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Review of provisions in district plans for frost fans

For: Horticulture New Zealand

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Disclaimer: This report is to provide advice to Horticulture NZ on the issue of frost fan provisions in district plans to assist in informing policy development and is not to be taken as Horticulture NZ policy.

Executive Summary

Frost fans are used on horticultural properties to prevent frost damage to crops, mainly fruit crops such as kiwifruit, summerfruit, and apples. Frost damage to crops, particularly at bud burst, can cause reduced crop yield and hence reduced revenue. Growers use frost fans as one mechanism to mitigate frost damage to crops as they move air to protect a crop from frost damage. However, such fans can generate noise which disturb neighbours, especially during night-time when sleep can be disturbed.

District councils can manage the land use of installing a frost fan structure and the noise that it emits through district plan provisions. This has led to a range of provisions included in district plans to address the issues, with inconsistency across the country.

Horticulture New Zealand has sought information regarding provisions for frost fans to assist with advocacy for growers in district plan processes to enable the use of the devices. This report provides an analysis of current provisions and rationale in plans and makes recommendations for rules to be included in district plans and additional actions that HortNZ could undertake on this issue.

A description of frost fans is provided to show how frost fans mitigate frost damage to crops and also describe the noise characteristics and measures.

There are a number of issues arising from the use of frost fans, particularly noise during night time that can impact of sleep for people in the vicinity. This is exacerbated where orchards are located near rural lifestyle or rural residential dwellings where occupants have an expectation of rural amenity that is relatively quiet, which leads to reverse sensitivity issues and complaints.

This report assesses and analyses provisions in a number of district plans and decisions in relevant Environment Court cases to identify provisions that respond to the issues while ensuring the ability of growers to use frost fans to protect their crops.

The district plans assessed are a representative sample of where horticulture is undertaken and are analysed according to the provisions in the rules, noting that not all plans include all provisions:

- Activity status
- Frost fan noise limits
- Measurements points
- Setbacks
- Temperature
- Wind speed
- Fan speed
- Purpose
- Special audible characteristics
- Maintenance

- Certification
- Notice
- Cumulative effects
- New noise sensitive activities
- Internal noise standards
- Exceptions
- Frost fan height
- Matters of control or discretion.

Comparison between the various plans are set out in tables in the Appendix at the end of the report.

The discussion section considers the appropriateness of the various controls included in the various district plan rules to assess how best to:

- Enable the use of frost fans to protect crops from damage from frost; while
- Ensuring adequate amenity and disturbance from noise to neighbouring properties.

The discussion section sets out the rationale as to why a provision may be included in a district plan rule.

Based on the analysis in the discussion section, recommendations are made for district plan provisions for frost fans. It is recommended that a permitted activity rule with conditions is appropriate in the NOISE chapter of a district plan, with a default activity status of restricted discretionary. A rule requiring acoustic insulation for new residential activity within 300m of a frost fan is also included and a separate rule to provide for frost fan height in the Rural zones.
The recommended provisions are set out to be consistent with the National Planning Standards format.

A number of recommendations and actions are identified in the final section that could assist HortNZ undertaking advocacy for use of frost fans by growers.

1. Background

Frost fans are used on horticultural properties to prevent frost damage to crops, mainly fruit crops such as kiwifruit, summerfruit, and apples. Frost damage to crops, particularly at bud burst, can cause reduced crop yield and hence reduced revenue.

Growers use a number of mechanisms to manage the risk of frost damage. These include frost fans, water, helicopters or frost burners. Each has advantages and disadvantages.

Frost fans are being increasingly installed as the mechanism to manage the risk. However, such fans can generate noise which disturb neighbours, especially during night-time when sleep can be disturbed.

District councils can manage the land use of installing a frost fan structure and the noise that it emits through district plan provisions. This has led to a range of provisions included in district plans to address the issues, with inconsistency across the country.

Horticulture New Zealand (HortNZ) seeks to develop an approach for managing frost fans that can be used across the country and represents best practice for the use of such devices.

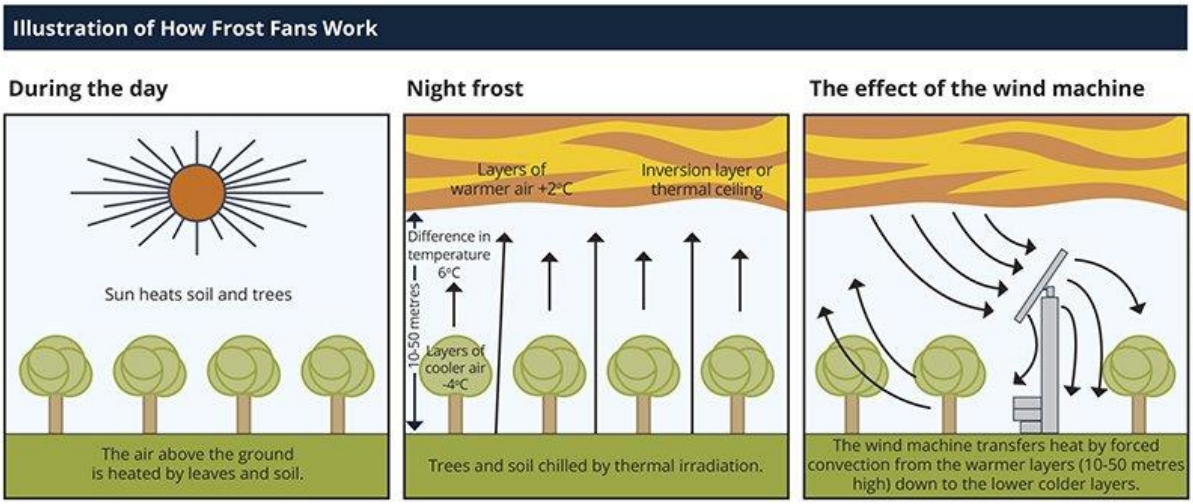
This report provides an analysis of current plan provisions and provides recommendations for a template rule for inclusion in submissions on district plans, as well as other recommendations to advance best practice in the use of frost fans by growers across the country.

2. Description of frost fans

Frost fans are used to move air to protect a crop from frost damage.

The potential for frost arises when heat from the sun warms the ground which is then released into the colder atmosphere at night. The heat loss is greatest just before dawn and this is usually when the maximum danger of frosts and frost damage occurs. This release of heat creates an 'inversion layer' of warmer air, which can be found from 10-50 metres above the ground.

The frost fan moves the air by drawing down the warmer air in the inversion layer by angling the blades slightly downwards to pull the inversion layer down to ground level to prevent frost damage and blow warmer air into the orchard or vineyard.



Source: NZ Frost Fans website

The blades moving through the air create noise, with the greatest sound generated by the tip of the blades as they are travelling the fastest through the air. The effectiveness of the frost fan to prevent frost damage is related to airflow which is in turn linked to fan speed. Therefore the blade configuration and speed will influence the amount of noise generated.

Malcolm Hunt prepared a report for HortNZ in 2009 for the Hurunui District Plan process in which he states:
"A four bladed design is considered more efficient at moving air and does not need to operate at the same revolutions to achieve the desired degree of frost protection." [1]

Mr Hunt also states that slowing the tip speed will reduce the noise level and that sound reduces in intensity with distance.

Some frost fans emit 'special audible characteristics' which are where there are additional tonal components or impulsiveness, such as the 'whop, whop' of the blades.

To adequately cover an orchard there can be one machine per 4 to 5 hectares, although this may vary according to terrain and crop type.

[1] Hunt, M 2009

Source: NZ Frost Fans website

3. Noise characteristics and measures

Noise measurements should be undertaken in accordance with NZS6801:2008 Acoustics – Measurement of Environmental Sound and assessed in accordance with NZS6902:2008 Acoustics – Environmental Noise. These are the NZ Standards which set out how noise should be measured and assessed and replace earlier versions (1991 and 1999) which are sometimes still referred to in district plans. L_{Aeq} and $L_{AF(Max)}$ are the main descriptors now used for environmental sound.

L_{Aeq} is defined in the National Planning Standard as having the same meaning as 'time averaged A-weighted sound pressure level' in NZ Standards 6801:2008 Acoustics- Measurement of Environmental Sound. This is the average noise level over a certain time period.

$L_{AF(Max)}$ is defined in the National Planning Standard as having the same meaning as the 'maximum A-frequency weighted, F-time weighted sound pressure level' in NZ Standards 6801:2008 Acoustics- Measurement of Environmental Sound. It is the single highest sampled level of sound and is sometimes used in night time emission limits.

Some earlier district plans used the L_{10} measure which represents the sound level that is exceeded 10% of the time. L_{10} would usually measure 2-3 dB above the L_{Aeq} measure so a 60 dB L_{10} would equate to 57dB $L_{Aeq.}$

Noise is measured by 'sound exposure levels' (SEL) which represent the experience of noise. These are measured in units of decibels (dB), with an 'A' weighting used to reflect the sensitivity of human hearing to sound frequencies.

The noise from frost fans is not consistent and varies throughout the duration of use. Therefore Malcolm Hunt recommended that measurement for frost fans is L_{Aeq} measured over 15 minutes:

> *"Because the cyclic variations occur over a matter of minutes a measurement/ assessment period of 15 minutes will ensure adequate account is taken of variations in noise output of frost protection fans."*[2]

55 dB L_{Aeq} (15min) is a common measure used in plans. The components of the measure are:

55 dB	The decibel measurement of the sound
A	The A weighted sound exposure level
L_{eq}	The sound exposure averaged over a certain period of time
15mins	The time period over which the measurement is taken

There also needs to be a descriptor of where the sound is measured from – the distance from the source. For frost fans this is typically the notional boundary of a dwelling in the vicinity of the frost fan within the same zone, or the boundary of a zone or property in another zone.
Some earlier district plans used the L_{10} measure which represents the sound level that is exceeded 10% of the time. L_{10} would usually measure 2-3 dB above the L_{Aeq} measure so a 60 dB L_{10} would equate to 57dB $L_{Aeq.}$

Special audible characteristics (SAC) can exist for tonality and impulsiveness for which a penalty may be applied. Applying such a penalty of up to 5dB would reduce the permitted noise level from a frost fan. NZS6802:2008 sets out a test for tonality to determine whether a penalty should be applied.

Special audible characteristics were a consideration in NZ Winegrowers and HortNZ v Marlborough District Council [2013 NZEnvC 7] with the Court determining that fans with special audible characteristics should be assessed and a penalty applied.

The World Health Organisation (WHO) has issued guidelines for appropriate noise levels at residential properties to ensure sleep protection from noise sources.[3] To avoid sleep disturbance the guidelines generally consider that an indoor level of 30dBA and 45 dBL_{Amax} is needed. It is generally considered that an external night time noise source outside a residential dwelling should be less than 45dB L_{Aeq} and 60dB L_{AFmax} to achieve the WHO guidelines. (The Acoustics report for the Whangarei District Plan Change 110 noted that the WHO guidelines are widely

[2] Hunt, M Pg 5

[3] World Health Organisation, Guidelines for Community Noise ed B Berglund, T Lindvall, D.H Schwela, 1999 https://apps.who.int/iris/handle/10665/66217

regarded as unreasonably stringent.[4]) In the case of frost fans it is assumed that windows will be closed during a night time frost event. The level of reduction will also be influenced by the orientation of the bedroom to the noise source.

4. Issues arising from use of frost fans

Frost fans are only used for limited times during the year when the risk of frost damage is high. However, the fans create noise, and as they are usually used during night time, can impact on sleep for people in the vicinity.

This issue is exacerbated where orchards are located near rural lifestyle or rural residential dwellings where occupants have an expectation of rural amenity that is relatively quiet. Reverse sensitivity effects can result with pressure on councils to reduce the degree of impact of the noise. However, this can lead to reduced productivity for the orchard and therefore not enable optimal production from the land.

This tension has led to considerable debate as to how best frost fans should be managed.

A range of district councils have sought to address the issues through inclusion of provisions in district plans. The range of mechanisms used varies between plans. Some considerations include:

- Setback distances of frost fans
- Frost fans noise limits
- Limitations on use of frost fans
- Operating procedures
- Noise insulation of dwellings

This report assesses and analyses provisions in a number of district plans and decisions in relevant Environment Court cases to identify provisions that respond to the issues while ensuring the ability of growers to use frost fans to protect their crops.

While the focus of this report is on the provisions in the district plans there is still a duty under s16 of the RMA to avoid unreasonable noise, which requires that best practicable option be adopted to ensure that emission of noise from land or water does not exceed a reasonable level.

Even if an activity complies with the noise limits in a District Plan, the activity can still be unreasonable for the purpose of s16 of the RMA. Whether the noise is unreasonable requires an objective assessment and is a question of fact and degree. Factors such as frequency, intensity, duration, offensiveness/ character and location may be taken into account.

There are a number of Environment Court cases that assess whether noise is unreasonable and apply an objective test.[5]

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[4] Marshall Day Acoustics 2014, Pg 7

[5] Nelson City Council Delaware Bay Residents Assoc Inc v Harvey [2010] NZEnvC 48

Zdrahal v Wellington City Council [1995] 1 NZLR 700

5. District Plans assessment

The plans assessed for this analysis are a representative sample of where horticulture is undertaken and have provisions for frost fans. Some of the provisions have been added as a result of specific plan changes, with the provisions in the Hurunui District Plan the result of Environment Court decision in February 2011 in which HortNZ was involved.[6] The provisions in the Marlborough Environment Plan are based on an earlier plan change and Environment Court decision.[7]

Plans assessed:

Operative Plans	Notified Plans
Central Otago District Plan Hurunui District Plan Marlborough Environment Plan Western Bay of Plenty District Plan Hastings District Plan Tasman Resource Management Plan Opotiki District Plan Whangarei District Plan	Proposed Selwyn District Plan 2021 Proposed Waimakariri District Plan 2021 Proposed Central Hawkes Bay District Plan 2021

Other district plans that could have been included are Whakatane, Waikato, Wairarapa, Ashburton, Queenstown Lakes but the sample analysed are representative of main fruit growing regions and where reports and decisions are readily available which provide the rationale and basis for the provisions.

Attached to this report are tables which provide a summary of relevant provisions in district plans for frost fans:

- Table 1 sets out a comparison of various components for frost fans rules across the operative plans.
- Table 2 compares provisions in three recently notified plans based on the National Planning Standards[8] format with provisions located in a noise chapter.
- Table 3 sets out the relevant objectives and policies relating to frost fans from the operative plans.

In Table 1 and Table 2 the components that are used in rules to varying extents are:

- Activity status
- Noise limits
- Measurement point

Graham v Tauranga District Council A 37/01

[6] 2011 NZEnvC 030

[7] 2013 NZEnvC 7 and 2014 NZEnvC 85

[8] https://environment.govt.nz/acts-and-regulations/national-planning-standards/

- Setbacks
- Temperature
- Wind speed
- Purpose of use
- Height of fan
- Special audible characteristics
- Maintenance
- Certification
- Notice of usage
- Cumulative effects
- Exceptions
- New noise sensitive activities

Matters of control or discretion where a resource consent is required are also listed.

The analysis compares the use of the various components and assesses the extent to which they contribute to an efficient rule framework.

Table 3 sets out the various approaches to the objectives and policies, which provide the policy framework for assessing resource consents for frost fans.

There are currently a range of ways that noise provisions are incorporated into district plans:

- In a standalone noise chapter
- In the rural zone chapter
- A mixture of both noise and rural zone chapters

The National Planning Standard[9] format requires a standalone Noise chapter which includes all the noise provisions, including objectives and policies.

[9] National Planning Standards 7 District Wide Matters Standard Para 33

6. Analysis of Provisions in district plans

6.1 Date of plans

The plans included in the comparison range from 2008 to 2021 and demonstrate an evolving approach where the newer plans have taken a wider approach to the issues, including addition of acoustic insulation requirements. The three recently notified plans are 2020-2021.

Operative plans

Date	Plan
2008	Central Otago District Plan (Operative)
2011	Hurunui District Plan (Notified Dec 2008 Resolved by Environment Ct decision Feb 2011)
2012	Tasman Resource Management Plan (Plan Change 14 notified May 2009, Operative August 2012)
2016	Whangarei District Plan (Plan Change 110 notified Nov 2014, Operative May 2016)
2020	Hastings District Plan (Notified 2013, Operative March 2020) Marlborough Environment Plan (Notified June 2016, Decision Feb 2020 – no appeals on frost fan provisions therefore operative) Western Bay of Plenty District Plan (Plan Change 87 Notified July 2019, Operative Oct 2020)
2021	Opotiki District Plan (Notified 2016, Operative Jan 2021)

Notified plans

Date	Plan
2020	Proposed Selwyn District Plan (Notified 5 Oct 2020, hearings held on noise provisions Feb 2022)
2021	Proposed Central Hawkes Bay District Plan (Notified 28 May 2021, Hearing on rural noise provisions pending)
2021	Proposed Waimakariri District Plan (Notified 17 Sept 2021, Awaiting summary of decisions sought)

It is noted that a number of plans have been changed through specific plan changes for frost fans, for example: Tasman Resource Management Plan, Hurunui District Plan and the Western Bay of Plenty District Plan. The Plan Change to the Whangarei District Plan was for the whole noise chapter, not just frost fan provisions. The provisions in the Marlborough Environment Plan are essentially the same as resolved through Plan Changes notified in 2009 and Environment Court decisions in 2013 and 2014.

Note – throughout this report for simplicity I refer to the specific districts and plans by the location e.g. Hurunui means Hurunui District or Hurunui District Plan.

6.2 Rural zone noise limits

The permitted baseline[10] for noise in the rural zones are set in the noise limits for the zone. There are a range of limits and timeframes in the plans assessed.

Day

	50dBA	**55dBA**	**65dB**	**7am – 7pm**	**7am – 10pm**	**Other**
Central Otago		L10			X	
Hastings		LAeq			X	
Hurunui		LAeq		X		
Marlborough			LAeq		X	
Opotiki	LAeq				X	
Tasman		LAeq				7am – 9pm*
WBOP	LAeq				X Mon-Sat	7am – 6pm Sunday
Whangarei		LAeq			X	

*Note that Tasman differentiates Day as being Monday – Friday 7am – 9pm and Saturday 7am – 6pm (excluding public holidays) At all other times the night limits apply.

Night

	40dBA	**45dBA**	**65dBA**	**LMax 65dBA**	**LMax 70dBA**	**Lmax 75dBA**
Central Otago	L10				X	
Hastings		LAeq				X
Hurunui		LAeq			X	
Marlborough			LAeq			X
Opotiki	LAeq				X	
Tasman	LAeq				X	
WBOP	LAeq			X		
Whangarei	LAeq				X	

6.3 Objectives and policies

The objectives and policies from the district plans assessed are set out in Table 3 to provide a comparison in approaches.

[10] The permitted baseline is the extent of adverse effects from an activity that would occur with the permitted activity rules. In the case of noise limits the permitted baseline would be the noise limits for the zone.

The provisions for objectives and policies relating to frost fans vary according to the structure of the plan – whether they are in a noise chapter or a rural chapter, or a combination of both.

Most plans have a generic objective for the rural zone that provides for rural production activities and their adverse effects.

However, specific objectives for Noise mainly focus on the amenity values for the community and exposure to noise and make no, or little, recognition of the background noise in the environment.

Some objectives and policies make specific provision for rural noise so it is clear what is anticipated in the rural zone.

The Proposed Central Hawkes Bay District Plan has two noise objectives which balance exposure to noise with the activities which are compatible with the role, function and character of the receiving zone.

Any resource consent would need to assess the objectives of both the NOISE and GRUZ provisions.

6.4 Rule activity status

The activity status for frost fans is generally a permitted activity if standards are complied with. The default activity status varies generally between Restricted discretionary or Discretionary.

Restricted Discretionary	**Discretionary**
Central Otago Hastings Opotiki Tasman Western BOP Selwyn Waimakariri	Whangarei Central HB

Hurunui has a more tiered approach depending on the setback from other properties and noise levels:

Permitted 3.4.3.9 h)	**Controlled 3.4.4.1**	**Discretionary 3.4.6.12**	**NC**
If it meets: - all standards in 3.4.3.9 h)	If it meets: - all standards in 3.4.3.9 h) except the setback distance	If it meets: - all standards in 3.4.3.9 h) except the setback distance - standards in 3.4.6.12	If the permitted, controlled or discretionary activity standards are not met

-including is no more than 55dB LAeq (10min) and - not located within 300m of a dwelling on a separate lot in different ownership or 1000m of a settlement area	- all standards in 3.4.4.1 - not located within 150m of a dwelling on a separate lot in different ownership	- is more than 55dB LAeq (10min) but does not exceed 60dBLAeq (10min) - not located within 150m of a dwelling on a separate lot in different ownership	Any frost fan closer than 150m of a dwelling on a separate lot in different ownership or within 500m of a settlement area is NC.

Marlborough is the exception to the permitted activity approach as it has a controlled activity rule, requiring resource consent for all frost fans and sets out a range of standards that need to be met. Where the standards in the controlled activity rule are not met then the activity is discretionary.

Waimakariri has proposed a controlled activity rule with a default of Restricted Discretionary if the standards are not met.

While not included in the analysis Queenstown Lakes default activity rule is non-complying if the permitted activity standards are not met.

Of particular interest is that the Western Bay of Plenty PC87 notified in 2019 amended the activity status of the frost fan rule from Controlled to Permitted. The s32 Report states that controlled activity consents were being issued with a standard set of provisions and if an activity could meet those requirements then it should be permitted. The default was then changed to restricted discretionary.

6.5 Frost fan noise limit

The noise limits for frost fans varies from between 55dBL_{AEQ} to 65dBA L_{10}.

55dB L_{Aeq} (10min)	**55dB L_{Aeq} (15min)**	**55dB L_{Aeq} or 65dB L_{Amax}**	**60dB L_{Aeq} 10mins**	**65dB$L_{Aeq(15min)}$**	**65dBA L_{10}**
Hurunui	Marlborough	WBOP	Opotiki	Hastings	Central Otago
Whangarei	Selwyn	Tasman (but not doesn't include max)			
Waimakariri					
Central HB					

It should be noted that the use of the L_{10} measure has been updated to L_{Aeq} so the Central Otago plan is not using the most up to date acoustic measures.
Some L_{Aeq} measures are over 10, 15 or an unspecified number of minutes.
To be accurate an L_{Aeq} measure should state the time that it is taken over. Some plans have not specified the time frame. NZS6802:2008 has a standardised reference time interval of 15 minutes.

6.6 Measurement point

All the frost fan rules stipulate where the noise measurement is to be taken. In some cases the measurement point will vary to use a lesser distance and there can be different thresholds used within the Rural Zone from those to another zone boundary.

300m	**Notional Boundary in Rural Zone**	**300m or Notional boundary whichever is least**	**Within site boundary in other zones**
Central Otago	Hurunui	Hastings	Hastings
	Opotiki	Marlborough	Opotiki
	WBOP	Tasman	Tasman
	Whangarei		WBOP
	Selwyn		Hurunui
	Waimakariri		
	Central HB		

Taking measurements at the notional boundary is the most common measurement location within the Rural Zone. This is consistent with the NZ Standards for noise as to the location of the measurement point. Where the measurement is taken from a property outside the Rural Zone (e.g. Residential zone or Rural Living) it is generally accepted that the measurement point is at the zone boundary.

Notional boundary is defined in the National Planning Standards:
Means a line 20 metres from any side of a residential unit or other building used for a noise sensitive activity or the legal boundary where this is closer to such a boundary.

Therefore, if a residential unit is closer than 20m to the boundary the point of measurement is the site boundary.

Hurunui sets the measurement to the notional boundary of a dwelling on a separate lot within 1km.

A 300m distance is used in some instances for the measurement point as it is consistent with the setback distance in the plan for a frost fan and sets a benchmark for any future residences in the vicinity.

It should be noted that some plans require the measurement to be taken at a 'residential unit' or 'dwelling' (Hurunui, Tasman, WBOP, Waimakariri) while others use 'noise sensitive activities' (Whangarei, Hastings, Selwyn). Central Hawkes Bay refers to the 'site'. Marlborough refers to 'habitable buildings' which includes visitor accommodation.

6.7 Setback

Not all plans stipulate a specified setback distance for a new frost fan from other dwellings or zone boundaries, relying on the noise measurement as the determinant of the necessary separation distance. Nor do plans stipulate a specific setback of dwellings from existing frost fans other than through the requirement for acoustic insulation discussed below.

	Zone boundary	**Dwelling not on property**
Central Otago	300m	100m
Hurunui	Permitted Activity 1000m Controlled Activity 500m (Settlement area)	Permitted Activity 300m Controlled Activity 150m
Marlborough	500m	
Waimakariri	1km (Residential)	300m

WBOP specifically states that the distance required to achieve the 55dB L_{Aeq} will vary depending on the noise performance of the frost protection fan.

Pre 2009 the Marlborough District Plan had a setback of 100m from a dwelling house not located on the property but this has not been carried forward into the Marlborough Environment Plan.

There are a range of factors that influence the distance from a frost fan to achieve the recommended 55dB L_{Aeq} such as the type of fan, orientation of the blade, typography and mitigating factors.

The Hunt report demonstrates that sounds reduces in intensity with distance and in a typical situation would generally achieve 55dB L_{Aeq} at 300m.[11]

[11] Hunt, M 2009 Pg 6

6.8 Temperature

Some plans stipulate the temperature at which frost fans may operate or refer to 'frost danger period'.

Below 1^{O}C^{-}	**Less than or equal to 2^{O}C^{-}**	**Turned off at 3^{O}C^{-}**	**Turned off at 4^{O}C^{-}**
Central Otago	Hurunui	Tasman	WBOP
Marlborough	Tasman		
	WBOP		
	Waimakariki		

The plans may stipulate where the temperature is to be taken:

- Tasman – at the lowest level of the frost tender part of the crop
- WBOP - Canopy height (Mainly kiwifruit grown as a canopy in WBOP)
- Hurunui - height above ground of the buds on the plant
- Marlborough – lowest point of bud height of plant to be protected

6.9 Wind speed

Both Marlborough and Hurunui and Waimakariki have a condition that the frost fan will not operate in wind speeds exceeding 8km/hr to limit the circumstances in which a frost fan will be used. The limitations on wind speed arose from consideration by the Environment Court[12]. Advise to the court was that noise from frost fans would be more impulsive at higher wind speeds.

6.10 Fan Speed

Central Otago has a specific condition that the fan speed does not exceed the speed of sound. The genesis of this condition is not known and it has not been replicated in other plans. A similar condition was in the pre-2009 Marlborough plan but was not carried over into later plans.

6.11 Purpose

Central Otago, Hurunui, Marlborough, Tasman and Whangarei have a specified purpose that the frost fan is only operated for protection of crops from frost and specifically from bud burst to harvest. The intent of the clause is to ensure that the frost fans are only being used at the specific times of year.

[12] 2011 NZEnvC 030 NZ Winegrowers v Hurunui District Council

6.12 Special audible characteristics

Hurunui, Marlborough and Whangarei specifically refer to special audible characteristics, with Hurunui and Whangarei stating that no adjustment is to be made to the noise levels for special audible characteristics as the noise limits have taken these into account.

However Marlborough, as a result of the Environment Court decision, have included provision for a 5dB penalty for tonality or impulsiveness.

6.13 Maintenance

Five plans – Hurunui, Marlborough, Tasman, WBOP and Whangarei – all include specific provisions for timing of maintenance with a range of provisions. Maintenance is generally to be during daytime 8am – 5pm on weekdays.

6.14 Certification

Three plans – Hurunui, Tasman and WBOP- require certification of the noise levels by an acoustic engineer and a plan of location be provided to the Council to demonstrate compliance with the permitted activity rules.

Providing location of the device would ensure that council is aware of location of frost fans when implementing requirements for acoustic insulation for new dwellings.

6.15 Notice

Whangarei requires that a notice be placed on the road frontage with the details of the person responsible for the fan.

6.16 Cumulative effects

Hurunui and Tasman both include a requirement that noise levels are to be assessed in combination with noise from any other authorised frost fan, thereby assessing the cumulative effects of the new fan.

The Environment Court, in considering the Hurunui Plan Change 18 addressed a request to amend the provision to include additional 1dBa increase due to cumulative effects. The court noted ‘we agree that the Plan’s cumulative effects approach is unusual’ particularly given that even a quiet frost fan would be affected in areas where the noise levels were near the

performance standard.[13] However the Court accepted that the plan change had been through a Schedule 1 process and the provisions were not subject to appeal so was unable to consider or amend the provisions.

Western Bay of Plenty considered introducing provisions to address cumulative effects but decided against proceeding with such an approach.

The proposed plan for Waimakariri requires that the noise level applies both to individual and cumulative noise from all frost fans within 1km of a residential unit. This is similar to the Hurunui plan. As the activity status is controlled council will be aware of frost fans in the vicinity.

The Whangarei plan and the proposed plan for Selwyn requires that the noise performance standard be met by all frost fans on the site operating simultaneously. This is cumulative to the extent of the fans on a specific site, but does not include fans located on other sites.

The matters of discretion for two plans – Hurunui and Western Bay of Plenty - include consideration of cumulative effects.

6.17 New noise sensitive activities

Hurunui, Marlborough, Tasman and Western Bay of Plenty have requirements for limitations on dwellings near an existing frost fan, with requirements for acoustic insulation.

Central Otago has a provision requiring that noise sensitive activities be sited, oriented and constructed so as to ensure that habitable spaces within the building are adequately isolated from any noise source on another site. This provision includes noise from frost fans. It sets a standard of indoor design level of 45 dBA L_{max}. The reasons state:
It is also considered appropriate that where a new activity that may be noise sensitive locates in the rural environment next to an activity that generates noise then the developer of the new activity should take steps to mitigate the effects of that noise. The cost should not be borne by the existing activity unless it does not meet the 70dBA standard.

Western Bay of Plenty introduced the acoustic insultation provisions in PC87 in 2020 requiring new dwellings to be designed to mitigate noise effects from frost protection fans where they are located within 300m of an existing or approved fan to achieve an internal noise level of 30dBA in any bedroom and 40dBA in other habitable rooms. The s32 Report for the plan change stated that this requirement recognises the need for the horticultural industry to protect valuable crops while also protecting the health and amenity of people who wish to build dwellings near frost fans, and an efficient method to avoid potential reverse sensitivity effects.

Marlborough and Tasman have a similar provisions for new dwellings within 300m of an existing frost fan.

[13] 2011 NZEnvC 030 Para 36

Hurunui requires acoustic insulation of new dwellings within 1000m of a frost fan in the Rural Zone and has a design guide for noise levels, adjusted for the number of fans in the vicinity.

It is noted that the Marlborough provisions requiring acoustic insulation of dwellings are located in the standards for permitted activities for construction and siting of building while the Western Bay of Plenty and Tasman are located with the noise provisions.

Hurunui acoustic insulation provisions are included in the standards for permitted activities but separate from the noise provisions in the same section.

Given the structure for district plans under the National Planning Standards consideration will need to be given to where requirements for acoustic insulation should be located.

None of the three proposed plans include provisions for acoustic insulation of dwellings near a frost fan.

The plans use a range of terms to determine what is included in the requirement for acoustic insulation. Tasman refers to 'residential activity', and Hurunui limits the requirement to 'new dwellings'. Western Bay uses 'dwellings' which includes minor dwellings as defined and also addition of 'habitable space' to an existing dwelling.

The Marlborough Plan provision refers to 'noise sensitive activities' which is defined in the Plan:

> *means any use of land and/or buildings that is likely to be susceptible to the effects of noise emitted from nearby land uses in the course of their legitimate operation and functioning. Examples include dwellings, visitor accommodation, hospitals, health care and medical centres, residential care housing, educational institutions, structures for the purpose of, or activities involving public assembly.*

Consideration needs to be given to what types of buildings would require an acoustic insulation requirement to be applied.

6.18 Internal noise standard

Linked to the requirement for acoustic insulation is the internal noise standard which the insulation must achieve. Hurunui, Tasman and WBOP have a standard of 30dBA in bedrooms, with WBOP also having 40dBA for other habitable rooms.

Marlborough does not require an internal noise standard but prescribes the insultation standard depending on the distance from a frost fan. These standards were set in the 2014 Environment Court decision NZEnvC 85.

6.19 Exception

Western Bay of Plenty includes provision for a frost fan as a permitted activity where it exceeds the noise standards if the written approval of owners of the land and owners and occupiers of dwellings to which the non-compliance applies is obtained and the noise levels are assessed by an acoustic engineer and provided to council.

6.20 Height

The permitted height of frost fans varies across plans and could influence the efficiency of their operation.

10m	**12m**	**12.5**	**12m not including blades**	**15m inclusive of blades or to tip**
Marlborough	Opotiki	Tasman	Hurunui	Central Otago
	Selwyn			Hastings
	Waimakariri			WBOP
				Central HB

The height of Frost Boss (a common make of frost fans) towers is 10.4m with the blades being 2.7 metres – having an overall height of 13.1m. Height is required to reach into the inversion layer to enable air to be moved.

6.21 Matters of control or discretion

The matters of control or discretion for controlled or restricted discretionary rules included in operative plans are relatively standard and focus on the operation of the devices including:

- Operational requirements of frost control fans;
- Proximity to a residential area or dwelling including the visual effects;
- Noise mitigation measures;
- Generation of noise with special audible characteristics;
- Frequency and duration of operation
- Location, orientation
- Monitoring and reporting

Western Bay of Plenty and Hurunui include cumulative effects of noise from other frost fans in the vicinity.

Western Bay of Plenty also includes a best practicable option matter:
The best practicable option for preventing or minimising adverse effects associated noise emissions. This may include, but is not limited to consideration of alternative options for frost

protection, effectiveness of those alternative options, affordability, cumulative effects of existing frost protection fans in the vicinity, effects on established land uses, and proposed mitigation.

Whangarei does not include matters of discretion as the default activity status is discretionary.

The Proposed plans for Selwyn and Waimakariri rely on generic matters of discretion that apply to most noise activities so are not specific to frost fan operations.

Proposed Central Hawkes Bay plan has a default of a discretionary activity. It lists assessment matters but these are not limited as matters of discretion.

7. Discussion

7.1 The number of potential conditions for frost fan rules is extensive and somewhat complicated if all those currently used in district plans are applied.

In assessing an appropriate rule and conditions it needs to be clear what is sought to be achieved:

- Enabling the use of frost fans to protect crops from damage from frost; while
- Ensuring adequate amenity and disturbance from noise to neighbouring properties.

In assessing what would be appropriate standards the tests of efficiency and effectiveness should be applied.

The discussion assesses potential conditions identified in Section 6 above to align with these criteria.

In developing provisions for frost fans, a distinction needs to be made between the rural zone where activities such as frost fans could be anticipated, and other zones such as residential and rural lifestyle where a different level of amenity could reasonably be anticipated. Key to addressing this issue is the Council zoning framework to ensure that incompatible activities are not inappropriately located.

There also needs to be clear policy that enables use of machinery and frost fans for rural production alongside policy for residential amenity and provides a framework if resource consent is required.

A minor point to note is the use of terminology in that plans refer to 'frost protection fans', frost control fans' or 'frost fans'. As the fans do not 'control' the frost it is preferred to just refer to 'frost fans' which is the industry terminology commonly used.

7.2 Objectives and policies

The range of objectives and policies providing for rural production activities and generation of noise demonstrate that there is a 'mixed approach' to how noise generating activities, such as frost fans, would be assessed in a resource consent situation.

Where there are objectives and policies across respective chapters there will be the need to ensure that there is adequate cross referencing and integrated management.

For instance: in the Selwyn District Plan hearings for noise HortNZ raised the issue that the objective only focused on amenity for the community and not the context of the receiving environment in which the noise occurred. The s42A Report response was that the rural matters were addressed in the rural chapter so were not needed in the noise provisions. However, the

rural provisions made no specific mention of noise so it is unclear how the respective provisions would interact. This is a matter that will need to be resolved through the developing use of the new National Planning Standards framework.

Central Hawkes Bay Proposed District Plan has a balancing approach with two noise objectives so that the focus is not exclusively on amenity values being protected but that the rural production values are also recognised and provided for. This dual approach has merit so it is clear in the Noise provisions how the respective matters interact.

While the focus on the noise provisions is usually on the rules, of note is an Environment Court decision on a subdivision consent in the Gibbston Character Zone of Queenstown Lakes DC[14] where the court placed considerable weight on the objective and policies of the Proposed District Plan:

> *The economic viability, character and landscape values of the Gibbston Character Zone are protected by enabling viticulture and other appropriate activities that rely on the rural resource of the Gibbston Valley and managing the adverse effects resulting from other activities locating in the zone. (Obj 23.2.1).*

The noise objective (Obj 36.2.1) is:

> *The adverse effects of noise emissions are controlled to a reasonable level to manage the potential for conflict arising from adverse noise effects between land use activities.*

The Court took the view that if the proposal materially conflicts with the plans intentions to protect rural production values then that 'strongly counts against' the proposal.

Therefore, the interaction between provisions that provide for rural production and other uses in the rural environment is an important consideration as to whether an activity such as frost fans are adequately provided for, particularly in the context of potential reverse sensitivity.

The recommendations is to include an objective and policy framework that would specifically provide for rural production activities that generate noise.

7.3 Rule activity status

The majority of the plans assessed have a permitted activity status for frost fans if standards are complied with. I consider that this is the most efficient approach as it avoids the need for resource consent where a frost fan can operate without disturbing those in the vicinity. If the standards cannot be complied with then a resource consent pathway is provided to ensure that adverse effects from the operation are appropriately managed.

If a permitted activity rule cannot be met then a Restricted discretionary activity rule with clear

[14] 2021 NZEnvC 23 The case has been appealed to the High Court but decision is still pending.

matters of discretion status would generally apply.

It is noted that a controlled activity consent with clear matters of control would provide a greater degree of certainty to the grower that would secure the right to operate. A controlled activity would also provide council with information about location of frost fans in terms of identifying potential reverse sensitivity effects from new residential activities, however this can be addressed by requiring a condition of a permitted activity that Council is provided with information regarding the frost fan, including evidence that the permitted noise standards are met.

Under the Resource Management Act, a controlled activity consent cannot be declined and there are limitations as to the conditions that may be applied. This is anticipated to change under the proposed Natural and Built Environment Act where there will be the ability to decline a controlled activity consent which is more akin to the current Restricted Discretionary activity.

I do not consider that the tiered approach of Hurunui is necessary to achieve appropriate management of adverse effects. Nor is a non-complying activity considered appropriate as matters of non-compliance can be addressed through conditions on an RDA resource consent.

In my opinion, a clear permitted activity rule with standards and a default restricted discretionary activity rule provides greater certainty for applicants, affected parties and council.

7.4 Frost fan noise limits

A noise limit for frost fans of 55dB $L_{AEQ\ (15\ mins)}$ should be used as the benchmark for a permitted activity. Where the noise level is higher the effects should be assessed through a resource consent. This limit was established through the Environment Court hearing on the Marlborough Plan Change and has been adopted by other plans, although there are variations in the time over which the assessment is to take place. A measurement period of 15 minutes enables the variations in noise output from the frost fans to be adequately taken into account.

A limit of 55dB $L_{AEQ\ (15\ mins)}$ means that a level of 30dBA $L_{Aeq\ (15\ mins)}$ should be able to be achieved indoors to avoid sleep disturbance.

There does not appear to be a need to apply a Lmax limit given the nature of the noise generated.

7.5 Measurement point

The notional boundary of a residential unit is the generally accepted measurement point of noise in the Rural Zone, rather than an arbitrary distance. Where the frost fan is located in the vicinity of a zone boundary then the boundary should be the point of measurement.

7.6 Setbacks

Not all the plans stipulate a specified setback distance from other dwelling or zone boundaries, relying on the noise measurement as the determinant of the necessary separation distances. The topography and orientation can influence the noise levels emitted therefore a setback distance is a fairly blunt instrument and not necessarily effects based.

Setback distances range from 100m – 1000m, with 300m being a middle ground.

The Hurunui DP has a 1000m distance to a residential dwelling, within which compliance with the noise limits must be demonstrated. This appears to be a result of the Marshall Day Report that identified a 1 km distance for assessment based on a report for Griffith City and Leeston Shire councils in New South Wales.[15]

Marshall Day, in the same report[16], state:
We do not recommend using distance as a criterion for noise control as this does not encourage good design or provide certainty that an intended level of amenity will be achieved.

However the report describes testing of a number of frost fans and determines that: *Generally a 55 dBA L_{10} limit would prevent frost fan noise within at least 300m of any houses and for some types of frost fans a separation distance of up to 400m would be required.*

The report also notes that development of quieter frost fans could result in fans being able to be located closer than 300-400m to houses.

This Marshall Day report was referred to in the s42A Report for PC18 to the Hurunui District Plan and provided the basis for a 300m setback from houses.[17]

The Proposed Waimakariri District Plan has a 300m setback from dwellings. The Issues and Options Paper for the Waimakariri DP states that the rule is based on a simplified version of rules developed by Marshall Day Acoustics for the Hurunui District, which includes the 300m setback.

Technical advice from Malcolm Hunt[18] suggests that the noise levels dissipate over distances and that at 300m from a fan a level of 55dBA L_{eq} should be able to be achieved, so a setback of 300m provides a reasonable level of surety that dwellings beyond that distance will not be significantly adversely affected by the frost fan noise.

[15] Marshall Day Acoustics 2006 Hurunui Frost Fans Proposed Noise Rule Report 06014c/1 Jan 2006 Pg 5

[16] Ibid Pg 7

[17] White, E, s42A Report for PC18 Hurunui District Plan

[18] Refer Hunt Report Pg 6

It should be noted that both the Marshall Day and Hunt reports for Hurunui District are dated 2009 and technology improvements since then could reduce the setbacks that a plan should consider.

The technical specifications for the Frost Boss fans state that the 4 bladed model C49 achieves 51dB at 240m with 55dB achieved at 240- 260m and the 5 bladed model C59 achieves 49dB at 300m, with 55dB achieved at 180- 200m. The four and five blade models tend to be quieter so a two or three blade machine would require a greater distance to achieve 55db.

While I consider a setback to be arbitrary it can provide a level of guidance in a plan in that location of frost fans within the 300m of a dwelling will be subject to greater scrutiny through a resource consent process, or provide a threshold for requiring acoustic insultation.

7.7 Temperature

Use of a temperature at which frost fans may be operated provides a measurable condition to ensure that management of frost fans address adverse effects to the extent reasonably possible. I recommend that 2^0C is used. It is also important to state where the measurement is taken, with the various plans having a range of locations. I recommend that 'the lowest level of the frost tender part of the crop' be used as it applies to a range of crops.

7.8 Wind speed

Marlborough and Hurunui and the proposed Waimakariri Plan have conditions related to wind speed with frost fans not to be operated in wind speed over 8km/hr. While it is likely that a frost fan may be noisier in higher wind speeds such conditions are unlikely to exist when frost is present. Therefore I do not consider it is necessary to include a condition relating to wind speed.

7.9 Fan speed

Central Otago is the only District Plan that currently stipulates a fan speed. Given the age of this plan and the fact that fan speed has not been adopted in any other plan I consider that this condition is not necessary. A grower will adjust fan speed to reflect conditions and to ensure that the noise limit is met, which is a more appropriate method to control fan speed than stating an arbitrary speed. A similar condition was in the pre -2009 Marlborough plan but was not carried over.

7.10 Purpose

A condition to limit the use of frost fans for only protection of crops from frost from bud burst to harvest has been added to some plans as a measurable condition to address concerns that frost fans were being used inappropriately or with inadequate management. If there is a

permitted activity condition that limits the use then if a grower wants to use the frost fan for purposes other than protection of crops from frost then a resource consent would be required.

The Environment Court in the Hurunui case accepted the inclusion of a 'purpose' standard as "an efficient and effective means to limit the frequency of use of frost control fans". [19]

7.11 Special audible characteristics

The matter of special audible characteristics is well traversed in the Environment Court cases for Hurunui and Marlborough. In the s42A Report for PC18 for the Hurunui District Plan[20] there was debate about the appropriateness of applying a condition and states:

> *Marshall Day believes that, even amongst acoustic consultants, there is no agreement as to whether or not a given noise source contains special audible character. For the sake of simplicity, they consider it better to remove this element from the discussion, because it is so subjective.*

No penalty was included in the Plan for special audible characteristics as it was taken that the noise limit of 55dBA L_{Aeq} took into account the issue of special audible characteristics and this was later endorsed in the Environment Court decision.

Given this context I do not consider that a penalty for special audible characteristics should be applied in a permitted activity rule if a sound limit of 55dB $L_{Aeq(15mins)}$ is applied.

7.12 Maintenance

As maintenance will generally be undertaken outside of hours of use for frost fighting or other than between bud burst and harvest it is appropriate that there is provision for such maintenance to be undertaken. A specific condition for daytime use for maintenance is included in the recommended rule below.

7.13 Certification

Hurunui, Tasman and Western Bay of Plenty all include a permitted activity condition requiring certification of the frost fan noise levels by an appropriately qualified acoustic engineer to be provided to the Council. These three councils also require acoustic insulation for new dwellings within the vicinity of a frost fan. It would appear that the condition is needed so the council has a record of where frost fans are located so that proximity of new dwellings can be ascertained when building consent is sought for dwellings.

Marlborough also requires acoustic insulation but the activity is a controlled activity so council would be aware of the location of frost fans through the consent process.

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[19] 2011 NZEnvC 030 Para 72

[20] S42A Report PC18 Hurunui district Plan Para 7.37

I am recommending a permitted activity condition similar to Hurunui, Tasman and Western Bay of Plenty for acoustic insulation, so also include a requirement that location and noise limits for frost fans be provided to council.

I also recommend that the certification is undertaken by an appropriately qualified acoustic engineer. Such a person is independent from the frost fan company. It has been suggested that the frost fan company could undertake the certification but advice from a district council with multiple frost fans is that frost fan companies do not have the expertise to be able to do this verification and that growers in the district have not found this to be an issue.

7.14 Notice

Whangarei includes a specific permitted activity condition that a notice be placed on the road frontage with the details of the person responsible for the fan. This condition has the effect of enabling any party concerned about the operation of a frost fan to contact the person responsible for the device.

Given the potential tensions that can emerge when parties feel aggrieved by noise effects it may not necessarily be the most appropriate mechanism to use to engage with the frost fan operator. It may be more appropriate to channel any communication through council.

The Environment Court considered a signage rule Marlborough[21] but rejected the requirement as most complaints arise at night and it may not be clear which fan is emitting noise that may be complained about so the rule was not appropriate.

I do not consider that such a condition is necessary as part of the package in managing the adverse effects of frost fans.

7.15 Cumulative effects

The issue of cumulative effects is somewhat complex in that it is difficult for a grower to account for the noise from frost fans on properties other than their own. The Environment Court has not considered the issue of cumulative effects in any detail other than noting in the Hurunui case that the approach was 'unusual'.

The technical data available indicates that cumulative effects are limited:
If two frost fans are running, and they are each the same distance from an observer, we find that the cumulative noise of these two machines would result in a 3 dB increase over the noise level measure if one of the machines was running alone. Where one or other of the frost fans

[21] 2013 NZEnvC 7 at 83

lies at a greater distance to the receiving position than the other, a noise level increase of less that 3dB will occur. Thus, the cumulative noise level effect is not large. [22]

Given that frost fans are generally spaced out across properties the likelihood of two or more fans being in the same proximity to a residential property are limited, thereby reducing the potential for cumulative effects.

I do not recommend that a cumulative permitted activity standard be included in rule for frost fans, but if cumulative effects are to be factored into a permitted activity standard then it should only apply to frost fans located on the same site operated simultaneously, not all frost fans in the vicinity.

7.16 New noise sensitive activities

To address the need to protect a growers ability to use frost fans to protect crops requirements for acoustic insulation for new residential units in the vicinity of existing frost fans in the Rural Zone has benefits. It is efficient in avoiding potential reverse sensitivity effects at a later stage.

In analysing provisions in existing plans it was noted that the provisions for acoustic insulation were located in different parts of the plans. The National Planning Standard 7 District Wide Matters specifically states at Para 33 that all provisions for managing noise must be located in the Noise chapter including:

> *c. sound insulation requirements for sensitive activities and limits to the location of those activities relative to noise generating activities.*

Therefore, inclusion of acoustic insulation requirements will need to be in the NOISE chapter of plans developed under the National Planning Standard.

The use of terminology to which the requirement relates should also use the National Planning Standards terminology, such as residential units. Given that the acoustic insulation is designed to avoid sleep disturbance the focus should be on buildings where people sleep. Therefore the wide definition of 'noise sensitive activities' as used in Marlborough is potentially broader than necessarily required to meet the need relating to sleep disturbance.

The National Planning Standards do not have definitions of noise sensitive activities or sensitive activities although most district plans include such definitions, which may include places such as educational facilities and healthcare facilities.

The types of activities which may locate in a Rural Zone where sleep may be affected would be:

- Residential units

[22] Hunt 2009 Section 7

- Minor residential units
- Visitor accommodation

The National Planning Standards have a definition for 'residential activity' that means the use of land and buildings for peoples living accommodation and this would include both residential unit and minor residential unit as well as visitor accommodation.

Therefore it is recommended that any requirement for acoustic insulation should be for 'residential activity' or 'residential activity and visitor accommodation' if considered necessary to specify visitor accommodation. The requirement should apply to residential activity on a separate site in different ownership so the requirement does not apply to the site on which the frost fan is located.

There is also a question as to whether the acoustic insulation noise standard applies to only bedrooms in terms of sleep disturbance (Marlborough, Hurunui) or whether it should extend to other areas such as habitable rooms (WBOP) or living area (Tasman). Given that the effect of frost fans is generally during the early morning hours a limitation to bedrooms should be sufficient. It does not stop an owner applying acoustic insulation to other areas of the residential activity, but the council focus of control is on the effect of sleep disturbance.

Hurunui sets a distance of 1km for the acoustic insulation requirement while Western Bay of Plenty, Marlborough and Tasman have a distance of 300m.

There is a cost arising from the requirement for acoustic insulation and therefore consideration needs to be given to the extent of the requirement that is justified. A distance of 300 metres correlates with the setback distance used in some plans.

The recommended provision is:
Any new residential activity locating within 300m of an existing frost fan on a separate site in different ownership must be designed and constructed to ensure that the noise level inside any bedroom will not exceed 30dB L_{Aeq} when windows are closed and frost fans are operating. Written certification of such compliance from an appropriately qualified and experienced acoustic engineer shall be submitted with the building consent application for the residential activity.

7.17 Internal noise standard

The Marlborough Plan uses an acoustic insulation standard rather than an internal noise standard of 30dB L_{Aeq}. Applying a noise standard rather than an insulation standard means that the property owner has flexibility on how the standard is reached rather than having to comply with a prescribed form of insulation. This is reflected in the recommended provision above for acoustic insulation.

7.18 Exception

Western Bay of Plenty includes provision for a frost fan as a permitted activity where it exceeds the noise standards if the written approval of owners of the land and owners and occupiers of dwellings to which the non-compliance applies is obtained and the noise levels are assessed by an acoustic engineer and provided to council.

Such a condition would enable a frost fan to operate outside the permitted activity conditions without requiring resource consent. To this extent it would be a cost efficient provision. However the condition is quite lengthy and complex and I wonder what appetite there is for councils to provide such an exclusion from the permitted activity regime.

I consider it would be worth discussing with council staff the approach of such a condition and whether they consider it a useful addition to the toolbox to manage frost fans.

7.19 Height

There are some considerable differences in the height of frost fans provided for across respective plans – from 10m – 15m. Some provisions state that they include or exclude the blades. It should be noted that the frost fan structure, while tall, is slim.

In my opinion a height standard should be clear that the blades are part of the structure and should be included in the overall height provided for in the plan.

Manufacturers state that the fan needs to be high enough to reach into the inversion layer, hence the height of the fans. The Frost Boss fans have a 10.4m tower and 2.7m blades giving an overall height of 13.1m.

It is recommended that the height be 15m inclusive of the blade or tip.

Given that the height provision is not directly linked to the noise provisions a requirement for height will be located in the Rural Zone chapter rather than the Noise chapter.

7.20 Additional provision

I do note that there is no condition in any of the plans assessed that requires operators of frost fans to keep records of the operation and use of fans. Given the potential for complaints it would seem appropriate as a permitted activity condition that records are kept of the operation so usage can be verified and compliance with permitted activity conditions measured.

I consider keeping records would be best practice so inclusion of a permitted activity condition should not be an onerous requirement for a grower.

7.20 Matters of discretion

The matters of discretion should be specific to the frost fans, rather than a generic set of matters, because the matters relating to frost fans are specific to the nature of their operation.

The following are common matters of discretion used in current plans:

- Operational requirements of frost control fans;
- Proximity to a residential area or dwelling including the visual effects;
- Noise mitigation measures;
- Generation of noise with special audible characteristics;
- Frequency and duration of operation
- Location, orientation
- Monitoring and reporting

It is recommended that cumulative effects also be included as a matter of discretion where a resource consent is required.

8. Recommended provisions for inclusion in district plans for frost fans

8.1 Objectives and policies

Objectives	
NOISE-O1	Ensure residents of the District are exposed to an appropriate level of noise for the zone in which they reside/live or work.
NOISE-O2	Activities generate noise effects that are compatible with the role, function and predominant character of each receiving zone.

Policies	
NOISE-P1	Manage the noise level, location, duration, time, intensity and any special characteristics of noise generating activities, to reflect the function, character and amenity values of each zone
NOISE-P2	To recognise that noise associated with primary production activities is appropriate for the working nature of the rural environment by exempting it from the noise limits. The operation of noisy equipment (in particular rural airstrips, audible bird scaring devices and frost fans) is provided for subject to appropriate controls.
NOISE-P3	Rural production activities are not constrained by reverse sensitivity effects arising from noise sensitive activities located in the Rural Zones.

8.2 Rules

NOISE R-X	**Operation of frost fans**	
Rural zones	Activity status: PER Where: 1. Noise from the frost fan shall not exceed 55dB $LA_{eq\ (15mins)}$ when measured at or within the notional boundary of any existing residential activity on a site in different ownership or at the boundary of any non-rural zone. No adjustment for special audible characteristics shall be applied to measured or calculated noise levels 2. Frost fans must not be located within 300m of a residential activity on a separate site in different ownership or a zone boundary 3. Frost fans are used for protection of crops from frost from bud break to harvest	Activity status when compliance not achieved: RDIS Matters of discretion are restricted to: 1. Operational requirements of frost control fans; 2. Proximity to a residential area or dwelling including the visual effects; 3. Cumulative effects 4. Noise mitigation measures; 5. Generation of noise with special audible characteristics; 6. Frequency and duration of operation 7. Location, orientation 8. Monitoring and reporting

	4. Frost fans are only operated when the air at canopy height is 2^0C or less 5. Operation for maintenance shall only take place between 8am and 6pm Monday to Friday except in urgent unforeseen situations. 6. Evidence of installation of a frost fan meeting this standard shall be provided to Council including certification from an appropriately qualified and experienced acoustic engineer that the noise limits in 1) are met and providing the location of the frost fan. 7. Records shall be kept stating the date, temperature, times and length of use of each frost fan and made available to Council on request. Records may include telemetry records.	

NOISE R-X	**Residential activity within 300m of a frost fan**	
Rural zones	Activity status: PER Where: *1.* Any new residential activity locating within 300m of an existing frost fan on a separate site in different ownership must be designed and constructed to ensure that the noise level inside any bedroom will not exceed 30dB L_{Aeq} when windows are closed and frost fans are operating. *2.* Written certification of such compliance from an appropriately qualified and experienced acoustic engineer shall be submitted with the building consent application for the residential activity.	Activity status when compliance not achieved: RDIS Matters of discretion are restricted to: 1. Ability to meet internal noise standard 2. Potential reverse sensitivity effects 3. Mitigation methods

GRUZ S-X	Height	
Rural zones	Activity status: PER Where: 1. The height of a frost fans is no more than 15m including blades	Activity status when compliance not achieved: RDIS Matters of discretion are restricted to: 1. Effect on rural character 2. Necessity to exceed height restriction 3. How the structure enables a more efficient use of the site.

9. Other actions

There are other actions that could be taken to advance best practice of frost fan use which would work alongside the regulatory framework.

9.1 Liaison with growers and product groups

It is recommended that HortNZ discusses with product groups that use frost fans (NZKGI, NZ Apples and Pears, Summerfruit) the development of the policy position and surveys growers and product groups on current issues with frost fans to inform and refine the position.

9.2 Best practice guide.

NZ Winegrowers has a best practice guide for use of frost fans and it could be a useful tool for growers. It could be developed in conjunction with the relevant product groups, frost fan distributors and acoustic consultants.

9.3 Liaison with district councils

There are a number of councils currently reviewing district plans that will include noise provisions for frost fans. These plans will need to be in the National Planning Standards framework. Working with these councils in the development phase could assist in agreeing approaches prior to plan notification and advance a more nationally consistent approach.

9.4 Liaison with Acoustic consultants – technical advice

Councils are very dependent on the advice from acoustic consultants in developing plans. At present there is often difference of opinions amongst the consultants. It would be beneficial for all parties if there was agreement between the consultants on the appropriate provisions in plans, thereby simplifying the plan development process. In particular the setback distance from residential activities would benefit from acoustic advice to confirm an appropriate setback (currently recommended to be 300m).

HortNZ could take a role to facilitate discussions between the various acoustic consultants. There is an Acoustical Society of NZ[23] which may be an initial point of contact.

9.5 Liaison with NZ Wine

Winegrowers are also users of frost fans so development of an agreed approach across interested parties should include NZ Wine and winegrowers.

9.7 Frost fan manufacturers and distributors

Growers are getting advice from frost fan manufacturers and distributors who may not necessarily be cognisant of district plan rule requirements. For instance: they may determine a location for a fan based on operational factors but not take into account potential for conflict with neighbours and district plan requirements. Establishing contact with frost fan manufacturers and distributors to increase awareness could assist the industry overall. There could be the potential for supporting development of new technologies that reduce noise generated by frost fans, including accessing government funding for such new technology development.

10. Additional recommendations

10.1 Other district plan matters

A key component of any effective frost fan provisions relies on the zoning provisions in the district plan and the approach to enabling rural production and avoiding reverse sensitivity. This is particularly relevant where there has been rural lifestyle development in areas where growing activities take place.

10.2 Quality Planning website

If an agreed position could be developed for frost fans with acoustic consultants, councils and industry then information could be developed and placed on the Quality Planning website.

10.3 Audible bird scaring devices

Use of audible bird scaring devices can be a contentious issue and lead to conflicts between neighbours. A number of councils have provisions for audible bird scaring devices which vary across districts. There is potential for a similar process to be undertaken for these devices to establish best practice and a more consistent planning approach.

[23] https://www.acoustics.org.nz

10. References

Environment Court cases:
NZ Winegrowers and Horticulture NZ v Marlborough District Council [2013] NZEnvC 7
NZ Winegrowers and Horticulture NZ v Marlborough District Council [2014] NZEnvC 85
NZ Winegrowers and Waipara Valley Winegrowers Inc v Hurunui District Council [2011] NZEnvC 030
Gibbston Vines Ltd v Queenstown Lakes District Council [2021] NZEnvC 23

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Hunt, M Noise Assessment: Frost protection fans, March 2009 Report for Horticulture NZ, Malcolm Hunt Associates, Wellington
Marshall Day Acoustics, Hurunui Frost Fans Proposed Noise Rules Report 06014C/1 Jan 2006
Marshall Day Acoustics Whangarei District Plan Review Rp 001 2014326 29 July 2014
MfE, National Planning Standards https://environment.govt.nz/acts-and-regulations/national-planning-standards/
Western Bay of Plenty District Council S32 Report PC87 2019
White, E, s42A Report PC18 Hurunui District Plan, 2009
World Health Organisation, Guidelines for Community Noise ed B Berglund, T Lindvall, D.H Schwela, 1999 https://apps.who.int/iris/handle/10665/66217

Appendix – Tables of frost fan provisions.

Table 1: Frost fan provisions comparison - Operative District Plans

Provision	Central Otago	Hastings	Hurunui	Marlborough	Opotiki	Tasman	WBOP	Whangarei
Date of plan	Operative Apr 2008	Operative March 2020	Frost fan provisions PC18 notified Dec 2008 Environment Court decision Feb 2011	Proposed Marlborough Environment Plan Notified 9 June 2016 Decisions 21 Feb 2020 No appeals on provisions so essentially operative	Operative 5 Jan 2021	Plan Change 14 notified May 2009 Operative August 2012	Plan Change 87 Operative Oct 2020	PC110 notified 2014 Operative May 2016
Rural zone noise limits	7am to 10pm 55 dBA L10 10pm to 7am 40 dBA L10 and 70 dBA Lmax	7am-7pm 55dB $L_{Aeq\ (15\ min)}$ 7pm – 10pm 50 dB $L_{Aeq\ (15\ mins)}$ 10pm – 7am 45 dB$L_{Aeq\ (15\ mins)}$ and 75 dB L_{AFmax}	7am-7pm 55 db L_{Aeq} 7pm – 7am 45 db L_{Aeq} and 70 db L_{AFmax}	7.00 am to 10.00 pm 65dB LAeq 10.00 pm to 7.00 am 65dBLAeq 75dB LAFmax	7am – 10pm 50LAeq 40LAeq Other times 40LAeq 70LAmax	Day Leq 55 dBA Night 40 dBA Lmax 70 dBA	Mon-Sat 7am – 10pm 50dB L_{Aeq} Sun 7am – 6pm 50dB L_{Aeq} All other times 40dB L_{Aeq} 65dB L_{Amax}	0700 to 2200 hours 55dB LAeq 10pm – 7am 40 dB LAeq 70dB LAFmax
Objectives (see Table 2 below)	4.3.1 (Rural) 12.3.2 (Noise)	OBJ NSO1 OBJ NSO2 PPO3 (Plains Production Zone)	Obj 3.1 (Rural) Obj 3.2 (Rural)	Obj 14.1 Obj 14.4	Obj 8.2.3	Obj 7.4.2	Noise Obj 4C.1.2.1. Rural Obj 18.2.1	Noise Obj NAV 3.1 NAV3.2 Rural obj RPE1.2
Policy (see Table 2 below)	4.4.9 Policy Rural 12.4.2 Policy Noise	NSP4. PPP13 PPP14 PPP15	Policy 3.1 Policy 3.8 Policy 3.9	Policy 14.1.7 Policy 14.4.5	Policy 8.2.3.5	Policy 7.4.3.2 Policy 7.4.3.9.	Noise Policies 4C.1.2.2 (1) 4C 1.2.2 (2) Rural Policies 18.2.2	Noise policies NAV4.1 NAV4.2 NAV4.3 NAV4.4 Rural policies

Provision	Central Otago	Hastings	Hurunui	Marlborough	Opotiki	Tasman	WBOP	Whangarei
								RPE1.3.1
Rule ref	4.7.6	5.2.5 Section 25 – Noise 25.1.7B	3.4.3.9h)	3.4.1	8.3	17.5.2.1 e)	4C.1.3.6	NAV 6.13
Rule activity status	PA is 4.7.6 met	PA if 25.1.7B met	PA if all standards met	Controlled	PA 8.3.1.1 subject to standards 8.6.6.1	PA if standards met	PA	PA
Default status	RDA (4.7.3 i)	RDA	3.4.4.1 CA if doesn't meet setback distances in 3.4.3.9 h) of 300m from dwelling 3.4.6.12 DA if doesn't meet setback distances in 3.4.3.9 h) of 300m from dwelling and more than 55db but not exceed 60dB. 3.4.7.3 Non complying if P, C or D not met	Discretionary 3.6	RDA 8.3.3	RDA 17.5.2.5	RDA 4C.1.4.2	Disc
Frost fan Noise limit	65dBA L10	65dB$L_{Aeq(15min)}$	55dB $L_{Aeq\ (10min)}$	55dB $L_{Aeq\ (15min)}$	60dB LAeq 10mins	55 dBA Leq	55dB *LAeq* or 65dB *LAmax*	55 dB LAeq (10 min)
Measurement point	300m	300m from device or Notional boundary of any existing noise sensitive activity or any point in residential zone	Notional boundary of dwelling on separate lot within 1km	300m or Notional boundary of any existing habitable building	Notional boundary of any other rural zoned site or at the boundary of a residential zone.	at or within the notional boundary of any dwelling that existed before the frost protection device is installed At zone boundary OR 300m	Notional boundary of dwelling At any point in other zones	the notional boundary of any noise sensitive activity on a separate site under different ownership.

Provision	Central Otago	Hastings	Hurunui	Marlborough	Opotiki	Tasman	WBOP	Whangarei
Height	15m	15m - to tip of blade	12m not including blades	10m	12m	12.5m	15m inclusive of blades	
Setback	300m to any Residential or Rural Settlement Resource Area 100m to any dwelling within rural zone		300m of a dwelling on separate lot under different ownership 1000m of a settlement area	500m from other zones			Distance will vary according to type of fan	
Temperature	Below 1^{O}c		Less than or equal to 2^{O}C	Less than 1^{O}C		Less than 2OC and turn off when at 3OC	Not before 2OC and turn off at 4	
Wind speed			No greater than 8km/hr	No greater than 8km/hr				
Speed	Not exceed speed of sound							
Purpose	Protect crops from frost		Protection of crops on site from bud burst to harvest	Protection of crops from bud burst to harvest		used only for frost protection, for crops that have a distinct period of bud-burst and a distinct end of harvest, and only in the period between bud-burst and end of harvest.		Protection of crops from frost only
Special audible characteristics			No adjustment to be made to noise levels	5dB penalty for tonality or impulsiveness				Included – no adjustment to be made
Maintenance			Between 7.30am and 6pm weekdays	8am – 5pm		8am – 6pm	Monday to Friday 8am to 5pm	Daytime
Certification			Compliance demonstrated			Copy of acoustic certification lodged with	Report to Council for PA evidence	

Provision	Central Otago	Hastings	Hurunui	Marlborough	Opotiki	Tasman	WBOP	Whangarei
			with acoustic report			Council prior to installation	that noise levels met	
Notice								Include notice to road frontage with details of person responsible for fan
Cumulative effects			Noise to be assessed in combination with all frost fans operating simultaneously within 1km of dwelling			Noise to be assessed in combination with noise from any other authorised frost protection device		Noise to be assessed with all frost fans on the site
Exception							Written approval from neighbours	
New noise sensitive activities	4.7.6 E d) Any new noise sensitive activity shall be sited to ensure habitable spaces are isolated and adequate sound isolation achieves a indoor sound level of 45 dBA Lmax.		3.4.3.22 Acoustic insulation near frost fans within 1000m of a frost fan	3.2.4.1 new dwellings within 300m of existing frost fan – standards for insulation		17.5.2.1 g) Any new dwelling within 300m	4C.1.3.2 iii) Any new dwelling or addition of habitable space within 300m of an existing frost fan	
Internal noise standard			30dB L_{Aeq}			Must have indoor design of 30 dBA Leq	30dBA LAeq 15mins in any bedroom and 40dBA LAeq 15	

Provision	Central Otago	Hastings	Hurunui	Marlborough	Opotiki	Tasman	WBOP	Whangarei
						and 45 dBA Lmax	mins in any habitable room	
Matters of discretion	Location of buildings and activities		Operational requirements of frost control fans; Proximity to a residential area or dwelling including the visual effects; Noise mitigation measures; Generation of noise with special audible characteristics; Cumulative effects of noise from other frost control fans in the vicinity; and Frequency and duration of operation.	Operational requirements of frost fan Orientation, rotational constraints, speed of ff power source Operation for maintenance purposes Recording information Monitoring and reporting Contact details Review of conditions	Location of frost fan. Sound levels at any point within at the notional boundary of any dwelling on another site.	Operational requirements of frost protection devices. C14 5/09 Op 8/12 (2) Noise mitigation measures. (3) Hours of operation (including maintenance). (4) Height of the device	The level of noise that is to be emitted from the frost protection fan(s). The effect of noise on the owners of land, and owners and occupiers of *dwellings* who will be affected by noise levels over 55dB *LAeq* and/or 65dB *LAmax*. The hours of operation, duration and frequency of use of the frost protection fan(s). The best practicable option for preventing or minimising adverse effects associated	

Provision	Central Otago	Hastings	Hurunui	Marlborough	Opotiki	Tasman	WBOP	Whangarei
							noise emissions. This may include, but is not limited to consideration of alternative options for frost protection, effectiveness of those alternative options, affordability, cumulative effects of existing frost protection fans in the vicinity, effects on established land uses, and proposed mitigation. The operational requirements of the frost protection fan(s).	

Table 2: Frost fan provisions in Proposed plans in the National Planning Standards format

Provision	Selwyn	Waimakariri	CHB
Date of plan	Notified 5 Oct 2020	Notified 17 Sept 2021	Notified 28 May 2021
Rural zone noise limits	NOISE- Table 5 GRUZ 7am – 10pm 55 dB LAeq(15 mins) 10pm – 7am 45 dB LAeq (15 mins) / 70 LAF max	NOISE-Table 2 Noise limits GRUZ 7am – 10pm 50LAeq 10pm – 7am 40LAeq/ 70LAmax Measured at boundary of site receiving noise (NOTE should be notional boundary for rural zone)	NOISE-S4 Zone noise limits GRUZ 7am – 10pm 50LAeq Other times 40LAeq/ 70LAmax
Objective	No specific objective for rural noise – sought in submissions S42A Report recommendations The health and wellbeing of people and communities and their amenity values are protected from ~~significant levels of noise~~ ~~adverse noise effects consistent with the anticipated outcomes of the receiving environment~~	NOISE-O1 Noise does not adversely affect human health, communities, natural values and the anticipated amenity values of the receiving environment	NOISE-O1 Ensure residents of the District are exposed to an appropriate level of noise for the zone in which they reside/live or work. NOISE-O2 Activities generate noise effects that are compatible with the role, function and predominant character of each receiving zone
Policy	NOISE-P1 Manage noise effects by setting: 1. Maximum noise limits to reflect the character and amenity of each zone 2. Limits on the location, frequency, and duration of specific activities that generate noise 3. A vibration standard Specific rural noise policy sought in submissions Rural policies don't specifically refer to noise	NOISE-P2 Enable specific noise generating activities of limited duration that are: 1. Required for anticipated activities within zones of the District, including construction noise, audible bird scaring devices, frost control fans, temporary activities and emergency services, and 2. Where noise levels and characteristics are consistent with the character and amenity values of the receiving environment	NOISE-P3 To recognise that noise associated with agricultural, viticultural and horticultural activities is appropriate for the working nature of the rural environment by exempting it from the noise limits. The operation of noisy equipment (in particular rural airstrips, audible bird scaring devices and frost fans) is provided for subject to appropriate controls.
Rule ref	NOISE-R12	NOISE-R20	NOISE-S5 Specific activities exempt from noise limits in NOISE-S4 – 30 Frost fans
Rule activity status	PA in GRUZ if meet standards	CON if meets standards	PA
Default status	RDIS	RDIS	DIS

Provision	Selwyn	Waimakariri	CHB
Noise limit	55 dB LAeq (15 mins) from all frost fans operating simultaneously on a site	55 dB LAeq (10 mins) includes noise level to individual and cumulative noise from all frost fans within 1km of the residential unit	55 dB LAeq (10 mins)
Measurement point	Measured at notional boundary of any noise sensitive activity on separate site under different ownership	Measured at notional boundary of any residential unit or minor residential unit on a site in different ownership	Measured at notional boundary of any other site in General Rural or Rural Production Zone or within site boundary of any site in the Rural Lifestyle, General Residential or Settlement zones
Height	12m	12m	15m tip of blade at highest point
Setback		Not within 300m of a residential unit or minor residential unit or 1km of any residential zone	
Temperature		Local air temperature is 2^{O}c or less	
Wind speed		Speeds up to 8km/hr	
Speed			
Purpose		Limited to period between bud burst and harvest	
Special audible characteristics			
Maintenance		Monday – Friday 7.30am – 6pm	
Certification		Compliance demonstrated by acoustic expert	
Notice			
Cumulative effects	Noise generated by all frost fans operating simultaneously on a site does not exceed performance standard	Noise level applies to both individual and cumulative noise from all fans within 1km of the residential unit	
Exception			
New noise sensitive activities			
Internal noise standard			
Matters of discretion	NOISE- MAT1 Health and Wellbeing and Amenity Values 1. The level, duration and character of the noise, including the ambient noise levels 2. The nature and location of nearby activities and the adverse values they may experience from the noise	NOISE-MD1 1. Noise duration, timing, noise level and characteristics and potential adverse effects in the receiving environment 2. Any effects on the health or wellbeing of persons living or working in the receiving environment	Lists assessment matters but not limited.

Provision	Selwyn	Waimakariri	CHB
	3. Whether the noise is likely to detract from the amenity values or general environmental quality of the area in which they are received 4. Whether the noise generated is likely to cause sleep disturbance or result in adverse health or wellbeing effects 5. Any mitigation or noise attenuation measures proposed, such as: reduction of noise at the source, alternative techniques or machinery available, insulation or enclosure of the noise source, mounding or screen fencing/ walls, hours of operation 6. The extent to which alternative locations and methods have been considered to avoid, remedy or mitigate any adverse effects recognising any technical, operational and practical constraints.	3. The location of the noise generating activity and the degree to which the amenity values of any residential activity may be adversely affected 4. The extent to which noise effects are received at upper levels of multi-level buildings 5. Any proposals to reduce or modify the characteristics of noise generation, including; a) Reduction of noise at source b) Alternative techniques or machinery which may be available c) Insultation or enclosure of machinery d) Mounding, screen fencing/ walls or landscape characteristics e) Hours of operation 6. The adequacy of measures to address the adverse effects of noise on the natural character values of the coastal environment 7. Any adverse effects of noise on ecological values 8. The characteristics of the existing noise environment and the character the objectives and policies of the zone are seeking to achieve 9. Any relevant standards, codes of practice or assessment methods based on recognised acoustic principles, including those which address the reasonableness of the noise in terms of the community health and amenity values and/ or sleep protection 10. Temporary military training activities…..	

Table 3: Objectives and policies – relevant provisions to frost fan noise

Central Otago (Noise provisions included in Rural Chapter and District wide chapter - noise)

Rural 4.3.1 Objective –Needs of the District's People and Communities To recognise that communities need to provide for their social, economic and cultural wellbeing, and for their health and safety at the same time as ensuring environmental quality is maintained and enhanced	Rural 4.4.9 Policy - Effects of Rural Activities To recognise that some rural activities, particularly those of a short duration or seasonal nature, often generate noise and other effects that can disturb neighbours by ensuring that new developments locating near such activities recognise and accept the prevailing environmental characteristics associated with production and other activities found in the Rural Resource Area.
Noise 12.3.2 Objective - Protection from Noise To avoid, remedy or mitigate the adverse effects of noise on the District's amenity values and the health and wellbeing of the District's people.	Noise12.4.2 Policy Noise: To determine the suitability of noise generating activities in any given locality by having regard to: (a) The specific characteristics and amenity values of the locality from which the noise originates, and (b) The sound pressure level of the proposed activity, and (c) The frequency that the noisy activity takes place, and (d) The length of time that the noise continues, and (e) Any special characteristics of the noise, to ensure that the adverse effects of noise on other activities and the natural and physical resources of the locality (including cumulative effects) reflect standards acceptable to the community.

Hastings (Noise provisions included in Noise Chapter. Plains Production Zone is where frost fans are generally located so policy framework for that zone included below.)

OBJ NSO1 To manage the emission and mitigate the adverse effects of noise so as to maintain or enhance the acoustic environment. OBJ NSO2 to ensure that adverse effects of noise do not unreasonably affect people's health	NSP4 Manage the emission of noise associated with agricultural, viticultural and horticultural activities so that the operation of noise equipment, and in particular crop protection equipment, is provided for while avoiding generation of unnecessary or unreasonably high noise levels.
Plains Production (PP) Zone OBJECTIVE PPO3 To retain the rural character and amenity values of the Plains Production Zone.	POLICY PPP13 *Require that any new development or activity is consistent with the open and low scale nature that comprises the rural character and amenity of the Plains Production Zone*. POLICY PPP14 *Require that any new activity locating within the Plains Production Zone shall have a level of adverse effects on existing lawfully established land uses that are no more than minor.*

	POLICY PPP15 *Noise levels for activities should not be inconsistent with the character and amenity of the Plains Production Zone.* Explanation Activities associated with rural production can generate significant amounts of noise. While there is a recognised 'right to farm' philosophy built into the Plan in Policy PPP13, there is a need to have limits that maintain the character of the area and protect the health of residents. Performance Standards for noise have been drafted and set at a level which recognises the need for activities to operate in a way that does not unduly restrict normal practices associated with activities in the Plains Production Zone in order to protect their continued economic operation while maintaining appropriate amenity standards for residents in the Zone.

Hurunui (Noise provisions included in Rural Chapter)

Obj 3.1 The character and amenity values of rural areas of the district are maintained while providing for a variety of activities including those associated with primary production. Obj 3.2 Rural areas are managed so that primary production activities are able to be carried out efficiently and effectively.	Policy 3.1 To ensure that rural areas remain productive by recognising that some primary production activities lead to a range of effects including noise, dust, odour, traffic and visual effects. Policy 3.8 To control noise emissions at reasonable levels and where they exceed those levels, mitigate the effects of noise through noise reduction methods including separation distances between those noise-emitting activities and sensitive activities. Policy 3.9 To provide for frost control fans as part of primary production activities, while avoiding or mitigating the generation of noise exceeding a reasonable level

Marlborough (Obj and policies in Vol 2 Ch 14 Use of the Rural Environment Rules in Vol 2 Ch 3 Rural environment)

Objective 14.1 – Rural environments are maintained as a resource for primary production activities, enabling these activities to continue contributing to social and economic wellbeing whilst ensuring the adverse effects of these activities are appropriately managed.	Policy 14.1.7 – Recognise that primary production activities in rural environments may result in effects including noise, dust, smell and traffic generation, and that these will require mitigation where they have a significant adverse effect on the environment. The inherent nature of land-based primary production activities means that intermittently
Objective 14.4 – Rural character and amenity values are maintained and or enhanced where appropriate and reverse sensitivity effects are avoided.	Policy 14.4.5 – Noise limits consistent with the character and amenity of the Rural and Coastal Environment Zones have been established to provide for the protection of community health and welfare. Explanation: The adverse effects of noise are an issue in rural environments where noise may impact on the health of people and communities, as well as their enjoyment of the

	District. While there is always background noise, some noise can become a nuisance and even cause health problems through its character, duration or time of occurrence. Rural environments contain a wide range of activities that result in levels of noise effects that may be contrary to the expectations of people more used to the amenity of urban areas. Traditional rural activities, such as late night and early morning use of machinery that creates noise are normally acceptable to people used to a rural environment, particularly where their livelihood is dependent on the land. However, to ensure that the character and amenity of rural areas is maintained, limits through permitted activity standards will be imposed.

Opotiki (Noise provisions included in Rural Chapter)

Rural Obj 8.2.3 Avoid, remedy or mitigate adverse environmental effects of activities undertaken within the Rural Zone, while recognising and providing for rural production activities and their anticipated effects	Rural policy 8.2.3.5 Mitigation or avoidance of potential adverse effects, including reverse sensitivity, of new dwellings or incompatible activities on legally authorised activities

Tasman (Obj and policies in Partl II Rural Environment effects. Rules in Part II Ch 17 Zone rules)

Rural Obj 7.4.2 Avoidance, remedying or mitigation of the adverse effects of a wide range of existing and potential future activities, including effects on rural character and amenity values	Rural Policy 7.4.3.2 To provide for rural activities which may involve levels and types of effects, including noise, dust, smoke and odour, that may be permanent, temporary or seasonal, and that may not meet standards typically expected in urban areas. Rural policy 7.4.3.9 To ensure that adequate physical or spatial buffers or other techniques are applied when allowing new allotments or buildings primarily or exclusively for residential purposes in rural areas, so that productive land use opportunities are not compromised

WBOP (Noise provisions in Ch 4 Amenity Rural provisions in Ch 18 Rural)

Noise Amenity objective 4C.1.2.1 An environment free of unreasonable noise in accordance with the character and amenity of the zone within which the noise is generated and received.	Noise amenity Policies 4C.1.2.2 (1) Ensure activities do not generate noise levels inconsistent with the character and amenity of the zone in which the generated noise is received. 4C 1.2.2 (2) Exempt from the maximum permitted noise level requirements are those activities which are an integral part of accepted management practices of activities associated with production land in rural areas as well as other activities clearly of a temporary nature (e.g. *construction* works, military training exercises).

Rural Zone 18.2.1 Objectives 1. The rural land resource and *versatile land* capability is maintained to enable its use for rural production activities. 2. Primary productive activities should be able to operate in the Rural Zone without unreasonable constraints being imposed on them by other activities. 3. Appropriate provision for activities not directly based on primary production but which have a functional or other legitimate need for a rural location. 4. The efficient use and *development* of the rural land resource for primary production. 5. Maintain the rural character and amenity values associated with the low density rural environment	Rural Zone 18.2.2 Policies 1. Subdivision, use and *development* of *versatile land* should occur in a way which retains its potential to be used for a range of productive rural purposes and which maximises the likelihood of it actually being used for such purposes. 4. Subdivision, use and *development* which has the potential to inhibit the efficient use and development of rural land for primary production or to inhibit the efficient use and *development* of existing mineral extraction sites (including vehicle access routes to such resources) should be avoided or minimised.

Whangarei (Noise provisions in NAV chapter Rural in Rural Production Zone (RPE))

NAV3 Objectives 1. To enable a mix of activities to occur across a range of Environments, while ensuring that noise and vibration is managed within appropriate levels for the health and wellbeing of people and communities, and for the amenity and character of the local environment. 2. To ensure that activities that seek a high level of acoustic and vibration amenity do not unduly compromise the ability of other lawful activities to operate	NAV4 Policies 1. To establish reasonable noise and vibration limits and controls that enable appropriate activities to operate while maintaining the characteristic amenity values of each Environment. 2. To avoid reverse sensitivity effects by: a. Requiring suitable acoustic design standards for noise sensitive activities located in or adjacent to areas anticipating high noise levels. b. Restricting noise sensitive activities in Environments where they could unduly compromise the continuing operation of appropriate business activities. c. Considering the use of other mechanisms, such as noise control boundaries, buffer areas or building setbacks, as appropriate tools to protect existing or future activities. 3. To ensure that high noise generating activities located in noise sensitive areas maintain the characteristic amenity values of each Environment by: a. Establishing noise limits that are consistent with anticipated noise and vibration levels in each Environment. b. Requiring high noise generating activities to provide suitable mitigation measures to maintain appropriate noise levels for the health and wellbeing of people and communities, and for the amenity and character of the local environment 4 To avoid restricting primary production activities by providing provisions that acknowledge their seasonal characteristics, transitory periods of noisiness and the effects of reverse sensitivity
RPE.1.2 Objectives 1. Identify and protect productive rural land resources for a diverse range of rural production activities.	RPE 1.3 Policies 1. To protect the distinctive rural character and amenity of the RPE including but not limited to:

2. Enable a wide range of rural production activities and provide for commercial and industrial activities that support rural production activities and/or rural communities including recreation and tourist based activities to establish and operate in the RPE to contribute to the District's economy. 3. Recognise, maintain and where appropriate protect the rural character and amenity of the RPE. 4. Avoid adverse effects on productive land resources from residential, rural residential and rural living subdivision and development in the RPE.	a. A dominance of natural features including landforms, watercourses and vegetation. b. A predominately working rural production environment, including: i. The presence of large numbers of farmed animals and extensive areas of plant, vine or fruit crops and areas of forestry. ii. ancillary activities and structures (including crop support and crop protection structures) across the landscape. c. Seasonal activities. d. A low intensity of development, involving a combination of domestic and rural production buildings. e. Varying levels of noise associated with seasonal and intermittent rural production activities. f. Relatively open space and low density of development. g Odours, noise and dust typical of rural activities. h. Generally low levels of vehicle traffic with seasonal fluctuations.