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PROPOSED CHANGE TO THE MATAMATA PIAKO DISTRICT PLAN

OPEN COUNTRY DAIRY

ACOUSTIC DESIGN REPORT

Report No 16108v3

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1. INTRODUCTION

Open Country Dairy (OCD) currently operates a milk powder processing plant at its site at Factory Road, Waharoa. OCD is currently proposing a plan change to the Matamata Piako District Council District Plan (District Plan) to establish a Development Concept Plan (DCP) for the activities. Figure 1 shows the area to be included in the DCP. This report develops noise criteria for the proposed DCP and provides an assessment of the OCD activities on the site to demonstrate the industry will be able to operate within the suggested limits of the DCP.

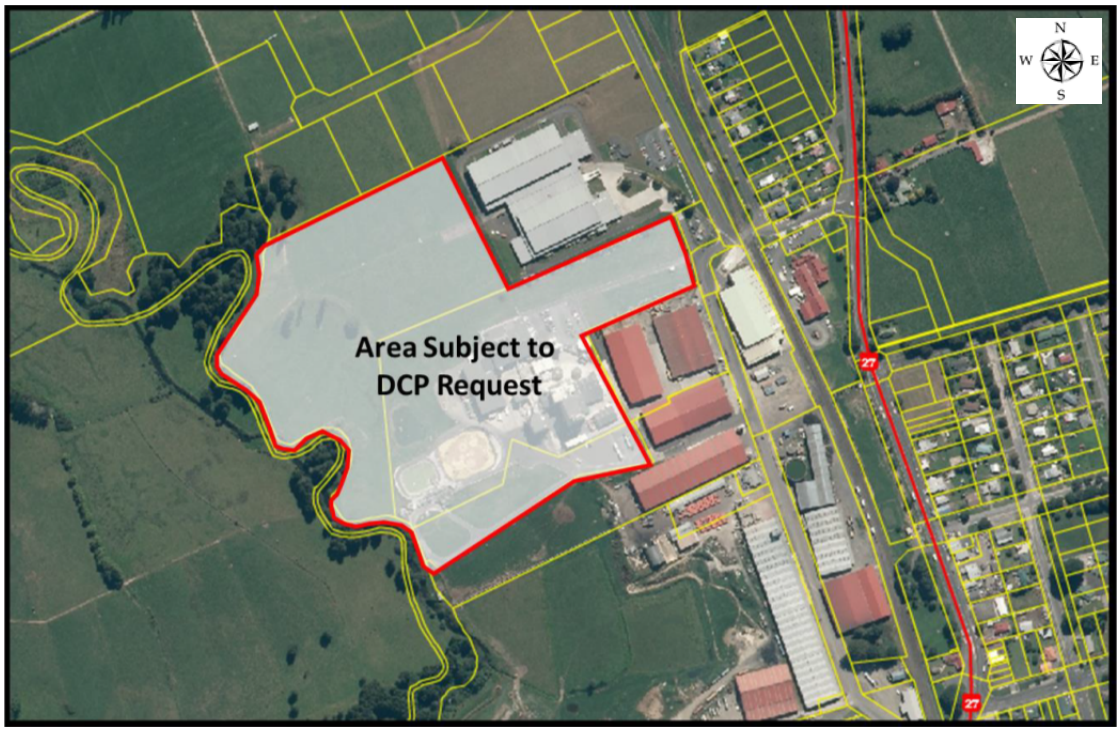


Figure 1. Area within the Proposed Development Concept Plan

2. NEIGHBOURS' EXPECTATIONS

This section of the report discusses the noise expectations of those within the neighbouring sites and what noise limits would be reasonable for the protection of their amenity. Section 3 then develops these expectations into noise rules for the DCP.

2.1. The District Plan

The District Plan provides an understanding of the expectations of those within the area and is therefore useful in setting noise limits for the DCP. The southern portion of the DCP is zoned Industrial in the District Plan with the remaining northern section zoned Rural, as shown on Figure 2 below. The immediate neighbours to the DCP are a mixture of industrial and rural. The closest residential zone is to the east, on the far side of State Highway 27. It is noted that while zoned rural, the sites immediately to the north are of industrial use.

The relevant District Plan noise rules are:

> *The noise level (L_{10}) as measured at the noise emission control boundary shall not exceed the following:*
>
> *Monday to Saturday 7.00am to 10.00pm 50dBA*
>
> *At all other times including Sundays and Public Holidays 40dBA*
>
> *10.00pm to 7.00am. The L_{max} shall not exceed 65dBA*
>
> *The noise level (L_{10}) as measured within the boundary of any adjacent industrial zone shall not exceed 65dBA.*
>
> *Or*
>
> *To be determined on the basis of the Noise Assessment*

The notional boundary is a line 20m from the façade of the dwelling or the site boundary when this is closer.

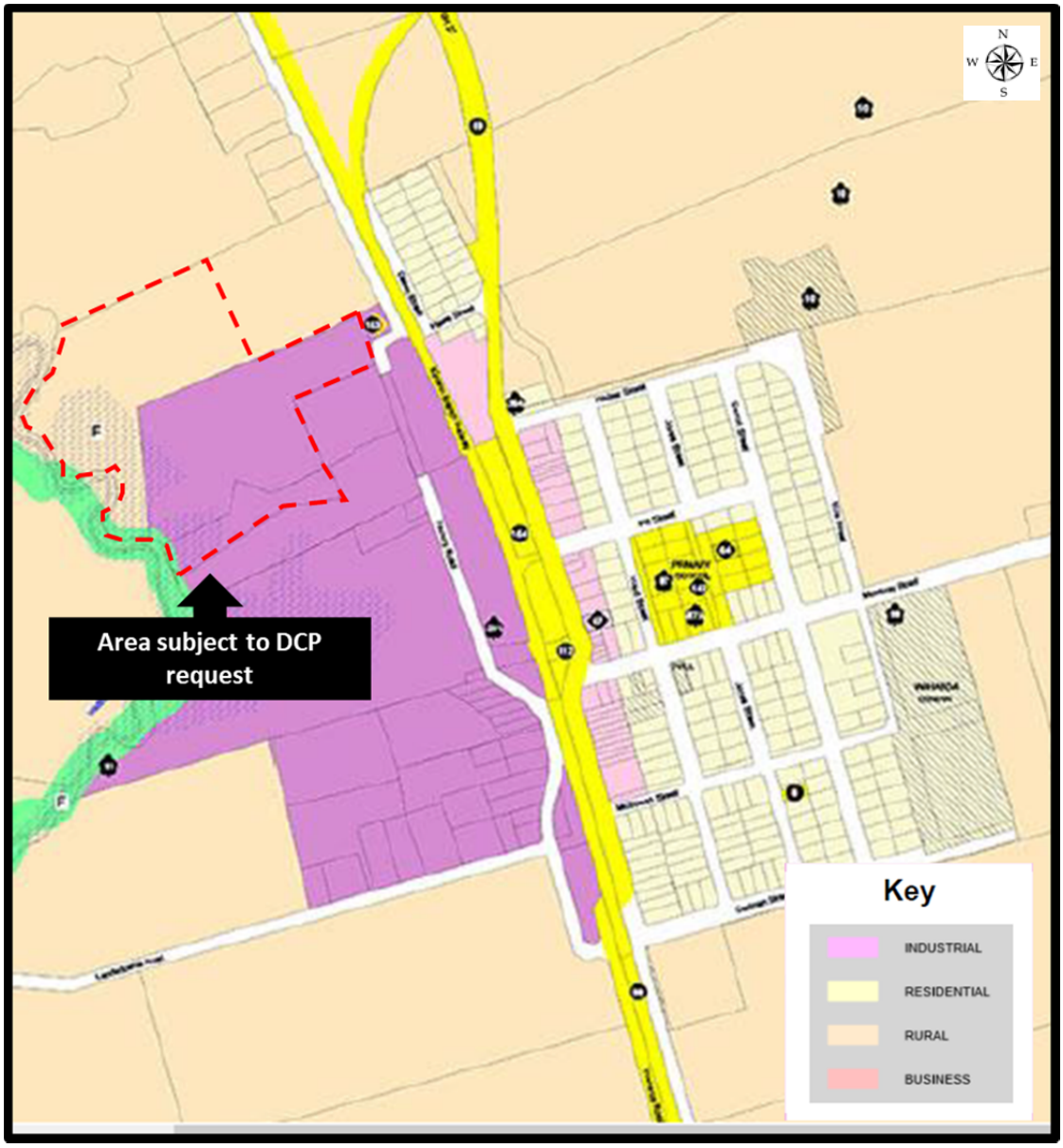


Figure 2. District Plan Zoning Map

2.2. Existing Consent Conditions

Existing consent conditions can also be useful for describing the expectations of those neighbouring OCD. However, in this case, the resource consent does not provide any noise criteria so is not considered further.

2.3. NZS 6802

NZS 6802: 2008 ‘Acoustics – Environmental Noise’ (NZS 6802) provides the following recommendations for the upper limit of residential amenity, which has relevance for dwellings in the rural zone:

8.6.2 As a guideline for the reasonable protection of health and amenity associated with use of land for residential purposes, the noise limits in table 3 should generally not be exceeded at any point within the boundary of a residential site, for example, at any point within the notional boundary of a rural dwelling.

Table 3 - Guideline residential upper noise limits

Daytime(1)	*55dB $L_{Aeq(15\ min)}$*
Evening(1,2)	*50dB $L_{Aeq(15\ min)}$*
Night-time(1)	*45 dB $L_{Aeq(15\ min)}$*
Night-time(1) L_{max}	*75 dB $L_{Aeq(15\ min)}$*

NOTE-

(1) The definition of times of day are a matter for the relevant local authority and should recognize that a period of not less than 8 hours needs to be provided for sleep to ensure at least the minimum acceptable degree of health protection.

(2) Inclusion of an evening period and its hours of application are a matter for the relevant local authority.

(3) This clause is not framed as a consent condition, rule or national environmental standard and should not be quoted for those purposes. See C8.1.3 for suggested format of consent conditions, rules or national environmental standards.

8.6.6 As a guideline for the protection of the amenity values within heavy industrial zones, that is, intra-zonal noise limits, limits of up to 75 dB $L_{Aeq\ (15min)}$ may be set within an area or zone to enable the area or zone objectives to be fulfilled. Within industrial areas or zones, no noise limits might be appropriate for similar types of activities, but

differing levels of activity may require different levels of protection. For example, administration activities associated with a light industrial activity might require protection from an adjoining heavy industrial site. In such areas, the basis for protection should be speech interference levels indoors. If residential accommodation (for example, a caretaker's flat) is permitted in industrial or commercial zones, separate rules should apply to the residential accommodation to achieve adequate isolation of habitable rooms within such buildings from external noise.

2.4. AS/ NZS 2107

AS/ NZS 2107: 2016 'Acoustics – Recommended Design Sound Levels and Reverberation Times for Building Interiors' has also been referred to. It should be noted that as the criteria of AS/ NZS 2107 are internal, they differ from the external criteria discussed in the remainder of section 2. It is generally accepted that the reduction through a window open for ventilation is 15dB and this has been added to the criteria of AS/ NZS 2107 so that the following Table reports externals levels and is therefore directly comparable with the other criteria of this section.

Table 1. Summary of AS/ NZS Recommendations (Externally)

Type of occupancy/ activity	Recommended external design sound level, L_{Aeq}, dB(A)[1]	
	Satisfactory	**Maximum**
RESIDENTIAL BUILDINGS		
Houses and apartments near minor roads –		
Living areas	45	55
Sleeping areas	45	50
INDUSTRIAL BUILDINGS		
Light machinery	70	85
Packaging and delivery	70	75
Foremen's offices	60	65
Lunch rooms	55	70

1. When measured externally, which differs to the internal measurement position adopted by AS/ NZS 2107.

3. DEVELOPMENT OF NOISE CRITERIA FOR THE DCP

This section describes the approach taken to develop suitable noise rules for the DCP. It addresses the Standards suitable for the measurement and assessment of noise, the way in which noise should be described (noise metric), the numerical limits that should be adopted and the times over which they should apply and where they should apply.

3.1. Noise Standards

It is considered that the New Zealand Standard for the measurement of noise (NZS 6801) and the Standard for the assessment of environmental sound (NZS 6802) as adopted by the District Plan remain appropriate for the DCP but that the District Plan rules be modified for the most recent editions of each Standard. These are summarised below in section 3.5.

3.2. Noise Metric

While the District Plan uses the L_{10} noise metric to describe operational noise, most modern approaches to noise control use the L_{Aeq} metric and it is recommended that the DCP adopt the most up to date approach. In reality, both metrics are similar meaning an assessment under each will likely produce the same conclusions. For sleep protection, the District Plan adopts the L_{max} criterion, which is a measure of the highest level of noise and is used to protect against the onset of, and awakenings from, sleep. The more recent documents discussed above retain the L_{max} although refer to it as the L_{AFMax}, which is preferred for consistency with the adopted Standards.

3.3. Time Periods

It is generally accepted that day and night noise limits are needed and most documentation, including the District Plan, use 7.00am and 10.00pm as the thresholds and it is recommended that these be retained for the DCP. The District Plan currently applies the night time criteria during the day time on Sundays and

Public Holidays. Given that the criteria suggested below are considered to offer suitable levels of amenity for day time and night time respectively, the limits proposed for the DCP do not repeat the District Plan's adoption of night time limits for Sundays and Public Holidays.

3.4. Numerical Limits

NZS 6802 and AS/ NZS 2107 identify that higher L_{eq} levels than contained within the District Plan could be proposed for residential amenity. However, these higher levels represent the upper level of residential amenity and, to maintain a high level of amenity, the numerical limits of the District Plan are favoured, that is 50dB during the day time and 40dB during the night time.

The exception is the L_{AFmax} criterion. The District Plan currently uses a level of 65dB for this limit which it is felt would place undue constraints on the noise maker while offering little more protection to the noise receiver. For this reason, it is recommended that this level be increased to 75dB in accordance with NZS 6802.

Reference to AS/NZS 2107 indicates that the District Plan requirement of 65dBA at the boundaries of the adjacent Industrial zoned properties is reasonable. While NZS 6802 could be used to promote an increase in this limit, the existing level has been conservatively maintained.

3.5. Assessment Location

The District Plan and NZS 6802 adopt measurement positions of the receiving boundary for the residential and industrial zones and the notional boundary for rural zones. The notional boundary concept is adopted so as to provide protection to the dwelling and a nominal outdoor living area without placing unnecessary restrictions on the noise maker by requiring protection to unoccupied rural land.

The DCP looks to replace the various measurement positions described by the District Plan with a Noise Emission Control Boundary (NECB). In fact, two such

boundaries are considered necessary, one for the more distant surrounding residential dwellings with relatively low limits and a second closer NECB for the industrial neighbours. The first approach considered for the preparation of the NECB was to simply join up the boundaries and notional boundaries of the sites surrounding OCD to form a continuous boundary, the NECB. The problem with this approach is that there are very few dwellings to the west of the site and as such, no clear indication as to the route that the NECB should follow between dwellings. Any attempt to develop the NECB in this manner would therefore be arbitrary. It was therefore considered that a better method of developing the NECB was to predict noise from the activities on site and produce noise contours equivalent to the adopted criteria of 65dB L_{Aeq} to the industrial sites and 50dB L_{Aeq} day time and 40dB L_{Aeq} night to the residential and rural dwellings.

Rather than simply use the noise levels currently produced by the OCD activities it is considered appropriate to future proof the DCP by predicting the potential future noise levels from the site. A common difficulty with this approach is the unknown nature of any future developments. However, in this case, OCD have a strong understanding of their future and have already developed a plan for possible extensions. The following discusses how these future noise levels have been modelled.

3.5.1. Calculation method

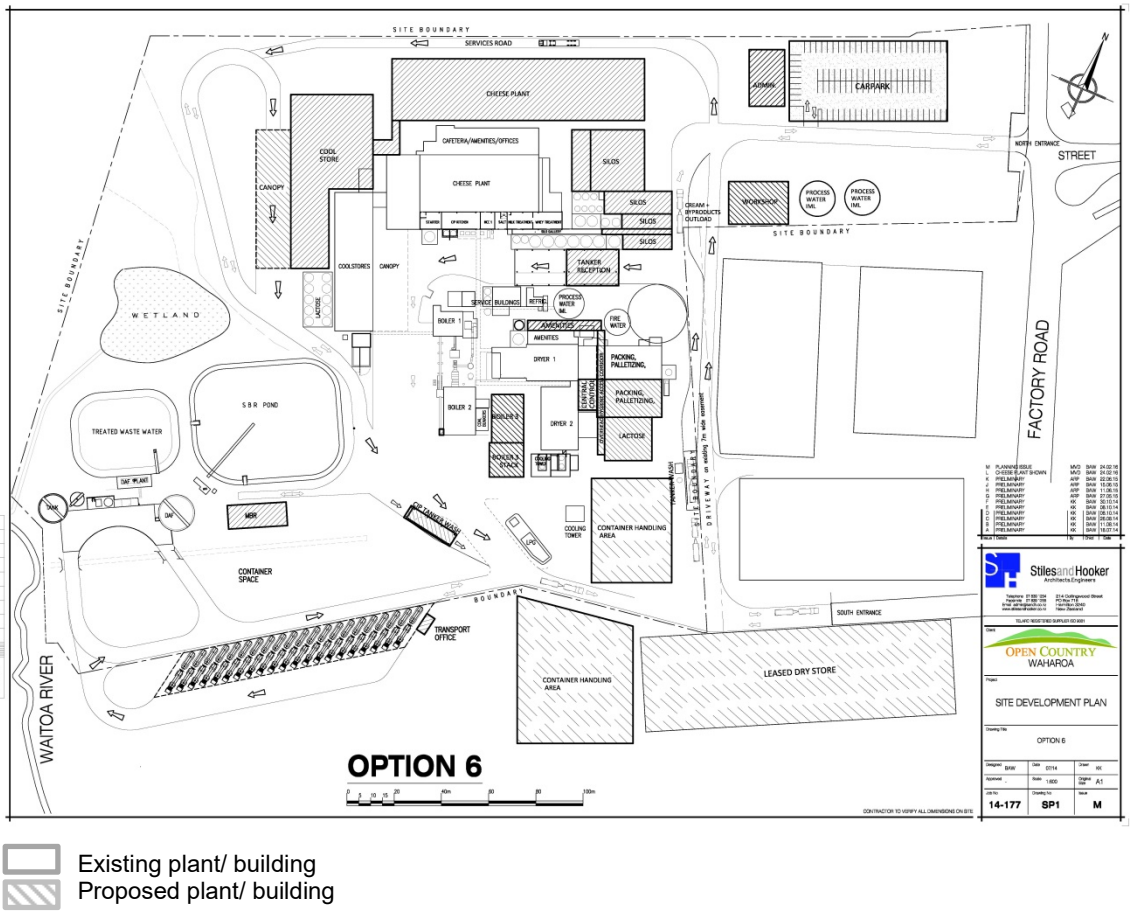
Noise from the various proposed activities has been predicted to the surrounding sites using the Predictor computer software. Predictor allows a full scale model of the site and the surrounding area to be created and takes into account all variables that affect noise propagation, such as distance, screening from topography and buildings and ground absorption. Predictor uses the algorithms of ISO 9613 parts 1 and 2.

The base data for Predictor was obtained from measurements of each individual item of existing plant on site. These measurements were undertaken over two days, 24 April and 17 June 2016, with the data being directly imported into Predictor. Two days were required to capture all of the onsite plant.

Measurements were also undertaken at selected points about the perimeter of the site. Calculating the noise level at each of these boundary locations with Predictor provided a calibration check of the noise model. For the sites that were not adversely affected by road traffic noise, predicted levels were within 2dB of the measured levels which it is considered, demonstrates good correlation and provides confirmation that modelling is an accurate assessment tool.

3.5.2. Modelled Scenarios

With a model of the existing situation in Predictor, the additional plant proposed by the three Stages of the development was then added to the model. Each Stage is described in more detail below and relates to Figure 3 below.



Existing plant/ building
Proposed plant/ building

Figure 3. Site Plan showing Proposed additional Plant and Buildings

STAGE 1 DEVELOPMENT

Stage 1 consists of new buildings for the proposed increase to the cheese lactose and AMF production and an increase to the existing storerooms. The proposed buildings will contain all of the new plant and, given that the buildings will be of concrete construction, it is reasonable to assume that the noise effects of these proposed activities will have a negligible effect on noise levels. For this reason, the noise from the additional Stage 1 plant is not specifically considered. A further feature of Stage 1 is the addition of another water treatment plant in the south western corner of the site. Noise from the associated plant has been taken from measurements of the existing water treatment plant nearby. Stage 1 also includes an increase in the current wetland area and the addition of ancillary buildings and tanks, none of which will result in any noise.

The existing traffic associated with the site varies in relation to season. Milk tankers with trailers enter the site through the southern site access way, the milk is unloaded and then the tankers continue around the site to leave again through the southern access way. Delivery trucks and those removing finished goods from site will follow a similar track around the site. In total, there are up to 246 truck movements per day associated with the current site. The proposed Stage 1 will add an additional 135 truck movements per day which comprises of 95 tanker movements, 20 delivery movements and 20 movements associated with outbound product. Both the existing and the proposed tanker deliveries will be spread evenly over the day time period, that is, from 7.00am to 10.00pm. Trucks carrying outbound product will access the new cool stores built to the west of the site via a new access way that will pass almost full length along the northern boundary.

Private staff vehicles currently enter and leave the site using the northern entrance with all parking in the car park adjacent to the existing office. 98 vehicles arrive at the start of the shift with the same number leaving again at the conclusion of a shift. Typically, there is only a day time shift meaning that the peak flow is 98 vehicles that the traffic engineer advises will enter, or leave, the site over approximately half an hour. During peak season when a night shift is added, the peak flow will consist of vehicles arriving for the start of a shift with the same number leaving again at the conclusion of the shift. The total flow of 196 vehicles will take place over one hour.

The peak night time flow will be 96 vehicles over half an hour. As a result of Stage 1, a further 51 vehicle movements are expected per shift.

The predicted levels reported in section 3.5.6 below represent peak tanker and staff vehicle movements.

STAGE 2 DEVELOPMENT

Stage 2 includes the addition of a third boiler and dryer. OCD report that these two items of plant will be similar to the existing boiler 2 and dryer 2 and the noise measurements of these two existing items of plant have been used to represent the proposed plant.

Further plant is proposed for the processing of cheese, lactose and AMF with all plant being contained within the buildings constructed as part of Stage 1. Again, the noise from the new plant will be contained within the buildings and as such, it is not specifically included in the analysis.

As part of Stage 2, the route that the milk tankers transit through the site will change. Tankers will now enter from the northern access way and almost immediately enter the Tanker Wash followed by the Tanker Reception, both of which are being relocated from near the centre of the site. Once the pumps are empty the truck and trailers will continue south across the site to exit through the southern access way. In total, Stage 2 will result in a further 124 truck movements per day over Stage 1, which includes milk tankers, delivery trucks and trucks carrying outbound product.

Included in Stage 2 is a truck park to be constructed in the south western corner of the site. It is understood that the milk tanker fleet is currently domiciled off site but, as a future proofing measure, Stage 2 includes the provision to accommodate these vehicles on site. The Stage 2 analysis includes the truck park filling and emptying at either end of the day.

STAGE 3 DEVELOPMENT

Stage 3 consists of efficiencies made to what will be the existing plant. Any changes to the operation of that plant will be managed so that plant noise levels do not alter.

Stage 3 will see a further 124 truck movements per day, which includes milk tankers, delivery trucks and trucks carrying outbound product.

3.5.3. Receivers

The closest residential dwellings about the site have been considered, as have the closest commercial buildings. Each is shown on Figure 4 below.

3.5.4. Averaging

It is generally accepted that a noise that occurs over part of a day has less effect than the same noise occurring all day. NZS6802 describes a process by which noise of limited duration can be averaged over the day time period as described by the District Plan. Given the plant's relatively continuous operation over a 24 hour period, the assessment does not include averaging.

3.5.5. Special Audible Characteristics

Noise that has a special audible characteristic, such as tonality or impulsiveness, is likely to arouse adverse community response at lower levels than a noise without such characteristics. During the field measurements of each item of plant, a spectral analysis was undertaken to determine if the noise included a tone. For those items of plant that contained a tone, the 5dB penalty was added to the measured noise level and this figure was then entered into Predictor. This approach differs slightly from the 1991 edition of NZS 6802 adopted by the District Plan which, rather an increasing the source level by 5dB, requires that the District Plan performance criterion is reduced by 5dB. The approach adopted by this assessment is consistent with later editions of NZS 6802 proposed for the DCP and is favoured, as it does not unnecessarily punish the plant on site that does not have a tonal component.

Figure 4. Surrounding Receivers

3.5.6. Noise Levels

The calculated noise levels resulting from the existing operation scenario and proposed Stages 1, 2 and 3 are shown below to each of the surrounding receivers. The noise levels have been predicted using the L_{10} noise metric and can therefore be compared directly to the District Plan criteria. However, to also allow comparison against the L_{Aeq} metric proposed for the DCP, it has been assumed that the two metrics are equivalent. This is a conservative assumption as it leads to the L_{Aeq} levels being over reported by 2-3dB.

Table 2. Summary of Predicted Noise Levels to Surrounding Sites

Site	Description	Predicted Noise Levels to Surrounding Receivers (dBA L_{Aeq})							
		Existing		Stage 1		Stage 2		Stage 3	
		Day	Night	Day	Night	Day	Night	Day	Night
1	SH1 North 1	21	20	21	21	21	21	21	21
2	Casey St	41	40	40	39	40	39	41	39
3	Hawes St	39	39	40	39	41	39	41	39
4	Ward Street	34	34	36	36	35	34	34	34
5	SH	35	35	38	38	35	35	35	35
6	Landsdowne 1	23	23	23	23	24	24	24	24
7	Landsdowne 2	22	22	22	22	23	23	23	23
8	Landsdowne 3	33	33	33	33	33	33	33	33
9	Commercial 1	48	48	52	47	53	47	54	47
10	Commercial 2	60	60	53	52	57	53	61	53
11	Commercial 3	60	56	66	65	63	55	59	55
12	Commercial 4	61	61	62	62	62	62	62	62
13	Commercial 5	42	42	42	42	45	43	47	43
14	Commercial 6	37	36	38	38	39	38	40	38

The District Plan and the proposed DCP also include an L_{max} criterion during the night time to the residential sites. Noise from the plant itself is steady meaning that the L_{AFmax} will be similar to the L_{Aeq} level at any of the surrounding residential sites. Vehicles leaving at night time after a change of shift will likely result in a higher L_{AFmax}, but given that the nearest residence is approximately 150m from the new car park, the resulting level will be well below the 65dB limit of the District Plan and the 75dB limit proposed for the DCP and it is therefore not specifically considered.

Table 2 indicates that noise from all Stages of the OCD site will comply with the noise rules of the District Plan and those adopted for the DCP. The exception is site 10, the industrial activity immediately to the north of the OCD site. As this activity is on a rural zoned site, the predicted levels exceed the District Plan limits by up to 21dBA. However, this site is a well-established industrial activity and is predicted to receive levels that are both within acceptable limits for an industrial activity (as described by the District Plan) and as proposed for the DCP.

3.5.7. Noise Contours

The following Figure 5 is the noise contours developed for the loudest Stage 3 expansion of the OCD site. It shows:

1. The 65dB L_{Aeq} contour, which it is proposed to use to develop the NECB for the industrial activities, including site 10;

2. The 50dB L_{Aeq} contour, which it is proposed to develop the NECB for the residential and rural zones, as it equates to the day time limit considered acceptable for residential amenity; and

3. The 40dB L_{Aeq} contour, which it is proposed to develop the NECB for the residential and rural zones, as it equates to the night time limit considered acceptable for residential amenity.

It should be noted that due to the interpolation method used to prepare the contours, there can be slight differences between the levels calculated for discrete locations (Table 2) and the noise contours of Figure 5. Table 2 should take precedence and serves to highlight the fact that the noise contours, and therefore the NECB, are a planning tool only.

While the three contours shown on Figure 5 could simply be equated to the various NECBs, they have been refined as follows:

1. Given the different noise limits of the residential/ rural dwellings and the industrial sites, two NECBs are proposed as follows:

- Inner NECB - developed from the 65dB contour for the Industrial zone; and

- Outer NECB – developed from the 50dB and 40dB contours for the residential/ rural dwellings.

2. Two contour lines (50dB day time and 40dB night time) have been produced for the residential/ rural situation. In reality, only the most distant is required meaning the 40dB night time contour has been used to develop the outer NECB. The 50dB contour can therefore be discarded.

3. Rather than arbitrary lines in space, the practical approach has been taken and, where possible and reasonable, the NECBs have been aligned with site boundaries.

The above approach leads to Figure 5.

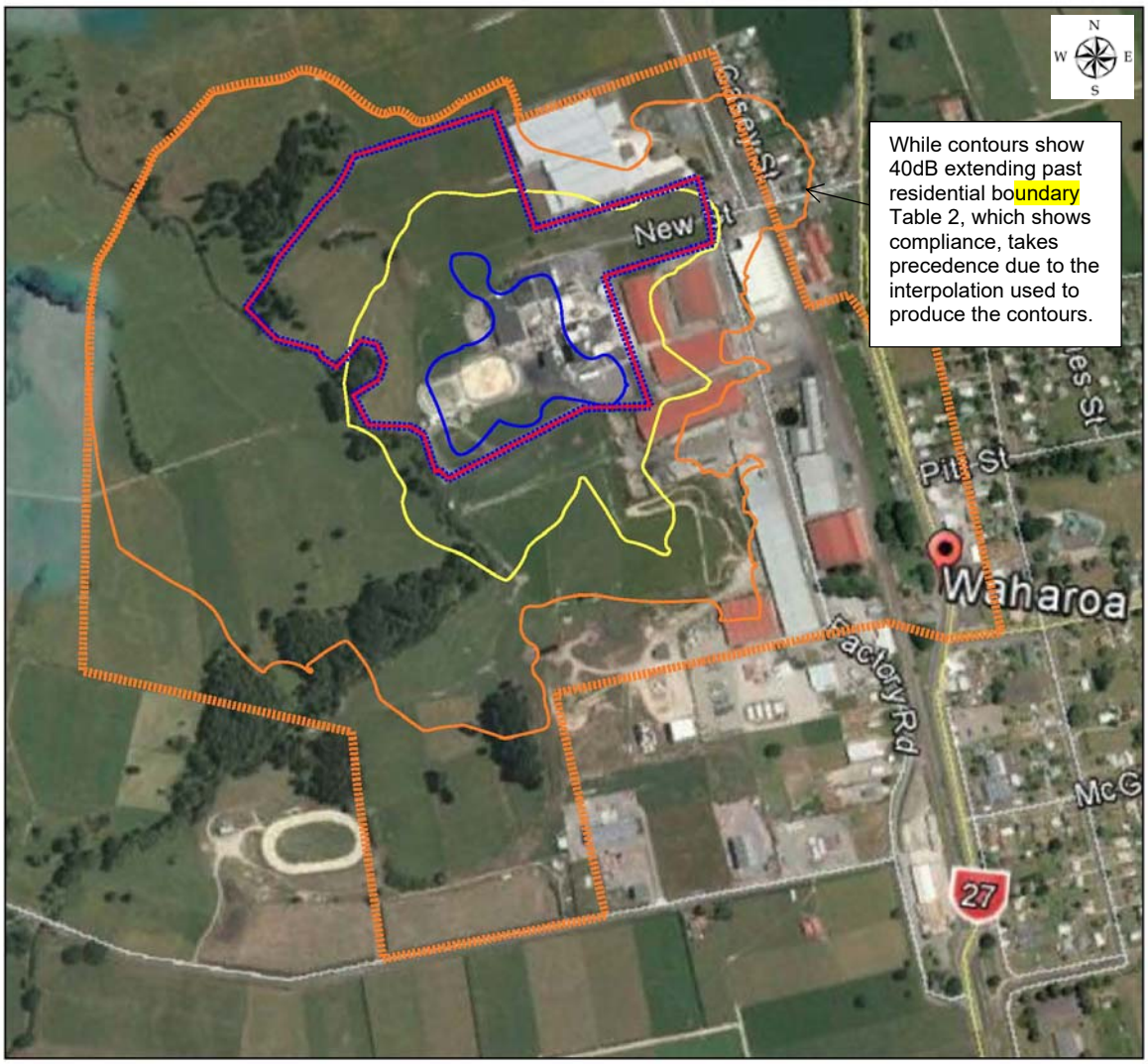


Figure 5. Noise Contours and Development of NECBs

Figure 5 shows:

1. The blue 65dB contour line is well within the boundary of the DCP meaning that the inner NECB has been located at the site boundary;

2. The yellow 50dB contour is well within the tan 40dB contour meaning that it is of no use and the 40dB contour can be used to set the outer NECB;

3. The outer NECB has generally been set to follow site boundaries. The exception is to the northwest where, in the absence of a close boundary, the outer NECB follows to the 40dB contour.

4. In the north east, the 40dB contour is shown as extending over the residences. Table 2 confirms this not to be the case meaning that the outer NECB can follow the residential boundary.

3.6. Suggested DCP Noise Conditions

Based on section 3, suitable noise rules for the DCP would be:

1. The inner and the outer Noise Emission Control Boundary are as defined on Figure 5;

2. Noise from operational activities on site shall not exceed:

   - When measured at the inner noise control boundary:

     At all times: 65dB L_{Aeq}

   - When measured at the outer noise control boundary:

     7.00am – 10.00pm: 50dB L_{Aeq}
     10.00pm – 7.00am: 40dB L_{Aeq} and 75dB L_{AFmax}.

3. Noise shall be measured in accordance with NZS 6801: 2008 ‘Acoustics - Measurement of Environmental Sound’ and assessed in accordance with NZS 6802: 2008 ‘Acoustics – Environmental Noise’.

4. FUTURE DEVELOPMENT

The work presented above is based on the existing residential dwellings. Should a new dwelling be constructed at some point in the future that is within the Outer NECB, it would in all likelihood receive higher levels than those developed in section 3.4. This does not necessarily mean that the new dwelling would be exposed to levels unsuitable for residential amenity as, as is discussed in section 3.4, the proposed criterion to the residences is below what is considered the upper level of acceptability.

For any such new dwellings, the Outer NECB would serve as notification to the future occupants that the activities of OCD do generate noise. While outside of the scope of this report, one approach that Council could take is to introduce building controls to any new residence within the outer NECB that would require the house facades to be designed and constructed to control internal levels of noise.

5. CONCLUSIONS

This report develops noise limits for incorporation into the Development Concept Plan that is currently been prepared of Open Country Dairy in Waharoa. The criteria are based on the relevant noise rules of the District Plan but modified to represent current practice. The proposed criteria introduce the Noise Effects Contour Boundary. With the suggested noise conditions in place, noise from the operation of the dairy factory will be within limits that are considered reasonable for the surrounding environment. Further analysis shows that it will be practicable for Open Country Dairy to manage the existing and proposed future activities within the parameters of the proposed conditions.