How To Guide:

Writing a Dust Monitoring Plan

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Introduction

Dust emissions are an inevitable part of earth-moving activities, including construction and remediation.

The scale of the impact depends on how effectively site managers can plan for emissions and execute dust suppression measures to reduce harm. Local regulatory bodies will have set prescribed limits to protect sensitive receptors in the community, and these limits must be adhered to at all times. If mitigation procedures cannot contain emissions within these limits, projects risk incurring fines or costly site shutdowns.

A well-designed monitoring plan is critical for project success, ensuring increased transparency of data and greater control over emissions and other project variables. Build trust among the community, satisfy regulators, and enhance your ability to deliver project goals on time and on budget, without the potential disruption caused by ineffective dust monitoring and poor planning.

An effective plan will include a thorough assessment of risk factors native to your site and the surrounding area, factoring in relevant legislation and the size of the project. When deciding on a monitoring system, pay close attention to site-specific challenges.

For optimal results, select a monitoring system using the best available hardware and software your budget allows. With clear objectives and a sound suppression plan in place, your project may proceed responsibly and safely. By doing so, you will avoid costly delays while continuing to protect the health and well-being of workers and the community.

Overview

This document provides a broad overview of key features and questions when designing a dust monitoring plan for your next project.

The steps we'll be covering will look something like this →

01. Provide an Overview of the Project

- What are the relevant prices of legalization?
- Set out objectives and a scope of the monitoring plan.

02. Define Potential Risk Factors

- For example: dust plumes, exhaust, emissions.
- Factor in meteorological factors and site location.

03. Draft Monitoring Procedures

04. Establish Mitigation Procedures

- Following a site survey, risk assessment and mitigation plan, it can be helpful to keep a self-inspection checklist.

05. Determine Corrective Action and Emergency Response Plan

- If mitigation procedures are unable to reduce emissions below safe limits, an emergency response will be needed.

06. Draft Monitoring Report

- To regulations and reassure the surrounding community of their continued health and well-being.

Key Questions to Ask

Here are some key questions to ask when first designing your dust monitoring plan:

→

01.

Provide a broad overview of the project (background on any work completed to this point, project goals, the who/what/when/where/why)

02.

What are the relevant pieces of legislation here? What local regulations do we need to be aware of in designing an appropriate monitoring plan?

- Do these regulations call for real-time perimeter monitoring?
- If not, are there circumstances that would cause you to go above and beyond? Will you be supplementing the baseline regulatory requirements with real-time monitoring?

03.

Set out the objectives and scope of the monitoring plan, for example:

- Quantify dust levels being generated on-site – how much is leaving the site and entering the community?
- Identify potential dust migration pathways.
- To investigate whether current management methods are effective or if they need upgrading.
- Who is this plan protecting? Who are the sensitive receptors/stakeholders that will be positively impacted by this plan? (e.g., workers, the surrounding community).
- What are the primary concerns/what are you protecting against?

Defining Potential Risk Factors

Air quality impacts arising from earth-moving activities may include, but are not limited to:

Potential Risk Factors

- Elevated concentrations of particulate matter
- Dust plumes
- Exhaust emissions from diesel-powered machinery and equipment
- The release of toxic contaminants contained in soil
- Trackout dust (caused by vehicles passing over unpaved ground)

The level of risk for each will be impacted by the site location and its proximity to sensitive receptors, both human (nearby housing and schools) and environmental (vegetation, lakes, protected wildlife.) The quantity of dust being produced will depend on the area of land being prepared and the level of activity. When assessing risk, meteorological factors like wind and rain also needed to be factored in. Wind speed and direction will influence the dispersion of dust throughout the surrounding area and impact the placement of monitoring devices. More wind equals more risk, though existing structures like buildings or trees can help lessen its impact. Rain is a natural dust suppressant, so activities taking place in drier climates are likely to generate higher dust emissions.

A site map can be a useful tool during this step of building your dust monitoring plan, providing a clear overview of site boundaries, key features, and the location of nearby receptors.

See next page for site map example

Site Map Example

A thorough site background assessment is essential to outlining potential risk factors.

Key questions could include →

01.

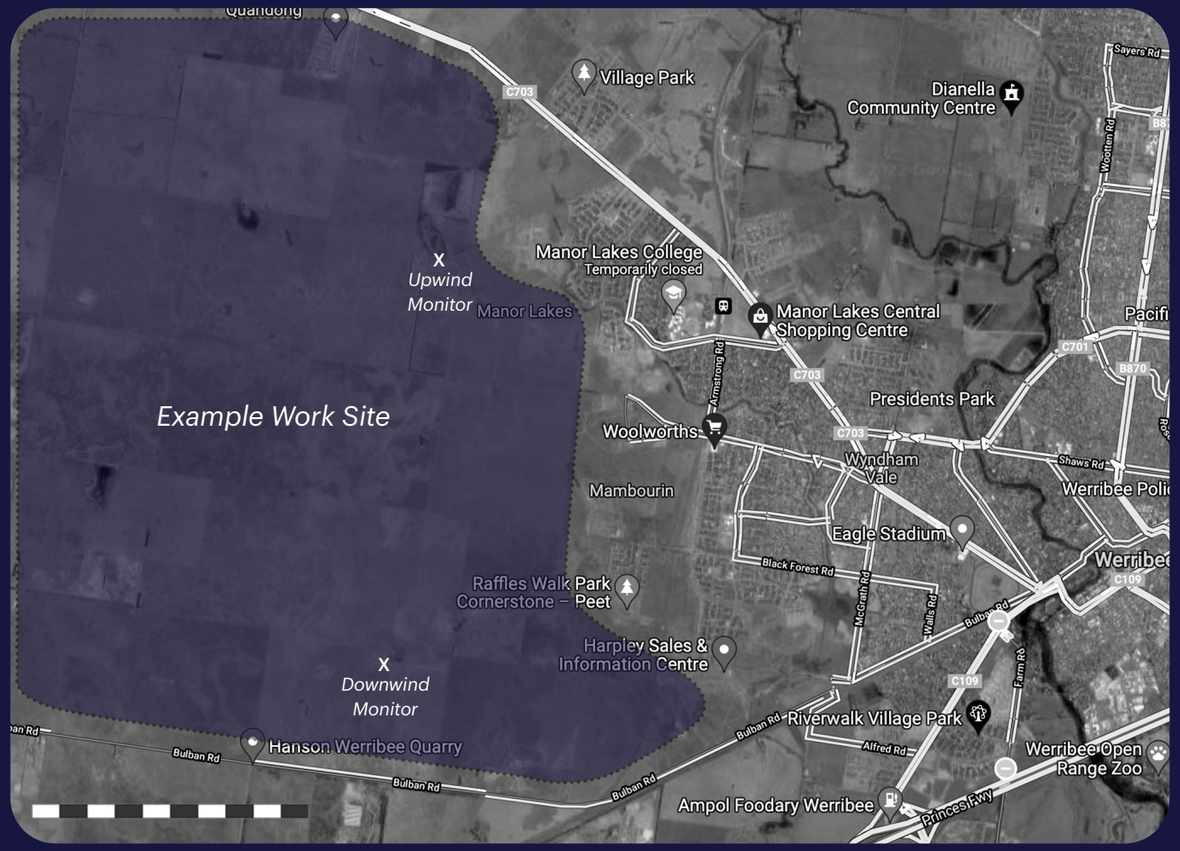
Site background assessment

- Is there anything notable about the location, climate, or geography of the site that may be relevant to dust creation or migration patterns? Wind, rain, any air pollutant or naturally occurring dust sources?

- What are some possible sources of fugitive dust emissions caused by site operations?

  For example:

  - Drilling and blasting
  - Uncovered stockpiles of fine material
  - Processing/transport of materials
  - Unsealed surfaces



Above: example of what a simple site map may look like, showing upwind and downwind monitor locations and any communities located near the site border.

Monitoring Procedures

Following a comprehensive risk assessment, including all site-specific, environmental, and regulatory factors, the next step is to decide on a monitoring plan.

A robust air monitoring plan is at the foundation of any successful earth-moving project. Keeping workers and communities safe while meeting regulations requires actionable, defensible data. How you choose to select and deploy instrumentation will have a sizeable impact on whether you're likely to meet project goals.

Obtaining quality data starts with selecting a combination of hardware and software capable of delivering what you need. Take stock of environmental factors that could affect the accuracy of results (e.g., high levels of humidity, high or frequently changeable winds), and look for technology that addresses these particular challenges.

If you're looking to reduce on-site visits, look for a monitoring system that can reliably deliver remote data, including two-way integration for off-site maintenance and support. If you plan to share data with the community or project stakeholders, look for integrated software that offers easy visualization and quick reporting. Once you've decided on a system, take a moment to carefully consider how many units you'll require for accurate results given the site and surrounding environment. Where you place monitors means everything for effectiveness. Make sure you're not placing them in areas impacted by obstacles (e.g., behind a tree, below the height of any boundary wall.)

If you intend on monitoring any complementary pollutants (e.g., VOCs from petroleum-impacted soil, NO_2 from vehicle exhaust), look for flexible systems equipped to provide a complete air monitoring picture.

Monitoring Procedures

In determining your approach to monitoring activities, consider these key questions:

→

01.

Outline the exact nature of proposed monitoring activities, including:

- How many monitoring units will you be using? How might site conditions affect the quantity required?
- Where will these systems be located? How can you maximize effectiveness through optimal placement?
- What baseline monitoring activities will you be undertaking to determine existing dust concentrations?
- Is your proposed monitoring system “built for purpose” – is it designed for this specific monitoring application?
- Which particulate matter sizes are you measuring for (e.g., PM_{10}, $PM_{2.5}$, etc)?

01 Continued ↓

- Will you be measuring any toxic gases/ pollutants made airborne by the remediation process (e.g., VOCs, NO_2)?
- Do you require additional components or features to address site-specific challenges (e.g., a heated inlet for high humidity, baseline zero calibration)?

02.

What recording/reporting methods will you be using?

- How often will you be taking measurements – are you measuring continuously or in discrete intervals? Will you be measuring in real time?
- What are your reporting intervals – daily, weekly, monthly?
- Will your chosen software enable you to easily gather, verify, visualize, and share good quality data with key stakeholders/ the community?
- Are you able to set up automatic alerts delivered to your mobile device in the event of an incident (e.g., rising pollution levels, sensor drift, data going offline, etc)?
- Are you able to gather data remotely (saving on labor costs and reducing on-site visits)?
- What about ongoing maintenance and troubleshooting?
- Is the system set up to support remote management via two-way integration?

Mitigation Procedures

Dust mitigation procedures help reduce the risks posed by earth-moving activities, both for sensitive receptors and the possibility of regulatory infringement.

Procedures will need to be put in place for each of the primary sources of dust creation (demolition, earth-moving, construction, and trackout.) Taking a proactive approach to mitigation using real-time data will go a long way toward minimizing risk.

A selection of applicable mitigation procedures may include ↓

- Where possible, commence baseline monitoring at least three months before work (or a new phase of work) commences
- Setting up a continuous real-time monitoring network measuring dust and particulate matter, per local regulations
- Carry out regular site inspections, and make findings readily available to regulators and the community
- Arrange site activities to be as far away from sensitive receptors as possible
- Erect screens or barriers at least as high as stockpiles
- Ensure site vehicles are covered when entering/ leaving to prevent the escape of materials
- Ensure an adequate supply of water for wetting of stockpiles and roads, minimizing airborne particles

For easy reference, see the next page for how this could be represented graphically →

Mitigation Procedures

The data gathered from a thorough site assessment (proximity of receptors, site-specific risk factors) will help inform whether a particular on-site activity is likely to be low, medium, or high impact for dust creation. Use any historical data to help predict how weather or site conditions may impact risk. Accurately grading these scenarios before beginning work will enable you to put effective procedures in place.

Area of Impact	Level of Risk For Each Stage of Dust Creation			
	Demolition	Earthworks	Construction	Trackout
Community Health	High	High	High	Medium
Surrounding Environment	High	High	Medium	Low
Dust Soiling	High	High	Medium	Low

Mitigation Procedures

In determining your approach to suppression and mitigation, questions you'll want to consider include:
→

01.

Determining your approach

- What is the most effective mix of available mitigation procedures given the nature of the site and project goals?
- How can historical data help provide guidance for reducing site emissions?
- What is the action level for the project? Does it differ depending on environmental conditions or the size/nature of the pollutant?
- At what stage will operations need to be ceased and corrective action taken? How do local regulations impact where this level lies?
- What are the roles and responsibilities of each party involved (e.g., site manager, environmental manager, contractors, etc)?

Once you have carried out a thorough site survey, assessed risk factors, and decided upon an appropriate mitigation plan, it can be helpful to keep a self- inspection checklist. A checklist will help ensure that all appropriate steps have been taken to comply with any relevant legislation.

As part of these inspections, daily monitoring records should also be kept. These should detail the time and date of measurements, along with weather conditions, and any control measures actioned. This may be necessary for meeting any regulations which require daily records to be shared on request.

See next page for how an example record sheet. →

Mitigation Procedures

This is an example of a record sheet that should be kept daily and to be shared on request.
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Date: _____

Dust Monitoring Records

Company Information	Facility/Site Information

Monitoring Personnel:	
Name:	Company:

Dust Monitor Information	Calibration Data
Brand: Model: Type:	Method: Zero Check/Flow Check (Daily) Date: By:

Time	Monitoring Location			Comments
	Dust (mg/m^3)	Dust (mg/m^3)	Dust (mg/m^3)	

I certify that the information contained in the above document is true and correct. I further certify that the above listed monitors were operated in a manner consistent with the manufacturer's specifications and the conditions specified. In addition, I certify that the above readings represent the actual measurements I observed and recorded durign the excavation process.

Signed: _____ Date: _____

Corrective Action and Emergency Response

If planned mitigation procedures are unable to reduce emissions below safe limits, an emergency response will be needed.

Even with a robust plan in place, it is not always possible to plan for adverse shifts in weather or other potential disruptions that may cause emissions to spike.

If dust levels are found to exceed legal thresholds, the following short-term measures are examples of how you might go about restoring equilibrium ↓

- Site shutdowns or reductions in dust-producing activities until dust levels are lowered below action levels.
- Covering accumulated dirt and soil to protect from environmental factors such as wind and heat that can cause increased emissions.
- Removal of accumulated dirt and soil if the covering is shown to be insufficient.
- Increased wetting of soil and unpaved areas (frequency/volume/coverage).
- Adding additional personnel if needed for emergency dust suppression.
- Establish routine audits of dust suppression methods to ensure effectiveness (e.g., checking soil coverings are adequate, wetting procedures are completed to a high standard, monitoring transport procedures, etc).

Figures and Appendices

When constructing a dust monitoring plan, you'll also want to include any visual assets that help site staff understand and implement these procedures.

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Possible visual assets to include ↓

- Site map, including site boundary, features, receptors
- Map of monitoring locations
- Chart showing environmental factors – mean monthly rainfall, temperature, etc
- Air monitoring form (provide space for logging of environmental factors, daily site activities, incident reports, actions undertaken, and follow-up actions required)

Summary

A robust dust monitoring plan will include a thorough account of all possible risk factors, along with suppression techniques for minimizing impact. Upon completion, you should have a clear picture of where monitoring systems will be located and emergency response procedures to action in the event of an incident. This will allow you to meet regulations and reassure the surrounding community of their continued health and well-being.

If you have any further questions around dust monitoring plans or how to go about deploying an effective real-time monitoring system, we're always happy to help.

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To learn more visit:
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