Before the Independent Hearing Commissioners
Appointed by the Taranaki Regional Council

Under	the Resource Management Act 1991
In the matter of	a resource consent for air discharge relating to the poultry farm operation at 58 Airport Drive, New Plymouth (5262-3.0)

Summary Statement and Rebuttal Evidence of Jason Savelio Karena Pene

14 February 2022

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1 My full name is Jason Savelio Karena Pene. I prepared a statement of evidence dated 28 January 2022 in relation to air quality. My qualifications and experience are set out in that statement.

2 I repeat the confirmation given in that statement that I have read and agree to comply with the Code of Conduct for Expert Witnesses in the Environment Court.

Summary and conclusions

3 In summary of my evidence, I consider the two key considerations in relation to air quality impacts of the application are as follows:

(a) The effects of emissions from the existing operation (to form a baseline for the assessment of effects from the proposed operation).

(b) The effects of the changes to the operation and discharges to air proposed in the application to determine the effects of emissions from the proposed operation (for which consent is sought).

4 In summary of the effects of the existing operation, further detail of the concerns of neighbours has been provided in evidence from and on behalf of submitters. However, independent investigations of odour have not corroborated the presence of offensive and objectionable odour from the existing operation, as referred to in submissions. There is a divergence of opinions on this matter but I consider it unlikely that offensive or objectionable odour would result from continuation of the current operation (which is not proposed in the application).

5 In summary of the effects of proposed changes, the proposal includes a number of measures that are likely to substantially reduce the impact of emissions from the site, in terms of both amenity and health, including a scaling back of the activity. With those additional measures in place I consider that a very high standard of emissions management will be in place, which I consider continues to appropriately respond to the sensitivity of the local environment.

6 Overall, with the proposed mitigation measures in place I do not anticipate offensive and objectionable odour and dust in the surrounding area as a result of the upgraded operation. The additional dispersion modelling results I have provided in this statement further support this assertion.

7 A number of changes to condition of consent recommended in the s42A report and evidence of submitters has been proposed by AFTL, I consider those conditions of consent would provide for effective management of the discharges and their potential effects in the environment.

Matters raised in evidence on behalf of other parties

8 I address the following matters raised in the evidence of Mr Donovan van Kekem and Mr Duncan Backshall on behalf of submitters and Mr Gary Bedford's supplementary statement on behalf of the Taranaki Regional Council (TRC).

Additional odour complaint

9 Mr Bedford refers to an odour complaint received from Mr and Mrs Hibell at 47 Airport Drive on 25 January 2020. As Mr Bedford notes, as the complaint was lodged by email, the TRC was not able to conduct contemporaneous on-site investigations.

10 The complaint noted that "*it was bad enough for us to have to close windows and garage door at 5 45pm*" on the previous evening (of 24 January 2020).

11 In correction of my statement of evidence in chief (paragraph 58), I visited the site on 23 and 24 January 2022 and was present in the area in the lead up to the period referred to above.

12 Having been at the application site earlier in the day, I returned to the site at approximately 1:30pm and was present until 4:45pm (periodically observing odour over this period). During this time there were light winds from the north and north-northwest and odour was not being propagated in the direction of the Hibell property to the west-southwest. This was the case when I left at approximately 4:45pm.

13 I have tabulated 1-hour average weather observation data from the New Plymouth AWS weather station for 24 January 2020. This indicates that there was a change in overlying wind flows from the north and northwest to the northeast between 5pm and 6pm and later to the east-northeast. These are conditions in which the Hibell property was likely to be down wind of the site.

14 I consider that odour levels that I observed at the boundary earlier in the day (very weak intensity or not present with the occasional occurrence of weak intensity odour) were unlikely to be conducive to an occurrence of offensive or objectionable odour at the Hibell property much further away. As I note below in paragraphs 44 to 49 I consider it physically unfeasible that odour intensities beyond the site boundary would be higher than I observed at the boundary. However, I was not present to confirm odour levels at the exact period noted in the complaint.

Odour concentration predictions

15 Mr Backshall and Mr Van Kekem have each requested peak predicted off-site odour concentration prediction results from the odour dispersion modelling investigation I described in my evidence in chief.

16 The intent of the dispersion modelling investigation was to quantify the relative change in ambient odour levels in the area associated with proposed modifications. For this reason I focussed on the predicted changes in odour concentrations rather the predicted odour concentrations associated with the proposed activity themselves.

17 In response to the requests in submitters' evidence, Table 1 below describes the 99.5th percentile 1-hour average odour concentrations predicted at submitter dwellings and other dwellings in the area. The spatial distribution of the odour concentration predictions is illustrated in Figure 1.

Table 1: Predicted 99.5th percentile 1-hour average odour concentration predicted at sensitive receptor locations as a result of the proposed operation (with conversion to free range configuration and installation of roof vents)

Receptor location (dwelling)	**Predicted 99.5th percentile 1-hour average odour concentration**
66 Airport Drive	4.0
76 Airport Drive	2.8
47 Airport Drive	1.9
40 Airport Drive	1.6
35 Airport Drive	1.1
Highest concentration at any other dwelling[1]	4.3

[1] At 69 Airport Drive

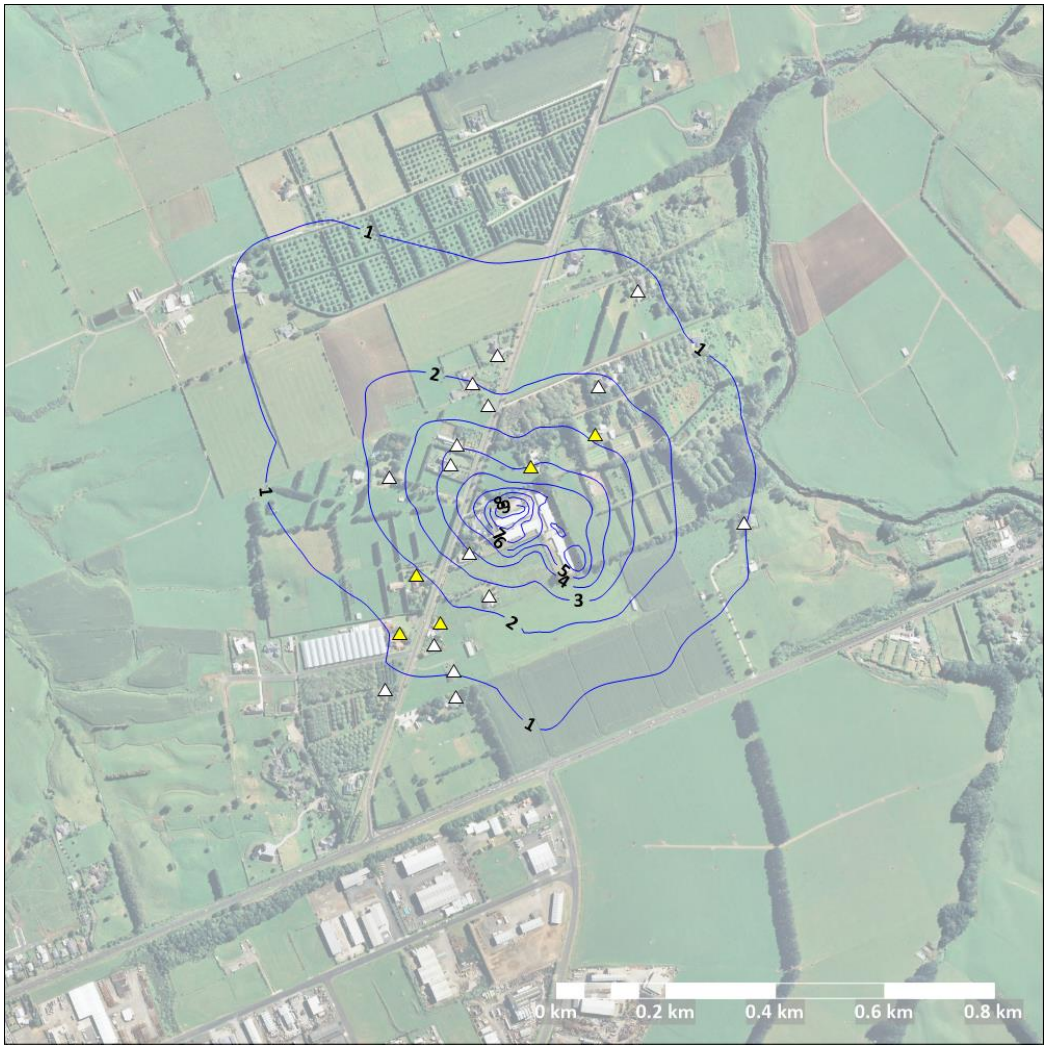

Figure 1: Spatial distribution of 99.5th percentile 1-hour average odour concentrations associated with the proposed operation (including change to free range configuration and installation of roof vents). Submitter dwelling locations are denoted in yellow, other dwelling location in white

18 I agree with Mr van Kekem that odour concentration predictions of this type "*are often compared against a 5 OU criteria for rural dwelling receptors"*[2] and consider this to be the relevant assessment criterion in this case (noting that this criterion is not intended as a strict pass/fail criterion).

19 The odour concentrations predictions account for two of the proposed improvements (conversion to free range configuration and installation of roof vents) but do not such account for other proposed measures that will reduce odour impacts, including the change to indirect heating methods and installation of improved climate control. The odour concentrations presented above will likely be further reduced as a result.

[2] Paragraph 8.6 of Mr van Kekem's statement

20 Notwithstanding this, the peak odour concentrations are predicted to remain below the criterion at local dwellings. Odour concentrations should be further reduced below the criterion with the additional odour management I have referred to above.

Dust emissions and impacts

21 Mr van Kekem[3] has highlighted dust deposits visible on windbreak fencing and accessways adjacent to the existing horizontal fans.

22 Mr Bedford has listed the means by which PM_{10} emissions are to be minimised[4] and these are also applicable to larger fractions of dust/particulate matter. In particular I consider the impacts of dust emissions will be further mitigated for the following reasons:

(a) The additional height to the celling inlets to chimney exhaust fans floor level where litter is disturbance will reduce emissions to atmosphere as that particulate matter has a tendency to settle and return to floor level with gravity.

(b) The height and vertical orientation of the new chimney vents will increase dispersion and dilution (as I have predicted to occur for odour). Mr van Kekem has noted that dust will travel further from the sheds as a result of the new vents, which I agree with, but the potential quantity of dust deposition in the surrounding areas will be substantially reduced through dispersion and dilution.

23 As a result, the potential for dust impacts on property or amenity beyond the boundary of the site is likely to be substantially reduced. Visible deposition of dust within the site (as illustrated in the s42A report and reproduced in Mr van Kekem's statement) and offensive and objectionable dust beyond the boundary as a result of the proposal is unlikely.

24 The use of water sprays at the point of discharge of the new chimney vents being trialled by AFTL would likely further reduce potential dust emissions but the management of dust from the site in my opinion is not reliant on this measure.

[3] Paragraphs 8.17 and 8.18 of Mr Van Kekem's statement

[4] Page 12 of Mr Bedford's statement

Health effects

25 Glenis McDonald has provided further details of the symptoms and frequency with which they occur in her statement and the odour diaries appended to the evidence of Mr van Kekem.

26 Ammonia is a by-product of intensive chicken farming and one of the contaminants Mrs McDonald refers specifically in her statement of evidence in relation to health effects. Of the contaminants she has referred to, ammonia is likely to be emitted in the largest quantities.

27 TRC's has conducted instrumental monitoring of ambient ammonia concentrations in and around the site, as detailed in the s42A report and the supplementary statement of Mr Bedford. The results of this monitoring indicate that that ammonia levels at or near the boundary of the site remained well within the relevant health assessment criteria for this contaminant[5] at the time. Corresponding ammonia levels beyond the boundary would be further diluted.

28 The TRC's measurements indicate that ammonia emissions from the site were unlikely to cause adverse health effects at the times the measurements were carried out. The effects of ammonia emissions from the site will be further reduced by modifications proposed by ATFL, including the reduction in housed birds, internal monitoring of and control based on ammonia levels, heating and ventilation improvements.

29 PM_{10} is another health contaminant emitted from intensive poultry farming operations that Mr Backshall has referred to in his statement[6]. PM_{10} particulate will be emitted as a component of dust, though the majority of dust from the poultry sheds is likely to be comprised of larger particle sizes (which are not associated with respiratory health effects of PM_{10} and finer fractions).

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[5] I consider the relevant health assessment criteria for the TRC's measurements to be the Acute Reference Exposure Level (REL) of 3,200 µg/m^3 (equating to 4.3 ppm) published by the California Office of Environment Health Hazard Assessment (OEHHA). California REL are defined as "*an exposure that is not likely to cause adverse health effects in a human population, including sensitive subgroups, exposed to that concentration (in units of micrograms per cubic meter or µg/m^3) for the specified exposure duration on an intermittent basis*". Use of RELs in the absence of corresponding national, regional or World Health Organisation assessment criteria is recommended in the Ministry for the Environment "Good Practice Guide for Assessing Discharges to Air from Industry", 2016.

[6] Paragraphs 4.55 to 4.58 of Mr Backshall's statement

30 Mr Bedford has listed the means by which PM_{10} emissions are to be minimised[7] and I agree with Mr Backshall in his assertion that he "*would not expect PM_{10} emissions from an operation of the scale of the Airport Drive poultry farm to result*"[8].

31 Although Mr Bedford notes that there is "*no justification for a PM_{10} condition"* he has further considered that "*there is no disadvantage to the applicant by imposing one"*[7].

32 With respect, I disagree Mr Bedford's latter assertion as I consider there to be a clear disadvantage to AFTL in that it has no control over potentially more significant background influences on the AFTL's ability to comply with his suggested condition. Mr Bedford has referred to the impact of naturally occurring marine aerosols in Taranaki on PM_{10} concentrations. Additional PM_{10} influences in the area are likely to include emissions from vehicle movements over unsealed surfaces, rural production activities such as crop harvesting and soil preparation and solid fuel combustion for home heating at nearby dwellings in winter.

33 Mr Bedford has referred to national standards in proposing the condition. However the Resource Management (National Environmental Standards for Air Quality) Regulations 2004 (NES-AQ) recognise the potential for background causes of exceedances of ambient air quality standards. Restrictions on the granting of consent for discharges to air relate to whether the discharge "*is likely, at any time, to cause the concentration of that gas in the airshed to breach its ambient air quality standard*"[9]. There is no reference in Mr Bedford's proposed PM_{10} condition to any exceedance of the proposed limit being caused by the consented discharges.

34 Additionally, under the NES-AQ, ambient standards are to be applied "*where people are likely to be exposed to the contaminant*"[10]. In the case of the ambient PM_{10} standard (which is specified for 24-hour average PM_{10} concentrations) people are unlikely to be present and exposed at the boundary of the site – this is instead more likely to occur at dwellings in the area.

35 Mr Bedford and Mr Backshall appear to agree (as do I) that there is no justification for Mr Bedford's suggested PM_{10} condition in terms of effects on the environment

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[7] Page 12 of Mr Bedford's statement

[8] Paragraph 4.57 of Mr Backshall's statement

[9] NES-AQ Regulation 20 and 21 (which relate to discharges of carbon monoxide, oxides of nitrogen, volatile organic compounds and sulphur dioxide). The proposed discharges of PM_{10} are not restricted under Regulation 17 as the site and surrounding area are not located within an airshed that meets the definition of "polluted".

[10] NES-AQ Regulation 14(1)(c)

and the condition would not be consistent with the NES-AQ regulations Mr Bedford has referred in proposing the condition.

Scope for improvement in litter conditions

36 Mr Backshall has noted the following in relation to the proposed installation of the DACS ventilation system:

> Mr Pene states that this should make substantial reductions in odour emissions, although I note that this will depend on the degree to which litter condition improves during the growing cycle. If litter condition is already well controlled, then the potential for further odour reduction may be limited.

37 The operation is well run and the litter I have inspected has been in good condition for the purposes of odour management. That isn't to say that further improvement is not available. I expect that the condition of litter will be improved over the course of the year but in particular in winter. Litter moisture content is often hardest to manage in winter when cooler ambient conditions mean that both the water carrying capacity of air and ventilation rates are lower. In these conditions the improved climate control will allow greater control of internal humidity and litter moisture content.

Impact of shelter belt vegetation

38 Mr Backshall has noted the impact of shelter belt vegetation on air flow

39 I agree that the shelter belt vegetation is likely to reduce the speed of air flow at ground level and potential modify its direction at times. This is consistent with my observations of wind at the site at ground level in low wind speed ambient conditions.

40 Mr Backshall has also noted the following:[11]:

> It is unclear whether the effects of these obstacles have been allowed for in the dispersion model.

41 The shelter belts are not impervious to air flow (in a way that a solid wall would be, for example) and a portion of air flow will pass through the vegetation. CALPUFF and other dispersion models used in New Zealand are not capable of representing this partial flow and it is not common practice for vegetation to be incorporated in building downwash flow calculations. On a broader scale, the effects of vegetation

[11] Paragraph 4.18 of Mr Backshall's statement

on air flow are accounted for in meteorological modelling through land use and surface roughness representations.

42 A benefit of the larger height of the proposed chimney stack vents (taller than typically applied for poultry shed operations in New Zealand) is the effects of adjacent shelter belt vegetation will be diminished. In addition to the height of the discharge, vertical momentum (similar to the "horizontal jet" illustrated in Figure 1) and thermal buoyancy will carry emission plumes further above the shelter belt before substantial dispersion occurs.

43 I therefore consider it unlikely that the shelter beds would have significantly altered odour modelling predictions for the proposed operation were they able to be accounted for in dispersion modelling.

Observations conducted at boundary as indicator of impacts beyond the boundary

44 Mr Van Kekem[12] raises concerns that as the observations made by TRC officers, myself and other air quality experts were not conducted beyond the boundary they may not be representative of odour levels at the latter locations for the following reason:

> At times due to thermal buoyancy of odour emissions an odour plume can rise above ground level before settling.

45 Thermal buoyancy of an emission plumes to air can have an important influence on the propagation and dispersion of the plume where there is a negative temperature gradient between the emissions and the receiving environment (i.e. the emissions are hotter than atmospheric conditions).

[12] Paragraph 6.6 of Mr van Kekem's statement

46 However, in the case of horizontal discharges such as those from the side wall vents in the current configuration, horizontal momentum of the emission is initially likely to be the predominant influence on propagation. This is referred to as the "horizontal jet" in the following figure excerpt from an investigation conducted for the Australian RIRDC[13], illustrating the phases of horizontal emission plume development.

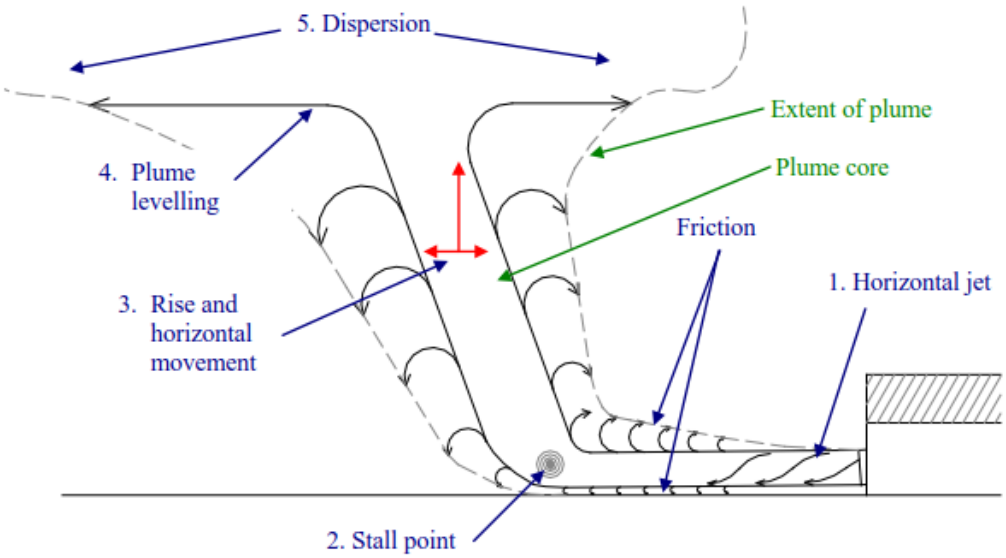

Figure 2: Diagram showing transitional phases of poultry shed plumes

47 As illustrated in the figure above, once friction has exhausted the momentum of the horizontal jet the plume is able to rise through thermal buoyancy (where the plume is warmer than atmosphere). As Mr Van Kekem has noted, it is possible that as the warm plume cools it may settle back to ground level (following the dispersion stage illustrated in the figure above).

48 When I visited the site in January 2022 during the latter half of a growing cycle (when the ventilation requirement was reasonably high) horizontal momentum was predominant at the boundary locations I made observations (i.e. the horizontal emissions had clearly not reached the stall point). I therefore I consider it unfeasible that higher odour levels than I observed at the site boundary were occurring simultaneously at locations beyond the boundary.

49 Given that horizontal ventilation rates were also likely to have been high during TRC's observations during peak periods of the growing cycle, I also consider it

[13] Dunlop M.et. al. 2010, "Separation Distances for Broiler Farms. Verifying methods and investigation the effects of thermal buoyancy". RIRDC Publication No. 10/073.

highly unlikely that odour levels were higher beyond the boundary during those peak observations.

Conditions of consent

Dust monitoring

50 Mr Van Kekem has suggested a requirement for monitoring of dust levels against the requirement the limits of Condition 10.

51 While I don't disagree with the premise of monitoring in the instance that a potential compliance issue in relation to dust beyond the boundary is highlighted, I have the following reservations about the proposed modifications to the condition:

(a) The suggested trigger for monitoring is proposed as "*should TRC observe dust beyond the boundary of the site*". There is no requirement under the existing consent (or the permitted activity rule for intensive poultry farming) that dust is to be fully internalised and that no dust is to be emitted beyond the site boundary. Dust emissions beyond property boundaries are fairly common in rural areas (for example as a result of background particulate sources I describe in paragraph 32 above). I consider that any trigger should relate to a potential for dust emitted beyond the boundary being offensive or objectionable.

(b) A requirement is proposed that monitoring is to be conducted in accordance with the appropriate respective AS/NZ standards for each dust monitoring parameter. This may preclude monitoring methods that are used for monitoring to total suspended particulate (including where AS/NZS methods are specified for the PM_{10} fraction of particulate only).

52 For these reasons I consider the monitoring requirement as currently propose by Mr Van Kekem to be inappropriate and should not be adopted.

Ground cover in range area

53 I consider that Mr Van Kekem's suggestion of a minimum vegetative cover requirement for range areas to be reasonable. Although Mr Bedford notes that proposed avocado trees may interfere with the ability of AFTL to comply with the requirement. However, this is a stipulation of SPCA standards for free range farms

54 I therefore consider adoption of the wording of the SPCA standard requirement with a requirement that six months be allowed following the exercise of the consent to grow ground cover over currently exposed areas to the required standard (as proposed in the rebuttal statement of Mr McDean) to be appropriate.

Air Quality Management Plan

55 I consider Mr Van Kekem's suggestion for an Air Quality Management Plan (AQMP) condition to be appropriate would provide further certainty that abnormal emissions of the type referred to my Mr Backshall[14] will be avoided.

56 An AQMP condition based on conditions granted in other regions is proffered in the evidence of Mr McDean.

Setback requirements for new vents

57 Mr Van Kekem recommends that proposed setback distance for new stacks from neighbours dwellings include the curtilage of the dwellings. However, the stacks have already been installed based on separation from the dwelling itself. The dispersion modelling predictions indicate difference in terms of odour concentrations is inconsequential and consider the requirement should relate to a setback from the dwelling as proposed in the s42A report.

Operational monitoring requirements

58 I consider Mr Van Kekem's suggestions in relation to Conditions 6 and 7 to be reasonable (in relation to calibration and specification of sensors) and a requirement to describe monitoring trigger levels and response actions is included in the AQMP condition recommended in the evidence of Mr McDean.

PM_{10} concentration limit

59 As I have discussed above (paragraphs 31 to 35), I agree with Mr Bedford and Mr Backshall that there is no justification based on environmental effects Mr Bedford's proposed condition limiting PM_{10} concentrations beyond the boundary. Additionally I consider the proposed condition is not consistent with the NES-AQ in important aspects and AFTL would also potentially have little or no control over its ability to comply with such as condition. I therefore do not consider such a condition to be appropriate.

60 Overall with the changes I have discussed above I consider the conditions of consent would provide for effective management of the discharges and their potential effects in the environment to the extent that offensive or objectionable odour or other unacceptable effects are unlikely.

[14] Paragraph 4.53 of Mr Backshall's statement

Attachment A: Wind speed and directions measured at New Plymouth AWS weather station, 24 January 2022

Date/time (daylight savings)	Wind speed (m/s)	Wind direction (°)	Wind direction (cardinal)	Air temperature (°C)
24/01/2022 0:00	3.1	160	SSE	17
24/01/2022 1:00	2.6	160	SSE	16.4
24/01/2022 2:00	3.1	160	SSE	16.1
24/01/2022 3:00	2.1	160	SSE	16
24/01/2022 4:00	2.6	160	SSE	16.5
24/01/2022 5:00	1.5	150	SSE	16.6
24/01/2022 6:00	2.1	140	SE	16.8
24/01/2022 7:00	2.6	160	SSE	17
24/01/2022 8:00	2.6	170	S	17.4
24/01/2022 9:00	1.5	140	SE	18.6
24/01/2022 10:00	2.1	120	ESE	20.1
24/01/2022 11:00	2.6	40	NE	21.2
24/01/2022 12:00	3.6	20	NNE	20.7
24/01/2022 13:00	3.1	40	NE	21.1
24/01/2022 14:00	3.6	340	NNW	20.6
24/01/2022 15:00	4.1	320	NW	21.4
24/01/2022 16:00	2.6	310	NW	20.1
24/01/2022 17:00	2.1	360	N	21
24/01/2022 18:00	2.6	300	NE	20.3
24/01/2022 19:00	3.1	310	ENE	18.8
24/01/2022 20:00	3.6	310	ENE	18.6
24/01/2022 21:00	2.1	330	SE	18.1
24/01/2022 22:00	2.6	340	SSE	17.9
24/01/2022 23:00	3.1	340	SSE	18
25/01/2022 0:00	2.6	320	SE	18