5. Assessment of Effects

Introduction

Nature of the Discharge

5.1 Dust is primarily generated from wind blowing across surfaces containing coal particulates, most notably the coal stockpiles; and, to a lesser extent, from the road and yard areas particularly when vehicles are in use. Other activities that can also generate dust include the:

a. Unloading coal into the receival hopper from the wagons and from the gantry stacker;[1]

b. Stacking and removing coal onto the stockpiles using front-end loaders and shaping of stockpiles using bulldozers;[2]

c. Removing of coal from the stockpiles using a dozer and front-end loaders and placing in the load-out hoppers for conveyance to a ship;

d. Transporting coal on the conveyors; and

e. Transferring coal onto the ship.

5.2 The particles of coal that can be lifted by the wind are called total suspended particulates (TSP). The larger coal particles lifted by the wind tend to be deposited on the surfaces within a short distance (approximately 100 - 200 m) from the coal stockyard whereas the smaller (less than 20 microns in size) particles get carried further by the wind.

5.3 The very small particles coal dust particles can stay suspended in the atmosphere for significant periods and can be inhaled by humans and other animals, and therefore could potentially have health effects in sufficient concentrations.[3]

5.4 The dark black colour of particles means the coal dust is more visible when deposited on surfaces than many other forms of dust and therefore is more noticeable.

---

[1] But noting that coal is damp when delivered and therefore only small amounts of dust are generated during unloading and loading

[2] Two front-end loaders and a dozer are usually used during load-in and three front-end loaders and a dozer are usually used during load out. Therefore, on occasions up to five front-end loaders and two bulldozers may be in use if load-in and load-out is occurring simultaneously

[3] As illustrated in **Figure 4.8** (Chapter **4)**, the smaller, inhalable fraction of particulate matter includes particles that are 10 micrometres in diameter (PM_{10} known as 'coarse particles') and 2.5 micrometres in diameter ($PM_{2.5}$ known as 'fine particles')

Actual or Potential Effects

5.5 The actual and potential effects of the discharge of this coal dust to air on the receiving environment are discussed under the following sub-headings:

a. Effects on the community, particularly those residences shown in the area **Figure 4.4** (refer **Chapter 4**) i.e. properties off Gilmour Terrace, Randolph Terrace, and between Sumner Road and Reserve Terrace below the Timeball Station;

b. Physical and ecological effects within the coastal marine area;

c. Effects on marine avifauna and marine mammals; and

d. Effects on the terrestrial ecology in the vicinity of the coal stockyard.

5.6 Before discussing the effects of coal dust on those matters listed above, the positive (economic) effects of enabling the coal stockyard to continue to operate is first addressed.

5.7 The actual and potential effects of coal dust on Te Hapū o Ngāti Wheke is addressed in the report prepared by Dyanna Jolly attached in **Appendix 10** and will not be repeated here, noting the engagement process is outlined in **Chapter 7** of the AEE.

5.8 The effects of coal dust on recreationalists using Urumau Reserve or people viewing the coal stockyard and the Harbour from Windy Point is considered to be negligible and is not considered any further. This is because these are transient activities that will not be exposed to coal dust for any prolonged period.

5.9 There is no evidence to suggest there would be any impacts of coal dust on the Battery Point gun emplacements and it will not be considered further. The gun emplacements are upwind[4] of the coal stockyard, which is reflected in the monitoring data in the vicinity of emplacements[5] that shows low-levels of coal dust. Furthermore, no dust has informally been observed on the structures, and any dust that happened to land on the structures would be washed-off after rain.

[4] The prevailing wind is from the east

[5] See dust deposition monitoring site "17" in Figure 5.2 of the air quality assessment attached in **Appendix 6**. This gauge is proposed to be discontinued into the future

Positive Effects of the Coal Stockyard Operation Continuing

5.10 An assessment of the economic effects of the continued use of the coal stockyard has been prepared by Brown, Copeland & Co Ltd and is attached in **Appendix 5.**

5.11 The economic assessment firstly observes that merchandise trade, international cargo shipping and seaports are extremely important to the economic wellbeing of New Zealanders because the relatively small size of our population, labour force and economy limits the range of commodities that can be efficiently produced in New Zealand. LPC's export coal trade is part of the merchandise trade, upon which New Zealand is heavily reliant.

5.12 The report states that the coal stockyard operation is relevant to the economy of Christchurch City, the Canterbury region and the West Coast region. The economic benefits assessed for these respective communities identified in this report is based on an annual coal throughput of 1.25 million tonnes.

5.13 With respect to the Christchurch economy the assessment states that the continuation of the coal exports via Lyttelton would result in:

a. The retention of 89 FTE (full time equivalent) jobs;

b. The retention of $9.9 million per annum in wages and salaries; and

c. The retention of $7.8 million per annum in expenditure on other goods and services from local Christchurch businesses.

5.14 There are also indirect economic effects that flow from the above. These indirect effects are called the 'multiplier effects' and, in essence, are the economic benefits that accrue to various suppliers of goods and services to the companies and employers associated with the coal stockyard. The economic report states that the total direct and indirect economic effects to the city and wider region, assuming a multiplier of 1.75, would result in:

a. The retention of 156 FTE jobs;

b. The retention of $17.3 million per annum in wages and salaries; and

c. The retention of $13.7 million per annum in expenditure on other goods and services from local Christchurch businesses.

5.15 The assessment report notes that coal producers on the West Coast have stated that without the export of coal via Lyttelton Port the coal exports from the West Coast would cease. The two river ports at Greymouth and Westport are shallow and in any case are not accessible for larger vessels used in the export of coal. While small quantities of coal have been shipped by small conventional vessels and barges in the past, this option is not considered to be commercially viable.

5.16 The coal stockyard is therefore relevant to the West Coast region's economy, and the economic report states that the continuation of mining and the coal exports via Lyttelton would result in:

a. The retention of 290 FTE jobs;

b. The retention of $29.0 million per annum in wages and salaries; and

c. The retention of $95.2 million per annum in expenditure on other goods and services from local West Coat businesses (plus an additional $44.8 million per annum on expenditure in Christchurch businesses resulting as a result of mining operations).

5.17 The indirect economic effects that flow from the above would result in[6];

a. The retention of 592 FTE jobs;

b. The retention of $44.4 million per annum in wages and salaries; and

c. The retention of $120 million per annum in expenditure on other goods and services from local West Coat businesses (plus an additional $56.4 million per annum on expenditure in Christchurch businesses as a result of mining operations).

5.18 In addition to the economic benefits released from increased economic activity generally, there are also a number of other benefits associated with coal stockyard, which include:

a. Retention of people in the Buller District;[7]

b. The continued use of existing assets, including KiwiRail's Midland line;

c. Central Government Royalty payments in the order of $2.5 million dollars per year;

[6] Different multipliers have in this instance been used for employment, wages and salaries, and for expenditure
[7] For example, the mining company Bathhurst report that its Buller District workforce have 160 children enrolled at the local schools

d. Dividends to the Christchurch City Council; and

e. Funding assistance for various community organisations and projects in Christchurch and in the West Coast.

5.19 The economic assessment observes that the coal producing companies are a major user of the Midland Line and by contributing to its fixed costs helps sustain the Midland Line for freight and passenger services (including the Tranz Alpine service) to and from the West Coast.

5.20 The economic assessment concludes that the renewal of LPC's coal air discharge permit:

a. Will enable the residents and businesses of Christchurch, the Canterbury Regional and the West Coast to provide for their economic well-being;

b. Is consistent with "the efficient use and development of natural and physical resources"; and

c. Will provide opportunities for economic growth and employment.

Effects on the Community

Health Effects

5.21 In order to better understand the potential human health effects associated with coal dust on the community, Tonkin & Taylor (see **Appendix 6**) has in summary:

a. Used dispersion modelling to help identify the most suitable locations for the monitoring of potentially respirable coal dust (the PM_{10} and $PM_{2.5}$ fraction);

b. Ensured the primary monitoring site represents the worst case exposure;[8]

c. Selected a range of other sites to better understand the spatial differences in PM_{10} concentrations; and

d. Analysed the data that was continuously monitored over the last summer.

[8] Located off Gilmore Terrace just above the Timeball Station

5.22 Tonkin & Taylor observe that the results should be conservative because the monitoring period was much drier than usual and with a greater prevalence of north-easterly wind conditions.

5.23 The results of the monitoring need to be compared with the relevant guidelines/standards that are used in assessing whether human health is being protected. The criteria used are shown on **Table 5.1** and also superimposed on the graph in **Figure 5.1**.

5.24 The monitoring data, measured at the primary station located off Gilmore Terrace, show that the PM_{10} and $PM_{2.5}$ concentrations for total dust (including coal dust) are low relative to the corresponding guidelines/standards: concentrations are typically less than half the relative standard/guideline. Therefore, under these guidelines/standards human health from total dust concentration at this location should be protected.

Contaminant	Concentration (µg/m³)	Averaging period	Reference
PM_{10}	50	24-hour	NES_{AQ}[9]
	20	Annual	AAQG[10]
$PM_{2.5}$	25	24-hour	WHO[11]
	10	Annual	WHO

Table 5.1: Air quality criteria for the protection of human health. Source: Tonkin & Taylor

5.25 Of interest, there was also little relationship between the concentration levels recorded at the station and the amount of coal received into the coal stockyard over a given day, which indicates other contributions to the PM_{10} and $PM_{2.5}$ fraction are equally more important.

5.26 To get a better understanding of the contribution of coal dust emissions to total ambient PM_{10} and $PM_{2.5}$ concentrations, LPC also engaged the Institute of Geological and Nuclear Sciences Limited ('*GNS Science*') to carry out a composition analysis of the samples collected at the primary monitoring station off Gilmore Terrace. The report from GNS Science is appended to the air quality assessment contained in **Appendix 6**.

5.27 The analysis by GNS Science identifies six general source types of dust contributing to measured PM_{10} and $PM_{2.5}$ concentrations, as shown in **Figure 5.2**.

[9] NES_{AQ} is the ambient air quality standards set in the National Environmental Standards for Air Quality
[10] AAQG is the Ministry for the Environment (2002) National Ambient Air Quality Guidelines
[11] World Health Organisation (WHO) air quality guidelines

5.28 The pie charts show that the dominant source of dust particles are marine aerosols. These marine aerosols account for 40% of the total concentration of the PM_{10} size fraction and 33% of the total concentration of the $PM_{2.5}$ size fraction. The air quality assessment observes that the predominance of natural marine aerosols helps explain why overall PM_{10} and $PM_{2.5}$ concentrations are low when compared to the relevant standards and guidelines for PM_{10} and $PM_{2.5}$.

5.29 Coal dust contributes on average 29% of the measured concentrations of the PM_{10} size fraction but reduces to just 7% of the $PM_{2.5}$ size fraction, which was expected because coal particles are assumed to be relatively coarse. Conversely, combustion sources (motor vehicles and ship emissions) become more prevalent with the $PM_{2.5}$ size fraction.

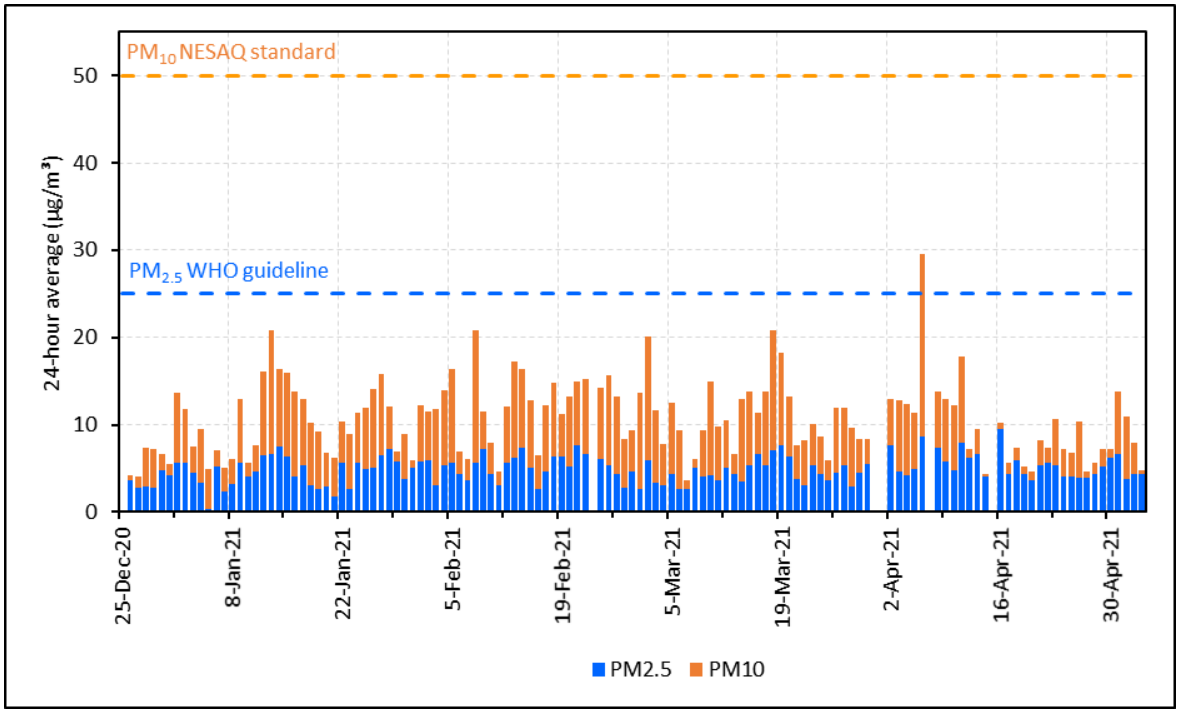

Figure 5.1: Measured 24-hour average $PM_{2.5}$ and PM_{10} for the monitoring period off Gilmore Terrace. Source: Tonkin & Taylor

5.30 The PM_{10} concentration at Gilmore Terrace was elevated on the 6 April 2021 as shown on **Figure 5.1**. The analysis work from GNS Science shows the elevated level was the result of marine aerosols. Marine aerosols are also thought to be responsible for elevated results recorded at Woolston.[12]

[12] Noting there was no coal was received at the coal stockyard on that day nor was the wind direction from the coal stockyard, with the exception of the last two hours of the day

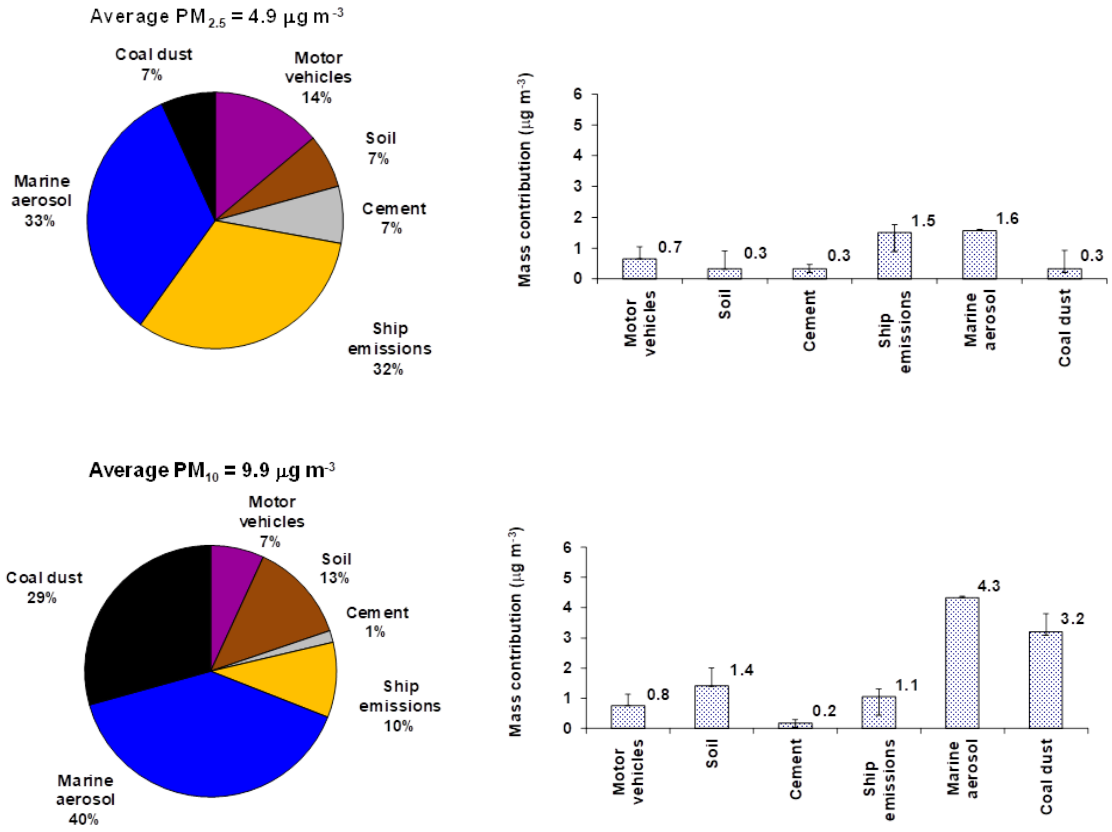

Figure 5.2: Average source contribution of PM_{10} (top) and $PM_{2.5}$ (bottom) at the primary monitoring station off Gilmore Terrace. Source: GNS Science

5.31 The Woolston site monitored by Environment Canterbury was more generally compared with summer monitoring undertaken for this consent at Lyttelton. The results show PM_{10} concentrations for the same period at Woolston were within the NES_{AQ} of 50 µg/m³, but are relatively higher than those measured at the Gilmore Terrace. The higher concentrations probably reflect the industrial nature of the Woolston site. Concentrations of $PM_{2.5}$ were similar.

5.32 During winter, however, the concentrations at the Woolston site were significantly higher with numerous recorded exceedances of the NES_{AQ} for PM_{10} and the WHO guideline for $PM_{2.5}$. These wintertime exceedances are mainly the results of domestic home heating emissions during the colder winter months. The results in this broader context indicates that the coal stockyard is not having a dramatic effect on PM_{10} and $PM_{2.5}$ concentrations.

5.33 The air quality assessment attached in **Appendix 6** then examines how the 1-hourly PM_{10} and $PM_{2.5}$ concentrations correlate with wind direction. The analysis indicates that some $PM_{10,}$ and to a lesser extent $PM_{2.5}$ is coming from the general direction of the coal stockyard,

although the wind strength did not correlate well with peak concentrations. In other words, peak concentrations occurred during relatively light winds, which are not typically associated with generating dust.

5.34 The Gilmore Terrace site and coal stockyard monitoring site, which are located each side of the coal stockyard, were also compared. Maximum 1-hour average PM_{10} concentrations were higher at the Gilmore Terrace site but not significantly so. The comparative results indicate that the coal stockyard operation (and other port activities) is only a minor contributor to the maximum 1-hour average PM_{10} concentration at Gilmore Terrace.

5.35 The air quality assessment concludes overall that the PM_{10} and $PM_{2.5}$ emissions from the coal stockyard will not result in concentrations that approach the relevant standards/guidelines for human health protection. The contribution of discharges from the coal stockyard to the PM_{10} and $PM_{2.5}$ concentrations, measured at the Gilmore Terrace station, is considered to be very small, if not negligible, which was selected as the potentially most impacted residential location. Accordingly, the potential for human health effects from coal dust are considered to be less than minor.

Nuisance Effects

5.36 In order to assess the effects of coal dust nuisance Tonkin & Taylor (again see **Appendix 6**) has carried out a FIDOL evaluation on the operation to date, and then assessed the potential for nuisance effects from ongoing operation of the coal stockyard, taking into account the mitigation and monitoring measures (see **Chapter 6**). A 'FIDOL' evaluation in summary examines the:

a. **F**requency - frequency of exposure to coal dust;

b. **I**ntensity – intensity of the impact;

c. **D**uration – how long a sensitive is exposed to coal dust;

d. **O**ffensiveness – how offensive is the coal dust; and

e. **L**ocation – degree of sensitivity of the location of the coal stock yard.

5.37 To assess the above FIDOL factors the previous dust deposition monitoring results have been reviewed together with complaints information.

5.38 The results generally show:

a. Maximum deposition rates at sensitive receptors typically occurred in years when coal imports were highest (from 2008 to 2012); and

b. Elevated deposition rates occurred between October to March.

5.39 The graph in **Figure 5.3** shows the comparative deposition rates between monitoring stations since 2008. The air quality assessment contains a map showing the location of the monitoring stations; but, of note, stations 10/10a[13] are located at 2 Reserve Terrace, stations 11/11a are located at 12 Gilmour Terrace and station 13/13a at 16 Gilmore Terrace.

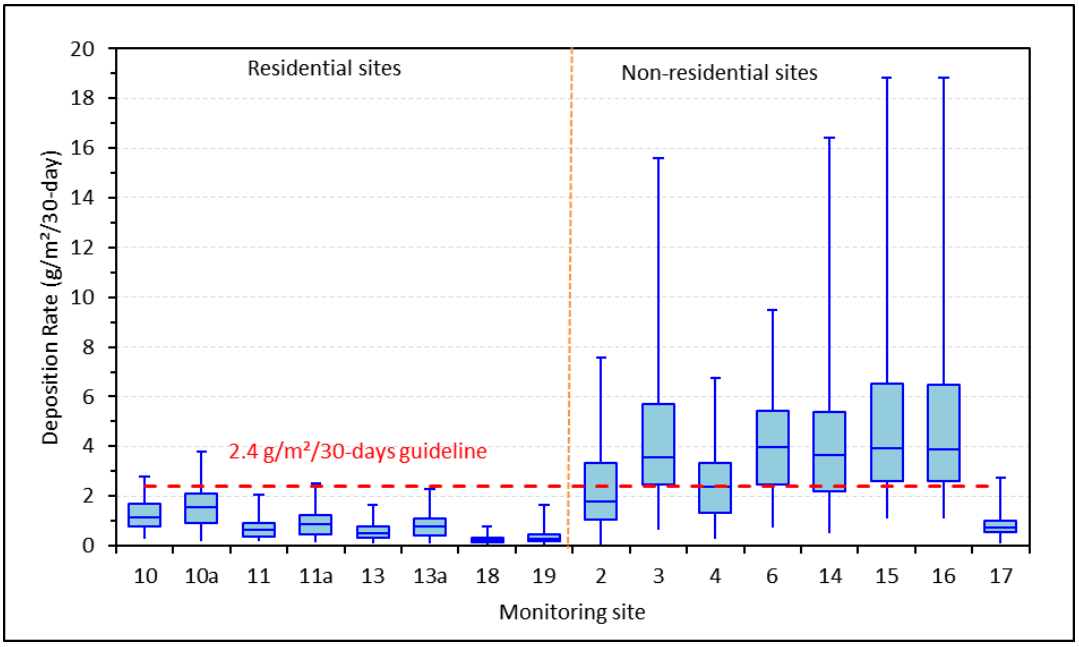

Figure 5.3: Box and whisker plot of coal deposition rates for the period 2008 to 2020. Source: Tonkin & Taylor

5.40 The red dashed-line represents a threshold from an earlier study that might give rise to complaint (2.4 g/m²/30-days or about ½ a teaspoon per m² per 30 days). This is also the imposed limit on the current conditions of consent (see **Appendix 2**).

5.41 As shown on the graph there have been exceedances at times, particularly at site 10a.[14] These exceedances were more frequent when annual throughputs of coal were much higher as shown in **Figure 5.4**.

[13] Stations 10a, 11a, and 13a are sampled every 15 days in accordance with the existing conditions consent
[14] The box represents the results that fall with the inter quartile range (IQR). Twenty five percent of results occur above and below the box and the upper whisker of the box plot is the largest number that is smaller than 1.5 x the IQR.

5.42 The complaints record appears to support the finding that complaints increase when deposition rates reached or exceeded 2.4 g/m²/30-days. The higher deposition rates also coincide with greater annual throughputs, and there were a greater number of complaints when throughputs were much higher.

5.43 However, the air quality assessment also observes that the level of complaint attributed to the coal stockyard are relatively low for an activity of this scale and proximity to a built up residential activity.

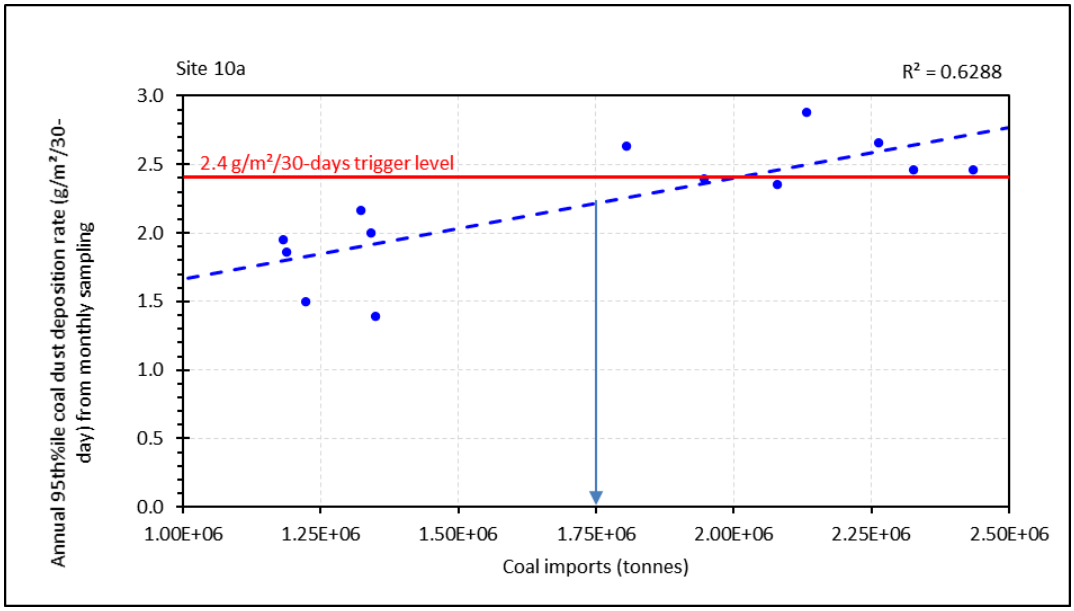

Figure 5.4: Relationship between coal imports and coal dust deposition rate for the most impacted residential site (Site 10a). Source: Tonkin & Taylor

5.44 The air quality assessment then performed the FIDOL evaluation and, after taking in all the factors into account, concludes that there has been a low to moderate potential for dust nuisance to occur: that is coal dust that could give rise to an offensive or objectionable effect.

5.45 The reasons for the conclusion in summary are:

a. The nature of coal stockyard operation, together with the meteorological conditions, can give rise to frequent dust impacts over the duration of the summer period in particular;

b. Given coal dust is dark black in colour, it is considered to be a particularly offensive form of dust; but

c. The moderately-large separation distance, and the presence of the spur, between the coal stockyard and the nearest residential receptors helps to minimise the intensity of coal dust impact (even if exposure can be frequent); and

d. The lower-intensity of impact is reflected in the depositional monitoring data and complaint records.[15]

5.46 Overall, the air quality assessment concludes that with the proposed implementation of the mitigation measures that are described in the air quality assessment and in **Chapter 6**, that the future adverse dust nuisance effects can be managed to a level that is 'less than minor'.

Physical and Ecological Effects within Coastal Marine Area

Introduction

5.47 In order to assess the effects of coal dust on the ecology of the coastal marine area, the Cawthron Institute[16] (see **Appendix 7**) has:

a. Estimated the amount of coal dust falling within the coastal marine area;

b. Estimated how the coal particles can disperse in the tidal currents to determine the extent of an area that may potentially be affected;

c. Examined the degree to which the coal particles might leach volatile hydrocarbons and metals or semi-metals into the seawater; and

d. Taking into account the above and the receiving environment involved, assess the potential ecological effects due to changes in physiochemistry of the seawater or the seafloor.

5.48 The Cawthron assessment assumes a deposition rate of coal dust onto the adjoining seawater that ranges from 112 mg/m^2/day up to 701 mg/m^2/day scenario and is used for calculating the effects on the seafloor sediment and seawater column.[17]

5.49 In reality, most of the coal particles do not settle immediately on the seafloor. Even the larger particles (200 µm) for example are estimated to travel for some 200m in a fast tide

[15] Accepting a significant increase in annual coal throughput appears to increase intensity levels
[16] The Cawthron Institute have extensive experience in this locality, preparing assessments and routinely carrying out monitoring work in the CMA
[17] These estimates are conservative because the dust deposition gauges are located on land that immediately adjoin the coal stockyard, and the high levels at gauge 22 were measured when quarry trucks were frequently passing by

while the small (75 µm) dust particles could travel up to approximately 6 km. Cawthron states that the majority of coal will settle on the seafloor within 1.5 km of the coal stockyard and this radius from the coal stockyard is considered to be the "area of interest" for its assessment work.

5.50 Given the amount of coal dust falling onto the seawater is small, the main issue is to determine whether the coal is potentially toxic and could affect the chemistry of the water column and the seafloor sediments within the area of interest (1.5km).

5.51 While coal consists approximately 85% carbon, the coal particles also contain various volatile organic compounds as well as a range of inorganic metals or semi-metals, including zinc, copper, lead, arsenic, nickel and so on.

5.52 With respect to the hydrocarbons, Cawthron has determined that the bioavailable fraction of polycyclic aromatic hydrocarbons (PAHs), for the deposition rates described earlier (112-701 mg/m$^{2/}$day), would be well under the relevant default guidelines[18] and this calculation is conservative given no dispersion by the currents has been factored in.

5.53 To see how easily the metals and semi-metals can leach (escape) into the seawater an 'elutriate' test in the laboratory was performed on a representative sample of coal particles. Even at the highest rates, the detectable toxicants (copper, manganese, and zinc) are two orders of magnitude below concentrations required for a 99% species protection level. Again, the results assume no dispersion with a seafloor concentration from 112 mg/L up to 701mg/L.

5.54 Cawthron notes that the above results are consistent with previous studies that show coal does not generally leach bioavailable levels of PAHs or trace metal. Furthermore, the concentrations presented are considered highly conservative given that at any moment coal will become dispersed rather than being restricted to a 1m^2 area of the seafloor for a day. Given the low seafloor concentrations estimated for hydrocarbons or metals then the water column toxicity would not be an issue.

5.55 The report then assesses the ecological risk using the above results. To do this, two approaches are used. The first approach[19] emphasises the potential risk to threatened habitats and taxa, whereas the second approach[20] focusses more on the likelihood of the

[18] Australian and New Zealand Guidelines for Fresh and Marine Water Quality, 2018
[19]EIAG 2018. Ecological Impact Assessment. EIANZ guidelines for use in New Zealand: terrestrial and freshwater ecosystems. 2nd edition, May 2018
[20] Burgman M 2005. Risks and decisions for conservation and environmental management. Cambridge. 504 p.

effect actually occurring. When considered in unison the two results can be complementary according to Cawthron.

5.56 In both cases there was predicted to be a very low risk of having a very low level of effect from the deposition of coal dust to the sea surface, within the immediate 1.5km area of interest. The report goes on to state, that given the potential direct effects are predicted to be less than minor then the potential indirect effects have not been considered further in this assessment.

5.57 The same conclusions apply to any changes to the seafloor. The report also acknowledges that the amount of dust deposited in the marine environment will reduce once the Stage 2 Reclamation in Te Awaparahi Bay is constructed.

Ecological Effects on Marine Avifauna

5.58 A desktop review of the effects on marine avifauna has been prepared by Boffa Miskell[21] and the report is attached in **Appendix 8**. The report firstly assesses whether there are any indirect effects on marine avifauna caused by a reduced food supply or by reduced foraging from visual foragers (shags, terns and little penguin) due to increased turbidity.

5.1 The report concludes that the magnitude of potential effects on marine avifauna food supply and foraging ability will be negligible. This conclusion is based on the Cawthron Institute's findings that any potential changes to coastal water physiochemistry (including turbidity) or changes to sediment physiochemistry would have a very low risk of having a low level of effect from the deposition of coal dust to the sea surface.

5.2 The report secondly assesses the potential for mortalities or disturbance on marine avifauna due to machinery or coal ship movements. For example, mortalities can occur for breeding birds if nests are established within areas where machinery movement occurs. Indirect disturbance may occur to birds through land and sea-based activities generally.

5.3 The report notes that there are penguins known to nest within the riprap along the coastal frontage edge of the coal stockyard. However, there has been no evidence of direct mortalities of penguins, nor other marine avifauna that may be roosting on the coastal edge.

5.4 In terms of potential disturbance, the continued presence of breeding penguins both along the coastal frontage edge of the coal yard and elsewhere around the Port, including other

[21]Boffa Miskell, like the Cawthron Institute, has extensive experience in this locality, preparing assessments and carrying out surveys of birds in the vicinity previously

species, indicates that the birds are able to persist in the presence of the operating land- and sea-based port activities.

5.5 The report concludes that there should be no direct mortalities of marine avifauna mortalities into the future, assuming port operations and vessel traffic continue at a similar level. Furthermore, in terms of the operational disturbance, the magnitude of any potential effects is considered to be negligible.

Ecological Effects on Marine Mammals

5.6 No expert assessment has been carried out on the actual or potential effects on marine mammals. As for marine avifauna, it is reasonable to conclude there would be no material loss of food supply for dolphins or seals (based on the findings of the Cawthron Institute) because the magnitude of effects on the marine ecology generally has been assessed as negligible.

Effects on Terrestrial Ecology

5.7 Tonkin & Taylor has assessed the effects of coal dust on species and communities that reside on land in the vicinity of the coal stockyard (see **Appendix 9**). The area is located within the Port Hills Ecological District of the Banks Ecological Region. The report observes that the surrounding area in general has high ecological values as there are multiple 'Threatened' and 'At risk' plant, lizard, bird and invertebrate species present.

5.8 The report notes from the literature that large volumes of dust (greater than 1.0 g/m2/day) can potentially affect the physiological processes of plants. However, the highest monthly recording of dust on the landward side of the coal stockyard was on average 0.6 g/m2/day, which is still well below the threshold indicated in the research that could cause negative physiological effects on plants. Other monitoring stations had lesser recorded amounts.

5.9 The visual assessment of vegetation along Sumner Road indicated that dust effects on vegetation was negligible as there was no obvious dust accumulation on the leaves of understorey species or within the rank exotic grasses. Although there was no access to old Sumner Road, vegetation health along the native/exotic scrub that buffered the coal stockyard also appeared to be in good condition.

5.10 The assessment considers that with continuing dust management at the coal stockyard, the effects on the surrounding plant communities to be low or very low and the same conclusion applies to fauna that might reside in the vicinity.

5.11 Finally, the amount of coal dust that could settle on the pines within Urumau Reserve was examined to see whether an elevated fire risk might result. The coal dust deposition rate, during a worst-case month, ranges between 2 and 6.5 g/m². The upper amount is equivalent to about a teaspoon of coal dust. The highest level of coal deposition in the vicinity of the pine plantation over the entire monitoring period was approximately 19 g/m2/month - or about 4 teaspoons of coal dust. This amount of coal dust is considered negligible relative to the dry biomass under the trees. Fire and Emergency New Zealand were contacted and confirmed that there should be no increase in risk compared to that present from the pine forest.[22]

[22] Pers Comm. Wayne Hamilton (Fire Investigation Officer, FENZ)