aggregate cover 3. Artificial wind barrier 4. Critical area planting 5. Manure application 6. Reduced vehicle speed 7. Synthetic particulate suppressant 8. Track-out control system 9. Tree, shrub, or windbreak planting 10. Watering 		

²¹ [Fugitive Dust-A Guide to the Control of Windblown Dust on Agricultural Lands in Nevada](#) - (U.S. Department of Agriculture, 2007)

Heavy Construction Operations-construction of building or road^{22, 23}

Dust control guidance for roads, surfaces and highways

Major haul roads and traffic routes	<ol style="list-style-type: none"> 1. Install permanent surfaces with regular 2. inspection and maintenance. 3. Plan routes to be away from residents and other sensitive receptors, such as schools and hospitals. 		
Construction and maintenance of unsurfaced roads and verges	<ol style="list-style-type: none"> 1. Grade fine materials from unsurfaced 2. unsurfaced roads and verges haul roads. 3. Keep in compacted condition using static 4. sprinklers, bowsters, commercially available additives and binders 		
Public roads	Clean regularly		
Edges of roads and footpaths	Clean by using hand broom with damping, as necessary.		
High level walkways and surfaces (scaffold planking and other surfaces)	Clean regularly using wet methods and not dry sweeping.		
Vehicle waiting areas and hard standings	<ol style="list-style-type: none"> 1. Regularly inspect and keep clean by brushing or vacuum sweeping. 2. Spray regularly with water to maintain surface moisture if needed. 		
Vehicle and wheel washing	<ol style="list-style-type: none"> 1. Washing facilities, such as hose-pipes and ample water supply should be provided at site exits, including mechanical wheel spinners where practicable. 2. If necessary, all vehicles should be washed down before exiting the site 		
Site traffic	<ol style="list-style-type: none"> 1. Restrict general site traffic to watered or treated haul roads. 2. Keep vehicle movements to a minimum 3. Implement a speed limit of at least 32 km/h for surfaced roads and 8 km/h for unmade surfaces to slow vehicles and therefore reduce fugitive dust emissions 		

²² [Heavy Construction Operations](#)- (EPA)

²³ [Control of Dust from construction and demolition activities](#) (Kukadia, Upton, & Hall , 2003)

Road cleaning	<ol style="list-style-type: none"> 1. Approved mechanical road sweeper should be readily available, with circular brush commonly fitted to side for cleaning kerbs, removed. 2. Frequency of cleaning will depend on site size, location and operation. However, cleaning should be carried out on a daily basis (working day) or more frequently if required. 		
<i>Dust control guidance for static and mobile combustion plant</i>			
Visible exhaust smoke	Vehicles and equipment should not emit black smoke from exhaust systems except during ignition at start-up.		
Maintenance	Engines and exhaust systems should be maintained so that exhaust emissions do not breach statutory emission limits set for the vehicle/equipment type and mode of operation		
Servicing	This should be routinely scheduled, rather than just following breakdowns		
Operating time	Internal combustion plant should not be left running unnecessarily		
Exhaust direction	Vehicle exhausts should be directed away from the ground and other surfaces and preferably upwards to avoid road dust being re-suspended to the air.		
Exhaust heights	Exhausts should be positioned at a sufficient height to ensure adequate local dispersal of emissions.		
Location of plant and equipment	Plant and equipment should be operated away from residential areas or sensitive receptors near to the site.		
<i>Dust control guidance for emissions from tarmac laying, bitumen surfacing and coating</i>			
Bitumen over-heating	<ol style="list-style-type: none"> 1. Do not overheat bitumen, but use minimum acceptable temperature. 2. Measure temperature directly, especially on large heating plant. 3. Avoid if possible, heating with open flame burners. 		
Fume production	Cover pots or tanks containing hot bitumen.		
Spillage	Minimize spillages, especially any likely to contact open flames		
Direct application of open flames (torching)	<ol style="list-style-type: none"> 1. Use great care 2. Avoid overheating the surface. 		

<i>Dust control guidance for emissions from handling of materials</i>			
Debris handling	<ol style="list-style-type: none"> 1. Always keep the number of handling operations to a minimum by ensuring that dusty material isn't moved or handled unnecessarily. 2. Wind speed reduction 3. Wet suppression. Dust control plans should contain precautions against watering programs that confound track out problems. 	<ol style="list-style-type: none"> 1. Visual cues will be the primary trigger for mitigative action to be taken with respect to fugitive dust emissions. Higher wind speeds increase emissions by enhanced ventilation of the process and by retardation of coarse particle deposition 2. If the weather forecast indicates dry conditions and strong winds are likely. As guideline, consider Wind threshold is 10m/s. 3. If an Air Quality Advisory is issued, recommended mitigative or contingency dust management actions should be taken 	<ol style="list-style-type: none"> 1. Cease activities during high wind events or when dust emissions cannot be adequately controlled.
Truck transport	<ol style="list-style-type: none"> 1. Loads could be covered to avoid loss of material in transport, especially if material is transported offsite 2. Wet suppression 3. Paving 4. Chemical stabilization- Chemical stabilization usually cost-effective for relatively long-term or semi permanent unpaved roads 		
Loading materials onto vehicles and conveyors	<ol style="list-style-type: none"> 1. Drop heights must be kept to a minimum and enclosed wherever possible. 2. Damp down with water. 		
Bulldozers	Wet suppression. Excavated materials may already be moist and not require additional wetting. Furthermore, most soils are associated with an "optimum moisture" for compaction		
Pan scrapers	Wet suppression of travel routes		
Cut/fill material handling	<ol style="list-style-type: none"> 1. Wind speed reduction 2. Wet suppression 		
Cut/fill haulage	<ol style="list-style-type: none"> 1. Wet suppression 2. Paving 3. Chemical stabilization 		
General construction	<ol style="list-style-type: none"> 1. Wind speed reduction 2. Wet suppression 3. Early paving of permanent roads 		

<i>Dust control guidance for emissions from stockpiles</i>			
Stockpile location	Stockpiles should be located away from sensitive receptors eg residential, commercial and educational buildings, places of public access or other features, such as watercourses.		
Building stockpiles	<ol style="list-style-type: none"> 1. Ensure slopes of stockpiles, tips and mounds are at an angle not greater than the natural angle of repose of the material. 2. Avoid sharp changes of shape 		
Small and short-term stockpiles - protecting from wind erosion	<ol style="list-style-type: none"> 1. Where possible, ensure stockpiles are kept enclosed or under sheeting. 2. Dusty materials can be damped down using suitable and sufficient water sprays. 3. Wind barriers (protective fences) of similar size and height to the stockpile may be used. 		
Larger and long-term stockpiles	<ol style="list-style-type: none"> 1. Shrouding, wind shielding using screens, watering and controlled spraying of the surface with chemical bonding agents. 2. Wind barriers (protective fences) of similar size and height to the stockpile may be used. 3. Long-term stockpiles can be capped or grassed over. 		
<i>Dust control guidance for emissions from spillages</i>			
Cleaning up	Methods and equipment should be in place for immediate clean-up of spillages of dusty or potentially dusty materials.		
Inspection	Regularly inspect site for spillages.		
Cement powder (and similar)	Clean up spillages using wet handling methods.		
<i>Dust control guidance for emissions during site preparation and restoration ²⁴</i>			
Earthworks, excavation and digging	<ol style="list-style-type: none"> 1. Vegetation and cover should be removed in discrete sections and not all at once. 2. Earthworks, excavation and digging activities should be kept damp and, if possible, be avoided during exceptionally dry weather periods 		
Completed earthworks	Stabilize surfaces and/or re-vegetate as soon as possible.		
Storage mounds	<ol style="list-style-type: none"> 1. Seal surfaces by seeding or surface with vegetation that has previously been removed from the site. For example, turfing which has been removed may be stored and reused. 2. Alternatively, cover with correctly secured tarpaulins. 		

²⁴ [Control of dust from construction and demolition activities](#) (Kukadia, Upton, & Hall, 2003)

Landscaping	Soils may be landscaped into suitable shapes for secondary functions, such as visual screening.		
Transitory soil mounds	Soil mounds should be treated with surface binding agents to reduce wind erosion.		
Processing aggregates, crushing and screening	<ol style="list-style-type: none"> 1. Crushers should be sited as far away as and screening possible from sensitive receptors. 2. Mobile plant for crushing, screening and grading of materials may require authorisation 		
<i>Dust control guidance for emissions during demolition activities</i>			
Blasting using explosives	Blasting should be avoided and other method used wherever possible.		
Sheeting/screening	Buildings should be screened with suitable debris screens and sheets.		
Biological materials	<ol style="list-style-type: none"> 1. Bird droppings and other biological material should be removed prior to demolition. 2. Care must be taken that the material does not become airborne, but is sufficiently contained 		
Asbestos	Asbestos must be removed by a registered specialist contractor prior to demolition.		
Lead	Waste containing lead should be properly managed according to Guideline to managing lead-containing construction and demolition waste in BC		
Water sprays	<ol style="list-style-type: none"> 1. Suitable and sufficient water sprays must be used. 2. Spraying should be carried out prior to and during demolition 		
Chutes for dropping demolition materials to ground level	<ol style="list-style-type: none"> 1. Enclose chutes and skips. Regular water spraying should be carried out. 2. Material drop heights should be minimized. 		
Burning of waste materials, foliage	Revise local regulations. Open burning for Land clearing is prohibited. The use of forced air technology may be permitted.		
Removal of materials from site	Materials should be removed from the site as soon as is practical. Prolonged storage of debris on site or exposure to wind should be avoided.		
Transport of materials	Vehicles removing demolition materials must have their loads effectively sheeted.		

Vehicle routes	As far as practical, routes should be located away from residential and commercial properties.		
Crushing of material for reuse, transportation or disposal	<ol style="list-style-type: none"> 1. Crushers should be sited as far away as possible from sensitive receptors. 2. Mobile plant, e.g. crushing, screening and roadstone coating plant, will require authorisation by the Local Authority in whose area the operating company's registered office is situated. 		
<i>Dust control guidance for emissions from cutting, grinding and drilling</i>			
Cutting, grinding, drilling, sawing, trimming, planing, sanding	<ol style="list-style-type: none"> 1. Cutting on site should be avoided by using prefabrication whenever possible. 2. Avoid cutting out errors and re-bars. 3. Employ equipment and techniques that minimize dust emissions, using best available dust suppression measures. 4. Use water sprays to minimize dust from cutting equipment. 5. Local exhaust ventilation should be used where possible. 6. Fans and filters should be serviced and maintained to ensure correct operation. 7. Design to fill wherever feasible rather than cutting back oversized work. 		
Cutting roadways, pavements, blocks etc.	<ol style="list-style-type: none"> 1. Use a diamond bladed floor saw with water pumped through to suppress dust. 2. Standard angle grinders and disk cutters with no dust control should not be used for this purpose. 		
Raking out mortar/pointing	<ol style="list-style-type: none"> 1. Standard angle grinders and disk cutters with no dust control should not be used. 2. A mortar raking kit, fitted on to a standard 5" angle grinder can be used on soft mortar. For hard mortar, a super-saw with oscillating blades can be used. 		
Angle grinders and disk cutters	Dust extraction/minimisation systems should always be used		

<i>Dust control guidance for emissions from scabbling, sand and grit blasting and facade cleaning</i>			
Scabbling	<p>If possible, scabbling should be avoided altogether. Alternative strategies include:</p> <ol style="list-style-type: none"> 1. designing tolerances for infilling rather than cutting back oversize work 2. increasing the size of concrete pours to reduce the need for scabbling 3. the use of bonding agents 4. designing the concrete components themselves to affect interfaces 5. the use of wet grit blasting for outside work. <p>If scabbling cannot be avoided then the dust emission risk should be assessed, including the size of area to be scabbled, material used, amount of dust likely to be emitted etc.</p> <p>If necessary, the following control procedures should be used:</p> <ol style="list-style-type: none"> 1. fit tools with dust bags 2. pre-wash work surfaces 3. screen off areas to be scabbled to limit the spread of dust 4. vacuum up, rather than sweep away residual dust as this can generate more dust than the scabbling operation itself. 		
Sand, grit or shot blasting and facade cleaning	<ol style="list-style-type: none"> 1. Silica-free material should be used for abrasive cleaning, since the inhalation of silica dust is harmful. 2. Wet processes should be used wherever possible. These introduce water into the air/grit stream, greatly reducing the dust hazard to both building occupiers and the general public. 3. Ensure that slurries do not dry out. <p>If dry grit blasting is unavoidable:</p> <ol style="list-style-type: none"> 1. assess the emission of dust (especially respirable dust) 2. sheet all work areas before commencement of operations 3. seal all windows and openings in the structure with polyethylene sheeting 4. use local exhaust extraction and filtering, if possible. 		
<i>Dust control guidance for emissions from mixing processes</i>			
Mixing and granular materials	<ol style="list-style-type: none"> 1. The use of pre-mixed plasters and masonry compounds is recommended. 2. The mixing of concrete or bentonite slurries should take place in enclosed or shielded areas. 3. Fine materials should be palletised and shrink wrapped where possible. 		

Welding and soldering	Welding, cutting and similar processes must be carried out according to the requirements of CSA Standard W117.2-94, Safety in Welding, Cutting, and Allied Processes		
Dust control guidance for emissions from internal and external finishing and refurbishment			
Painting and decorating	<ol style="list-style-type: none"> 1. Sanding and cutting machinery should be fitted with dust suppression or collection equipment. 2. Vacuum cleaning should be used wherever possible 		
Fitting out - plastering, rendering, decorative finishing, furniture fitting	<ol style="list-style-type: none"> 1. Cutting and sanding machinery should be fitted with dust suppression/collection equipment. 2. Vacuum cleaning should be used whenever possible. 		
Installation of electrical systems and plumbing - chasing of walls, be fitted soffits and floors	<ol style="list-style-type: none"> 1. Cutting and sanding machinery should be fitted with dust suppression/collection soffits and floors equipment. 2. Vacuum cleaning should be used whenever possible. 		
Installation of fire proofing and insulation	<ol style="list-style-type: none"> 1. Dust suppressants should be used when blowing fibres into voids and spaces 2. Local exhaust ventilation should be used when handling and cutting fibrous insulating materials. 		
Cleaning processes	<ol style="list-style-type: none"> 1. Dry sweeping should be avoided and only carried out with vacuum extraction methods attached. 2. Damp sweeping using fine mist should be used. 3. Washing and damping down should be carried out whenever necessary. 		

Road Dust²⁵

Material selection	<ol style="list-style-type: none"> 1. Reduce the finer particle fraction of traction material- Material larger than 300 microns 2. Use winter traction materials with angular particles (i.e., crushed) for better traction. 3. Use a durable aggregate less likely to breakdown through road wear (coarser sands, harder crushed aggregate) 		
Material application	<ol style="list-style-type: none"> 1. Reduce application rates as much as possible while maintaining service-considering local road conditions (i.e., type of surface, grade, travel speed, level of use), and current and forecast weather conditions (i.e., temperature, precipitation, time of day) 2. Consider applying liquid de-icing compounds in conjunction with winter traction materials. Pre-wetting aggregate with a liquid Magnesium Chloride (MgCl₂) or Calcium Chloride (CaCl₂) brine as the traction material is spread can help the material to embed into ice or snow on the road's surface 3. Consider the use of alternative winter traction material treatments (heated aggregate) 4. Consider the use of innovative equipment for applying winter traction materials and for maintaining them on road surfaces (spreader with a rearward velocity, graders and plows equipped with tooted blades) 		
Material collection/ clean-up	<ol style="list-style-type: none"> 1. Consider the application of dust suppressants to control dust generation in later winter as snow begins to melt. Several areas use de-icing compounds or other dust suppressants for this purpose.^{26, 27} 2. Schedule the removal of accumulated winter traction materials as early in spring as possible to shorten the potential period of dust generation (as early as local weather permits). 3. Apply dust suppressants during spring clean-up activities 4. Ensure that equipment used for material collection is well maintained and functioning; mechanical broom sweepers (useful for heavier materials but less efficient in removing fine particles), vacuum sweepers (effective pick-up of material near curbs but inefficient cleaning along the entire sweeping width), and regenerative air sweepers (more thorough cleaning of all particle sizes over the road surface) 	If an Air Quality Advisory is issued, recommended mitigative or contingency dust management actions should be taken	Use of dust suppressant

²⁵ [Best Management Practices to Mitigate Road Dust from Winter Traction Materials-](#) (Ministry of Water, Land and Air Protection, 2005)

²⁶ [Dust Palliative Selection and Application Guide-United States Department of Agriculture](#) (U.S. Department of Agriculture, 1999)

²⁷ [Dust Control for unpaved Roads](#) (Federation of Canadian Municipalities and National Research Council, 2005)

Appendix 1- Example of Dust Advisory

Dust Advisory:

MEDIA RELEASE

For Immediate Release - Attention Editor

ROAD DUST ADVISORY IN EFFECT FOR BURNS LAKE

(April 4, 2017 - Smithers) The Ministry of Environment in collaboration with Northern Health has issued a Road Dust Advisory for Burns Lake because of high concentrations of coarse particulate matter that are expected to persist until there is precipitation or dust suppression. Levels tend to be highest around busy roads and industrial operations. This advisory is in effect until further notice.

Persons with chronic underlying medical conditions should postpone strenuous exercise near busy roads until the advisory is lifted. Exposure is particularly a concern for infants, the elderly and those who have diabetes, and lung or heart disease. Real-time air quality observations and information regarding the health effects of air pollution can be found at www.bcairquality.ca

Coarse particulate matter refers to airborne solid or liquid droplets with diameters between 2.5 and 10 micrometers (μm). Together with fine particulate matter (airborne solid or liquid droplets with diameters of 2.5 μm or less), these particles are referred to as PM_{10} . Sources of PM_{10} contributing to this air quality episode include road dust from the emission of winter traction material along busy and dry road surfaces. PM_{10} can easily penetrate indoors because of their small size.

Tips to reduce your personal health risk:

- Avoid roads with heavy vehicle traffic.
- Continue to manage medical conditions such as asthma, chronic respiratory disease and heart failure. If symptoms continue to be bothersome, seek medical attention.
- Use common sense regarding outdoor physical activity; if your breathing becomes difficult or uncomfortable, stop or reduce the activity.
- Maintaining good overall health is a good way to reduce health risks resulting from short-term exposure to air pollution.

For persons with chronic underlying medical conditions:

- Residents with asthma or other chronic illness should activate their asthma or personal care plan.
- Stay indoors, keep windows and doors closed and reduce indoor sources of pollution such as smoking, vacuuming and use of wood stoves.
- Run an air cleaner. Some room air cleaners, such as HEPA filters, can help reduce indoor particulate levels provided they are the right size for your home and filters are changed regularly.

Appendix 2- Dust Management Plan and Self-Inspection Checklist Templates

Dust Management Plan for (Company's Name) _____

Date _____

Dust Activity: General areas		Calculate total area to be treated: _____ m ²		Prevailing wind direction _____	
Source Description	Preventive and Mitigative Dust Control Measures	Thresholds / Triggers for Management	Contingency Dust Control Measures	Responsibility for implementation (Department/Area)	Maintenance (daily, weekly, bi-weekly, monthly, etc.)

Dust Activity: Roads... handling materials, stockpiling, etc.		Calculate total area to be treated: _____ m ²		Prevailing wind direction _____	
Source Description	Preventive and Mitigative Dust Control Measures	Thresholds / Triggers for Management	Contingency Dust Control Measures	Responsibility for implementation (Department/Area)	Maintenance (daily, weekly, bi-weekly, monthly, etc.)

Revision History			
Approval Date	Effective Date	Document Version	Notes

Instructions

- 1 Start with a Facility Site Plan Map. Record all roads, staging areas, parking lots, and other open areas subject to wind erosion or activities and sources susceptible to produce fugitive dust. Calculate the total area which must be treated with dust suppression measures. Indicate prevailing wind direction. Use the Dust Management Plan template above to produce your own plan and map.
- 2 Study the daily traffic volumes on the roads and open areas and determine whether they are used frequently or occasionally. Consider daily routine modifications which will reduce traffic in some areas or eliminate it altogether.
- 3 Assign dust control methods according to how frequently the surface in an area is disturbed, and **color-** code your map to show which method to apply where.
- 4 Calculate how often any periodic dust control treatment must be applied, and draw up a more detailed Self-Inspection Checklist per each “Dust activity” or “source” to record the scheduled applications/planned maintenance. Edit the checklist as required.
- 5 Record All Dust Control Activities on your checklist daily. You may also want to log weather information, such as average wind speed and direction, temperature, rainfall, etc.

Using a Self-Inspection Checklist helps you incorporate the routine tasks of fugitive dust control into your daily schedule. It serves as a job reminder on a daily basis, and as a record of your efforts to keep dust problems to a minimum. You can identify problem areas before they get out of hand, and plan for seasonal changes or for any unforeseen circumstances. ²⁸

Prevention	Occasional Use Areas	Frequent Use Areas	
Limit surface area disturbed Limit Work in Wind events Apply Suppressive as needed Clean up spills Immediately	Grow groundcover Erect windbreaks Apply crust chemicals	Pave roads Enclose storage areas Cover storage piles Water/Sweep often	Reduce speed limits Minimize trips Limit area access Prevent carryout offsite

Use Your Checklist Daily or as needed

Dust Activity: By specific Area of the plant/facility						Total area to be treated: _____m ²		Prevailing wind direction _____										
Date	Source Description	Preventive and Mitigative Dust Control Measures	Contingency Dust Control Measures	Responsibility for implementation (staff/operator's name)	Maintenance (daily, weekly, bi-weekly, monthly, etc.)	Inspection (daily/end of shift or activity)		Weather information						Observed / closed out				
						M	T	W	T	F	S	S	Temp	Wind	Wind Gust	Humidity	Precipitation	
						✓												

²⁸ [Fugitive Dust Control Self-Inspection Handbook](#) (California Environmental Protection Agency, U.S., 2007)

Appendix 3- Approved Dust Palliatives in BC

Detailed information on how to select dust suppressants can be found at: [Dust Control for Unpaved Roads](#)

In BC, [approved dust palliatives](#) (Ministry of Transportation and Infrastructure, 2022) are:

Accepted Products
Freezgard Magnesium Chloride (552)
Calcium Chloride (328)
Calcium Lignosulphonate (102)
Sodium Lignosulphonate (103)
Milligan Road Dust Suppressant RDS (1122)
Tiger Calcium Gold 35% (1268)

Dust Suppressant	Traffic Volumes Average Daily Traffic			Surface Material								Climate Type		
	Light <100	Medium 100 to 250	Heavy >250 (1)	Plasticity Index			Fines (Passing 75 mm, No. 200, Sieve)					Wet and/or Rainy	Damp to Dry	Dry (2)
				<3	3-8	>8	<5	5-10	10-20	20-30	>30			
Calcium Chloride	✓✓	✓✓	✓	x	✓	✓✓	x	✓	✓✓	✓	x (3)	x (3, 4)	✓✓	x
Magnesium Chloride	✓✓	✓✓	✓	x	✓	✓✓	x	✓	✓✓	✓	x (3)	x (3, 4)	✓✓	✓
Petroleum	✓	✓	✓	✓✓	✓	x	✓	✓	✓ (5)	x	x	✓ (3)	✓✓	✓
Lignin	✓✓	✓✓	✓	x	✓	✓✓ (5)	x	✓	✓✓	✓✓	✓✓ (3,5)	x (4)	✓✓	✓✓
Tall Oil	✓✓	✓	x	✓✓	✓	x	x	✓	✓✓ (5)	✓✓ (5)	x	✓	✓✓	✓✓
Vegetable Oils	✓	x	x	✓	✓	✓	x	✓	✓	x	x	x	✓	✓
Electro-Chemical	✓✓	✓	✓	x	✓	✓✓	x	✓	✓✓	✓✓	✓✓	✓✓ (3, 4)	✓	✓
Synthetic Polymers	✓✓	✓	x	✓✓	✓	x	x	✓✓	✓✓ (5)	x	x	✓	✓✓	✓✓
Clay Additives (5)	✓✓	✓	x	✓✓	✓✓	✓	✓✓	✓	✓	x	x	x (3)	✓	✓✓
Legend: ✓✓ = Good ✓ = Fair x = Poor NOTES: (1) May require higher or more frequent application rates, especially with high truck volumes. (2) Greater than 20 days with less than 40 percent relative humidity. (3) May become slippery in wet weather. (4) SS-1 or CSS-1 with only clean, open-graded aggregate. (5) Road mix for best results.														
<i>Source: Bolander and Yamada (1999).</i>														

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