1 Document Status

The most recent revision of this document is in Sharefile as the initial Documentation Management System.

2 Application

This Procedure forms a part of the Erosion and Sediment Control Plan (ESCP) for Te Ahu A Turanga: Manawatū Tararua Highway (the Project). The proposed construction works on the Project include bulk earthworks operations and haul roads that will require dust management.

The purpose of this plan is to ensure that the required level of dust management is achieved on site during these operations.

3 Scope of works

The proposed construction works on the Project will include the following:

- Ground improvements
- Excavations
- Bridge construction (inside & outside highly sensitive ecological areas)
- Upgrading of existing road network
- Construction of roundabouts on existing road network
- Construction of a visitor centre

4 Potential Environmental Impacts of Activities.

The key potential environmental aspects and impacts relating to dust generation are:

<table>
<thead>
<tr>
<th>Aspects</th>
<th>Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dust generation from earthworks, material movement, crushing, vehicle</td>
<td>Nuisance to local residents from airborne dust and dust on local roads.</td>
</tr>
<tr>
<td>movements and bare soil particularly during dry, windy weather</td>
<td>Health and safety hazard to site workers from airborne dust particles</td>
</tr>
<tr>
<td>conditions</td>
<td>Deposition of dust to surrounding terrestrial and aquatic habitats,</td>
</tr>
<tr>
<td></td>
<td>contributing to sediment loads.</td>
</tr>
<tr>
<td></td>
<td>Dust particles in the environment affecting wind turbines</td>
</tr>
</tbody>
</table>
5 Key Responsibilities

Responsibilities
The **Environmental Manager** is responsible for:
- Communicating upcoming weather forecasts to the team
- Reviewing and updating this Procedure
- Organising monitoring as required;
- Developing and delivering training material on dust control;

The **Earthworks Manager** is responsible for:
- Ensuring the implementation of this Procedure;
- Communicating requirements to relevant site personnel; and
- Ensuring personnel have received appropriate training to competently carry out their duties with respect to this procedure.

The **H&S Manager** is responsible for:
- Inspections and checks in order to verify conformance with this Procedure;
- Assisting the Construction Manager in their duties.

All **Site Personnel** involved in activities with a potential to generate dust are responsible for:
- Following the requirements of this Procedure;
- Following the requirements of the Emergency Spill Response Procedure (Appendix 5 to the ESCP) in the event of spills (e.g. from stockpiles);
- Reporting any defects, incidents or accidents to the Construction Manager or Environmental Manager.

For activities with a potential to generate dust, relevant Work Instructions will establish the controls to be applied. During the development of Work Instructions, the following issues will be considered.

6 General Procedure

It is a key principle for the Project that a proactive approach will be taken to dust management on the site, rather than a reactive approach involving dust control once effects are occurring. As construction of the Project involves large scale earthworks and pavement construction, both of these activities have the potential to generate dust. To minimise potential dust nuisance:

- Earthworks will be staged (as far as practicable) so as to minimise the length of time that areas are exposed to drying;
- The route and speed of vehicles working on the site will be controlled appropriately, limiting vehicle speeds over unsealed surfaces to 20 km/hr during dry weather, when within 100 m of sensitive receptors; and
- Materials will be applied on surfaces to minimise dust generation.
- Pavement works will be closely monitored during the time of stabilisation to ensure there is no cement dust mobilisation from the works.
7 Dust Management

7.1 Dust Sources & Generation

The construction activities that will take place throughout the Project that may generate discharges of dust to air are:

- Earthworks, including vegetation removal, stripping of topsoil.
- Vehicle movements on unpaved surfaces.
- Loading and unloading of materials.
- Wind generated dust from dry exposed surfaces such as stockpiles and yard areas.
- Use of cement and/or lime for assisting in structural fill compaction.
- Pavement construction (cement stabilisation)

7.1.1 Factors Influencing Dust Generation

The major factors that influence dust generation are:

- Wind speed across the surface;
  - The critical wind speed for pickup of dust from surfaces is 5 m/s (18km/h) as an hourly average.
  - Pickup increases rapidly above 10 m/s (36km/h) as an hourly average.
- The percentage of fine particles in the material on the surface.
- Moisture content of the material on the surface.
- The area of exposed surface.
- Disturbances such as traffic, excavation, loading and unloading of materials.
- The height of the source above the surrounding ground level (for drops of material).

The smaller the particle size of the material on the surface of a road or an exposed surface, the more easily the particles are able to be picked up and entrained in the wind. Moisture binds particles together preventing them from being disturbed by wind or vehicle movements.

The larger the area of exposed material the more potential there will be for dust emissions. Vehicles travelling over exposed surfaces tend to pulverise any surface particles. Particles are lifted and dropped from the rolling wheels and the road surface is exposed to strong air currents due to turbulence between the wheels and the surface. Dust is also sucked into the turbulent wake created behind moving vehicles.

7.2 Dust Monitoring

Due to large areas of the Project alignment being isolated from the surrounding community we recognise that any potential dust nuisance is likely to be confined to a small group of sensitive receivers in close proximity to the Project works. As such, dust monitoring and mitigation will be focused on these areas/receivers. Monitoring will consist of visual checks made by the Site Engineers and Site Supervisors during the day.

Specific dust monitoring will include the use of nephelometers near houses at either at the Woodville end of the alignment that are downwind under prevailing winds and close to the works. For sensitive ecological areas (F2, F4, F7, E1, E2, E4 and B1), and where wind turbines are downwind and within 100 metres of the site, (TAP9, TAP10, TAP47 and TAP50) deposition monitors will be installed.
7.3 Meteorological Monitoring

Meteorological monitoring at a location near the Project on the Ruahine Ranges will be undertaken so as to inform staff of the occurrence of strong wind conditions (10 m/s hourly average or greater), which can exacerbate dust emissions from exposed areas.

The equipment is to include the measurement of wind speed and direction at a height of 10 m above ground level. The equipment will be set up at a location near the Project alignment on the Ruahine Ranges where there is sufficient cell phone coverage for telemetry purposes and no nearby obstructions, such as buildings or tall vegetation. The equipment is to be setup in accordance with ‘AS2923 – 1987 Ambient Air Grade for Measurement of Horizontal Wind for Air Quality Applications’

Real time meteorological data from station will be continuously recorded using an electronic data logging system with an averaging time for each parameter of not more than two minutes. The results are available to staff in real time, with the logging system automated to send messages to site operations to alert them that wind speeds are 10 m/s or greater.

7.4 Sensitive Receivers

A small number of neighbouring properties have been identified as sensitive receivers due to their proximity and exposure to strong winds from the direction of the construction works. These properties are located into three discrete groups along the alignment. (Refer Table 1 below and Figures 1 – Sensitive receivers map).

Table 1 Sensitive Receivers

<table>
<thead>
<tr>
<th>Reference</th>
<th>Address</th>
<th>Building Type</th>
<th>Distance to Works</th>
</tr>
</thead>
<tbody>
<tr>
<td>TAP09, TAP10</td>
<td>Ruahine Area</td>
<td>Turbines</td>
<td>Within 100m of Project works in direction of West to N’westerly winds from Project site</td>
</tr>
<tr>
<td>F2, F4, E1, E2</td>
<td>Ruahine Area</td>
<td>Ecological</td>
<td>Within 100m of Project works in direction of West to N’westerly winds from Project site</td>
</tr>
<tr>
<td>B1</td>
<td>Ballantrae Area</td>
<td>Research</td>
<td>East &amp; north of Project works within 100m</td>
</tr>
<tr>
<td>TAP46, TP4509</td>
<td>Ballantrae Area</td>
<td>Turbines</td>
<td>Within 100m of Project works</td>
</tr>
<tr>
<td>F7, E4</td>
<td>Ballantrae Area</td>
<td>Ecological</td>
<td>Within 100m of Project works</td>
</tr>
<tr>
<td>R5, R6, R7, R9</td>
<td>Woodville Area</td>
<td>Residential</td>
<td>Within 100m of Project works in direction of East &amp; S’Easterly winds from Project site</td>
</tr>
</tbody>
</table>
PROCEDURE

Project Name: Te Ahu A Turanga: Manawatū Tararua Highway
WBS Code: TAT-0-EV-06030-CP-RP-0006-A

Procedure: Appendix 3: Dust Control Procedure

Figure 1 Sensitive Recievers
Dust Risk zones have been defined by reference to the location of these receivers and are shown below in Table 2.

**Table 2 Extent of Dust Risk Zones**

<table>
<thead>
<tr>
<th>Sensitive Receiver Group</th>
<th>Dusk Risk Zone Extent (Chainage Start and Finish)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ruahine Range Area</td>
<td>TBC</td>
</tr>
<tr>
<td>Ballantrae Area</td>
<td>TBC</td>
</tr>
<tr>
<td>Woodville Area</td>
<td>TBC</td>
</tr>
</tbody>
</table>

### 7.5 Dust Monitoring

There will be daily observations of active work areas for any significant visible dust emissions. This monitoring will focus on haul routes, frequently trafficked areas, excavation sites and fill/spoil areas, with particular attention of the areas within 200m of residences and 100 of those other areas (i.e., wind turbines and sensitive ecological areas) identified as being sensitive receivers. During prolonged dry weather, observations will be carried out more frequently.

Checks of weather forecasts at the start of each day (particularly the absence of rain and whether strong winds are expected) will be used to inform activities to be undertaken, including advising staff of the potential risk for dust impacts.

All staff working in these areas will be trained on what to look for and required to be aware of the potential for dust nuisance. Work instruction and daily toolboxes will reinforce this requirement.

For the sensitive residential receivers detailed above (being R4, R5 and R7 near Woodville), instrumental continuous dust monitors (nephelometers) will be established in general accordance with AS/NZS 3580.12.1:20151 or similar. These monitors will provide real-time feedback on dust levels near these sensitive locations, to provide notice of elevated dust levels and to allow a pro-active response. These monitors will be located between the construction works and receptors R4, R5 and R7 when construction works are within approximately 100m of any of those receptors.

A 1-hour average trigger level for PM$_{10}$ is the most suitable for managing dust when using nephelometer instruments. The following concentration trigger will be used, but may be reviewed subject to operator experience and/or community feedback:

**Trigger concentration (PM$_{10}$): 150 µg/m³, hourly average**

Should this trigger level be reached then an automated message will be sent to site operations. Dust generating activities will cease in that location until such time that emissions can be adequately controlled, and concentrations reduce to within the trigger levels. This may mean an increase in water application, using polymers to increase the effectiveness of the water management, reconsidering construction activities, and/or ceasing work in some areas.

Dust deposition monitoring will be undertaken in and around the most exposed wind turbines (TAP9, TP10, TAP47 and TAP50) and sensitive ecological areas (F2, F4, F7, E1, E2, E4 and B1) for the duration of construction works in a given area (i.e., those located within 100m of the Project works and downwind during

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prevailing winds of construction works). Deposition monitors once set up collect deposited material. A baseline sample will be collected over a month, after which the collected sample is retrieved and sent to a laboratory for analysis to confirm the rate of measured deposition. The results can then be compared to a trigger value of 4 grams per square metre per 30-days above background levels (4 g/m²/30-days) (Ministry for the Environment’s ‘Good Practice Guide for Assessing and Managing Dust’ (MfE 2016) for the duration of the construction works.

The results of deposition monitoring should be reviewed each month against site activities for the period coinciding with the monitoring. Where results are elevated (i.e., those that approach or exceed the above trigger value) then the potential causes will be investigated, and where possible additional control measures implemented to minimise ongoing emissions. This could include (but not be limited to) an increase in water application, using dust suppressants to increase the effectiveness of the water management, or reconsidering construction activities.

Directional dust deposition gauges in relation to monitoring downwind of identified wind turbines will be used. The methodology is set out in AS/NZS 3580.10.2:2013.

In relation to ecological receptors, where deposition on horizontal surfaces is more a concern, a traditional dust deposition gauge will be used. The methodology is set out in AS/NZS 3580.10.1:2016.

7.6 Dust Management Toolbox

The following dust management and mitigation measures will be undertaken as required to minimise overall dust emissions and nuisance.

7.6.1 Water Resources

The Project will have one surface water take authorised by Horizons as described in Table 3 below.

Table 3: Consent to take Water

<table>
<thead>
<tr>
<th>Resource Consent</th>
<th>Description of Authorised Activity</th>
<th>Instantaneous Take Rate Restriction</th>
<th>Daily Allocation</th>
<th>Annual Allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>TBC</td>
<td>To take xxm³ of water from the Manawatū River</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This consent will be utilised. Water will be withdrawn and made available for water carts by way of a pump system from the Manawatū River and will be pumped along the alignment and to three separate water reservoirs located for water trucks to access for dust control purposes.

Each reservoir will have the capacity to hold 3000 cubic meters of water. This allows the team to take the water from the Manawatū River at a slow and consistent rate, while having enough water for construction and dust control at the times when it is needed.

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7.6.2 Water Carts

Water carts or tankers will act as the primary method for controlling dust on site (Refer Photo 1 and 2). Water cart use will be focused in the dust risk zones described in Table 2 (Section 6.3). The number of carts required, and the frequency of watering will be determined by the Earthworks and Environmental Managers who will consider vehicle movements, weather conditions, and the proximity of the nearest sensitive receiver.

Photo 1: Water Cart in Operation
7.6.3 Surface Application of Dust Suppressants

Biodegradable dust suppressants may be used to protect the high-risk areas and be applied to surfaces where dust has been identified as a significant risk. The inert nature of these products makes them ideal as an environmentally friendly application. The decision as to whether a polymer stabiliser will be utilised rests with Construction and Environmental Managers.

Polymer stabilisers will not only be used to treat dust nuisance issues but also as a soil binder if it is deemed suitable. Polymers added to water can improve the efficiency and effectiveness of the water application for dust suppression on high risk haul roads that have the potential to cause significant dust concerns.

7.6.4 Hay Mulch Stabilisation

Hay mulch stabilisation will eliminate open areas as sources of dust. Hay mulch may also be used to stabilise finished areas adjacent to sensitive receivers or neighbours to mitigate as much dust nuisance as possible.

Hay mulch is only effective in low wind zones unless it is applied with a tacifier to reduce the likelihood of it being blown off before the area can be stabilised. It is noted that a large percentage of the route is a high wind zone.
7.6.5 Progressive stabilisation

Areas of work will be progressively stabilised, either temporary or permanently, including the rolling and finishing off areas as works progress. This helps to minimise the duration that areas could give rise to dust emissions impacting on sensitive locations.

7.6.6 Loading and Unloading of Materials

The drop height of material from the operation of diggers and loaders is to be minimised to reduce the potential for wind-blown dust. Digger and loader operators should be trained to ensure that the material being dropped from the digger/loader bucket is done as close as practicable to the truck or surface being loaded and not from an unnecessary height.

7.6.7 Top Soil Stockpile Management

Topsoil stockpiles will all be located as far from sensitive receptors as possible and the surface of the stockpile stabilised with grass seed and hay or straw mulch upon their completion. Topsoil stockpiles will also be constructed with a low profile wherever possible to reduce the height of the bund and thus further reduce the stockpiles ability to generate dust as it has a lower profile exposed to wind. Wherever practically possible stockpiles will not be positioned any closer than 100m from a dwelling house.

7.6.8 Entranceways

Stabilised entranceways will be constructed at all site entrances to minimise the tracking of material out of the construction areas and onto local roads where it would dry and become a source of dust. The standard of the construction for these entranceways is described in the Auckland Council Guideline Document 2016/005 Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region, June 2016 (GD05).

Portable water blasters and water carts will be available to wash the road adjacent to the entranceways in the event of construction vehicles tracking material onto either local roads or the State Highway. Road sweeper vehicles and sucker trucks will routinely maintain the roads around the site entrances in order to keep fine material accumulating on the road surface where vehicle movement might generate dust.

7.6.9 Restriction of Work

If wind conditions are severe enough, construction activities may need to be restricted or cease altogether in order to mitigate any potential dust issues when within 100 m of sensitive receivers. The decision to restrict or cease all work will be made by the Construction Manager and the Environmental Manager.

To assist in making the decision the following criteria shall be reviewed:

- Wind speed and direction currently prevailing (such as 10 m/s as an hourly average).
- The construction activity currently being performed, and the length of time that activity is to continue.
- The distance to the nearest sensitive receptor and the nature of their sensitivity (such as 200m of a dwelling, 100m of a wind turbine or sensitive ecological area).
- The presence of historical complaints and the outcome of investigations into those complaints.
- The existence of a current complaint.
- The mitigation measures currently being applied and the additional measures that might be utilised.
7.6.10 Sensitive Area Screening

As a contingency measure for sensitive locations within 50 m of potential dust sources and should monitoring (described in Section 7.5.5) indicate the need, wind break fencing could be erected between the sensitive location and the source to help further minimise dust impacts on the receptor.

7.6.11 Site Wide Communication of Dust Risk

On site delineation of the dust sensitive zones will be marked with Dust Risk signs (Refer Photo 3) to prompt and remind construction staff that they are operating in a sensitive area. Site wide text message warnings will be issued by the Environmental Manager to Project Engineers & Site Engineers, (including pavement crews) when environmental conditions reach a point where a dust nuisance is possible.

7.6.12 Complaints

Complaints may be received by one or more of the regulatory authorities, a member of the public, or a member of the Project team. It is the responsibility of the Environmental Manager to respond to and follow up all complaints relating to dust. The Environmental Manager is responsible for ensuring suitably qualified personnel are available to respond to complaints at all times including after hours and on weekends when complaints regarding dust could be received.

On call staff will be notified of the complaint via the Communications Manager acting in accordance with the complaint management procedures detailed in the Communications Management Plan. The on-call staff will respond by visiting the area in question and then implementing dust mitigation measures where it is deemed necessary and in accordance with direction from the Environmental Manager.

7.6.13 Weather Monitoring

The Environmental Manager will obtain daily forecasts and circulate to all Zone Managers and Project Engineers and other appropriate Project staff. Dust control measures will be prepared if dry, windy conditions are forecast.