Before Hawkes Bay Regional Council and Hastings District Council

In the matter of	the Resource Management Act 1991
And	
In the matter of	Application by Hastings District Council and Napier City Council to Hawke's Bay Regional Council for resource consents authorising the operation of Area B at Ōmarunui Landfill (**consent application**)
And	
In the matter of	A notice of requirement by Hastings District Council to Hastings District Council for alteration of designation for the Ōmarunui Regional Landfill (**NoR**)

Statement of evidence by Jason Pene on behalf of Hastings District Council and Napier City Council

Dated 2 September 2021

INTRODUCTION

1. My name is Jason Savelio Karena Pene. I am a Principal Environmental Engineer at Tonkin & Taylor (**T+T**) and in this role I provide air quality and environmental engineering consultancy services to a range of private and public sector clients.

2. I set out my qualifications and experience as **Attachment A**.

3. This evidence relates to planning approvals being sought to authorise the operation of a landfill at Ōmarunui Regional Landfill (**Landfill**) in Area B, specifically:

    (a) Application by Hastings District Council and Napier City Council, as owners of the Landfill, for regional consents from Hawke's Bay Regional Council (**HBRC**); and

(b) A notice of requirement by Hastings District Council as requiring authority to Hastings District Council (**HDC**) to alter Designation D123 – Ōmarunui Landfill in the Hastings District Plan.

4. I refer to Hastings District Council in its capacity as requiring authority and applicant, and Napier City Council as applicant, together as the **Applicants**, and the application and notice of requirement together as the **Proposal**.

5. I have been engaged by the Applicants to provide advice in relation the air quality impacts and management of discharges to air from the Proposal.

6. In preparing this statement of evidence I have read the application documents, the submissions received on the Proposal and the evidence statements of Mr Phillip Doolan, Mr Tony Bryce and Ms Andrea Brabant. I have also read the section 42A reports prepared by Mr McKay on the NoR, and that prepared by Mr Shirras in relation to the consent applications.

7. I have visited the site and surrounds on several occasions since 2018 and participated in a meeting with submitters on the Proposal at the site on 24 March 2021.

CODE OF CONDUCT

8. I confirm that I have read the Expert Witnesses Code of Conduct contained in the Environment Court of New Zealand Practice Note 2014. My evidence has been prepared in compliance with that Code in the same way as I would if giving evidence in the Environment Court. In particular, unless I state otherwise, this evidence is within my sphere of expertise and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

SCOPE OF EVIDENCE

9. My evidence addresses the following matters:

(a) A summary of the Air Quality Impact Assessment (**Air Quality Assessment**) attached to the Assessment of Environmental Effects (**AEE**) as Appendix M, including subsequent updates. This will include a brief description of the following:

(i) The nature and sources of emissions to air from the landfill.

(ii) The environmental setting of the discharges to air, including sensitivity of the receiving environment air contaminants and influences on the dispersion and propagation of landfill emissions.

(iii) The methodology and key findings of the assessments of air quality impacts of the operation that I have conducted, including in relation to:

(aa) Odour emissions

(bb) Hazardous air pollutants

(cc) Dust emissions.

(iv) Overall conclusions in relation to the potential air quality effects of the Proposal.

(b) Respond to matters relating to air quality raised in submissions.

(c) Respond to matters in the Section 42A Report (Resource Consent) that relating to air quality.

(d) Comment on the proposed conditions of consent.

NATURE OF THE DISCHARGES TO AIR AND DISCHARGE ACTIVITIES

10. The discharges to air from the proposed Area B at Ōmarunui Landfill will primarily consist of:

(a) odour from solid waste received and filled at the site, which has the potential to cause nuisance or amenity effects in the environment;

(b) by-products arising from the controlled combustion, in generator engines and flares, of landfill gas (**LFG**) generated from the decomposition of waste, which will be collected from Area B (as well as the preceding completed Areas A and D);

(c) fugitive releases of LFG from filled sections of Area B, which may include odorous or hazardous components; and

(d) dust emissions from landfill construction activities, vehicle movements over unsealed surfaces or handling of dusty wastes; which has the potential to soil property and cause nuisance if deposition exposure occurs in sufficient quantities.

Odour emissions

11. Odour, which has the potential to cause nuisance with sufficient exposure, is typically the key air contaminant of concern in relation to the operation of municipal landfills.

12. Odour at a landfill is mainly derived from anaerobic degradation of organic components of waste, which may occur both before and after receipt at the site. Key odour sources include:

(a) Waste receipt and active filling of waste

(b) Filled and covered areas

(c) Residual or uncombusted odour from LFG collection and treatment; and

(d) Leachate collection and recirculation.

Landfill gas emissions

13. LFG is also generated from the degradation of filled waste in an anaerobic environment and contains organic components from the decomposition or volatilisation of waste. LFG is comprised mainly of methane (typically comprising 45% to 60% of LFG), which is not toxic, and carbon dioxide, which is present in the atmosphere. Both methane and carbon dioxide are greenhouse gases (the effects of which are beyond the scope of this statement). LFG also contains small quantities of other organic components (referred to as non-methane organic compounds, NMOCs).

14. Reduced sulphur compounds, including hydrogen sulphide (H_2S) and more complex sulphur compounds, as well as other odorants are likely to be present in LFG in trace quantities. Certain NMOC components of LFG, such as benzene and formaldehyde, are classified as hazardous air pollutants that can cause health effects if people are exposed in sufficient doses.

Combustion emissions

15. LFG collected and extracted from filled areas at the landfill is currently combusted either in an engine to generate electricity for the national grid or in an enclosed flare.

16. Controlled combustion in both engines and flares typically provides efficient destruction of combustible components of LFG including methane and odorous and hazardous components.

17. Some of the exhaust by-products of combustion such as fine particulate matter (including the PM_{10} and $PM_{2.5}$ fractions), nitrogen dioxide (NO_2) and sulphur dioxide (SO_2) have the potential to cause adverse health effects with sufficient exposure. Similar to other methane-based fuels such as natural gas, LFG is relatively clean burning compared to solid or liquid fuels and the scale of emissions of particulate and other combustion contaminants is relatively low.

Dust emissions

18. Dust is likely to be generated during both the construction and filling phases of proposed Area B, as a result of handling of soil and other materials and disturbance of exposed soil surfaces (for example, from heavy vehicle movements).

19. Dust may cause nuisance or soil property as the dust particles gravitate towards and deposit on surfaces. Although strong winds may propagate dust further, typically the vast majority of deposition occurs within 100 m of the source.

ENVIRONMENTAL SETTING

Sensitivity to odour and other air contaminants

20. The landfill site is rurally located and the surrounding area is occupied predominantly by horticultural production, pastoral farming and plantation forestry. Due to the low density and intermittent human occupation associated with this type of activity, sensitivity to odour, dust and hazardous contaminants is generally low.

21. However, rural dwellings are also interspersed throughout the area. Occupation of dwellings is typically more consistent over time than in surrounding rural production areas (for example they may be occupied throughout both the day and night) and expectations of amenity will be higher in a home setting. The density of residential development of the area is generally low, though is higher in certain areas such as

the rural residential areas along Breckenridge Road to the southeast. However, the density of development is substantially less than in urban residential areas . As a result I consider that while the sensitivity in the area is highest at local dwellings, sensitivity is not as high as in an urban residential area.

22. The location of dwellings within 1 km of the currently operating Area D and proposed Area B represented in Figure 4.1 of the Air Assessment is represented in Attachment B to this statement. The dwellings are located primarily in the two valleys to the east and west of the range of hills in which the landfill, or at low elevations in the adjoining hills.

23. As I will elaborate on later in my evidence, there are a larger number of dwellings to the west (along Swamp Road) within 1 km of Area D than within 1 km of Area B to the east (along Ōmarunui Road). The curtilage of the nearest dwelling to the currently operational Area D (at 536 Swamp Road) is located 265 m from the extent of Area D. Three other dwellings along Swamp Road feature curtilage within 400 m of Area D.

24. By comparison, the curtilage of the nearest dwelling to the proposed extent of Area B (at 419 Ōmarunui Road) is located 455 m distant (the dwelling itself is 475 m from the fill extent). The curtilage of the next closest dwelling at 339 Ōmarunui Road is located 775 m from the proposed extent of Area B.

Meteorology and topography

25. The dispersion and propagation of air emissions is heavily influenced by local meteorological conditions (and by wind flows in particular). Local conditions are influenced by overlying regional meteorological conditions and by local topography (which can channel or disrupt air flow).

26. An indication of regional wind conditions in the wider area is provided by wind speed and direction measurement data from the Whakatū weather station located roughly 12 km to the southeast of the site on the Heretaunga Plains. I have reproduced a wind rose analysis of wind speeds and directions from this station from Figure 4.3 of the Air Assessment as Attachment C. This analysis indicates that overlying regional wind flows are predominantly from the southwest, as is common at North Island locations, with a secondary prevalence for winds from the opposite direction.

27. Elevated odour concentrations are most commonly associated with calm or low wind speed conditions. In cool, calm conditions that can occur overnight, katabatic drainage flows generally travel slowly downgradient over local terrain. From Area D these flows are currently likely to drain to the southwest towards Swamp Road. Conversely, at the Area B location this type of flow will generally be towards the north initially until it reaches the valley to the east and then to the east or northeast as flow is redirected by local terrain towards Ōmarunui Road and the Tutaekuri River beyond.

ASSESSMENT OF ODOUR IMPACTS

Odour assessment method

28. The odour assessment methodology was reviewed against the recommendations of the Ministry for the Environment's Good Practice Guide for Assessing and Managing Odour (Odour Guide) in relation to odour assessment tools and techniques in Table 5.1 of the Air Assessment.

29. The odour assessment incorporated the following techniques, for which I will summarise the key outcomes in the following paragraphs:

    (a) Siting and separation from sensitive activities.

    (b) A review of odour complaints and compliance relating to the existing landfill activities.

    (c) Observations of odour I have made at the site.

    (d) A review of odour management practices.

    (e) A summary of the potential for odour impacts based on consideration of what are known as the FIDOL factors.

Siting and separation from sensitive activities

30. The dispersion of odour is influenced by separation distance and meteorological conditions. In general, the risk of odour impacts reduces with increasing distance.

31. The presence of sensitive activities within a distance of 500 m (an evaluation distance recommended in guidance published by the Environmental Protection Agency of South Australia) from the existing Area D was compared with of the

proposed Area B. This comparison highlighted that there are four dwellings within 500 m of Area D but only one dwelling is located within 500 m from the extent of Area B (455 m). Comparing sensitive activities within 1 km of the landfill footprints, there are 15 dwellings within this radius of Area D compared with seven dwellings within 1 km of Area B.

32. This comparison indicates a general reduction in the number of people potentially exposed to odour from filling of Area B following the completion of Area D.

Odour complaints and compliance

33. The record of complaints received by HBRC in relation to odour from 2003 to 2019 was reviewed in the Air Assessment. This indicated that the frequency of complaints dropped substantially from 2012 (averaging fewer than 1 complaint a year from 2012 to 2019 compared with more than three complaints a year from 2003 to 2011). The reduction appeared to coincide with the implementation of a range of odour management improvements at the site. Complaints since 2012 were associated with irregular or infrequent events such as:

    (a) penetrations of completed fill areas
    (b) receipt of odorous loads
    (c) loss of LFG collection.

34. The HBRC s42A report notes at paragraph 2.15 that the frequency of complaints increased between October 2020 and April 2021, with 17 odour complaints received over this seven-month period.

35. HBRC also confirmed offensive and objectionable odour from the site on 12 April 2021 and HDC was served with an infringement notice for a breach of Condition 3 of the existing discharge to air consent AUTH 113990-03.

36. I understand that the recent increase in odour complaints and the non-compliance incident related to the receipt of untanned hides, as described by Mr Doolan. This incident highlights the importance of dealing with waste that is potentially odorous in an appropriate manner. I discuss odorous load management later in this statement below from paragraphs 50 to 55.

Odour observations

37. The Air Assessment described odour observations I made during two separate visits in 2018.

38. On my first visit in May 2018, I detected odour on-site at the observation platform overlooking Area D, downwind and approximately 100 m to the northeast of the working face, in weather conditions that were not conducive to accumulation of odour. At the time, the LFG collection system was not in operation while the engine was undergoing maintenance and the working face occupied a reasonably extensive area.

39. When I visited again in October 2018, on-site odours were much lower and were not detected downwind at the observation platform located between 70 m and 100 m from the working face at that time. The active working face was much smaller and the LFG collection and treatment was in operation.

40. I did not detect odour from the landfill beyond the site boundary on either occasion, though my access to downwind observation points was limited to public roads between 1.8 km and 2 km from the landfill.

41. Although these observations only provide two separate "snapshots" of odour levels in close proximity to landfill operations, they highlight the importance of the LFG collection system and minimising the size of the working face at minimising odour from the landfill.

Review of odour management measures

42. The key aspects of managing odours from the landfill are as follows:

    (a) Tipping and active working face
    (b) LFG capture and treatment
    (c) Management of odorous waste; and
    (d) Management of irregular odour events.

43. I will summarise these odour management measures in the following paragraphs, with reference to section 6.4 of the Air Assessment.

Tipping and active working face

44. The complaint record and my own odour observations have identified tipping and placement of received waste at the active working face (prior to application of cover) as a key potential odour source.

45. An important aspect of working face odour management is restricting the amount of waste exposed to the open air by minimising the working face area. I have recommended for Area B that the active working face be restricted to 1,200 m^2. A general upper bound for working face area of 1,200 m^2 is in line with restrictions in consents for other landfill operations in New Zealand and would provide reasonable control over refuse odour. Compliance with this restriction would also represent a reduction in the open working area that I understand occurs in practice at Area D. Odours are able to be controlled outside of filling hours through the application of daily cover over the working area.

LFG capture and treatment

46. The capture and treatment of LFG (and its odorous components) generated from the waste also forms an important part of the overall odour management regime at a landfill. Collected LFG is treated via controlled combustion in a flare or generator, which provides effective destruction of odorous compounds in the LFG. The control of LFG odour is therefore dependent on effective containment and extraction (which, in effect, is the ability to ensure as much LFG as practicable is directed to engines or flares for treatment).

47. Containment is provided by the landfill lining system and covering the filled waste with low-permeability materials. Collection is provided by a system of wells placed within the waste and connected to a gas extraction circuit. When filling of a new cell or area is commenced at a landfill there will be an interim period when there is insufficient waste depth to allow active extraction without drawing air into the waste mass. During this time, there will be relatively little methane generated as methanogenic activity is only beginning to establish. During this interim period, the odours from the waste and small volumes of LFG are minimised by the containment provided by daily and interim cover.

48. For the operation of Area B, active LFG extraction is able to be established much sooner than at a new landfill site. Small quantities of low quality (low methane

content) LFG, which would otherwise not be able to sustain a flare, can be extracted and combined into the existing LFG collection system. Active extraction can be commenced in these early stages of filling by installing horizontal gas collection wells, before there is sufficient depth of waste to allow vertical wells to be operated.

49. The existing flare and engine provide alternative combustion methods to allow continuity of treatment when either is out of operation, for example due to maintenance. The flare is capable of combusting the full quantity of LFG from the landfill.

Management of odorous waste

50. Receipt of particularly odorous loads can result in short-term increases in intensity or changes to the character of odour emissions from the working face as well as emission of odour while the load is in transit.

51. Key management measures for odour from this source typically include identification of odorous waste loads prior to receipt or on entry with subsequent implementation of special procedures for waste placement, including immediate burial and coverage. For infrequent loads this may involve burial at the working face followed by immediate covering with other refuse. For odorous loads received more frequently, burial in a designated burial pit (with rapid cover) may be required.

52. As I have discussed previously at paragraph 36, the recent increases in the frequency of loads of odorous tannery waste (hides or skins) resulted in the HBRC confirming the incidence of offensive and objectionable odour from the landfill earlier in 2021. I understand that, at times, the tannery waste has made up a substantial portion of the waste received at the site, effectively overwhelming special procedures for handling odorous loads (which require adequate non-odorous materials to mix/cover the odorous waste).

53. Odour from hides is derived mainly from degradation of putrescible organic components. There may be practical measures that can be implemented by the waste producer to minimise the degree of degradation occurring prior to receipt such as minimising the time between production and delivery to the landfill, keeping them chilled prior to delivery or stabilising or pre-treating the hides, for example by applying lime. If these approaches are not practical, then the volume of this waste

will need to be managed so that special waste acceptance practices can be practically implemented.

54. As discussed in the evidence of Mr Doolan, HDC has applied an increased special waste charge to the tannery waste. The effect of this measure has been a substantial reduction of this type of waste.

55. This hierarchy of prevention and minimisation is reflected in the landfill's odorous and special waste placement procedures. This should help to ensure that a similar situation does not occur in the future.

Management of irregular odour events

56. The complaint record and odour observations have also indicated that abnormal or irregular operational events activities have occasionally resulted in increases in odour emissions and the potential for odour nuisance in the area. This type of irregular event has included excavation of previously filled areas for installation of infrastructure, receipt of odorous loads and temporary cessation of LFG extraction for maintenance purposes.

57. As I note below, feedback from submitters to the east and southeast has noted the occasional exposure to odour from the currently operating Area D, which is most likely a result of irregular odour events (or to odour from waste transport or other sources). The closer proximity of Area B to these receptors highlights the importance of managing the risk and outcomes of irregular odour events at Area B.

58. I have discussed receipt of odorous loads and maintenance of the LFG extraction system above. Minimisation of the duration of penetrations of completed fill areas for infrastructure installation is also important and this can be achieved through progressive installation of LFG as filling is conducted (rather than retrospectively) and through careful planning of works prior to commencement.

Summary of odour management

59. I consider that particular attention should be paid to implementation the following measures at Area B to minimise the potential for nuisance effects in the surrounding area, including:

    (a) Minimisation of the working face area (generally within an area of 1,200 m^2).

(b) Installation of LFG collection as early as practicable as filling progresses at Area B.

(c) Pre-identification of loads of odorous waste and implementation of special placement procedures to minimise exposure of the material to the open air.

(d) Identification of trends in the frequency of receipt of odorous waste from individual sources and development of ongoing arrangements to reduce the odorous nature of the material prior to receipt at the site and/or manage volumes so that it can be handled appropriately using special placement procedures.

(e) Minimisation of the duration of penetration of completed fill areas for infrastructure installation.

60. Overall, provided that the measures I have recommended above are implemented rigorously I believe the odour management regime for Area B will cater for the proximity and potential exposure of adjacent dwellings and appropriately mitigate the potential for odour nuisance beyond the site boundary.

Summary of odour impacts

61. The potential for odour nuisance and, in particular, the potential for objectionable or offensive effects is assessed in New Zealand by considering the FIDOL factors (frequency, intensity, duration, offensiveness/character and location/sensitivity) in relation to exposure to odour in the environment. Section 6.5 of the Air Assessment summarised the potential for odour nuisance effects associated with operation of Area B considering the FIDOL factors. I have reproduced that assessment in Attachment D to this statement.

62. In summary, except at the occasional rural or rural residential dwelling, sensitivity to odour in this rural environment is generally low. In general, a greater degree of separation from dwellings will be available at Area B compared to the existing Area D landfill activities. Area B is generally well separated from local dwellings though the curtilage of the nearest dwelling at 419 Ōmarunui Road is approximately 455 m from the proposed fill extent (the dwelling is a further 20 m distant). This dwelling is located further from Area B than dwellings adjacent to the current Area D and it is separated from Area B by a ridgeline. However, this dwelling is also likely to be downwind of Area B in both prevailing winds and katabatic drainage flows (if and

when they occur). The mitigation measures I have recommended have taken account of potential exposure at this dwelling.

63. The record of complaints and observations highlights the increased risk of odour nuisance effects presented by irregular or abnormal events at the site including excavation of previously filled areas, cessation of LFG extraction for maintenance purposes and the regular receipt of odorous loads. I have recommended a range of mitigation measures (at Paragraph 59 above) to reduce the risk of these events occurring and to mitigate their impact in the event they do occur.

64. Provided these measures are rigorously implemented, my assessment is that frequency, duration and intensity of odour emitted from Area B should be appropriately reduced and that within this particular environmental setting and offensive or objectionable odour is unlikely.

ASSESSMENT OF HEALTH IMPACTS OF COMBUSTION AND LFG EMISSIONS

65. Certain components of LFG (such as hazardous volatile organic components) and the by-products of LFG combustion (such as nitrogen dioxide) have the potential to impact on human health. The scale of these contaminant emissions is relatively small and the degree of separation from sensitive receptor locations is reasonably large.

66. In the Air Assessment, the potential health impacts of these emissions were assessed in a semi-quantitative manner. This involved estimation of emissions concentrations of the hazardous contaminant emissions, a comparison health effects assessment criteria for ambient contaminant concentrations and a qualitative consideration of the dilution of emissions likely to be achieved over the separation distances that exist between the sources and local receptor locations.

67. This screening assessment highlighted that the scale of emissions is relatively small and the degree of geographical separation between the emission sources at Area B and the energy centre and sensitive locations to the east is relatively, large. As a result, ambient concentrations of hazardous air pollutants associated with LFG combustion and releases of LFG from the landfill are unlikely to exceed national assessment criteria that have been specified for protection of the public from health effects.

68. This conclusion is consistent with the findings of comprehensive human health risk assessments of landfill emissions that T+T has conducted for other much larger,

landfills such as the Redvale Landfill and the proposed Auckland Regional Landfill (both in Auckland).

ASSESSMENT OF IMPACTS OF DUST EMISSIONS

69. As I have noted above at paragraph 18, dust emissions from the disturbance or handling of soil and other dusty materials will tend to gravitate and deposit out of air over distance from the source. The majority of dust generated by earthworks-the activities will fall to the ground with 100 to 200 m of the source.

70. Area B itself is well separated from dust sensitive activities (such as local dwellings) and I do not anticipate any adverse effects associated with construction or filling activities within Area B. The only dust source within close enough proximity to sensitive activities to result in discernible exposure to dust is the Landfill Access Road that provides access to the existing and proposed landfill areas.

71. The Landfill Access Road is sealed for 1 km from the entrance on Ōmarunui Road and the movement of heavy waste delivery vehicles over this type of surface can generate dust.

72. Overall there is a large degree of separation of potential dust sources from sensitive locations and I am not aware of dust nuisance having been identified in the HBRC complaint record. As a result, I consider dust emissions from the Proposal are unlikely to cause adverse effects on amenity or property in the surrounding area.

COMMENT ON SUBMISSIONS

73. A number of submitters expressed concerns in relation to odour and air quality impacts of the Proposal. There were a number of themes to these concerns, which I address in turn in the following paragraphs.

Exacerbation of existing odour exposure

74. A number of submitters from Ōmarunui Road and Breckenridge Road to the east and southeast of the site have noted previous exposure to odour from existing landfill operations on occasion and have expressed concern about the potential exacerbation of their existing exposure to odour.

75. The occasional nature of the odour exposure noted in the submissions and the distance at which the exposure was noted (the submitter dwellings are located

between 1.4 km and 2.5 km away) would indicate to me that the odour exposure was most likely associated with irregular odour events (as I have described above) or from the transport of odorous waste to the site.

76. Given that Area B will be closer to the submitter locations than Area D, consistent application of measures to minimise the risk of occurrence of these and mitigation of outcomes will be important. I have recognised this in the recommendations I have made in relation to management and mitigation measures.

77. Measures to mitigate the regular receipt of odorous waste, such as minimisation or pre-treatment of waste, as well as covering of odorous loads would also mitigate the potential exposure to odour during transport to the site.

Characterisation of sensitivity of the receiving environment.

78. A number of submitters have disagreed with my assertion that the rural environment (other than at dwellings and their curtilage) is generally of low sensitivity to odour. As I have noted above, this is due mainly to the low frequency and density of human occupation on the forestry, pastoral and horticultural properties surrounding the site. At certain times of the year, such as during harvest periods, larger numbers of people may be present on horticultural production properties and sensitivity to odour will increase but, in general, occupation at particular locations on adjacent properties is intermittent or infrequent.

79. My assessment of odour impacts has focussed on exposure at local dwellings, which are locations where people may be present at all times of the day and where the nature of activities means that sensitivity to odour effects is high.

HBRC AND HDC SECTION 42A REPORTS

80. Both the s42A reports of the HBRC and HDC discuss impacts on air quality and air quality amenity. I believe I have addressed those matters in this statement, above.

CONCLUSIONS

81. In summary, it is my opinion that:

    (a) The Proposal will result in the emission of a range of contaminants to air, including odour, hazardous LFG components and combustion by-products

and dust. Of these contaminant emissions, I consider that odour has the greatest potential to cause adverse effects in the local environment.

(b) In general, outside of local dwellings, the local rural environment has a low sensitivity to odour and other air contaminants due to the low density and frequency of people being present. Sensitivity will be higher at dwellings and the potential for adverse air quality effects is therefore highest at these locations.

(c) The transfer of landfill activities from Area D (to the west of the site) to Area B in the east will lead to a greater degree of separation from dwellings in general. Notwithstanding this, one dwelling (at 419 Ōmarunui Road) is located with 500 m of Area B and will likely be downwind in both the prevailing wind direction and in katabatic drainage flows in which dispersion of odour will be diminished.

(d) Odour emissions from the site may be higher during irregular events, such as excavation of previously filled areas for infrastructure installation and cessation of LFG extraction for maintenance purposes. Odour from t type of event has been noted in complaints, my own observations and appears to have been noted in submissions. Odour emissions were also increased earlier in 2021 through increases in the receipt of odorous tannery waste loads, which resulted in objectionable odour beyond the boundary as confirmed by the HBRC.

(e) The odour management regime employed at Area B should take account of both the potential for odour exposure at 419 Ōmarunui Road and the potential impacts of irregular events. In this vein I have recommended that the following measures be adopted at Area B:

(i) Minimisation of the working face area (generally within an area of 1,200 m^2).

(ii) Pre-identification of individual odorous loads and implementation of special filling procedures to minimise exposure of the material at the site.

(iii) Identification of trends in the frequency of receipt of odorous waste from individual sources and development of ongoing arrangements

with the source or implementation of measures to minimise receipt of odorous waste or ensure that the waste is pre-treated to minimise the development of odour prior to receipt at the site.

(iv) Minimisation of the duration of penetration of completed fill areas for infrastructure installation.

(v) Installation of LFG collection as early as practicable as filling progresses at Area B; and

(vi) Minimisation of downtime of the LFG extraction system for maintenance purposes.

(f) Provided these measures are rigorously implemented, I consider that the potential odour nuisance effects of the Proposal would be appropriately avoided or mitigated and reoccurrence of offensive or objectionable odour in the surrounding environment would be unlikely.

(g) In relation to the emission of hazardous air pollutants, either as components of LFG or in combustion exhaust, the quantum of these emissions is relatively small and there is a relatively large separation to sensitive receptor locations. I consider emission of these contaminants from the Proposal are unlikely to result in adverse health or other environmental effects.

(h) In relation to the emission of dust from the proposal, I consider that these emissions are unlikely to cause any adverse effects on property or amenity in the area.

(i) I have reviewed the proposed conditons of consent provided with Ms Brabant's evidence and consider they address all of the matters I have raised and are appropriate to address potential effects on air quality.

Jason Pene
2 September 2021

My name is Jason Savelio Karena Pene. I am a Principal Environmental Engineer at Tonkin & Taylor ("T+T")

I hold a Bachelor of Engineering degree with honours in Chemical and Process Engineering from the University of Canterbury and I am a Certified Air Quality Professional of the Clean Air Society of Australia and New Zealand (CASANZ).

I have been involved in the assessment and management of environmental impacts, with a particular focus on discharges of contaminants to air, including odour, in various roles in consultancy, for regulatory authorities and in industry for over 20 years.

Of specific relevance to this statement of evidence, I have conducted and overseen odour and air quality impact assessments of a range of from industrial, municipal and agricultural emissions sources in New Zealand including the following:

(a) Dispersion modelling of odour emissions from the Redvale Landfill near Auckland.

(b) Monitoring of ambient hazardous air pollutant concentrations at the Whitford Landfill near Auckland.

(c) Assessment of air quality impacts of discharges to air from the Spicer Landfill near Wellington.

(d) Assessment of air quality impacts of refuse transfer stations, composting and solid waste processing operations in the Auckland, Waikato and Bay of Plenty regions.

(e) Technical review of air quality impacts of landfill gas flaring, composting and other solid waste activities on behalf Auckland Council, Waikato Regional Council and Environment Canterbury.

(f) Environmental compliance monitoring of landfills in the Wellington region on behalf of Greater Wellington Regional Council.

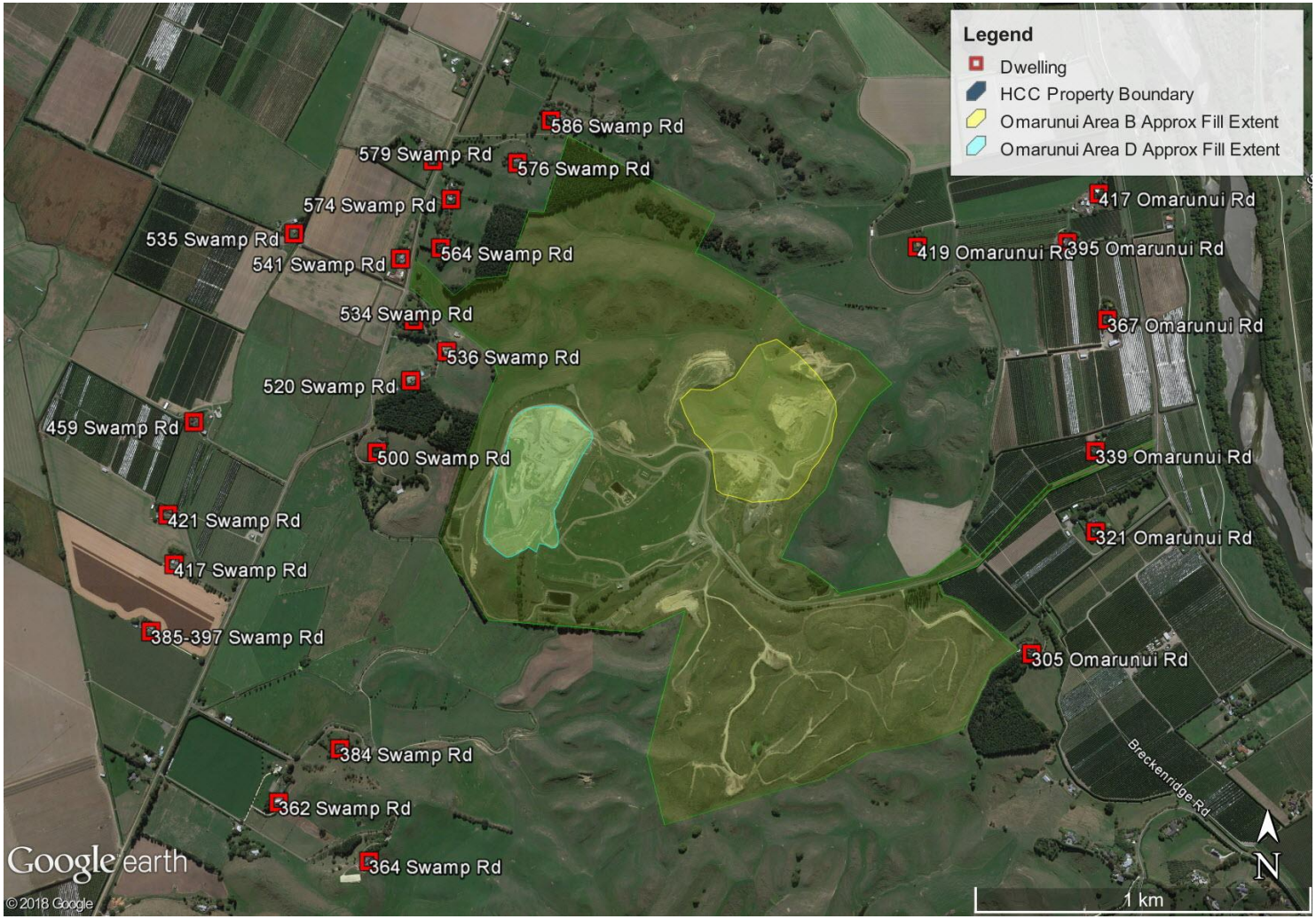

Figure B1: Site locality and dwellings located within 1km of Area B (proposed) and Area D (existing)

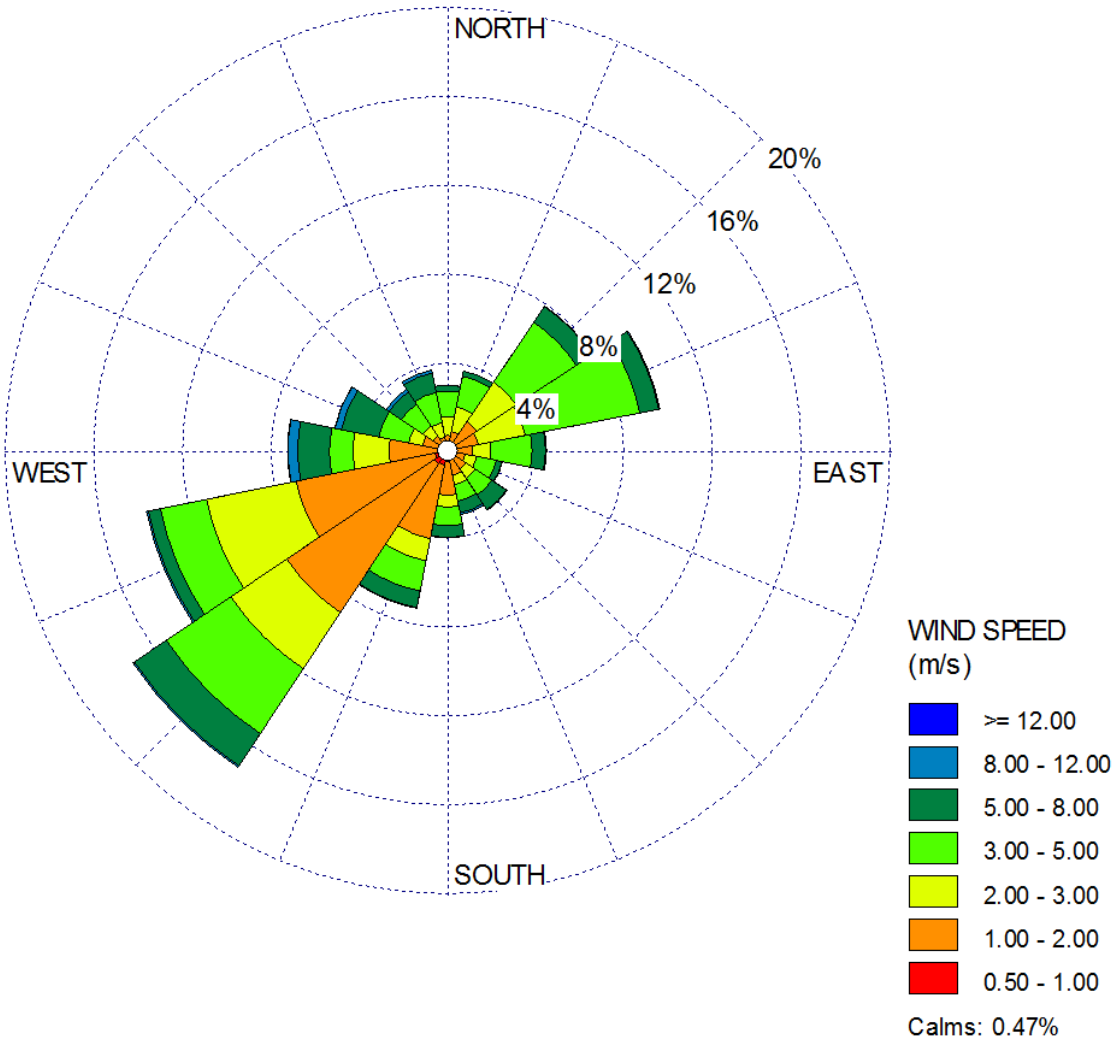

Figure C1: Frequency of wind speeds and directions measured at Whakatū 2011-2015 (1-hour average data)

Factor	Consideration
Location	As noted in section 4.1 [of the Air Assessment], the site is located in a rural area on a ridge of hills separating two valleys featuring rural residential development. In general, the forestry, pastoral and horticultural activities that form the majority of the receiving environment have a low sensitivity to odour given the infrequent and transient human occupation of these areas and potential for background agricultural type odour. However, sensitivity will be elevated at rural dwellings due to prolonged human occupation and high expectation of amenity. Local dwellings are generally well separated from Area B (the degree of separation will be greater than corresponding distances between Area D and adjacent dwellings). The existing dwelling at 419 Ōmarunui Road lies approximately 475 m from the proposed fill extent of Area B and no other dwellings lie within 500 m.
Offensiveness/ Character	Odour from landfilling activities is primarily generated from anaerobic degradation of waste. The character of odour may vary by source to some degree but in general is likely to have an unpleasant character (strongly negative hedonic tone).
Frequency/ duration	The frequency and duration of odour experienced at off-site locations will be dictated by the frequency of emissions from the plant and by wind conditions. The frequency and duration of emissions will depend on the operation of odour sources (e.g. filling activities) at the site. As noted in section 4.3 [of the Air Assessment], based on wind observations at Whakatū to the west of the site, wind will be most frequently from the southwest quadrant and will tend to push odour toward the northeast. Katabatic drainage flows that may occur in overnight calm conditions will also tend to push odour from the valley in which Area B is located toward the northeast (toward the nearest dwelling at 419 Ōmarunui Road).
Intensity	The intensity of odour experienced at off-site locations will be dictated by the intensity of emissions from the site and the degree of dispersion that occurs prior the emissions reaching receptor locations. The intensity of odour emissions from filling activities will vary depending on operating hours and receipt of odorous load but the complaint record and brief odour observations indicate that odour intensity should generally be able to be mitigated through implementation of the measures described in section 6.4 [of the Air Assessment]. The complaint record and odour observations indicate that occasional or abnormal activities, such as excavation of previously filled areas, cessation of LFG extraction for maintenance purposes and receipt of odorous loads, can result in increases in the intensity of odour emissions and associated off-site odour levels. These records highlight the need to provide effective management of these activities to minimise the potential for off-site odour nuisance. The degree of dispersion of odour will be influenced by weather conditions (described in section 4.3 [of the Air Assessment]) and the degree of geographical separation between emission source and receptor location (described in section 6.1 [of the Air Assessment] and below in this table). In general, the transfer of filling activities from Area D to Area B will increase separation distances from the more populated areas to the east and reduce separation distances to the west. One dwelling is located within 500 m of Area B (whereas four dwelling are located within this distance of Area D). This dwelling is located downwind in prevailing wind conditions.