Before the Hearing Commissioners
Appointed by Canterbury Regional Council and Selwyn District Council

Under	The Resource Management Act 1991
In the matter of	an application by Southern Screenworks Limited for land use consents and discharge permits associated with the extension of, and changes to, existing quarry operations at 50 Bealey Road, Kirwee

Statement of evidence of Jeffrey George Bluett

31 March 2025

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Qualifications and experience

1 My full name is Jeffrey George Bluett. I have a BSc in Chemistry (Otago University 1984) and a MSc (First Class Hons) in meteorology (Lincoln University 1997). I am currently employed by Pattle Delamore Partners Limited as a Technical Director – Air Quality and have held that position since 2019.

2 I am a life member and Fellow of the Clean Air Society of Australia and New Zealand (CASANZ). Within CASANZ, I currently hold or have held the following positions: Society Vice President (2019 to present), New Zealand Branch President (2018 to 2019), Society Council Member (2014 to present), New Zealand Branch Secretary (2014-18), and Transport Special Interest Group deputy chair (2009 to 2014). I was awarded CASANZ's distinguished service medal in 2013.

3 I have over 25 years' experience in the field of air quality and have authored, or co-authored, approximately 100 reports and peer reviewed papers in respect of transport, industrial, domestic and agricultural emissions to air. In relation to monitoring and assessing the impacts of quarry dust, my recent projects have included leading:

(a) Environment Canterbury's review of the Management of Dust Discharged from Quarries[1];

(b) The construction dust section of CASANZ's *Good Practice Guide for the Assessment and Management of Air Pollution from Road Transport Projects*[2].

(c) The Council review of five quarry air discharge consent applications for Canterbury Regional Council (CRC);

(d) The air quality assessments and air quality monitoring programmes for three quarry developments in Yaldhurst, Rangiora and Motueka;

(e) The assessment of the impacts of dust discharged from two large and adjacent North Island limestone quarries; and

(f) A research project for the New Zealand Transport Agency on understanding the effects of dust discharged from un-sealed public roads.

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[1] Literature Review: Regulatory best practice for quarry dust management in New Zealand. PDP report number C04881800R001. 6 March 2024.

[2] Good Practice Guide for the Assessment and Management of Air Pollution from Road Transport Projects. CASANZ Technical Report 2023.

4 My technical skills and experience directly relevant to my evidence include:

(a) Quarry operations;

(b) Generation of dust;

(c) Dispersion of dust;

(d) Deposition and impacts of dust;

(e) Mitigating dust emissions; and

(f) Meteorology and dust monitoring.

5 My role in relation to Southern Screenworks Limited (**Southern Screenworks**) application to extend the existing quarry at 50 Bealey Road, Kirwee (**Application** and **Site**) has been to provide advice in relation to air quality. I drafted the Aylesbury Quarry Extension: Dust Impact Assessment report to the Assessment of Environment Effects (**AEE**) accompanying the Application, which appears at Appendix D of the AEE. I also drafted the responses to the RMA section 92 request for further information issued by CRC and the site's draft Dust Management and Monitoring Plan (DMMP) which is attached to my evidence as **Appendix A**.

6 In preparing this statement of evidence I have considered the following documents:

(a) the AEE accompanying the Application;

(b) submissions relevant to my area of expertise;

(c) the statements of evidence of Mr Alan King, Ms Sarah Bonnington, Ms Naomi Crawford, Mr Victor Mthamo and Mr Kevin Bligh; and,

(d) CRC and Selwyn District Council (SDC) section 42A reports.

7 I visited the Application Site on 19 February 2025. The purpose of my site visit included becoming familiar with the current extraction screening, crushing, stockpiling, material handling and rehabilitation processes. I also drove around the boundary of the proposed extension to better understand the receiving environment and identify the location and nature of the potentially sensitive receptors. I spent some time focusing on the wind and dust monitoring site and equipment to enable me to better interpret the data which the site is producing.

8 I attended the pre-hearing meeting with submitters held on 11 March.

Code of Conduct for Expert Witnesses

9 While this is not a hearing before the Environment Court, I confirm that I have read the Code of Conduct for expert witnesses contained in the Environment Court of New Zealand Practice Note 2023 and that I have complied with it when preparing my evidence. Other than when I state I am relying on the advice of another person, this evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

Scope of evidence

10 I have prepared evidence in relation to:

(a) the proposed activity;

(b) the existing environment that applies to the Application Site with regard to air quality;

(c) the key findings of my assessment of effects;

(i) type of dust discharged from the proposed activity

(ii) sources of dust from the proposed activity;

(iii) potential effects of dust;

(iv) mitigation of the potential effects of discharges of dust;

(v) monitoring of dust and wind;

(vi) generator exhaust emissions and potential effects

(vii) assessment of the potential effects of the discharge of dust and generator exhaust emissions from this activity on the environment;

(d) matters raised by submitters to the Application;

(e) matters raised in the CRC and SDC staff reports (issued under s42A of the RMA); and,

(f) proposed conditions of consent.

Executive summary

11 The proposed extension of the Aylesbury Quarry will generally involve a continuation of current quarrying operations and processes, although on adjacent land. Aggregate extraction and processing rates, and heavy vehicle movements, are expected to remain generally consistent with the current activity. Quarrying will

be undertaken in stages, to a depth of up to 10 m below existing ground level. Extraction activities will occur in sub-stages with progressive rehabilitation undertaken. An active working quarry area (i.e. the open unconsolidated area) across both the extension area and the existing quarry will be no more than approximately 6 ha at one time.

12 The receiving environment is rural in nature, with only five dwellings within 250 m of the extension site. Data from the Darfield weather station (2011 to 2015) shows windspeeds for strong winds, i.e. over 5 m/s occur 30% of the time, and windspeeds over 7.5 m/s occur 10% of the time. These winds are primarily from the northerly to north-westerly direction. On site wind monitoring data (February 2024 to February 2025) demonstrates a lower frequency of strong winds, a reduced frequency of northerlies and nor west winds and a higher frequency of southwest winds. I have based my assessment on the Darfield data and consider that to be a conservative approach.

13 The main discharge to air from the site will be particulate matter (dust), including a fraction that is ten microns or smaller (PM_{10}) and 2.5 microns or smaller ($PM_{2.5}$) and a respirable fraction that contains crystalline silica (RSC). Based on previous studies I am aware of, the amount of $PM_{2.5}$ generated by quarry activities is very low.

14 The main potential air quality effect associated with the quarry is dust nuisance and potential human health effects from the fine fraction of dust. I have undertaken a FIDOL assessment (frequency, intensity, duration, offensiveness and location of impacts) informed by a review of wind and dust monitoring data and complaints records. Based on that assessment, I consider that the risk of any noxious, dangerous, objectionable, or offensive effects from the proposed activities at or beyond the boundary of the site extension is low at the five residences to the south and west of the site and for SH73 to the north, and will be negligible at all other locations.

15 I have proposed an extensive range of dust mitigation and monitoring measures, to be captured in a Dust Management and Monitoring Plan (DMMP), which builds on existing site management practices such as dust suppression. I have identified routine measures alongside additional measures (Tier 1 and Tier 2) that are proposed to apply in stronger winds. This includes two on-site dust monitoring instruments, including one which is mobile and can be placed between the dust source and downwind sensitive receptors. Together with the separation distances for the nearby properties that have been volunteered by Southern Screenworks, these dust management and monitoring measures will further reduce the risk of any adverse dust impacts.

16 I expect up to 1.85 ha of the active working quarry area will require active dust suppression. I have calculated the amount of water required to adequately suppress dust over that area. Southern Screenworks has sufficient access to water (via storage tanks and a permitted activity take) to undertake adequate dust suppression 97% of the year. Dust suppressions or stop work measures will be sufficient to cover the remaining 3% (i.e., 5 days) of the year.

17 Given the FIDOL assessment, proposed setbacks and proposed dust mitigation measures, I consider that the risk of adverse amenity effects related to dust at or beyond the boundary of the site is very low. The analysis of the on-site PM_{10} data supports this conclusion.

18 The analysis of on-site PM_{10} data also supports a conclusion that downwind concentrations of both PM_{10} and RCS will be well below the relevant health impact assessment criteria. I have also assessed the potential human health effects of PM_{10} and RCS using the Mote study data and have reached a parallel conclusion that the off-site concentrations of these two pollutants are not expected to approach or exceed relevant human health guidelines or the NESAQ.

19 In terms of emissions from the diesel generator, in my opinion pollutant concentrations will also be well below the respective health impact guidelines.

Proposed activity

20 Southern Screenworks is proposing to expand its quarrying operations into an area of approximately 66 ha of land adjacent to its existing operation at Aylesbury Quarry. The proposal is to quarry to a depth of up to 10 m below existing ground level. The activities at the site extension will be a continuation of the processes that have been used to develop the existing Aylesbury Quarry. I have assumed that the processes used in the extension are identical to those used in the existing quarry, although cleanfilling is not proposed in the extension (other than the potential use of overburden and clean imported topsoil as a final rehabilitation layer), and only the location of dust sources will change.

21 The quarrying operations are undertaken in stages as the quarry develops. A staging plan is attached to the evidence of Ms Sarah Bonnington and extraction activities are proposed to be undertaken in sub-stages within those stages, with progressive rehabilitation undertaken so that an active working quarry area across both the extension area (i.e. the open unconsolidated area) and the existing quarry will be no more than approx. 6 ha at one time, of which it is expected up to 1.85 ha will require active dust suppression. The active working quarry area shall comprise the following:

(a) Working extraction faces and adjacent operational areas;

(b) Active areas of rehabilitation;

(c) Stockpiling and load out areas;

(d) Areas where aggregate processing takes place; and,

(e) Unsealed quarry haul roads.

22 It is proposed to quarry the entire area identified, except for boundary setbacks and setback distances from the residential properties at 23, 137 and 153 Bealey Road, which has been discussed with respective residents of those properties. The quarrying process is expected to take more than 30 years.

23 Aggregate extraction and processing rates are expected to remain generally consistent with current volumes and within the truck movements provided for by the existing extraction volume.

24 Aggregate processing will occur throughout the year between the hours of 7 am to 6 pm Monday to Friday. During Stage 1 and the initial part of Stage 2 of the extension, the extracted material will be transported to the existing processing area located within the existing quarry, and will be processed, stockpiled then transported offsite via trucks and truck and trailers from the existing heavy vehicle access. As quarrying progresses, processing will also occur within some parts of the extension area.

25 Handling[3] rates will be a maximum of 100 tonnes per hour which is the capacity of Southern Screenworks' current processing plant and also the rate referred to as a permitted activity by Rule 7.35 of the Canterbury Air Regional Plan (CARP).

26 The screening and crushing plant operated by Southern Screenworks in the Aylesbury quarry is powered by electricity which is supplied by a diesel-powered generator which discharges products of combustion.

Existing environment

27 The surrounding area is rural in nature and is generally surrounded by farming activities with a low density of dwellings. The site and surrounding area are zoned 'Rural Outer Plains' under the operative Selwyn District Plan and General Rural (GRUZ) under the Partially Operative Selwyn District Plan – Appeals Version (POSDP). The Midland Railway line and State Highway 73 is beyond the northern site boundary while Bealey Road runs along the southern site boundary. Sensitive

[3] means extraction, quarrying, mining, processing, screening, conveying, blasting, or crushing of any material.

receptors, in this case residential dwellings, identified from a desktop review and the site visit are shown in **Figure 1**.

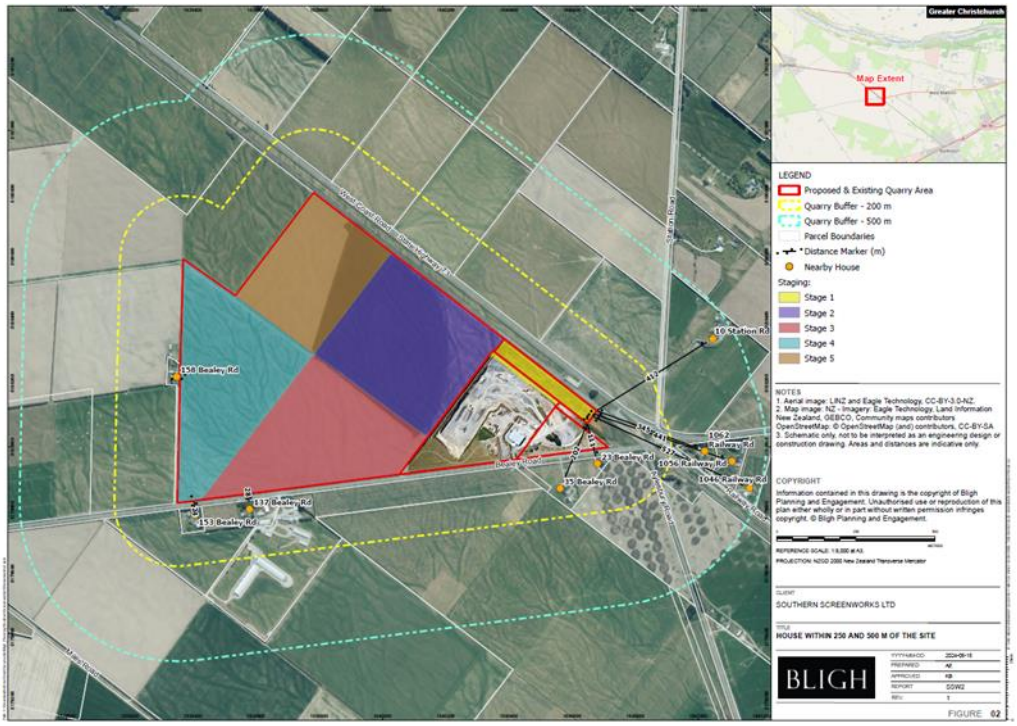

Figure 1. Location of Sensitive Receptors (Source: Bligh).

28 In some situations, dust can be mobilised when windspeeds are over 5 m/s. High-risk dust conditions occur when windspeeds are over 7.5 m/s.

29 A windrose showing the data collected at the Darfield weather station between 2011-2015 and used in the AEE is shown in **Figure 2**. The Darfield weather station is the closest location in the national climate network to the Southern Screenworks site. Unfortunately, the site stopped monitoring in 2015 and more recent data is not available. At the Darfield weather station site over the period 2011-2015, windspeeds over 5 m/s occur 30% of the time, and windspeeds over 7.5 m/s occur 10% of the time. These winds are primarily from the northerly to north-westerly direction.

30 Windspeed and wind direction has been recorded on site over the period February 2024 to February 2025. The windrose from this data set is shown in **Figure 5**. There are significant differences between Darfield and on-site data. The key differences between the Darfield and onsite data are:

(a) Less frequent northerlies and less frequent nor-westerlies (lower frequency exposure for receptors on Bealey Road);

(b) Greater frequency of SW (no sensitive receptors downwind in that direction);

(c) Slightly higher frequency of north-easterlies – (exposure at 137 Bealey increases);

(d) Lower frequency of windspeeds over 5 m/s (19% vs 30%); and,

(e) Lower frequency of windspeeds over 7.5 m/s (3% vs 10%).

31 On-site wind direction and windspeed measurements indicate that the frequency and intensity of dust exposure is likely be lower than those suggested in the assessment submitted with the consent application using the Darfield data.

32 It would have been ideal to have Darfield data for the same period as we have on-site data. However, the 2024-2025 data is not available from Darfield. The next closest site available with that time period of data is Lincoln Broadfield EWS (station number 17603) located 21 km to the southeast of the Southern Screenworks site. The windrose from Lincoln Broadfield for February 2024 to February 2025 is shown in

33 **Figure** 4, The comparison of the onsite and Lincoln windroses shows a similar low frequency of northerly and nor-west winds compared to the Darfield data. In my view this demonstrates that the on-site wind data is more likely to represent an accurate picture of potential dust risk than the Darfield data presented in the AEE.

34 It is my opinion that the Darfield data presents a conservative (higher dust risk) than on site wind monitoring shows.

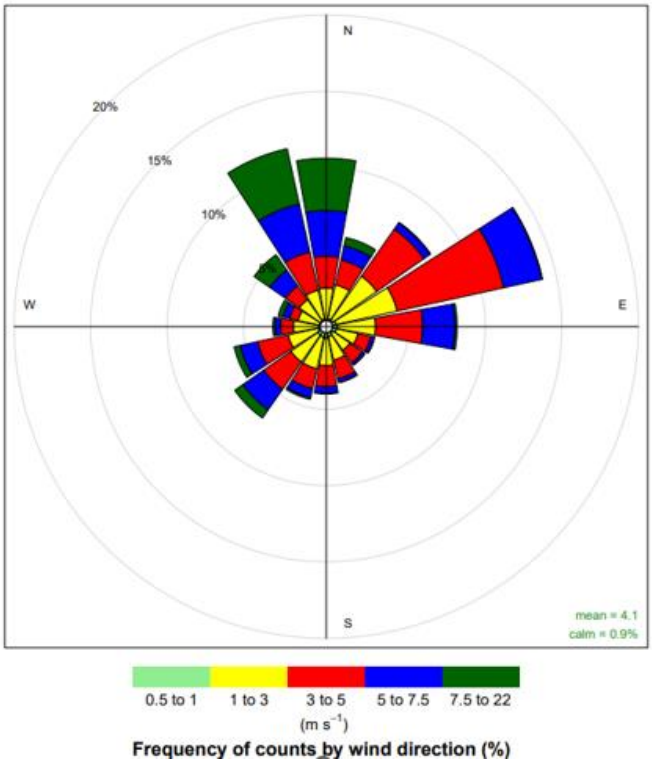

Figure 2: Windrose - Darfield Weather Station: 2011-2015

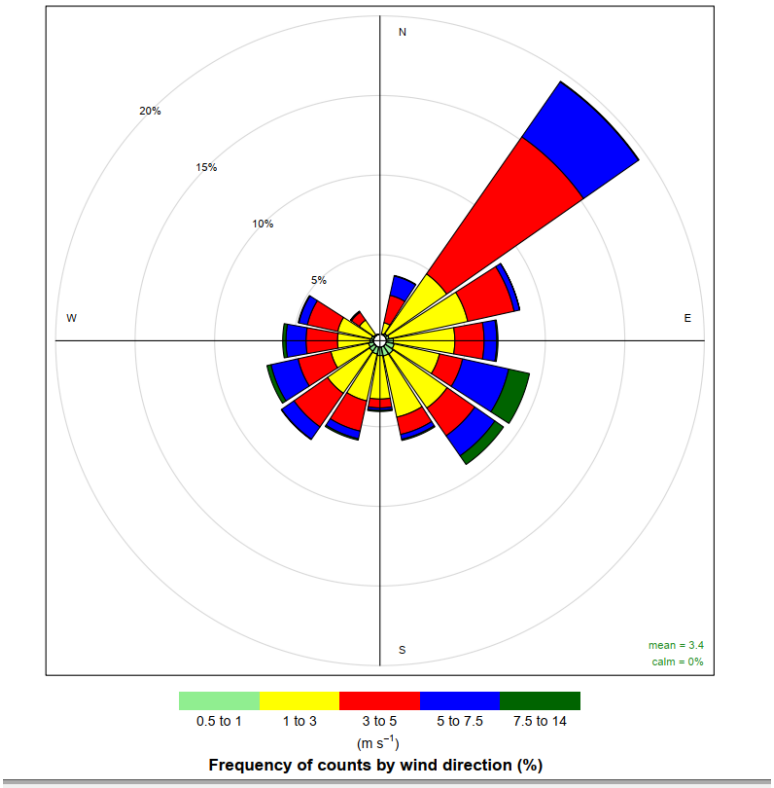

Figure 3: Windrose – Southern Screenworks February 2024 to February 2025.

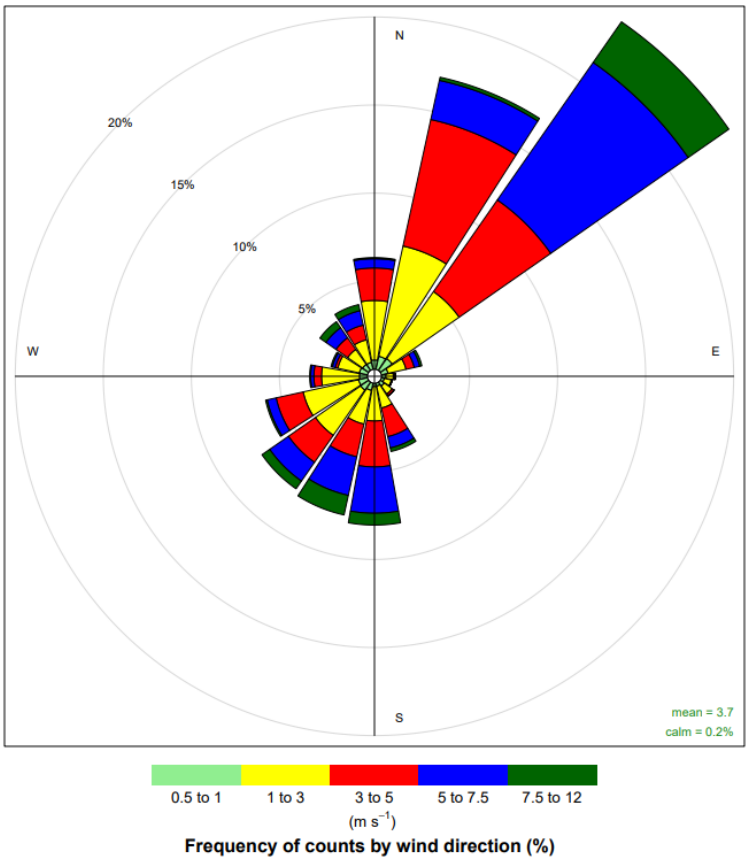

Figure 4: Windrose – Lincoln Broadfields February 2024 to February 2025.

Types of dust discharged from the proposed activity

35 Dust is generally categorised by particle size (defined by the aerodynamic diameter of particles) as follows:

(a) Deposited dust – PM of generally greater than 30 µm in diameter. This coarse size fraction falls out of suspension in the air relatively rapidly and deposits on exposed surfaces, generally within 100 m of the source. The bulk of dust emissions from handling and storage of gravel will be comprised of this fraction.

(b) Total suspended particulates (TSP) – PM of generally less than 30 µm in diameter. PM of this size fraction remains suspended in the air for a longer time and therefore has the potential to travel further than larger fractions. TSP (particularly the coarse fractions larger than 10 µm) have the potential to affect visibility.

(c) Fine inhalable or respirable fractions of TSP such as PM_{10} can penetrate the nose or mouth under normal breathing conditions. PM_{10} is currently the

mandated indicator of the potential for health effects of PM in New Zealand. However internationally $PM_{2.5}$ is accepted as having a stronger association with adverse health effects than PM_{10}.

36 The emissions or potential health impacts of $PM_{2.5}$ have not been considered in any detail in my assessment or evidence. This is because the amount of $PM_{2.5}$ generated by quarry activities is very low. The Mote study PM2.5 monitoring demonstrated that concentrations were largely unaffected by quarry activities.

37 Each of these types of dust could be discharged from various aspects of the proposed activity, as illustrated in the following section.

Sources and characteristics of dust discharged from the proposed activity

38 The Site's key dust sources and the type of dust potentially discharged from each aspect of the proposed activity (including their size) are detailed in Table 1:

Table 1: Sources and characteristics of dust

Source	Description	Dust type	Relative size of dust source
Development of site	Removal and stockpiling of overburden. Construction of bunds	Soil dust. Mainly deposited dust or TSP with a small component of PM_{10}.	Medium
Excavation of gravel	Disturbance of material being extracted from the ground will generate dust.	Grey gravel dust. Mainly deposited dust or TSP with a small component of PM_{10}.	Medium
Vehicle movements	Dust generated by vehicles traversing Site access road and moving over other unsealed surfaces.	Grey road dust. Mainly deposited dust or TSP with a small component of PM_{10}.	Large
Disturbing stockpiles	The deposition and removal of materials from stockpiles will generate dust.	Grey gravel dust. Mainly deposited dust or TSP with a small component of PM_{10}.	Medium

Table 1: Sources and characteristics of dust

Source	Description	Dust type	Relative size of dust source
Stockpiles	Higher speed winds passing over stockpiles can generate dust.	Grey gravel dust. Mainly deposited dust or TSP with a small component of PM_{10}.	Small
Site rehabilitation	Disturbance of material being used for site rehabilitation will generate dust.	Soil dust. Mainly deposited dust or TSP with a small component of PM10	Medium

39 At this point in my evidence, I consider it useful to make a qualitative comparison of particulate emissions discharged from the current and proposed activities. In my opinion the particulate emissions from the proposed extension of the quarry will not increase appreciably, nor will there be a significant increase in concentrations of PM10. The reasons for this include:

(a) the maximum extraction and processing rates are not changing;

(b) the active quarry area will not increase to any large degree;

(c) the dust mitigation strategy will have additional tools included and become more effective with the impact of real-time wind and dust monitoring.

Potential effects of dust

40 Particulate emissions have the potential to cause nuisance beyond the site boundary. Dust nuisance is caused where dust has impacts on amenity values. Annoyance to neighbours may occur from soiling of property such as windows, houses, cars, and washing hung out to dry. The degree of amenity effects tends to increase with darker colours of dust. For example, coal dust is considered more offensive than grey aggregate dust. For most people, the major effect of nuisance dust is the increased requirement for cleaning.

41 Human health effects can occur from exposure to PM_{10} and smaller size fractions of particulate matter such as $PM_{2.5}$. The gravels extracted from the site may contain trace amounts of crystalline quartz silica, which has been classified by IARC as (Group I) carcinogenic to humans when inhaled. Prolonged or repeated inhalation of respirable crystalline silica (RCS) can also cause a lung disorder, silicosis. While

the gravels will contain crystalline quartz silica, most of the material is bound into larger particle of rock which cannot be inhaled.

42 RCS is sometimes considered in detail for large scale quarries or areas with multiple quarries, when they are crushing and screening large volumes of gravel close to sensitive receptors. This is not the case for the Southern Screenworks Quarry which proposes to operate at the same handling limit as set out in the permitted activity rule 7.35 of the CARP. CRC undertook an RCS monitoring programme[4] at the Yaldhurst quarry zone which showed that health impacts were unlikely to occur as a result of quarry dust emissions. I have referred to this study in my assessment of health effects set out at paragraphs 97 to 102.

Management of Dust (1) - Monitoring of dust and wind

43 The site currently has a comprehensive wind and dust monitoring programme. This includes real-time instrumental wind measurements, regular and scheduled visual dust monitoring and real-time instrumental dust. This wind and dust monitoring programme will be continued and expanded if the quarry extension is granted.

44 A meteorological station that measures wind direction, wind speed, temperature and relative humidity is installed and operational onsite. **Figure 3** shows a photograph of the wind monitoring station. **Figure 4** shows a map indicating the location of the wind monitoring station mast. The location of the meteorological station is, as far as practical, consistent with the AS/NZS 3580.1.1:2016.

45 Visual monitoring of dust is undertaken to assess the level of dust emissions on the site and beyond its boundary. All staff are required to continuously visually monitor activities to identify dust events. The visual monitoring:

(a) Identifies source(s) of dust (e.g. from heavy machinery, stockpiles, earthworks or material disturbance, etc.);

(b) Identifies any areas of deposited dust from the site on surrounding roads and properties;

(c) Assess the extent and direction of any dust plumes (e.g. within boundary, cross-boundary, or covering a large extent);

(d) Identifies receptors potentially impacted by the plume (e.g. properties downwind to the northeast);

[4] Mote 2018. Yaldhurst Air Quality Monitoring - Summary Report: 22 December – 21 April 2018. Report prepared for Environment Canterbury by Mote Limited. 19 June 2018

(e) Assesses offensiveness as high, medium, or low; and

(f) Assesses overall impact as high, medium, or low.

46 Continuous monitoring is currently undertaken using a MetOne ES-642 monitor installed by Mote[5] in February 2024 at the site. The monitor installation and operation is in accordance with AS/NZS 3580.1.1:2016 Australian/New Zealand "Standard Methods for sampling and analysis of ambient air Part 1.1: Guide to siting air monitoring equipment". The monitor provides real-time PM_{10} data each minute, and sends an alert to the site Environmental Manager when concentrations exceed the predetermined trigger levels.

47 The monitor is located approximately in the centre of the current quarry site. **Figure 3** shows a photograph of the permanent dust and wind monitoring station. **Figure 4** shows a map indicating the location of the permanent dust and wind monitoring station mast.

48 Southern Screenworks propose that a second dust monitor will be operated between the active quarry area and the residential houses located on Bealey Road opposite the southern site boundary when quarrying is occurring within 250 m of any residential unit. **Figure 4** shows a map indicating the target monitoring zone for the second dust monitor as the blue outlined white rectangle.

49 The current dust monitor is centrally located and is well placed to capture the impacts of dust generated within the current footprint of the quarry which includes the dust sources of aggregate extraction, processing stockpiling and clean filling. As the quarry expands, the source of dust extraction will move and, at some stages of the quarry development, will get to within 200 m of the sensitive receptor located at 23 Bealey Road (in Stage 1) and 158 Bealey Road (in Stage 4 – although written approval has been obtained in relation to this property). The duration of extraction within 200m of 23 Bealey Road will likely be less than 6 months and extraction will not come closer than 150 m.

50 The second dust monitor will be mobile and relocated to capture the maximum impact of any dust generated by aggregate extraction on the close by sensitive receptors. In summary, the two dust monitors will work in tandem to inform the site's dust management strategy. The permanent monitor will provide the dust impact data from the processing, stockpiling and clean filling activities and the mobile monitor will provide dust impact data from the extraction activity.

[5] https://mote.io/

Figure 5. Photograph of the permanent dust and wind monitoring station mast

Figure 6 Map indicating the location of the permanent dust and wind monitoring station and the indicative target monitoring zones for the second dust monitor.

Management of Dust (2) - Mitigation of dust during operational hours

51 Dust prevention on site uses a three-tiered approach: Routine, Tier 1 and Tier 2.

52 Routine controls must be employed throughout the operation of the site, regardless of dust emissions. Routine controls reflect accepted good practice and include the mandatory consent condition requirements. They are expected to control dust to achieve the requirements of the consents for the majority of the time.

53 Tier 1 and 2 are additional controls that must be applied when certain triggers are met. Tier 1 and 2 dust control measures will most likely be required when dry and windy conditions exist, the quarry activity level is high and the activity is occurring within 250 m of a sensitive receptor.

54 Tier 1 controls are additional measures which must be implemented in addition to routine controls. Tier 1 controls will be implemented in the following circumstances:

(a) When wind or dust measurements exceed Tier 1 triggers. Tier 1 dust and wind alerts will be sent to the site manager from the monitoring system by text and email.

(b) The site manager sees plumes of dust arising from a dust source within the site; or

(c) A complaint is received in relation to dust generated from a dust source within the site.

55 Tier 2 controls are measures that are employed when wind or dust measurements exceed Tier 2 triggers. Tier 2 dust and wind alerts will be sent to the site manager from the monitoring system by text and email. Tier 2 controls will also be implemented when Tier 1 controls are in place and there are still visible plumes or a complaint has been made.

56 The routine, Tier 1 and Tier 2 dust control measures are detailed for each key dust source in the DMMP's Table 2: Sources of Dust and Tiered Controls to be Employed.

57 Routine dust suppression methods include:

(a) Timing dust-generating activities in periods of low dust risk (high moisture content of material and/or low windspeeds (<5 m/s);

(b) Undertaking extraction in sub-stages;

(c) Limiting areas requiring dust suppression to a maximum of 1.85 ha;

(d) Retaining the established shelterbelts along the boundary of Bealey Road and extending plantings in accordance with the landscape mitigation plans attached to the evidence of Ms Naomi Crawford;

(e) Not extracting within 150 m of the notional boundary of the principal residential unit at 23 Bealey Road and 200 m of the notional boundary of the principal residential units at 137 and 153 Bealey Road unless written approval has been obtained from the owners and occupiers of the relevant residential units;

(f) No processing of aggregate within Stages 3 and 4 of the site extension;

(g) Only carrying out aggregate processing on the floor of the pit;

(h) Only stockpiling on the floor of the pit;

(i) Minimising drop heights when depositing any material as part of the site preparation, loading of haul trucks, excavation, or rehabilitation;

(j) Use of water spray suppression or dust suppressants on the active aggregate extraction area, crushing, screening and stockpile areas, haul roads, and clean filling and active rehabilitation surfaces as needed to reduce dust generation;

(k) Grassing bunds as soon as practicable to stabilise the bund material and reduce opportunity for wind erosion;

(l) Rehabilitation of completed sections of the quarry as soon as practicable to minimise the potential for dust; and

(m) Maintaining all possible dust controls in line with the DMMP.

58 Tier 1 dust mitigation measures include:

(a) Continue with routine dust mitigation measures;

(b) Additional water application;

(c) A layer of pea gravel applied to unconsolidated surfaces;

(d) Reduce vehicle speed limits;

(e) Covering and/or dampening of loads with high dust emission potential (e.g. material with either low moisture content and/or a large proportion of fine materials); and

(f) Wet and/or limit height of stockpiles.

59 Tier 2 dust mitigation measures include:

(a) Continue with Tier 1 dust mitigation measures;

(b) Installation and operation of spray bars on the crusher and screening plant; and

(c) Stop work on all dust generating activities.

Management of Dust (3) - Mitigation of dust outside operational hours

60 Dust risks tend to be lower outside the hours of operation because dust generating activities have been stopped and windspeeds (especially during the night) tend to be lower. However, the on-site PM_{10} monitoring data suggests that on some occasions PM_{10} concentrations can become elevated outside of the hours of operation. To address this concern, the windspeed and dust alert system will be operational 24/7. This means outside the quarry operational hours the site manager will be made aware if and when high windspeeds occur and/or PM_{10} concentrations become elevated.

61 The key response to an out of hours alert will be a visit to the site to identify the dust source and ensuring that dust source is managed appropriately either with extra water at the end of the working day or fitted with a sprinkler system which can be remotely activated if and when high windspeeds occur and/or PM_{10} concentrations become elevated.

Management of Dust (4) - Dust Mitigation and Monitoring Plan

62 The proposed dust mitigation measures are set out in a draft Dust Mitigation and Monitoring Plan (DMMP) (**Appendix A**). The DMMP meets the recommendations on form and content made by MfE[6] and CRC[7]. The purpose of the DMMP is to set out actions and measures to ensure that consent conditions for Aylesbury Quarry relating to dust emissions and impacts are achieved and the potential effects of the discharge of dust are minimised as far as practicable.

63 In particular, the purposes of the DMMP are to:

(a) Ensure that there shall be no noxious, dangerous, objectionable or offensive dust beyond the boundary of the site;

(b) Avoid, remedy or mitigate any adverse effects of discharges of dust generated from the operation of the Aylesbury Quarry;

(c) Promote proactive solutions to the monitoring and control of dust discharges from the site; and,

(d) Ensure that the industry best practice options for monitoring and controlling dust are adopted.

64 The DMMP also sets out a complaints procedure which is recommended by both MfE and CRC. The importance of a complaints procedure is to ensure that the consent holder has a nominated person, a system and paper trail to demonstrate that all complaints are recorded, promptly investigated to identify the cause and resolved as quickly as practicable.

Availability of water for dust suppression

65 The primary method of suppressing dust from the quarry is to dampen the surface of the dust source. As discussed in the Section 92 response prepared by PDP (dated 13 November 2024) of the total 6 ha, approximately 3.5 ha is being actively quarried at any given time. I have calculated this as consisting of:

(a) 1 ha of the site is designated for active extraction;

(b) 2 ha is dedicated to the screening, crushing and stockpiling of quarried materials;

[6] Ministry for the Environment. (2016). Good Practice Guide for Assessing and Managing Dust.

[7] Canterbury Regional Council. (2017) Schedule 2. Clean Air Regional Plan.

(c) 0.5 ha is dedicated to clean filling, and rehabilitation.

66 The balance of approximately 2.5 ha is still open and sits within the active working area but is expected to have longer periods of inactivity. This will typically consist of:

(a) areas stripped and awaiting excavation;

(b) areas where excavation has occurred which is awaiting clean filling and/or rehabilitation;

(c) areas where rehabilitation has occurred but a complete grass cover not yet established; and,

(d) additional areas of haul roads as the site expands into later stages and haul roads not in use.

67 In my experience effective dust suppression can be achieved in quarries when 50% of the active area is treated with dust suppression water. The remaining 50% of the active area does not require water for dust suppression because the other routine mitigation measures are effective on their own and/or the area is not being trafficked or worked in another other way and/or the surface in the active area does not present a high dust risk.

68 I have identified that sufficient water must be available to provide dust suppression to a targeted area (within the active quarry area) of 1.85 ha at any given time. This 1.85 ha water suppression area comprises approximately:

(a) 0.5 ha of the crushing, screening and stockpile area;

(b) 0.5 ha of the active aggregate extraction area;

(c) 0.35 ha of haul roads, based upon 880 m of haul roads present on site (as estimated from aerial photographs), assuming roads have an average width of 4 m; and

(d) 0.5 ha of the site, which is used for clean filling and active rehabilitation.

69 I have completed a dust suppression water supply and demand assessment based on these open area calculations to establish if the Aylesbury Quarry site has sufficient water supply to meet its dust suppression needs.

70 Southern Screenworks has confirmed that there are four 30,000 L tanks for stormwater storage and one 30,000 L tank for town water supply storage. Water is supplied from roof runoff and supplemented with 100 m^3/day available to Southern Screenworks as a permitted activity under the Land and Water Regional Plan

(LWRP) Rule 5.114. The five tanks combine to provide the site a total water storage capacity of 150,000 L or 150 m^3.

71 The calculations for water demand are based on the following assumptions:

(a) If rainfall is more than 1 mm greater than evaporation on a given day, dust suppression is not required, and the balance of rainfall is carried over until the next day;

(b) The volume of water needed for dust suppression is calculated as 1 mm greater than the difference between evaporation and carried-over rainfall; and

(c) Dust suppression water application rate is 1 mm/hr (1 litre/m^2/hr).

72 This assessment shows that using the water available on site and water management procedures, Southern Screenworks have sufficient water available for dust suppression on more than 97% of days per year to ensure that offensive or objectionable dust effects will not occur off site. Records of dust suppression, water capture and water use on site together with visual observations, the on-site PM_{10} monitoring data and lack of complaints show that the current supply of water is sufficient to provide effective dust control on the current site.

73 On the remaining 3% (i.e. 5 days) of days Southern Screenworks will need to rely upon alternative methods of dust control such importing water, or the suppression of dust through non-water means, which is discussed in more detail below. Alternatively, quarry operations could cease while dust suppression continues at a much lower rate using the available water for the remaining, but much smaller area of, high dust risk surfaces.

74 For periods when there is expected to be a shortfall of water for dust suppression, such as anticipated periods of extended dry conditions, dust emissions on the site can be mitigated through the use of dust suppressants in accordance with permitted activity Rule 5.18 of the LWRP (as discussed in Section 3.2.1 of the Statutory Assessment submitted with the AEE). These dust suppressants can be effective for long periods (ie, months at a time). I have observed their effectiveness in a field study we conducted for NZTA on unsealed roads[8]. The study was undertaken at an unsealed roadside site used by up to 150 logging trucks per day travelling at approximately 50 km/hr. A comparison of the PM_{10} concentrations monitored at the untreated and treated sites show the application of the suppressant significantly reduced the impact of dust discharged from the road.

[8] Research Report 590 Impacts of exposure to dust on unsealed roads. https://www.nzta.govt.nz/resources/research/reports/590/

75 In light of the above, I consider that dust suppression objectives can be achieved through a combination of water and chemical suppressant application measures. Ultimately, the option also exists for Southern Screenworks to cease some or all parts of operations as a means to minimise dust generation during particularly dry periods. Therefore, I am confident that any risk of a shortfall of water needed for dust mitigation during dry conditions can be addressed through good practice mitigation measures which can be required through conditions of consent and detailed in the DMMP.

Qualitative assessment of potential amenity impacts of dust

76 The nuisance effects of dust emissions are influenced by the nature of the source, sensitivity of the receiving environment and on individual perception. For example, the level of tolerance to dust deposition can vary significantly between individuals. Individual responses can also be affected by the perceived value of the activity producing the dust.

77 The Ministry for the Environment's (MfE) Good Practice Guide to Assessing and Managing the Impacts of Dust (Ministry for the Environment, 2016) and CARP recommends that the nuisance effect of dust emissions may be assessed by using FIDOL factors to take into account the nature of the source in the context of receiving environment:

(a) Frequency - How often an individual is exposed to the dust;

(b) Intensity - the concentration of the dust;

(c) Duration - the length of exposure time;

(d) Offensiveness/character - the type of dust; and

(e) Location - the type of land use and nature of human activities in the vicinity of the dust source.

78 Different combinations of these factors can result in adverse effects. Location is particularly important as this relates to sensitivity of the receiving environment. Depending on the severity of the dust event, one single occurrence may be sufficient to consider that a significant adverse effect has occurred. In other situations, however, the event may be short enough, and the impact on neighbours sufficiently minor, that the events would need to be happening more frequently for an adverse effect to be deemed to have occurred.

79 **Frequency.** The nearest offsite receptors from the site extension lie to the south and west. Using the conservative Darfield data, the wind conditions with the potential for offsite dust effects on these receptors (strong winds >5m/s from the

north and northwest) occur 22% of the time. This exposure frequency assessment equates to a moderate to dust risk.

80 **Intensity.** The distance of any existing highly sensitive receptors to the dust-generating activities from the site extension area, who have not given written approval,[9] will be a minimum of 150 m in the case of 23 Bealey Road and 200 m, in the cases of 137 and 153 Bealey Road which in almost all situations provide adequate dispersion to the concentrations of any emitted particulate matter. As such, concentrations of particulate matter have the potential to be low at these nearest receptors. This intensity assessment equates to a low dust risk.

81 **Duration.** The duration of events when wind conditions could give rise to dust travelling in the direction of sensitive receptors is typically short but may at times be sustained for several hours. This duration equates to a moderate dust risk.

82 **Offensiveness.** The light brown colour of the dust from soil material and light grey colour of gravel are both low offensiveness from deposition. This offensiveness assessment equates to a low dust risk.

83 **Location.** The environment is rural and generally considered of low sensitivity. The nearest highly sensitive receptor who has not already provided written approval will be located a minimum of 150 m from any active working area of the quarry extension with other sensitive receptors who have not provided written approval at least 200 m away (137 and 153 Bealey Road). This proximity to 23 Bealey Road will be temporary. Quarrying activity will move quickly out of the 150 m to 200 m zone and will continue moving away from 23 Bealey Road. State Highway 73 has the potential to be affected by dust from the site activities due to the proximity of the road to the quarry. This location assessment equates to moderate to low dust risk. I note that the proximity risk can be mitigated though a stop-work consent condition which has been offered.

84 Considering the separation distances between dust sources and sensitive receptors and the assessment of each of the FIDOL factors above I consider that the risk of any noxious, dangerous, objectionable, or offensive effects from the proposed activities at or beyond the boundary of the site extension is low at the five residences to the south and west of the site (noting that 35 and 158 Bealey Road have provided written approval in any event) and for SH73, and will be negligible at all other locations. I note the combined effect of both separation distances and the dust mitigation measures will further reduce the risk of any adverse dust impacts occurring as a result of quarry activities.

[9] Written approval has been obtained from 35 and 158 Bealey Road.

Quantitative assessment of potential amenity impacts of dust

85 I have used the data from the on-site meteorological and PM_{10} monitors to provide a quantitative assessment of the impacts of dust discharged from quarry activities. The equipment was installed in February 2024. Up until February 2025 the data capture rate was greater than 99%. The location and photographs of the instruments are shown in **Appendix B** along with the results of the data analysis.

86 The following paragraphs present a summary of the key findings from the data analysis.

87 **PM_{10} concentrations.** PM_{10} concentrations measured at the site are lower than we had anticipated. I expected that the average background concentrations of PM_{10} at a rural site (like Southern Screenworks) would be in the order of 10 $\mu g/m^3$. Only a small % of measurements at the site are above 10 $\mu g/m^3$. As a sense check of what I saw as relatively low concentrations, I checked in with Mote who operate the Southern Screenworks and 30 similar sites. Mote responded by saying that the Southern Screenworks was within the range of PM_{10} concentrations they have observed at other similar quarry sites.

88 **Wind Direction.** The wind directions from the quarry to the monitor are generally from the northern hemisphere. Wind directions from other sources (background) to the monitor are generally from the southern hemisphere. PM_{10} concentrations are generally higher from the northern hemisphere than the southern hemisphere – indicating dust emissions from the quarry do have an influence on PM_{10} concentrations. The difference between average PM_{10} concentrations measured when the wind direction is from the site are slightly higher (3 $\mu g/m^3$) than when the wind is from other directions (background).

89 **Effect of site being open.** On average PM_{10} concentrations are marginally higher on closed days. This could reflect the lack of dust suppression when the quarry is closed. Of the top 20 PM_{10} concentration measurements made, 75 % of high events occur on days when the site is open and 25 % occur on days when the site is closed.

90 **Effect of hours of operation on days when quarry is open.** Of the top 20 PM_{10} concentration measurements made, 66% of these measurements occurred outside the hours of operation and 33% of high events occurred inside the hours of operation on open days.

91 **Effects of dust suppression.** Of the top 20 PM_{10} concentration measurements made, 75% of these events occur on days when there is no water used for dust suppression and 25% events occur on days when there were two tanker loads of water were used for dust suppression.

92 The key messages I took from the data is that the measured PM_{10} concentrations are lower than my experience at other quarries and the difference between when winds were blowing from the quarry and those blowing from the background were small. This makes sense considering the quarry is a relatively low intensity operation. The trends in the PM_{10} mainly align with quarry activities or can be explained by considering meteorological conditions.

93 In conclusion, the findings of the quantitative assessment support the conclusions drawn from the qualitative assessment. Both assessment approaches lead to the conclusion that dust emissions from the proposed quarry are unlikely to cause any adverse effects that are greater than minor.

Assessment of potential health impacts of dust

94 The dust discharged from excavation of gravels and vehicles travelling over unsealed haul roads from unconsolidated surfaces contains a small amount of PM_{10}, which can penetrate into human lungs and can potentially cause adverse health effects. The National Environmental Standard – Air Quality (NESAQ) for PM_{10} (50 µg/m³ as a 24-hour average) has been set to protect the general population from adverse health effects (MfE, 2004).

95 I have used the k-factor corrected data from the on-site PM_{10} monitoring programme February 2024 to February 2025 to cross check the assessment of potential health impacts presented in the AEE. A frequency plot of the 24-hour average PM_{10} concentrations measured on site are shown in **Figure 7**.

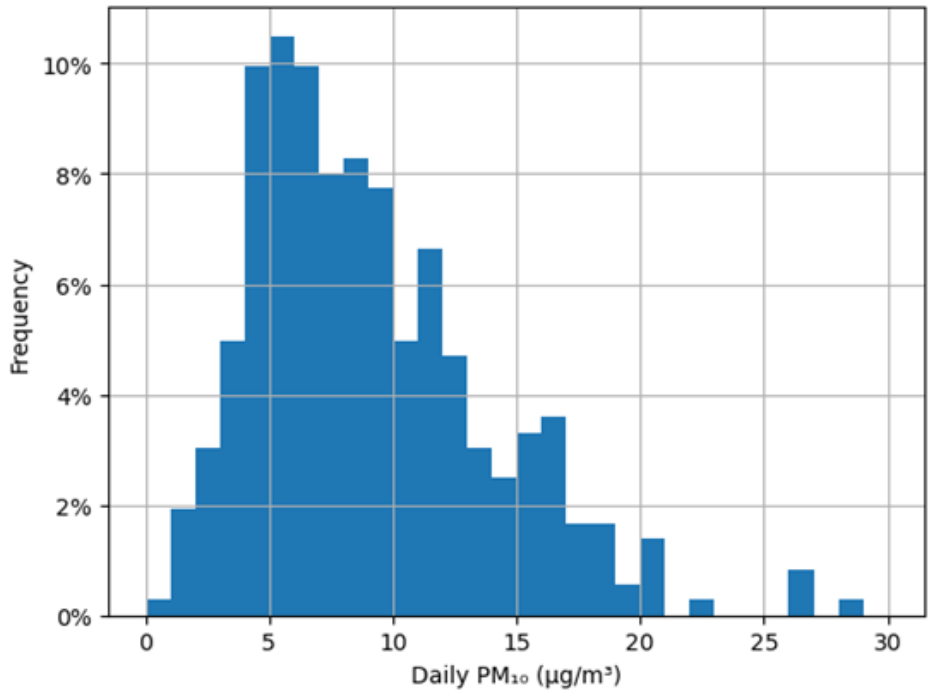

Figure 7. Frequency plot: 24-hour average PM_{10} concentrations measured on site

96 **Figure 7** shows the maximum monitored 24-hour average PM_{10} concentration measured was less than 30 $\mu g/m^3$. In my experience a typical rural background 24-hour PM_{10} concentrations are around 12 $\mu g/m^3$. 0ver 60 % of readings are less than 12 $\mu g/m^3$ and the average 24-hour average PM_{10} concentration is approximately 9 $\mu g/m^3$.

97 Given the site's processes, the sources of dust and proposed dust mitigation measures, the amount of PM_{10} discharged from the site is expected to be small and is not likely to cause a large increase in ground level concentrations of PM_{10} at or beyond the site boundary. Dust effects will be minimised by the mitigation and monitoring methods as set out above and through the DMMP. Provided these measures are implemented it is my opinion that any increase in PM_{10} concentrations will be well below the limit set by the NESAQ. The data from the current onsite monitoring programme strongly supports this conclusion.

98 Furthermore, monitoring of the Yaldhurst Quarry zone[2], did not find RCS concentrations at concentrations of concern for human health. All but two of the RCS measurements taken were below the limit of detection of the chemical analysis. I expect that this will also be the case for the Southern Screenworks site extension given the considerably smaller scale of the operations compared to Yaldhurst.

99 The Mote Yaldhurst Study concluded RCS concentrations were very low and well within the appropriate ambient air quality guideline for the protection of public health, specifically the Californian 'Office of Office of Environmental Health Hazard Assessment' (OEHHA) guideline of 3 $\mu g/m^3$ expressed as an annual average. I have relied on the OEHHA guidance in the absence of a New Zealand or World Health Organisation (WHO) air quality standard or guideline. This is consistent with MfE guidance for air quality assessments.

100 I have used the k-factor corrected data from the on-site PM_{10} monitoring programme February 2024 to February 2025 as a proxy measurement of PM4 to check the assessment of potential health impacts of RCS presented in the AEE. The current New Zealand Workplace Exposure Standard (WES): for RCS (quartz) is 0.05 mg/m^3 (50 $\mu g/m^3$), meaning workers must not be exposed to levels of RCS greater than this value over an eight-hour working day. **Figure 8** shows the time series for the 8-hour PM_{10} rolling average for the k-factor corrected data from the on-site monitoring programme.

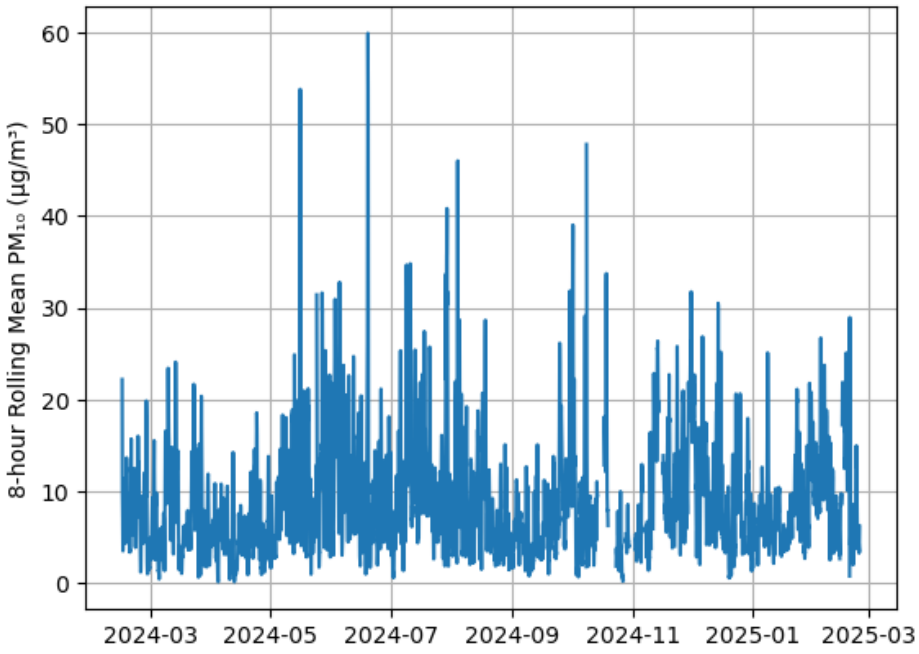

Figure 8. Time series for the 8-hour PM_{10} from the on-site monitoring programme

101 **Figure 8** shows that in 13 months there were two potential exceedances of WES for RCS. When considering these potential exceedances it is important to consider that:

(a) PM_4 (the size range for measuring RCS) concentrations are likely to be less than half of PM_{10} concentrations; and,

(b) Not all PM_4 will be RSC.

102 The Chronic Reference Exposure Level (CREL) is sometimes used to assess the longer term (annual) exposure risk of RCS. The RCS annual CREL is defined as 3 µg/m^3. The annual average on-site PM_{10} concentration is 9 µg/m^3. While this is above 3 µg/m^3 due to the factors detailed in paragraph 100 (a) and (b) the risk of the RCS CREL being exceeded on this site is very low.

103 The Mote Study concluded RCS concentrations well within the Californian 'Office of Office of Environmental Health Hazard Assessment' (OEHHA) guideline of 3 µg/m³ expressed as an annual average. This finding provides support for the conclusion I have drawn on the potential impact of RCS using the on-site PM_{10} data.

104 In my opinion using the PM_{10} data as a proxy measurement for RCS is a very conservative approach which indicates that the risk of the WES for RCS being exceeded is negligible. In summary, the on-site monitored PM_{10} concentrations support the finding that RCS concentrations will be below the relevant health impact assessment criteria.

Diesel generator emissions and potential health impacts

105 The screening and crushing plant operated Southern Screenworks in the Aylesbury Quarry is powered by electricity which is supplied by a diesel-powered generator. To supply the required electricity, Southern Screenworks currently use a Caterpillar 550 generator with a maximum electrical power output of 440 kilowatts and a diesel fuel consumption of 100 litres per hour. The contaminants discharged in the generator exhaust include PM_{10}, $PM_{2.5}$, nitrogen dioxide (NO_2) and carbon monoxide. The amount fuel consumed, and rate of contaminants discharged from the generator is approximately equivalent to a typical semi-trailer truck (450 kw).

106 My qualitative assessment of the potential health impacts of the contaminants discharged from the generator considered the following factors:

(a) Hours of operation are typically a maximum of 4 hours per day when operating, between the hours of 7:00 am and 5:00 pm;

(b) The amount of contaminants discharged is limited to the maximum fuel use of the generator which is well maintained and provides good dispersion;

(c) Duration of exposure is likely to be low with no locations where the public are likely to be for more than 10 minutes;

(d) Sensitivity of receiving environment is low – typically agricultural land use; and,

(e) Distance to sensitive receptors is large >350 m (and will be at least 500 m when processing within the extension stages).

107 Weighing up factors outlined in paragraph 105 (a) to (e), it is my opinion that the ground level concentrations of the pollutants discharged from the generator will be well below the relevant health impact assessment criteria. This outcome of this assessment aligns with my experience at other similar sites.

Summary: Assessment of effects

108 Given the assessment of each of the FIDOL factors the separation distances between dust sources and sensitive receptors and the impact of dust mitigation and monitoring, I consider that the risk of any adverse amenity dust effects at or beyond the boundary of the site extension is very low. The analysis of the on-site PM_{10} data supports the amenity effect conclusion drawn from the FIDOL assessment.

The analysis of the on-site monitored PM_{10} concentrations support the finding that downwind concentrations of both PM_{10} and RCS beyond the site boundary will be well below the relevant health impact assessment criteria.

I have also assessed the potential human health effects of PM_{10} and RCS using the Mote study data and have reached a parallel conclusion that the off-site concentrations of these two pollutants are not expected to approach or exceed relevant human health guidelines or the NESAQ.

109 Given the small scale of generator emissions and my experience at other sites, it is my opinion that pollutant concentrations will be well below the respective health impact guidelines.

Matters raised by submitters

110 I have reviewed the submissions made on the Southern Screenworks application. Five of the eight submitters raised concerns with the potential effects of dust discharged from the proposed activity. The points relevant to my dust assessment from these submissions can be summarised as follows:

(a) NZTA (SH 73) - excessive amounts of dust blowing onto the carriageway and affect the efficient and safe operation of the state highway;

(b) Dion Coleman (153 Bealey Road) – health impacts of dust and silica because of long exposures due to working at home;

(c) Christine Wiig (1062 Railway Road) - health impacts of dust;

(d) Benjamin and Julie Voice (137 Bealey Road) – significant dust impacts; and,

(e) Lou and Karen Nunn (23 Bealey Road) - health impacts of dust, amenity impacts of dust, impact of increased operation and larger scale quarry, effect of changing weather patterns.

111 In my view, the submissions contain three key dust themes:

(a) Concerns of the health and amenity impacts from the discharge of dust;

(b) Safety impacts for road users caused by dust plumes that may obscure vision; and,

(c) Need for effective dust mitigation measures, including an effective buffer distance for aggregate extraction and processing activities.

112 I acknowledge the health concerns of the submitters. In my experience this issue has been raised in every quarry activity I have been involved. As outlined in paragraphs 93 to 103 of my evidence, based on my experience with similar quarries and my understanding of the available data, and the effectiveness of the proposed mitigation measures I am confident that concentrations of PM_{10} and RCS will be well below the relevant health impact guidelines.

113 I have heard the submitters requests for effective dust mitigation measures and I agree quarry dust can be a nuisance if not managed properly. To ensure that dust does not cause unacceptable adverse effects, the FIDOL dust assessment and onsite PM_{10} monitoring have been used to inform the dust mitigation measures and DMMP. In my view, the buffers offered by Southern Screenworks for both extraction and processing will provide effective protection from the dust emitted from the site. The likely dust travel distance is detailed in paragraph 125 of my evidence; therefore, it is my opinion the vast majority of dust and RCS will be deposited within the buffer zone between the dust source and submitter's location.

114 My view of, and recommendations on, additional dust mitigation measures are covered in paragraphs 51 to 61 of this evidence. In addition to the mitigation measures, I recommend a wind and dust monitoring programme which is able to measure the effectiveness of the mitigation measures in place, together with a warning and trigger system which requires additional mitigation measures if the dust risk is high. The dust monitoring programme will employ two dust monitors one sited permanently near the current processing site and one sited to measure the downwind impact of the quarry at the submitter locations.

115 In regard to dust, various relief sought by submitters includes:

(a) cease works when windspeeds are greater than 10 m/s;

(b) fully bund the northern boundary of the site;

(c) extended landscaping;

(d) a second dust monitor;

(e) 5 m high bund along Bealey Road;

(f) 950 m buffer for crushing activity;

(g) 300 m buffer for extraction activity;

(h) no dust to be discharged beyond the boundary; and

(i) limit exposed area to 2 ha;

116 The proposed mitigation measures may not match the exact relief sought by the submitters (e.g. bunds will be 3 m high not 5 m high and proposed buffer between extraction and houses is 200 m not 300 m except on Saturdays). However, each one of these issues is addressed in the conditions and/or in the DMMP to the degree which my experience suggests is necessary to ensure that any adverse effect the dust emissions may cause will be no greater than minor. In my experience with similar quarries, the 200 m buffer distance and two dust monitors

offered by Southern Screenworks is above and beyond what I have seen as accepted good practice.

117 I further note that when works are occurring at a 200 m setback distance proposed by Southern Screenworks from 137 and 153 Bealey Road and the handling rate of 100 tonnes an hour, any effects are below the level provided for as a permitted activity by Rule 7.35 of the CARP.

118 In summary, my view is that the proposed dust mitigation measures, DMMP and consent conditions will satisfactorily address the concerns raised by the submitters.

Matters raised by CRC/SDC staff reports

CRC Section 42A report

119 I have reviewed CRC's Section 42A report[10] written by Edward Ryde. Within his report, Mr Ryde presents a summary of Mr Van Kekem's Technical Review[11] of my air quality assessment. Mr Van Kekem's Technical Review is attached as Appendix 2 to Mr Ryde's Section 42A report.

120 Based on the advice provided by Mr Van Kekem, in paragraph 116 of his evidence Mr Ryde states *"I consider that the human health and nuisance effects from the discharge of dust to air will be sufficiently controlled if the proposed mitigation measures are diligently implemented and if separation distances between product processing activities and sensitive receptors recommended by Mr Van Kekem in accordance with the Victorian EPA is implemented*".

121 Based on the advice provided by Mr Van Kekem, in paragraph 178 of his evidence Mr Ryde states "*I generally agree that any cumulative effects can be minimised and managed adequately, noting that there are no other major dust sources in the locality*".

122 Mr Ryde's statements quoted in the above paragraphs are largely aligned to the findings presented in the AEE and in my evidence. However, there are a number of minor points of clarification that are needed to demonstrate that both the council and the have arrived at the same conclusion. I discuss these issues in the following paragraphs.

[10] CRC Section 42A Officer's Report CRC244887 to CRC244890. Report of Edward Ryde CRC. 24 March 2025.

[11] Independent air quality review of consent application: CRC244890 Southern Screenworks – Aylesbury Quarry expansion. Donovan Van Kekem, NZ Air 29 October 2024.

123 I note Mr van Kekem's report pre-dates the further 92 response[12] I prepared and amendments proffered by the applicant through draft consent conditions.

124 While the *Victorian EPA*[13] recommended a separation distance for a quarry without blasting of 500 m. The Vic EPA 500 m distance is the minimum distance in the absence of a site-specific assessment and can be varied based on the findings of such an assessment.

125 This is what I have done for this project and determined that the setbacks proposed are appropriate. The information provided with the AEE and this evidence is consistent with the requirements of the Vic EPA. As a comparison to the Vic EPA recommendation, I note that another internationally recognised air quality body, the Institute of Air Quality Management (IAQM)[14], recommend a buffer distance of 250 m for a gravel quarry.

126 While locating the screening and crushing plant in Stages 3 and 4 will meet the 500 m buffer distance, in my opinion that distance in excess of what is needed to ensure that no significant dust impacts will occur beyond the boundary of the site. I have undertaken an analysis of the Mote Study[15] data for the purposes of estimating dust plume travel distance. A time series of the 1-hour average PM_{10} data on two days when dust alert triggers were exceeded (18-19 April 2018) provides a useful insight into the extent of the quarry dust plume. The timeseries of PM_{10} concentrations measured at 50 m and 250 m downwind are almost identical, only a 3% difference on average across the two days. My comparison of the maximum 24-hour average PM_{10} concentration measured at background and the three sites located 160 to 250 m downwind of the Yaldhurst quarry suggest that beyond 250 m the change in PM_{10} concentrations due to the influence of the quarry's emissions is not distinguishable from background PM_{10} concentrations.

127 In summary, it is my opinion that the Vicn EPA recommended a separation distance of 500 m is unnecessarily conservative for the Southern Screenworks site.

128 In paragraphs 42 and 106, Mr Ryde highlights a perceived uncertainty created in my dust assessment by the relatively short (5 month) wind data record available at the time the assessment was undertaken. In my evidence, I have presented the data from 13 months of wind monitoring on-site and demonstrated why I consider that this data is representative of the wind conditions experienced on the site and

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[12] Southern Screenworks Limited: Matters of Clarification dated 13 November 2024.

[13] Separation distance Guideline. Publication 1949 EPA Victoria. August 2024.

[14] Guidance on the Assessment of Mineral Dust Impacts for Planning. IAQM. 2016.

[15] Mote 2018. Yaldhurst Air Quality Monitoring - Summary Report: 22 December – 21 April 2018. Report prepared for Environment Canterbury by Mote Limited. 19 June 2018

how using the Darfield data presents a worse-case conservative assessment. In other words, the actual impacts are likely to be less than those presented in the assessment.

129 In paragraph 178 of the s42A report, Mr Ryde concludes that the activity is in an appropriate location in terms of the aggregate resource, but it is not appropriate given the proximity to sensitive receptors. It is my view that, given the considerable buffer distances provided by the applicant for both gravel extraction and gravel processing, the location of these activities is appropriate regardless of the presence of residential dwellings. Nevertheless, given the recommendation to grant consent, my assumption is that Mr Ryde agrees that the activity is appropriate in light of the setbacks now proposed.

130 I did not initially include an assessment of the proposed application against the requirements of Regulation 17 of the NES-AQ because the activity is not in a polluted airshed. For completeness, I concur with Mr Ryde's finding (paragraph 141 of his evidence) that the application is not contrary to Regulation 17.

131 In Mr Ryde's assessment of the proposed activity against the objectives and policies contained in Chapter 14 (Air Quality) of the Canterbury Regional Policy Statement (paragraphs 220 to 230 of the s42A report), he suggests that the alignment of the proposed activity with the relevant objectives and policies is highly dependent on Southern Screenworks being vigilant with their dust mitigation strategy. I concur with Mr Ryde on this point. I wish to emphasise that it is Southern Screenworks desire to be vigilant that is driving the development of their visual, real-time meteorological and real-time dust monitoring programme. They have established this proactively as it is not a requirement of their current consent. Southern Screenworks' environmental monitoring programme will provide real-time information on the performance of their dust mitigation programme and provide alerts if and when additional mitigation is required. This system provides a transparent and auditable trail of information which can demonstrate how vigilant they are being (or not) with their dust mitigation processes.

SDC s42a report

132 I have reviewed the dust-related sections of SDC's section 42A report[16] written by Timothy Hegarty. The key dust issue raised in Mr Hegarty's report is in relation to the NZTA's submission on the application and their concern about potential impact of dust on the vehicles using SH73. To the best of my knowledge, and confirmed by the traffic evidence presented by Mr Leckie, to date there have been no significant safety issues with dust from the current quarry causing dust plumes

[16] Section 42A SDC Planning Report. RC245428 &245429. Report of Timothy Hegarty, Jacobs New Zealand Limited. 24 March 2025.

which reduce visibility on SH73, although I do acknowledge the boundary of the extended quarry will be closer than that of the current quarry. Mr Hegarty's view is that the proposed DMMP will be sufficient to control dust to a level that will avoid effects of the save operation of SH73 (paragraph 106 of his evidence).

133 In paragraph 107 of his evidence Mr Hegarty highlights NZTA are seeking a stop work dust control measure when winds are stronger than 10 m/s (10-minute average) and blowing from the north and northwest.

134 While I agree with Mr Hegarty that the currently proposed DMMP will be sufficient to control dust, Southern Screenworks has offered additional conditions to provide the additional protection NZTA are seeking. There are two criteria suggested in NZTA's "*stop-work*" dust response; the windspeed and wind direction.

135 Southern Screenworks' on-site meteorological monitoring will be set up to provide alerts when the windspeeds exceed 5 m/s and 7.5 m/s (rolling 1-hour average). while the proposed Southern Screenworks' alerts averaging period is longer, the windspeeds are lower and in my opinion will provide a least an equal amount of warning/protection as the 10 m/s (10-minute average) criteria that NZTA are seeking.

136 SH73 runs on the northern boundary of the proposed site in a NW/SE direction. For the dust from the site to impact SH73 the wind direction would have to be from the SW sector not the N-NW as suggested by NZTA.

137 While in my opinion it is not necessary, I suggested to Southern Screenworks that a windspeed and wind direction alert could be offered that specifically aims to reduce any potential dust impact on the users of SH73. When the wind direction was blowing from within the arc of 180^{o}N to 270^{o}N Tier 1 dust mitigation measures would kick in when windspeeds are > 5 m/s and Tier 2 dust mitigation measures (including stop-work) would kick in when windspeeds are > 7.5 m/s. This can be done with the equipment and systems already in place and without having any undue impact on the quarry's operational considerations and will be included in the DMMP.

Proposed consent conditions

138 I have reviewed the draft air discharge consent conditions included in the s42A report and provided feedback on them to Southern Screenworks. I understand these generally reflect a set of conditions developed by Mr Bligh and supplied to the Council officers following the pre-hearing meeting, discussions with the submitters and the Council officers. Some minor amendments have been proposed by the Council officers which I generally agree with.

139 My feedback aimed to ensure that the consent conditions would be effective at minimising dust emissions impacts, straightforward for consent compliance purposes, and practical for the consent holder to implement amongst the day-to-day work activities. To this end the following paragraphs highlight some minor amendments I am suggesting to the current draft of air discharge consent conditions. References to condition numbers are per the section 42A report.

140 **Condition 6(e)** requires the consent holder to undertake all practicable measures to prevent the discharge of dust including covering and/or dampening loads with dust emission potential. It is my view that covering or dampening all loads is un-necessary. These additional mitigation measures should only be implemented when the loads have high dust potential or when required as a Tier 1 in my suggested hierarchy of dust control measures.

141 **Condition 14**[17] defines the content of DMMP. I do not consider condition 14(d) or 14(k) necessary. These issues are already covered by other conditions and are therefore repetitive. I do not consider 14(n) helpful. This condition is not clear on what additional information is required beyond that this is already contained in the DMMP.

142 **New condition – Condition 15**[18] requires that the DMMP is reviewed by a SQEP, at least every two years. I do not consider this necessary given the type and scale of activity proposed by Southern Screenworks is consistent with the requirements of the relevant CARP permitted activity rule. If this condition is retained, I recommend it be amended to read "*any amendments to the DMMP must be reviewed by a SQEP*". This approach is pragmatic and delivers a review when there is a change in the DMMP.

143 **Condition 18**[19] – defines the performance measures of the meteorological instrumentation. There are a number of performance measures in condition 18 that do not align with the instruments installed or do not align with best practice.

144 The accuracy of meteorological sensors is typically reported at a particular wind speed e.g. 2% error at 12 m/s which is the accuracy of the meteorological sensor currently installed at Aylesbury. This means that at wind speeds below 10 m/s the Southern Screenworks instrument complies with the requirements. However, at wind speeds above 12 m/s the absolute error increases to the point that the instrument would not comply.

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[17] Condition 15 of proposed amended conditions attached to Mr Bligh's evidence.

[18] Condition 16 of proposed amended conditions attached to Mr Bligh's evidence.

[19] Condition 19 of proposed amended conditions attached to Mr Bligh's evidence.

145 Similarly, the accuracy of wind direction is also usually expressed as a function of wind speed. In this case e.g. 2% RMSE at 12 m/s (again the accuracy of the Aylesbury meteorological sensor). The Aylesbury meteorological sensor complies with the 1-degree accuracy requirement up to about 50 metres per second.

146 I note that AS/NZS 3580.14:2014 entitled "Methods for sampling and analysis of ambient air Part 14: Meteorological monitoring for ambient air quality monitoring applications" stipulates specifications for meteorological instruments that are used for air quality monitoring.

(a) Table 2 on Page 11 requires the wind speed accuracy to be 3% or ±0.2 m/s (whichever is the greater).

(b) Table 3 on Page 12 requires the wind direction accuracy to be: ±3°

147 In summary, the current consent condition to require instrumental accuracy greater than that recommended in AS/NZS 3580.14:2014. Apart from the accuracy of the wind sensor, the other requirements will be met by the Aylesbury instruments. I recommend that condition 18 be amended to align with the requirement of AS/NZS 3580.14:2014.

148 **New condition - Condition 28**[20] defines responses to alerts or visible dust plumes. I have suggested minor editorial amendments which I consider improve the clarity of the condition.

149 **Condition 30**[21] requires a record of all complaints relating to contaminants discharged to air from the site and associated activities. I recommend the complaints record identified what dust generating activities were occurring on site at the time of the complaint.

150 **New condition – condition 31** requires Southern Screenworks to provide an annual report to CRC. My experience is that an annual report is a lot of work and can be un-necessary or uninformative if dust mitigation and monitoring have been effective and no complaints have been made, or no dust alert have been exceeded. I do not consider the annual report necessary given the type and scale of activity proposed by Southern Screenworks is consistent with the requirements of the relevant CARP permitted activity rule. However, if this condition is retained, to make it pragmatic and workable I recommend the condition be amended so that annual report only be required when this is a complaint or if dust alert values have been exceeded.

[20] Condition 29 of proposed amended conditions attached to Mr Bligh's evidence.

[21] Condition 31 of proposed amended conditions attached to Mr Bligh's evidence.

151 The attached conditions to Mr Bligh's evidence presents the details of these suggested amendments.

Conclusion

152 I have proposed an extensive range of dust mitigation and monitoring measures, to be captured in a Dust Management and Monitoring Plan (DMMP), which builds on existing site management practices such as dust suppression. I have identified routine measures alongside additional measures (Tier 1 and Tier 2) that are proposed to apply in stronger winds. This includes two on-site dust monitoring instruments, including one which is mobile and can be placed between the dust source and downwind sensitive receptors. Together with the separation distances for the nearby properties that have been volunteered by Southern Screenworks, these dust management and monitoring measures will further reduce the risk of any adverse dust impacts.

153 I expect up to 1.85 ha of the active working quarry area will require active dust suppression. I have calculated the amount of water required to adequately suppress dust over that area. Southern Screenworks has sufficient access to water (via storage tanks and a permitted activity take) to undertake adequate dust suppression 97% of the year. Dust suppressions or stop work measures will be sufficient to cover the remaining 3% (i.e., 5 days) of the year.

154 Given the FIDOL assessment, proposed setbacks and proposed dust mitigation measures, I consider that the risk of adverse amenity effects related to dust at or beyond the boundary of the site is very low. The analysis of the on-site PM_{10} data supports this conclusion.

155 The analysis of on-site PM_{10} data also supports a conclusion that downwind concentrations of both PM_{10} and RCS will be well below the relevant health impact assessment criteria. I have also assessed the potential human health effects of PM_{10} and RCS using the Mote study data and have reached a parallel conclusion that the off-site concentrations of these two pollutants are not expected to approach or exceed relevant human health guidelines or the NESAQ.

156 In terms of emissions from the diesel generator, in my opinion pollutant concentrations will also be well below the respective health impact guidelines.

157 I conclude that the risk of any noxious, dangerous, objectionable, or offensive effects from the proposed activities at or beyond the boundary of the site extension

is low at the five residences to the south and west of the site and for SH73 to the north, and will be negligible at all other locations.

158 With the mitigation proposed, I consider any adverse effects on air quality will be less than minor and acceptable at all off-site locations.

Jeffrey George Bluett

31 March 2025

Appendix A: DRAFT Dust Mitigation and Management Plan

Air Quality Management and Monitoring Plan – Aylesbury Quarry

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R
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F
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- Prepared for

Southern Screenworks

- March 2025

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Quality Control Sheet

TITLE	Air Quality Management and Monitoring Plan – Aylesbury Quarry
CLIENT	Southern Screenworks
ISSUE DATE	2025
JOB REFERENCE	

Revision History

REV	Date	Status/Purpose	Prepared By	Reviewed by	Approved
1	07/03/25	DRAFT for Client Review	Fergus Robertson	Jeff Bluett	NA

DOCUMENT CONTRIBUTORS

Prepared by

SIGNATURE

Fergus Robertson

Reviewed by

SIGNATURE

Reviewer's Name.

Approved by

Approver's name.

Limitations:

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Appendices

1.0 Introduction

This Air Quality Management and Monitoring Plan (AQMMP) has been prepared by Pattle Delamore Partners Ltd (PDP) on behalf of Southern Screenworks Limited (Southern Screenworks).

1.1 Purpose

The purpose of the AQMMP is to set out actions and measures to ensure that consent conditions for Aylesbury Quarry relating to dust emissions and impacts are achieved. In particular, the purposes of the AQMMP are to:

- Ensure that there shall be no noxious, dangerous, objectionable or offensive dust beyond the boundary of the site; and,
- Ensure that the best practicable option for controlling dust is adopted.

In addition, the AQMMP provides a framework for the quarry and restoration operations and site personnel, in particular to:

- Avoid, remedy or mitigate any adverse effects of discharges of dust generated from the operation of the Aylesbury Quarry;
- Promote proactive solutions to the control of dust discharges from the site; and
- Present industry best practice options for dust controls.

1.2 Background Information

Southern Screenworks intend to undertake the extraction of gravel, stockpiling of topsoil, and reinstatement of quarried land in three stages at Aylesbury Quarry.

An assessment of the sensitivity of the receiving environment and identification of the location of highly sensitive receptors is provided in Air Quality Assessment of Environmental Effects (AEE), dated May 2024. The location of the quarry and the location of the sensitive receptors within 500 m of the boundary of the site are shown in are in **Figure 1**

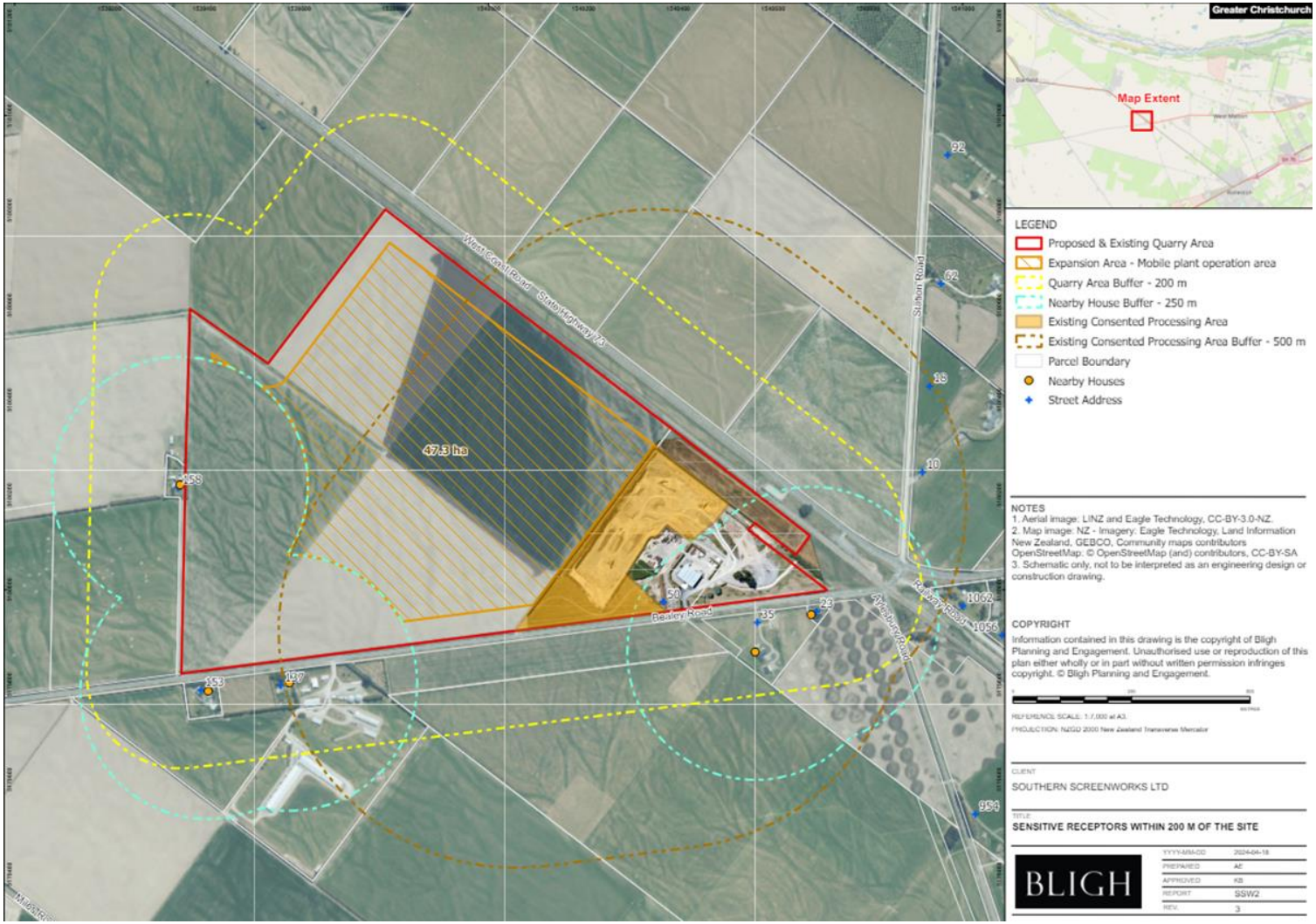


Figure 1:Location of Sensitive Receptors (Source: Bligh)

Within the overall requirement to ensure that there is no noxious, dangerous, objectionable or offensive dust beyond the boundary of the site, a key focus of the management plan is to avoid adverse effects at the nearest neighbouring residential dwellings.

1.3 Description of Activity and Dust Sources

A description of the activity and dust sources is provided in the Assessment of Environmental Effects dated May 2024.

2.0 DRAFT Consent Compliance Requirements

The DRAFT consent conditions relevant to the dust emissions and impacts are as follows:

- Condition 2: "*The discharges described in Condition (1) of this consent must not result in an offensive, objectionable, noxious or dangerous effect beyond the boundary of the property on which the consent is exercised*."
- Condition 3: "*No processing shall occur within 50 m of an external site boundary."*
- Condition 6: *The consent holder shall undertake all practicable measures to prevent the discharge of dust. Such measures shall include but not be limited to:*

  a. *Maintaining all possible dust controls in line with the Dust Management and Monitoring Plan (DMMP) required by Condition 9;*

  b. *Carrying out aggregate processing on the floor of the pit;*

  c. *Stockpiling on the floor of the pit;*

  d. *Minimising drop heights when depositing any material as part of the site preparation, loading of haul trucks, excavation, or rehabilitation;*

  e. *Covering and/or dampening of loads with high dust emission potential;*

  f. *Avoiding extraction, crushing and screening within 100m of the northern site boundary when wind speeds from the south and southwest (155 to 255°N) are equal to, or exceed, 7.5 m/s as a 1 hour average during dry weather conditions;*

  g. *Applying water or dust suppressants to keep haul roads and other exposed surfaces damp;*

  h. *Limiting vehicle speeds on site to not more than 15 kilometres per hour;*

  i. *Grassing bunds as soon as practicable to stabilise the bund material and reduce opportunity for wind erosion; and*

j. Rehabilitation of completed sections of the quarry as soon as practicable to minimise the potential for dust emissions and to meet the open area limit defined in condition 5

- Condition 15: "*a) In-person inspections of quarry operations are to be undertaken on each day of operation to check for:*

  i) Any visible dust emission sources within the site;

  ii) Visible dust going beyond the boundary of the site; and

  iii) The adequacy of dust suppression.

  b) All visual observations shall be recorded and be provided to Canterbury Regional Council upon request."

- New condition 19: *All meteorological monitoring data must be recorded using an electronic data logging system and be retained for the duration of this consent and provided to the Canterbury Regional Council, Attention: Compliance Manager upon request.*

- Condition 21: The meteorological monitoring system shall send an alert to the Quarry Manager or other nominated person, when 1-hour rolling average windspeeds exceed:

  a) 5 m/s, that will be used to prompt the consent holder to carefully monitor dust sources and, if required, implement Tier 1 mitigation measures as specified in the DMMP.

  b) 7.5 m/s, that will be used to prompt the consent holder to implement Tier 2 mitigation measures as specified in the DMMP

- Condition 22. The dust monitoring system shall send an alert to the site manager (or delegate) when 1-hour average rolling concentrations exceed:

  a) 150 µg/m³, that will be used to prompt the consent holder to carefully monitor dust sources and, if required, implement Tier 1 mitigation measures as specified in the DMMP.

  b) 200 µg/m³, that is used to prompt the consent holder to implement Tier 2 mitigation measures as specified in the DMMP

- Condition 23: "*The bunds shall be watered when required to suppress potential dust, until a grass cover has been established. An 80 percent grass cover is to be maintained on earth bunds at all times during quarrying operations."*

- Condition 28: If at any time, including outside normal operating hours, visible dust is blowing beyond the site boundary or if quarry activities cause real time PM_{10} particulate concentrations measured at or near the site boundaries in accordance with Conditions 17 and 18 to reach

or exceed 150 µg/m3, as a 1-hour average updated every ten minutes the Consent Holder must:

a) *Cease all quarry activities within 250 m of an off-site sensitive receptor except for dust suppression measures;*

b) *Investigate possible sources of dust;*

c) *instigate required dust suppression activities including but not limited to the watering of inactive exposed surfaces;*

d) *Only resume quarry activities (other than dust suppression) once there is no longer visible dust blowing beyond the site boundaries and when the PM10 particulate concentration falls below 100 µg/m3 as a 1-hour average; and*

e) *Notify Canterbury Regional Council, Attention: Compliance Manager within one working day of the dust event, including its cause and the dust suppression actions undertaken.*

- Condition 28. *The Quarry Manager, or another nominated person, must be available at all times (including outside quarry operation hours) to respond to dust emission complaints and issues. The contact details must be displayed on signage at the site entrance and at the quarry office adjacent to the vehicle entrance. With the exception of the quarry office signage, the contact details must be able to be read from outside the gates.*

3.0 Air Contaminant Sources

3.1 Dust

The Site's key dust sources are detailed in :

Table 1: Sources and characteristics of dust

Source	Description	Dust type	Relative size of dust source
Development of site	Removal and stockpiling of overburden. Construction of bunds	Soil dust. Mainly deposited dust or TSP with a small component of PM_{10}.	Medium
Excavation of gravel	Disturbance of material being extracted from the ground will generate dust.	Grey gravel dust. Mainly deposited dust or TSP with a small component of PM_{10}.	Medium
Processing of Gravel	The breaking of pit run gravel into smaller pieces and screening this material will generate dust.	Grey gravel dust. Mainly deposited dust or TSP with a small component of PM_{10}	Medium
Vehicle movements	Dust generated by vehicles traversing Site access road and moving over other unsealed surfaces.	Gray road dust. Mainly deposited dust or TSP with a small component of PM_{10}.	Large
Disturbing stockpiles	The deposition and removal of materials from stockpiles will generate dust.	Grey gravel dust. Mainly deposited dust or TSP with a small component of PM_{10}.	Medium
Stockpiles	Higher speed winds passing over stockpiles can generate dust.	Grey gravel dust. Mainly deposited dust or TSP with a small component of PM_{10}.	Small
Site rehabilitation	Disturbance of material being used for site rehabilitation will generate dust.	Soil dust. Mainly deposited dust or TSP with a small component of PM10	Medium

3.2 Vehicles, Machinery and Generator Emissions.

Vehicles, machinery and the generator operated on site will discharge products of combustion including PM_{10}, $PM_{2.5}$, NO_2 and CO.

4.0 Management and Mitigation Measures

4.1 Dust Tiered Mitigation Measures – Operational Hours

Dust prevention on site uses a three-tiered approach.

Routine controls must be employed throughout the operation of the site, regardless of dust emissions. Routine controls include the mandatory consent condition requirements set out above, and additional controls that must be applied where practicable. Routine controls are expected to control dust to achieve the requirements of the consents.

Tier 1 controls are additional measures which must (where relevant to the dust source at issue) be implemented in addition to routine controls, in the following circumstances:

- The site manager identifies high dust risk potential conditions which include dry high fine material surfaces and either predicted or monitored high windspeeds toward sensitive receptors (as detailed in Section **Error! Reference source not found.**);
- The site manager sees plumes of dust arising from a dust source within the site (as detailed in Section **Error! Reference source not found.**); or,
- A complaint is received in relation to dust generated from a dust source within the site.

Tier 2 controls are measures that are employed in the instance of extremely high levels of dust where Tier 1 controls are not sufficient, or when wind speeds exceed 7.5 m/s as a 10-minute average.

Routine, Tier 1 and Tier 2 control measures are summarised in **Error! Reference source not found.**.

Table 2: Sources of Dust and Tiered Controls to be Employed			
Sources of Dust	**Routine, must be employed**	**Tier 1 Controls (Additional, as needed)**	**Tier 2 Controls (Additional, as needed)**
Disturbing materials including site preparation, rehabilitation	• For the purposes of site preparation, gravel extraction gravel export off site or site remediation, the loading on to or removal of material from stockpiles or other activities which may disturb materials must only be undertaken during low or medium dust risk wind conditions (as defined in Table 3 below. I.e. 1-hour average windspeed below 7.5 m/s). • No excavations may be undertaken if high wind is forecast in the period before measures can be implemented to secure the excavated area and any stockpiles from the effects of dust generation (this does not prevent the consent holder from backfilling excavations with clean fill if groundwater levels are rising). • No materials may be disturbed when wind speeds are above 7.5 m/s and there is a	• Continue with routine dust mitigation measures. • Adequate water suppression systems must be available at the site to dampen areas that are to be worked prior to any earthworks or material disturbance commencing and shall be used on the site until further earthworks or material disturbance in that area are not required. • Covering and/or dampening of loads with high dust emission	• Continue with tier 1 dust mitigation measures. • Stop quarrying activities which are disturbing materials until the dust source can be controlled and the impact of the dust reduced to that allowed by the consent conditions.

	sensitive receptor located within 250 m in the downwind direction.	potential (e.g. material with either low moisture content and/or a large proportion of fine materials);	
	• In addition, where practicable: Machine operation measures will be implemented including: a) Minimizing drop heights; b) Wetting dusty materials such as topsoil or other quarry materials that continue fine particles which may generate dust; c) Covering truckloads of dusty material if these are to be transported off site; d) Locate machine operations to provide the largest practical buffer distance to sensitive receptors; and,	D R A F T	

	e) Timing machine operation to avoid times of high dust risk.		
Aggregate processing	• Aggregate processing must only be undertaken during low or medium dust risk wind conditions (as defined in Table 3 below. I.e. 1-hour average windspeed below 7.5 m/s). • No Aggregate processing may be undertaken if high wind is forecast in the period before measures can be implemented to secure the processing area any stockpiles from the effects of dust generation. • No Aggregate processing when wind speeds are above 7.5 m/s and there is a sensitive receptor located within 250 m in the downwind direction.	• Continue with routine dust mitigation measures; • Covering and/or dampening of loads with high dust emission potential (e.g. material with either low moisture content and/or a large proportion of fine materials);	• Continue with tier 1 dust mitigation measures. • Stop aggregate processing activities until the dust source can be controlled and the impact of the dust reduced to that allowed by the consent conditions. • Installation and operation of spray bars on the crusher and screening plant.

	• Locate aggregate processing operations to provide the largest practical buffer distance to sensitive receptors; and, • Timing aggregate processing operations to avoid times of high dust risk.		
Unpaved surfaces such as site access roads	• Limit the area of exposed unpaved surfaces. • When vehicles are travelling over dry unsealed dust producing surfaces these be watered using a water cannon or water cart system. • Onsite speed limit of 15 km/hr.	• Continue with routine dust mitigation measures; • Increase water application rate to ensure that in-use unpaved roads are kept damp. • A layer of pea gravel applied to unconsolidated surfaces; • Reduce vehicle speed limits; • Covering and/or dampening of loads with high dust emission potential (e.g. material with either low moisture content and/or a large proportion of fine materials);	• Continue with tier 1 dust mitigation measures; • Halt all vehicle and machine movements until the dust source can be controlled and the impact of the dust reduced.
	In addition, where practicable: • Cover surfaces with coarse materials. • Compact all unconsolidated surfaces.		

Vehicles	• Deep sided trucks (dump trucks) are used for transport within the site to reduce spill • Onsite speed limit of 15 km/hr will be enforced. • Any spills of soil from vehicles are swept up and washed down on the same day as the spill. • Sweeping of the sealed road is undertaken weekly in summer when there are deposits of fine material visible on the road and when visible plumes of dust are being generated by trucks travelling on the road. Sweeping of the sealed road shall be undertaken daily if the weekly sweep does not resolve the dust issue. • Avoid transport load spillages by ensuring loads are spread evenly across the truck and trailer decks and by ensuring the load is within the weight carrying capacity of the truck and trailer units. • As far as practical minimise travel distances and/or maximise buffer distances between site access roads and site boundary through appropriate site layout and design.	• Continue with routine dust mitigation measures; • Limit vehicle speeds on unsealed surfaces to 10 km/hr when traveling within 250 m of the site boundary or when vehicle generated dust plumes approach the boundary of the site. • Covering and/or dampening of loads with high dust emission potential (e.g. material with either low moisture content and/or a large proportion of fine materials);	• Continue with tier 1 dust mitigation measures; • Halt all vehicle and machine movements until the dust source can be controlled and the impact of the dust reduced.

Stockpiles (including placement and removal)	• Maintain the height of gravel stockpiles to a maximum of 8 m. • Maintain the height of topsoil stockpiles to a maximum of 3 m. In addition, where practicable: • Locate stockpiles as far away as practicable from identified sensitive receptors. • Orientate stockpiles to maximise wind sheltering as much as possible. • Load and remove stockpiled material from site as soon as practical.	• Continue with routine dust mitigation measures; • Dampen the surface of stockpiles • Further limit the height and slope of stockpiles to reduce wind entrainment. • Vegetation of long-term stockpiles. • Dampen stockpiles if they are producing visible dust emissions.	• Continue with tier 1 dust mitigation measures; • Stop stockpile disturbance until the dust source can be controlled and the impact of the dust reduced to that allowed by the consent conditions.

4.2 Dust Mitigation Measures – Out of Operational Hours

Dust risks tend to be lower outside the hours of operation because dust generating activities have been stopped and windspeeds (especially during the night) tend to be lower. However, the on-site PM_{10} monitoring data suggests that on some occasions PM_{10} concentrations can become elevated outside of the hours of operation. To address this concern, the windspeed and dust alert system will be operational 24/7. This means outside the quarry operational hours the site manager will be made aware if and when high windspeeds occur and/or PM_{10} concentrations become elevated.

The key response to an out of hours alert will be a visit to the site to identify the dust source and ensuring that dust source is managed appropriately either with extra water at the end of the working day or fitted with a sprinkler system which can be remotely activated if and when high windspeeds occur and/or PM_{10} concentrations become elevated.

4.3 Water Application Rate

As a benchmark for dust suppression the Ministry for the Environment Good practice guide on assessing and managing dust recommends a water application rate 1 mm/hour (or 1 litre/m^2) per hour.

A water truck maybe used along haul roads and active quarry areas. All mitigation installed must be designed to ensure 1 mm water per hour over 18,500 m^2 can be achieved by the quarry operations on dry days at any stage.

4.4 Vehicles, Machinery and Generator Emissions

The vehicle, machine and generator engines and all associated emission control systems will be maintained in accordance with the manufacturer's instructions.

5.0 Roles and Responsibilities

5.1 Site Manager and Staff

The Site Manager has the day-to-day responsibility for implementing the DMMP. The Site Manager has the responsibility to ensure that:

- The conditions of all relevant resource consents are complied with at all times;
- The dust control and mitigation measures and procedures outlined in the DMMP are implemented effectively;
- There are adequate personnel and equipment on site at all times to implement the dust control;

- Processes and equipment are in place to enable water application outside quarry operational hours when required;
- The meteorological and dust monitoring programmes are carried out as required, including recording of daily observations;
- Any complaints received are investigated and resolved as far as practicable; and
- All records are kept and are available to the relevant regulatory authorities.

All personnel working on the Project have responsibility for following the requirements of the air discharge consent conditions and the DMMP and reporting to the Site Manager on these issues.

5.2 Staff Training

Successful dust management depends on appropriate actions by site personnel in effective day-to-day and after-hours operations of the site. Environmental training for all staff will be undertaken as part of the site induction programme. The environmental induction will include the following information specific to this DMMP:

- Information about the activities that may cause dust discharges within the site with the potential to impact neighbouring areas;
- Consent requirements;
- Dust mitigation procedures;
- Description of dust and meteorological monitoring for the site; and
- Complaints management procedures.

Staff training records will be maintained on site. The records will include:

- Who was trained;
- When the person was trained; and
- General description of training content and whether follow up/refresher courses are required at a later date.

6.0 Implementation and Operation of DMMP

The Site Manager is responsible for implementing the DMMP including to:

- Identify key staff responsible for dust management and assign roles;
- Undertake staff training focusing on the objectives, responsibilities and actions defined by the DMMP;
- Establish daily processes and scheduling activities;

- Implement a daily briefing meeting; and
- Undertake regular debriefs and reviews of the DMMP.

The Site Manager is responsible for reviewing the effectiveness of the DMMP and if necessary, ensuring it is revised (on the advice of a suitably qualified and experienced expert) to improve management and mitigation measures to reduce any dust impacts.

7.0 Environmental Monitoring Programme

7.1 Dust Monitoring

7.1.1 **Visual**

Visual monitoring of dust must be undertaken to assess the level of dust emissions on the site and beyond its boundary. The visual monitoring will:

- Identity source(s) of dust (e.g. from heavy machinery, stockpiles, earthworks or material disturbance, etc.);
- Identify any areas of deposited dust from the site on surrounding roads and properties;
- Assess the extent and direction of any dust plumes (e.g. within boundary, cross-boundary, or covering a large extent);
- Identify receptors potentially impacted by the plume (e.g. properties downwind to the northeast);
- Assess offensiveness as high, medium, or low; and
- Assess overall impact as high, medium, or low.

All staff are required to continuously visually monitor activities to identify dust events. The Site Manager or delegate undertakes a site walkover and visual dust monitoring at least once per day, in the early afternoon, to assess the overall effectiveness of the DMMP and ensure compliance with the requirements of the resource consent conditions.

Site observations are recorded in a daily log form, an example of which is provided as Appendix B. The daily log forms will be kept for at least 5 years.

Recording relevant inspection results, as well as the conditions of external and internal factors on the log forms, must be used to help assess if control measures are effective and to define appropriate corrective or preventative actions in the event that adverse effects occur.

7.1.2 Instrumental

Continuous monitoring dust monitoring is undertaken using a MetOne ES-642 monitor installed by Mote in February 2024 at the Aylesbury Quarry site.

The monitor installation and operation is in accordance with AS/NZS 3580.1.1:2016 Australian/New Zealand "*Standard Methods for sampling and analysis of ambient air Part 1.1: Guide to siting air monitoring equipment*".

The monitor provides real-time PM_{10} data each minute, and will send an alert to the site Environmental Manager when concentrations exceed the predetermined trigger levels, shown in .

Table 3: PM_{10} Trigger levels

1-hour averaged PM_{10} ($\mu g/m^3$)	Actions
150	Implement Teir 1 Dust mitigation measures.
200	Implement Teir2 Dust mitigation measures.

7.2 Meteorological Monitoring

Monitoring of weather forecasts will be undertaken daily and used to inform the potential need for additional mitigation measures (e.g. in the event that strong winds are forecast).

Before the daily briefing meeting, the Site Manager must obtain the weather forecast for the day and identify whether high dust risk conditions (see Table 4) may occur. If high dust risk conditions are forecast, the Site Manager will highlight this to other on-site staff and instruct whether any additional dust mitigation is to be implemented for that day.

The forecast occurrence of high dust risk conditions shall be noted in the daily log along with any outcomes from the daily briefing meeting.

A meteorological station that will measure wind direction, wind speed, temperature and relative humidity must be set up on site. The location of the meteorological station must be, as far as practical, consistent with the AS/NZS 3580.1.1:2016.

The meteorological station will provide real time data to the site staff. This information will be used to assist with the dust management of the site. The station must record:

- Wind speed as 1-minute vector averages with maximum resolution of 0.1 m/s, accuracy of at least within +/- 0.2 m/s, and a stall speed no greater than 0.5 m/s;
- Wind direction as 1-minute vector averages with maximum resolution of 1.0 degree and accuracy of at least within +/- 1.0 degree, and a stall speed no greater than 0.5 m/s;
- Rainfall and evaporation as hourly averages with maximum resolution of 1 mm/day and accuracy that meets standard good practice as specified by the National Environmental Monitoring Standards (NESMS) for Rainfall Recording (Version 1.0 June 2012);
- Screened temperature with accuracy of +/- 0.5 degrees; and
- Humidity (%RH) with accuracy of +/- 5 percent.

The meteorological system must be set up to send email and SMS text alerts to site staff. An alert will be sent when 1-hour average windspeeds exceed 5 m/s which must prompt site staff to carefully monitor dust sources and implement additional mitigation measures if required. An alert will be sent when 1-hour average windspeeds exceed 7.5 m/s, which must prompt site staff to stop work on dust generating activities.

The meteorological data will be archived and be available for reviewing and responding to any dust and odour complaints received by the site staff.

Table 4 shows a summary of the meteorological conditions contributing to different dust risk levels, the associated notifications, and required responses.

Table 4: Dust Risk Levels, Meteorological Conditions and Responses

Dust Risk Level	Wind Speed	Wind Direction (blowing from)	Notification	Response
Low	< 5 m/s	All directions	-	-
Medium	5 – 7.5 m/s		Text & email	Implement Tier 1 dust mitigation measures
High	≥ 7.5 m/s		Text & email	Implement Tier 1 dust mitigation measures

Through use of real-time meteorological data to target dust suppression, combined with the two-tier approach to dust prevention detailed in Section 4.1, dust suppression water application will be carefully targeted. This approach will

ensure that the objective of mitigating adverse effects of dust discharges without exceedance of the water take limit can be achieved.

Meteorological data will be logged and archived and will be used in the complaint response procedure (see Section **Error! Reference source not found.**).

7.3 Frequency of Monitoring

Table 5 outlines the frequency of the activities undertaken as part of the monitoring programme.

Table 5: Monitoring Programme Activities and Frequency

Monitoring Activities	Frequency
Instrumental monitoring of meteorological conditions.	Continuous
Instrumental monitoring of dust concentrations.	Continuous
Check weather forecasts for strong winds and rainfall to plan appropriate activities and dust management response (7-day forecasts also available on www.metvuw.com and www.metservice.com).	Daily and as conditions change
Visual dust monitoring early afternoon site walkover.	Daily
Inspect site access and egress points to ensure dust is being contained to within the site.	Daily
Daily log form for visual monitoring of dust.	Daily
Inspect watering systems (water cannon, sprinklers, water carts and any other spray system) to ensure equipment is maintained and functioning to effectively dampen exposed areas.	Weekly
Inspect dust generating activities (as listed in Section **Error! Reference source not found.**) to ensure dust emissions are effectively controlled.	Ongoing
Monitor dust generating activities and water application rate.	In winds over 7.5 m/s blowing all directions.

7.4 Reporting of Monitoring Programme

The following information must be recorded in a daily log or equivalent system (an example of the type of detail that may comprise the daily log is provided in Appendix A of this DMMP):

- Results of the daily site inspections of visible dust emissions;
- Likely source(s) of any observed dust;
- General weather conditions during the day (i.e., windy, calm, warm, rain etc.);
- The frequency of use of the sprinkler system, water cannon and any water carts (if needed);
- Dust control equipment malfunctions and any remedial action(s) taken;
- Any unusual on-site activities; and
- Records of any complaints or other community feedback.

The log forms will be collated and stored on site and will be made available to SDC staff upon request.

8.0 DMMP Review

The DMMP will be reviewed and updated, with the necessary re-certification, throughout the course of the quarrying activity timeline to reflect changes in dust management techniques, staging of excavation and fill areas, or changes to the receiving environment. Re-certification by CRC will be required for any relevant revisions of a material nature for the DMMP. The review will take into consideration:

- Any significant changes to dust management activities or methods;
- Key changes to roles and responsibilities;
- Changes in industry best practice option for dust controls;
- Results of inspection and maintenance programmes, logs of incidents, corrective actions, internal or external assessments; and
- The outcome of investigations into discharges of dust/odour/air pollutants.

Reasons for making changes to the DMMP will be documented and version tracking will be recorded in the 'Document Control' register at the start of this report. A copy of the original DMMP document and subsequent versions will be kept for the project records and marked as obsolete. Each new/updated version of the DMMP documentation will be issued with a version number and date.

9.0 Complaints

9.1 Receipt Procedure

Southern Screenworks acknowledges the importance of ensuring that any complaints are recorded and promptly investigated to identify and resolve the cause of the complaint. Requirements and procedures for complaints are detailed below.

The Site Manager is responsible for response to and follow up all complaints regarding dust or any other air quality matters, and to ensure that suitable trained personnel are available to respond to complaints at all times.

Following the receipt of a complaint the Site Manager must, as soon as is possible, respond as follows:

- Undertake a site inspection. Check the required Tier 2 dust controls are in place. Note all dust-producing activities taking place and the mitigation methods being used, take photographs for reference as appropriate. If the complaint was related to an event in the recent past, where possible, note any dust-producing activities taking place at that time and review on site weather records and daily log;
- Initiate any remedial action necessary, which may include a stop work period;
- Note the time and date of the complaint/s and (unless the complainant refuses to provide them) the identity and contact details of the complainant. Ask the complainant to describe the discharge:
    f) Is it constant or intermittent?
    g) How long has it been going on for?
    h) Is it worse at any time of day?
    i) Does it come from an identifiable source?
- Review meteorological data from the on-site station;
- Note if the complaint has been referred to the SDC;
- As soon as possible (within 1 hour, where practicable), visit the area from where the complaint originated to ascertain if dust is still a problem;
- If it becomes apparent that there may be a source of dust other than the quarry activities causing the complaint, it is important to verify this, for example, photograph the source and emissions and/or make notes;

- As soon as possible after initial investigations have been completed, contact the complainant to explain any problems found and remedial actions taken; and
- If necessary, update any relevant procedures to prevent any recurrence of problems and record any remedial action taken.

9.2 Response Procedure

Following the receipt of the complaint, the following actions will be undertaken:

- Fill out the appropriate complaint form, attached as Appendix B to this DMMP;
- Advise site personnel as soon as is practicable that a complaint has been received, what the findings of the investigation were, and any remedial action taken; and
- Call or visit the complainant to update them on the actions taken and to check that the issue has been resolved.

10.0 Emergency Contacts

Internal contacts for the site in the event of an emergency of other problems are provided in Table 6 and Table 7 below.

Table 6: Internal Environmental Emergency Contact Details

Role	Name	Organisation	Phone
Site Manager	TBC	Southern Screenworks	TBC
Environmental and Consents Officer	TBC	Southern Screenworks	TBC
After Hours Contact	TBC	TBC	TBC

Table 7: External Environmental Emergency Contact Details

Role	Name	Organisation	Phone	Email
Consents Compliance Team	TBC	Selwyn District Council	TBC	TBC

Appendix A: Daily Log Form

Daily Dust Inspection Log

Date: _____ Time: _____

Inspection by: _____

Current weather conditions (e.g. sunny, cloudy, rainy): _____

Wind speed and direction (e.g. light, moderate, strong): _____

Weather forecast for next 24 hours (e.g. rainy, windy): _____

Area(s) inspected: _____

Scope of Inspection	Circle Relevant Item	Comments
Is there visible dust from site work activities, stockpiles, earthworks areas, or material disturbance areas or site access roads?	Y N N/A	
Are unsealed surfaces dry and need spraying with water?	Y N N/A	
Are any exposed earthworks or or material disturbance areas visibly dry and need water spray?	Y N N/A	
Stockpiles covered/stabilised where needed?	Y N N/A	
Are there any signs of dust going off site as a result of site activities? [Inspect land adjacent to the site exits and adjoining roads for the presence of dust deposits.]	Y N N/A	
If wind speeds are strong or forecast to be strong (over 5 m/s) are additional inspection and mitigation measures being put in place? (e.g. increase water application, restrictions on dusty activities)	Y N N/A	
Are watering systems (e.g. sprinklers, water carts, wheel wash) operating effectively to minimise dust?	Y N N/A	

Scope of Inspection	Circle Relevant Item	Comments
Are trucks carrying loose (uncovered) material entering or leaving the site?	Y N N/A	
How frequently has water sprinkling/spraying been used today (i.e. number of sprinklers, cannons, time, area watered)		
Note and dust control equipment malfunctions (and remedial actions taken as appropriate)		
Any unusual on-site activities today?		
Complaints received / community feedback		

Appendix B: Complaints Records

DUST COMPLAINT & ASSESSMENT FORM

PART A: Complaint Details

Date: Time:

Complaint Received By:

Name:

Address:

Contact phone numbers:

Possible source:

Anonymous: Y/N

Is dust occurring now?

Complaint details (include impacts/effects experienced by complainant:

PART B: Complainant Location Assessment

Date: Time:

Assessors Name:

Person spoken to at complaint location:

Reason for investigation: COMPLAINT/PROACTIVE

Complaint details (include impacts/effects experienced by complainant:

INITIAL IMPRESSIONS:

Type of dust

Time of the intial impression:

Any visible dust deposits: Y/N

Plume width (if known):

VISIBLE DUST DEPOSITS

Describe approximate quantites and extent

When was surface last cleaned?

Frequency of cleaning:

Describe the appearance of the deposits:

Colour		Any odour	
Shape		Water soluble	
Size		Other	
Crystalline or powdery			
Hard, soft			

Weather Data (see over)

Wind direction:
Wind velocity:
Cloud cover:
Temperature:
Rainfall in past 24 hrs:

Photos Taken: Y/N Samples taken Y/N

Diagram/description of where photos were taken.

Diagram/description of where samples were taken:

Sample collection: Use a small paintbrush (clean) to sweep samples of the dust onto a sheet of paper and then into a clean plastic bag. At least half a teaspoonful will be required for analysis. Lesser amounts may be colected on strips of clear cellotape, which should then be stuck onto sheets of clear plastic to preserve the samples. Label all samples and record date, time, location, etc on a separate sheet of paper if required.

Based on your assessment on this occasion, which of the following applies:

- [ ] I did not find any dust
- [ ] I did find dust and consider it would not be objectionable at any location for any duration or frequency
- [ ] I did find dust and consider it would be objectionable if it became continuous
- [ ] I did find dust and consider it would be objectionable if it occurred on a regular or frequent basis
- [ ] I did detect dust and consider it to be objectionable even in periods of short duration.

FINAL CHECKLIST

- [ ] Upwind assessment completed. Record details below. If not, detail reason: _____
- [ ] Aerial photo/sketch showing location of assessment and upwind assessment attached
- [ ] Are there potential witness statements to obtain YES/NO

REMARKS

PART C: Off-site dust and 360° assessment

Assess the dust upwind of the suspected source and if possible conduct a 360° sweep around the source assessing the odour at different points

OTHER POTENTIAL SOURCES **Time:** _____

Check for road works, ploughing, construction activities, burn-offs, unsealed roads, unsealed sites

Site 1:

Wind direction: Wind strength: Wind stability: GPS Loc:
Visible dust: Desciption of dust
Comment:

Site 2:

Wind direction: Wind strength: Wind stability: GPS Loc:
Visible dust: Desciption of dust:
Comment:

Site 3:

Wind direction: Wind strength: Wind stability: GPS Loc:
Visible dust: Description of dust:
Comment:

Diagram of Suspected source, dust assessment sites and dust plume:

N

COMMENTS

PART D: Source On-site Investigation

If source of dust identified, visit site, identify yourself and show warrant. Explain the findings of your investigation to staff.

Date: Time: Source Identified:

Staff spoken to:: Position:

Staff contact phone number:

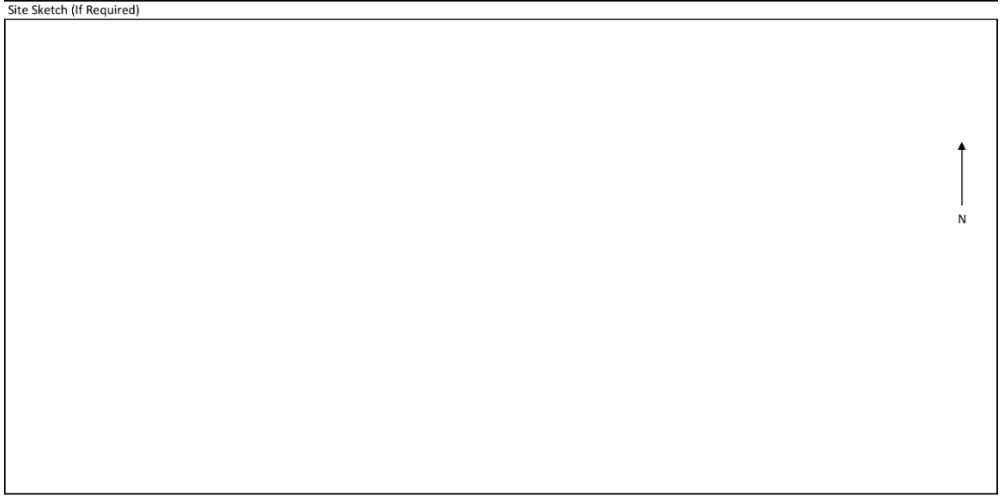
Current site operations:

Reason/explanation given for dust

Other Comments

Monitoring results/samples/other records

Site Sketch (If Required)



SIGNED BY ASSESSOR _____ DATE: _____

PART E: Dust Reference Sheet

Definitions

Objectionable The term objectionable is the term used in consent conditions and is an ingredient of any subsequent enforcement action. It is a subjective term and is open to interpretation. There is guidance from case law which defines objectionable as: unpleasant or offensive or repugnant; open to objection or undesirable or disapproved of; noxious or dangerous. A test will be applied by the court that the term objectionable will be as it applies to "the minds of a significant cross section of reasonable people in the community". The assessor must bear this test in mind when completing their assessment.

Frequency How often an individual is exposed to dust nuisance events

Intensity As indicated by dust quantity/concentration and the degree of nuisance

Duration The length of the particular dust event

Character How objectionable the dust is, having regard to the nature of the dust

Land Beaufort Wind Scale

B. No.	Description	How to Recognise
0	Calm	Smoke rises straight up
1	Light Air	Smoke drifts
2	Light Breeze	Wind felt on face; leaves rustle
3	Gentle Breeze	Flags flap; twigs move all the time
4	Moderate Breeze	Papers blow; small branches move
5	Fresh Breeze	Small trees sway
6	Strong Breeze	Large branches move, wind whistles
7	Near Gale	Whole trees sway

Measuring Temperature

Use descriptions below or obtain local meterological data, especially temperature from websites such as www.metservice.govt.nz

Cold
Cool
Mild
Warm
Hot

Measuring Cloud Cover

Okta No.	Description
0	Clear Sky
1	Sunny
2	Mostly sunny
3	
4	Half the sky is covered in cloud
5	
6	Mostly cloudy
7	Considerable cloudiness
8	Overcast
F	Fog / Mist

During the day the sun is always shining, so the amount of sunshine reaching the ground depends on the amount and duration of any cloud cover. The amount of cloud cover is usually given in units called oktas. Each okta represents one eighth of the sky covered by cloud.

Appendix B: Wind and dust plots from on-site data

PATTLE DELAMORE PARTNERS LTD
Level 2, 134 Oxford Terrace
Christchurch Central, Christchurch 8011
PO Box 389, Christchurch 8140, New Zealand

Office +64 3 345 7100
Web **www.pdp.co.nz**

Memorandum

TO	Sarah Bonnington, Jen Vella and Kevin Bligh	FROM	Fergus Robertson and Jeff Bluett
	Southern Screenworks	DATE	18 March 2025
RE	Southern Screenworks – Pre-hearing meeting - Air Quality Monitoring Programme: February 2024 to February 2025 – Summary Results		

1.0 Purpose of memorandum

The purpose of this memorandum is to provide updated wind/ dust monitoring data to February 2025, including an explanation of polar plot data, for you to provide to Environment Canterbury and submitters as agreed at the pre-hearing meeting on 11 March 2025.

2.0 Location of Air Quality and Meteorological Monitoring Site:

3.0 Air Quality and Meteorological Monitoring Equipment

4.0 Key Data Streams

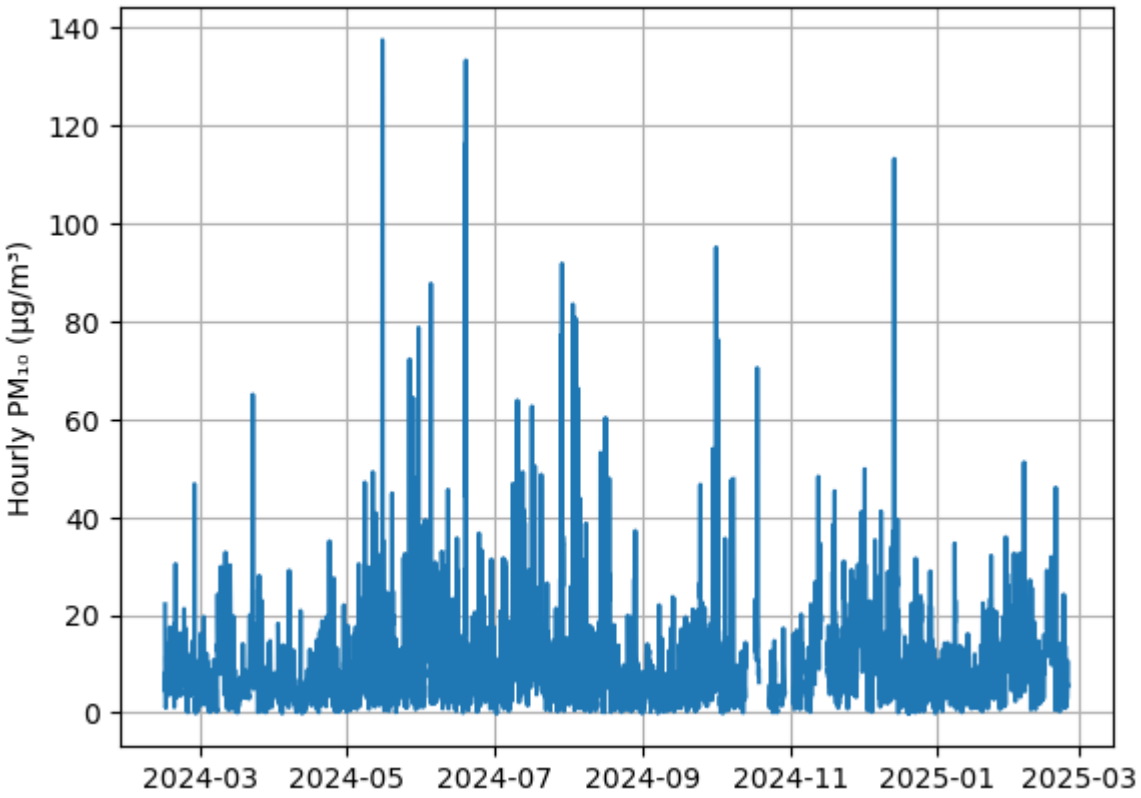
- Install Date: 15 February 2024
- Analysis Date: 26 February 2025
- Total number of 376 days = 9024 hours.

4.1 Windspeed (m/s)

4.2 Wind direction (°N)

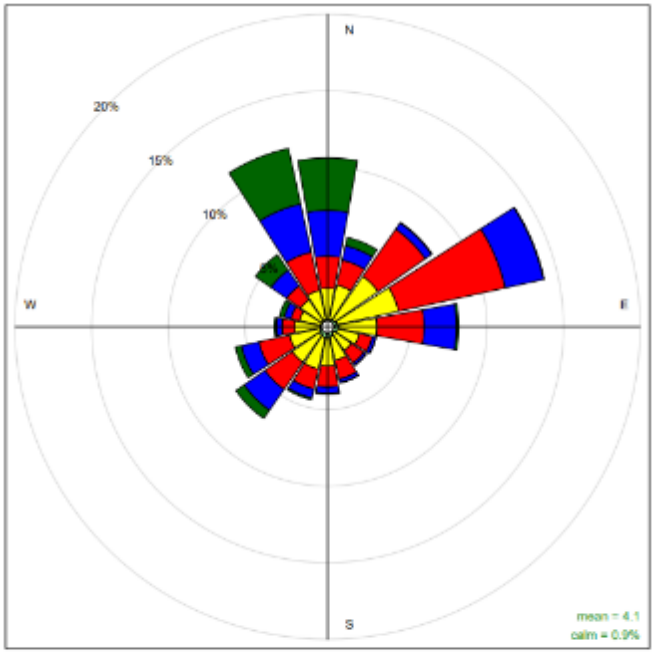
4.3 Data capture

- PM_{10} (1-hour average µg/m^3) Number of 1-hour PM_{10} data points captured = 9002
- Data capture rate **99.7%**
    - Excellent data capture rate.
- Time series

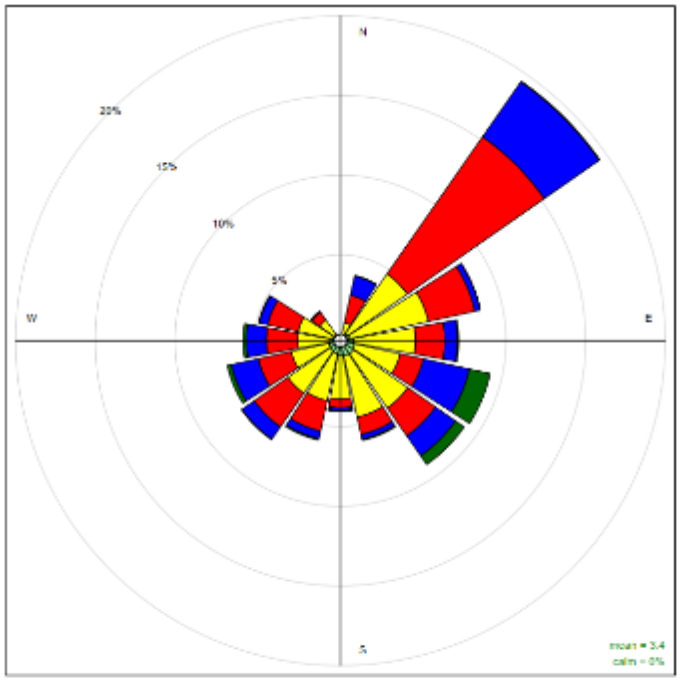


5.0 Local Wind Conditions

From AEE (May 2024). Data collected from Darfield 2011-2015



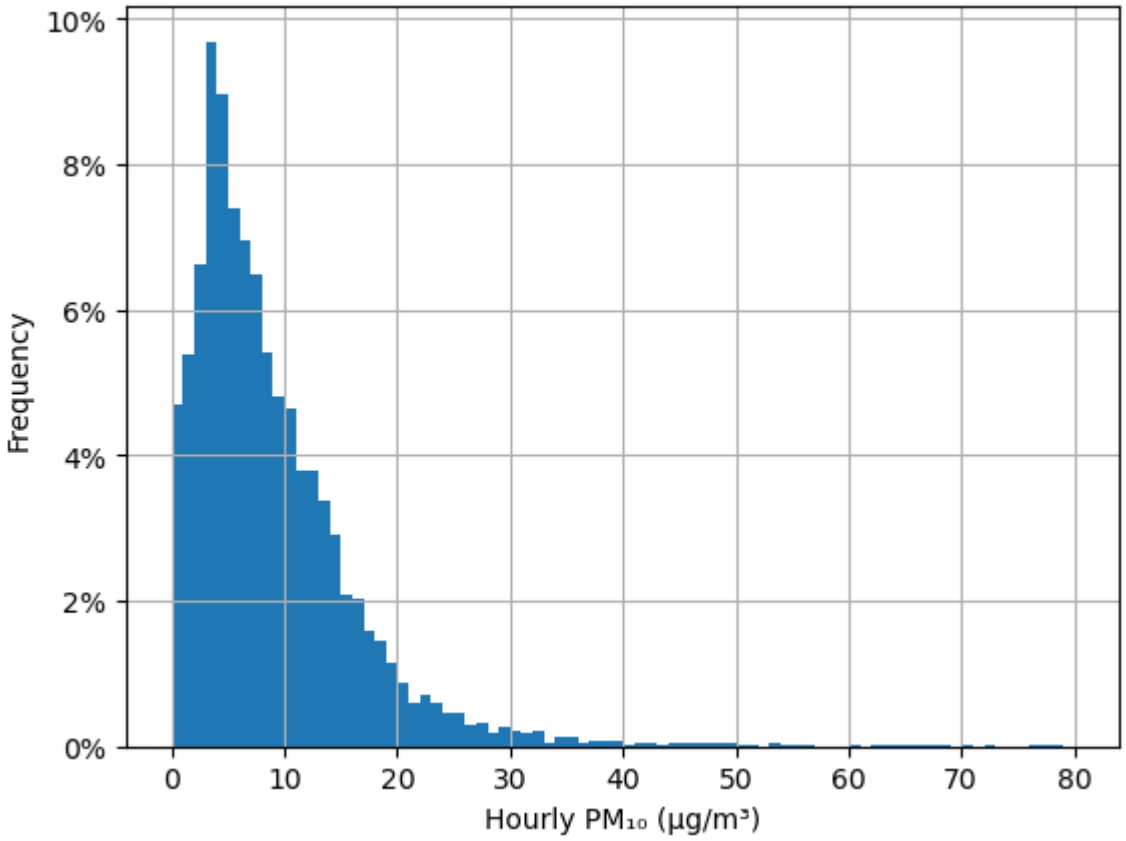
From onsite measurements;

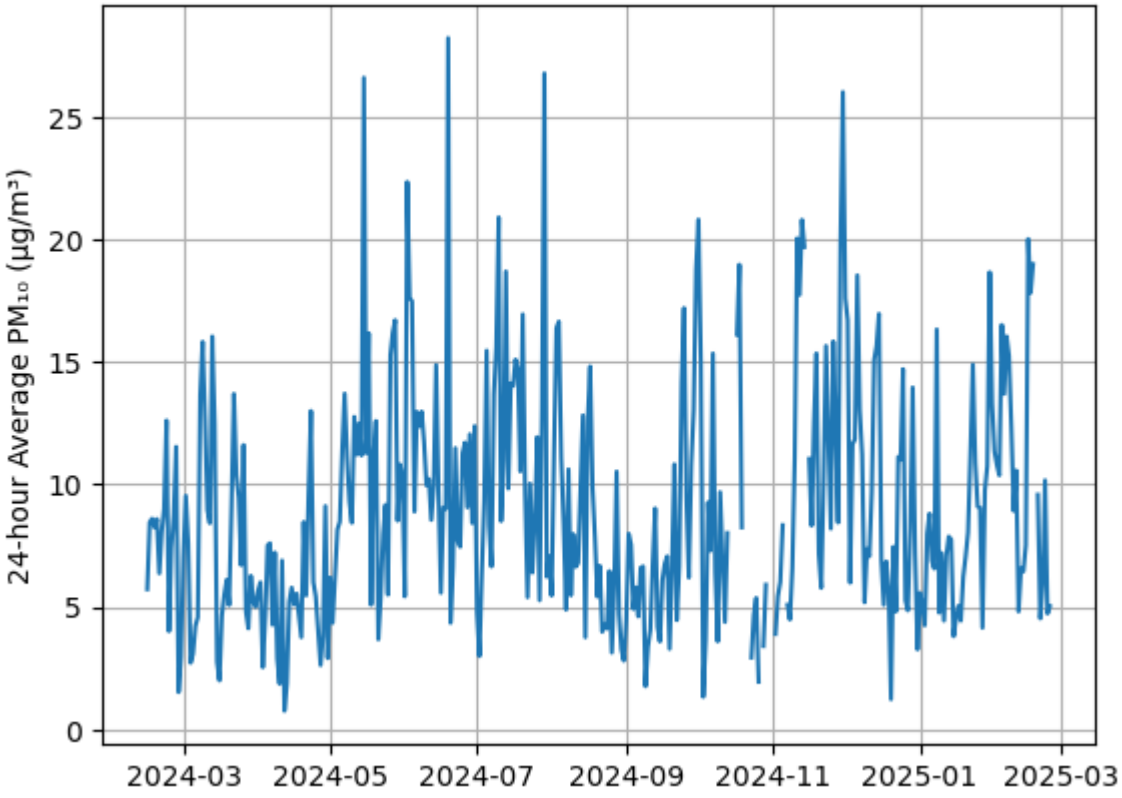


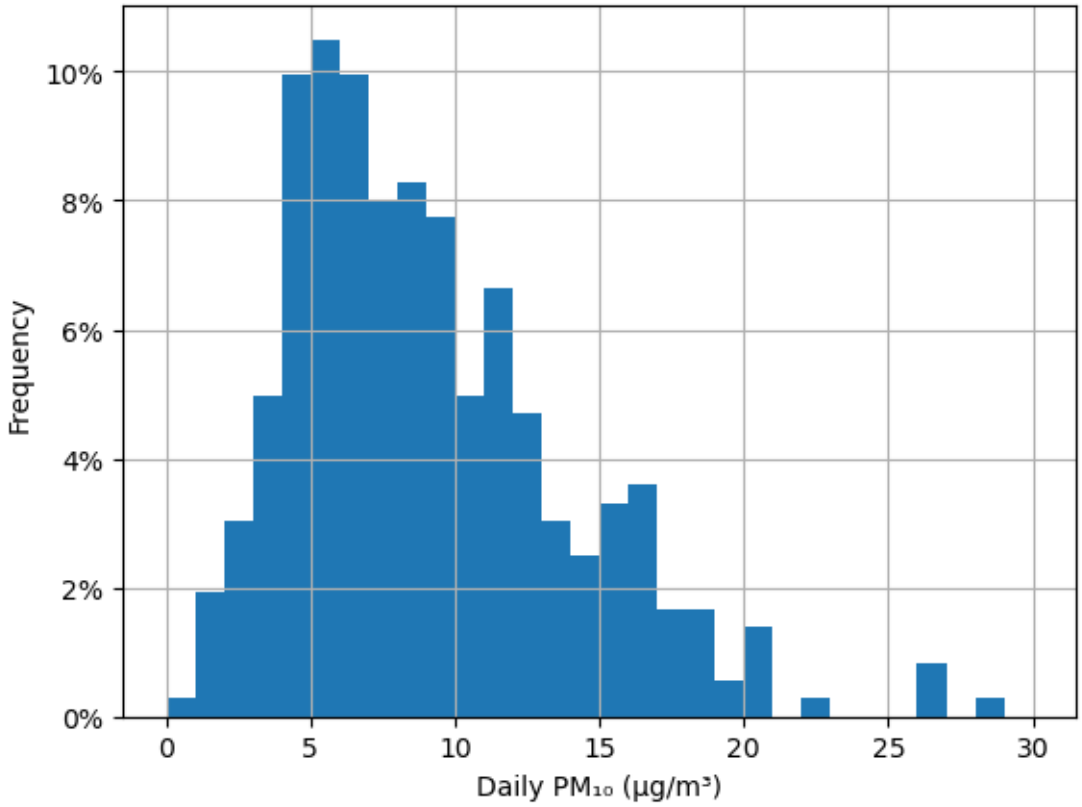
Summary:

- The are significant differences between Darfield and on-site data.
- Key differences are the onsite data has:
    - Less northerlies and therefore lower frequency exposure for receptors on Bealey Road
    - Greater frequency of SW (no sensitive receptors in that direction)
    - Slightly higher frequency of NE – exposure at 137 Bealey increases
- On-site wind directions generally more favourable than those presented in the AEE.

6.0 PM_{10} Concentrations, High medium or low?



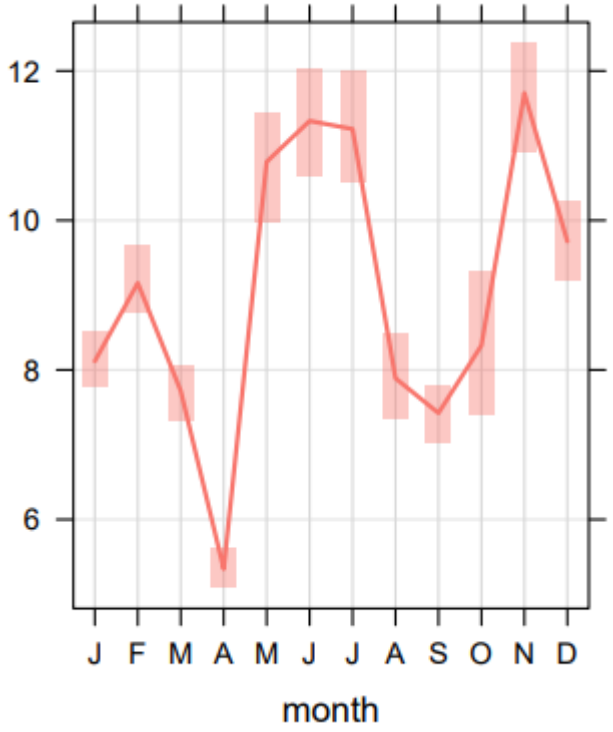

24-hour Average PM₁₀ (µg/m³)
0
5
10
15
20
25
2024-03
2024-05
2024-07
2024-09
2024-11
2025-01
2025-03


Frequency
0%
2%
4%
6%
8%
10%
0
5
10
15
20
25
30
Daily PM₁₀ (µg/m³)

Summary:

- The PM_{10} concentrations measured at the site are comparatively low.
- Average background concentrations of PM_{10} at a rural site (like Southern Screenworks) usually in the order of 10 μg/m3.
- Only a small % of measurements at the site are above 10 $\mu g/m^3$.

7.0 Seasonal Trends in PM_{10} concentrations



Summary:

- The data shows no clear seasonal trend in PM_{10} concentrations
- The difference between the months is small (max difference of 6.1 $\mu g/m^3$ between April and November)

8.0 How to read a polar plot

The sections below contain polar plots. This section explains how to read a polar plot.

- Vertical and horizontal axis indicate wind direction.
  - North-South on vertical axis and
  - East-West on horizontal axis.

- Wind direction is 'coming from', ie a southerly wind is coming from the south
- The rings indicate wind speed at 2 m/s intervals moving out from the centre. Low windspeeds are at the intersection of x and y axes. Higher windspeeds are the outer rings.

- The coloured blobs indicate PM10 concentrations. Blue to green is low (<2 µg/m^3) and red is high (>14 µg/m^3). See the scale on the right-hand side of the plot.

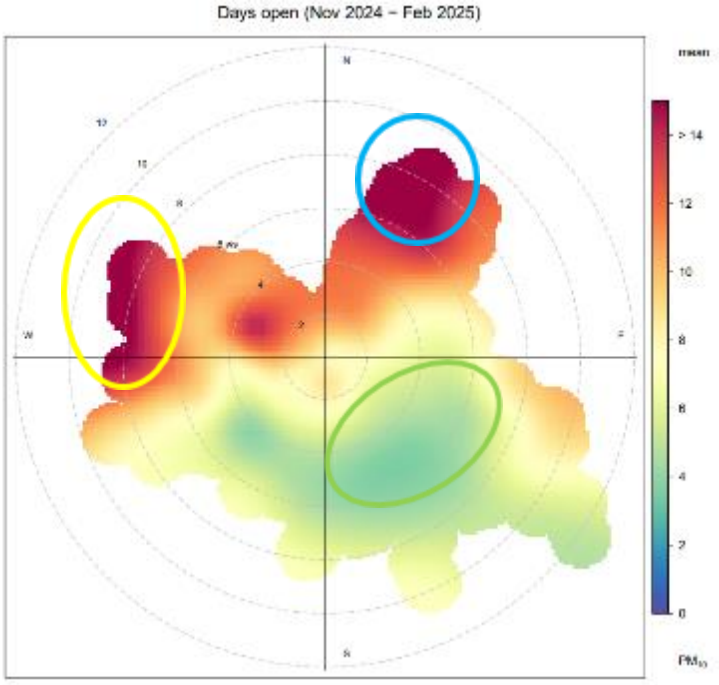
An example polar plot is shown below. It can be read as follows:

Some of the highest PM_{10} concentrations were recorded when the wind is either:

- 6-9 m/s from the NNE (nor-north-east) – see blue ring on plot
- 9 m/s from the WNW (west-nor-west). See yellow ring on plot

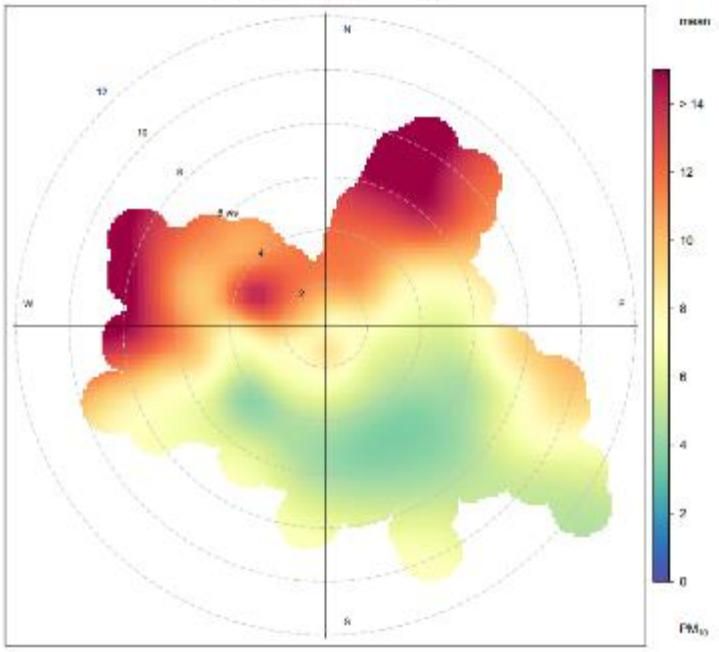
Some of the lowest PM_{10} concentrations were recorded when the wind is

- 4-8 m/s from the SW (south-west) – see green ring on plot

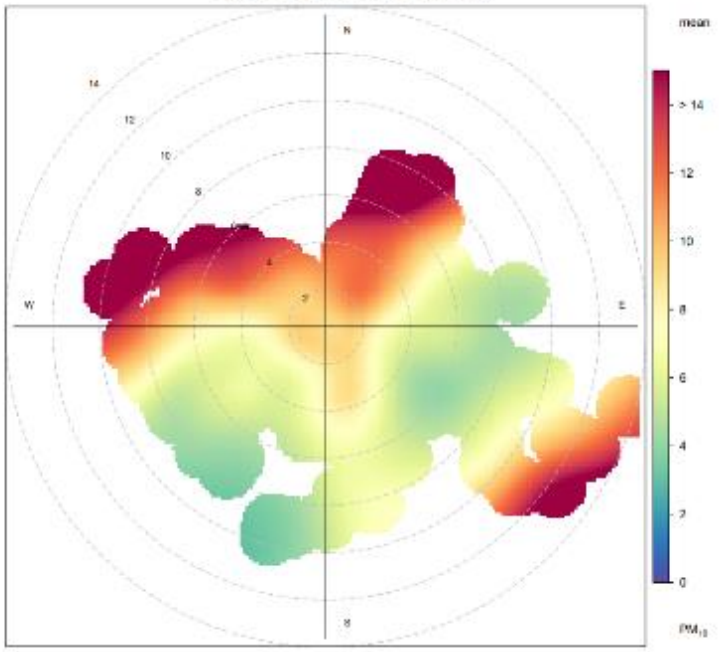


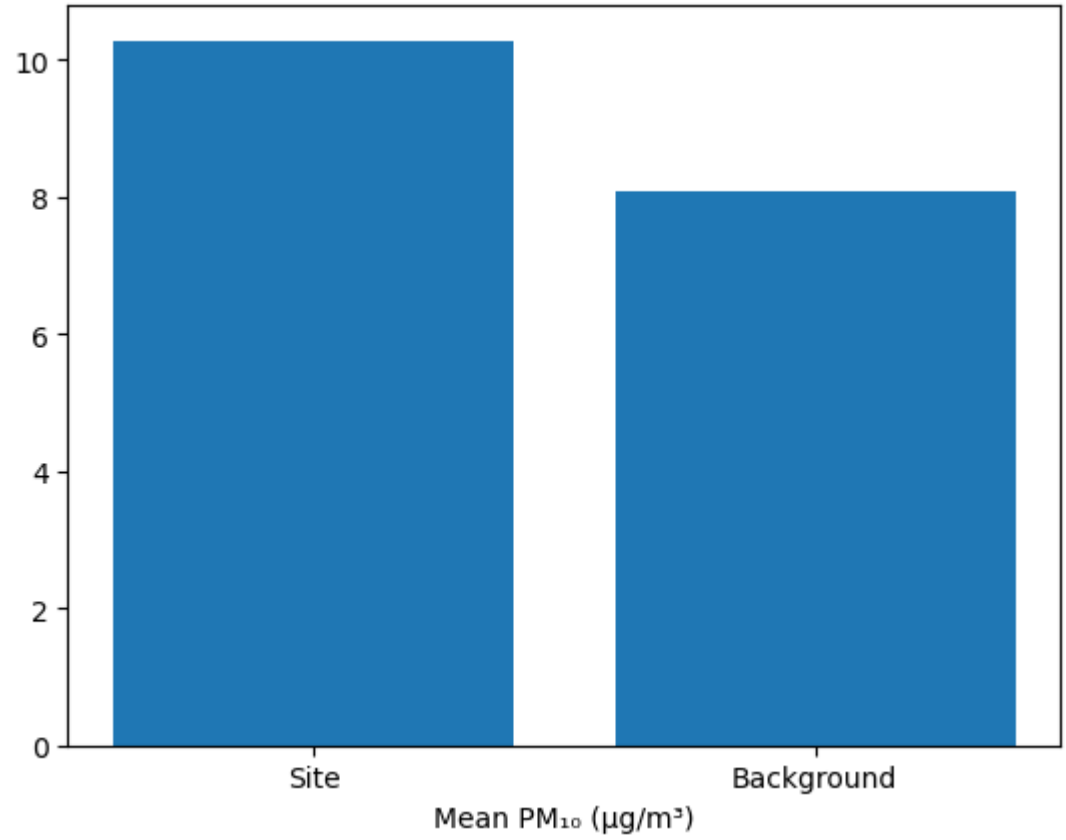
9.0 Wind Direction Tends in PM_{10} concentrations

Days open (Nov 2024 – Feb 2025)



Days closed (Nov 2024 – Feb 2025)

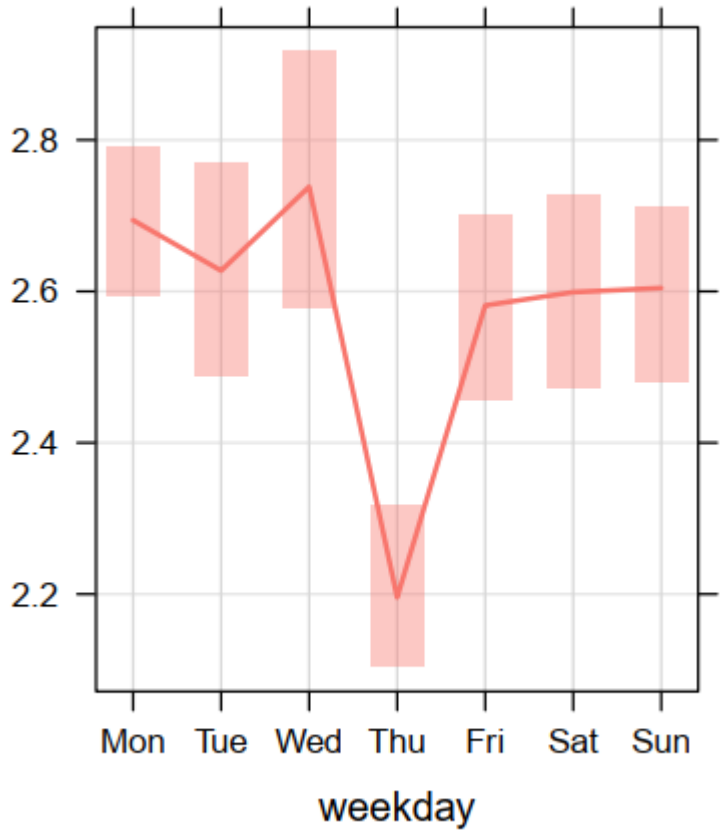




Summary:

- The wind directions from the quarry to the monitor are generally from the northern hemisphere
- Wind directions from other sources (background) to the monitor are generally from the southern hemisphere of the plot.
- PM_{10} concentrations are generally higher from the northern hemisphere than the southern hemisphere – indicating emissions from the quarry do have an influence on PM_{10} concentrations.
- The difference between average PM_{10} concentrations measured when the wind direction is from the site are slightly higher (0.75 µg/m^3) than when the wind is from other directions (background).
- PM_{10} concentrations are marginally higher on closed days.

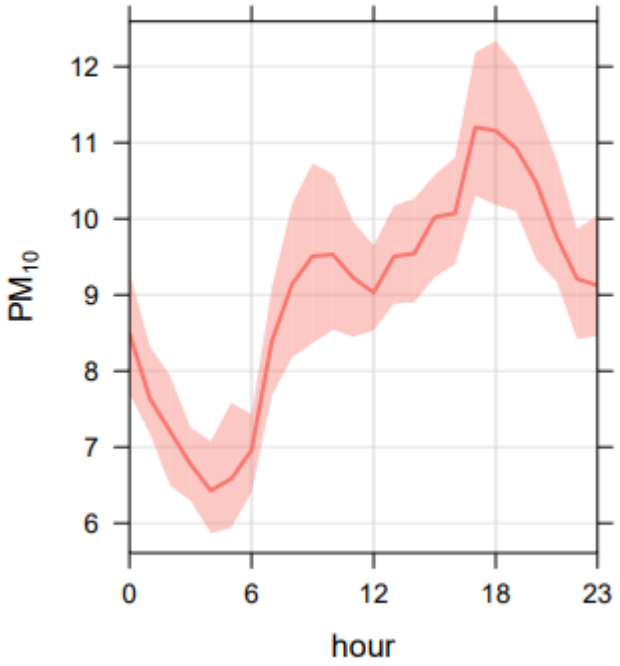
10.0 Weekday Trends in PM_{10} concentrations.



Summary:

- There is no clear weekday trend in PM_{10} concentrations.
- The weekend vs weekday concentrations are similar.
- The lack of difference between weekend and weekday concentrations are consistent with the results shown in section 8.0 (open vs closed days).

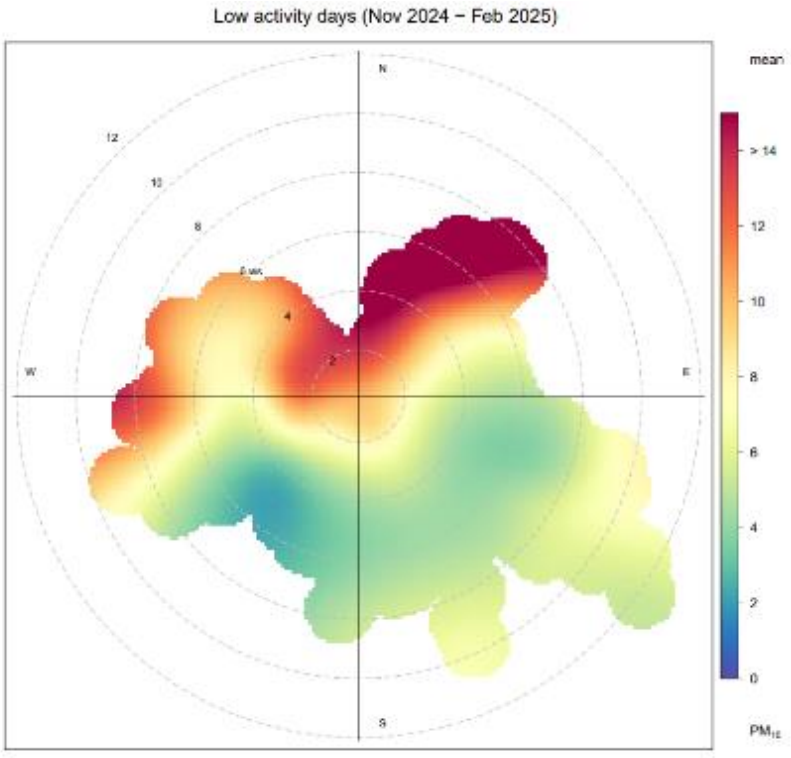
11.0 Diurnal Trends in PM_{10} concentrations

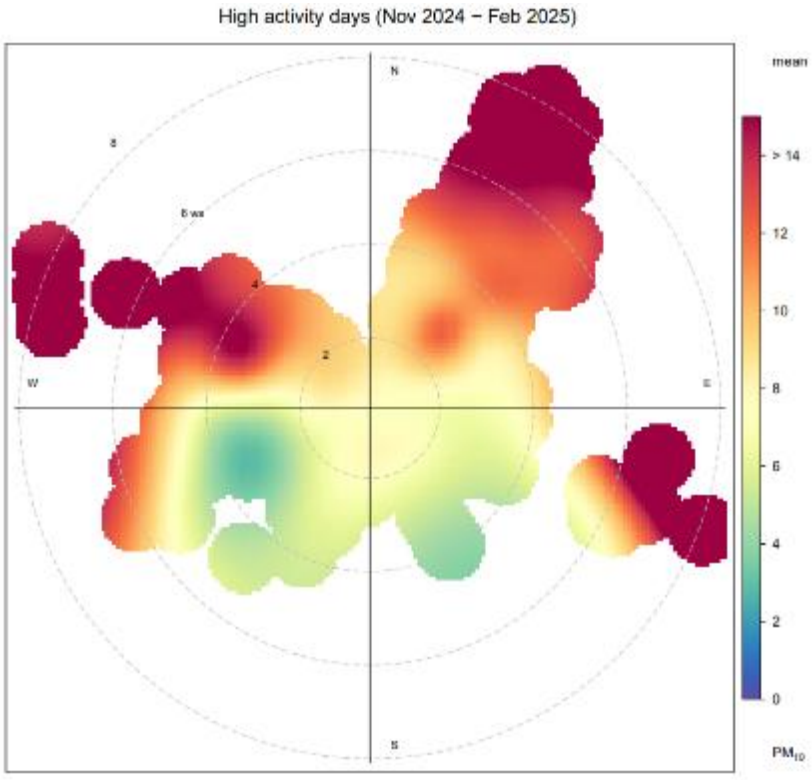


Summary:

- The PM_{10} concentrations:
  - Are at a minimum at 04:00
  - Generally, increase over the period 05:00 to 18:00
  - Are at a peak at 18:00
  - Decrease over the hours 18:00 to 04:00

12.0 Quarry activity trends in PM_{10} concentrations





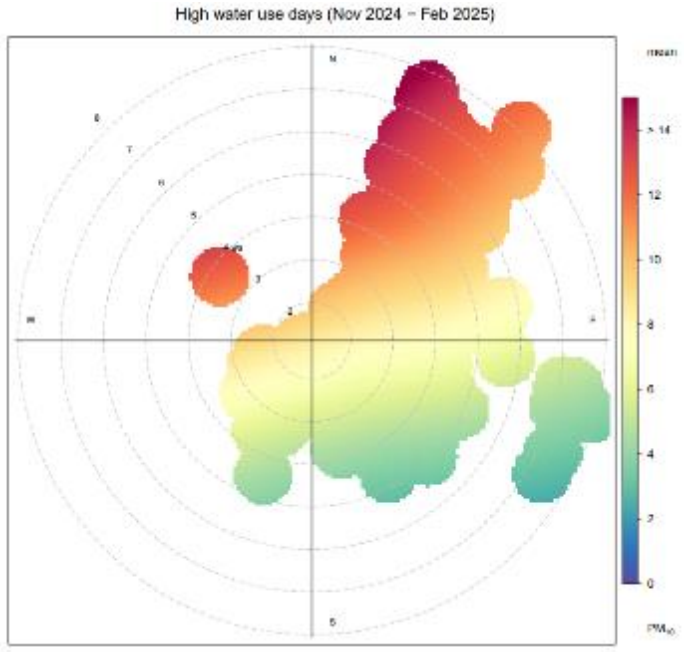
Summary:

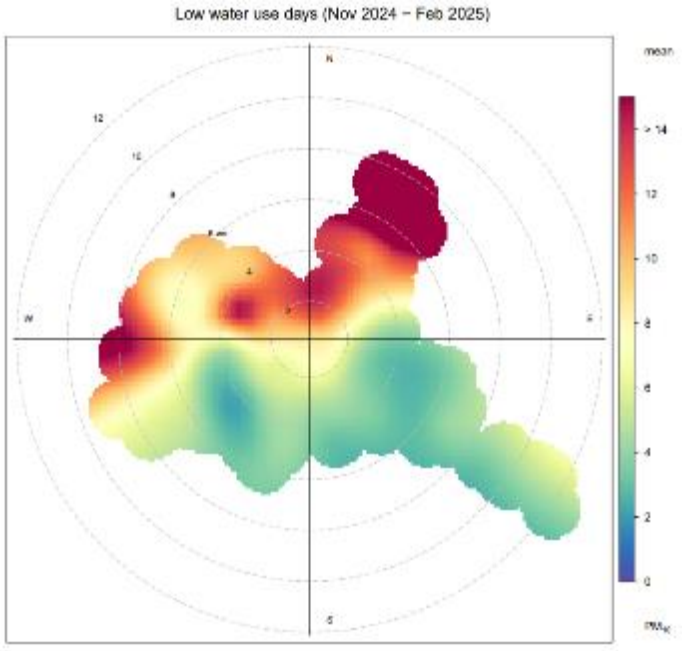
- The PM_{10} concentrations tend to be higher on high activity days:
    - The impact of the screening and crushing is inferred on high activity days (red dots to the NW)

- The impact of trucks leaving the site is inferred on high activity days (red dots to the SE)
- The vehicle parking area. (red dots to the NE)

- The largest dust source on low activity days appears to be the vehicle parking area.

13.0 Dust suppression water trends in PM_{10} concentrations





Summary:

- The PM_{10} concentrations tend to be higher on low water days:
  - The impact of the screening and crushing is inferred on high activity days (red dots to the NW)
  - The vehicle parking area (red dots to the NE)

- The largest dust source on high water days appears to be the vehicle parking area.

14.0 Top 20 events

We've had a look at the top 20 dust events at Southern Screenworks. Here's a quick overview of the most interesting results:

- Of these events, the median wind direction is 150 degrees, which is approximately in the direction of the stockpile/unsealed haul roads to the south of the monitoring station
- 15 of the events occurred on days where no water carts were used (including days where the site was closed)
- 5 of the events occurred on days where the site was closed
- 7 of the events occurred during hours of operation, 13 of the events occurred outside the hours of operation
- Only 1 event occurred during hours of operation on a day when the water cart was used (2024-10-18 10:00am)
- 4 events occurred on days where the site activities are classified as "High", although only 2 of these are between 7am and 6pm
- 6 events occurred on days where the site activities are classified as "Medium", although only 3 of these are between 7am and 6pm
- 5 events occurred on days where the site activities are classified as "Low", although only 2 of these are between 7am and 6pm

Prepared by

Jeff Bluett

Technical Director Air Quality