

Odour Management Plan

Prepared for

Wongan Hills Limited

Prepared by

L E W E
Environmental
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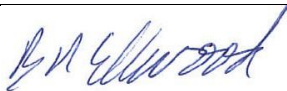
July 2022



Odour Management Plan

Wongan Hills Limited

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TABLE OF CONTENTS

1	INTRODUCTION.....	1
1.1	Management Plan Purpose and Scope.....	1
2	GENERAL.....	2
2.1	Location.....	2
2.2	Process Description.....	3
3	OPERATION	4
3.1	Barn Capacity and Operation	4
3.2	Barn Management.....	4
3.3	Cattle composting System	4
3.4	Compost Removals and Additions	4
3.5	Monitoring	5
4	SITE MANAGEMENT.....	6
4.1	Key personnel.....	6
4.2	Specific Responsibilities	6
4.3	Training Requirements	7
5	ENVIRONMENTAL PERFORMANCE STANDARDS.....	8
5.1	Resource Consent Requirements.....	8
6	POTENTIAL SOURCES OF ODOUR.....	9
6.1	Description of the Discharge.....	9
6.2	Description of Good Management Practices.....	11
7	ENVIRONMENTAL FACTORS	12
7.1	Wind	12
7.2	Amenity, Cultural, Heritage and Community Values	14
8	INCIDENT MANAGEMENT	16



9	COMPLAINTS	17
10	INTERNAL ANNUAL REVIEW	18
11	APPENDICES.....	19
Appendix A	Proposed Resource Consent CRCXXXXXX Conditions	
Appendix B	Compost spreading log	
Appendix C	Incident Form	
Appendix D	Incident and Complaint Logs	



1 INTRODUCTION

This Odour Management Plan (OMP) describes odour management procedures that will be undertaken by Wongon Hillis Limited (WHL) to minimise discharges to air from the housing of more than 30 animals in composting bed barns and the application of composted bedding material to land. It is important that these procedures are followed to prevent adverse environmental effects and ensure compliance with resource consent conditions.

The plan should be reviewed annually to incorporate any changes and improvements to the management system and in response to any complaints. Any changes will be recorded, and a copy of the current OMP sent to the Canterbury Regional Council (ECan) on request.

1.1 Management Plan Purpose and Scope

This Management Plan has been prepared for WHL and its relevant contractors. Is intended to provide a reference document detailing the management practices and considerations required to ensure a compliant composting barn and composting application system.

The scope of this manual is the management of odour from the operation of the composting barns and the application of compost to land by WHL on WHL owned properties.

The OMP identifies the following:

- Key personnel responsible for implementing the OMP;
- Environmental performance standards of the Resource Consents;
- Odour control procedures;
- Methods for managing complaints regarding odours and keeping records relating to compliance; and
- Application and incident and complaint templates.



2 GENERAL

2.1 Location

The overall property is located along Kaituna Valley Road, RD2, Christchurch 7672. There are several land parcels that make up the overall property. The total property area with the potential to receive compost from the facilities is shown in Figure 2.1. The four composting barns are proposed to be located on Part Lot 2 DP 1631, and their general location is shown in Figure 2.2.

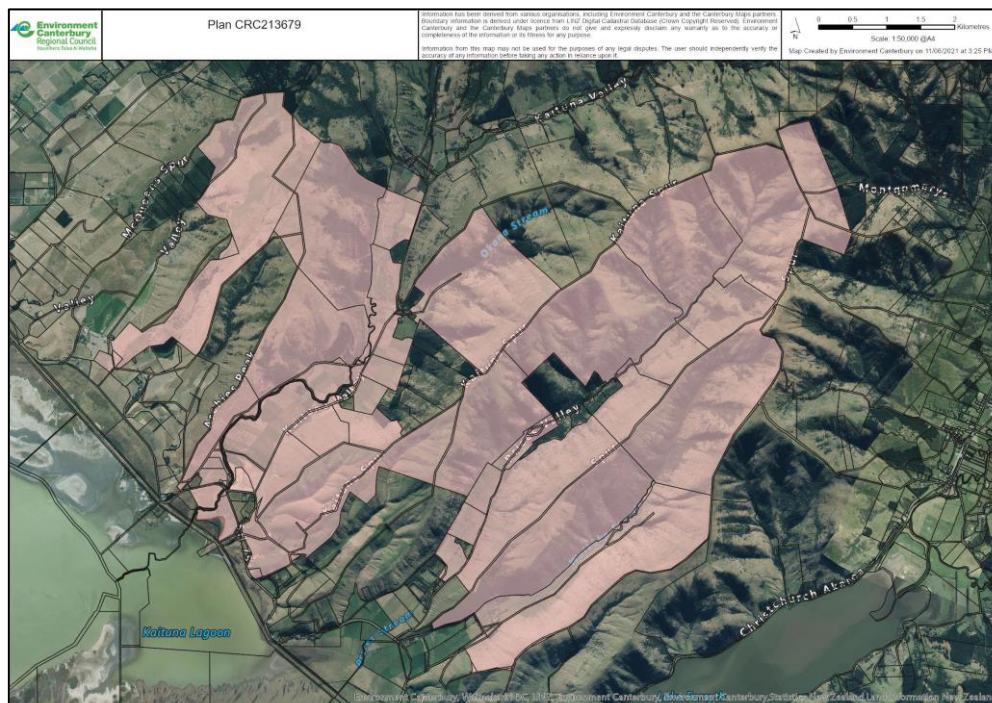


Figure 2.1: Total Property Area (CRC213679)

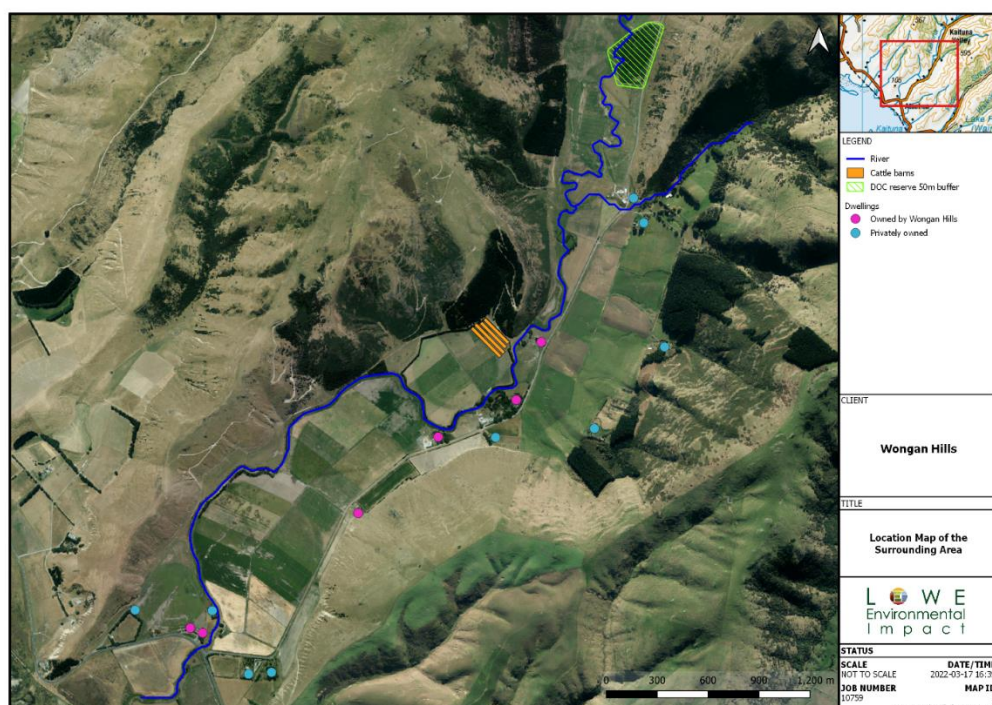


Figure 2.2: Location of Composting Barns and Dwellings



2.2 Process Description

WHL will operate four composting barns and feed pad facilities on their farm in Kaituna Valley. It is proposed that approximately 2,200 animals are kept in four composting barns for 24 hours of the day, where they will have access to adlib feed and water for the entire time. The composted bedding material generated from the barn will be spread to land every 1-3 years.



3 OPERATION

3.1 Barn Capacity and Operation

The barns together will hold up to 2,200 animals which come in at 500 kg live weight (LW) and leave at 650-700 kg LW after being in the barn for approximately 120-150 days. There will be animals in the barns all year round.

It is proposed that the animals are kept in the composting pens for 24 hours of the day, but will have restricted access to parts of the barn area while the compost beds are cultivated. There is no effluent generated from the hard stand feed pad as the stock remain on the compost bedding side of the feed races.

The animals are expected to produce 62.4 L of wastewater a day, with 100% excreted on the bedding litter in the barn which evaporates due to the heat of the composting.

3.2 Barn Management

The base area of the barns will be lined with approximately 12 m wide heavy duty plastic liners which are overlapped by 0.3 to 1 m and taped to seal. The longitudinal join at the centre of the barn will be the furthest distance away from the barn edges, where there is the greatest potential for moisture egress. Aquaflex or similar soil moisture monitoring tape will be installed at a location above the central join in the plastic to monitor moisture levels. The barns contain a covering of approximately 800 mm of Sawdust/woodchip and other material high in plant carbohydrates and lignin. Every 4-8 weeks Sawdust/woodchip will be deposited into the barns to maintain the desired depth in the barns. As a minimum, each pen will be tilled daily, between the hours of 7am to 5pm to promote aerobic composting.

3.3 Cattle Composting System

The cattle composting system is designed to avoid the generation of liquid effluent by using composting material in all of the areas that hold stock. Compost formation within the barns occurs when the bedding material in the barns is mixed with dung and urine and decomposes into compost through biological activity. The composting material is tilled daily to create aerobic conditions, and the biological activity in the barns generates warmth from the composting which evaporates the moisture within the animal effluent.

3.4 Compost Removals and Additions

Compost removals and additions to the barns will be managed with a truck and loader. It is planned that compost will be removed every 1-3 years. During compost removal the loader will be fitted with a laser level to indicate level to be removed, this will ensure that the plastic liner is protected. After removal, the compost will be applied directly to the land discharge area. If any temporary storage of compost is required, an impervious surface will be used for storage, where compost will be covered if stored for longer than three days. The removal of compost and the timing of the application to land will be planned to coincide with crop establishment and times of low seasonal rainfall and moisture deficits to ensure that there is enough suitable area for the discharge of compost to land. Wongan Hills use soil moisture to schedule irrigation, this data will also be used to schedule compost application. This will ensure that material is not discharged when the soil moisture exceeds field capacity.



3.5 Monitoring

The following items, listed in the Table 3.1 below, are to be monitored to ensure efficient operation of the composting bans.

Table 3.1: Monitoring Procedures

Parameter	Method	Frequency
Temperature Monitoring	Temperature readings are taken before tilling at three depths within the compost at two locations within in each barn (one in the centre and one approximately two metres from the outer wall).	Weekly
Moisture Testing	Moisture probes- readings are taken before tilling at three depths within the compost at two locations within in each barn (one in the centre and one approximately two metres from the outer wall).	Weekly
	Qualitative squeeze test- A handful of compost is smelled, and then squeezed by hand. The type of smell (sweet to offensive) and if moisture is squeezed out is recorded.	Weekly
	Moisture monitoring tapes- Aquaflex or similar soil moisture monitoring tapes will be installed at one location above the central join in the plastic to monitor for moisture leaking down through the bark/compost material. Data is automatically recorded or can be downloaded for review.	N/A
Periodic Carbon to Nitrogen Ratio Monitoring	Analyses of carbon to nitrogen ratio and data is recorded and archived.	Monthly



4 SITE MANAGEMENT

4.1 Key personnel

Key personnel and contact phone numbers associated with the composting barns operation and compost application to land are shown below in Table 4.1.

Table 4.1: Contact Information

Organisation	Position	Work Contact	After Hours Contact
Wongan Hills Limited	WHL General Manager: Matt Iremonger	027 444 2808	027 444 2808
	WHL Composting Barn Manager: TBC	TBC	TBC
	WHL Owner: Brent Thomas	0274526418	0274526418
Emergency Services	Police / Fire / Ambulance	111	111
	National Poisons Centre	03 479 7248 0800 764 766 (urgent)	03 479 7248 0800 764 766 (urgent)
Regulatory			
Christchurch City Council	53 Hereford Street, Christchurch Central City, Christchurch 8013	03 941 8999 24 hr Hotline	
Environment Canterbury	200 Tuam Street, Christchurch Central City, Christchurch 8011	0800 324 636 0800 765 588 (24/7 Environmental Issue Hotline)	0800 765 588

4.2 Specific Responsibilities

Every staff member has a role and/or responsibility to ensure this OMP is effective at managing odours. WHL is responsible for the implementation of this plan. The composting barn manager shall be able to be contacted at all times.

The WHL Managers are responsible for the Following:

- Ensuring that Resource Consent conditions are adhered to;
- Ensuring that the OMP is reviewed annually and that ECan are provided with copies of any updates to the OMP, as required;
- Notification to the ECan of any consent condition breaches;
- Maintains overall responsibility to ensure this OMP is used, annually reviewed, and staff are suitably trained in its contents;
- Day to day responsibility for the management and maintenance of the composting barns and operations;
- Manage and control potential odour sources;
- Preventative maintenance and urgent repairs to ensure the performance of the barns are not compromised;
- Respond to complaints;



- Recording and reporting regular measurements associated with the barn operations, including regular inspections, maintenance and monitoring of the composting material.

All Staff are responsible for the following:

- Ensure this OMP is used;
- Ensure that there is no discharge of odour that is objectionable or offensive beyond the property boundary.

4.3 Training Requirements

WHL have an overall responsibility for ensuring staff are available, appropriately trained and funded. Training records set out which staff have undergone which training and when.

Training includes but is not limited to:

- General introduction of Operations and Management practices and Health and Safety practices for the site;
- Employees are aware of their responsibilities in all areas, including the environment;
- Site OMP introduction;
- Compliance with consent conditions;
- Compost testing;
- General environmental awareness and education;
- Emergency response training for all employees and contractors
- Safety and contingency procedures; and
- Reporting.

All contractors undergo a comprehensive site induction. There is a key focus is on health, safety, and the environment, including a holistic approach to aspects of good practice. Regular assessments of contractors are carried out with all inductions signed off by both parties and records kept on site.



5 ENVIRONMENTAL PERFORMANCE STANDARDS

The discharge to air and application of compost to land is subject to the provisions of the Resource Management Act 1991, the National Environmental Standards for Air Quality, Regional and District Plans and the conditions of resource consent CRCXXXXXX.

The full text of consent CRCXXXXXX is attached in **Appendix A**.

5.1 Resource Consent Requirements

As per the requirements of Resource Consents CRCXXXXXX the following monitoring and reporting requirements will be completed.

1. TBC



6 POTENTIAL SOURCES OF ODOUR

6.1 Description of the Discharge

The major sources of odours at the property are:

- The housing of animals in the composting barns; and
- Application of compost to land.

The production of the odour is expected to be very low from the composting barns (pers Professor Keith Woodford). The design and stocking rates are set along with the daily tillage of the bedding material to ensure that aerobic conditions are maintained. The aerobic conditions avoids ammonia, methane and volatile sulphur compound volatilisation. The 100% compost barns also avoid the need for collection, storage, and discharge of effluent from the barns. This eliminates the potential for anaerobic conditions.

The Christchurch City Council Commissioner David Mountfort considered odour in his decision to grant a land use consent to Wongan Hills To undertake intensive farming, including the construction of two composting cattle feed barns and other ancillary sheds/structures. The consenting officer visited a similar facility and provided the following comment in the decision.

Odour, Noise and Dust

Having visited operational barns at Chertsey it was apparent that effects arising from odour, noise and dust were negligible and no different from that would arise from a normal farming operation. In this regard the effluent pond and solid waste were largely odourless. Ms Rayne was satisfied that the operation was not giving rise to effects that would constitute a nuisance for other parties. Consequently, I accept Mr Boye's assessment that any effects will be less than minor. However, it is also important, given the scale of the proposed buildings, that construction noise is appropriately managed. Consequently, conditions to this effect have been recommended (CCC RMA20211675 decision pg 12)

These positive observations with respect to odour when visiting a similar site are an important consideration in the assessment of potential odour effects for the proposed composting barn system. These observations are supported anecdotally by the lack of odour related concerns raised by the industry experts (pers Professor Keith Woodford) and the absence of an identified need for air quality related adverse effects research in the development of composting barn animal housing systems in New Zealand.

The absence of air quality research locally and internationally into adverse odour from aerobic composting barns provides a strong indication that the proposed activities can be managed well so as to avoid off-site odour effects and avoid an odour nuisance.

In the unlikely event that an odour is produced, the likely cause is that the composted bedding material is no longer aerobic (pers Professor Keith Woodward). To mitigate this situation, additional tilling or replacement compost bedding material can be imported into the barn.

The potential for odour nuisance, and the potential for objectionable or offensive effects in particular, may be assessed by considering what are termed the FIDOL factors (as outlined above in the section on the approach to the assessment) at locations where odour may be observed.



These factors are considered in relation to the potential for odour nuisance at the nearest receptors in Table 6.1.

Table 6.1: FIDOL assessment of odour

Descriptor	Comment
Frequency/duration	Meteorological conditions including wind speed and wind direction may affect the frequency and duration in which receptors are affected, particularly at low wind speeds. As discussed in Section 7.1, light winds (generally 10 km/hr or less) are worst case in terms of the propagation of odour from a source. By comparison, stronger winds will act to rapidly disperse and dilute odours to low concentrations. The most prevalent occurrence of light winds occurs during late evening and early morning hours, when there will be little in the way of active processing of the compost beds or stock movement within the barns. During daytime hours, the prevalence of light winds is much lower. Notwithstanding this, such light winds predominantly drain down the valley parallel and away from the nearest sensitivity activity location, southeast and raised above the site. Any adverse conditions (anaerobic) giving rise to significant odour generation and the potential for emission effects are expected to be very infrequent.
Intensity	The intensity of odour emissions will be a function of the amount of bedding material that has become anaerobic and management and mitigation measures implemented to recover the aerobic state. Experience with observations in and around the existing composting barn sites is that odour is not normally apparent and does not linger on visitor clothing, and is not noticeable when immediately outside of the barns. Provided management and mitigation measures are implemented, then odour intensity at sensitive off-site locations is expected to be negligible during normal operation. The main risk of odour is therefore associated with a process failure maintaining an aerobic state of the compost. Experience from existing barns shows that this is a rare occurrence and relatively easily amended by increased tilling frequency, new compostable material, moisture management and changes in stocking densities. Given the above, it is considered that the intensity of any odour impacts associated with the proposed operation will generally be negligible even at the nearest sensitive off-site location.
Offensiveness	Under poor composting practices, the compost material has the potential for NH₃, methane and volatile sulphur compound emissions. These emissions are corrosive, and the odour character can have an unpleasant hedonic tone prior to dispersion and mixing. The nature and character of potential odour from the site is low and will depend upon a failure of the aerobic composting process, the right



	atmospheric transport conditions taking odours offsite to a sensitive activity. Odours associated with the ammonia, methane and volatile sulphur compound are associated with anaerobic conditions, which can be avoided by compost tilling, stocking rate management and bedding material replacement.
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A further mitigation avoiding potential nuisance odour is the location of the barns on WHL's property. The closest neighbouring sensitive activity is a distance at 441 m from the closest barn. This distance, while less than 500 m, will allow any odour emitted from the barns to be dispersed and mixed. This dwelling is located at a higher elevation than the barns and uphill of likely cold air drainage pathways and out of prevailing wind direction with respect to local wind direction data. The higher elevation of the nearest dwelling dampens the airflow in still conditions moving from the barns.

Odour is not expected to be observable at the identified sensitive locations during normal operation of the barns. Unusual anaerobic conditions or failure of the composting process, which could lead to more significant odour emissions, are likely to be a very rare occurrence.

6.2 Description of Good Management Practices

Odour generation within the composting barns is avoided by good design and management. Key design and management points include:

- Barn design - roof pitch of 18° to induce airflow, roof and sidewall ventilation, Minimum eave height;
- Barn management to ensure water supply and rainfall do enter the barn compost and saturate the bedding material;
- Regular daily composting tilling to maintain aerobic conditions;
- Compost tilling to greater than 50% of the compost depth;
- Compost renewal and top-up;
- Stocking density management;
- Compost carbon to nitrogen ratio monitoring; and
- Compost removal and spreading to land.



7 ENVIRONMENTAL FACTORS

The environment surrounding the property is rural in nature, with sheep and beef, dairy grazing and other agricultural uses present. Figure 2.2 shows the composting barns' location in relation to neighbouring dwellings which could be considered Sensitive Activities as defined by the CARP. Table 7.1 provides Sensitive Activities (dwelling) address details and distance from the sensitive activity boundary to the closest point of the barns.

Table 7.1: Sensitive Activities Details

Sensitive Activity Address	Proximity from Sensitive Activity boundary to Barns
230 Kaituna Valley Rd	461 m south
16 Okana Road	692 m south-east
12 Okana Rd	941 m east
8 Okana Rd	1 km north-east
17 Okana Rd	1.1 km north-east
2579 Christchurch Akaroa Rd	2.2 km south-west
28 Kaituna Valley Rd	2.3 km south-west
40 Kaituna Valley Rd	2.3 km south-west
2549 Christchurch Akaroa Road	2.6 km south-west

The major factor that influences odour from the property is the aerobic/anaerobic nature of the compost.

Compost applications are to be reported using the application log in **Appendix B**. The log is to be kept up to date by the Composting Barn Manager and be available to ECan on request. As a minimum, the log shall include:

- (a) A record of all compost discharged for the previous three months;
- (b) The date of application;
- (c) The source compost applied to land;
- (d) The location of the application;
- (e) The estimated daily quantity of compost discharged at each location; and
- (f) The wind direction at the time of application.

7.1 Wind

Hourly surface wind is averaged from data collected from NIWA weather station Diamond Harbour Ews (station number 40985), located 14.5 km north-east of the site. The windrose indicates that the most frequent winds in the area are from the south-west, with some occasional north-east winds. Wind speeds range between 0.4 and 53.6 kilometres per hour (km/h), seen below in Figure 7.1. The other nearby NIWA weather station is Lincoln, Broadfield Ews (station number 17603) which is located 22.2 km north-west of the site. Here, the windrose indicates that the most frequent winds are from the north with some occasional south-east winds. Wind speeds range between 0 and 74.2 km/hr, seen below in Figure 7.2. The privately owned weather station on the farm is situated at -43.76351, 172.67259; 0.63 km south west of the barns. From this station, the predominant winds are mostly from the north east and south west, seen in Figure 7.3, and range between 0 and 45 km/hr.

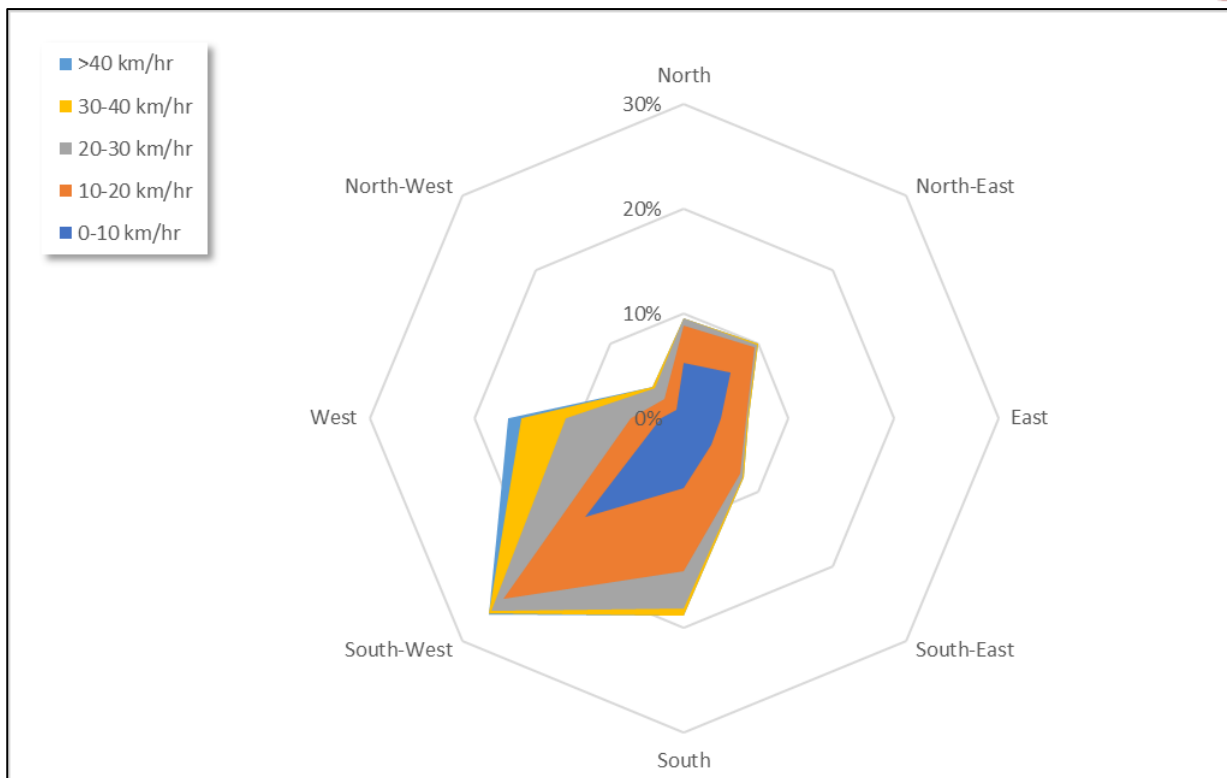


Figure 7.1: Windrose for Diamond Harbour

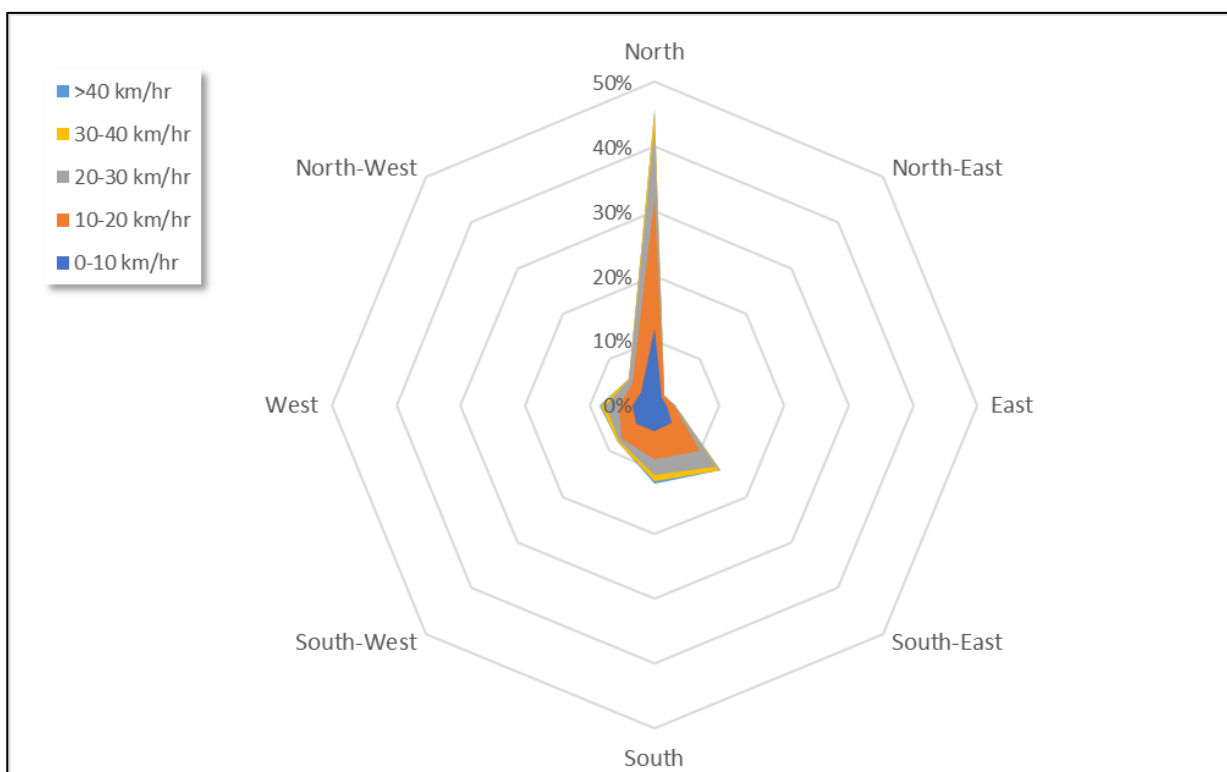


Figure 7.2: Windrose for Lincoln, Broadfield Ews

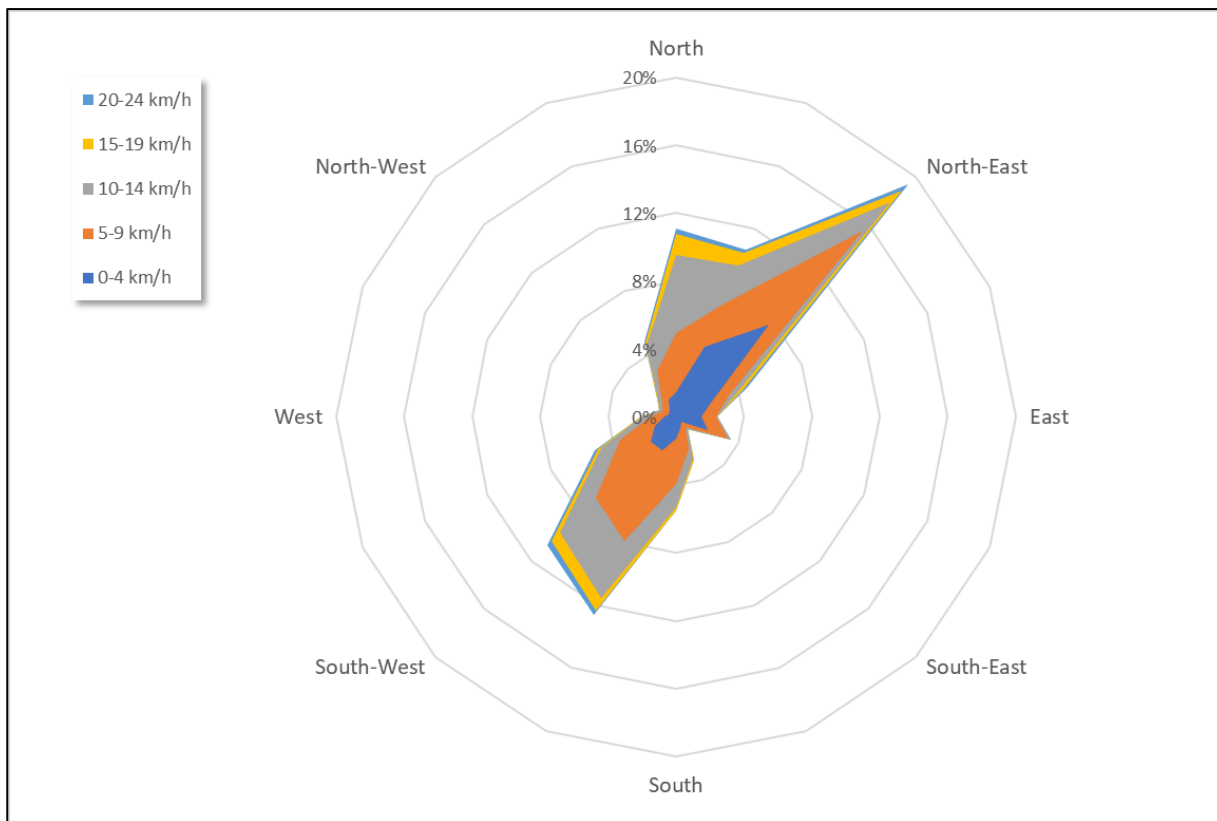


Figure 7.3: Windrose from Wongan Hills Farm Weather Station

Odour propagation is usually greatest during low-wind conditions, typically when winds are less than 10 km/hr (hourly average). Winds of less than 10 km/hr predominately occur from the north east with reference to the farm data. The winds less than 10 km/hr occur 68 % of the time at the farm weather station and encompass the majority of wind speeds.

This wind rose data from onsite shows that the winds are directed by the complex terrain up and down the Kaituna Valley. Correspondingly, cold air drainage katabatic winds, which are most likely to transport odour, will also follow the topography. It is predicted from the topography and wind rose data that the cold air drainage will be down the valley in a south westerly direction.

7.2 Amenity, Cultural, Heritage and Community Values

There are no archaeological sites relevant to this part of the Kaituna Valley listed in the Banks Peninsula Landscape Study for Christchurch City Council (compiled by Boffa and Miskell Limited 2007).

Part of the Kaituna Valley is listed on the Environment Canterbury GIS maps, as within the area of interest of Te Runanga o Koukourarata and Te Runanga o Rapiki. Figure 7.4 shows the Canterbury Maps listed Runanga sensitive areas and the closest silent area.

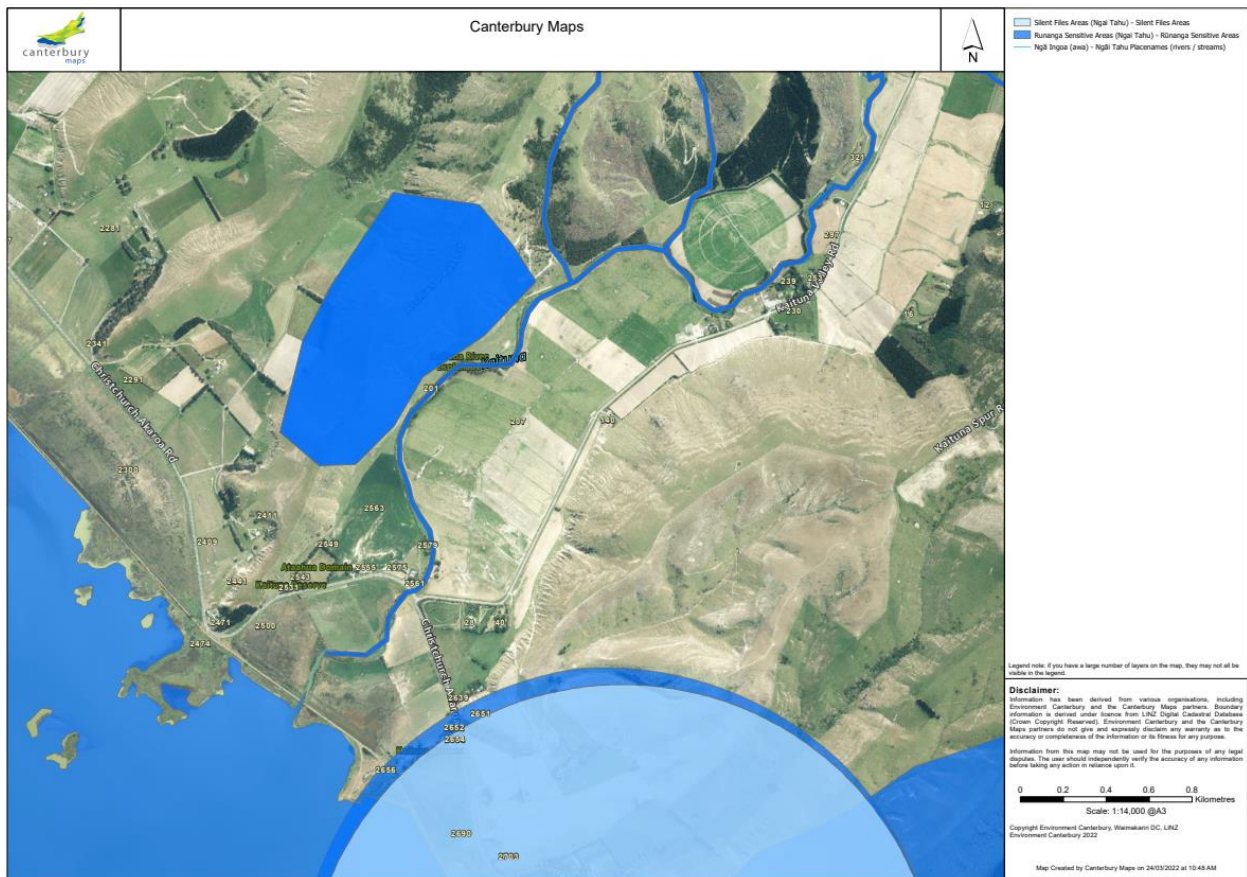


Figure 7.4: Culturally Sensitive Areas

Both Te Waihora and the Kaituna River are "Cultural Landscape/Values Management Areas".

The land through which the river flows has been in pasture for many years. WHL has working closely with Ngāi Tahu and Runanga to plant the Kaituna River riparian strips with natives under the Whakaora Te Waihora Programme (joint Ngāi Tahu & ECan project). These riparian strips have been fenced off from stock.



8 INCIDENT MANAGEMENT

Where an incident has occurred, a formal pathway is required to be completed including:

- Identification of incident;
- Date and time;
- Immediate on-site remedial actions;
- Reporting;
- Follow up – Corrective or Preventative Actions;
- Incidents include (but are not limited to);
- Odour discharges beyond the property boundary;
- Spillages;
- Complaints; and
- Breakdowns/Malfunctions.

Incidents need to be scaled as – Incident, Near Miss or Non-Compliance.

Once the immediate on-site remedial actions have been completed an Incident Form is required to be completed. A copy of the Incident Form is included in **Appendix C**.

Each Incident Form is required to be submitted by the WHL Barn Manager to the WHL General Manager for follow-up. Follow-up actions require a Corrective or Preventative action to be established, including identifying the person responsible for the action and a date for the action to be completed. Where appropriate, ECan will be contacted in accordance with the requirements of the Resource Consent.

The WHL Barn Manager will also give the Incident Form an identification number based on its category – Incident or Complaint, and record them in the appropriate Management Logs. Numbering for the Logs are as follows - starting with the corresponding letter (I or C) then the year suffix (2022 = 22) followed by a consecutive number system (starting at 001), for example - I22001 and C22001 for the Incidents and Complaints, respectively. Copies of the Incident Log and Complaints Log templates are included in **Appendix D**.

Where a system malfunction or breakdown has occurred at the composting barn facility, this will be dealt with in accordance with the Barn Operations and Maintenance manual. Following any incident specifically associated to the compost application, work is to be stopped immediately and the issue to be isolated and resolved as soon as possible. An Incident Form (refer to Appendix C) is required to be completed and the procedure above completed.



9 COMPLAINTS

Complaints may be referred by a regulatory authority or a member of the public. It is the responsibility of the WHL General Manager to respond to and follow up all complaints regarding odours.

Actions to be taken as soon as possible following a complaint:

- Note the time, date, identity and contact details of the complainant;
- Note weather conditions including wind direction, wind speed and rainfall;
- Ask complainant to describe the nature of the odour emission; is it constant or intermittent, how long has it been occurring, is it worse at any time of day, does it come from an identifiable source;
- After receipt of a complaint, undertake a site inspection as soon as possible. Note all odour generating activities taking place and the mitigation methods that are being used. Take any remedial action, if necessary;
- If it becomes apparent that there may be a source of odour other than the property causing the nuisance, it is important to verify this. Photograph the source and emissions if possible;
- As soon as possible after the initial investigations have been completed, contact the complainant to explain any problems identified and remedial actions taken;
- If necessary, update any relevant procedures including this OMP to prevent any recurrence of problems; and
- File the complaint on a complaint register.



10 INTERNAL ANNUAL REVIEW

This OMP shall be reviewed annually by the General WHL Manager and the Composting Barn Manager together annually and after receiving any complaints, incidents, or changes of operation on site. This will cover issues such as:

- Any significant changes to site activities, facilities, or odour management;
- Key changes to the company (restructuring etc.);
- Changes in legal requirements, Council or industry requirements;
- Results from inspections, logs of incidents, corrective actions, internal/external reviews etc;
- Public complaints; and
- The granting of new resource consents and the maintenance and monitoring programmes required for compliance.

A more frequent review or update will be required as a result of events such as the following:

- Incidents that highlight a major gap in odour management, training etc.;
- Inspections may highlight an on-going problem that requires a significant change to prevent it from re-occurring; and
- Monitoring data may show that the composting barn may not be managed or operating as efficiently as was intended.

Any changes made must be reflected in the information contained within the OMP about the site, odour management controls and programmes/systems, and therefore, each of these must be updated. If large parts of the OMP change, it will need to be re-submitted to the Council, and site staff/drivers advised or re-trained if necessary.



11 APPENDICES

- Appendix A** Proposed Resource Consent CRCXXXXXX Conditions
- Appendix B** Compost spreading log
- Appendix C** Incident Form
- Appendix D** Incident and Complaint Logs



APPENDIX A

Proposed Resource Consent CRCXXXXXX Conditions



APPENDIX B

Compost spreading log

Spreading Log

[illegible]



APPENDIX C

Incident Form

Incident Form					
Date		Time		Name	
Type of Incident (circle option on each line)					
Incident		Near Miss		Non-Compliance	
Complaint	Spillage	Breakdown/Malfunction		Other	
Location (circle one)					
Barn	Public Road		WHL property		Other
	Address				
Weather Conditions (wind direction, wind speed and rainfall)					
Description of Incident and On-site Remedial Actions					
Complaint Details					
Name			Phone #		
Address					
☐ Forwarded to WHL Owner			Signed		
Follow Up					
Date			Name		
Corrective or Preventive Action Identified					
Action to be implemented					
By Whom					
Deadline for Implementation					
Incident/Complaint Id #					
Copies to (where required)					
☐ WHL File			☐ ECan		
			☐ Other (Specify)		



APPENDIX D

Incident and Complaint Logs

Incident Record Log

[illegible]

Complaint Record Log

[illegible]

