



caring about you & your environment

Report 01.30

1 February 2001

File: Env 6/1/3

[Report 2001.Env0130.BR:mm]

Report to Environment Committee
from Brenda Rosser, Resource Technician

Dust Deposition on the Kapiti Coast

1. Purpose

To inform the Committee of the results of an investigation of dust deposition on the Kapiti Coast.

2. Background

The Wellington Regional Council has carried out dust deposition monitoring since September 1996. This monitoring has determined coastal background deposition rates on Wellington's southern coast; assessed the contribution of quarry dust to urban background levels in the Hutt Valley; and established background dust levels in the Hutt Valley.

Previous dust monitoring in New Zealand and Australia has indicated that normal urban background levels of 1-4 g/m²/30 days can be expected (*Discussion Document On Proposed Ambient Air Quality Guidelines*, Ministry for the Environment, June 1994). However, dust monitoring in the Taita area during 1996 and 1997 (see Report No. WRC/RINV-T98/02), and in the Hutt Valley during 1999 and 2000 indicated that, on average, the background levels were 5-6 g/m²/30 days. Elevated dust levels in the Hutt Valley were found to be a natural consequence of the geomorphological setting of the valley, and the Hutt River is an important source of particulate dust in the Hutt Valley.

Deposited particulate matter is the proportion of dust that settles out from the atmosphere under the influence of gravity, or as a result of frictional contact with surfaces. The size of airborne dust particle ranges from 0.001mm to 0.5mm in diameter. Particulate matter that settles out of the atmosphere tends to be larger and heavier dusts, generally larger than 0.02 mm, which are usually not considered to be a health hazard. Deposited particulate matter can, however, be a physical nuisance due to the soiling of surfaces.

The objective of this investigation was to determine background rates of particulate matter deposition in the Kapiti area.

3. Methodology

A monitoring network of 10 dust deposition gauges was established from Paekakariki to Otaki. Dust deposition monitoring on the Kapiti Coast was undertaken using horizontal deposit gauges (the method is outlined in the Draft International Standard ISO/DIS 4222.2). Deposition gauges were collected and replaced every 30 days. Monitoring was carried out from October 1999 to October 2000.

The deposition gauges were placed at sites that were not expected to be influenced by local dust generating activities (e.g. quarries).

4. Results

The results of dust deposition monitoring on the Kapiti Coast for the period from October 1999 to October 2000 are presented in the report “Kapiti Coast Dust Deposition Investigation” (Publication number: WRC/RI-T-00/41). Copies of this report are available for Councillors who would like a copy. The key findings of the report are:

- The average amount of dust deposited on the Kapiti Coast was 5.0 g/m²/30 days. However, the rate of dust deposition was quite variable, both through time and spatially. The average rate for Otaki was 5.4 g/m²/30 days, Waikanae was 6.0 g/m²/30 days, and the average value in the Paraparamu area was 3.3 g/m²/30 days.
- Variation in the rate of dust deposition throughout the year is apparent. Deposition rates were generally low (<5 g/m²/30 days) from January to April, and again from July to August. Elevated levels were experienced from October to December, and during May and June.
- The amount of dust deposited at a site was dependent upon on the climate. Higher rates of dust deposition occurred during the windier sampling periods. Stronger and more frequent winds provide a mechanism to entrain fine particles from sea and land surfaces, and to transport the particles throughout the region. A moderate negative linear correlation was exhibited between the number of calm days (where the maximum wind gust was 1 m/s or less) and the rate of dust deposition. This suggests that it is the presence or absence of wind that is important, rather than the specific wind speed or direction. No correlation was found between wind direction and the rate of dust deposition.
- The average amount of dust deposited in the Kapiti area for each sampling period exhibited a moderate positive linear correlation ($R^2 = 0.52$) with the amount of rain that fell during the same period. This positive relationship indicated that more dust was deposited during sampling periods that experienced greater rainfall as precipitation can act as a mechanism to deposit dust particles from the atmosphere. A similar positive relationship between

rainfall and dust deposition rates was observed in the Hutt Valley in 1999 (see Report No. WRC/RINV-T-99/12).

- The climate in the Kapiti area over the whole sampling period was characterised by moderate La Nina conditions that weakened during early spring. La Nina weather patterns are typically associated with anticyclonic conditions over the South Island bringing stronger winds from the northeast direction and weaker winds from the southwest. Rainfall was below the long term average for most of the year, although rainfall was above average from November 1999 to January 2000. Lower rates of dust deposition were experienced during periods with less wind and below average rainfall.
- The total amount of dust deposited can be divided up into the soluble and insoluble fractions. The insoluble fraction represents inorganic particles such as sand, silt and insoluble salts. The soluble fraction is made up predominantly of sea salt particles. None of the sites monitored showed a particular dominance of the soluble or insoluble fraction over the sampling period. Instead, the proportion of each varied throughout the year.
- There is a trend of increasing dust deposition rates nearer to the coast, with the highest rate of dust deposition measured near Te Horo Beach. This is probably the result of sand and salt particles being blown inland. The concentration of sea salt and the rate of formation of salt particles at the sea surface increases with wind speed. There was a moderate ($R^2=0.45$) positive linear correlation between the weight of the soluble fraction and wind speed at the Te Horo deposit gauge.
- There did not appear to be persistently elevated levels of dust at the sites situated beside major rivers. The Otaki Depot site, situated adjacent to the Otaki River, experienced a mean rate of dust deposition of $3.5 \text{ g/m}^2/30$ days over the sampling period, and the deposit gauge adjacent to the Waikanae River had a mean deposition rate of $4.9 \text{ g/m}^2/30$ days. The apparent minor effect of these substantial river systems on the rate of dust deposition is probably due to the unconfined nature of the lower part of the river valleys on the coastal plain. This is in contrast to the geomorphological setting of the Hutt River valley, which is confined between well defined topographic features for its entire length.

5. Conclusion

The mean dust deposition rate on the Kapiti Coast of $5.002 \text{ g/m}^2/30$ days is slightly higher than the expected background rate of $1-4 \text{ g/m}^2/30$ days, but it is not considered to be excessive due to the coastal plain/alluvial geomorphological setting.

6. **Implications**

The results of this investigation provide baseline information that can be used to assess the impacts of dust generating activities, either as part of a resource consent application, or in response to public complaints.

7. **Communications**

The findings of this report will be communicated to the public through a press release. Copies of the report will also be sent to Kapiti Coast District Council.

8. **Recommendation**

That the report be received and the contents noted.

Report prepared by:

Approved for submission:

BRENDA ROSSER
Resource Technician

JOHN SHERRIFF
Manager, Resource Investigations

JANE BRADBURY
Divisional Manager, Environment