

Amendments to the Christchurch Central
Recovery Plan in respect of the Canterbury
Multi-Use Arena

Proposal for the exercise of Ministerial power
under section 38 of the Greater Christchurch
Regeneration Act 2016

June 2021

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1 Explanatory Overview

- 1.1 The purpose of the Amendments being proposed to the Christchurch Central Recovery Plan (CCRP) and by statutory direction in the CCRP, to the Christchurch District Plan, is to more effectively achieve the regeneration outcomes sought by the CCRP in respect of the Canterbury Multi-Use Arena (CMUA) and the Central City. At a high level these outcomes include a vibrant and prosperous City, with the anchor projects attracting people to the central city, replacing community facilities that have been destroyed, stimulating other development around them and contributing as much to economic and social recovery as possible e.g. encouraging further private investment, and celebrating Christchurch's identity and enhancing civic pride through culture, sport and recreation and the arts.
- 1.2 At a more specific level however, there is a need to reconcile two CCRP objectives, one being the successful operation of the CMUA and another being the creation of a high quality inner city living environment nearby. These Amendments are being proposed to address this difficulty and to provide clarity and certainty for all parties as to what reasonable noise outcomes might be for the design and management of the Arena and for the communities around it, in the context of regeneration and a central city location. The Amendments propose a package of noise management measures which will result in a modest level of control of noise, especially noise from concerts at the Arena, while still enabling the CMUA to operate in a viable manner.
- 1.3 Following the Canterbury Earthquakes, the Canterbury Earthquake Recovery Act 2011 was passed by government to provide a broad planning and decision-making framework for recovery of Christchurch City and its surrounds. This was superseded in 2016 by the Greater Christchurch Regeneration Act (GCRA). The Acts provided for the development of first Recovery and then Regeneration Plans. The effect of such Plans is that Councils exercising powers under the RMA are required not to act inconsistently with the Plans, and they bind District Plans. The Plans are higher order documents implementing a different purpose to that of the RMA, which is sustainable management of resources. The purpose of the Greater Christchurch Regeneration Act is to support the regeneration of greater Christchurch, including through enabling a focused and expedited regeneration process. Regeneration has a wide definition as set out in section 3 of the GCRA, and includes urban renewal and development which improves the wellbeing of communities.
- 1.4 The Christchurch Central Recovery Plan was developed under the CER Act and continues to have statutory weight and bind the District Plan until the end of June 2021. One of the key anchor projects in the Christchurch Central Recovery Plan (CCRP) is the Stadium, now known as the Canterbury Multi Use Arena (CMUA). The CCRP states in its "Vibrant City" section that the CMUA is intended to be "a world class option for attracting and

hosting events”. The CMUA project will revitalise and improve the area around it. It will be a catalyst for regeneration, including further development and redevelopment both in the immediate and wider areas, and will promote the sporting and cultural identity of Christchurch while providing a significant public and community facility.

- 1.5 The CMUA is expected to attract people, business, investment and visitors to the city, and will promote urban renewal and development in a way which improves environmental, economic, social and community wellbeing. It can be noted that in both the initial and second rounds of public consultation on noise effects of the CMUA, a large majority of respondents were supportive of the CMUA in general terms, and stated that it would have economic and social benefits for the City and encourage vibrancy.
- 1.6 The Christchurch City Council (the Council) needs the CMUA to be able to operate in a successful manner, to ensure that the benefits of the CMUA for the Central City can be maximised to the extent possible and the CMUA can be a driver for regeneration. However, indications from noise modelling are that the “proof of concept” design of the CMUA would offer limited sound insulation, because it incorporates a partly solid and partly Ethylene Tetra fluoro ethylene (ETFE) roof and an ETFE northern façade in order to enable sufficient natural sunlight for turf growth. This design will result in noise spill to the surrounding area during concerts.
- 1.7 In May 2021 further noise modelling by Kōtui, the Consortium appointed by Council to design and build the CMUA, indicated that varying the Proof of Concept scenario by replacing the ETFE on the northern facade with a lightweight solid wall, has the potential to decrease noise emissions to the north of the CMUA by 2-3 decibels compared to the earlier noise modelling. However noise levels outside the CMUA would still be relatively high.
- 1.8 A vibrant city centre requires a resident population to sustain a diverse range of activity. An increase in the residential population of the Central City has been an aim of the Council for some years, and this is reflected in both CCRP and District Plan policies seeking to establish a high quality inner city living environment to support the restoration and enhancement of the Central City. Significant noise leakage from the CMUA during major events, even if infrequently, could be considered by some potential residents as reducing residential amenity in the area, and could discourage them from wanting to live there.
- 1.9 The CCRP placed a designation for the CMUA in the City Plan which has been carried through into the District Plan. A “designation” under the RMA enables public works and utilities to be built as a permitted activity rather than needing resource consent. The designation for the CMUA that was introduced by the CCRP, in the name of the Minister

for Greater Christchurch Regeneration, had no conditions on design of the stadium, number of concerts or noise levels produced. The CCRP did introduce a noise insulation rule for “sensitive activities” (primarily residential development) within 75m of the CMUA, but indications from noise modelling are that this is inadequate to mitigate noise effects on the wider neighbourhood.

1.10 The CCRP and therefore the District Plan also provides limited direction or guidance on how the two objectives of the successful operation of the CMUA and the establishment of a high quality inner city living environment nearby, can be managed or resolved. This creates a risk of ad hoc or piecemeal decisions on any future plan changes, resource consents, other approvals or enforcement in the area.

1.11 The Council considers that this risk for future decision-making, combined with the need for residents, businesses and the CMUA operator to have certainty about what Council considers to be reasonable noise expectations in the circumstances of the Central City, means there is a need to take a proactive approach now and make amendments to the CCRP and thereby to the District Plan. The amendments will articulate the twin objectives and identify how they can best be reconciled through setting out a package of noise management measures.

1.12 This package includes the following key elements:

- A. An amendment to the CCRP Vibrant City section which notes the need to manage noise from the stadium.
- B. A new policy in the District Plan which sets out the specific outcomes sought for the CMUA itself and for mitigation of adverse effects of noise from the CMUA on neighbouring inner city residential areas.
- C. A number of noise related conditions to be added to the designation for the CMUA, as follows.
 - i. A noise limit for up to 6 concerts per calendar year of 80 dB $L_{Aeq(15 mins)}$ outside the CMUA; and for up to a further 9 concerts per calendar year of 75 dB $L_{Aeq(15 mins)}$. It is not considered necessary to have a noise limit on sporting or other motorised events because these activities are less noisy overall, including producing little or no bass noise and generally finishing earlier than concerts.
 - ii. A noise limit on public address (PA) systems for non-concert events, because a PA system for a sporting event is much more likely to produce sudden sharp noise than a PA system for a concert.
 - iii. Noise loggers for real time noise monitoring at several compliance points around the CMUA.
 - iv. A standard finishing time of 11p.m., other than on New Year’s Eve when concerts could continue to 12.30 a.m.
 - v. A requirement for a noise management plan, which will set out how the noise limits will be achieved, and how a range of other noise related

activities will be addressed. It will also include a complaints procedure and a process to enable the establishment of a Noise Liaison Committee or similar mechanism.

- D. An amended noise insulation rule, which significantly extends the area of application of insulation requirements for new noise sensitive activities and strengthens them, in respect of noise from the CMUA.

- 1.13 Together, the proposed measures represent a point on the spectrum between maximum enabling of the stadium and maximum mitigation of noise for nearby residents, that appropriately balances all of Council's objectives for the Central City and the CMUA in the context of regeneration. Council considers that the economic and social benefits of a financially viable Arena for regeneration in the Central City and beyond, and for the cultural and sporting identity of the City, must be given considerable weight in this decision-making process.
- 1.14 The reality is that noise limits at the CMUA which are practical and achievable and which are not likely to discourage acts from coming to Christchurch, cannot on their own result in as much noise reduction in indoor noise levels as might be desirable during loud concerts. This is why changes to the noise insulation requirements for new development in the wider neighbourhood are also proposed as part of the package of measures. Some newer buildings in the area e.g. post- earthquake constructions with some mass in building materials used, may already mitigate noise to desirable levels. However when loud concerts are taking place, indoor noise levels in some other existing dwellings, especially those of lightweight construction may be undesirably high.
- 1.15 It must be recognised that Council cannot legally require existing buildings to be retrospectively noise insulated. However, the duration and frequency as well as the character of that noise, may be of just as much significance to residents as the amount of loud noise experienced over a time period. The proposed Amendments include some measures (such as the standard finishing time for concerts, and the upper limit on numbers of loud concerts per year) which will benefit all residents, including those who will not benefit from acoustic insulation, and also more distant residents beyond the proposed additional insulation areas.
- 1.16 The package of measures can be reviewed as required in the future, for example by an alteration to the designation to amend the conditions, or by a resource consent application e.g. to depart from the standard Central City noise rules on a one-off basis.

2 The Proposal

- 2.1 The Proposal has three parts. It is proposed that the Christchurch Central Recovery Plan (CCRP) be amended by the Minister with delegated responsibility for residual Greater Christchurch Regeneration portfolio matters, to better achieve the intended regeneration outcomes of the CCRP, by:
- Strengthening policy direction in respect of noise effects from the Stadium (now known as the Canterbury Multi-Use Arena or CMUA).
 - Amending the name of the designation from Stadium (incorporating Spectator Events Facility) to Canterbury Multi-Use Arena, and adding conditions to the designation for the CMUA relating to the management and mitigation of noise from the CMUA, and in particular concert noise.
 - Extending the current rule for acoustic insulation of new buildings for “sensitive activities” to additional areas of the Central City, and increasing the standard of insulation that applies, to improve the amenity of Central City residents living near the CMUA.¹
- 2.2 The text of the proposed changes can be found at **Appendix 1** to this report. If the proposed Amendments to the CCRP are approved by the Minister with delegated responsibility for residual Greater Christchurch Regeneration portfolio matters, the Amendments specified for the Christchurch District Plan will be incorporated into it in accordance with section 61 of the Greater Christchurch Regeneration Act 2016 (GCR Act).
- 2.3 In this report, the Canterbury Multi-Use Arena may be referred as the CMUA and occasionally “the Arena”. The word Stadium may still be used where there is a historical context. There is no proposal to change, add or delete any of the purposes listed for the designation (activities and facilities provided for under the designation).

3 Background to the Proposal

- 3.1 In response to the devastating effects of the Canterbury earthquakes of 2010 and 2011 on the Central City, the CCRP defined the future form of the Central City, and identified the locations of key anchor projects needed to optimise recovery. One of the key anchor projects is the Stadium (now called the Canterbury Multi-Use Arena or CMUA), a large

¹ This rule applies to “habitable spaces” within residential units and guest accommodation units e.g. bedrooms, living rooms, lounges and kitchens, both in residential and commercial zones.

multi-purpose covered sports and entertainment venue to be located in the Central City between Hereford, Madras, Tuam and Barbadoes Streets.

- 3.2 The purpose of the Anchor projects collectively was to “reflect community aspirations, replace community facilities that have been destroyed, stimulate other development around them, contribute as much as possible to the recovery as a whole, and attract people to the Central City”². The location of the stadium was chosen for reasons including proximity to public transport routes, and the new Bus Interchange, and that it would be at a walkable distance from the city and so had the ability to stimulate support facilities such as retail food and beverage in the surrounding area.³
- 3.3 The CCRP inserted the Stadium designation into the City Plan in 2012, and that designation was carried over into the Christchurch Replacement District Plan in 2016. The designation includes a “purpose” section listing the types of activities and facilities which are anticipated, however there are no conditions attached to the designation which would limit how the CMUA can operate, including no conditions on noise. A designation means that the CMUA is permitted by the District Plan.
- 3.4 The residential provisions of the City Plan were amended in January 2015, through the “A Liveable City” Addendum to the CCRP. The objective for the Central City Residential zone (now called the Residential Central City zone in the District Plan) to the north and northeast of the Stadium site was to provide “A predominantly residential environment offering a range of residential opportunities, including medium to high density living, within the Central City, to support the restoration and enhancement of a vibrant City Centre.” Policies included “providing for a progressive increase in the residential population of the Central City” (refer also to section 5.9). These objectives and policies are now incorporated in the District Plan and with other objectives and policies, guide the District Plan Residential Central City zoning.
- 3.5 Developed concurrently, the Noise and Entertainment provisions of the CCRP were amended through an Addendum to the CCRP, published in December 2014. These changes included adding to an existing rule, so as to require acoustic insulation for residential units and guest accommodation units within 75m of the Stadium designation. This was in response to a recognition that the successful operation of the Stadium and the establishment of a high quality inner city living environment might need to be reconciled, since noise from the Stadium during major events could have adverse effects on the neighbouring inner city living environment.

² Central City Recovery Plan, page 45.

³ Statement of evidence of Marc Baily for Canterbury Earthquake Recovery Authority, to Christchurch Replacement District Plan Independent Hearings Panel, January 2015.

- 3.6 Plans for the CMUA, including its layout and design have advanced since then. The Investment Case put by the Christchurch City Council to central government in late 2019 proposed a partly solid and partly Ethylene Tetra fluoro ethylene (ETFE) roof along with an ETFE northern façade. ETFE is a strong, lightweight and very durable form of fluorine based plastic which transmits light well but has very little sound insulation benefit. This design for the CMUA was proposed in order to enable sufficient natural sunlight for turf growth, as natural turf is required by the relevant sporting codes. A totally solid roof and retractable turf has been found to be prohibitively expensive.
- 3.7 Further analysis was undertaken to determine whether the CCRP provisions as a whole would appropriately manage the potential adverse effects of noise beyond the CMUA site, given the proximity of residential areas to the north and northeast of the site.⁴ It became clear that during concerts there is likely to be significant noise leakage from the CMUA. This poses a risk that noise spill issues could lead to a demand for significant restrictions on the ability of the Arena to host concerts, reducing revenue generation from the facility, and endangering its viability and contribution to regeneration. Regeneration also requires an increase in the residential population of the Central City to support businesses, and this means the Central City needs to be a desirable place to live.
- 3.8 The choice of location and the possible design of the CMUA has set up a need to reconcile two sets of objectives (these objectives and policies are discussed further in section 4). Achieving both objectives requires examination of the scale and significance of those competing considerations. Design of the building so that it performs as well as possible from an acoustic perspective is the first step towards ensuring that noise emitted from the building is kept to a level that is consistent with all of Council's objectives for the Central City and with the obligation of all land occupiers under section 16 of the RMA to ensure that noise does not exceed a reasonable level.
- 3.9 In May 2021 further noise modelling by Kōtui, the Consortium appointed by Council to design and build the CMUA, indicated that varying the Proof of Concept scenario by replacing the ETFE on the northern facade with a lightweight solid wall to around 28m in height (the "Solid Bowl" concept), has the potential to decrease noise emissions to the north of the CMUA by two to three decibels compared to the earlier noise modelling, depending on location. The solid bowl concept has now been adopted by the design team going forward. However noise levels outside the CMUA would still be relatively high.
- 3.10 The new modelling by the Kotui design team also indicates that noise being emitted to the south could increase over that previously considered. This is primarily related to the

⁴ Canterbury Multi-Use Arena – Business Case: Acoustics, Marshall Day Acoustics, 2019.

extent of ETFE in the roof and to the revised assumption that the roof will essentially be flat rather than slightly tilted to the north, with more of the noise escaping through the roof thereby being directed to the south. A revised proposed Outer Insulation Area was publicly notified by Council as a variation to the previous CMUA noise management proposals in late May 2021. While there is a net increase in properties affected by these two design changes, fewer properties used for residential purposes will be affected overall.

- 3.11 In the context of optimising regeneration benefits, and with the budget available, it is not possible to completely mitigate noise from the CMUA within its own boundary. Noise management measures however, can better manage and mitigate off-site noise effects, so that there are low overall noise annoyance levels for residents and noise complaints are kept to a low level.
- 3.12 Management of noise is likely to be most effective if noise is managed or mitigated with a combination of measures, including both mitigation at source and mitigation where noise is received at dwellings. These measures need to be reasonable and practical. The Amendments now proposed aim to manage noise, and still enable the CMUA to operate viably to provide regeneration benefits to the Central City and to the City and wider region.
- 3.13 The decision being sought is that the Minister with delegated responsibility for residual Greater Christchurch Regeneration portfolio matters approves the proposed Amendments to the CCRP, including approving a statutory direction that the proposed provisions be inserted in the District Plan and in the designation, under section 38 of the GCR Act.

4 CCRP objective and policy context

- 4.1 The objective of these Amendments is to more effectively achieve the intended regeneration outcomes of the CCRP and the Canterbury Multi- Use Arena (CMUA) for the Central City and to improve certainty for residents, investors and the CMUA operators, by setting reasonable noise expectations for design and management of the facility and noise insulation requirements for new noise sensitive development in the area. The designation for the CMUA was inserted in the District Plan through the CCRP as part of achieving recovery/regeneration objectives. Enhancing the provisions of the designation and the District Plan through introducing conditions on noise, and adding noise insulation rules so as to improve the delivery of those outcomes would be an appropriate use of those GCR Act powers. The outcomes being sought are the regeneration ones that produced the designation for the CMUA in the first place.

- 4.2 Relevant objectives and policies in the Christchurch Central Recovery Plan and in the District Plan are set out in **Appendix 2**.
- 4.3 The Amendments now proposed to the CCRP, directing amendments to the District Plan, are a strengthening of the intention in the CCRP objectives and policies and those now in the District Plan to balance a diversity of activities with co-existence/compatibility of the resulting mix of land uses. The District Plan needs to aim for both regeneration of Central City business, community and cultural activities and opportunities for high quality inner city living, and should provide policy context for Council decisions in respect of the CMUA and its neighbourhood in situations of competing aspirations.
- 4.4 Council needs to identify a point somewhere on the spectrum between maximum enabling of the CMUA and maximum mitigation of noise for nearby residents, which gives guidance as to how this will occur. Council considers that the economic and social benefits of a financially viable Arena for regeneration in the Central City and beyond, and for the cultural and sporting identity of the City, must be given considerable weight in its decision making processes.
- 4.5 Section 5 below provides information on the regeneration context and on the residents and dwellings in the area.
- 4.6 Section 6 summarises the need and sets out the rationale for the specific amendments being proposed. Within this section, paragraphs 6.9 to 6.12 discuss the new policy proposed for the District Plan, and the rationale for the wording proposed.

5 Regeneration Context

- 5.1 At a regional level, the Canterbury Multi-Use Arena Investment Case⁵ notes that the current gap in Canterbury's event facilities hierarchy for large scale events is hindering tourism and economic activity in the region, and that Christchurch's long held identity as a sporting and cultural capital is currently diminished by its inability to host major events. Key benefits of the CMUA at the regional level are therefore the additional investment and economic growth that it would create in the region by attracting people, business, and visitors from outside the region to the city for major sporting and entertainment events, and promoting Christchurch as an attractive place to live, work and visit, with a strong identity as a sporting and cultural centre.

⁵ Prepared by Ernst Young, 2019

- 5.2 This is in line with ChristchurchNZ's Major Events Strategy 2018, which states that "Major events attract large numbers of spectators/participants from outside the host location, which drives economic activity such as visitor spend and employment. This generates social and cultural benefits by providing opportunities for the community to connect, learn and celebrate their culture and identity and create legacy infrastructure e.g. additional hospitality or leisure facilities".
- 5.3 At the level of Christchurch's CBD, the Investment Case for the CMUA states that "Lack of frequent, larger events in the CBD adversely affects the vibrancy and vitality of the CBD"; and "There is evidence that planned investment in CBD is being deferred due to uncertainty over the delivery of regeneration projects". A key benefit of the development of the CMUA will be that it will provide certainty to private investors and accelerate levels of investment and relocation of businesses into the CBD, including complementary businesses in the area to the west of the CMUA.
- 5.4 The CMUA will provide a significant public and community facility, and will have the ability to host a range of smaller as well as larger entertainment, sporting and community events, making a strong contribution to the vibrancy and viability of the CBD.
- 5.5 At the local level the CMUA has the potential to be a major stimulus to development and redevelopment in the eastern part of the Central City and to encourage revitalisation and improvement of the area around it by urban renewal and development. This is likely to be both for businesses and residential intensification in accordance with CCRP and District Plan policies.
- 5.6 Significant noise leakage from the CMUA during major events, even if infrequently, is however likely to be considered by some as reducing residential amenity in the area. This additional issue could add to other factors such as the price of Central City property, lack of land/garden space, distance from schools etc which already make it make it difficult to attract people to live in the Central City⁶. Indications from Council research are that positive attractants would include the increased vibrancy and amenity intended by the CCRP, the provision of community facilities and well-designed public spaces, and strong inclusive communities.
- 5.7 The aim of these Amendments to the Christchurch Central Recovery Plan is to ensure that the noise effects of the CMUA are appropriately managed and mitigated, so that the CMUA can fit comfortably within its neighbourhood, and so that the regeneration and recovery outcomes envisaged for the CMUA in the CCRP can be realised to the greatest extent possible. Additional and separate work is being undertaken by Council

⁶ CCC (Feb 2020): Central City Residential Programme (Project 8011) Subproject C1: Support alternative housing approaches and projects.

on how other non-noise effects e.g. traffic and parking, can be managed or mitigated as required.

Area around the CMUA

- 5.8 The following sections provide some context on the area around the CMUA in terms of regeneration and also provide context for the acoustic insulation measures proposed in the Amendments.
- 5.9 Pre-earthquakes, the Central City as a whole had a residential population of approximately 8,000. Immediately post-earthquakes, this fell below 5,000. The residential population of the Central City as a whole was estimated by Statistics NZ to be around 7,170 in September 2020, a growth of 8.3% from previous year. This number still falls short of the population necessary to support a “prosperous commercial and entertainment hub.” This is suggested in the CCRP’s “A Liveable City” residential chapter as being between 12,000 and 24,000.⁷ The Council’s Central City Action Plan (2018) includes an aim of 20,000. This is considered to be the minimum critical residential mass necessary to achieve the self-sustaining regeneration of the Central City.
- 5.10 Post- earthquakes, redevelopment of the eastern part of the Central City has generally been slower than redevelopment of the Central City west of the river. Considerable demolition and redevelopment has occurred in the east, resulting in a mix in ages of buildings, but still including many vacant sites.
- 5.11 The vast majority of residential units near the CMUA are within the Residential Central City zone to the north and northeast of the CMUA, which extends eastwards to Fitzgerald Avenue (**Appendix 3** - Central City Planning Map). There are only a very few dwellings in the Central City Mixed Use zone to the east and south. The area to the west of the CMUA location is zoned Central City Business zone and Central City (South Frame) Mixed Use zone. The East Frame of the Central City is also zoned Central City Business and it includes an increasing number of post earthquake residential units, mostly near the southwest corner of Latimer Square. It is anticipated that the whole East Frame area will eventually be residential and public open space.

⁷ This is on the basis of international research suggesting that cities the size of Christchurch require three to six percent of their population living in the central city.

Residents of the Area

- 5.12 To establish a picture of residents living near the CMUA, Census data has been examined for the 10 SA1 areas defined by Statistics NZ (SA1s were previously called meshblocks), which make up nearly all the area bounded by Chester Street East, Oxford Terrace, Manchester Street, St Asaph Street and Fitzgerald Avenue. This area is larger than but encompasses nearly all of the Outer Noise Insulation Area where these Amendments propose additional acoustic insulation in respect of CMUA noise, except for a small area west of Manchester Street, and a small area south of St Asaph Street. The area was chosen to approximate the extent of the modelled 70 dB Ldn noise contour (see paragraph 6.54 and following for further explanation).
- 5.13 The 2018 Census recorded 1584 people usually resident in these 10 SA1 areas. 56.7% of these were male, which is a greater proportion than for Christchurch City generally (49.9%) or for New Zealand (49.4%). About half of the usually resident population were NZ born and half overseas born. There were significantly fewer children (only 14.6% aged 0-19 years) than in Christchurch generally (23.6%) or in New Zealand (26.1%), and significantly more people in the 20-34 years age group (51.7%) than in Christchurch (23.6%) or New Zealand (20.8%). The proportion of people in each age group of 35 or over in the 10 SA1 areas was similar to the Christchurch or national averages.
- 5.14 Income levels were generally relatively low, with 61% of the population aged 15 years and over having a personal income of \$50,000 or less (New Zealand's median income in June 2018 was around \$52,000⁸. 9 of the 10 SA1s had scores of 6 - 9 on the 2018 NZ Deprivation Index⁹ (with 10 being the most deprived score). The outlier is the SA1 containing the East Frame housing which had a score of 3 on the Deprivation Index.
- 5.15 The vast majority of households in this area (82.4%) are renting rather than either owning or partly owning their own home or the dwelling being held in a family trust. This proportion of renting is much higher than the figure for Christchurch of 36.5% and for New Zealand of 35.5%. 91% of those renting in the area around the CMUA are renting from private landlords.

Dwellings and Guest Accommodation in the Area

- 5.16 The following information has been obtained from the Central City Housing Stocktake conducted by Council in February 2020. Information has been extracted for the same

⁸ Statistics NZ: Labour Market Statistics June 2018 quarter

⁹ The Deprivation Index combines data on access to the internet, income, employment, qualifications, home ownership, living space and living condition (dampness of dwellings etc).

area as described in paragraph 5.12. Information from visual surveying has been aligned by property with age of housing unit information extracted from building consent data.

- 5.17 The housing stock in this area of the Central City is now very mixed in terms of age, and the nature of the accommodation. There are indications that over time and especially post-earthquakes, intensification has been occurring with older standalone houses being replaced by multi-unit developments.
- 5.18 There is now a significant amount of guest accommodation in the area, with 175 “units” of guest accommodation, most of which has been built since the earthquakes. The majority of units are at the Rydges Latimer hotel which has 139 rooms/suites (this property is zoned Residential Guest Accommodation).
- 5.19 Apart from guest accommodation, there are 169 residential units in 3-6 storey apartments, all built since the earthquakes, and 186 units in a number of blocks of units/terraced houses of various configurations of up to 3 storeys, mostly with shared walls. These 186 units are of mixed ages, with 125 of these built since the earthquakes, and 61 dating from before this time. There are only 28 single storey and 19 two-storey standalone houses, with most of these recorded as built in the decade 1910-1919. These are probably the remnants of the original houses in this area. There are a few dwelling units under construction.

6 Need for Amendments to CCRP and reasons for the specific amendments proposed

Need

- 6.1 Two sets of acoustic advice from Marshall Day and one from Kotui Consortium have informed these Amendments. The Marshall Day advice is the 2019 acoustics report referenced in section 2 and appended to this report as **Appendix 4A**, which contains indicative noise modelling for the CMUA, and considerable acoustics advice in 2020, and 2021 during the development of these Amendments, which is summarised in **Appendix 4B**. **Appendix 5** is the 2021 noise advice from Kotui titled “Summary of Acoustic Modelling Assumptions and Results for Proof of Concept Scenario”. It compares the Proof of Concept scenario with a “solid bowl” variation of the Proof of Concept scenario which removes the ETFE on the northern face of the building, and provides further noise modelling. The inputs and assumptions to the two sets of noise modelling were standardised to the degree possible (given minor recent design changes) to allow comparison.

- 6.2 The 2019 report concludes that based on indicative noise modelling, i.e. with the design of the building as at “proof of concept” stage rather than final design, during large concert events noise levels beyond the CMUA at 11m above the ground (i.e. above the localised blocking effect of buildings of less than this height), would be greater than 75 dB L_{Aeq}^{10} within most of the area approximately bounded by Tuam, Manchester, and Gloucester Streets and Fitzgerald Avenue. This is based on a reverberant noise level inside the Arena of 105 dB L_{Aeq} , a level typically generated by concerts, and a noise level immediately outside of around 85 dB L_{Aeq} , and mapping of noise levels is on a heat map basis. I.e. gradations of colour. It is also based on an assumption of no mitigation of noise at source, since the designation for the CMUA has no conditions limiting noise emitted.
- 6.3 The 2019 report noted that there is no NZ Standard for concert noise. NZ stadia operate under a wide range of noise mitigation rules in the relevant District Plans, as shown in **Appendix 6** to this report. Large stadia generally have specific noise rules applying to them as part of the noise sections of District Plans, and sometimes as part of their own stadium - specific zone.
- 6.4 The Marshall Day 2019 report quoted a widely used UK national Code of Practice on Environmental Noise Control at Concerts¹¹ which uses a guidance level of a maximum of 75 dB L_{Aeq} (outside the stadia) for concerts. Marshall Day indicated that at 75 dB L_{Aeq} or above, limits on duration, timing and number of concerts would be necessary and “it may also be necessary to change sound insulation requirements across a swathe of the Central City”.
- 6.5 Revised modelled noise levels in 5dB noise contours, as most recently modelled by Kotui in May 2021, are displayed in **Appendix 3** to this report on the Central City Map sheet from the Christchurch District Plan. Note that the contour lines provide an overly definitive picture of what noise levels may actually be, and noise levels on individual sites may differ from this. The purpose of mapping contours, apart from providing an illustration of potential noise levels, is to assist in deciding what the outer extent should be of any area where additional noise insulation might be required.
- 6.6 This map also shows where existing noise insulation rules in the District Plan already apply, as dotted areas. These are Rule 6.1.7.2.1 in respect of traffic noise within 40m of Main or Local Distributor roads in the Central City, and Rule 6.1.6.2.9 for the Central City in respect of noise from entertainment areas. (Both of these rules apply only to habitable spaces within residential units and guest accommodation units). The levels of acoustic insulation present in some recent buildings, particularly those further from the

¹⁰ L_{Aeq} is a measure of average noise over any 15 minute period.

¹¹ From the UK Noise Council of the Chartered Institute of Environmental Health (1995)

CMUA or those with greater building mass, may therefore mitigate noise from the CMUA sufficiently, as noise insulation measures to reduce noise from one source may work equally well for another, depending on direction and level of the noise. However, there are gaps within residential blocks where no noise insulation requirement applies.

- 6.7 The dotted areas on the map in **Appendix 3** also include the rule for buildings within 75m of the Stadium accommodating noise sensitive activities which was added to Rule 6.1.6.2.9 in 2014. This rule only covers half of the Residential Central City zoned block directly north of the Stadium/CMUA designation, but there is a much wider area affected by noise from the CMUA with residentially zoned blocks within it.
- 6.8 Both mitigation of noise at its source and mitigation of noise for sensitive land uses near the CMUA have been considered in the development of these Amendments. The package of measures proposed is intended to address the main elements of noise which contribute to annoyance or acceptance, and manage or mitigate adverse noise effects, while still enabling the CMUA to operate as an effective and viable public and community facility, which provides economic and social benefit and stimulates other development and redevelopment around it both in the neighbourhoods around it and in the City as a whole.

Policy changes

- 6.9 It is proposed firstly to amend the Vibrant City section of the CCRP in relation to the Stadium, to make reference to the need to carefully manage noise from large events at the Stadium. Amending the CCRP enables changes to be made to the District Plan in an expeditious manner, including changes to the designation of the Minister with delegated responsibility for residual Greater Christchurch Regeneration portfolio matters (see also **Appendix 7** in relation to use of the GCRA).
- 6.10 It is proposed to strengthen and clearly state the policy intention in the District Plan to balance diversity of activities in this area with co-existence/compatibility of the resulting mix of uses.
- 6.11 Apart from considering the noise levels permitted for the Central City and for different zones in the District Plan (which the designating authority is not required to comply with), another guide as to what might be reasonable in the circumstances of the project, can be policies in the Plan. These give guidance and direction as to what actions and policy positions the Council will take on particular matters, in order to achieve the environmental outcomes sought in the objectives. Policies also give a context and direction for the consideration of resource consent applications.
- 6.12 Council's overall objective on noise is set out in Objective 6.1.2.1., that "Adverse noise effects on the amenity values and health of people and communities are managed to

levels consistent with the anticipated outcomes for the receiving environment”. In the context of the Central City and urban regeneration post-earthquakes, this objective needs to be made more specific through policies. Policy 6.1.2.1.3 is more specific in regard to entertainment and hospitality activities in the identified Entertainment and Hospitality precincts in the Central City and in key locations for temporary activities such as (North) Hagley Park.

- 6.13 A similar second part of the policy is proposed to be added in these Amendments as Policy 6.1.2.1.3.b (see **Appendix 1**) to directly address the circumstances of the Canterbury Multi-Use Arena and its location to the east of the City Centre, with residential areas nearby and in an area where Council wishes to encourage an increase in residential population.
- 6.14 The policy has been kept in two halves, rather than combined into one policy, with the second half focusing on noise effects on neighbouring inner city residential areas rather than on (noise) sensitive activities. This is because the use of the word “while” to combine the two would suggest a weighing up and balancing of different considerations under the RMA. While these amendments are proposed to the CCRP and through that to the District Plan, the primary consideration here is regeneration in a Central City context, which requires regeneration both via the success of the CMUA, and via the success of residential development in the Central City and near the CMUA, i.e. the success of both is the driver and primary aim for Council, rather than mitigating noise, which is of course a secondary aim.
- 6.15 Nevertheless the new policy is proposed to be inserted in the Noise Chapter in the District Plan. Consideration was given to the possibility of amending either Chapter 14 Residential policies, or the Central City Mixed Use zone policies as the zone in which the CMUA is located, or (more tangentially) the Central City Business zone policies to make reference to the CMUA and its effects on this environment. However, apart from within the RCC zone, there is now also considerable and increasing residential development in the East Frame of the Central City, under another designation and with an underlying Central City Business zoning.
- 6.16 The conclusion was reached that adding policies to each of the RCC, CCMU or CB zones is not an effective option and a better option is to directly address the activity and the effect at issue by inserting new or amended policies into the more generic noise chapter of the District Plan. Management of the effects at issue also sits better under the overall noise objective. It cannot be said that CMUA noise can be managed to levels consistent with the [usual] anticipated outcomes for a receiving residential environment, or that amenity values will be protected or maintained, as some adverse effects will occur. Neither is the degree of mitigation specified in the proposed policy. That is because the degree of mitigation is represented by the package of measures proposed, which will

better manage and mitigate noise effects, not just effects of level but effects of duration and frequency.

- 6.17 The appropriate comparison here is not with “protecting or maintaining” existing amenity levels, but with the degree of improvement of residents’ experience of noise from the CMUA, compared with the existing situation where there would be very little management or mitigation of that noise.

Mitigation at source

- 6.18 A more direct method of ensuring that adverse effects of a designated project are managed or mitigated is to make the designation and more specifically the land use activities that it authorises, subject to conditions designed to address those effects. These Amendments propose to do that for the CMUA in respect of noise (see **Appendix 1**). However those conditions need to be framed in such a way that, while mitigating extremes of potential noise effects, they do not undermine the viability of the CMUA and endanger the benefits that it can provide. Reasons for the specific conditions and other rule amendments proposed are set out in the following sections.
- 6.19 Several conditions are proposed, addressing different features of noise and its mitigation, e.g. noise levels overall, and the duration and frequency of loud concerts. Consideration has been given to other options such as whether fewer conditions would be adequate to manage noise, or whether exceptions could or should be provided from some conditions in some circumstances. Comments on other options are included under the explanation for each condition proposed. It has been concluded that each of the topics covered in the conditions influence acceptability and certainty of outcome, and that they would be best introduced as a package. All of the proposed conditions have been framed to meet the following criteria:
- Conditions should be appropriate in the circumstances of regeneration and a Central City location;
 - Any noise limits on concerts should produce at least some reduction in external noise compared with what would otherwise be experienced;
 - Any noise limits should be technically feasible/achievable, not compromise concert experiences inside the Arena and be unlikely to discourage touring acts from coming to Christchurch;
 - Conditions should be as simple as possible, and able to be relatively easily implemented and monitored;

- Conditions should give certainty as to noise outcomes to be anticipated, and easily understood conditions such as finishing times should be likely to be generally accepted by the public.

Condition 1.a - Noise limits for concerts

- 6.20 Condition 1.a. proposes a noise limit for concerts of 80 dB L_{Aeq} outside the CMUA for up to 6 concerts per year. Larger concerts of a scale needing to use the whole Arena would be likely to have the stage positioned near the northern end of the building. Consequently, higher noise levels would be experienced in residential areas to the north and northeast.
- 6.21 It is proposed that there be a slightly lower noise limit of 75 dB L_{Aeq} for up to a further 9 concerts per year. These slightly less noisy concerts might or might not use the whole Arena, with the possibility of the stage being positioned further south depending on the scale of the concert and the final design of the CMUA. (Sound and lighting equipment need to be suspended from roof trusses, so configurations for concerts depend on the final positioning of these trusses).
- 6.22 If there was only one external noise limit of 80 dB L_{Aeq} for all concerts, as in the proposal as notified in January 2021, more noise could be produced overall, and there would effectively be no requirement for the slightly less noisy concerts to limit their noise levels.
- 6.23 At the point of notification of the proposal for written comment from the public, noise consultants Marshall Day had recommended reducing the external noise limit for all concerts including the loudest ones, to no more than 75 dB L_{Aeq} . This would allow for an upper limit of approximately 100 dB L_{Aeq} inside the stadium. They advised that in their experience levels of noise as high as 105 dB L_{Aeq} are less common than they once were. This could also mean a smaller area of the Central City and fewer households would be affected by high noise levels during concerts.
- 6.24 The proposal is now for a compromise between these two positions with as noted, up to 6 concerts provided for with a maximum of 80 dB L_{Aeq} outside the CMUA, and up to an additional 9 concerts of a maximum of 75 dB L_{Aeq} . This is because a lower noise level for larger concerts, i.e. restricting noise levels inside the stadium to a maximum of 100 dB could result in some acts being reluctant to come to Christchurch. Feedback from concert promoters¹² has been that they consider acts should be able to retain control

¹² Responses received May 2020 from four promoters representing three Australasian entertainment companies.

over noise levels, including some acts being able to produce more than 105 dB inside the Arena. (There was some support however for other types of noise rules, e.g. caps on numbers of concerts in the interests of giving neighbours certainty).

- 6.25 For the CMUA to be successful it needs to be financially viable. The economic and social benefits of the Arena for regeneration in the Central City and beyond, and for the cultural and sporting identity of the City, must be given considerable weight in this decision-making process. The City needs to be able to compete with other centres to attract concerts, and also potentially attract more concerts than it hosted pre-earthquakes. While a further decrease in noise emitted would benefit residents in the vicinity of the CMUA, acoustic advice is that a higher maximum noise level of 80 dB L_{Aeq} compared to 75 dB L_{Aeq} could be less significant to most residents than frequency and duration of noise.
- 6.26 Noise levels for concerts are measured as average noise over any 15 minute period. The limit proposed outside for louder concerts is 80 dB L_{Aeq} which will represent a decrease of up to 5 decibels (dB L_{Aeq}) for louder concerts, on the average noise which noise modelling indicates could otherwise be experienced at this location. Noise levels inside the stadium could be between 100 and 105 dB L_{Aeq} under this noise limit, as opposed to levels of between 105 and 110 dB L_{Aeq} which could otherwise be produced.
- 6.27 Acoustic advice is that these proposed maximum average concert noise levels are practical and achievable, and will still result in a good concert experience. A greater restriction, for example requiring a 10 dB L_{Aeq} reduction of noise levels within the CMUA, would effectively require noise levels to be subjectively halved compared to noise levels which could otherwise be produced, because decibels are measured on a logarithmic scale. This could seriously compromise the ability of the venue to attract concerts, as discussed above. However, it is anticipated that up to 5 dB reductions can be achieved by careful management of noise at source by the event sound engineer, using fixed noise loggers both on and off the CMUA site, and monitoring and adjusting of noise live during concerts to ensure compliance.
- 6.28 Some limit on noise level is proposed here because the indicative noise levels during concerts as modelled and shown in **Appendix 3** have the potential to cause annoyance to residents in the area, with more annoyance closer to the Arena where noise levels are higher. These noise levels could discourage people from living in the Central City. The proposed noise level limit will mitigate extremes of noise level, but noise levels inside houses and apartments closer to the Arena might still be relatively high in the absence of other measures e.g. noise insulation requirements.
- 6.29 Acoustic advice is that it is not necessary to have a limit on overall noise levels at sporting events or at motorised events such as Nitro Circus, because these events are

likely to be held earlier in the evening or during afternoon hours, and finish earlier and produce less noise overall than concerts. In particular less bass noise is produced than during concerts.

Condition 1.a - Number of concert days

- 6.30 Condition 1a also proposes to limit the number of concert event days. Number caps have been proposed primarily to reassure residents that concerts will not take place constantly, or even especially frequently. Having limits on the number of noisy events per year, whatever those number limits are, will work together with finishing times to provide certainty to communities as to the likely future noise environment. Acoustic advice is that frequency and duration of noise are the two most significant factors in residents' acceptance of loud noise, with levels themselves of somewhat lesser significance.
- 6.31 During Council's Have Your Say consultation exercise in August 2020, 69 % of respondents indicated that they did not consider it necessary to have any limit on the number of concerts. There was however a marked locational difference in those who held that view, between those living outside the Central City at 81.5%, versus 45% of the Inside Central City respondents. Similar results were obtained in February 2021, although the topics for people to comment on were more specific. 71% of respondents on the concert number proposed (at that time a maximum of 15 per year) sought either no limit on the number of loud concerts or a higher figure. There were however a few respondents from inside the Central City who were seeking fewer concerts.
- 6.32 There has been extensive consideration of concert number options. A position of up to 6 louder concerts and up to 9 less loud concerts was finally reached, based on a balancing up of all of the Council's objectives for the Central City and for the CMUA and also its duty as a landowner to adopt the best practicable option to ensure that the emission of noise does not exceed a reasonable level. The numbers proposed should provide flexibility for the venue operator to attract concerts, without competitive disadvantage.
- 6.33 The proposed caps (6 louder and 9 slightly less loud concerts) still total to 15 concerts maximum, which is generous both by comparison with other venues in New Zealand, with the most common number of loud concerts being permitted per year being 6. It is also generous in the light of the CMUA being located so close to residential areas compared to most other stadia in New Zealand (see **Appendix 6**), and with respect to available guidance on concert noise¹³. It is likely that in most years fewer loud concert

¹³ Code of Practice on Environmental Noise Control at Concerts, the UK Noise Council of the Chartered Institute of Environmental Health, 1995. Note that this guidance is currently being reviewed.

events than this will actually take place. However the successful operation of the CMUA will have significant regeneration and economic, social and cultural benefits for the City and the region, and this maximum needs to be considered in that context.

Condition 1.b - Noise limits on PA systems for non-concert events

- 6.34 Condition 1.b proposes noise limits on public address (PA) systems for non-concert events in the CMUA as well as outside of it, but still on the site. A maximum PA noise level is included for sporting and other non-concert events because a PA system associated with, for example, a sporting event is much more likely to produce sudden sharp noise compared with a PA system for a concert, and therefore needs to be specifically managed. (In a concert context, PA noise is of little significance). For sporting and other non-concert events, PA systems, both speaking and music, are generally agreed to be potentially annoying to neighbours.
- 6.35 There will be a built-in PA system in the CMUA which will be specifically designed as part of the CMUA, for announcements, half-time music etc. This would be separate to the sound systems used for concerts themselves, as touring acts usually bring and set up their own sound equipment, noise from which would be controlled under condition 1.a. discussed above. Any temporary amplification systems used inside or outside the CMUA would also need specific design which considered acceptable loudspeaker array positions, sound power and orientations as part of the set-up for any event, with adjustments made prior to an event where necessary to achieve compliance.
- 6.36 The limits proposed in Condition 1 b. of 70 dB L_{Aeq} and 85 L_{Amax} represent what are considered to be reasonable upper limits on average noise from PA systems, and maximum noise from this source at any point in time. It should be noted that crowd noise is exempt from meeting any noise standards in the District Plan, and similarly it is not proposed to control this in these proposed conditions for the CMUA designation.

Condition 1.c. –Loggers/ Compliance points

- 6.37 Condition 1.c. requires at least four permanent noise loggers to be used for live/real time monitoring and assessment of noise during concerts or other noise producing events. Real time monitoring is best practice and would enable a rapid response if noise limits are or may be breached.
- 6.38 A primary compliance point is proposed at the boundary of the Residential Central City zone at the northwestern corner of Hereford and Barbadoes Streets. A noise logger here would measure noise levels to be used to calculate whether an event complied

with the designation conditions. It would also allow the calculation of the relationship between the noise level inside the CMUA and the external noise level to assist the operator in setting up for concerts and other events to ensure compliance. Measurements at this compliance point would also enable calculation of noise levels that could be experienced further from the CMUA in noise sensitive locations such as within residential areas. It is understood that Hereford Street in the area immediately to the north of the CMUA would be likely to be closed to through traffic during concerts, so interference from traffic noise at this compliance point is likely to be reduced and would likely have minimal impact on measured concert noise levels.

- 6.39 Additional outside compliance points are needed to collectively provide coverage of noise emissions to the west, south and east sides of the CMUA. A location at the southwest corner of Latimer Square i.e. closer to East Frame housing development has been suggested by Otakaro Ltd, but could suffer from interference from traffic noise as this portion of Hereford Street is less likely to be closed to traffic during major events than the portion immediately to the north of the CMUA. The location of the additional compliance points do not need to be specified in the designation conditions, and can be determined later through the Noise Management Plan once the design of the CMUA is finalised and taking into account localised effects from ventilation and access points as well as noise emissions through the façade.
- 6.40 Newer noise loggers are significantly less expensive and smaller than older ones and can vary in physical form, with the option of mounting to existing Council infrastructure rather than being standalone.

Condition 1.d – Reference noise contours for compliance

- 6.41 Measured noise levels at the compliance points will need to be calculated back to reference noise contours. These are now the recently modelled noise contours for the CMUA solid bowl scenario modelled at 11m above ground level by Kotui in May 2021. 11m above ground level rather than the more usual 1.5m above ground level (i.e. approximate person height) is used as a modelling height because it avoids the immediate blocking effect of one to three storey buildings (permitted height in the Residential Central City zone is in fact 14m) and is a more accurate representation of the spatial spread of noise which mostly emanates from the CMUA roof.
- 6.42 The appropriate reference contour at the northern compliance point will be either the 80 dB L_{Aeq} contour or 75 dB L_{Aeq} contour as modelled depending on the scale of the concert. Because of the orientation of the building to the north, the appropriate reference contour for the western and eastern compliance points will be either the 75

or 70 L_{Aeq} modelled contour, depending on the location of the openings to the building, and for the southerly compliance point, the 70 dB L_{Aeq} modelled contour.

Condition 2 – Standard finishing time

- 6.43 Condition 2 proposes a standard finishing time of 11pm on any day of the week for all concerts, other than on New Year's Eve when any concert in the Arena could continue until 12.30am. Certainty around the time events will cease to generate noise is potentially the single most important factor contributing to community acceptance of noise. 11pm is considered to be a time which represents a reasonable balance between the needs of the venue operator, the expectations of touring entertainers, and the needs of surrounding residents, and will give certainty to all. 11pm has also been supported as a finishing time by Venues Ōtautahi, who are likely to be the venue operator. The finishing time for music of 11pm will mean that for some events, patrons will still be leaving the CMUA after 11pm.
- 6.44 Feedback from the Have Your Say consultation exercise undertaken by Council in August 2020 did indicate that many of the respondents (particularly those who live outside the Central City) would like concerts to be able to continue later than this. There was similar feedback to the February 2021 consultation. However, this needs to be weighed against the fact that concerts being permitted to continue until 11.30pm or midnight is uncommon around New Zealand, and only occurs in locations which are further from large numbers of residents. It also needs to be recognised that a proportion of concert goers will move from the Arena into the City Centre when concerts finish, which will benefit local hospitality businesses.
- 6.45 A standard finishing time for all nights of the week is proposed, because in recent years large concerts in Christchurch have tended to take place on weeknights, with the same act scheduled at weekends in Auckland. Therefore having a later finishing time for weekends than for weeknights is considered impractical. Similarly having noise level conditions with lower noise levels after a certain time is considered impractical.

Condition 3 – Concert tallies

- 6.46 Concerts generating less than 90 dB L_{Aeq} inside the Arena would not be counted towards the maximum number of concerts. 90 dB L_{Aeq} equates to 65 dB L_{Aeq} outside of the Arena. This would provide for the occasional relatively small scale community event which would still be of a scale to use a portion of the Arena, such as family scale concerts which might have otherwise taken place in North Hagley Park, or Lazy Days concerts.

Marshall Day's advice is that such events do not add noticeably to the overall or cumulative noise level being experienced over a period of time. They have not been included in the noise modelling (in any case it is very unclear how many might take place here in a typical year) and can essentially be disregarded from the perspective of potential noise nuisance.

Condition 4 - Noise Management Plan

- 6.47 Condition 5 requires a Noise Management Plan (NMP) to be in place before any concerts, sporting events or motorised events are held at the CMUA. It is standard practice for large community stadiums to be required to have a noise management plan in place which sets out how they will achieve the noise limits set, and how they will address a range of noise related issues associated with the activity in order to mitigate potential noise nuisance. These could include matters such as pack-in and pack-out timings and durations, timing of rubbish collections, and management of heavy vehicles and equipment on site at night and early in the morning, with the aim of limiting noise after 11pm and before 7am to the greatest extent possible.
- 6.48 This noise management plan will sit outside of the District Plan and will be checked by the Council (hence the reference to certification in this condition) to ensure that the specified issues have been dealt with. If not, amendments would need to be agreed.
- 6.49 The conditions on noise which are attached to the designation such as noise limits or caps on numbers of concerts cannot be changed through the NMP preparation and certification process.
- 6.50 The NMP condition proposed lists a number of specific matters related to noise management which need to be covered in the document, including provision for liaison with neighbours and the setting up of a complaints procedure.
- 6.51 In written comments in response to the public notification in February 2021, the Dean of the Christchurch Transitional Cathedral has asked that the Cathedral be involved in the noise management plan for this project. This is appropriate given the proximity of the CMUA to the Transitional Cathedral and the likely need for co-existence between the two once the CMUA is built, and while the Transitional Cathedral remains in use on this site.

Condition 5 – Noise Liaison Committee

- 6.52 Condition 5 requires the establishment of a Noise Liaison Committee or similar mechanism e.g. an Arena Liaison Committee or Community Liaison Committee to facilitate communication between members of local communities, the venue operator and Council’s Regulatory Compliance officers. This requirement will contribute to ongoing and meaningful engagement with local communities in respect of potential noise issues. Under Condition 4, the Noise Management Plan must set out a process for establishment of this committee and for making decisions on which parties should be represented on the Committee, and what its functions, budget and administrative arrangements will be.
- 6.53 There are existing Noise Liaison Committees for the Christchurch International Airport, Lyttelton Port, and Ruapuna Raceway and Speedway. Their functions are specified in the District Plan, and were agreed over some months of discussion between parties, and during appeals or mediation in each case. For the CMUA project, it is considered too early in the design and construction of the CMUA to determine the detailed representation on, and specific functions for the proposed Noise Liaison Committee. This can be done through the Noise Management Plan process.

Mitigation where noise is received

Amendment to Rule 6.1.6.2.9 Noise insulation

- 6.54 The proposed amendment to Rule 6.1.6.2.9 Noise insulation, is not a condition that would apply to the designation for the CMUA, but rather a separate amendment to the District Plan to address noise as it is received and heard inside residential and other buildings for noise sensitive activities such as guest accommodation which are located near the CMUA. The amendment is proposed for new dwellings because the noise limits that are practical to impose on events at the CMUA may still result in indoor noise levels in dwellings near the CMUA that create annoyance during concerts. Under the RMA, Councils cannot impose retrospective requirements on existing dwellings, although owners themselves can voluntarily acoustically treat such buildings. It should be borne in mind that non-“noise sensitive” buildings e.g. those used for commercial or industrial purposes would not be subject to this rule.
- 6.55 The amendment proposed is to an existing rule in the District Plan. The existing rule requires that for certain areas, new residential and other buildings for noise sensitive activities such as guest accommodation which contain “habitable spaces” (see footnote 1 on p3) use construction materials (generally materials of greater mass) which will reduce inside noise levels by either 30 or 35 dB compared to outside noise levels. The

higher reduction figure required is used for noisier areas or where an even lower internal noise level is desirable e.g. in bedrooms to facilitate sleep. The aim is to improve indoor noise levels.

- 6.56 Categories 1 and 2 in the existing rule are references to limited areas where noise levels may be high in the future, due to a concentration of entertainment activities such as bars and nightclubs (Category 1 is expected to be noisiest). Category 3 is the rest of the Central City. An addition to the existing rule was made for the Stadium in 2014, but as already noted above, the 75m distance specified from the Stadium/CMUA where noise insulation would be required for new buildings is now proposed to be enlarged.
- 6.57 This proposed amendment to the rule therefore specifies a larger area where noise insulation would be required, to be called the CMUA Outer Noise Insulation Area. This mapped area includes land parcels where according to indicative noise modelling, noise levels outside buildings would be 70 dB L_{Aeq} or higher during concerts if there was no noise reduction at source i.e. at the CMUA. Parcels on the edge of the area which have 50% or more of their area within that contour have also been included. **(Appendix 1)**.
- 6.58 70dB L_{Aeq} has been chosen as a level for defining a noise insulation area because it represents a level at which a 30 dB external to internal noise reduction would result in an internal noise level of 40 dB. This is the same as target indoor noise levels in other parts of the District Plan at this time.
- 6.59 A larger area for acoustic insulation might perhaps be justifiable on noise grounds, e.g. out to the 65 dB noise contour. However, in this outer area between the 70 and 65 dB noise contours, acoustic advice is that there would be more variability in noise levels received due to a greater chance of intervening blocking buildings, even at the 11m (around 3 storeys) above ground level that the indicative modelling is based on. This means using a standard external to internal noise reduction measure would likely “over-engineer” in some cases. Critically, a choice to require additional insulation over this wide an area would need to be balanced against the infrequent nature of the noise and the cost that acoustic insulation rules impose on landowners and developers (see paragraph 6.70 and following below).
- 6.60 As noted in sections 1 and 2, recent noise modelling has occurred as part of the design process, with some changes in the contours from those previously modelled. The contours have shrunk slightly to the north as a result of the decision to replace the ETFE northern façade with a solid wall. The contours have however expanded to the south as a result of the decision to use an essentially flat roof, rather than the roof being slightly tilted to the north. This has meant that some city blocks and property owners who were previously subject to less modelled noise were brought into the proposed Outer Noise

Insulation Area and therefore those properties were notified of this change to the proposal on and around 22 May 2021.

- 6.61 Most of these properties to the south of the CMUA are not used for residential purposes whereas most of those to the north of the CMUA are, which means that although there is a net increase in properties affected, it is likely that fewer properties used for residential purposes will be affected overall.
- 6.62 These Amendments also propose a higher standard of insulation than currently applies to the area within 75m of the Stadium/CMUA. The amended rule in a new Part E is proposed so as to be consistent with the existing noise insulation rule for the noisiest areas, i.e. Parts A and B of the rule. This is a rule that developers will already be familiar with. The amended rule would require a 30 dB external to internal noise reduction for habitable spaces and a 35 dB decrease in respect of bedrooms. The acoustic advice earlier in 2020 did not indicate a clear preference for a level of noise reduction, but commented that a two level standard could allow developers to make some savings around designing façade performance. Advice later in 2020 based on the Council's decision to propose a 80 dB L_{Aeq} noise level limit across all concerts, does indicate a preference for a noise level reduction of 35 dB across both bedrooms and other habitable spaces, given the level of noise which could be emitted from the stadium, albeit infrequently; and the extent of noise reduction that would be required close to the Arena, to reach more acceptable internal noise levels. Evidence is also emerging in the Central City in relation to existing entertainment noise, that a 30 dB decrease in respect of bedrooms is not always adequate to significantly reduce annoyance.
- 6.63 It is considered that a noise insulation reduction of 35 dB for bedrooms and 30 dB reduction for other habitable spaces may still be adequate for the area between the 70 and 75 dB noise contours. The rule is more targeted than requiring a 35 dB decrease across all spaces in dwellings, and as noted will slightly decrease costs for developers, compared to a flat 35 dB decrease across all habitable spaces, albeit that it is slightly more complex.
- 6.64 It is proposed however to introduce a third level of noise insulation into Rule 6.1.6.2.9 by defining a CMUA Inner Noise Insulation Area, based on properties where according to indicative noise modelling, noise levels outside buildings would be 75 dB L_{Aeq} or higher during concerts if there was no noise reduction at source i.e. at the CMUA. Parcels on the edge of this area which have 50% or more of their area within that contour have also been included, as for the outer area. (**Appendix 1**). The noise level reduction required for new dwelling units in this area, in a new Part F to the Rule would be 35 dB across both bedrooms and all other habitable spaces.

- 6.65 This will bring a small cost increase over and above the measures required in the CMUA Outer Noise Insulation Area, and is readily achievable with standard building designs and materials, albeit generally of higher mass than the market minimum. There is further discussion of costs of noise insulation in the next section. Acoustic advice is that it is not realistic to require any higher noise reductions than a 35 dB reduction e.g. a 40 dB reduction, because this represents a breakpoint of noticeably greater cost, and would begin to utilise specialist or seldom used products and construction methods.
- 6.66 The adoption of a “35/35” noise insulation requirement should not imply that the CMUA will be noisier than living in or living adjoining the Noise and Entertainment precincts in the Central City. While the CMUA may be noisier during infrequent concerts, this may not be the case overall because Entertainment Precinct noise may be more frequent and is likely to be experienced by nearby residents until later hours in the night and early morning.
- 6.67 The proposed new CMUA Noise Insulation Areas overlap with the existing noise areas around the Noise and Entertainment Precincts in some limited areas. Where this occurs the stricter of the two rules will apply.
- 6.68 It should be noted that noise insulation is different to, and additional to thermal insulation. Acoustic advice indicates that in respect of noise from the CMUA, each dwelling unit would require a means of alternative ventilation and temperature control so that windows could remain closed. Glazing would need to be of an architectural or commercial standard, since thermal double glazing has relatively poor acoustic performance. More efficient means of noise reduction across windows can be achieved by using thicker glazing, secondary glazing or laminated glass. Walls and roofs of lightweight or masonry construction may require some heavier or additional layers.
- 6.69 Existing buildings in the CMUA area have a mix of claddings with about half being plaster clad (both pre and post-earthquake construction). There has been an increasing tendency to use heavier claddings post-earthquakes, e.g. concrete panels. This may indicate that some more recently constructed buildings may already have adequate noise insulation at least in the walls. At least 61% of buildings in the area are post-earthquake. (There are some deficiencies in historical building consent data for age of dwelling or residential unit, so this figure cannot be regarded as definitive). Thermal glazing has been required by the NZ Building Code since late 2007, however as noted this is not a guarantee of good acoustic performance. Nevertheless achieving a noise reduction of 30 dB or even 35 dB externally to internally in a modern building should not be a difficult exercise.

Costs of noise insulation

- 6.70 There will be modest additional costs to some individual owners of residential properties in the vicinity of the CMUA, in respect of any future building to acoustic insulation standards, e.g. the costs of acoustic advice, the costs of additional or heavier materials to reduce external to internal noise transmission, and potentially the costs of ventilation systems to allow windows to be closed.
- 6.71 **Appendix 3** showing Central City zonings and the currently modelled noise contours shows that there are significant areas within the Central City where noise insulation is already required for new buildings for sensitive uses, to protect residents either from noise primarily from Entertainment and Hospitality Precincts (Rule 6.1.6.2.9) or from traffic noise on Main Distributor or Local Distributor Roads (Rule 6.1.7.2.1). There are however gaps in these rules in residential areas, e.g. for properties adjoining local roads, or within residential blocks further than 40m from the relevant roads. Under these proposed Amendments, these additional areas would also become subject to noise insulation rules, resulting in additional building costs for these properties.
- 6.72 The scale of additional building costs will depend partly on the type of building concerned, with acoustic glazing being one of the more significant costs. Terraced units or town houses and apartment buildings are the most common types of buildings in the area, with most of these having been recently constructed. These types of buildings are more economical to “acoustically treat” than traditional standalone houses, as these structures have a reduced amount of façade per dwelling unit.
- 6.73 There is little NZ research on the base costs of acoustic insulation i.e. incorporating acoustic insulation into buildings at all, because noise exposure circumstances vary so much. Many rules elsewhere in NZ are based on a target indoor noise level, meaning more insulation is required in closer proximity to the noise source. The Central City noise (receipt) rule introduced by the CCRP however (Rule 6.1.6.2.9)¹⁴, took an alternative approach of specifying standard noise reduction requirements in particular areas, which is likely to reduce the need for bespoke acoustic assessments of proposed new dwellings.
- 6.74 A 2013 study by Beca for NZTA calculated acoustic treatment costs for a typical single storey home and typical double storey home (both clad in Linea weatherboard) at various distances from hypothetical State Highways with varying surfaces and traffic volumes. Costs varied from around \$8000 to around \$22,000 for a single storey house and from around \$7000 to around \$27,000 for a double storey house. Acoustic treatment as a percentage of total cost for the double storey home in the Beca study

¹⁴ A different rule in the District Plan, Rule 6.1.5.2.2 controls the generation of noise on sites in the Central City. Note that under the RMA, designated sites are not required to comply with District Plan rules.

varied from 2% to 8%. (Christchurch's construction cost inflation has slowed to around 2% per year¹⁵ since post-earthquake peak increases of around 6% per year). Acoustic treatment costs may be lower than this percentage of total cost for building in the area around the CMUA as single standalone homes are no longer common in the area, and as noted above most recently constructed buildings have cladding materials of greater mass than weatherboard, e.g. concrete panels, or brick.

- 6.75 With regard to the difference in costs between acoustic insulation to a 30 dB reduction standard, and acoustic insulation to a 35 dB reduction standard, acoustic advice is that this difference is also not likely to be great. For example if external walls were brick and concrete no additional wall treatment would be required, although bedroom windows might require more effective acoustic glazing.
- 6.76 Otakaro Ltd, in its feedback on the proposal as a strategic partner, commissioned acoustics and quantity surveying advice in respect the buildings for which it is responsible in the East Frame. This investigated the additional costs of moving from a 30 dB reduction for bedrooms only (the current Rule 6.1.6.2.9) to the rule proposed in these Amendments of requiring 35 dB reduction for bedrooms and 30 dB for other habitable spaces, external to internal. This work produced estimated additional costs of \$2000- \$8000 per unit (smaller costs for smaller units) to meet the proposed new requirements in the next East Frame development lots of 'Superlot' 6 and 'Superlot' 10, which are currently being designed.
- 6.77 Council does not yet have any comparable figures for the additional costs of moving from a 30 dB reduction for bedrooms only, to a requirement for 35 dB reductions across all habitable spaces in a dwelling. Additional costs would be very dependent on the baseline construction materials adopted for the comparison; additional wall treatment might be required if starting from a base of lightweight materials eg timber cladding.
- 6.78 It has to be noted that there has already been a high degree of redevelopment post-earthquake in the CMUA Inner Noise Insulation Area, which will mean that this requirement is not as effective at improving indoor noise environments as it would be, for example in a greenfields or even immediately post-earthquake situation. However there are still some properties which have yet to be redeveloped post-earthquakes, and there could be a degree of retrofitting of acoustic insulation on a voluntary basis.
- 6.79 Property owners and residents in the area may consider that the additional costs of acoustic insulation are justifiable to achieve a higher standard of indoor amenity. Noise insulation will mitigate external noise from other sources, as well as infrequent loud noise from the CMUA. Noise from the CMUA itself will likely occur in the evening and

¹⁵ "NZ Construction Inflation to slow due to escalating costs", Scoop Independent News, July 2018.

predominantly in summer when windows would often be open and some degree of outdoor living might be occurring. The provision of mechanical ventilation as part of the acoustic insulation package would mitigate the effects of closed windows indoors, and while outside living might be noisier than desirable, noise from the CMUA will only occur intermittently. At a community level the benefits of achieving better living environments are anticipated to be considerably greater than the costs.

Existing buildings

- 6.80 Council cannot legally apply noise insulation rules to existing buildings retrospectively, so this rule can only apply to new residential and other noise sensitive buildings when they are constructed. This means that for some existing dwellings, indoor noise levels would remain higher than desirable during concerts, meaning that in some circumstances and for some communities there is no “easy” way to mitigate noise level effects.
- 6.81 However, it must also be recognised that considering only noise levels in and of themselves, is likely to represent an oversimplified view of this issue and of the package of measures proposed. The duration and frequency as well as the character of that noise, may be of just as much significance to residents as the amount of loud noise experienced over a time period.
- 6.82 The proposed Amendments include some measures which will benefit all residents, including those who will not benefit from acoustic insulation. Proposed measures in this category include the standard finishing time for concerts, and the upper limit on numbers of loud concerts per year, which will also benefit more distant residents beyond the proposed additional insulation area. The Noise Management Plan required will cover issues such as the pack-in and pack-out timings and durations, timing of rubbish collections and management of heavy vehicles and equipment on site at night and in the early morning, and will also identify locations where residents will be given prior notice of forthcoming noisy events. These issues are likely to be of particular concern to those living very close to the CMUA.

7 Draft of Notice to be published under subsequent step of the CCRP Amendment process

- 7.1 A draft of the notice that would be published under section 38, should the Minister with delegated responsibility for residual Greater Christchurch Regeneration portfolio matters approve the Proposal, is set out in **Appendix 8**.

Appendix 1 – Proposed Amendments to CCRP and Christchurch District Plan

STATUTORY DIRECTION TO AMEND THE CHRISTCHURCH CENTRAL RECOVERY PLAN

In accordance with section 38 of the Greater Christchurch Regeneration Act 2016, the “Vibrant City” section of the Christchurch Central Recovery Plan is amended at page 85 as set out in Appendix 1 to the Proposal to the Minister.

PROPOSED AMENDMENT TO CHRISTCHURCH CENTRAL RECOVERY PLAN

NB: Additions are shown in **bold underline** and deletions in ~~**bold strikethrough**~~.

A) AMENDMENT TO “A VIBRANT CITY” SECTION (p85)

Stadium- Canterbury Multi-Use Arena

A large multi-purpose sports and entertainment venue is proposed for central Christchurch. With **seating for up to a maximum capacity of** 35,000 people **for concerts, and a 25,000 seat capacity for sports events** the covered stadium will position central Christchurch as a world-class option for attracting and hosting events. Its main purpose will be to host rugby union, rugby league and football up to an international level, and also allow for entertainment events such as concerts.

The stadium will be located to the east of the Frame, over three city blocks between Hereford and Tuam Streets, bounded by Madras and Barbadoes Streets. This location is well connected with main transport routes and within easy walking distance of parking facilities and the Core. **It is also close to inner city residential areas, so noise from large events at the stadium such as concerts will need to be carefully managed to mitigate effects on residential amenity, while still enabling the stadium to be a driver for regeneration.**

The Stadium will include :

- 35,000 **maximum capacity for concerts, and 25,000** seat capacity **for sports events,** with **the option of 5000 4300 additional** demountable seats to allow for staging and scaling of events.
- **2500 of the seats (10%) will be in cCorporate suites, open corporate seating, and lounge spaces** ~~**with 4000 seat capacity and members seating.**~~
- ~~**Option of a A**~~ fixed, partly solid and partly transparent roof to allow natural turf and enable multiple uses.
- Optimum spectator viewing through rectangular format for field of play and seating.

STATUTORY DIRECTION TO AMEND THE CHRISTCHURCH DISTRICT PLAN

In accordance with section 38 of the Greater Christchurch Regeneration Act 2016, Christchurch City Council is directed to amend its District Plan as set out in Appendix 1 to the Proposal to the Minister. This includes amendments to Chapter 6, Policy 6.1.2.1.3; Chapter 6, Rule 6.1.6.2.9; Chapter 10, Designation H4; and the replacement of the Planning Map sheet Central City Entertainment and Hospitality Precincts, with a revised Planning Map sheet titled “Central City Noise Environments”.

Christchurch City Council shall make these amendments as soon as practicable but no later than two weeks after the Gazettal of this amendment to the Christchurch Central Recovery Plan.

PROPOSED AMENDMENT TO CHRISTCHURCH DISTRICT PLAN

NB: Additions are shown in **bold underline** and deletions in ~~**bold strikethrough**~~.

A) AMENDMENT TO CHAPTER 6, POLICY 6.1.2.1.3

Objective 6.1.2.1 – Adverse noise effects

- a. Adverse noise effects on the amenity values and health of people and communities are managed to levels consistent with the anticipated outcomes for the receiving environment.

Policy 6.1.2.1.3 - Entertainment and hospitality activities in precinct areas and key locations in the Central City

Add a new clause b as follows:

- b. i. **Enable the Canterbury Multi- Use Arena (CMUA) to attract and host a wide range of sporting events, concerts and other entertainment events and activities, so that it can act as a catalyst for regeneration, make a significant contribution to the vibrancy of the Central City, and promote the sporting and cultural identity of Christchurch.**
- ii. **Ensure that noise from the CMUA is managed to levels, durations and frequencies which, in combination with insulation requirements and a Noise Management Plan, mitigate adverse effects on the amenity values of neighbouring inner city residential areas.**

B) AMENDMENT TO CHAPTER 6, RULE 6.1.6.2.9

Delete wording in clause a.i.C of the rule as shown and add a new clause E as shown:

A. Category 2 Precincts:

E. CMUA Outer Noise Insulation Area as shown on the Central City Noise Environments

Planning Map:

I. 35 dB $D_{tr, 2m, nT, w} + C_{tr}$ for bedrooms

II. 30 dB $D_{tr, 2m, nT, w} + C_{tr}$ for other habitable spaces.

F. CMUA Inner Noise Insulation Area as shown on the Central City Noise Environments

Planning Map:

I. 35 dB $D_{tr, 2m, nT, w} + C_{tr}$ for bedrooms

II. 35 dB $D_{tr, 2m, nT, w} + C_{tr}$ for other habitable spaces

C) AMENDMENTS TO CHAPTER 10, DESIGNATION H4

- a) In Schedule H, delete the name of (Designation) H4 “~~Stadium (Incorporating Spectator Events Facility)~~” and replace it with H4 “Canterbury Multi-Use Arena”.

- b) Delete the wording “N/A” under the subtitle “Conditions” for Designation H4 Canterbury Multi Use Arena, and replace it with the following conditions:

1. NOISE LIMITS

- a. **The noise generated by concerts held at the Arena shall not exceed the following levels outside the Arena:**
- i. **for up to 6 concerts per calendar year, 80 dB $L_{Aeq(15\ min)}$, and**
 - ii. **for up to an additional 9 concerts per calendar year, 75 dB $L_{Aeq(15\ min)}$;**
- b. **The noise generated outside the Arena by public address systems for any non-concert events held either inside or outside the Arena building shall not exceed:**
- i. **70 dB $L_{Aeq(15\ min)}$, and**
 - ii. **85 dB L_{Amax}**
- c. **Loggers/Compliance points:**
- i. **Live/real time monitoring and assessment of noise shall be undertaken during concerts and during other events where PA systems are in use. Monitoring and assessment shall include the use of permanent noise loggers outside the Arena.**
 - ii. **For the purposes of conditions 1.a, 1.b, 1.c.i and iv, 1.d and 3, one noise logger shall be located at a northern compliance point at the boundary of the Residential Central City zone, at the northwest corner of Hereford and Barbadoes Streets.**
 - iii. **Other than the noise logger in condition 1.c.ii, there shall be at least three further noise loggers located at other compliance points to be agreed with CCC Regulatory Compliance Officers and set out in the Noise Management Plan, that collectively provide coverage of noise emissions to the west, south and east sides of the Arena.**
 - iv. **All noise loggers shall be positioned between 1.5m and 11.0m above ground, with locations selected to capture likely maximum off-site noise emissions during concerts, taking into account localised effects from ventilation and access points as well as noise emissions through the building façade.**
- d. **Reference noise contours:**
- Noise levels shall be measured at the compliance points set out in condition 1.c., and calculated back to the following noise contours for the CMUA solid bowl scenario modelled at 11m above ground level by Kotui and dated 18 May 2021.**
- i. **For the northern (residential) compliance point, either the 80 or 75 dB L_{Aeq} noise contour.**

- ii. For the western and eastern compliance points, either the 75 or 70 dB L_{Aeq} noise contour as appropriate depending on the location of openings to the building.
- iii. For the southern compliance point, the 70 dB L_{Aeq} contour.

2. FINISHING TIMES FOR CONCERTS

All concerts shall finish by 23:00 hours on any day of the week, except that on New Year's Eve any concert held in the Arena shall finish by 12.30am on New Year's Day.

3. CONCERT TALLIES

- a. Concerts producing 65 dB L_{Aeq} (15 min) or less outside the Arena, shall not be included in the concert number totals in condition 1.a.
- b. An annual tally of concert events exceeding 65 dB_{Aeq}(15 min) outside the Arena, for the previous calendar year shall be sent by the venue operator before the end of January each year to the Council's Manager Regulatory Compliance (or equivalent position).

4. NOISE MANAGEMENT PLAN

- a. The venue operator shall prepare a Noise Management Plan (NMP), the primary objective of which is to set out practices and procedures to be adopted to ensure compliance with these conditions. A further objective of the NMP is to set out how other noise related matters not subject to specific conditions will be addressed. The venue operator shall ensure that all activities are undertaken in accordance with the latest certified version of the NMP, which shall be made available online on the venue operator's website.
- b. The NMP shall cover concerts, sporting events and motorised events.
- c. The requiring authority shall provide the proposed NMP as part of the outline plan documentation submitted to Council under section 176A of the Resource Management Act 1991.
- d. At least one month before the first concert, sporting event or motorised event is held, the finalised NMP shall be submitted to Council's Manager Resource Consents (or equivalent position) for certification that the NMP meets the requirements of these conditions. Within 15 working days, the Manager Resource Consents shall either confirm in writing that the NMP has been certified, or advise the operator in writing of the changes that need to be made to achieve certification.
- e. The NMP may be varied by the venue operator as a result of experience in operating concerts or other noise producing events at the venue, or a review may be requested by the Manager Resource Consents to deal with specific issues which have arisen. Any

changes shall be provided to the Manager Resource Consents for certification, with a response provided in accordance with the process in 4.d. above.

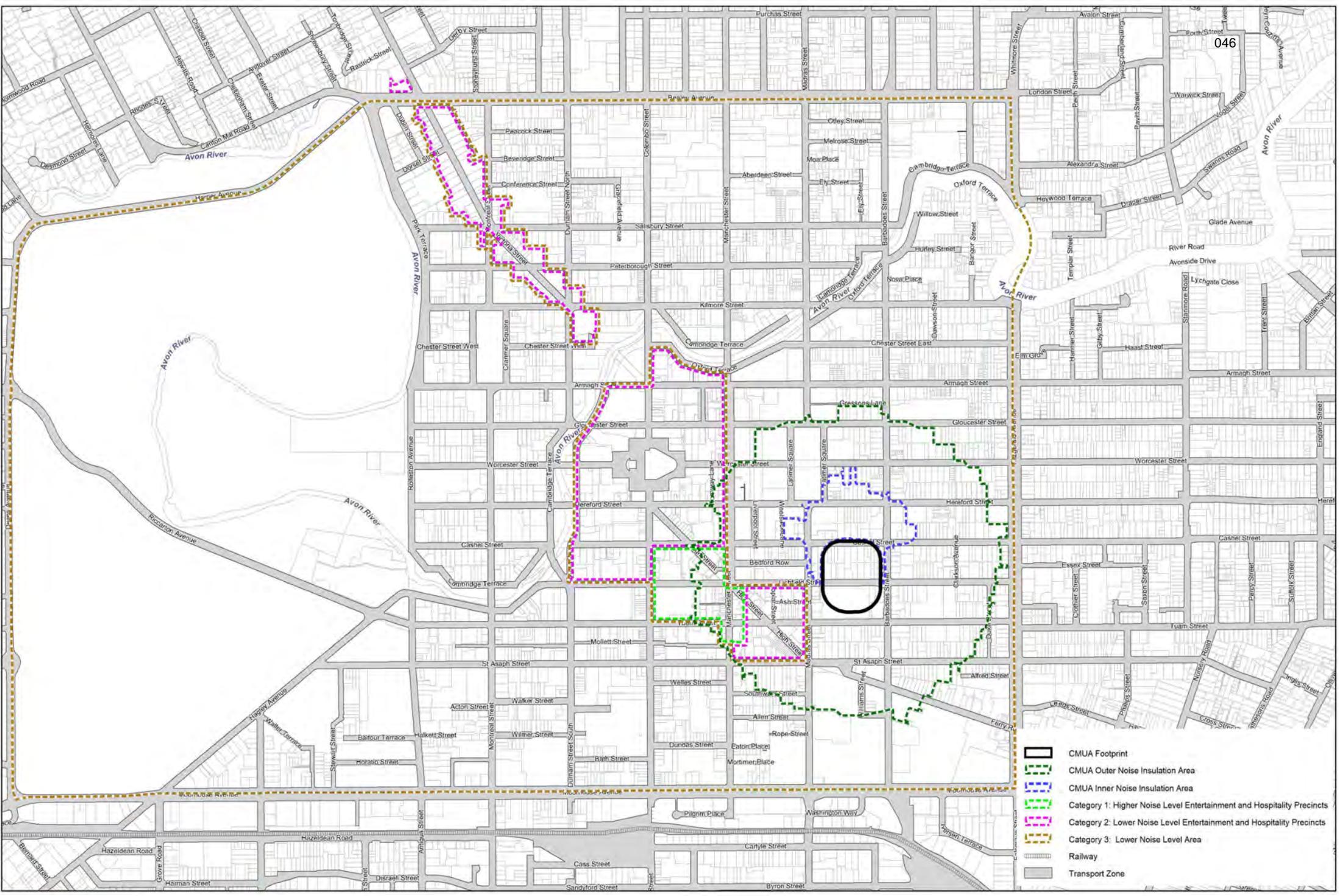
- f. The NMP shall cover at least the following matters:
- i. Practices and procedures to be adopted to ensure compliance with the noise limits set out above, including setting out roles and responsibilities for noise management and monitoring (including ensuring that promoters and visiting acts are aware of the noise limits and all other operational parameters) and specifying a monitoring regime.
 - ii. Details and locations of the permanent noise loggers referred to in condition 1.c..
 - iii. Management of concert events to control the emission of noise from the Arena, including the emission of low frequency bass noise.
 - iv. The set-up, positioning, orientation and operation of the loudspeakers and the public address system, including the duration and timing of testing.
 - v. Pack-in and pack-out timings and durations, timing of rubbish collections, and management of heavy vehicles and equipment on site at night and early in the morning, with the aim of limiting noise to the community between 23:00 hours and 07:00 hours to the greatest extent possible.
 - vi. Management of noise from any fireworks involving detonation outside the Arena but onsite.
 - vii. Measures to address any unreasonable behavioural noise outside the fully enclosed portions of the Arena, but onsite.
 - viii. Identification of the locations where residents will be given prior notice of forthcoming noisy events and the rationale for identifying those locations, and description of how residents will be informed.
 - ix. A complaints procedure that records all complaints received by the venue operator, and specifies actions to be taken following receipt of complaints, which must include liaison with Council Regulatory Compliance officers if a regulatory issue has arisen, and recording of any remedial actions taken. Records that protect privacy of individuals shall be accessible to the public e.g. available online at a specified webpage.
 - x. A process to enable the establishment of a Noise Liaison Committee as set out in Condition 5 below, and to make decisions on which parties should be represented on the Committee, and what its functions, budget and administrative arrangements will be.
 - xi. The identification of circumstances in which it would be appropriate to initiate a review of the contents of the NMP.

5. NOISE LIAISON COMMITTEE

- a. A Noise Liaison Committee or similar mechanism shall be established before the Arena is operational, to facilitate communication between members of local communities, the venue operator and Council's Regulatory Compliance officers. Minutes shall be kept of meetings held.

D) AMENDMENT TO CENTRAL CITY PLANNING MAPS

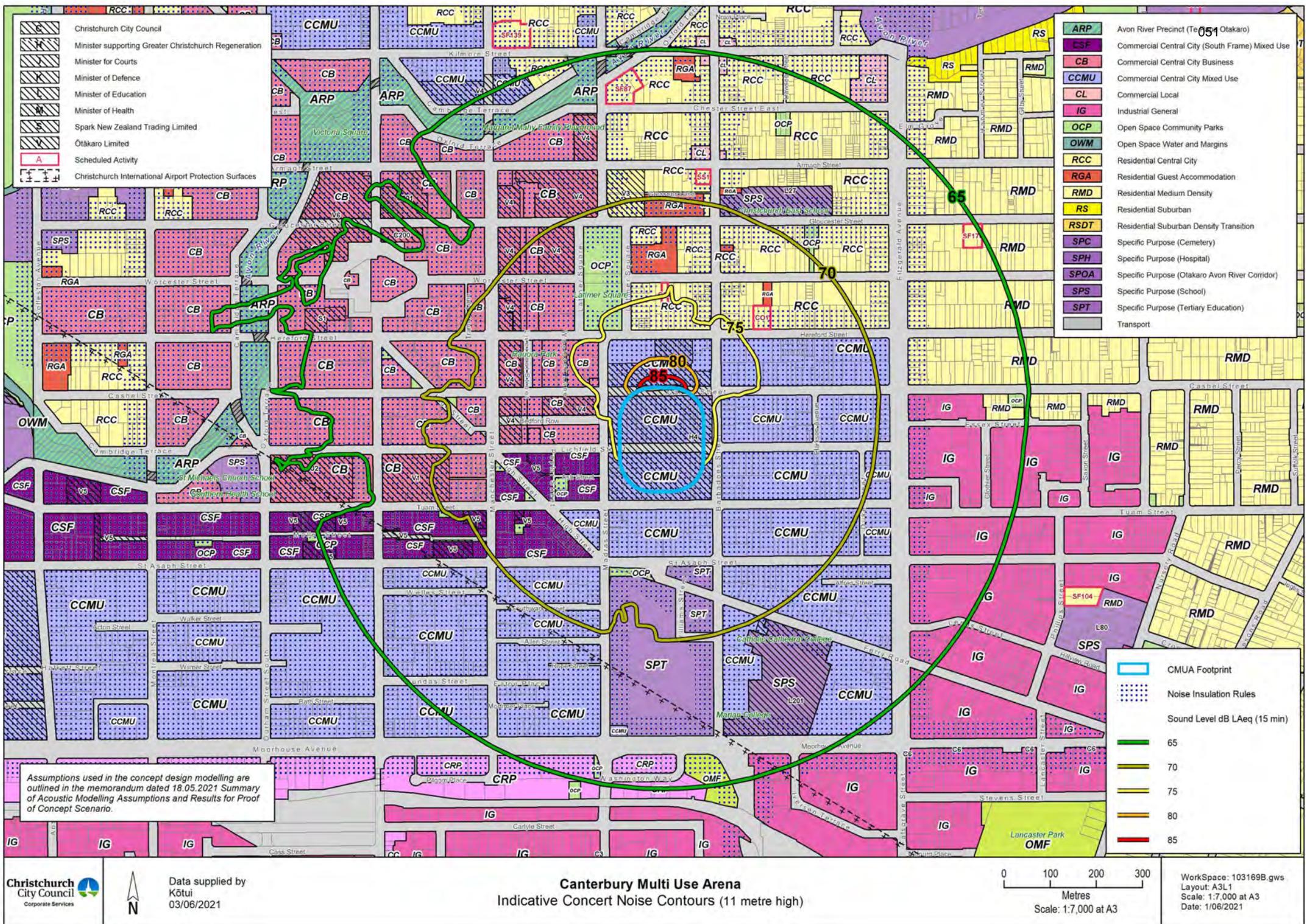
Amend the Central City Entertainment and Hospitality Precincts Planning Map to show a CMUA Outer Noise Insulation Area, and a CMUA Inner Noise Insulation Area, as shown on the attached Planning Map Sheet, and amend the title of the map to “Central City Noise Environments”.



Appendix 2 – Relevant CCRP and District Plan Objectives and Policies

1. Objective 12.2 of the CCRP: Role of the Central City (now part of Objective 15.2.5 of the District Plan) is “To restore and enhance the Central City as Christchurch’s principal focus for a diversity of business, accommodation, community and cultural activities, while managing adverse effects arising from the intended mix of activities”. Objective 12.3 of the CCRP: Efficiency and Viability (now also part of Objective 15.2.5 of the District Plan) is “To enable the efficient use and continued viability of the physical resources of the Central City, and promote the economic success and viability of the area.”
2. The underlying zone for the designation for the CMUA, i.e. the zoning it would have if the designation was uplifted, is the Central City Mixed Use zone. CCRP Objective 12.5: Role of the Central City Mixed Use Zone (now part of Objective 15.2.7 of the District Plan) is “The development of vibrant urban areas where a diverse and compatible mix of activities can co-exist in support of the Central City Business zone and other areas within the Central City”. This supports the choice of the CMUA location.
3. The Liveable City Residential Chapter of the CCRP notes at p8 that “the Recovery Plan is concerned with both regenerating the business area and expanding the opportunities for high quality inner city living so that each can support the other”. Objective 11.12 of the CCRP: Role of the Central City Residential zone (now Objective 14.2.8 of the District Plan) reflects this: “A predominantly residential environment offering a range of residential opportunities, including medium to high density living, with the Central City to support the restoration and enhancement of a vibrant city centre”.
4. Policy 11.12.1 of the CCRP (now Policy 14.2.1.3 of the District Plan) under this objective is “To restore and enhance the Central City by (amongst other things) providing for a progressive increase in the residential population of the Central City”. The District Plan policy also aims at providing for “a variety of housing types which are suitable for a range of individual housing needs”, and “assisting in the creation of new inner city residential neighbourhoods and [in] protecting the amenity of inner city residential neighbourhoods”.
5. While some of these objectives and policies are focused specifically on the economic success and viability of the Central City, or on increasing the residential population of the Central City, there are also objectives and policies in the CCRP (e.g. Objective 12.2 and 12.5 of the CCRP, referred to in i. and ii. above) which acknowledge a need to manage adverse effects resulting from the intended mix of activities. The proximity of the CCMU zone to the CCR (now RCC) zone to each other means that there is a need to manage adverse effects across zone boundaries. This was recognised by the amendment of the CCRP by the Noise and Entertainment provisions of the CCRP in late 2014.

Appendix 3 - Map of Noise Contours on Central City Planning Map



Appendix 4A and 4B – Noise Advice from Marshall Day

APPENDIX 4A



Project: **CANTERBURY MULTI-USE ARENA**

Prepared for: **Christchurch City Council**
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Attention: **Mike Davies**

Report No.: **Rp 001 20181126**

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Document control

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EXECUTIVE SUMMARY

TBC

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1.0 INTRODUCTION

Following on from our technical report evaluating different roof options¹, Christchurch City Council has engaged Marshall Day Acoustics to provide technical advice in support of business case analysis for the Canterbury Mixed Use Arena (CMUA).

The base case for analysis is described in detail in the project scoping documents. It is worth reiterating the base arena assumptions relevant to acoustics:

- Fully covered, with full or partial transparent roof - ETFE.
- Capacity for 25,000 permanent plus 5,000 temporary seats in primary mode. Capacity of 35,000+ for concerts.
- Ability for the arena to host other events year round, including expos, concerts, festivals, trade shows etc.
- Facilities appropriate for International events.
- Initially, exclude non-arena facilities such as hotels, gymnasiums, commercial/office space, apartments, multi-storey car-parking etc, however consideration of how such facilities would integrate in the future could be considered.
- The exterior must offer visual interest.

The project scope also provides core arena design considerations relevant to acoustics:

- Events – assume an average eight Super Rugby, eight Mitre 10 cup, one Rugby international, two Rugby League and one football sporting events; plus five concerts per annum. In addition, there may be expos etc.
- Ventilation, heating and heat release regarding in-situ turf growing considerations must be addressed.
- It is generally accepted that the light-weight ETFE roof solution at Forsyth Barr Stadium creates a lively and reverberant response that adds to a sports event experience. However, this effect is negatively perceived for PA and during concerts. There is a desire to improve the acoustic performance internally for CMUA in respect of concerts. The ETFE solution is also a significant factor in terms of noise break-out. While likely to be acceptable during sports events, during concerts after 10pm noise complaints are likely to be an issue. Any permanent ventilation openings created as part of turf management also allow significant noise break-out, which must be managed.
- The architect, structural engineer, mechanical engineer, acoustician and potentially also the fire engineer and turf consultant must address these 2 disparate requirements.

1.1 Sports Events Noise Levels

1.1.1 PA Noise

It is common to have music or speeches occurring pre-and post-match, as well as during games, e.g. national anthems, on field interviews, etc.

These noise levels need to be loud enough that the audience can clearly hear the commentary. The level required can be minimised by a well designed and installed PA sound system which could incorporate a noise limiter to prevent excessive noise levels. This is particularly relevant where the surrounding neighbourhood is predominantly residential in nature, as minimising noise effects from these regularly occurring events is a key consideration.

Nonetheless, a minimum noise level is required to effectively communicate to the audience. The reverberant noise level within the arena would typically range between 90 – 95 dB L_{Aeq}.

Table 1 provides typical noise spectrum for the PA system during sports events.

1.1.2 Crowd noise

Crowd noise during sports events can often be the dominant noise source. However, this is an uncontrollable noise source and it is generally accepted that crowd noise is excluded from any noise controls (this is the case for the majority of arena and stadia facilities throughout New Zealand).

1.2 Music Events Noise Levels

Music events such as large rock concerts typically generate reverberant noise levels in the range of 105 - 110 dB L_{Aeq}, with a significant amount of low frequency content.

Noise from music events is more difficult to control than sporting events, as a sound system will be brought in and operated by the touring company specifically for the event, rather than by the Arena operator. Table 1 provides typical noise spectrum for music events.

Table 1: Event Noise Levels

Source	Octave Band Centre Frequency (Hz)							dBA
	63	125	250	500	1000	2000	4000	
Sports Event	93	93	93	93	88	88	83	95
Music Event	112	107	107	102	97	97	92	105

1.3 Assessment Criteria

In assessing the acoustic performance of the arena, consideration needs to be given to:

1. Noise emissions from the arena

This report will consider only event noise. However, at design stage noise emissions from vehicle movements on site and building services equipment will also need to be assessed.

2. Room acoustics of the enclosed arena

While the internal acoustic environment is not necessarily a critical factor for sports events, it is of paramount concern for music events. There may be opportunity within the design to provide some variability to the room acoustics that would increase the flexibility and range of event types that could be hosted successfully.

¹ Rp 001 R04 20171104 Canterbury Multi Use Arena Strategic Assessment – Acoustics, 7 December 2017.

2.0 PLANNING, REGULATORY AND AMENITY CONSIDERATIONS

2.1 Christchurch District Plan Requirements

2.1.1 Central City Noise Rules

The CMUA site is covered by **Designation H4 Stadium**, required by the Minister supporting Greater Christchurch Regeneration. The Designation lapses on 31 July 2022 unless given effect. No specific noise rules are incorporated into the Designation. The area of the Designation overlay has underlying zoning of *Central City Mixed Use (CCMU) and Transport Zone*. The CCMU zone also extends to the east, south and southwest of the site.

To the west, adjacent sites are zoned:

- Commercial Central City (South Frame)
- Mixed Use (CCF)
- Commercial Central City Business Zone (CB),

To the north sites are zoned:

- Residential Central City (RCC)
- Open Space Community Parks (OCP).

The zoning map is shown in Figure 1. The CCF and CCMU zoned land west of Madras Street lies within the Category 2 Entertainment and Hospitality Precincts, while all other immediately adjacent sites lie within the Category 3 Lower Noise Area. (See Figure 2)

The applicable noise limits can be found in Rule 6.1.5.2.2 (Noise Limits within the Central City), which are summarised below in Table 2.

These rules apply at any point within a site receiving noise from the activity (excluding Transport Zones or Open Space Zones). Where activities exceed the permitted activity standards, the following apply:

- Activities exceeding by 10 decibels or less shall have restricted discretionary status (Rule 6.1.5.1.2).
- Activities exceeding by more than 10 decibels are non-complying with respect to noise (Rule 6.1.5.1.4).

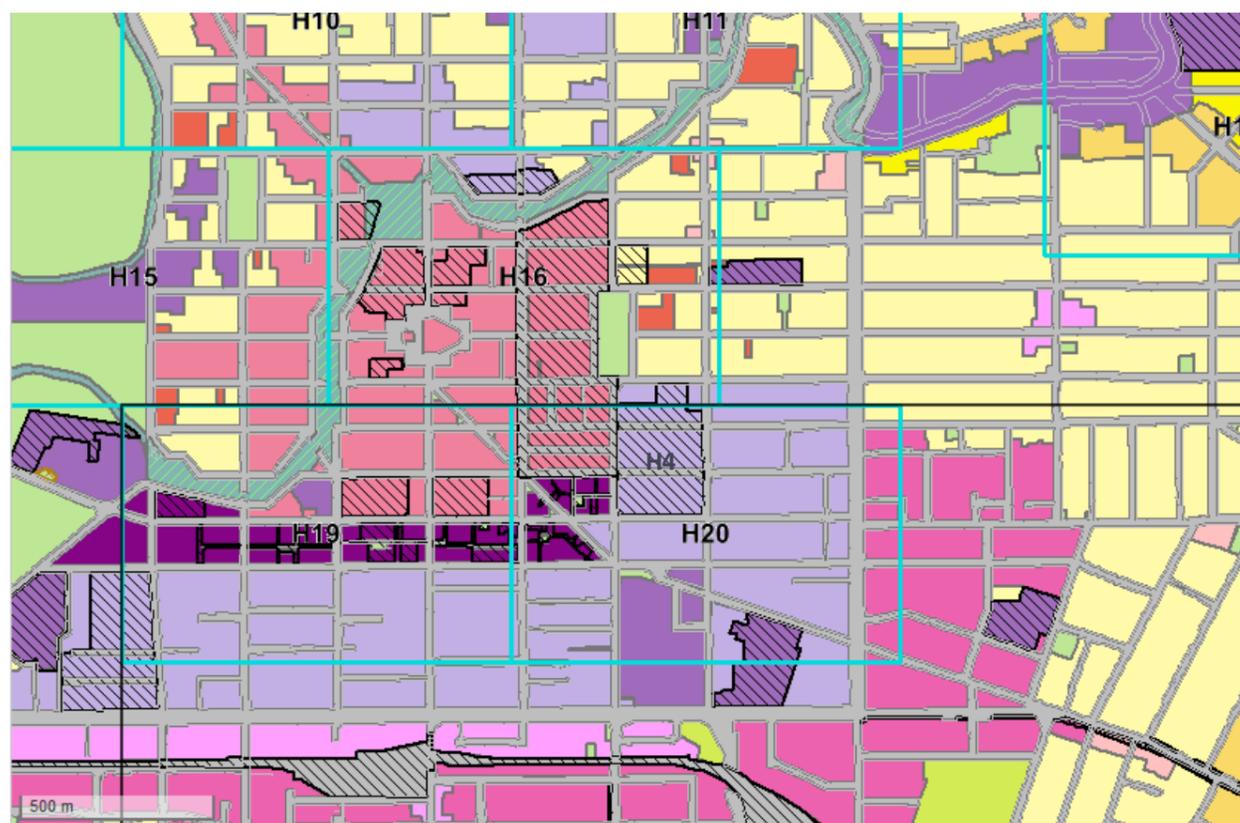
Rule 6.1.4.1 requires that, unless otherwise specified, noise should be measured in accordance with New Zealand Standard NZS 6801:2008 “Acoustics – Measurement of environmental sound” and assessed in accordance with New Zealand Standard NZS 6802:2008 “Acoustics - Environmental Noise” (except that provisions referring to Special Audible Characteristics shall not be applied).

While the fragmentation of zoning type and tiered noise limits makes for a complex planning environment at first glance, the overriding consideration is that much of both the immediately surrounding land and the city centre more generally allows for residential development. However, the applicable noise limits and the reduced hours of night-time also indicate that a reduced level of outdoor noise amenity can be expected in the central city, as opposed to more suburban areas of Christchurch.

Table 2: Zone noise limits (excerpt from Table 2, Section 6.1.5.2.2)

Category of Precinct in which the site receiving noise is located	Applicable to:	Time (Hrs)	Noise Limit		Exemptions
			dB L _{Aeq}	dB L _{Amax}	
a. Category 1: Higher noise level entertainment and hospitality precincts.	Activities other than discrete outdoor entertainment events	0700-0300	60	85	Note 1
		0300-0700	60	75	
	Discrete outdoor entertainment events	0700-2200	65	85	
		2200-0700	65	85	
b. Category 2: Lower noise level entertainment and hospitality precincts.	All except Victoria Street area	0700-0100	60	85	Note 2
		0100-0700	50	75	
	Victoria Street area	0700-2300	55	85	
		2300-0700	50	75	
c. Category 3: All Central City Areas other than Category 1 and 2 entertainment and hospitality precincts.	All activities	0700-2300	55	85	Note 3
		2300-0700	45	75	
1 This shall not include noise from people in outdoor areas of premises licensed for the sale, supply and/or consumption of alcohol that meet the specified outdoor area setback required by Rule 6.1.6.2.10.					
2 This shall not include noise from people in outdoor areas of premises licensed for the sale, supply and/or consumption of alcohol that meet the specified outdoor area setback required by Rule 6.1.6.2.10, between 0700 hours and 2300 hours for the Victoria Street area and between 0700 hours and 0100 hours for the remainder of Category 2.					
3 This shall not include noise from people in outdoor areas of premises licensed for the sale, supply and/or consumption of alcohol up to a maximum size of 50m ² , in all Category 3 Zones except Central City Residential Zone, between 0700 hours and 2300 hours.					

Figure 1: Christchurch City Zoning Map



Land Use Zones

Zone	Description
ARP	Avon River Precinct (Te Papa Ōtākaro) Zone
CB	Commercial Central City Business Zone
CCMU	Commercial Central City Mixed Use Zone
CSF	Commercial Central City (South Frame) Mixed Use Zone
CC	Commercial Core Zone
CL	Commercial Local Zone
CRP	Commercial Retail Park Zone
IG	Industrial General Zone
OCP	Open Space Community Parks Zone
OMF	Open Space Metropolitan Facilities Zone
OWM	Open Space Water and Margins Zone
RCC	Residential Central City Zone
RGA	Residential Guest Accommodation Zone
RMD	Residential Medium Density Zone
RS	Residential Suburban Zone
RSDT	Residential Suburban Density Transition Zone
SPC	Specific Purpose Cemetery Zone
SPLR	Specific Purpose Flat Land Recovery Zone
SPH	Specific Purpose Hospital Zone
SPS	Specific Purpose School Zone
SPT	Specific Purpose Tertiary Education Zone
	Transport Zone

Figure 2: Christchurch City Context Plan



2.1.2 Sound Insulation

With allowable higher noise levels within the city centre, the District Plan now includes minimum sound insulation requirements for sensitive receivers such as dwellings (Rule 6.1.6.2.9). These requirements can be summarised as:

A Category 2 Precincts:

- 35 dB $D_{tr, 2m, nT, w} + C_{tr}$ for bedrooms;
- 30 dB $D_{tr, 2m, nT, w} + C_{tr}$ for other habitable spaces.

B Category 3 Precincts adjoining the Category 1 Precinct:

- 35 dB $D_{tr, 2m, nT, w} + C_{tr}$ for bedrooms;
- 30 dB $D_{tr, 2m, nT, w} + C_{tr}$ for other habitable spaces.

C Category 3 Precincts zoned residential, if within 75 metres of a Category 1 or 2 Precinct or H8 Stadium (Incorporating Spectator Events Facility) shown on Planning Maps 32 and 39, and not already covered by B. above:

- 30 dB $D_{tr, 2m, nT, w} + C_{tr}$ for bedrooms.

D Category 3 Precincts zoned Commercial Central City Business, Commercial Central City Mixed Use, Commercial Central City Mixed Use (South Frame) and Commercial Local and not already covered by B. above:

- 30 dB $D_{tr, 2m, nT, w} + C_{tr}$ for bedrooms.

The combined effect of the relaxed noise limit/time and the enhanced sound insulation rule is to ensure that a reasonable indoor noise level will be achievable, particularly in bedrooms, during the critical late evening period when people are preparing for sleep.

2.1.3 Temporary Activities (Temporary Christchurch Stadium)

Rule 6.1.5.2.2 outlines noise limits for temporary activities intended to control adverse effects arising from general entertainment noise from music and non-people noise associated with activities such as bars and restaurants. However, such noise limits are not appropriate to address large-scale sporting fixtures or concerts that will generate significantly greater noise levels on a limited number of occasions throughout the year.

For such events, more appropriate noise limits can be found in the Open Space Metropolitan Facilities Zone (Temporary Christchurch Stadium) rules at 18.5.4.1.

Activity standards P1 and P2 limit noise generated by sporting events (and non-sporting events excluding concerts) to no more than:

- 65 dB L_{Aeq} (excluding crowd noise).

Activity standard P4 places limitations on hours of operation and noise:

- Permitted until 2200 or 2300 hours
- Noise limit of 85 dB L_{Aeq} at any sensitive dwelling

From our involvement in monitoring concert events at the Christchurch Temporary Stadium, we are aware that for the limited number of events occurring each year, the existing noise limit is moderately well tolerated until 2200 hours, after which time the number of complaints increases significantly with a spike around the time an event is scheduled to end. This suggests that the level of noise is regarded as intrusive and unwelcome by many but is tolerated on the basis that such events are rare and finish at a reasonable time.

2.2 Other Concert Venue Limits

In addition to the District Plan Rules discussed above, MDA has previously provided advice to Christchurch City Council regarding appropriate noise levels from events at AMI Stadium (Lancaster Park) during the rebuild of the East Stand² and to CERA when considering appropriate noise and sound insulation rules associated with an East Frame Stadium (now Designation H4)³.

2.2.1 AMI Stadium

For AMI Stadium, limits on the number of events and noise limit were applied:

- a maximum of six concerts in any two-year period is allowed (typically three per year)
- 65 dB L_{A10} (1 hour) and 85 dB L_{Amax}
- concerts finishing no later than 2300 hours and of no greater duration than 4.5 hours

By comparison to other stadia around New Zealand, AMI had rather stringent noise limits.

2.2.2 CERA

Similarly, when considering the East Frame Stadium on behalf of CERA, we recommended a combination of noise limits along with sound insulation rules consistent with those described Section 2.1.2 for nearby noise sensitive activities:

- 60 dB L_{Aeq} for sporting events – excluding crowd noise
- 75 dB L_{Aeq} for concerts

This assumes:

- 25 sporting events; and
- 3 concerts per year.

2.2.3 Other New Zealand Stadia

Marshall Day summarised District Plan and Consent noise limits applying to stadia around New Zealand in 2014 and updated several entries in this table in 2015. Each venue has additional rules and conditions, which we have not provided for the sake of brevity. This summarised data is provided in Appendix B.

While there is a significant range in noise limits applying at different venues, the general trend tends to be a limit of 80 to 85 dB L_{A10} for events finishing between 2200 and 2300 hours. Some venues have event finish times that are earlier or later than 2200 hours and some venues have lower (75 dB L_{A10}) or greater (90 dB L_{A10}) noise limits.

As a general trend, more permissive noise and time limits (louder or later) tend to be restricted in number.

² Rp 001 R05 2008108, dated 25th August 2008.

³ Lt 001 R01 2013644, dated 7th May 2016.

2.2.4 Marvel Stadium (Melbourne Docklands)

For Marvel Stadium there are a number of noise controls in place:

- No noise limit applies at noise sensitive receivers *within* the Docklands Precinct (variable distances, but consider ~450m from centre of arena as a good proxy);
- Noise sensitive receivers within the Docklands precinct are required to be designed to achieve no more than 40 dB L_{Aeq} within bedrooms. As no upper noise limit for concerts is provided, this does require the developer take on some risk;
- Music noise from concerts may not exceed 5 dB L_{Aeq} at noise sensitive receivers *outside* the Docklands precinct; and
- Concerts at Marvel Arena must be managed in accordance with a noise management plan approved by the relevant authority.

Thus, Marvel Arena has a number of key similarities and differences to the regulatory environment applying to CMUA.

We note that concerts at Marvel are generally held with the retractable solid roof *closed*.

2.2.5 Code of Practice on Environmental Noise Control at Concerts

The Noise Council of the Chartered Institute of Environmental Health (UK) have published a code of practice outlining guidelines for noise limits on concert venues. This document, which is widely used as a guidance document outside both within and outside the UK, specifies that the following noise limits should not be exceeded:

Table 3: Noise Council Specified Noise Limits

Concert days per calendar year, per venue	Venue Category	Guideline Value
1 to 3	Urban stadia or arenas	The music noise level should not exceed 75 dB L_{Aeq} (1 hour)
1 to 3	Outer urban and rural venues	The music noise level should not exceed 65 dB L_{Aeq} (1 hour)
4 to 12	All venues	The music noise level should not exceed the background noise level by more than 15 dB L_{Aeq} over a 15-minute period

According to these guidelines, a noise level of 75 dB L_{Aeq} (1hour) would likely be acceptable for up to three events every year without causing significant annoyance.

2.3 Summary of Noise Guidance

This guidance would indicate that a noise limits of 75 dB L_{Aeq} would not be unreasonable for concerts. In fact, many other entertainment venues around the country are permitted to hold events every year with noise limits of 80 – 85 dB L_{A10} (and some locations up to 90 dB L_{A10}), so higher noise limits may be appropriate, although this is dependent on what other controls are in place, such as event duration, finishing time, sound insulation of residential dwellings, etc and the overarching expectations set for the environment in the district Plan.

Nonetheless, in line with the discussion above, should the number of concerts or similar events be greater than three per year, we would recommend a lower noise limit as being ideal, increased sound insulation for nearby noise sensitive activities, a combination of both or restrictions on the development of noise sensitive activities within a defined area close to the CMUA.

It is beyond the scope of this report to determine where exactly such criteria would apply but given the implications inherent in choosing an arena roof and north wall with poor sound insulation it is important to have this context.

3.0 RECOMMENDED CRITERIA

Table 4 summarises our recommended objective design criteria for the arena.

Table 4: Recommended Objective Criteria for Breakout Noise

Criteria	
Boundary Noise Limits	
Christchurch City Plan	55 - 65 dB L_{Aeq}
MDA Suggested Concert Limit (ideal)	<75 dB L_{Aeq}
MDA Suggested Concert Limit (practical)	<85 dB L_{Aeq}

Additionally, the arena should be designed to be:

- Free from undesirable reflections;
- Free from acoustic focussing;
- Free from long time delays from loudspeaker source to receiver;
- Free from excessive low frequency reverberation;
- Free from undesirable acoustic anomalies; and
- Free of tonal and spectral content arising from building services and lighting (LED lights and active loudspeakers are prone to excessive cooling fan noise).

4.0 NOISE BREAKOUT TO THE ENVIRONMENT

Owing to the projects time constraints, we have restricted our modelling⁴ efforts to consideration of large-scale concerts in a North-South arena orientation - considered preferable for site activation and linkages to the wider city - while still being workable for turf growth.

Should an East-West design option be considered, results across the broader central city would be similar, but at shorter distances (<400 metres) we would expect a larger number of sites would receive noise levels above our proposed ideal noise level of 75 dB L_{Aeq} during concerts. In summary, our modelling assumes:

- A North-South long axis orientation;
- ETFE to majority of roof and north wall;
- Modest sound insulation to East, West and South walls and to remainder of roof not made from ETFE;
- Ventilation opening within, or immediately adjacent to, ETFE are not acoustically treated;
- Ventilation openings elsewhere are acoustically mitigated as described below; and
- A reverberant music noise level internally of 105 dB L_{Aeq} with the spectrum provided in Table 1.

Figures showing modelled noise breakout at different heights above ground and in sections through the CMUA are provided below to better describe the impacts of using different façade materials and ventilation strategies.

The purpose and critical factors associated with each figure or set of figures are described in the sections below.

Before considering these results, we provide some more detailed discussion of the Baseline Design building envelope materials that have been utilised in assessing the sound insulation performance of the CMUA.

4.1 Low Noise-Attenuation Materials

Two factors of the Baseline Design for CMUA allow for significant noise breakout. This will be especially evident during concerts and similar high-noise events. These factors are:

- The ETFE roof and north wall, which are acoustically transparent at low frequency and have little sound insulation benefit at high frequency; and
- Ventilation openings associated with turf ventilation and building cooling.

4.1.1 ETFE

The ETFE elements can be considered to all intents and purposes acoustically transparent (see Table 5). As a result, noise emissions from the arena will be significantly higher than for a solid roof construction.

Table 5: Approximate Transmission Loss of ETFE

	Octave Band Centre Frequency (Hz)						
	63	125	250	500	1000	2000	4000
Transmission Loss	1	3	2	7	8	10	14

There are no engineering noise control methods that can be applied to the ETFE surfaces that will also allow meaningful photosynthetic light to pass and which are also proven to have satisfactory longevity and cleanability.

Because of the considerable cost of such microperforated membranes, the resulting negative impact on turf growth and potential issues around longevity (UV and cleaning), we have not examined such systems further.

4.1.2 Ventilation

The current baseline design assumes that ventilation required for both turf health and cooling in event mode will be provided largely passively (much of the West stand excepted). Such ventilation openings are of necessity extremely large and must be arranged both to make use of dominant wind directions and to provide a reasonably even distribution of air both across the playing field at turf level and throughout the building concourse and stands during events.

Passive ventilation also requires that the pressure drop across ventilation openings is low. Engineering noise controls such as acoustic louvres, attenuators, plenums or lined bends tend to generate significant pressure drops, which in turn require larger open areas to achieve the necessary ventilation. Such engineering controls

can also be a significant expense (~\$2,000+GST/m² not including installation and supporting structure or mullions etc).

The acoustic transparency of the ETFE roof can be used to our advantage in this context. Placing ventilation openings immediately adjacent to, or within, the ETFE surface makes comparatively little difference to noise levels at receiving properties already exposed to high noise levels passing through the ETFE alone. In contrast, placing large unattenuated ventilation openings within solid areas of roof or walls does result in large increases in noise level.

By agreement with Populous and Aurecon, we have modelled the Baseline Design such that roof level ventilation is confined to the perimeter of the ETFE roof. This ventilation *is not attenuated*. By contrast, ventilation and heating/cooling for much of the West Stand, particularly the function room, suites, media and team facilities, including back of house and administration facilities, will be provided by mechanical plant. The plant rooms will receive and discharge air through acoustically treated louvres on the west side of the CUMA. We have assumed that such mechanical plant would be designed to comply with the underlying District Plan Noise limits.

The remaining ventilation paths are in the lower half of the CMUA Eastern, Southern and South-Eastern walls and the underside of the first tier of seats in the arena bowl. At time of writing the exact placement and extent of ventilation openings on the exterior wall have not been finalised and agreed between all parties.

For this reason, we present two scenarios:

1. A 'localised' option, where open areas during concert mode are confined to the main vomitory openings (each approximately 30 m² in area, and additional minimal façade openings which are acoustically attenuated.
2. A 'distributed' option is which ventilation area across the specified walls is both greater in open area and distribution and no acoustic attenuation is provided.

The greatest impact of adopting a solution resembling Option 2 will likely be felt in the first 200-400 metres from the CMUA at building heights generally less than three stories.

⁴ All modelling of environmental noise has been carried out using SoundPLAN v8.1 implementing ISO 9613.2: 1996.

4.2 High Noise-Attenuation Materials

In addition to the ETFE and ventilation areas, we have allowed for four other surface types in our noise breakout model of the CMUA:

1. Shingles/General wall cladding;
2. Concrete panels;
3. Glazed areas; and
4. Solid roof.

4.2.1 Shingles/General Walls

We understand that the current Baseline Design utilises large 'shingles' to form the wall surfaces of the CMUA, where this is not comprised of glass, concrete, ETFE or ventilation openings. Except where specified we have assumed that this façade element will form an acoustically sealed façade. The overall performance of this façade element is assumed to be equivalent to a material such as 18 mm compressed fibre cement sheet, although this does not limit the design choice to this material alone.

4.2.2 Concrete Panels

We have allowed for the walls from ground level to concourse height to be 100 mm thick concrete panels, except where the area is glazed (East, South and West entries), openings for vehicle access or ventilation (vomitories etc), or where ETFE is used (north wall).

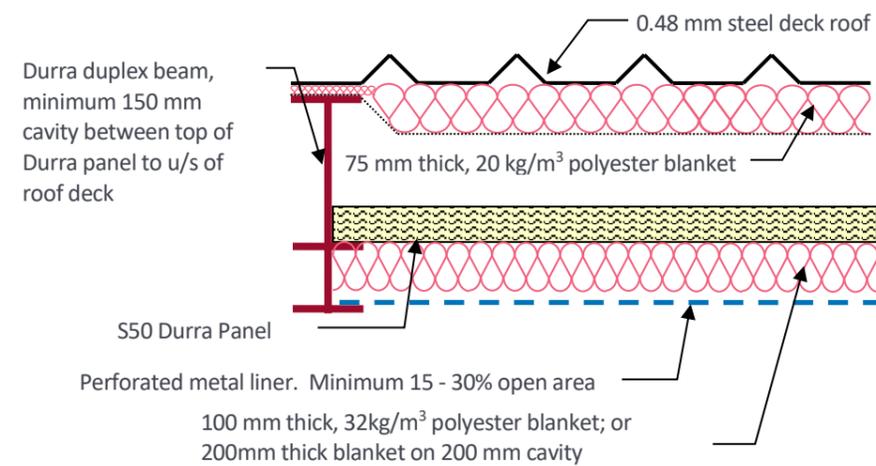
4.2.3 Glazed Areas

We have allowed for glazing for the full width of the West, South and East entries including doors to the full height of any stairs or associated concourse areas. Glass thickness will be determined by structural and wind loads based on a large pane size we have assumed a minimum of 20 mm laminated glazing (not double glazed).

4.2.4 Solid Roof

We have modelled the solid areas of the CMUA roof as being similar to Margaret Court Arena (Melbourne). This roof provides a modest degree of sound insulation, assisting in achieving useful reductions in noise breakout to the West, East and South of the CMUA, while also providing late afternoon shading for patrons and a place to apply internal acoustic treatment (absorption) to prevent the environment becoming overly reverberant. The construction is provided in Figure 3.

Figure 3: Possible solid roof construction



4.3 Noise contour at 11m above ground

We provide a noise contour at this height above ground as this is indicative of likely spread of noise across the broader City, where there are few buildings able to provide significant screening.

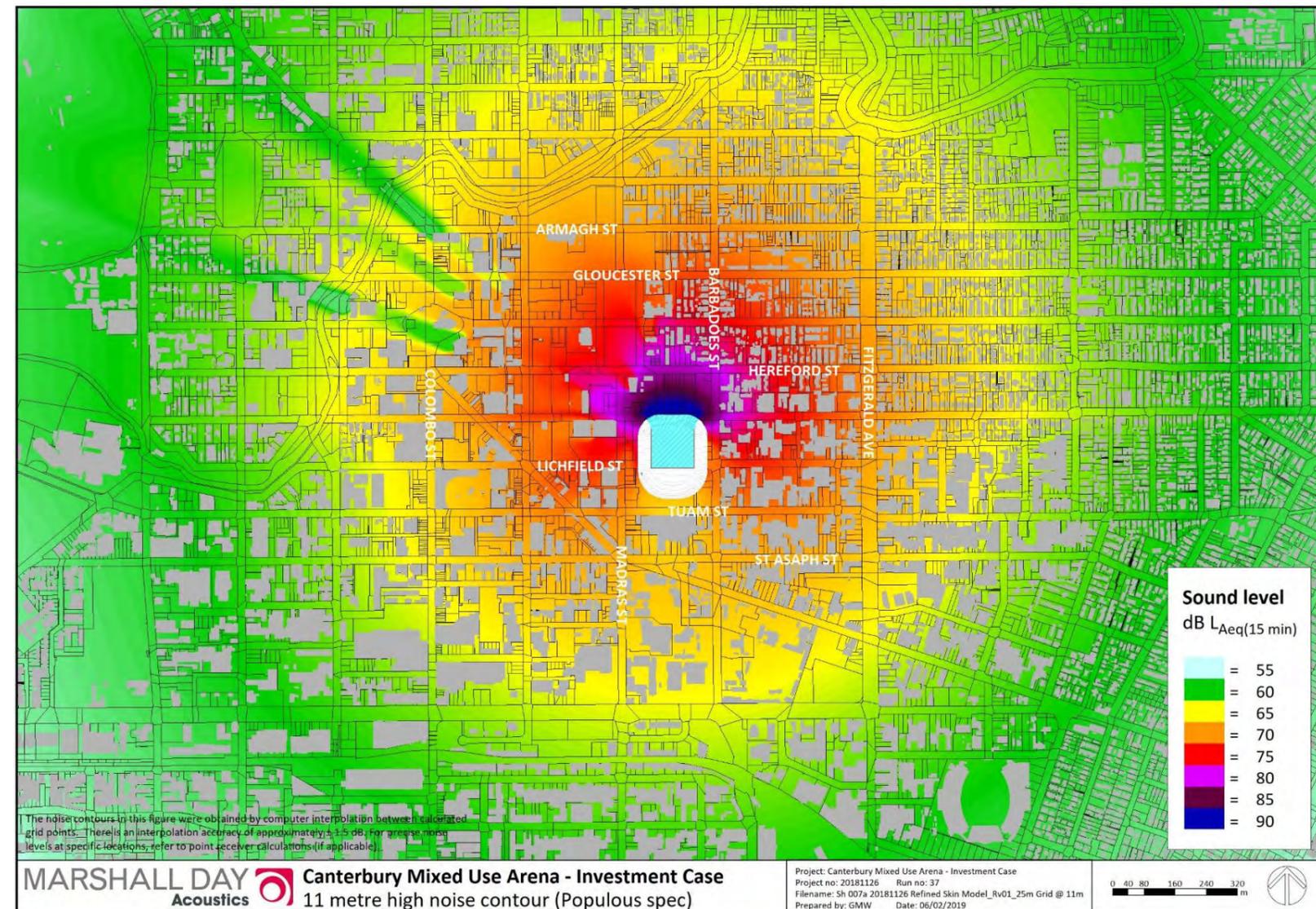
Figure 4 (larger version in Appendix C1) demonstrates that buildings of four storeys or taller cast significant acoustic shadows, screening building behind them from greater noise levels. This is particularly pronounced in the case of the cluster of tall hotel buildings in the vicinity of Cathedral Square, but is also demonstrated to some extent by the Cardboard Cathedral and the IRD building near the northwest corner of the Designation.

Much of the remaining northern portion of the CMUA site is exposed to noise levels of 85 to 100 dB L_{Aeq} .

Noise levels greater than 75 dB L_{Aeq} can be anticipated broadly within the area bounded by Tuam, Manchester, Gloucester streets and Fitzgerald Avenue.

Noise levels of around 85 dB L_{Aeq} can be anticipated at residential or mixed use sites facing the site on portions of Madras, Gloucester and Barbados Streets.

Figure 4: Noise contours at 11m above ground.



4.4 Noise contour at 1.5m above ground

We provide a noise contour at this height above ground as this is indicative of likely spread of noise across a relatively localised area of the broader CMUA neighbourhood. The influence of nearby buildings as both reflectors and screens of sound become apparent.

4.4.1 Localised (populous/MDA) proposed ventilation

Figure 5 (larger version in Appendix C2) demonstrates that existing buildings close to the CMUA site cast significant acoustic shadows, screening building behind them from greater noise levels. This is particularly pronounced for existing buildings on the north side of Hereford Street and when comparing the presence of existing buildings on Barbados Street (northeast of the site) to the absence of buildings on Madras Street (northwest of the site).

Much of the East Frame Residential and RCC Zones north of Lichfield Street is exposed to noise levels in the range 70-85 dB L_{Aeq} . As buildings infill this area, localised screening will be provided to sites beyond any new buildings, provided these do not exceed three storeys in height. The degree of screening provided will depend very much on the orientation and bulk of any new buildings.

4.4.2 Distributed (Aurecon) proposed ventilation

Figure 6 (larger version in Appendix C3) is broadly similar to the more localised ventilation scenario pictured in Figure 5, but with a greater spread of 70 dB L_{Aeq} and greater noise to the immediate West, South and East of the CMUA.

This is because of the greater ventilation open area allowed for.

Figure 5: Noise contours at 1.5m above ground – localised ventilation option.

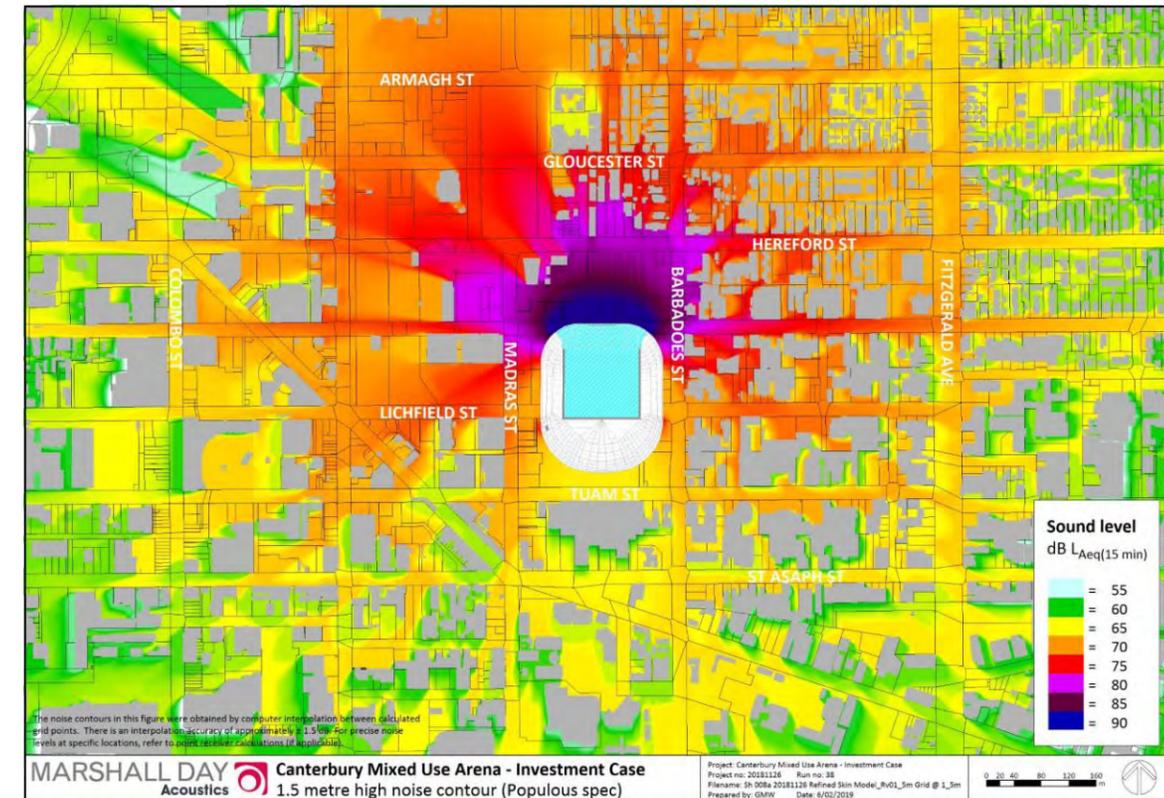
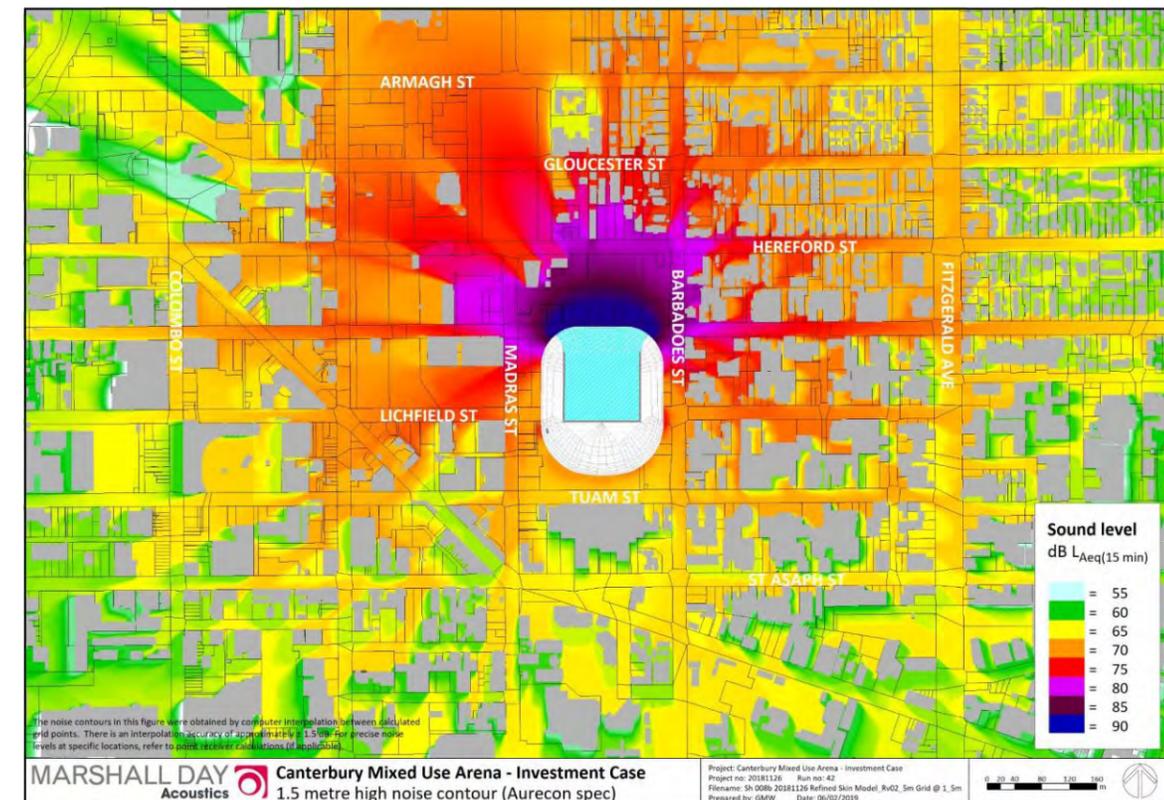


Figure 6: Noise contours at 1.5m above ground – distributed ventilation option.



4.5 Localised ventilation option 3D view 1.5m noise contour

Figure 7 (larger copy in Appendix C4) provides a zoomed in 3D view of part of Figure 5 from a viewpoint close to the intersection of Tuam and Barbados Streets, looking Northwest towards Cathedral Square. Latimer Square is shown as the cluster of trees to the centre right, with the East Frame residential area beyond.

Acoustic screening from existing buildings is evident, as is localised increases in noise breakout around ventilation openings.

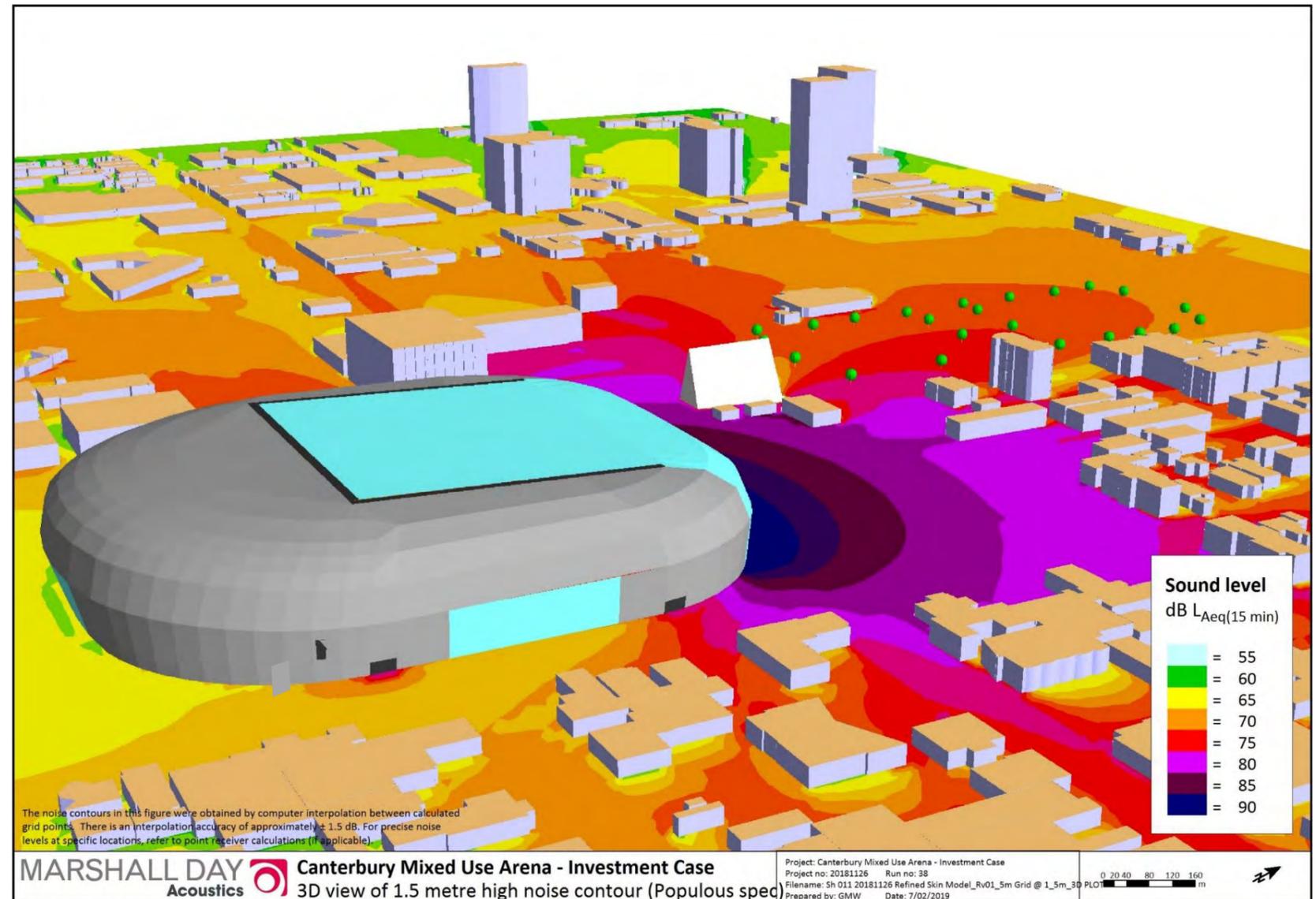
4.6 Cross Section noise contours through site

Cross sections of noise breakout from the CMUA for both Localised and distributed ventilation options are provided in Appendices C5 and C6. These cross sections should be viewed in conjunction with Appendices C3 and C4 (Figure 5 and Figure 6 respectively). The effect of varying ventilation opening location and size around the concourse and undercroft may appear somewhat subtle, but in practice the distributed option currently favoured by Aurecon would result in noise increases of 3-5 dB at closest sites to the West, South and East.

We note that neither ventilation has been fully developed and in some instances, MDA has had to interpret the exact location and size of openings described simply as 'large'.

Understanding the full effect of the ventilation openings requires further design work by multiple parties, including examining options for mitigation of noise emissions arising from any proposed design.

Figure 7: 3D Noise contour plot at 1.5m above ground (localised ventilation option)



4.7 Summary of Noise Breakout Considerations

Although the CMUA site is designated and the Designation has no noise rules or limits associated with it, we are mindful that venues which are perceived as being too noisy can be subject to complaints and political pressure from residents.

There are numerous examples across New Zealand and elsewhere of entertainment and civic facilities and infrastructure such as airports and ports that have found their lawfully conducted activities are ultimately constrained because of sustained complaints and public action. Where resident views and expectations are not achieved, resistance to concerts can be very strong (Eden Park). This contrasts with for example Claudelands Arena where MDA staff undertaking compliance monitoring of a concert had to assure a member of the public that a concert was in fact taking place. Thus, while the CMUA Designation does not apply limits, we consider it prudent to consider what guidance would represent an appropriate and reasonable level of noise sustainable in the long term.

In considering noise breakout to the community from the CMUA and taking the information provided in Section 2 into account, we have assumed noise levels at the following nearest residential zone boundaries:

- 65 dB L_{Aeq} for sports events; and
- 75 dB L_{Aeq} for concert events (Recommended Limit)

Note that with a concert limit of 75 dB L_{Aeq} we would anticipate that a maximum number of 3 concerts per year would be acceptable to the local community.

The calculated noise levels at the nearest residential zone boundary are summarised in Table 6.

Table 6: Noise level at nearest residential boundary

Event Type	Noise Level (dB L_{Aeq})	Excess of Guidance
Sports (excl crowd noise)	65-75	0-10
Concerts	75-85	0-10

At such noise levels, both sporting and concert events would most probably be limited in duration, timing and number, while it may also be necessary to change sound insulation requirements across a swathe of the central city.

In our view, noise levels at nearest dwellings of up to 75 dB L_{Aeq} prior to 2230 hours are likely to be reasonably well tolerated on a regular basis (perhaps 3 -6 times per year), particularly if community expectations are well managed. It has been our experience that noise arising from sporting events (which also tend to finish earlier) are better tolerated than noise from concerts (which have greater low frequency noise and tend to run later and longer).

The Baseline Design is broadly capable of achieving our suggested guidance to the south of Lichfield Street, but will exceed this guidance by up to around 10 dB north of Lichfield Street, especially directly north of the site on Hereford Street and to a lesser extent across much of the East Frame.

Planning/Legal advice is required to determine whether S16 and S17 of the RMA applies to noise generated by the Designation. In our opinion, noise at up to 75 dB L_{Aeq} for limited duration, finishing at 2230 hours and of limited occurrence throughout the year would not be unreasonable. It must be said that there is no hard standard as to how noise level and character, duration of event, time of finish and number of occurrences in a given period combine to define unreasonableness. While there are many examples of stadia in New Zealand that permit noise levels of around 85 dB for concerts (Appendix B), in practice many of these stadia do not exercise the full allocation of events permitted by their consent/planning provision.

There is certainly an argument to be made that for a limited number of events, noise levels of up to 85 dB L_{Aeq} may be acceptable to the community if appropriate restriction, management or planning expectations are implemented.

Given the lack of an acceptable engineering solution to noise breakout the North of the CMUA, we consider it critical that the following matters are addressed:

- Building services noise such as HVAC (where provided) be designed to comply with the applicable District Plan night-time noise limits for surrounding zones;
- Electrical generator be designed to comply with the applicable District Plan daytime noise limits, unless operation past 2300 hours is envisioned in which case compliance with the night-time limits should be achieved;
- PA system is designed to achieve the required performance, while resulting in the lowest level of noise to community possible;
- A noise management plan (NMP) for the operation of all activities on the site be developed that address how noise effects on the surrounding community be minimised and mitigated. This NMP should include, but not be limited to, matters such as maximum PA and concert noise level, cleaning and pack out following events, rubbish collection, management of heavy vehicles or equipment on site at night, duration, finishing time and number for events; and
- Changes to the District Plan rules, perhaps via overlays or other appropriate means to restrict noise sensitive development in localised areas most likely to be adversely affected by the CMUA, or to encourage development of types that are most likely to be compatible with the CMUA (for example accommodation likely to be booked by patrons attending an event at CMUA).

5.0 RAIN NOISE

The ETFE roof essentially acts like the skin of a drum and is very efficient at re-radiating the noise generated by rain impacting on the roof.

Development has focussed on 'rain suppressors' to reduce the rain noise levels. These 'rain suppressors' are a mesh fabric that is installed on top of the ETFE that dissipates the rain drops, reducing the rain drop impact on the roof.

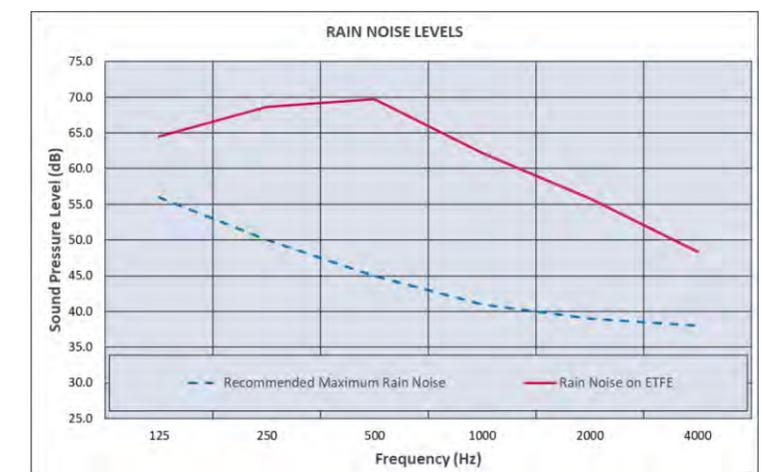
However, while a significant reduction can be achieved (around 10 – 13 decibels), even with the rain suppressor installed, rain noise levels within the arena would still exceed our recommended criteria. In addition, feedback from other disciplines has been that the increases in the need for cleaning and additional supporting structure, cost and the decrease in light transmission through the roof all suggest that rain suppressors would not be suitable for consideration in the CMUA Baseline Design. For these reasons we have not considered rain noise suppressors further.

While rain noise would not be detrimental to sports events, there is the possibility that music events would be disrupted during periods of high intensity rain as the background noise level would be significantly elevated. This would be most noticeable during periods of speech or for quiet music.

This may be considered a low risk in Christchurch given the low rainfall and typically short duration of high intensity rainfall.

Predicted rain noise in a design event, compared to the ideal specification, is provided in Figure 8.

Figure 8: Rain Noise Levels



6.0 SOUND QUALITY WITHIN THE CMUA

6.1 Concert Mode

Preliminary modelling of the room acoustics properties of the Baseline CMUA design (North-South orientation) as proposed has been carried out⁵. We have considered both 'large' (35,000-person capacity, audience standing on covered grass and occupying all but northern seats) and 'small' (just South stand and corner seats utilised) concert modes. For the large concert mode we have assumed that staging will be located to the immediate north of the playing field and that primary loud speaker stacks will be mounted off ground rigging erected for the event. For smaller events we have assumed that loudspeaker arrays will be suspended from the main truss line dividing the solid and ETFE roof constructions.

This modelling does not represent a fully developed design. Rather, the purpose is to establish that the CMUA baseline design is capable of providing a good quality experience for a wide variety of events.

A number of positive factors were noted. Spread of sound within the CMUA was acceptably even with no major areas of shadowing. There were no strong adverse reflections from the main ETFE roof area and reflections from the ETFE North wall were weak and diffuse.

The modelling did highlight some areas that must be addressed in the formal design phase. These were:

- The overall reverberation time (T30) was longer than ideal, especially in the critical 125 Hz octave. Failing to address this issue will result in a 'boomy' sound and reduced clarity, particularly for vocals.
- A number of vertical surfaces within the audience zone generate strong reflections. These are typified by the vertical concrete walls at circulation spaces on the terraces and the glass fronts of the Function Lounge, Suites, Team and Media boxes in the West Stand.
- Balustrades have been known to cause significant issues with adverse reflections. This was an issue in Vector Arena at the first rock concert held. The original post and wire balustrades had been replaced by flat glass. While the Baseline Design does not show balustrades, we expect that these will be present.

We provide possible solutions to each of these matters below.

6.1.1 Control of reverberation time

In large arena spaces significant absorption is required to achieve a suitably low level of reverberation for amplified music and sporting events.

It is important that the reverberation time is relatively balanced across the frequency range. Where there is insufficient low frequency

absorption the room becomes "boomy" which is particularly problematic for modern amplified music.

The occupied audience area provides predominantly mid and high frequency absorption. Loudspeakers are quite directional at these frequencies but are not directional at low frequencies. Absorptive room treatment should be a minimum of 200 - 500 mm thick to improve the low frequency performance and minimise the bass rise in reverberation.

While an absorptive fibreglass or polyester blanket would provide a lot of high frequency absorption, it is not practicable to install such a blanket in a sunlight transparent roof.

As a starting point for detailed design and costing, we recommend that the underside of the solid roof area of the CMUA is treated with fibrous thermal absorption at a density of 32 kg/m² and 200mm thick. This insulation should be over a 200-300 mm deep cavity to the roof above and on the room side should be covered with a slotted or perforated screen with approximately 30% open area.

There may be benefit in treating the vertical wall behind and above the highest row of seats. Currently we have not allowed for treatment in this area as there may also be some acoustic benefit in leaving this area hard. This is a matter to be resolved during formal design.

6.1.2 Vertical surfaces within audience bowl

As noted above, vertical surfaces such as terrace walls and glass fronts on premium areas must be treated to avoid reflections.

For areas of glass we have addressed this in the past by angling large fixed panes slightly downward similar to the concept used for recording studios (Figure 9, from Populous report page 46). Doors opening onto any terrace or balcony could be set back into an absorptively lined alcove. To eliminate return reflections.

Figure 9: Downward angled glass.

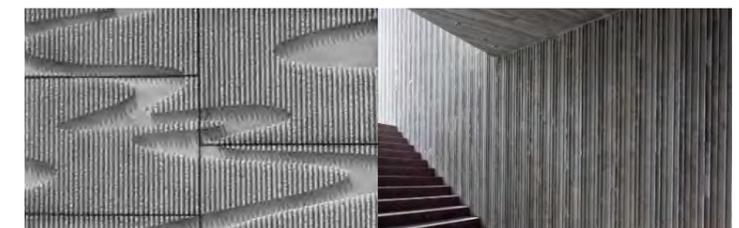
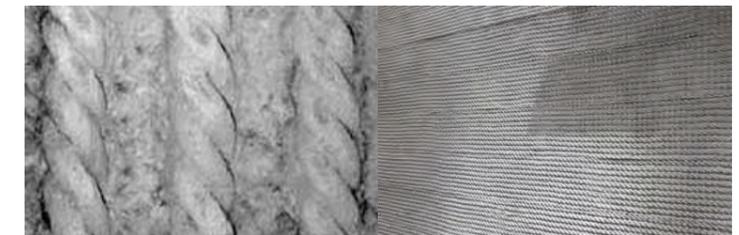


Areas of concrete upstand (Figure 10 – example shows black surfaces and unpainted concrete above – all to treat) can be cast to create surface roughness on the order of 20-50mm deep (the more variable the better). Examples are provided in Figure 11.

Figure 10: Areas of vertical concrete to treat.



Figure 11: vertical concrete treatment.



6.1.3 Balustrades

Balustrades are sometimes provided as either glass or concrete panels. For the CMUA we recommend balustrades are provided using finer materials such as pipe or wire (as in Figure 10). Where concrete must be used we recommend treating the field side of the balustrade as above. We do not recommend the use of glass balustrades, however, if glass is to be allowed, make provision for the hanging of heavy fabric curtains with minimum 40% pleat over these.

⁵ Odeon v15.0 Auditorium.

6.2 PA System Design

A well designed and implemented PA system is critical to both occupant safety and the user experience, especially for Sporting events where commentary must have both sufficient clarity and level to be easily intelligible over crowd noise and any music played to enhance atmosphere.

Because of the very large volume of the CMUA interior space, the challenging mix of surface finishes and the highly variable occupant volume we regard the design of the PA to be a specialist task.

In our experience allowance for design and provision of PA systems is frequently under costed in challenging environments with resulting poor performance.

6.3 Concourse Ceilings

As part of our calculation for noise breakout (Section 4), we have assumed that noise leaving the CMUA bowl via the Main East Concourse is reduced by means of an acoustically absorptive ceiling treatment. The minimum and preferred areas of ceiling treatment are shown in Figure 12 as red and blue shading respectively.

This ceiling treatment will also act to substantially improve patron comfort and experience while transiting what is often a painfully noisy area at time of peak occupation.

Figure 12: Areas of minimum (red) and optimal (blue) ceiling treatment.



Assuming that the concourse ceiling is constructed as per the Populous image (Figure 13, page 44 of Populous report), the acoustic treatment may consist of fibrous thermal insulation 75 mm thick at a density of 32 kg/m². This is a cost-effective product that is also quick to install. Generally, this would be coloured black and would sit directly on the soffit, with building services, lighting etc suspended below.

Alternatives such as stretched membrane panels, ceiling tiles, suspended 'clouds' and perforated or slotted panels of suitable design are also all options.

We note that if this treatment were extended to the entire concourse a benefit would accrue in both mitigation of noise breakout and patron experience.

Figure 13: Concourse ceiling option.



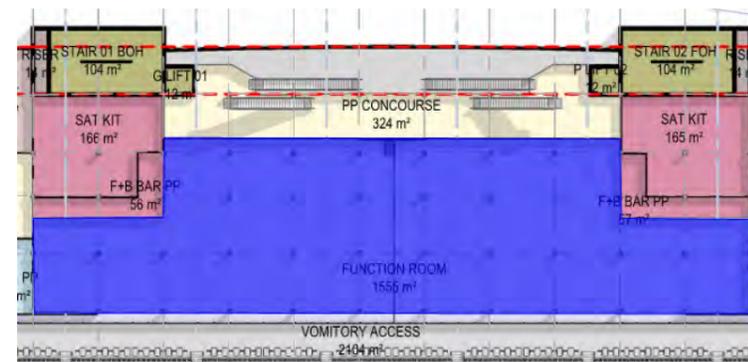
6.4 Function rooms, Suites, Media Rooms etc

Acoustically absorptive ceiling should also be allowed for in the following rooms at a minimum.

6.4.1 Function room

Allowance should be made for an acoustically absorptive ceiling with performance of NRC 1.0 over the blue shaded area in Figure 14.

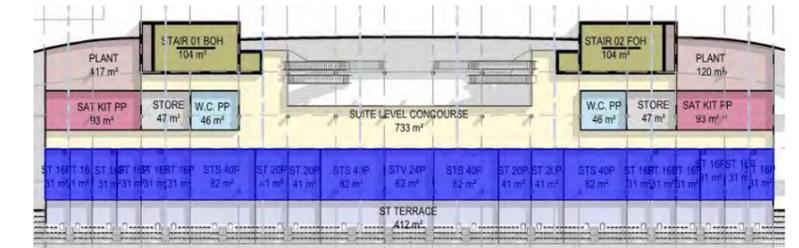
Figure 14: Function lounge – extent of ceiling to treat.



6.4.2 Suites

Allowance should be made for an acoustically absorptive ceiling with performance of NRC 1.0 over the blue shaded area in Figure 15.

Figure 15: Suites – extent of ceiling to treat.



6.4.3 Team and Media Rooms

Allowance should be made for an acoustically absorptive ceiling with performance of NRC 1.0 over the blue shaded area in Figure 16.

Figure 16: Other rooms - extent of ceiling to treat.



6.5 Summary of Room Acoustics

The proposed baseline design can provide a good quality internal acoustic environment with appropriate design and surface finishes.

We propose the objective criteria provided in Table 7 for reverberation time, building services noise and rain noise. These criteria are likely to be refined during preliminary design but are considered an appropriate starting point.

Table 7: Recommended Objective Criteria for Room Acoustics & Building Services

Criteria	
Reverberation Time	
for Sport Events	>3 sec (250 Hz – 2kHz)
for Concert Events	3.2 sec @ 125Hz 2-3 sec @ 250Hz – 2kHz)
Strong late reflections	None
Background Noise Levels within Arena (primary building services noise, lighting and active speakers for PA where used)	NC 35 - 40
Rain Noise (rainfall rate of 20 mm/hr)	45 dB L _{Aeq}

Other than ceiling treatments to function and entertainment spaces, the main issues we raise are:

- Allowance for adequate absorptive treatment to the solid portions of the CMUA ceiling to provide satisfactory low frequency reverberation time control without excessive deadening of mid and high frequencies.
- Sound diffusing treatment to large areas of vertical concrete within the CMUA bowl.
- Appropriate design of Suite and Function Room glazed façades to eliminate adverse sound reflections.
- Appropriate design of balustrades to eliminate adverse sound reflections.
- Absorptive treatment to areas of the Concourse ceiling to both mitigate noise breakout and improve patron experience.
- Design of building service to keep noise level at an appropriate background level.
- Considered and expert design of the PA system in what will be a challenging space.

We note that if control of reverberation *is* achieved, but control of adverse reflections *is not* achieved, then the adverse reflections will become more apparent and the user experience diminished compared to no treatment to either.

APPENDIX A GLOSSARY OF TERMINOLOGY

Frequency	The number of pressure fluctuation cycles per second of a sound wave. Measured in units of Hertz (Hz).	PNC	<u>Preferred Noise Criteria</u> A method used to assess background noise and assign a single value. Noise sources such as air conditioning are commonly rated using this method. NC & NR curves are similar and are used for the same purpose.
Hertz (Hz)	Hertz is the unit of frequency. One hertz is one cycle per second. One thousand hertz is a kilohertz (kHz).	RT or T₃₀	<u>Reverberation Time</u> The time (in seconds) taken for the sound pressure level generated by a particular noise incident to decay by 30 decibels following the conclusion of the noise event (hence T ₃₀ abbreviation). Reverberation Time is used for assessing the acoustic qualities of a space, describing how quickly sound decays within a space. The reverberation time is related to the room volume and total absorption.
Octave Band	A range of frequencies where the highest frequency included is twice the lowest frequency. Octave bands are referred to by their logarithmic centre frequencies, these being 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz, and 16 kHz for the audible range of sound.	Sound Insulation	When sound hits a surface, some of the sound energy travels through the material. 'Sound insulation' refers to ability of a material to stop sound travelling through it.
Noise	A sound that is unwanted by, or distracting to, the receiver.	Transmission Loss (TL)	The attenuation of sound pressure brought about by a building construction. Transmission loss is specified at each octave or one third octave frequency band.
Ambient	The ambient noise level is the noise level measured in the absence of the intrusive noise or the noise requiring control. Ambient noise levels are frequently measured to determine the situation prior to the addition of a new noise source.	R_w	<u>Weighted Sound Reduction Index</u> A single number rating of the sound insulation performance of a specific building element. R _w is measured in a laboratory. R _w is commonly used by manufacturers to describe the sound insulation performance of building elements such as plasterboard and concrete.
Special Audible Characteristics	Distinctive characteristics of a sound which are likely to subjectively cause adverse community response at lower levels than a sound without such characteristics. Examples are tonality (e.g. a hum or a whine) and impulsiveness (e.g. bangs or thumps).	R'_w	<u>Apparent Weighted Sound Reduction Index</u> Similar to the R _w value except that measurements are conducted in the field. Building tolerances and flanking noise have an effect on the performance of a partition when it is actually installed, which result in R' _w values lower than the laboratory derived R _w values.
dB	<u>Decibel</u> The unit of sound level. Expressed as a logarithmic ratio of sound pressure P relative to a reference pressure of Pr=20 µPa i.e. dB = 20 x log(P/Pr)		
A-weighting	The process by which noise levels are corrected to account for the non-linear frequency response of the human ear.		
L_{Aeq} (t)	The equivalent continuous (time-averaged) A-weighted sound level. This is commonly referred to as the average noise level. The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.		
L_{A10} (t)	The A-weighted noise level equalled or exceeded for 10% of the measurement period. This is commonly referred to as the average maximum noise level. The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.		
L_{Amax}	The A-weighted maximum noise level. The highest noise level which occurs during the measurement period.		
NR	<u>Noise Rating</u> A series of fixed frequency spectrum curves used to assess background noise and assign a single number value. NC curves are very similar and are used for the same purpose.		
NC	<u>Noise Criteria</u> A method used to assess continuous background noise and assign a single value. (Noise sources such as air conditioning are commonly assessed in this method). PNC & NR curves are very similar and are used for the same purpose.		

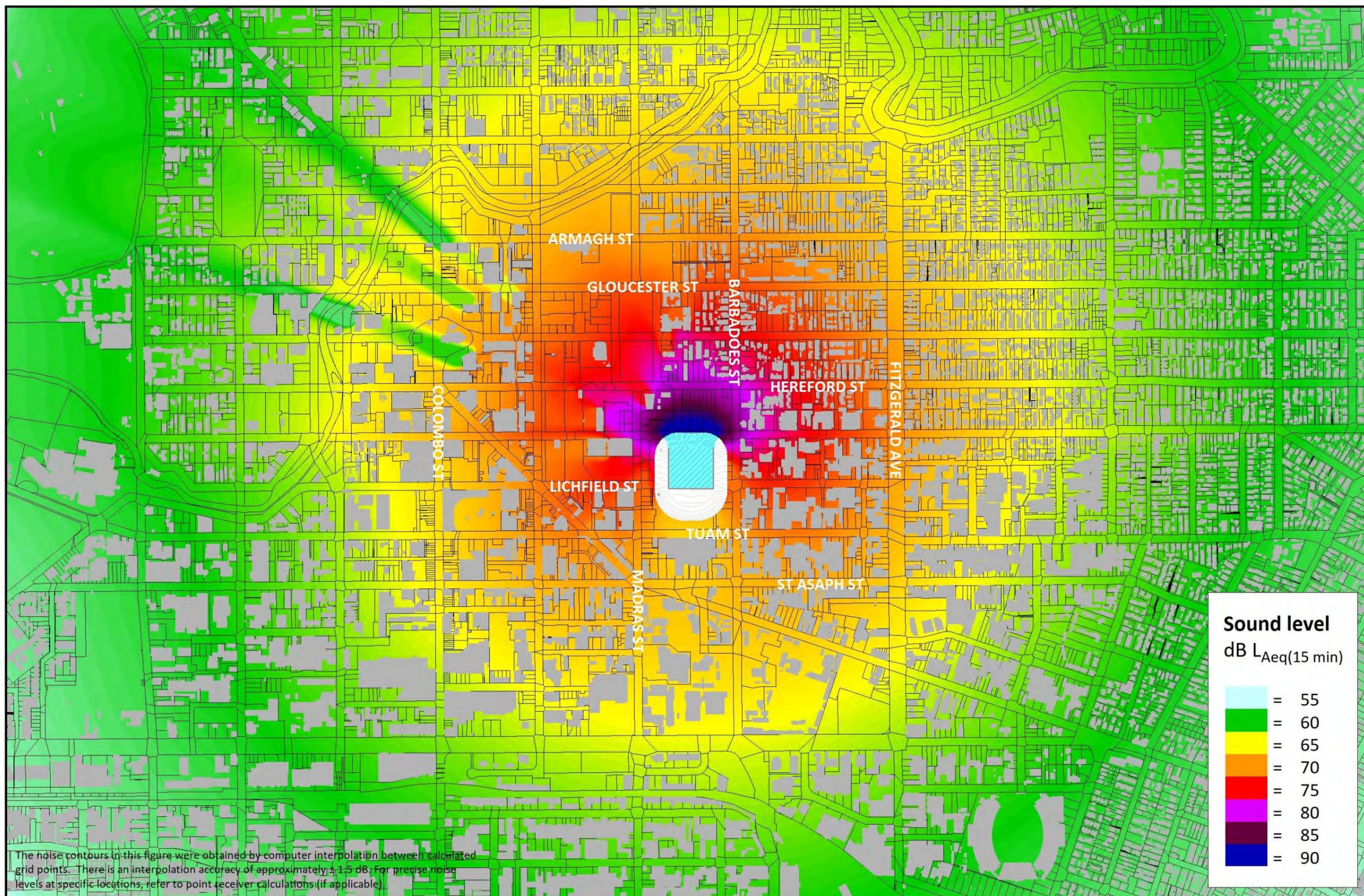
APPENDIX B SUMMARY OF STADIA NOISE LIMITS IN NEW ZEALAND

Venue	Maximum No of Events per annum	Total Duration per annum (hours)	Cut-off Time (hours)	Noise Limit dBA L ₁₀
Trust Stadium	9	6	2230	80
Proposed	6	12	2200	80
	2	2	2200	NA
Arena Manawatu, Palmerston Nth	30	435 (permitted between 0800 - 2230)	2230	75
Western Springs	6	48 hrs	2230/2330 (+30 mins on application)	85
Waikato	5	20 hrs	2300	80
Napier	5	63 hrs	2230/0000/0100	90
Wellington Stadium	6	84 hrs	2300	75
Auckland Viaduct Basin	12	90 hrs	2230/2300	75
Temporary Activities	3			85
North Shore Stadium (Albany)	16	80	2300	85 (< 4 hrs) 80 (> 4 hrs)
Okara Stadium Whangarei	5	25 hrs	2230	85 (3 off)
Rotorua	5	55 hrs	3 @ 2300 2 @ 2245	3 @ 90 2 @ 85
Hamilton MF Zone	5	3 + 4 hrs	2300	75
The Hub Hawera	6	Total 6 Single 3	0700 2200	80

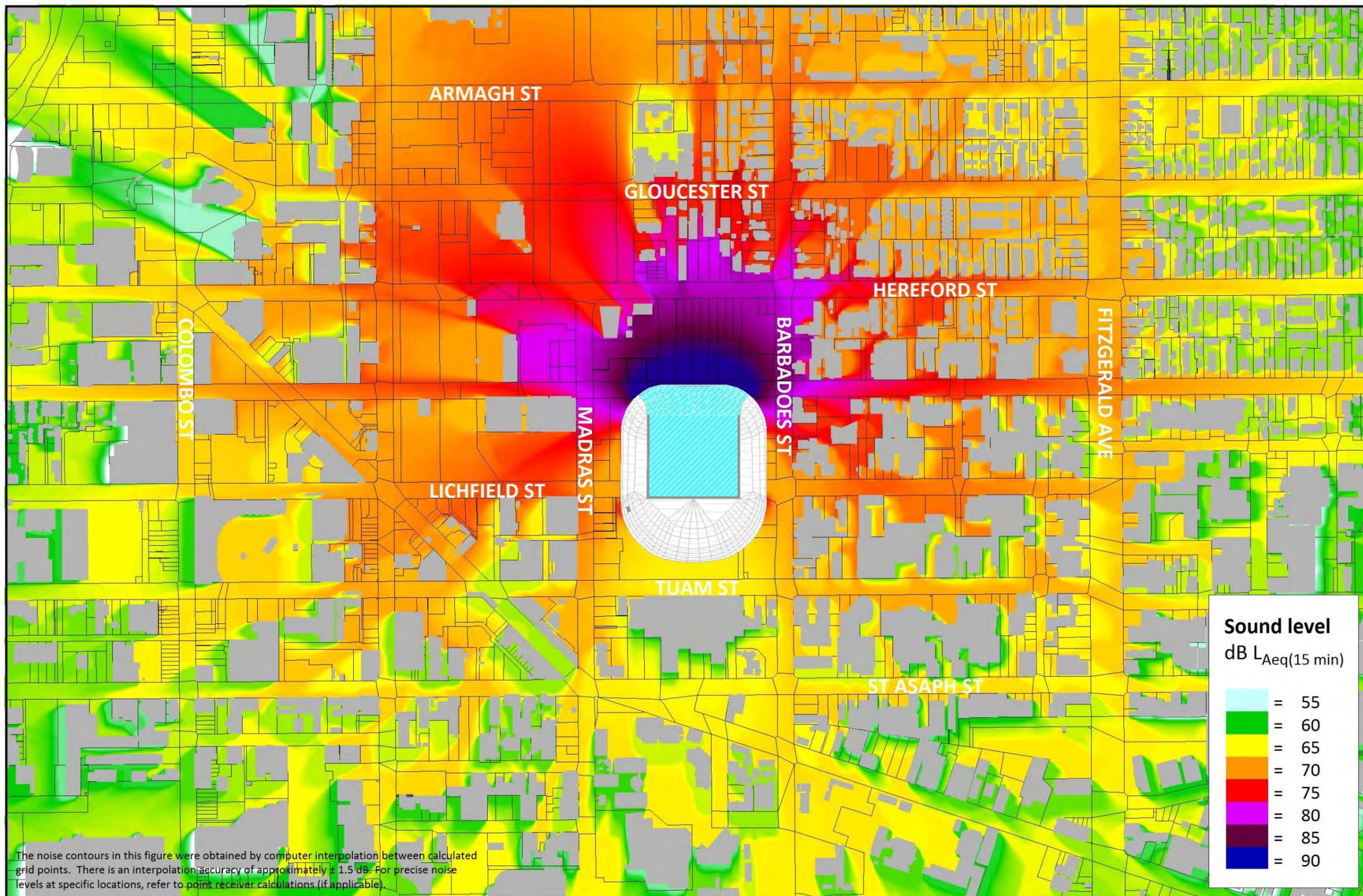
APPENDIX C NOISE MAPS

- C1. CMUA Concert Noise at 11m above ground
- C2. CMUA Concert Noise at 1.5m above ground (Populous proposed ventilation location/size)
- C3. CMUA Concert Noise at 1.5m above ground (Aurecon proposed ventilation location/size)
- C4. CMUA Concert Noise 3D Plot at 1.5m above ground (Populous proposed ventilation location/size)
- C5. CMUA Sections showing noise breakout (Populous proposed ventilation location/size)
- C6. CMUA Sections showing noise breakout (Aurecon proposed ventilation location/size)

C1 CMUA Concert Noise at 11m above ground



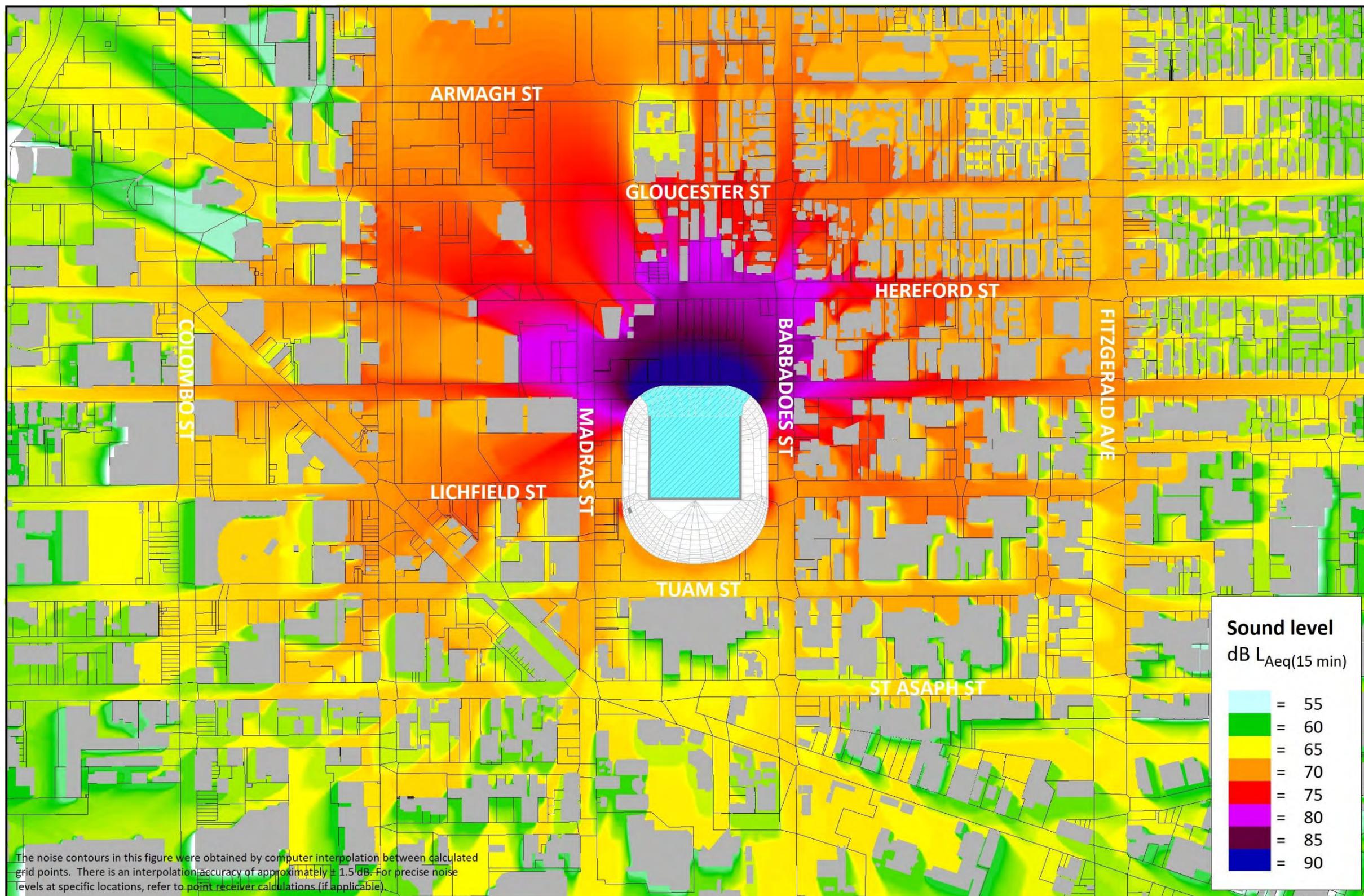
C2 CMUA Concert Noise at 1.5m above ground (Populous proposed ventilation location/size)



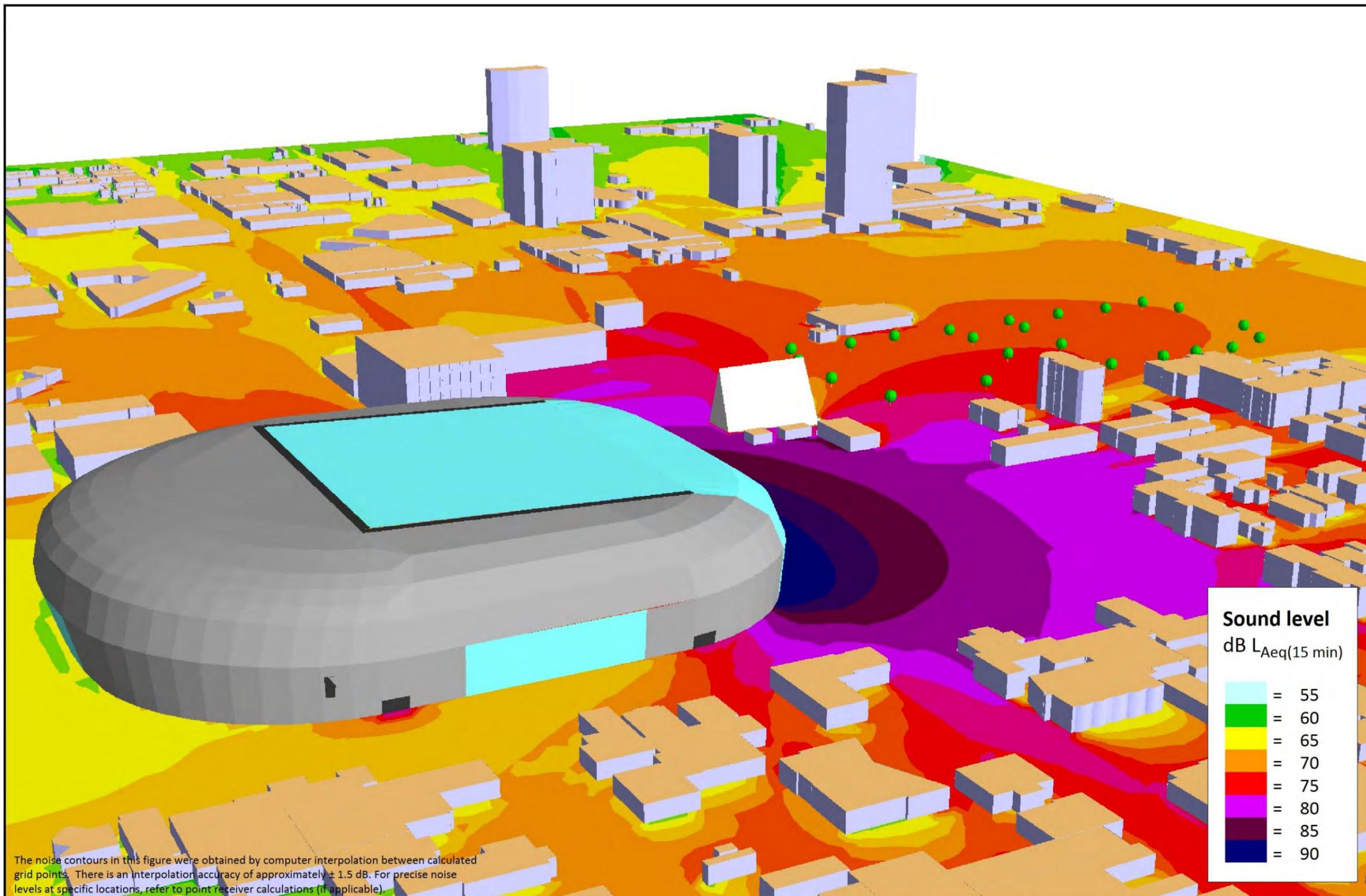
The noise contours in this figure were obtained by computer interpolation between calculated grid points. There is an interpolation accuracy of approximately ± 1.5 dB. For precise noise levels at specific locations, refer to point receiver calculations (if applicable).



C3 CMUA Concert Noise at 1.5m above ground (Aurecon proposed ventilation location/size)



C4 CMUA Concert Noise 3D Plot at 1.5m above ground (Populous proposed ventilation location/size)



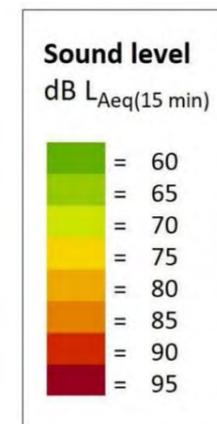
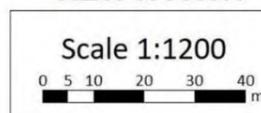
The noise contours in this figure were obtained by computer interpolation between calculated grid points. There is an interpolation accuracy of approximately ± 1.5 dB. For precise noise levels at specific locations, refer to point receiver calculations (if applicable).



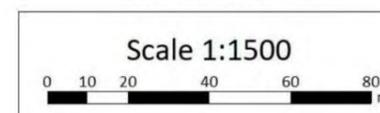
C5 CMUA Sections showing noise breakout (Populous proposed ventilation location/size)



WEST VIEW NORTH EAST



SOUTH VIEW WEST NORTH



The noise contours in this figure were obtained by computer interpolation between calculated grid points. There is an interpolation accuracy of approximately ± 1.5 dB. For precise noise levels at specific locations, refer to point receiver calculations (if applicable).

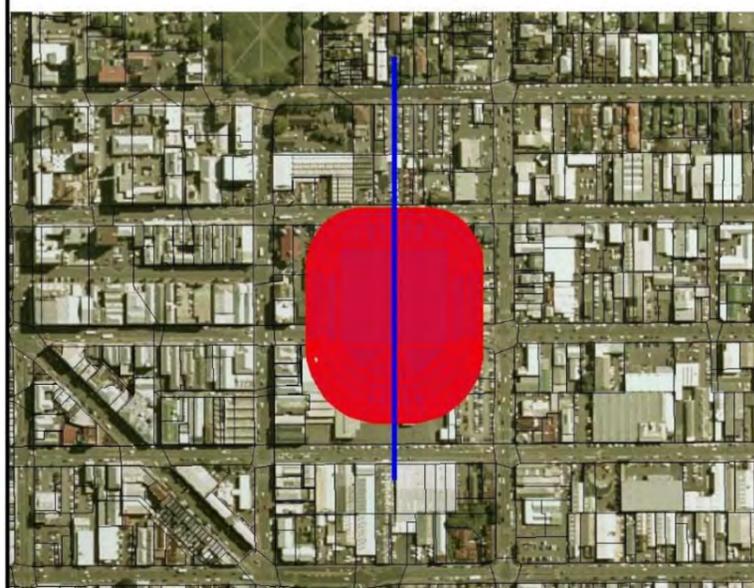
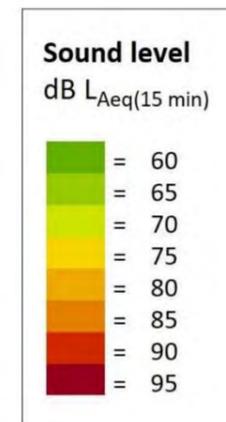
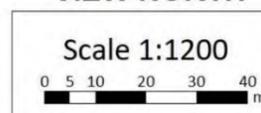
C6 CMUA Sections showing noise breakout (Aurecon proposed ventilation location/size)



WEST

VIEW NORTH

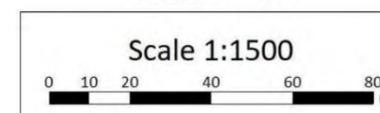
EAST



SOUTH

VIEW WEST

NORTH



The noise contours in this figure were obtained by computer interpolation between calculated grid points. There is an interpolation accuracy of approximately ± 1.5 dB. For precise noise levels at specific locations, refer to point receiver calculations (if applicable).

APPENDIX 4B



Project: **CANTERBURY MIXED USE ARENA**

Prepared for: **Christchurch City Council
 53 Hereford Street
 Christchurch 9999**

Attention: **Glenda Dixon**

Report No.: **Rp R03 002 20181126**

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1.0 THE PURPOSE OF THIS REPORT

Christchurch City Council is in the process of procuring the design and construction of a new arena in the central city to replace the now demolished Lancaster Park and the temporary stadium. This new facility is currently named the Canterbury Mixed Use Arena, or CMUA. The Christchurch Central Recovery Plan (CCRP) states that Christchurch is to become “a world class option for attracting and hosting events.” The CMUA is intended to be a driver and multiplier of business and social activity and redevelopment within the central city.

It is against this background that Marshall Day Acoustics has been engaged to provide advice to Council regarding possible conditions and limitations to be incorporated into the designation controlling the operation of the CMUA; and also possible alterations to the Christchurch District Plan designed to clearly signal the presence and potential for noise effects in the broader neighbourhood surrounding the CMUA.

This report presents our final advice in a manner that provides as much context and clarity as possible. A glossary of acoustical terms used in this report is provided in Appendix A.

2.0 THE MATTERS ADDRESSED

The planning and legislative context of this project will be addressed by Council staff. Marshall Day Acoustics has offered advice on amendments to two key elements of the Christchurch Central Recovery Plan (CCRP):

1. Proposed conditions to be added to the designation, that introduce:
 - noise limits for concerts and general PA system (non-concert) noise,
 - a finishing time for concerts,
 - a cap on the number of concert event days per year, and
 - a requirement for a noise management plan.
2. An amendment to a rule, which will enlarge the area around the stadium within which acoustic insulation is required for habitable spaces within new residential buildings and increase the level of acoustic insulation required.

To be successful, this combination of policy, rules and conditions must strike a balance between enabling sufficient utilisation of the CMUA for concerts that it achieves both the social and economic aims of regeneration, while protecting the amenity of residents in the neighbourhood to an appropriate degree.

Although Marshall Day Acoustics is supportive and encouraging of the CCRP and District Plan being amended to have a clear policy statement that supports the CMUA, we have focused our advice on the proposed conditions and rules. We discuss these in detail below. Supporting information and Q&A's are provided as appendices.

3.0 DETAIL

Because the CMUA makes extensive use of ETFE plastic film for much of the roof and northern façade, the sound insulation achieved by the façade is limited, particularly to the north of the CMUA. The ETFE roof is a requirement of the design driven by the fixed in place natural grass pitch. The trade-off in this design choice is that during concerts there will be significant noise emissions to the surrounding neighbourhood.

Options to limit noise spill are consequently very limited. Noise level can be reduced at source to a limited extent simply by turning down the concert volume. However, concert sound level can only be reduced to a certain extent before concert goers and touring acts will find the result unsatisfying. Other options to address noise effects are mitigation measures that limit the potential adverse

effects of noise by placing limits on the duration or occurrence of concerts, or by requiring enhanced sound insulation at the receiver.

No single control or mitigation will work in isolation. It is the combined effect of the various measures discussed below that creates the desired effect.

3.1 The effect of noise level

During a concert the most readily apparent feature of the sound received at nearby dwellings is the noise level or loudness. Annoyance and disruption of normal living patterns will become more pronounced in the community with increasing noise level, until a point is reached where tolerance ceases. We regard concerts that generate noise levels in excess of 70 dB L_{Aeq} at nearest residential areas as being 'high noise'. While annoyance will start to become apparent within the community at concert noise levels below 70 dB L_{Aeq} , the percentage of the community likely to become annoyed or highly annoyed will increase sharply with increasing noise level above around 65-70 dB L_{Aeq} . Our experience suggests that once individuals reach the point of being annoyed or highly annoyed, a further modest increase in noise level (within reason) has little additional impact. However, increasing the noise level of a concert results in a larger area of the neighbourhood being exposed to high noise levels, and therefore a greater number of people who are likely to become annoyed or highly annoyed.

For the CMUA concept design, an internal noise level of 105 dB L_{Aeq} results in noise levels at the nearest residential area of approximately 80 dB L_{Aeq} . A significant area within the central city residential zone would be exposed to noise levels in excess of 70 dB L_{Aeq} and a greater area again will be exposed to noise levels in excess of 65 dB L_{Aeq} . Our modelled noise contours for this scenario are provided in Appendix B, overlaid on the District Plan zoning map.

We do not recommend noise levels in excess of 105 dB L_{Aeq} inside the CMUA or 80 dB L_{Aeq} at the nearest residential areas as community response to such elevated noise levels, especially on a repeated basis is more likely to become very strong and it becomes difficult to provide adequate and practicable mitigation of adverse indoor noise effects through proposed measures such as sound insulation rules. Additionally, increasing the noise level will increase the number of people in the community who are likely to become annoyed or highly annoyed, because of the greater area of the city exposed to high noise levels. In fact, while 105 dB L_{Aeq} is preferred by many promoters and concert goers, in practice our experience is that such high noise levels are less common than they once were and many concert goers actually prefer a slightly quieter sound level and increasingly tend to wear hearing protection at concerts.

In our experience a noise level of 100 dB L_{Aeq} within the concert will provide a perfectly acceptable concert experience with minimal impact on the touring performers. This would also limit noise level at the nearest residential areas to 75 dB L_{Aeq} or less and substantially reduce the geographic area exposed to high noise levels, thus reducing the number of residents likely to become annoyed or highly annoyed.

Conversely, where other proposed noise controls and mitigation measures discussed below are in general accordance with our recommendations, we are of the view that concert events that generate less than 65 dB L_{Aeq} at the proposed compliance locations could be exempted from forming a part of the number-restricted concert allocation for CMUA on the basis that noise levels will be similar as for exempted activities that past experience has shown are not problematic. In addition, at and below this noise level the proposed sound insulation rule will ensure internal noise levels consistent with WHO Guidelines for preservation of sleep amenity.

3.2 The effect of noise character

A defining character of many genres of modern music is a strong low-frequency (bass) beat. Not all members of the community enjoy this bass beat, and in addition the beat can travel greater distances than high-frequency noise and more readily penetrate buildings. As a result it is this

character that generates many complaints, especially so at greater distances from the performance venue where the concert noise level may in fact be below the District Plan night-time noise level, but the bass beat character is still very apparent. For example, during concerts at both Lancaster Park and the Temporary Stadium, it was not unusual to have complaints generated at distances of 6-8 km.

Unfortunately for residents, it is not practical to 'eliminate' this low frequency sound. This is an inherent feature and character of these genres of music. Elimination of the bass and beat would impair and, in the eyes (ears) of most concert goers, likely destroy the concert experience. Studies of the average spectrum of a wide variety of modern musical genres shows that when normalised to the same sound level the level of sound in the 125 Hz octave band is very similar. However, some genres such as drum and bass have significantly greater noise levels in the 63 Hz octave band than say rock or pop genres.

We have suggested a modest level of control over this very low frequency sound, essentially limiting the 63 Hz octave band sound level at the nearest residential zone to that typical of rock music. We do not expect this control to eliminate complaints about bass noise either locally or at distance. However, we expect that this control will limit the extent of community annoyance during certain concerts to the 'typical' level with only minimal impact on the experience for both performers and concert goers. This control will have no effect on the overall noise level of concerts.

3.3 The effect of concert finish time

Setting defined concert finishing times is a commonly used mitigation tool both in New Zealand and internationally. Setting a concert finish time does not in itself reduce annoyance. People who feel adversely affected by concert noise will still become annoyed or highly annoyed during the course of the concert. The primary benefit of defined finish times is that they provide certainty to the community. People who have arranged to be elsewhere for the concert know what time they can return to relative peace and quiet. Residents who have remained in the area know the time by which noise will cease and when sleep will be possible.

We have found that setting a finish time for concerts increases acceptance/tolerance of concerts both because of this certainty and because the total exposure to intrusive noise levels is reduced.

We are aware that opinion in the community varies significantly regarding an appropriate finish time. The most suggested range of finishing times we have observed range between 10pm and midnight. In our experience promoters regard 10pm as impracticably early, but 10:30pm or 11pm appear to be quite acceptable.

In our view 11pm is an acceptable finish time based on the fact that this is still early enough to allow a satisfactory minimum sleep time for most people (noting the restricted number of occasions on which high-noise events will occur) and that many concerts will likely finish earlier in any case. We regard midnight as generally too late for residential areas. This is because the window of opportunity for adequate sleep becomes reduced (this effect is compounded when concerts or other sleep disrupting activities common in inner city areas are regular occurrences), and also because based on both our own experience and that of Council EHO staff, community tolerance of high noise beyond around 10pm drops sharply.

Historically, it has not been unusual for Council to permit a concert within the inner city on New Years Eve that runs until a later time – typically 12:30am. Council may feel that there is benefit in allowing a one-off later than normal finish for this specific concert at CMUA also. While a New Years Eve celebration is more likely to be tolerated by many, we anticipate that a late finish will still attract more complaints, from a wider geographic area, than will be the case for typical concerts. Taken as an isolated event, the effects on sleep amenity and disruption will be less pronounced than for repeated events. Overall, we anticipate that simply seeking this one late finish may increase the pressure on Council to further restrict the number and/or noise level of other concerts to reduce the overall cumulative effect.

3.4 The effect of limiting the number of concerts

As with finish time, limiting the number of high-noise concert events does not prevent annoyance during a concert, rather it provides a degree of certainty to the community and thereby limits the extent of annoyance.

We are not aware of any strong research that tightly links precise numbers of high-noise concerts to a level of community response. This holds true to other forms of intrusive noise that we have been involved with such as frost fans, private helicopter pads, and construction noise. In each of these examples, experience has shown that communities will tolerate a small number of quite intrusive high noise events on the basis that there is a greater community good from the noisy activity. Generally, the greater the perceived community benefit, the better the level of apparent community acceptance.

Our experience in New Zealand and elsewhere is that local communities will often be reasonably tolerant of up to six concert events per year, provided these are accompanied by other controls such as defined finish times and noise limits.

In the case of the CMUA we have considered other factors such as the CCRP and District Plan clearly having signalled for an extended period that the CMUA is to be located at this site and that the purpose of locating the CMUA at the chosen location is to act as a driver of business and social activity in the area. We have also considered the view that, because Christchurch has lacked an appropriate concert venue for a decade, the city has been by passed by numerous major touring performers and there is are strong cultural, social and economic drivers to providing for a facility that will be attractive to touring acts and commercially successful.

Because of this unique set of circumstances, we consider that the community may be more supportive of allowing up to 15 concerts at high noise level per year. This is a permissive control in our view, justified only by these unique circumstances. We understand that VBase consider that a limit of 15 concerts provides significant flexibility and scope to the CMUA operator to attract and schedule touring performers, while still providing community certainty and ensuring that overall living and sleep amenity are not significantly degraded.

This proposed restriction in number does not apply to sports or other events including concerts generating less than 65 dB L_{Aeq} that may be scheduled at the CMUA, as our experience (and that of Council enforcement officers) has been that such events have not generated high noise levels and have had few complaints as a result. We note that a limit on general PA noise is also proposed, which would control announcement and music noise associated with sporting and other non-concert events, while crowd noise would be exempt.

We did consider recommending a two-tier restriction. This was to be five concerts at a noise level of 80 dB L_{Aeq} and a further ten concerts at 75 dB L_{Aeq} . While a 5 dB difference in level is noticeable, especially when heard in direct comparison, both of the events would still be 'high noise' and therefore cause annoyance amongst some, but the difference in noise level between events weeks or months apart is not likely to be apparent or memorable for most of the community.

Ultimately, it is our recommendation that Council adopt 15 concerts at 75 dB L_{Aeq} if Council's objective is to reduce the number of residents in the neighbourhood who are likely to be annoyed or highly annoyed. On reflection we feel that providing a simple and flexible condition framework that provides certainty while mitigating potential noise effects is better than a more fine-grained set of conditions that are unlikely to achieve a markedly different result. Setting the external noise limit at 75 dB L_{Aeq} (100 dB L_{Aeq} internally) will limit the likely number of annoyed and highly annoyed people, while still enabling a good concert experience. Setting the noise limit at 80 dB L_{Aeq} may not result in a greater level of individual annoyance but is likely to result in a greater number of annoyed people in the local community.

Additional background discussion previously presented to Council is summarised in Appendix C.

3.5 Noise Management Plan

Noise management plans are a widely used tool that address matters related to noise that have not been controlled or mitigated via conditions or rules. A noise management plan allows flexibility in determining how to address factors that are variable, minor or may not have been identified prior to the CMUA commencing operation. The management plan will set out practices and procedures to be adopted including a monitoring regime to ensure compliance with the proposed noise conditions. The NMP condition should list specific matters which will need to be covered in the document, including how the CMUA operator will achieve the noise limits set, and how they will address a range of noise related issues associated with the activity, in order to mitigate potential noise nuisance. Provision for a liaison mechanism with neighbours and the setting up of a complaints procedure should also be included, as should a regular review of the noise management plan itself.

3.6 The effect of dwelling sound insulation

Ideally the intrusive noise level in bedrooms should be less than 30 dB L_{Aeq} and no more than 35 dB L_{Aeq} . This is consistent with guidance provided by the World Health Organisation. That is not to say that higher noise levels cannot be tolerated for short periods on some occasions. However, if noise levels significantly exceed these guidelines on many occasions or by large amounts, negative health consequences associated with sleep disruption will likely begin to manifest. Where control of noise at source cannot result in as much reduction as is desirable, requiring sound insulation of dwellings is a standard solution.

The required sound insulation specification depends on the target indoor sound level on the one hand and the stipulated outdoor design sound level on the other. For example, an outdoor level of 70 dB L_{Aeq} and a target indoor level of 35 dB L_{Aeq} , requires a sound insulation performance of 35 dB, whereas a target indoor level of 30 dB L_{Aeq} would require a sound insulation performance of 40 dB.

Broadly speaking we suggest targeting a sound insulation rule within the final modelled 70 dB L_{Aeq} contour. The rationale for this is based on allowing up to 35 dB L_{Aeq} in habitable rooms (especially bedrooms) and requiring a sound insulation rule that achieves at least a 35 dB reduction in noise. Dwellings closer to the CMUA may be exposed to as much as 75 or 80 dB L_{Aeq} (depending on the final limit chosen) and the resulting internal noise level could be as high as 40 to 45 dB L_{Aeq} for those dwellings.

As any new sound insulation rule would apply only to new dwellings, existing dwellings would not benefit from this enhanced sound insulation rule. By the same token, any developer constructing new dwellings in close proximity to the CMUA would be required to meet the minimum level of sound insulation required by any rule, but could also choose to adopt a greater level of sound insulation recognising the likelihood of high noise events.

While the noise contour should drive the decision-making process, the reality is that shifting the line by a few metres will not greatly reduce or increase the noise level. For the sake of clarity and ease of interpretation we suggest starting with any site crossed by the 70 dB contour, then regularising the included area by adding adjoining sites to create sensible and clearly delineated areas based on site boundaries and/or city blocks.

From our experience in the design, construction and implementation of dwelling sound insulation, Marshall Day's advice is that a sound insulation rule requiring 30 dB noise reduction would not achieve the desired outcome with respect to concert noise from the CMUA. A noise level reduction of 35 dB would provide the minimum appropriate level of sound insulation at a small cost increase and is readily achievable with standard building designs and materials, albeit generally of higher mass than the market minimum. By contrast, a noise reduction of 40 dB would likely require greater cost and begin to utilise specialist or seldom used products and construction methods and design choices may become more restricted.

For these reasons we recommend a sound insulation rule that requires a 35 dB $D_{tr, 2m, nT, w} + C_{tr}$ noise reduction over an area of the City broadly consistent with the concert noise emission 70 dB L_{Aeq} contour as shown in Appendix B. This is consistent with the current sound insulation rule applied to bedrooms elsewhere in the city.

4.0 RECOMMENDATIONS

In making our final recommendations to Council we have considered the factors above and drawn on our experience in New Zealand and locally, overseas guidance and anecdotal advice from the acoustical consulting profession in New Zealand and overseas. We stress that the controls proposed are a package that we are confident will provide adequate mitigation of potential adverse noise effects for local residents, enabling creation of a vibrant inner city community, while still enabling a successful concert venue operation at the CMUA. While other combinations/levels of control may also be successful, these would require careful consideration. A marked increase or decrease in one control may require significant adjustments in one or more other controls to compensate.

We recommend all of the following controls:

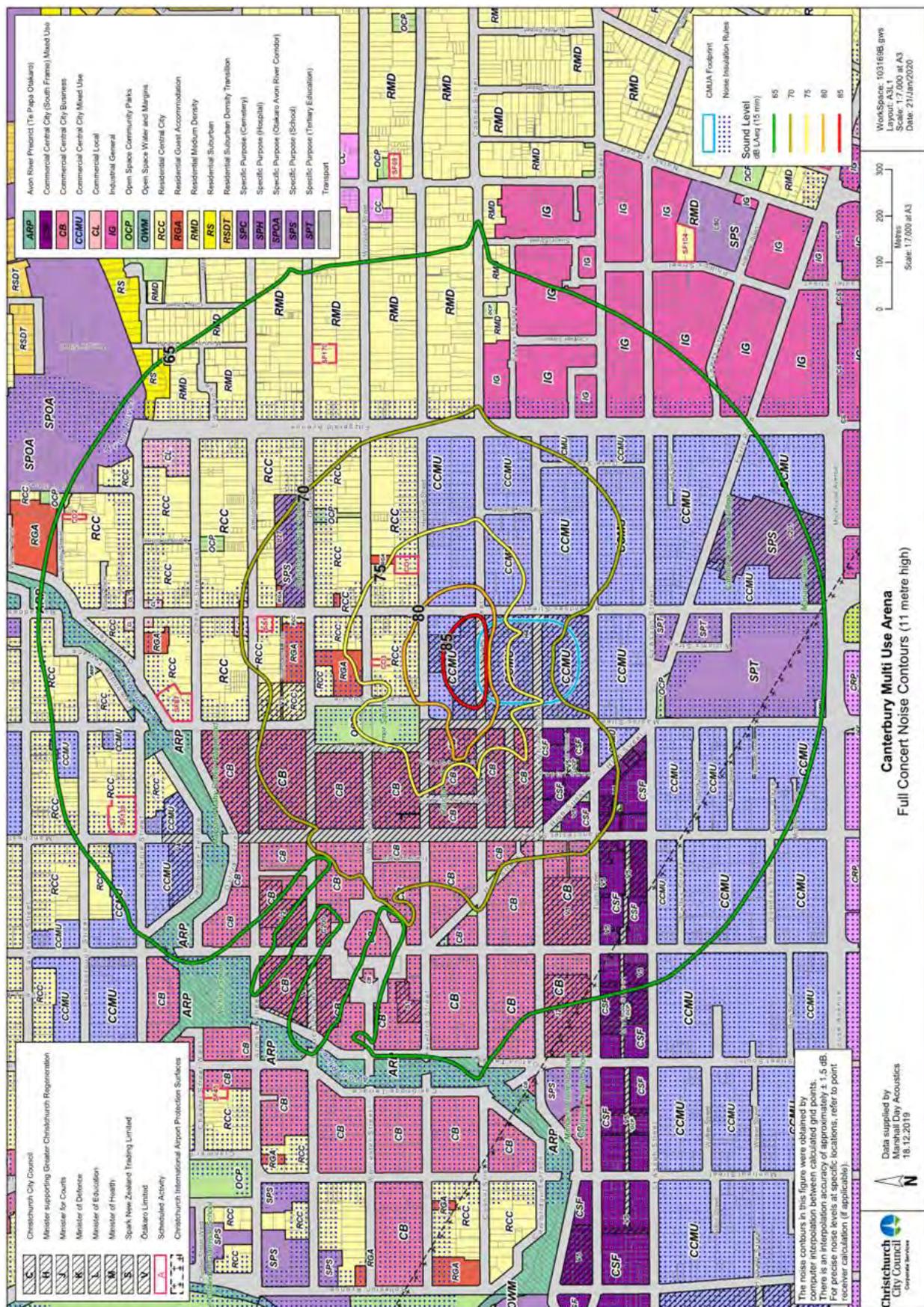
- No more than 15 concert events at noise levels greater than 65 dB L_{Aeq} at the proposed compliance location each year (the number of concerts at noise levels of less than 65 dB L_{Aeq} does not need to be restricted provided that other recommended controls are implemented);
- These events should ideally not generate more than 75 dB L_{Aeq} at the nearest residential areas and certainly not more than 80 dB L_{Aeq} ;
- The level of very low frequency bass noise should be subject to control;
- Concerts are to be finished by 11pm, with the possible exception of a New Years Eve or similar concert that may finish at a later time (we suggest no later than 12:30am);
- A noise management plan is to be prepared to address matters not covered by the proposed conditions above; and
- An area of enhanced sound insulation requirement for new and altered dwellings should be defined in the CCRP and District Plan to ensure a minimum level of indoor amenity.

APPENDIX A GLOSSARY OF TERMINOLOGY

Frequency	The number of pressure fluctuation cycles per second of a sound wave. Measured in units of Hertz (Hz).
Hertz (Hz)	Hertz is the unit of frequency. One hertz is one cycle per second. One thousand hertz is a kilohertz (kHz).
Octave Band	A range of frequencies where the highest frequency included is twice the lowest frequency. Octave bands are referred to by their logarithmic centre frequencies, these being 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz, and 16 kHz for the audible range of sound.
Noise	A sound that is unwanted by, or distracting to, the receiver.
SPL or L_p	<u>Sound Pressure Level</u> A logarithmic ratio of a sound pressure measured at distance, relative to the threshold of hearing (20 μ Pa RMS) and expressed in decibels.
dB	<u>Decibel</u> The unit of sound level. Expressed as a logarithmic ratio of sound pressure P relative to a reference pressure of $P_r=20 \mu\text{Pa}$ i.e. $\text{dB} = 20 \times \log(P/P_r)$
dBA	The unit of sound level which has its frequency characteristics modified by a filter (A-weighted) so as to more closely approximate the frequency bias of the human ear.
$L_{Aeq}(t)$	The equivalent continuous (time-averaged) A-weighted sound level. This is commonly referred to as the average noise level. The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.

APPENDIX B PREDICTED CONCERT NOISE CONTOURS & DISTRICT PLAN ZONES

Assumes 105 dB LAeq inside the CMUA



APPENDIX C BACKGROUND DISCUSSION REGARDING CONCERT NUMBERS AND NOISE LEVEL

C1 Special Event Noise Controls – NZ Wide

Community response to amplified music is influenced by several factors and varies significantly from individual to individual. However, acoustic experts are generally agreed that if concerts are limited in frequency, duration and have a clear known cut-off time, they are accepted by the community at considerably higher noise levels than the noise limits applying to general day to day activities. A short duration noise impact is considered reasonable when balanced against the wider community benefits of a large entertainment event.

This concept is reflected in the noise limits applying to most stadia around New Zealand. A summary of noise controls for ‘high noise events’ applying to stadia outside Auckland and Christchurch is attached in Appendix D4 and for Auckland stadia in Appendix D5. In summary, New Zealand stadia outside Auckland and Christchurch are allowed between 3 to 30 high noise events per year, with noise limits ranging from 75 to 90 dB and cut off times from 10pm to 11:30pm.

The Auckland Unitary Plan (AUP) has adopted a ‘multi-stage’ approach to the setting of noise limits for the major recreation facilities in Auckland. This ‘multi-stage’ approach sets higher noise limits for infrequent events and lower noise limits as the frequency of events increases. As discussed above, if high noise events are limited in frequency, duration and cut-off time, they are generally accepted by the community at considerably higher noise levels than the noise limits applying to day to day activities.

The AUP provides for concerts as a permitted activity at Western Springs, Mt Smart and North Harbour stadia and for the Ellerslie Racecourse, ASB Showgrounds, Bruce Pullman Park and ECOLight Stadium (Pukekohe) – Counties Stadium. These are all outdoor facilities and are surrounded by residential properties with varying proximity – but none as close as is proposed at the CMUA. Eden Park is the only major stadium in Auckland where concerts are not a permitted activity. Eden Park is also the closest comparable setting for a major stadium set close to residential zones as is proposed for the CMUA. Concerts at Eden Park are a discretionary activity for 6 events per year. Eden Park has recently submitted a resource consent application for 6 concerts per year at 75/80 dB at the residential interface.

While we have provided the detailed summary of the ‘three stage special event’ noise controls adopted in the AUP for these facilities in Appendix B, a condensed summary of the noise limits specifically applying to outdoor concerts at these facilities is provided in Table 1. The proposed conditions for Eden Park are also summarised in Table 1.

Table 1: Auckland High Noise Event Controls

Facility	Events per year	Duration (Hours) ¹	Cut-off time ²	Noise Limit (dB L _{Aeq})
Western Springs Stadium	6	6 + 2	10:00/11:00pm	82
Mt Smart Stadium	6	6 + 3	10:30pm	75
North Harbour Stadium	6	4 + 3	11:30pm	82
Ellerslie Racecourse, ASB Showgrounds, Bruce Pullman Park, ECOLight Stadium	5	6	10:30pm	75
Eden Park Proposed	6	6 + 3	10:30/11:00pm	75/80

- Where two cut-off times are shown (x+y) the first (x) is the maximum duration of the concert noise and ‘y’ is the maximum duration of sound check/rehearsal.
- The first cut-off time applies Sunday to Thursday and the second applies to Friday and Saturday nights.

C2 UK 'POP' Guide

The Noise Council of the Chartered Institute of Environmental Health (UK) have published a code of practice outlining guidelines for noise limits on concert venues. This document, specifies that the following noise limits should not be exceeded:

Table 2: Noise Council Specified Noise Limits

Concert days per calendar year, per venue	Venue Category	Guideline Value
1 to 3	Urban stadia or arenas	The music noise level should not exceed 75 dB $L_{Aeq(1\text{ hour})}$
1 to 3	Outer urban and rural venues	The music noise level should not exceed 65 dB $L_{Aeq(1\text{ hour})}$
4 to 12	All venues	The music noise level should not exceed the background noise level by more than 15 dB L_{Aeq} over a 15-minute period

According to these guidelines, a noise level of 75 dB $L_{Aeq(1\text{ hour})}$ would likely be acceptable for up to three events every year without causing significant annoyance. Assuming that the post 2200 hour background noise level in the residential neighbourhood to the north of the CMUA is typically 45-50 dB L_{Aeq} , this guidance suggests that a noise level of 70 to 75 dB L_{Aeq} may be acceptable up to 12 times per year.

C3 Discussion

Noise contours for a large (high-noise) concert at the CMUA are provided for reference in Appendix B based on the concept design of the building.

Community response to concert noise is a composite of individual responses, which vary greatly between extremes of acceptance of very high and frequent noise levels and complete rejection of any noise intrusion whatsoever. It is generally agreed by acoustic experts that if concerts are limited in duration, number of events and cut-off time, they are likely to be accepted by the community at considerably higher noise levels than the noise limits applying to day to day activities. This concept is reflected in the noise controls for stadia around New Zealand and the UK guidelines. While some stadia have noise limits of 80 to 90 dB at the residential zone boundary, 75 dB L_{Aeq} is the most used noise limit for concerts in New Zealand and this is proposed for the control of Eden Park concerts – also in close proximity to residential zones as is CMUA.

There is no doubt that some residents around the CMUA will be annoyed by the proposed levels of music noise for the short period that they occur. However, there will also be many people who will be indifferent and some who will enjoy the music. At least some residents are likely to suffer from some loss of sleep amenity. This is mitigated by the small number of events proposed and the relatively early finish times. A substantial increase in the number of events would erode sleep amenity further. We consider that the noise effects from the proposed concerts on the residential community are acceptable based on the short duration of the noise (3 to 6 hours), the cut-off time of 2300 and the infrequent occurrence (up to 15 concerts per year at a recommended noise level of 75 dB L_{Aeq}). The modelled noise levels here are less than or similar to what Auckland Council considers reasonable for residents around other large stadia and for temporary events in general parks.

It must be acknowledged that the proposed restrictions at the CMUA are more permissive than any similarly situated concert venue in New Zealand, which generally limit high-noise events to six concerts or fewer per year, with additional concerts permitted at lower noise levels. Such limits are already more permissive than the recommendations of the UK POP guide.

In our experience there is no single control that will render concert noise widely acceptable within the community. Responses from the community consultation presently under way clearly demonstrate this point. However, communication and community engagement are critical. In our experience at the temporary

stadium (Orange Theory), local complaints seem to have been substantially well managed by VBase, whereas communities at greater distance (Cashmere hills and the like) that receive a lower level of noise (albeit clearly audible), seem to be less tolerant of concert noise.

There are distinct limitations to the effectiveness of controlling the number of concerts relative to noise limits. For example, the external noise level at the arena from a 'small' concert may only be 5 dB less than a 'large' concert. While this is a perceptible difference, it is not a dramatic difference and may be overlooked by many in the community. So, if for example the venue was limited to say five 'large' concerts and ten 'small' concerts per annum, we suspect many in the community would not perceive these as markedly different and would not consider the restriction sufficient. Nonetheless, we do regard restrictions as a valid management tool, provided that the ability of the venue to operate commercially is not compromised. However, as discussed above, there is also merit in having simpler single noise limit for all concerts.

C4 Noise controls on stadia (excluding Christchurch & Auckland)

Venue	Maximum No of Events per annum	Total Duration per annum (hours)	Cut-off Time (hours)	Noise Limit dBA L₁₀ (Residential Zone)
Arena Manawatu, Palmerston Nth	30	435 (permitted between 8.00 am – 10.30pm)	2230	75
Waikato	5	20 hrs	11:00 pm	80
Napier	5	63 hrs	10:30/12:00pm/1:00 am	90
Wellington Stadium	6	84 hrs	11:00 pm	75
New Plymouth Rugby Park	52	260 hrs	10:00 pm	60
Rodney District	N/A	13 hrs	9:00 am /6:00 pm 6:00 pm /1:00 pm	80 75
Okara Stadium Whangarei	5	25 hrs	10:30 pm 11:00 pm	3 @ 85 75
Rotorua	5	55 hrs	3 @ 11:00 pm 2 @ 10:45 pm	3 @ 90 2 @ 85
Hamilton MF Zone	5	3 + 4 hrs	11:00 pm	75
The Hub Hawera	6	Total 6 Single 3	7.00 am 10.00 pm	80

C5 AUP Special Event Noise Controls

Facility	Event	Events per year	Duration (Hours) ¹	Cut-off time	Noise Limit (dB L _{Aeq})
Western Springs Stadium	High Noise	6	6	10:00/11:00pm	82
	Medium Noise	4	6	10:00pm	70
	Low Noise	4	6	10:00pm	55
Mt Smart Stadium	High Noise	6	6 + 3	10:30pm	75
	Medium Noise	30	6 + 3	10:30pm	65
	Low Noise	50	6 + 3	10:30pm	55
North Harbour Stadium	High Noise	6	4 + 3	11:30pm	82
	Medium Noise	10	4 + 3	11:00pm	82
	Other	-	-	10:30pm	55
Ellerslie Racecourse, ASB Showgrounds &	High Noise	5	6	10:30pm	75
Bruce Pullman Park, ECOLight Stadium	Medium Noise	15	6	10:30pm	65
Temporary Activity; Auckland wide	High Noise	3	6 + 2	11:00pm	80
	Medium Noise	12	6 + 2	11:00pm	70

1. Where two numbers are shown (x+y) the first (x) is the maximum duration of the concert and 'y' is the maximum duration of sound check/rehearsal.

Appendix 5 – Noise Advice from Kotui- May 2021



Memorandum

Project	Canterbury Multi-use Arena	Date:	18 / 05 / 2021
Our reference:	420545	Prepared by:	N.Redmond, N.Mackenzie M.Kamis,
Subject:	Summary of Acoustic Modelling Assumptions and Results for Proof of Concept Scenario		

1 Introduction

1.1 General

This memorandum summarises the noise spill modelling and results for the Canterbury Mixed-Use Arena for two scenarios:

- Proof of Concept, and
- 'Solid Bowl' variation of the Proof of Concept scenario which removes the ETFE on the northern face.

1.2 Purposed of this Memorandum

This memorandum has been prepared to outline the assumptions and approach to option assessment included within the concept phase design for acoustic noise spill modelling. The model has been developed for the purposes of assessing concept design options and not for regulatory planning purposes.

2 Noise Modelling

2.1 Inputs and Assumptions

- Established in SoundPLAN 8.2 noise modelling software and SoundPLANs implementation of ISO 9613-2.1996 sound propagation method.
- The entire site and surrounding areas modelled as hard flat ground.
- The surrounding building footprints and heights were sourced from Open Street Map. Adjustments and additions have been made (e.g. to include the Transitional Cathedral and recently constructed buildings based on Google Earth StreetView and photographs taken in the vicinity of the CMUA site).
- The model was created based on the proof of concept layouts with limited information about external facade openings. The exact placement of the CMUA building on the site has not yet been confirmed but the building has been placed at the approximately location indicated within the Marshall Day Acoustics Maps (northern end of CMUA aligned with Cashel Street).
- The ventilation openings as currently proposed have been included in the noise model. Additional openings for circulation and building services are not yet included. There is significant risk in assumptions around ventilation openings as the building architecture is anticipated to change significantly.
- The proof of concept and solid bowl scenarios have been assessed with a north facing orientation. Additional scenarios have been modelled however are not described in this memorandum.

This document is issued for the party which commissioned it and for specific purposes connected with the above-captioned project only. It should not be relied upon by any other party or used for any other purpose.

We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose, or containing any error or omission which is due to an error or omission in data supplied to us by other parties.

This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from us and from the party which commissioned it.

2.2 Source Noise Levels

Internal reverberant noise level for music events have been sourced from *Canterbury Multi-Use Arena Business Case – Acoustics* (Marshall Day Acoustics, RP 001 R02 20181126, 19 February 2019). The reverberant noise level for the concourse areas is modelled as 16 dB(A) lower than the bowl area, this reduction was calculated based on coupled volumes between the bowl and concourse spaces.

Table 1 Reverberant Noise Level - Bowl - Music Events

	Octave Band Centre Frequency (Hz)								Overall
	63	125	250	500	1k	2k	4k	8k*	
Linear Spectrum	112	107	107	102	97	97	92	87	115 dB
A-weighted spectrum	86	91	98	99	97	98	93	86	105 dB(A)

*Level at 8kHz was not provided with the Proof of Concept documentation.

2.3 Transmission Loss

The following transmission loss spectrums were assumed for the exterior shell of the modelled arena. Louvres have been modelled at 50% open area with no transmission loss.

Table 2 Transmission Loss for ETFE and Solid

	Transmission Loss at each Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
ETFE	0	0	2	5	8	13	18	23
Solid - Steel with insulation ⁽¹⁾	9	12	19	31	32	35	48	54
Solid - Steel with insulation and CRC lining ⁽²⁾	22	25	30	35	40	39	34	34

Note:

1. Solid construction modelled as 0.48mm profiled sheet steel lined with 50mm thick 10kg/m³ density internal insulation. Modelled to the north, east and west
2. Modelled to the southern wall

2.4 Sound Power Level per Area

The following Sound Power Levels per square metre have been applied in the model. The levels have been derived based on Table 1 and Table 2 data. A reverberant intensity level on the building envelope (i.e., not a direct incident level) has been assumed in the derived levels below.

Table 3 Modelled Sound Power Levels

	SWL/m ² (dB) at each Octave Band Centre Frequency (Hz)								Overall SWL per m ² , dB(A)
	63	125	250	500	1k	2k	4k	8k	
50% Open – Louvre (bowl)	103	98	98	93	88	88	83	78	96 dB(A)
50% Open – Louvre (concourse)	87	82	82	77	72	72	67	62	80 dB(A)
ETFE	106	101	99	91	83	78	68	58	94 dB(A)
Steel (bowl)	97	89	86	76	66	68	62	51	81 dB(A)
Steel (concourse)	81	73	70	60	50	52	46	35	65 dB(A)

2.5 CMUA Material Layout

The following table outlines the location and approximate area of ETFE, Steel and louvres on the external envelope of the arena.

Table 4 Summary of Materials Modelled

Material	Location
ETFE	Proof of Concept Option Extent: <ul style="list-style-type: none"> Rectangular shaped roof section extending to the northern edge (~17,500 m²) Northern face from roof edge to 11m above ground level (~2400m²) Solid Bowl Option Extent: <ul style="list-style-type: none"> Rectangular shaped roof section extending to the northern edge (~17,500 m²)
Louvre	<ul style="list-style-type: none"> 3 x Roof Louvres, East, South and West of the ETFE, 2m wide (~680m²) 1 x North Louvre, 5m high, starting at 6m above ground level (~380m²) 1 x East Louvre, 5m high, starting at 16m above ground level (~550m²) 1 x South Louvre, 5m high, starting at 16m above ground level (~290m²)
Solid	Proof of Concept: <ul style="list-style-type: none"> Lightweight steel to all remaining areas. Solid Bowl Option: <ul style="list-style-type: none"> Lightweight steel with CFC lining to southern wall of the bowl. Lightweight steel construction for all remaining areas.

3 Assessment of Best Practicable Options to Minimise Noise and Support Turf Health

3.1 Assessment Height

The Christchurch District Plan specifies that noise shall be measured in accordance with New Zealand Standard NZS 6801:2008 “Acoustics – Measurement of Environmental Sound” (NZS6801), and assessed in accordance with New Zealand Standard NZS 6802:2008 “Acoustics – Environmental Noise”¹ (NZS6802).

NZS 6801 recommends for measurements in outdoor spaces to be conducted at 1.2 to 1.5 metres above the immediate ground level. Where measurements are needed close to a building the measurement should be undertaken 1 to 2 metres from the building façade and 1.2 to 1.5 metres above the floor level of interest. Where measurements are needed close to a building a 3 dB reduction can be applied to remove the effect of building reflection and approximate a free field measurement.

The proposed District Plan Amendment does not provide a measurement height for the Residential Compliance Points (RCPs), however as the RCPs are located in an outdoor area (not within 1 to 2 metres of a building) a prediction height of 1.5 metres is considered applicable, consistent with NZS 6801.

The noise contour maps provided in the proposed District Plan Amendment are based on a noise contour height of 11 metres above ground level. Providing a higher level above ground noise contour helps demonstrate the spread of noise over the surrounding area however the reasoning behind specifically selecting 11 metres above ground level is not clear. It is noted that the *Residential Central City Zone* to the north of the CMUA site has a building height limit of 14 metres. In this respect the 11 metre limit may be based on an approximate upper storey floor level.

At this stage, to provide consistency with the work previously undertaken by Marshall Day for the District Plan Amendment we have provided noise contour maps at 1.5 metres and 11 metres above ground level.

¹ The Christchurch District Plan states that the provisions of NZS 6802 referring to Special Audible Characteristics shall not be applied.

3.2 Results

The predicted noise levels at the RCPs for the Proof of Concept and Solid Bowl Scenarios are summarised below

Table 5 Summary of Predicted Noise Levels at the Residential Compliance Points

Scenario	Description of Prediction Location	Prediction Height	Predicted Overall Noise Level, dB(A)	Predicted 63Hz octave band Level, dB	Difference between 63Hz and Overall Level
Proof of Concept	Latimer Hereford Compliance Point	1.5 m	76 dB(A)	91 dB	15 dB
		11 m	80 dB(A)	92 dB	12 dB
	Hereford Barbadoes Compliance Point	1.5 m	76 dB(A)	90 dB	14 dB
		11 m	79 dB(A)	92 dB	13 dB
Solid Bowl	Latimer Hereford Compliance Point	1.5 m	74 dB(A)	89 dB	15 dB
		11 m	77 dB(A)	90 dB	13 dB
	Hereford Barbadoes Compliance Point	1.5 m	73 dB(A)	88 dB	15 dB
		11 m	77 dB(A)	90 dB	13 dB

The results indicate that both scenarios comply with the overall noise limit criteria that is in the notified proposed District Plan amendment. However, both scenarios do not comply with the proposed bass noise limit. The predicted bass noise level difference is between 12 and 15 dB. rather than the proposed 'at most a 10 dB difference'. It is noted that predicted noise level difference is lower at 11 metres above the ground in comparison to 1.5 metres above the ground as the overall noise level is higher at 11 metres due to reduced shielding.

3.3 Noise Contour Maps

3.3.1 General

Noise contour maps at 1.5 metres and at 11 metres above ground level have been generated and provided in the following sections.

In the Proof of Concept scenario there are parts of the 80dB(A) contour line that infringe on the *Residential Central City Zone*. While the 80 dB(A) contour reaches some of the existing buildings within this zone, when the 3dB reduction to remove façade reflections is applied (in accordance with NZS 6801) the predicted noise level at the existing buildings within the *Residential Central City Zone* is predicted to achieve the 80 dB(A) overall level criteria currently proposed by the Council in the notified amendment to the District Plan.

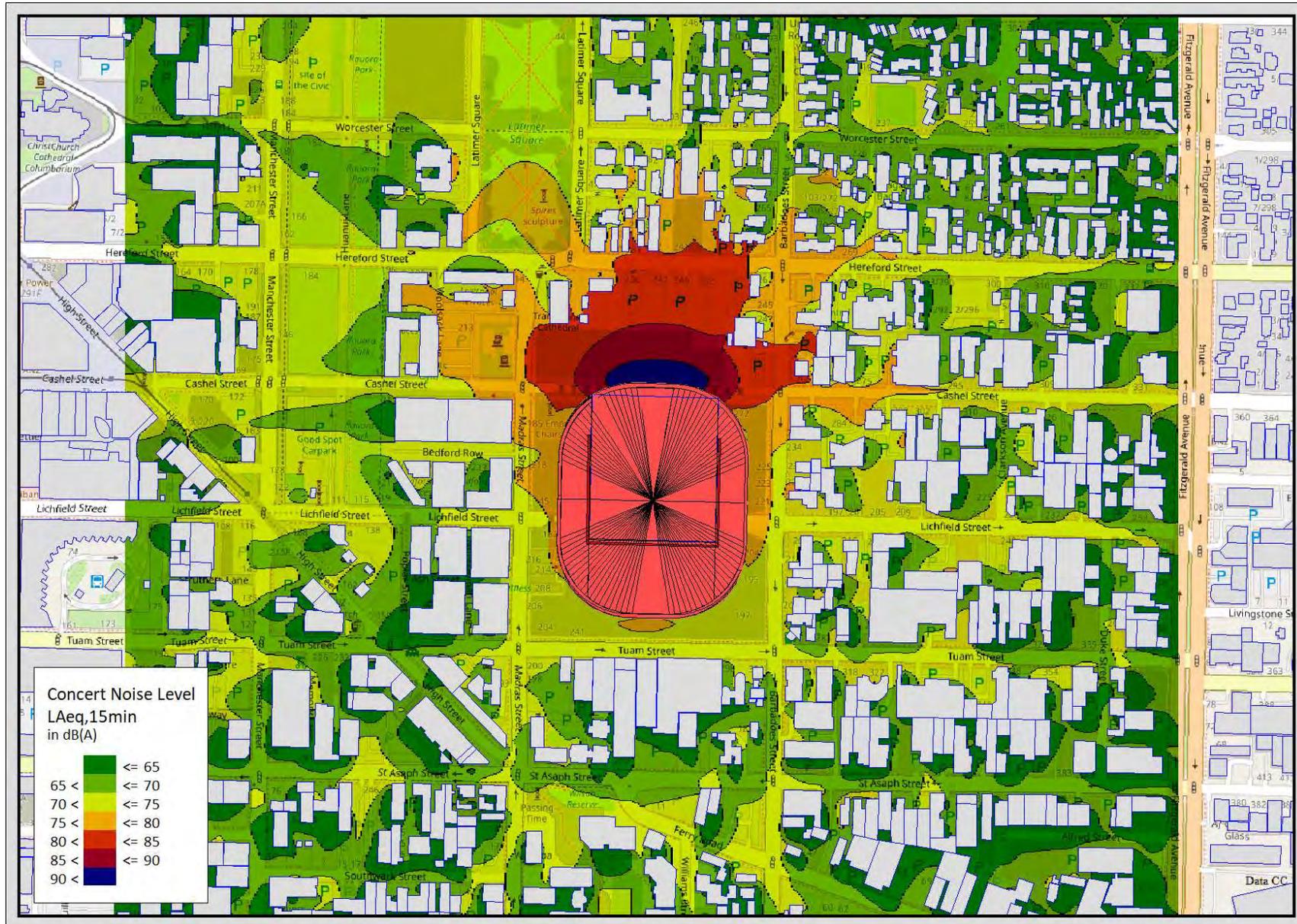
In the Solid Bowl scenario the 80 dB(A) contour line does not infringe on the *Residential Central City Zone*.

3.3.2 Consistency with Proof of Concept Modelling

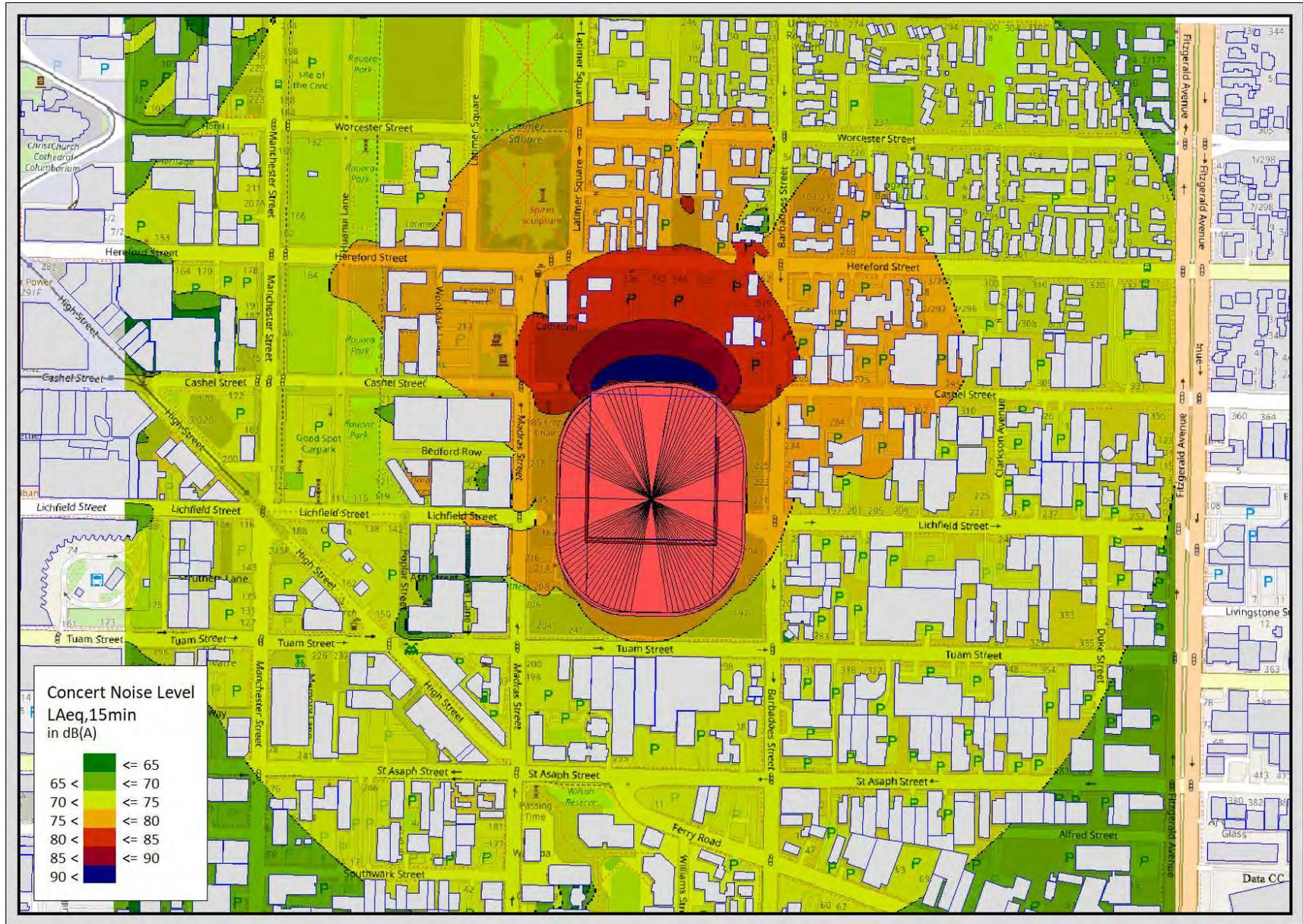
We note that there are differences between the predicted noise contours provided below and the work previously undertaken by Marshall Day. Some of the factors which may have contributed to this discrepancy are listed below:

- The building shape and placement of louvres/openings have changed through the concept design (and will continue to change as the design develops). In particular the concept design modelled by Marshall Day included a sloping roof which tilted down towards the northern edge.
- Different transmission loss spectrums have been applied – likely due to different construction materials being assumed for the solid components of the building
- It is unclear if the previous Proof of Concept modelling adjusted the noise level in the concourse in comparison to the bowl, and whether a reverberant intensity level or a direct incident level at the façade envelope was assumed.

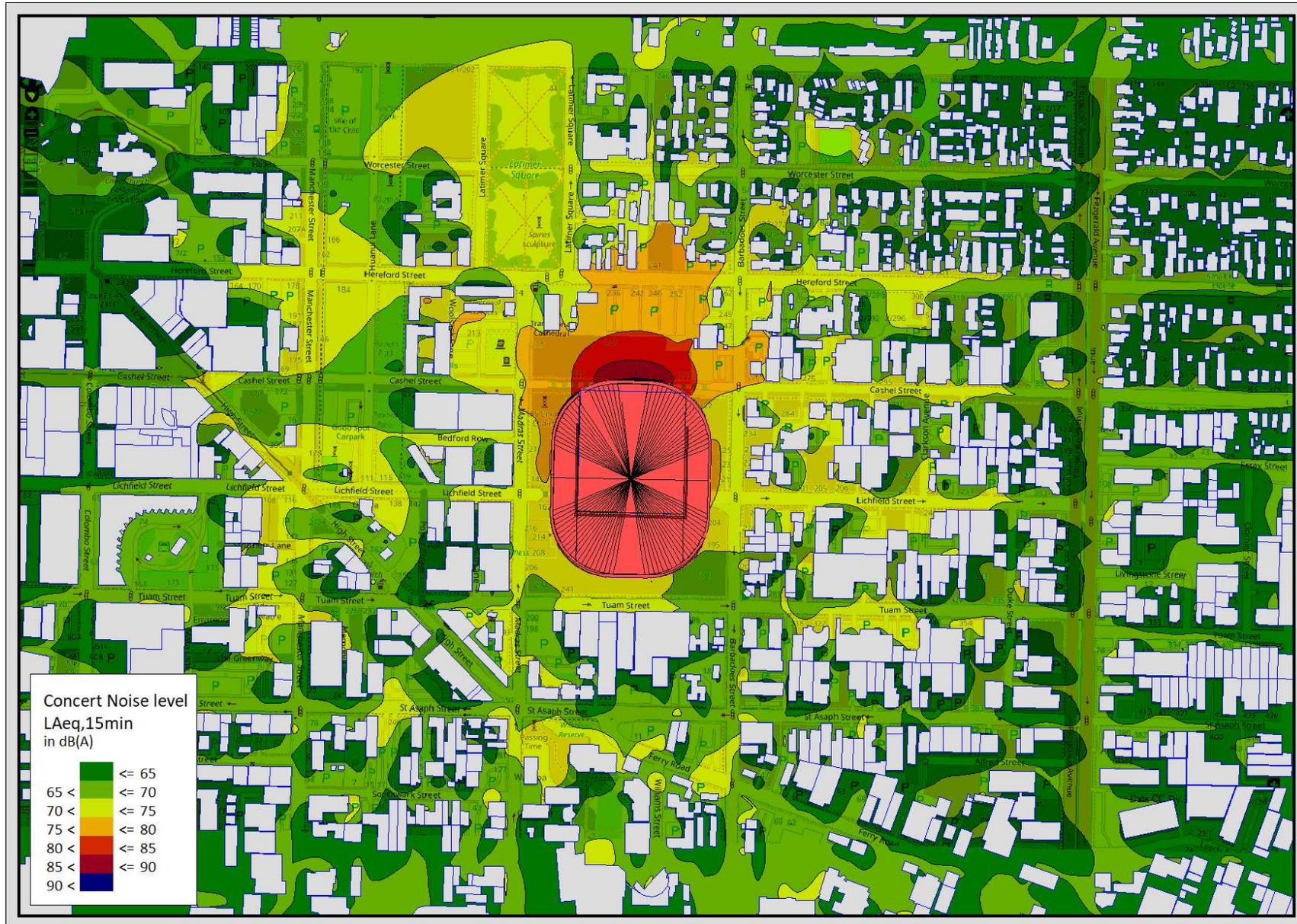
3.3.3 Proof of Concept - Noise Contour at 1.5 metres



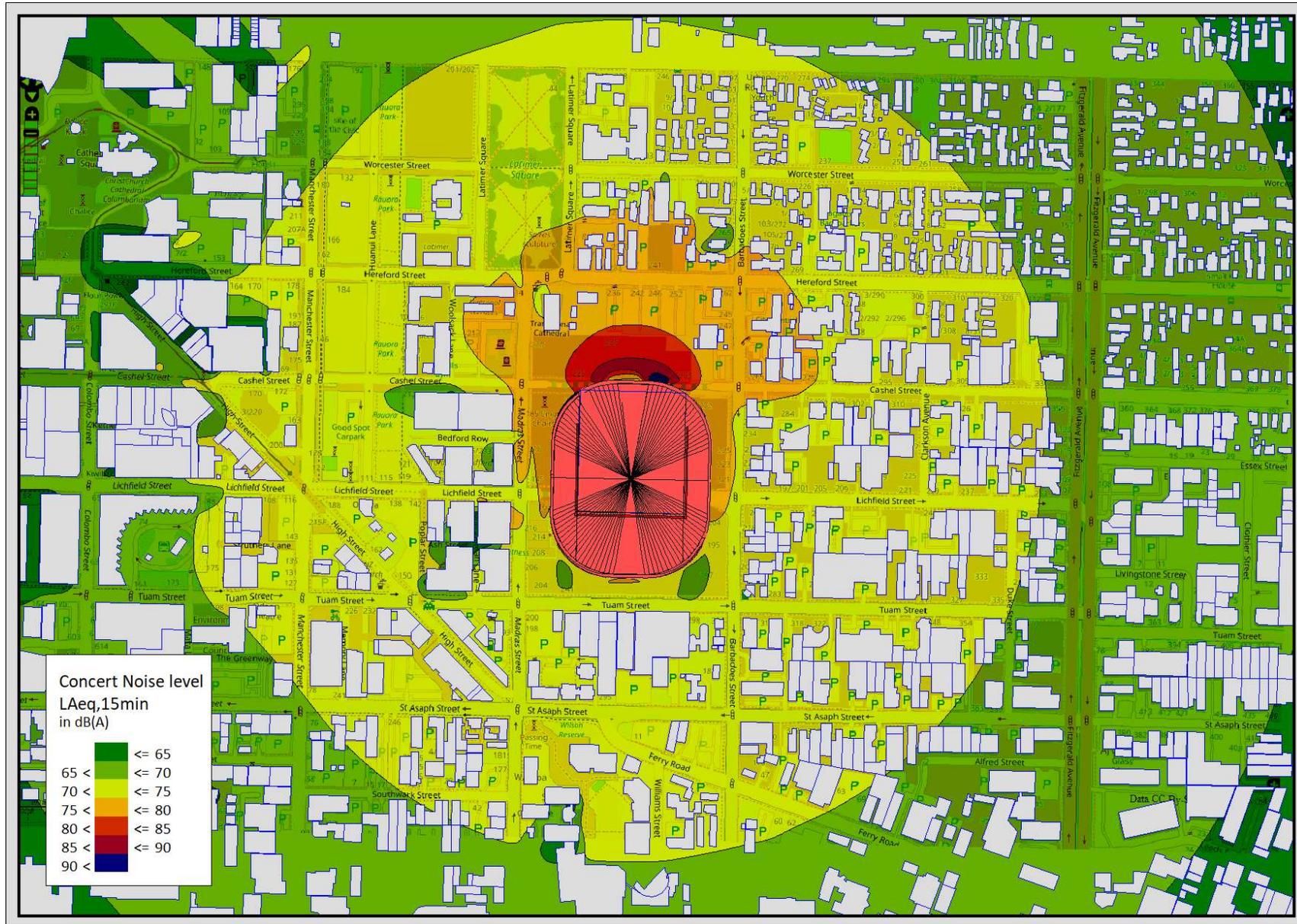
3.3.4 Proof of Concept - Noise Contour at 11 metres



3.3.5 Solid Bowl - Noise Contour at 1.5 metres



3.3.6 Solid Bowl - Noise Contour at 11 metres



Appendix 6 - Summary of Stadia Noise Provisions elsewhere in New Zealand

NZ Stadia Summary

Name of stadium/location	Capacity	Neighbourhood	Noise Limit (LAeq)	How many days per year	Finishing time	Other eg duration, days of week
North Harbour Stadium	25,000 sports	Industrial/commercial	82 up to 4 hours. LAeq 5min (all Auckland stadia are Precincts)	6 plus 10	11.30pm 11.00pm	If longer than 4 hours this counts as another event. No more than 4 in any 2 week period.
Western Springs	49, 000 concerts	Open space but residential to north and east	82	6	10.00 pm Sun to Thurs, 11pm Fri and Sat	Max 6 hours, if longer this counts as another event. Can also have 4 medium special noise events up to 70 dB LAeq. No more than 4 in any 2 week period.
Eden Park	60,000	Residential	80 dB LAeq (10 mins)	6	10.30pm	
Mt Smart Stadium	30,000	Industrial	75 dB LAeq (5mins) 65 dB LAeq (5 mins) 55 dB LAeq	6 plus 30 plus 50	10.30pm 10.30pm 10.30pm	No more than 4 in any 2 week period.
Stadium Waikato	25,800; plus 5000 temporary seats	Open space, but also some residential relatively close	75 dB LAeq (15mins) (Major Facilities zone)	6	11pm	Max 4 hours, except for two events which can be up to 7 hours. Public notice of noise events; NMP for each event.

Rotorua International Stadium	26,000; concerts 30,000	Open space but some residential relatively close	80 dB LAeq (1hour) 70 dB LAeq (1 hour) (PC4 decision)	4 plus 3		Max 3 hours; Max 12 hours. Octave band levels
Yarrow Stadium New Plymouth	25,500 – 30,000?	Residential but some open space nearby, To be repaired	70 dB LAeq (1 hour) as temporary activity up to 4 hours. If longer, 60 dB limit (Proposed DP)	4		Max 4 hours; or 2 up to 12 hours per day at lower noise limit. Octave band levels. NMP if compliance will not be achieved, incl programme for notification of affected owners and occupiers.
McLean Park Napier	19,700-23,700	Residential area	90 dB LAeq (15 min). (Temporary activity Ch 54 – 2011 ie old rules).	5	10pm Sun to Thurs; 12am Fri and Sat	24 hours max for concerts (within hours permitted).
Wellington (Sky) Stadium	34,500 seated	Industrial. Some residential to west and at distance	75	6	11pm	
Forsyth Barr Dunedin	30,750 sports; 36,000 for concerts	Industrial with some residential to west and at distance	75	3 at 65-75 dB; 12 between 55 and 65 dB	12.00pm Nov to Feb, 11pm remainder of year	Rules as to sequential events and events per week; publicity if events over 65.

Chch Temporary Stadium	18,000; 27,000 for concerts eg Phil Collins	Open space, but residential to east and south	85	No limit	10.00pm Sun to Thurs 11.00 pm Fri, Sat, public hol	Resource consent to go beyond hours
Hagley Park (open air)	20,000 plus?	Open space, but near residential	70 75	25 days per year 5 days per year plus NY Eve (later finishing time)	10.30pm 11.30pm	NY Day 12.30 am
TABLE SUMMARY	Table considers larger stadia in NZ plus Chch examples	Neighbourhood context variable, but often located in industrial area or large open space to provide space for stadium and parking, and distance to attenuate noise.	All stadiums specify a noise limit. This varies between 70 and 90 dB with average 75-80. Most common is 75 dB.	All have a cap on no. of loud events per year other than Chch Temporary Stadium. 6 is common	Most stadia have finishing times, most commonly 10.30pm Sun to Thurs and 11pm Fri and Sat.	

Other stadia not in table:

Owen Delaney Park Taupo – 20,000 – concerts 30,000?

ASB Baypark Mt Maunganui – 19,800

Toll Stadium Whangarei - 18,500

Rugby Park Invercargill – 18,000

Trafalgar Park Nelson - 18,000

CET Arena Palmerston North – 15,000

Appendix 7 - Ministerial Decision making Considerations under Section 38 and Section 11 of the GCRA

Section 38 considerations

1. Under section 38 of the GCR Act, in order to approve a draft amendment, the Minister with delegated responsibility for residual Greater Christchurch Regeneration portfolio matters must consider the matters in section 38(2). The Minister must:
 - a. Have particular regard to the views of:
 - i. Canterbury Regional Council;
 - ii. Te Runanga o Ngai Tahu; (section 38 (2)(a));
 - b. Consider the concise statement recording the view of strategic partners provided under section 33; (section 38 (2) (b));
 - c. Consider the concise statement summarising the comments and other input provided as a result of notification for written comment under section 34; (section 38 (2) (b));
 - d. Consider the proponent's advice on:
 - i. Whether the draft amendment has been developed in accordance with the outline approved under section 31 (section 38 (2) (c));
 - ii. How the views and comments provided under sections 33 and 34 have been considered and if relevant addressed (section 38 (2) (b));
 - e. Consider the fiscal and financial implications of the draft amendment (section 38 (2) (d));
 - f. Consider whether the draft amendment is in the public interest (section 38 (2) (e)).

Have the draft Amendments been developed in accordance with the Outline (section 38(2)(c))?

2. The Outline for Amendments to the CCRP was approved by Minister Megan Woods on the 3 August 2020. Public notice of the approval of the Outline and of Council's intention to develop Amendments to the CCRP was given in the Press on the 10 August and in the Christchurch Star on 13 August 2020.
3. The draft Amendments have been developed in accordance with the scope and process set out in the Outline.

4. The proposed new District Plan policy clearly sets out the Council's aspirations for the success of the CMUA as well as its intention to ensure that noise from the CMUA is managed so as to mitigate effects on the amenity of the inner city residential areas which are neighbours to the CMUA.
5. How these aspirations would be most appropriately resolved is articulated by the package of measures proposed, including conditions on the designation for the CMUA in respect of emission of noise, and a proposed amendment to a noise insulation rule in the District Plan.
6. These Amendments will result in a framework for the management of noise from the CMUA which provides certainty to all parties, and establishes clear noise expectations for design and management of the facility.
7. The process for development of the Amendments has closely followed that set out in the Outline, including two drop-in sessions to answer questions, one on 20 August 2020 following the notification of the Outline and one on 23 February following the drafting of the proposal and its notification for written comment. These were held at the Transitional Cathedral, which immediately adjoins the CMUA designation. The drop-in sessions were advertised through the Council website, emails to stakeholders and a leaflet drop in letterboxes in the area around the CMUA. Each of these methods of communication with interested parties invited people to contribute their views via Have Your Say, Council's online consultation portal, firstly on broad questions and then subsequently on more specific questions relating to management of noise from the CMUA. Over 140 responses were received to the first stage of consultation and 123 to the second stage, and responses have been taken into account in finalising the draft set of amendments.
8. A further round of consultation not signalled in the Outline, was to publicly notify revised proposed insulation areas in May 2021, as a result of design changes and remodelled contours bringing some city blocks and property owners who were previously subject to less modelled noise into the proposed Outer Noise Insulation Area. As the changes were to rules directly affecting future developments, this notification included letters to property owners in the area.

Advice of strategic partners and modifications made (section 38(2)(b) GCRA)

9. Refer to **Appendix 9** for a summary of the advice received from strategic and section 28 partners and modifications made to the proposal in response to that advice.

Feedback from public consultation and modifications made (section 38 (2)(b) GCRA)

10. Refer to **Appendix 10** for a summary of the feedback from notification for public written comment.
11. Submissions from the public e.g. from Fletchers have contributed to a decision to ask the appointed design and construction team to re-examine the design of the Arena, to consider in more detail any practicable ways to mitigate noise breakout. An option of a solid but lightweight wall on the northern façade to around 28m in height, rather than ETFE would decrease noise emitted to the north by between two and three decibels depending on location, and this option has now been adopted as part of the design proposal.
12. There have been modifications to the proposed monitoring and compliance regime as a result of feedback from the Canterbury District Health Board.

Fiscal and financial implications (s38 (2)(d))

13. There are no direct fiscal implications for central government as a result of this proposal to amend the CCRP, although the CMUA project itself has obviously had significant fiscal implications for central government. The Crown's contribution to the project includes separately funding the land acquisition and land remediation resulting from contamination, while its contribution to building the CMUA is \$220 million.
14. As well as these fiscal contributions the Crown has a wider interest in recovery in terms of facilitating revitalisation of the Central City through regeneration and residential development.
15. The Council is the agency responsible for delivery of the CMUA project and until recently has had control over project governance and project design and scope decisions. These latter functions have now been transferred to CMUA Project Delivery Limited which is now providing independent governance and financial control. An internal Project Reference Group of managers has also been set up within Council to liaise with the CMUA Board. It is anticipated that in due course, and probably before there is a need for an Outline Plan of Works to be submitted under the RMA, the designation for the CMUA will be transferred from the Crown (Minister with delegated responsibility for residual Greater Christchurch Regeneration portfolio matters) to the Council.
16. Uplifting of the designation by the Crown rather than transfer of the designation to the Council is considered unlikely, as that would remove the land use authorisation for the CMUA project. The designation would only ever be uplifted in the future by the Council, if a comprehensive CMUA zone (Stadium Zone) had been developed and was in place to replace it, including rules covering the emission of noise.

Financial implications

17. Any financial implications of noise control measures will be explored during the detailed design of the project in 2021. The operator of the CMUA is likely to be Venues Otautahi, a Council controlled organisation. The Long Term Plan funding of \$253 million over several years remains the Council's capital funding cap.
18. The requiring authority or venue operator will need to cover the costs of the preparation of a Noise Management Plan which will be required to be in place before noisy events can occur. As well there will be costs associated with the installation of permanent noise loggers to be used for compliance and monitoring, and the design of a monitoring system. There could be operational costs associated with ensuring that promoters and visiting acts are fully aware of noise limits, will properly control the emission of noise during events and will work within agreed parameters for the set-up, positioning and orientation of loudspeakers brought in for events.
19. It is not anticipated that there will be any opportunity costs in terms of concerts/acts being dissuaded from coming to Christchurch, as the noise limits proposed are expected to be practical and achievable, while still resulting in a good concert experience.
20. Costs of additional noise insulation are discussed in paragraphs 6.70 onwards of the main report.

Public interest (Section 38(2))

21. Mitigating noise to achieve a reasonable balance between regeneration and residential amenity can be considered a public interest issue. Public interest will often be multi-faceted and has to be "determined" based on the circumstances and the context.
22. In making a decision on the welfare or well-being of the general public, the important elements include who is the relevant public, what are their wants and what are the constraints on the decision. Other elements which help assess whether the proposed decision is in the public interest are the transparency of the decision-making process and whether it balances competing interests. A decision is likely to be in the public interest if it does not leave everybody uncertain as to what to expect, and is beneficial for all or most members of a given community or communities.
23. There are at least three relevant "publics" or communities in the context of the CMUA. One group is the residents or communities who live near the CMUA, another group is the potential patrons of events at the CMUA, and in particular noisy events, and a third group is the wider regional community, which will benefit economically, socially and culturally from the successful operation of the CMUA. The first two groups may in general have

competing interests in noise (e.g. want less noise rather than more noise), but even concert goers wanting a good concert experience do not necessarily want to experience maximum reverberant noise levels inside the Arena.

24. A constraint on the decision as to where the public interest lies, is the need to be sufficiently enabling in terms of noise limits that the CMUA can still attract a wide range of events and be a viable and successful facility, thus facilitating regeneration and social and economic benefits. The standards proposed are relatively enabling compared to those which apply to the majority of stadia in New Zealand, (e.g. see **Appendix 6**) yet should help avoid excessive noise effects. Some limits on noise which can be emitted will be balanced by a requirement for new development in the area to be noise insulated. The new requirement for noise insulation in respect of the CMUA is consistent with noise insulation requirements which already apply in parts of the surrounding area for other reasons, so does not represent a huge change.
25. Having clear and widely understood limits such as a standard finishing time and a cap on the number of events per year will promote certainty as to the future environment of the area and represents a balance between the needs of the venue operator, the expectations of touring entertainers, and the needs of surrounding residents. Ensuring that noise is considered proactively and factored into the design and operation of the facility, will help avoid significant noise nuisance, as will the proposed monitoring and compliance system including an agreed noise management plan.
26. Council considers that a decision to amend the Christchurch Central Recovery Plan in the manner proposed is in the public interest.

Section 11 considerations

27. Under section 11 of the GCR Act, in making a decision to approve amendments to a Regeneration Plan (in this case Recovery Plan) the Minister with delegated responsibility for residual Greater Christchurch Regeneration portfolio matters must also exercise his/her power in accordance with one or more purposes of the GCR Act (section 11 (1)), and also consider that the exercise of that power is necessary in the circumstances of the proposal (section 11 (2)).

Purposes of the GCR Act

Enabling a focused and expedited regeneration process

28. The Amendments are expected to enable a focused and expedited regeneration process (section 3 (1) (a)), by facilitating the realisation of the regeneration benefits provided by the CMUA.
29. Until the relevant parts of the Greater Christchurch Regeneration Act are repealed on 30 June 2021, the District Plan cannot be changed under RMA processes in a manner that is inconsistent with the CCRP (section 60 of the GCRA). There is little case law on the test of “inconsistent with” and none on section 60 of the GCRA. One case under the Canterbury Earthquake Recovery Act states “Whether a proposal is inconsistent with the Recovery Plan is a question of scale and degree and is to be judged in the particular circumstances of the case”.¹⁶ One way of approaching the question of whether a change would be inconsistent or not, is to ask whether or not it would alter the essential nature of what the document provides for.
30. From this perspective, including a wider area for noise insulation in respect of the stadium than the CCRP did, might not be considered inconsistent with the nature of that document, which provided for the stadium designation with some (very limited) noise mitigation via insulation. However, it is more clearly inconsistent with the CCRP to add conditions which are intended to constrain noise emitted from the designated site, when there were no such conditions in the original document. Such additions could therefore be precluded by section 60 of the Greater Christchurch Regeneration Act. On the other hand it could also be considered that mitigating noise through adding conditions will improve the wellbeing and residential amenity of the communities of the area.
31. Putting aside the question of whether the proposed Amendments are or are not inconsistent with the CCRP, a plan change to the District Plan could conceivably be introduced to amend the insulation rule introduced by the CCRP. However there would be no advantage in this course of action because there would still be a second separate process required for the designating authority to add conditions to the designation, as this cannot be done via a plan change. Council considers that a single CCRP Amendment process would expedite the process of making any necessary changes to the District Plan, by combining what would otherwise be two separate processes— a plan change regarding noise insulation rules, and the designating authority seeking to change the designation conditions – and avoiding the potentially significant delays which could be created by appeals on either. Initiating changes to the District Plan under the RMA would be likely to delay the process by 12 months or more.

¹⁶ Re Canterbury Cricket Association [2013] NZEnvC 184

32. It is important that the Amendments are developed now, so that the implications of potential noise effects beyond the CMUA site, and of the noise mitigation measures that are being proposed through these Amendments, can be considered during the finalisation of the design of the CMUA in 2021.
33. The CMUA is planned to be constructed and opened by 2024, which means that there is a tight schedule. The RMA requires that before construction can start, the designating authority (now the Minister with delegated responsibility for residual Greater Christchurch Regeneration portfolio matters, until the designation is transferred to the Christchurch City Council) must prepare an Outline Plan of Works (OPW) and submit it to the territorial authority for the territorial authority to be able to recommend changes, with this process scheduled to occur in 2021.
34. Since these Amendments are likely to propose conditions on the designation relating to noise, the Amendments need to be completed before the OPW is submitted. As discussed above, it is likely that at the least the amendments to add conditions on noise could be considered inconsistent with the CCRP. If that is the case, the amendments to add conditions could not be made before 30 June 2021 without also amending the CCRP. Waiting until after 30 June 2021 to initiate amendments to the designation would add delay to the construction of the CMUA, thus also delaying the regeneration benefits expected through the development and operation of the CMUA.

Facilitating the ongoing planning and regeneration of greater Christchurch

35. The Council expects that the Amendments will facilitate the ongoing planning and regeneration of greater Christchurch (section 3 (1) (b)), by helping to achieve the economic and social benefits of the CMUA for the wider regional community, including through the hosting of large events, while mitigating potential noise effects experienced in the immediate neighbourhood where necessary for regeneration.
36. Attention now to the management and mitigation of the effects of noise from the CMUA will provide improved certainty for residents, businesses and the CMUA operators on reasonable expectations for noise. That improved certainty will assist the community in making decisions on living and investing in the Central City, and will assist in the design and management of the CMUA. This extends to providing more certainty for Otakaro Ltd in planning future developments in the East Frame Residential Project and South Frame, which are close neighbours of the CMUA, with these Anchor Projects sharing the objective of contributing to a vibrant and successful inner Central City. The Council considers that this improved certainty will meet at least one of the purposes of the Act, that is, facilitating the ongoing planning and regeneration of greater Christchurch (section 3(1)(b)).

37. The CMUA project constitutes urban renewal as defined in the Greater Christchurch Regeneration Act. The regeneration purpose of the Act includes improving the environmental, economic, social, and cultural well-being, and the resilience, of communities through urban renewal and development.
38. The Council considers that enhancing the delivery of that project by proactively making targeted amendments to the CCRP to better manage potential noise effects from the CMUA would more effectively achieve regeneration outcomes than not making such amendments.

Enabling community input into the development (or amendment) of Regeneration Plans.

39. The engagement to date, and the formal opportunity for written comment on the draft Amendments, will enable community input into decisions on these Amendments and so meet section 3(1)(c) of the Act.

Recognising the local leadership of Canterbury Regional Council, and Te Rūnanga o Ngāi Tahu, in particular and providing them with a role in decision making under the Act.

40. The Christchurch City Council is delivering the CMUA project. Local leadership of the project and progressing its design and build, including taking a proactive approach by refining how the project is provided for in the District Plan, and taking into account the views of strategic partners, meets section 3(1)(d) of the GCR Act.

Necessity

41. The designation for the CMUA was inserted in the District Plan through the CCRP as part of achieving recovery/regeneration objectives. Enhancing the provisions of the designation and the District Plan through introducing conditions on noise, and adding noise insulation rules so as to improve the delivery of regeneration outcomes, with those outcomes including a gradual increase in the residential population of the Central City, is an appropriate use of GCR Act powers.
42. In making a decision to approve these Amendments, the Minister with delegated responsibility for residual Greater Christchurch Regeneration portfolio matters would be balancing a range of objectives, including enabling an expedited regeneration process and balancing the various facets of public interest in the CMUA. Improved certainty as to noise outcomes will assist the community in making decisions on living and investing in the Central City.

43. Amending the CCRP will facilitate changes to the District Plan, as the Amendments will then need to be incorporated into the District Plan in accordance with section 61 of the GCR Act.
44. No other mechanisms are realistically available at this time to enable all of these outcomes to be achieved. Waiting until after 30 June 2021 so as to initiate amendments to the designation after the GCR Act is repealed would add delay to the construction of the CMUA, thus also delaying the regeneration benefits expected through the development and operation of the CMUA.
45. For all of the reasons set out above, the Council is of the view that the Minister can reasonably consider it necessary to use her power to approve these Amendments to the CCRP.

Appendix 8 – Draft Notice of Decision on Proposal under Section 38

Gazette Notice:

DECISION ON AMENDING THE CHRISTCHURCH CENTRAL RECOVERY PLAN IN RESPECT OF NOISE FROM THE CANTERBURY MULTI-USE ARENA

Pursuant to section 38 of the Greater Christchurch Regeneration Act 2016 the Minister with delegated responsibility for residual Greater Christchurch Regeneration portfolio matters has exercised her powers to approve the Proposal to amend the Christchurch Central Recovery Plan to:

- Strengthen policy direction in respect of noise effects from the Stadium (now known as the Canterbury Multi-Use Arena or CMUA).
- Add conditions to the designation for the CMUA relating to the management and mitigation of noise from the CMUA, and in particular concert noise;
- Extend the current rule for acoustic insulation of new buildings for “sensitive activities” to additional areas of the Central City, and increase the standard of insulation that applies, to improve the amenity of Central City residents living near the CMUA.

The Amendments will be incorporated into the Christchurch District Plan in accordance with section 61 of the GCR Act.

The date on which the exercise of the power takes effect is on the [day] of [month] 2021.

Hon Dr Megan Woods, Minister with delegated responsibility for residual Greater Christchurch Regeneration portfolio matters.

Appendix 9 – Summary of views of Section 29 partners and Strategic partners and Council responses

CMUA - Concise Statement of Views of GCRA Section 29 Parties and Strategic Partners on Draft Proposal to Amend the Christchurch Central Regeneration Plan

Organisation	Summary of feedback / matters raised	Council Responses and changes made
Te Rūnanga o Ngāi Tahu (Te Rūnanga)	1. Te Rūnanga advises that Te Ngāi Tūāhiriri Rūnanga is the entity with responsibility for protection of resources and tribal interests within Christchurch City, including the site of the proposed CMUA and where the proposed planning rules will apply.	Acknowledged.
	2. Te Rūnanga and Ngāi Tūāhiriri support the Draft Proposal on the basis that it appropriately balances the operational needs of the Multi-Use Arena and the management of noise effects on surrounding residents, both of which are recognised as important factors in the regeneration of the Central City.	Support noted.
	3. Ngāi Tūāhiriri would welcome the opportunity to meet with the Christchurch City Council and the agencies undertaking the construction of the Multi-Use Arena to identify opportunities for partnering with or utilising the resources of Whitiora (the Ngāi Tūāhiriri skills centre).	Ongoing engagement is intended with Ngai Tuahiriri during the development of the CMUA.
Department of the Prime Minister and Cabinet	4. The Draft Amendment needs to be presented in a way which is logical and easy to navigate, and which provides sufficient information and explanation, for both the public and the Minister to better understand its effects and its benefits for regeneration.	The Draft Amendment has been edited following the receipt of comments from the partners and DPMC, by adding more explanation on why particular choices have been made, and the effects of those choices.
	5. Consider restructuring the proposal itself e.g. providing an explanatory overview, followed by the specific changes, and then more detailed technical /other analysis. Also consider not	An explanatory overview has now been added which sets out the problem, provides an overview of the noise management measures proposed and describes the

Organisation	Summary of feedback / matters raised	Council Responses and changes made
	<p>providing section 38 and section 11 GCRA comment at this stage, but only later in documentation for the Minister.</p>	<p>approach taken to reconciling the two objectives of successful operation of the CMUA and the establishment of a high quality inner city living environment, and the effects of that approach.</p> <p>Specific changes are still set out separately in Appendix 1 as putting them after the explanatory overview would disrupt the flow of the document. Section 38 and section 11 comment has been retained but moved to Appendix 7.</p>
	<p>6. It is unclear what qualifies as the amendment, what has statutory weight, where the statutory direction to amend the CCRP is and it is not clear that the proposed changes to provisions are to the District Plan to achieve consistency with the CCRP and no changes are proposed to the CCRP itself.</p>	<p>The Amendment is set out in Appendix 1 to the Proposal, as referenced in the contents list and in paragraph 2.2 . Some minor wording changes in respect of the Stadium have now been proposed to the CCRP itself in the “Vibrant City” section, but the bulk of the changes are to the District Plan. A statutory direction to amend the CCRP and the District Plan will be drafted once public comments are received and the Amendments are finalised.</p>
	<p>7. The draft Amendment appears to take a highly enabling approach to noise mitigation and management, with the balance of priorities weighted towards the CMUA’s ability to operate and attract a high level of events that generate noise. However it is not currently transparent that this prioritisation has been made; or how it might impact on other matters which are relevant for supporting regeneration, including the establishment of a high quality inner city living environment.</p>	<p>The approach taken is agreed to be enabling but not “highly” so, given the range of management and mitigation measures being proposed. Each element of the management package has been carefully considered, including management of the duration and frequency of the noise, and consideration of related noise matters through a Noise Management Plan. All of the measures work together, so that considering only noise levels on their own is likely to be an oversimplified view. The approach adopted has been made clearer in the</p>

Organisation	Summary of feedback / matters raised	Council Responses and changes made
		explanatory overview, with additional explanatory material in other sections.
	8. The draft Amendment lacks sufficient rationale as to why the Council considers this approach will provide better overall regeneration outcomes for the City and provide the most appropriate reconciliation of the CCRP's two objectives of the successful operation of the CMUA and the establishment of high quality inner city living.	As noted above, the rationale for the approach adopted has been further explained in this revision of the Proposal, and additional wording has been added to the new policy. The Council needs to promote regeneration both through the success of the CMUA and the success of residential development in the area, and the measures proposed for the management and mitigation of noise are considered to be the most appropriate possible in the circumstances.
	9. Further consideration should be given to addressing the rationale for the approach e.g. how the 15 loud concerts a year has been arrived at, and potential effects of those concerts on the surrounding environment. Also suggest adding more explanation of the potential effects of adding unlimited numbers of concerts producing less than 65 dB L_{Aeq} at the compliance point, to the total of 15 concerts.	Additional explanation on the potential impacts on the surrounding environment is found in section 6 eg at paragraph 6.28 and in the sections on the rationale for limits on number of concert days (condition 1.a.) and on noise limits (also condition 1.a.) in section 6 of the Proposal. Having no limit on numbers of concerts producing less than 65 dB L_{Aeq} outside the Arena is not an issue. As noted in paragraph 6.46, such smaller concert events do not add noticeably to overall or cumulative noise levels.
	10. The draft Amendment departs from the technical advice in relation to the maximum concert noise limit and the acoustic insulation requirements. The impact of these departures on the amenity of the surrounding environment does not appear to have been assessed, and as such, the extent to which the draft Amendment will support regeneration is not fully	a. Paragraph 6.20 onwards provides additional information on the factors leading to the proposal to stay with an external noise level of 80 dB L_{Aeq} outside the CMUA for up to 6 concerts per calendar year, but up to 9 concerts at the 75 dB L_{Aeq} previously recommended by noise consultants for all concerts. One significant factor is that feedback from concert

Organisation	Summary of feedback / matters raised	Council Responses and changes made
	<p>discernible. The impact of the departures from the technical advice should be further addressed including:</p> <ol style="list-style-type: none"> a. How does a higher maximum concert noise limit (80 dB_{L_{Aeq}} compared to the recommended 75 dB_{L_{Aeq}}) impact on the amenity of the surrounding environment for current and future residents? b. How has the proposal to only require internal noise reduction by 35 dB_{L_{Aeq}} for bedrooms, rather than for all habitable spaces, been arrived at. 	<p>promoters indicates that some acts may be reluctant to come to Christchurch if they were restricted to 100 dB_{L_{Aeq}} within the Arena. The Arena needs to be successful to provide economic and social benefits for regeneration in the Central City. It is understood that the most significant difference between 75 dB_{L_{Aeq}} and 80 dB_{L_{Aeq}} is a geographic one in that fewer households would be affected by high noise levels under the former limit.</p> <ol style="list-style-type: none"> b. It is now proposed that a higher level of insulation be required for a “CMUA Inner Noise Insulation Area” where noise levels outside buildings could be 75 dB_{L_{Aeq}} or higher during concerts. In this area a 35 dB reduction would be required across both bedrooms and other habitable spaces. This is likely to bring a small cost increase over and above the measures required in the “CMUA Outer Noise Insulation Area”.
	<p>11. Add more explanation of costs for developers and purchasers of new acoustic insulation requirements, and whether those design requirements might lead to some limitations on indoor/outdoor living.</p>	<p>Material on costs of insulation from the original section 38 and section 11 discussion has been brought into the main text at 6.70 and following, after description of the proposed insulation rules. As much cost information as is currently available has been provided, noting that noise exposure circumstances and rule requirements in NZ vary considerably. Paragraph 6.76 reports the results of investigation by Otakaro Ltd of the costs of moving from a 30 dB reduction for bedrooms only (Rule 6.1.6.2.9 as inserted by the CCRP) to a requirement for 35 dB for bedrooms and 30 dB for other habitable spaces, as</p>

Organisation	Summary of feedback / matters raised	Council Responses and changes made
		<p>proposed for the Outer Insulation Area in these Amendments. It can be noted that in their comments on the notified proposal, Fletchers dispute these results. Acoustic insulation cost estimates are very dependent on assumptions about base materials used, and the typology, design and orientation of buildings to the noise source.</p> <p>The provision of mechanical ventilation as part of the acoustic insulation package would mitigate the effects of closed windows indoors, and in any case noise from the CMUA will only occur intermittently.</p>
	<p>12. Explain what the effects of the draft Amendment will be for current residents, when there cannot be a requirement to retrofit acoustic insulation in existing dwellings via the District Plan.</p>	<p>See response on point 7. above. Where there cannot be a requirement to retrofit acoustic insulation in existing dwellings, there could be some reduction of amenity, especially for lightweight buildings. This will be counterbalanced to some degree by other measures managing duration and frequency of noise, and consideration of related noise matters through a Noise Management Plan, including prior notice of forthcoming noisy events. These factors will benefit all residents.</p>
	<p>13. Further explain why the proposed changes to the District Plan would be inconsistent with the CCRP, the nature of that inconsistency, and therefore why it is necessary to use the GCR Act.</p>	<p>The discussion of section 11 considerations in Appendix 7 has been revised to acknowledge that inconsistency with the CCRP is not clearcut with regard to expanding the area where noise insulation is required, but that adding conditions to constrain noise emitted from the designated site is more clearly inconsistent. However irrespective of this consideration, there is still an advantage in a single CCRP Amendment process because it will combine and</p>

Organisation	Summary of feedback / matters raised	Council Responses and changes made
		expedite what would otherwise be two separate processes.
	14. If the Crown’s fiscal and financial interests continue to be mentioned, take a more holistic approach eg to include contribution of land and funding for decontamination, and also note that the Crown has interests in wider recovery, including residential development in the East Frame.	See Appendix 7, fiscal and financial implications. Wording along the lines suggested is now found in paragraphs 10 and 11 of the Appendix.
	15. A number of minor amendments suggested to proposed policy, rule amendment and designation conditions. Key comments include: <ul style="list-style-type: none"> a. combine two parts of policy, b. restructure noise insulation rule, c. clarify that noise level references in condition 4.a.(now 3.a.) are 15 minute averages, d. clarify if the Noise Management Plan will be publicly available, e. refer to promoter and visiting act education about noise controls. f. map new noise insulation area on Planning Maps. 	Some but not all of the rewordings suggested by DPMC have been adopted. Some are not considered necessary. Key comments include: <ul style="list-style-type: none"> a. It is not considered appropriate to combine the two parts of policy, and link them with the word “while”, as this would suggest a weighing up and balancing of different considerations under the RMA, whereas this proposal is being advanced under the GCRA. Both parts of the policy need to be achieved and regeneration and the success of both the CMUA and residential development is the primary aim for Council rather than simply mitigating noise. b. It is not appropriate to restructure Rule 6.1.6.2.9 at this stage, as this rule relates to two different noise sources, the Noise and Entertainment precincts and the CMUA, with the former being beyond the scope of these Amendments. c. Noise level measurements in Condition 3.a have been clarified.

Organisation	Summary of feedback / matters raised	Council Responses and changes made
		<ul style="list-style-type: none"> d. Condition 4.a notes that the latest certified version of the NMP shall be made available on the venue operator's website. e. Wording has been added to Condition 4.f relating to communicating noise and other limits to promoters and visiting acts. f. Both proposed new noise insulation areas (with the CMUA Outer Noise Insulation Area amended for 2021 noise modelling) have now been mapped on the Central City Noise Environments Planning Map.
Otakaro Ltd	16. Otakaro fully supports the CMUA development and recognises the significant contribution the CMUA will make to the regeneration of Christchurch.	Support noted.
	17. Suggest additional wording is considered for the policy to highlight long term benefits of the CMUA for Christchurch eg making a significant contribution to the vibrancy of the Central City and promoting and supporting the sporting and cultural identity of Christchurch.	Additional wording has been added to the policy along the lines suggested.
	18. Reports commissioned by Otakaro showed that completed East Frame residential units in the new Liverpool neighbourhood will not meet the proposed noise reduction standards. Existing Central City residential neighbourhoods could change in character to more short-term accommodation/rental options, as a result of CMUA noise.	It is acknowledged that some recently completed units will not meet the proposed noise reduction standards, but some noise reduction is better than none. Provisions are not retrospective, so existing units will not be required to meet the new standards.
	19. There will be added costs to future residential development in the area. Quantity surveyors have estimated that for the next East Frame development lots, Superlot 6 and Superlot 10,	Otakaro's estimates of additional costs have now been referenced in the proposal, as they are the most specific available to date.

Organisation	Summary of feedback / matters raised	Council Responses and changes made
	<p>these additional costs could be between \$2000- \$8000 per unit depending on the unit typology. The noise effects and mitigation measures are a product of the current CMUA concept design. Otakaro’s view is that the CMUA design should mitigate the costs of the activity within its own boundary, rather than passing costs onto residents and landowners in the surrounding neighbourhoods. There should be proper cost benefit assessment of design options which could reduce the impact on surrounding neighbourhoods.</p>	<p>Alternative designs for the CMUA were examined during development of the "Proof of Concept" design. Changing the design to provide effective noise attenuation, including of bass noise, would require a heavy solid roof and walls and an alternative turf solution, and would significantly increase both construction and operational costs. More recently the consortium appointed to design and build the CMUA have investigated varying the Proof of Concept scenario by replacing the ETFE on the northern façade of the building with a lightweight solid wall to around 28m in height (the "Solid Bowl" concept), which will reduce noise emissions to the north of the CMUA by two to three decibels compared to the earlier noise modelling, thereby shrinking the reference noise contours slightly to the north. The solid bowl concept has now been adopted by the design team.</p>
	<p>20. Support proposed conditions on designation, and request that CCC consider adding another permanent noise logger near the East Frame Residential project.</p>	<p>It is agreed that additional outside compliance points to that originally proposed would be valuable, but the location suggested could suffer from interference from traffic noise. The proposed conditions now require at least four noise loggers to collectively provide coverage of noise emissions on all sides of the CMUA. The locations of the compliance points other than the residential to the north of the CMUA can be determined through the Noise Management Plan.</p>
	<p>21. Note that the requiring authority for the designation could choose to remove the designation (with conditions placed on it). Otakaro quotes Te Pae, where Council asked Otakaro to apply for resource consent for noise from outside activities not</p>	<p>Uplifting of the designation by the Crown rather than transfer of the designation to the Council is considered highly unlikely, as that would remove the land use authorisation for the CMUA project. The designation is only</p>

Organisation	Summary of feedback / matters raised	Council Responses and changes made
	covered by the designation and not meeting Central City noise rules.	<p>ever likely to be uplifted in the future by the Council, if a comprehensive CMUA zone (Stadium Zone) had been developed and was in place to replace it, including rules covering the emission of noise.</p> <p>The designation for the CMUA covers a wide range of activities and includes outside spaces, and is not considered comparable to that for Te Pae.</p>
Environment Canterbury	22. Support the intent of the proposed amendments to manage the potential adverse effects of noise beyond the CMUA site, given the proximity of inner city residential areas, while enabling the facility to operate viably to provide the intended regeneration outcomes.	Support noted.
	23. No specific comments on specific conditions proposed, but fully support the approach to developing a package of measures to effectively mitigate effects on the amenity of neighbouring residents, in a manner that does not undermine the viability of the CMUA.	Noted.
	24. Note that additional and separate work is being undertaken on how other non-noise effects (including traffic and parking) can be managed or mitigated as required.	Noted.
Selwyn District Council	25. No comments received.	Noted.
Waimakiriri District Council	26. Having reviewed the draft proposal and noted the three specific elements outlined in the letter [policy, adding conditions to designation, amending rule], the Waimakariri	Noted.

Organisation	Summary of feedback / matters raised	Council Responses and changes made
	District Council have no concerns about progressing these amendments.	

Appendix 10 – Summary of written comments from public - March 2021

Christchurch City Council

The Canterbury Multi-Use Arena

Summary of Written Comments from Public

March 2021

1. Introduction

Public notice of the opportunity to provide written comment on the proposed Amendments to the Christchurch Central Recovery Plan, in respect of Noise Management for the Canterbury Multi Use Arena, was published on 26 January 2021. Identified stakeholders in the project were also sent information by email on 26 January 2021, and leaflets dropped in all letterboxes in the area thereafter. Feedback on the Noise Management proposals was requested through Council’s “Have your Say” webpage between 26 January 2021 and 1 March 2021. A drop-in session originally scheduled for 16 February was held on 23 February.

As a result, written comments were received from 123 individuals and organisations.

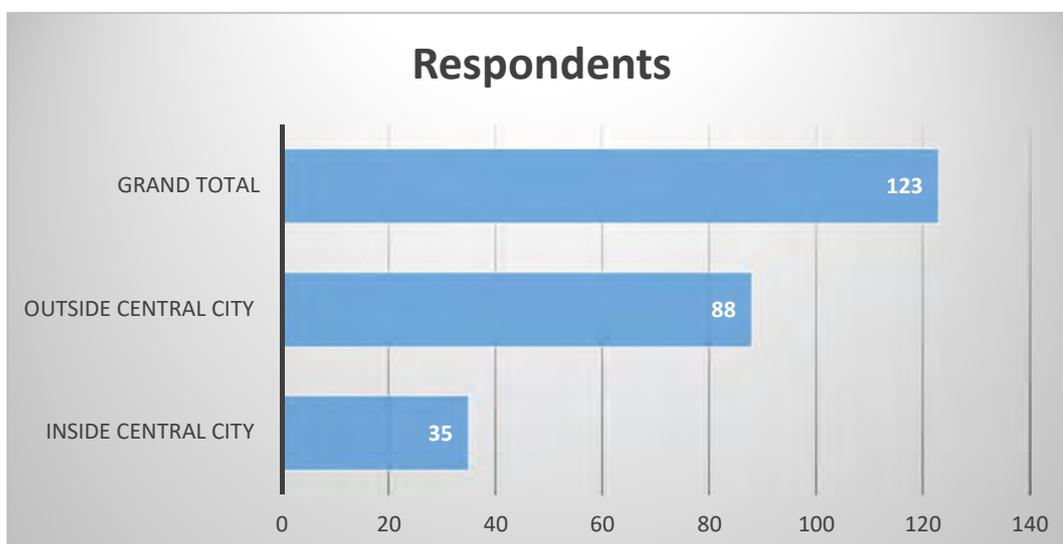
2. Overview of feedback topics

The Have Your Say webpage and information distributed via email and leaflets contained a summary of the noise management measures proposed. Nearly all respondents commented either specifically or more generally on a selection of these measures/topics, with a few raising additional matters. The summary was as follows:

- a. A noise limit for concerts of 80 dB LAeq (averaged over a 15 minute period) at a residential compliance point outside the Arena i.e. maximum of 105 dB LAeq (averaged over a 15 minute period) inside the Arena.
- b. A noise limit on public address (PA) systems for non-concert events.
- c. A bass noise limit, which will still allow a wide range of music types to produce an acceptable sound level for concertgoers, but will reduce the noise nuisance at distance.
- d. Real-time noise monitoring at specified compliance points.
- e. A standard finishing time of 11pm except for New Year’s Eve when concerts could continue to 12.30am.
- f. An upper limit of 15 concerts per year over 65 dB LAeq at a residential compliance point.
- g. A requirement for a noise management plan, which will set out how the noise limits will be achieved, and how a range of other noise-related activities will be addressed.
- h. An amended noise insulation rule, which strengthens the insulation requirements for new buildings in the area.

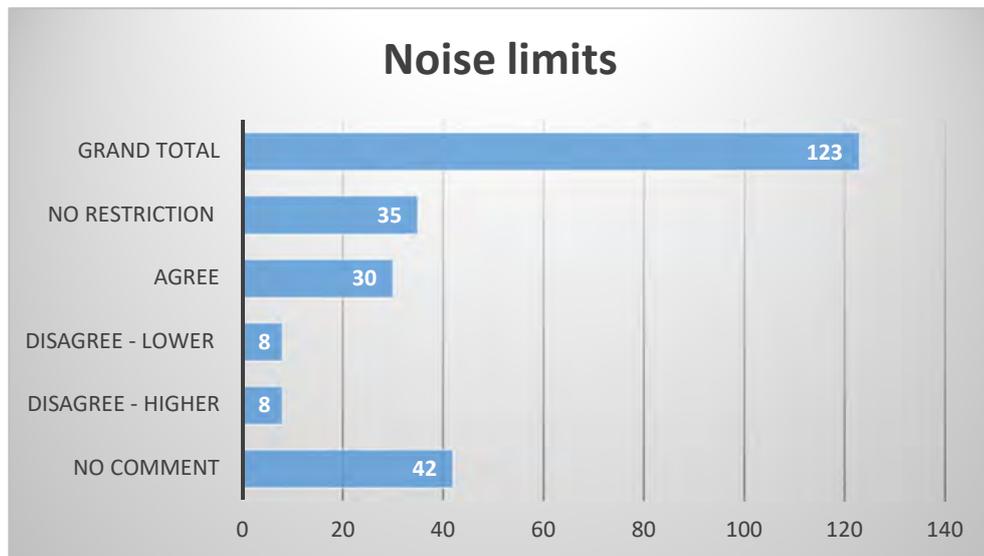
3. Analysis of feedback received:

An analysis of feedback received follows. Out of the 123 Respondents, 88 (71.5%) live outside the central city and 35 (28.5%) either live in or have a business or property interest within the central city (Four Avenues). This is similar to the proportions in the August/Sep 2020 feedback. A commentary on feedback received can be found in section 4.

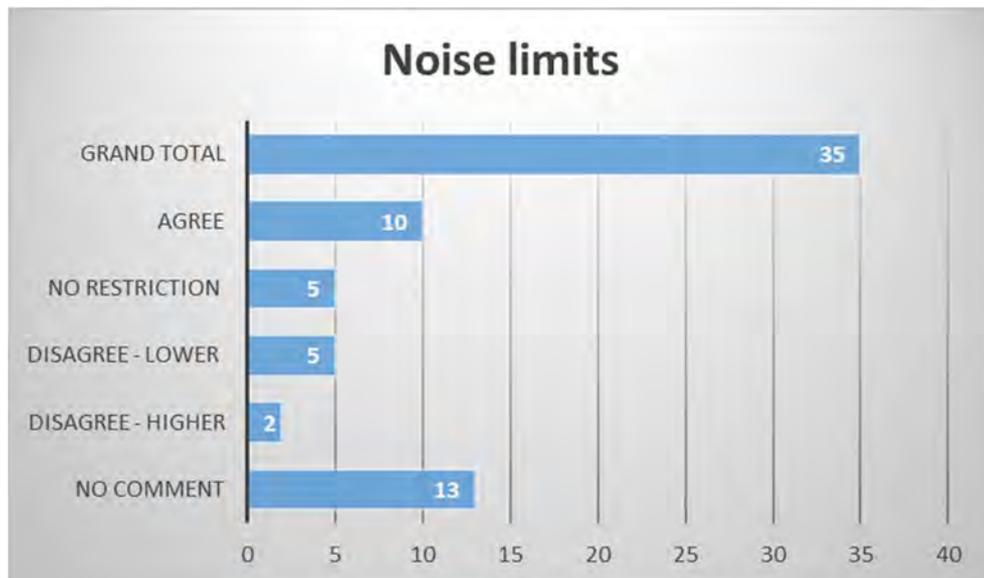


3.1 Noise limits (topics a.to d. in 2)

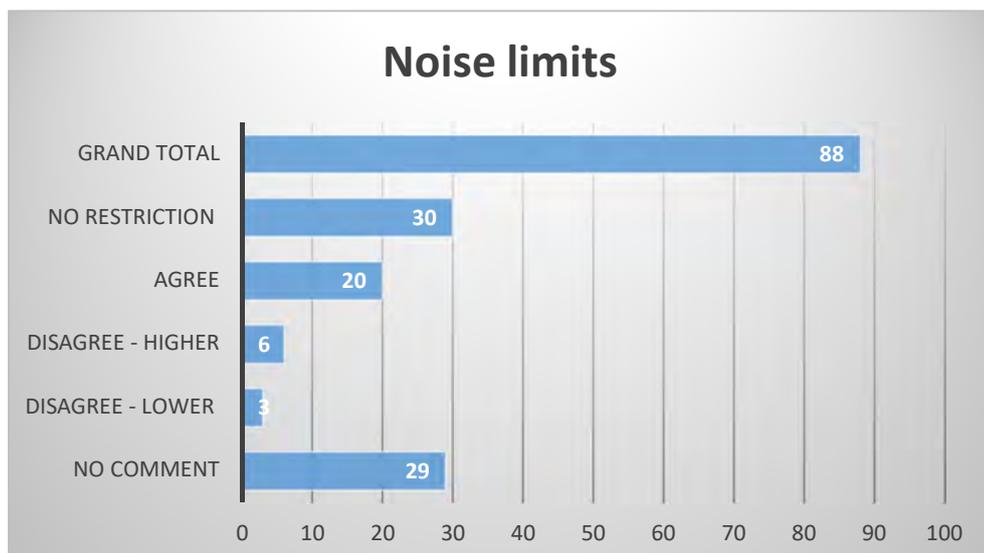
a. All Respondents



b. Inside Central City Respondents

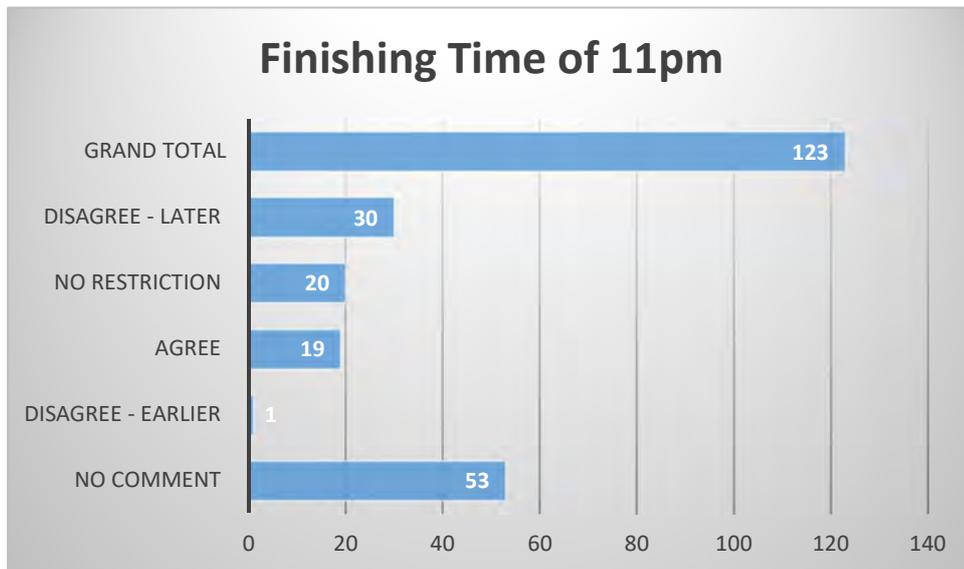


c. Outside Central City Respondents



3.2 Finishing Time of 11pm

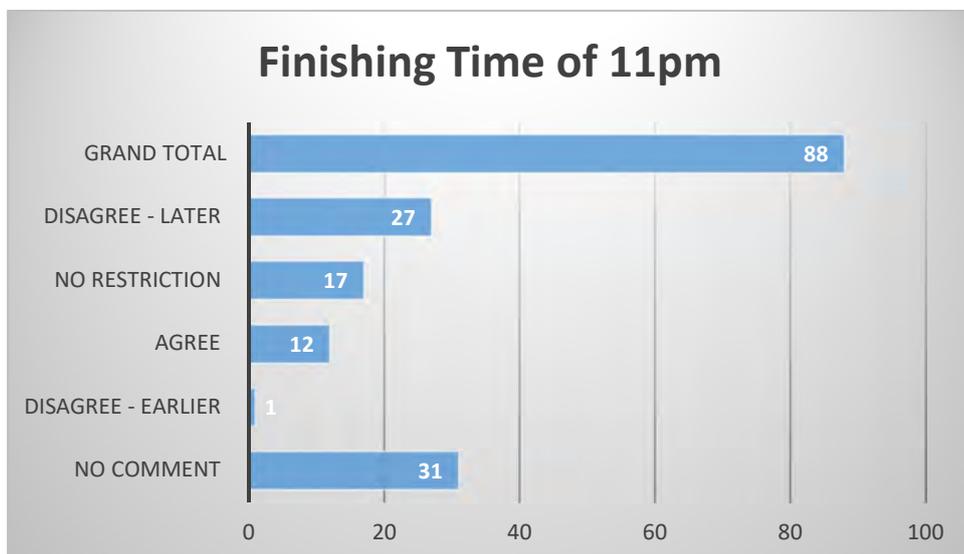
a. All Respondents



b. Inside Central City Respondents

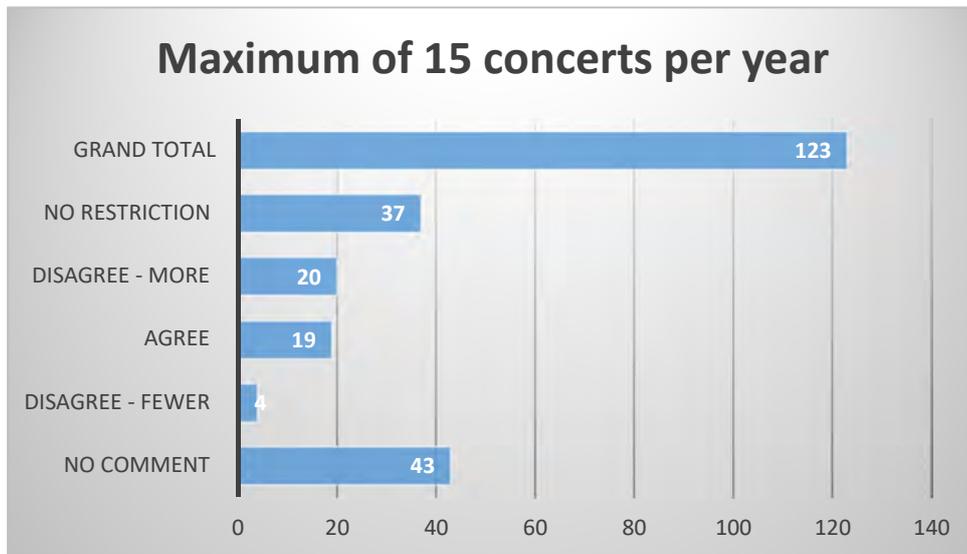


c. Outside Central City Respondents

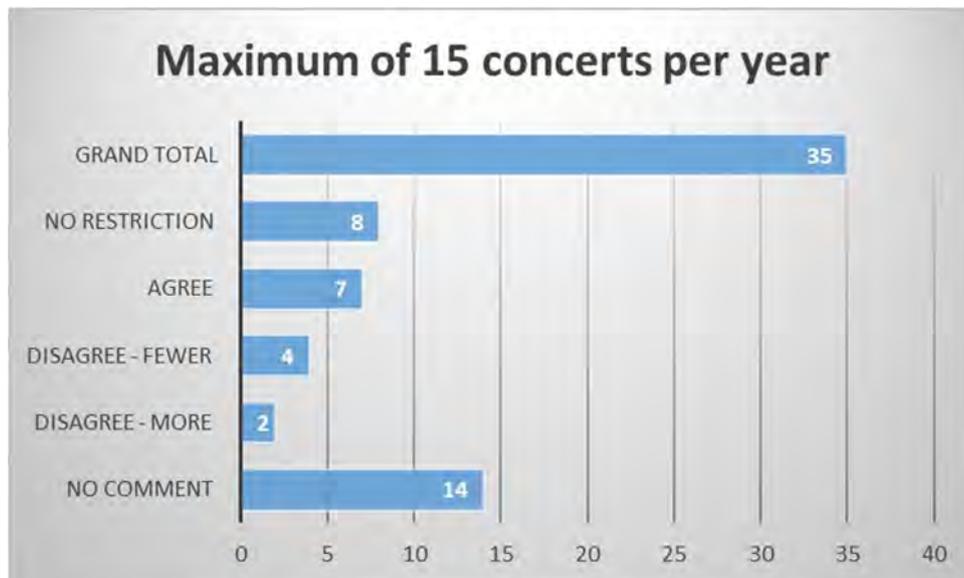


3.3 Maximum of 15 concerts per year

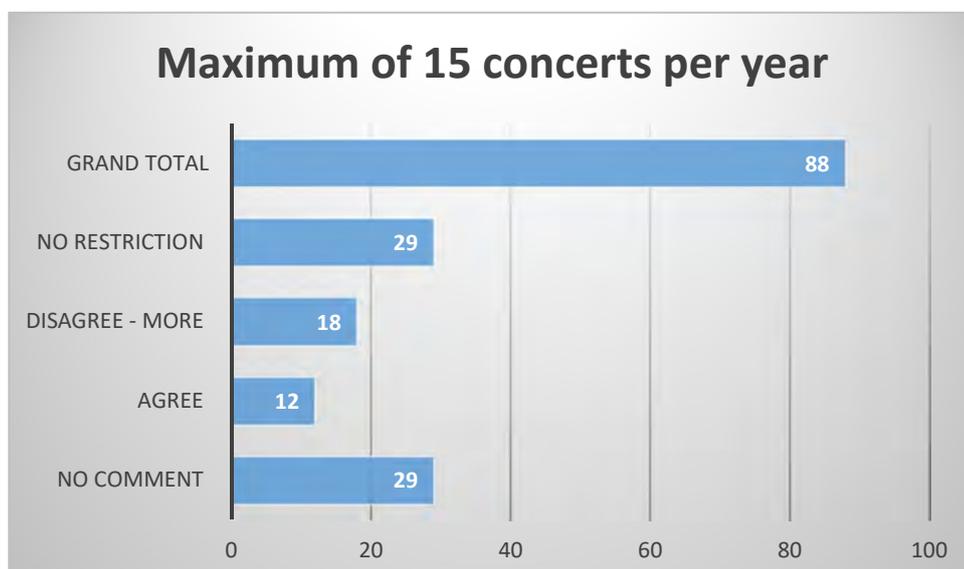
a. All Respondents



b. Inside Central City Respondents

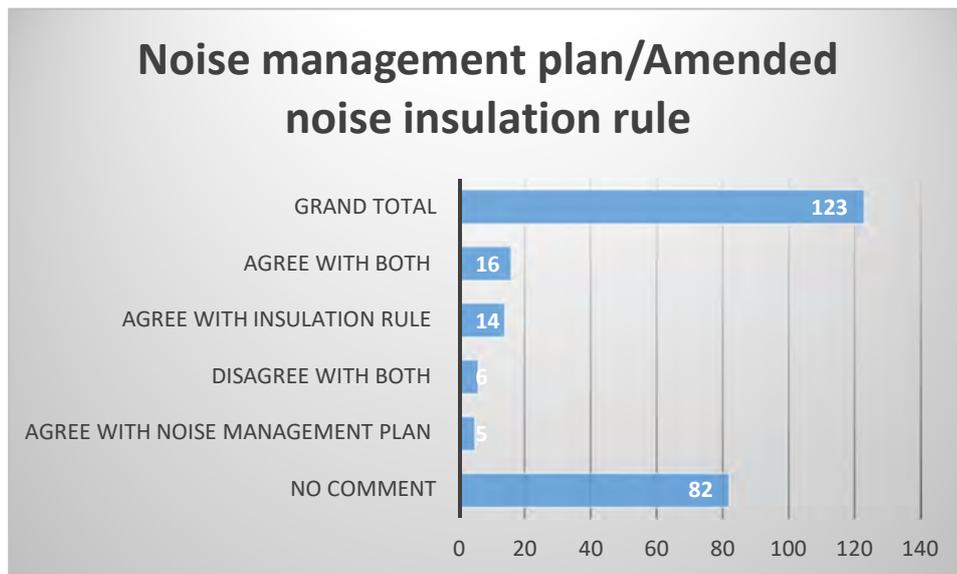


c. Outside Central City Respondents

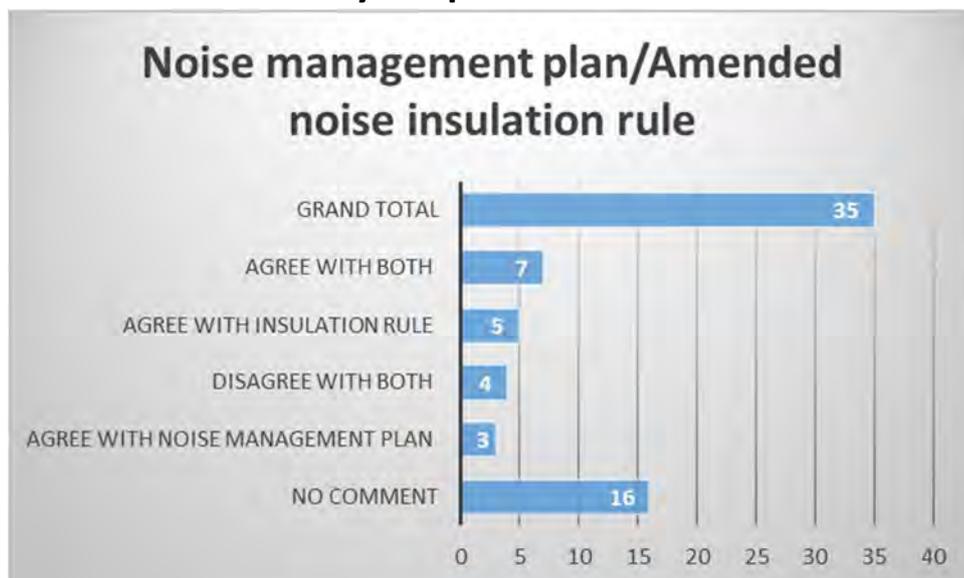


3.4 Noise management plan / Amended noise insulation rule

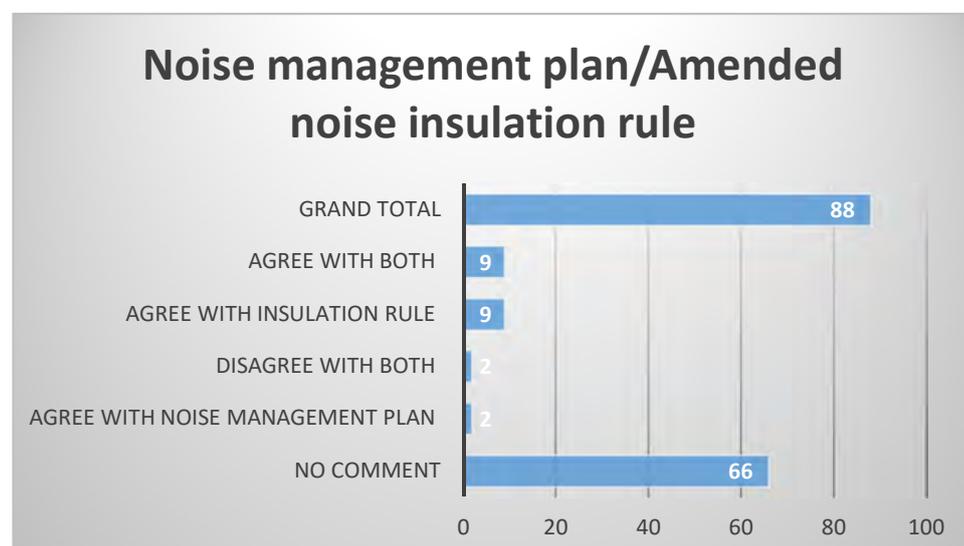
a. All Respondents



b. Inside Central City Respondents

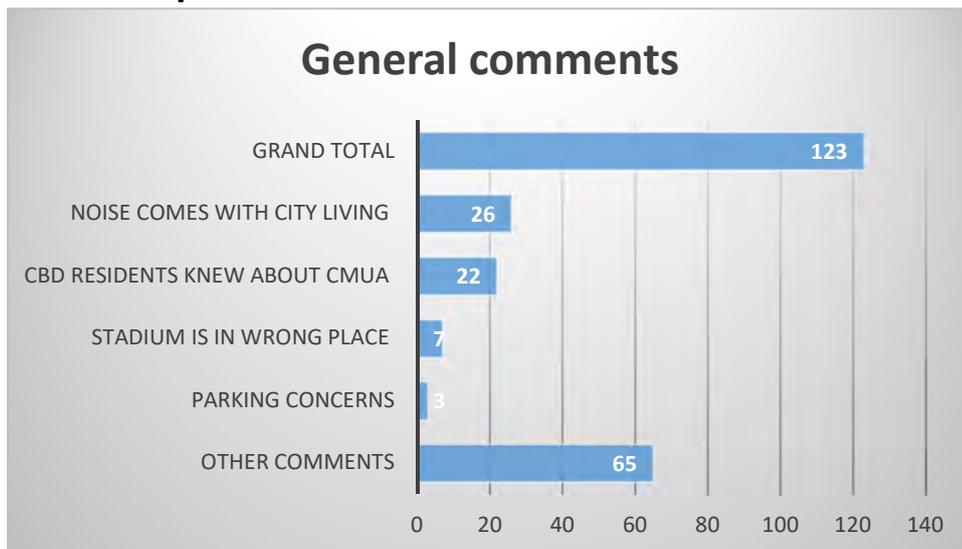


c. Outside Central City Respondents

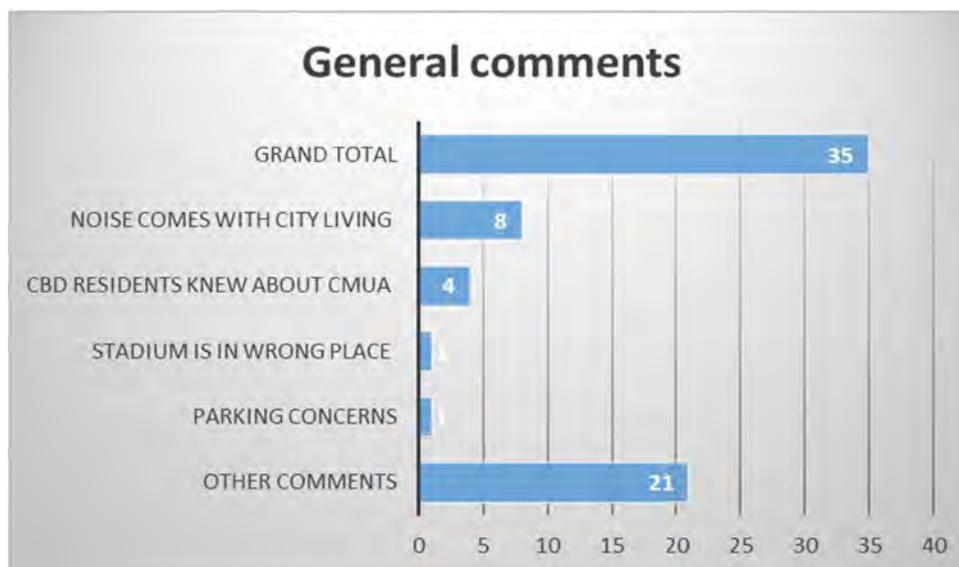


3.5 General comments

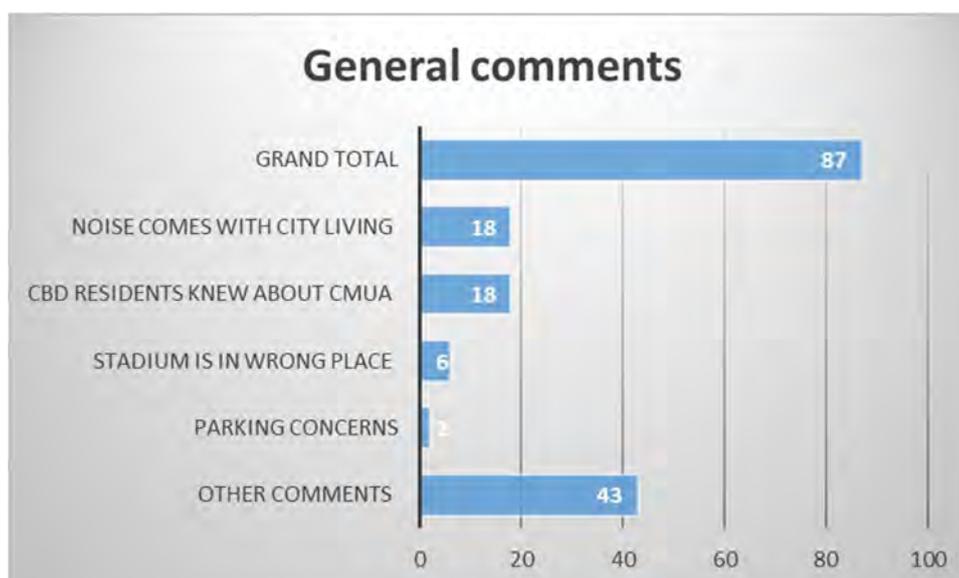
a. All Respondents



b. Inside Central City Respondents



c. Outside Central City Respondents



4. Commentary on Have Your Say Feedback

Noise Limits

- On the whole, respondents appear to have found it difficult to comment on the proposed noise limits. Some stated that they did not have any real idea of what the decibel levels quoted would sound like. Nearly a quarter of all respondents did agree with the noise limits, at least in general terms.
- Many respondents wanted fewer restrictions on noise, i.e. more lenient or no noise limits (35% of all respondents and 53% of those who commented on this topic at all), especially those respondents from outside the Central City. However a few respondents thought the restrictions in the proposal were too lenient.
- The Central City Business Association seeks an increase in noise limits from 80 dB LAeq outside the CMUA to 90 dB LAeq, and from 105 dB LAeq inside the CMUA to 120 dB LAeq (this latter figure inside would actually result in 95 dB LAeq outside). Fletchers seek a maximum of 6 concerts per year at 65 dB LAeq outside the stadium and 90 dB LAeq inside.
- There were only a few comments on a bass level limit. It was stated that bass is a major issue at distance from a venue, depending on wind direction, with the only “saving grace” being knowledge that there is a cut-off time, often 11pm. Others state that music with deep bass is part of a concert experience. One person said that Christchurch “is the largest city outside of London for drum and bass” and to limit bass noise “to calm a few residents” is short-sighted.

Finishing Time

- 43% of respondents did not comment on the proposed 11pm finishing time, but of those who did, 71% wanted a later finishing time or no finishing time.
- Examples of comments are: “11:00pm is far too early for any rave/electronic music type party”; “The proposed 11pm curfew is too early. We want to be an exciting and vibrant city that attracts people. Midnight or even 1am is a far more reasonable curfew”; “I believe the end time for noise should be 12.30am Friday, Saturday nights and evenings before and on public holidays (Except maybe Christmas Day) this will encourage promoters to bring events to Christchurch on those nights of the week”.

Maximum of 15 Concerts per Year

- Not everyone commented on this topic, but of the 80 who did, 71% of these respondents sought either no limit on the number of loud concerts or a higher number provided for per year.
- Examples of figures proposed are 20 per year, 2 per month i.e. 24 per year, and 30 per year. Suncorp Stadium in Brisbane is quoted as having a cap of 24 concerts per year. (NB this figure has not yet been verified).

- Examples of comments are: “The Arena is a massive investment for the city and so it is imperative that it is allowed to operate at its fullest capacity which will then attract top quality international and NZ events to Christchurch. We cannot afford to spend so much money on a facility that is expected to operate efficiently with so many proposed restrictions on its use”; “Christchurch needs to promote itself as a desired venue for international (and national) entertainers but limiting the annual amount to 15 is short-sighted. Having the opportunity to host more events will bring a much needed economic boost to our city and we should regain the 'number one' venue in the South Island again.” “If the city is to become a vibrant place such a limit would reduce the likelihood of the city centre housing locals rather than just Airbnb properties and limit the economics around the investment”.
- “Whilst I believe the limit of 15 concerts per year is fair and unlikely to be exceeded, there should be a path for one-off approvals if it does”.

Noise Management Plan/Amended Noise Insulation Rule

- Most respondents did not comment on these, with those who did generally being supportive of the concepts of a Noise Management Plan and of relatively strict noise insulation rules in Central City locations.
- There were a number of suggestions as to matters which need to be considered and could potentially be covered in the Noise Management Plan e.g. set up noise, rehearsal noise, take down noise, rubbish collection noise, construction noise.
- The most notable comments about the proposed noise insulation rule were from Fletchers, who dispute the costs of additional insulation quoted by Otakaro, consider that the costs will be higher, and state that the developer is being asked to fund a good public outcome, which is not reasonable or acceptable.

General Comments

- As for August/September 2020, there were a number of comments such as “The concerns of nearby residents should be ignored as they have chosen to live close by to a multi-use stadium”; “Everyone who has moved to the nearby area since the earthquakes knew full well a multi-purpose facility would be built on this site”.
- A submission from the Transitional Cathedral states that holy times should be respected including Christmas, Holy Week and Easter and no concerts held during these periods. The Dean asks that the Cathedral be involved in the noise management plan for this project. He also notes that the inner city community is fragile and diverse in ethnicity, with the community yet to fully engage with local issues.
- The CDHB seeks further monitoring locations which are not to the north of the stadium e.g. potentially three extra external locations around the CMUA, in order to cover the possibility of the noise distribution being altered through a different configuration for the stadium or the operation of future sound systems.

- They note that it is normal practice in New Zealand for operators of activities generating high levels of noise that cannot practicably be internalised, to offer to treat existing neighbouring buildings containing sensitive activities as required to achieve reasonable internal conditions in those buildings.

Appendix 11 – Summary of submissions on proposal to vary CMUA Noise Insulation Areas

CMUA – Summary of submissions on a variation to the proposal to amend the CCRP – Extension of the Outer Noise Insulation Area further to the south

Organisation	Summary of feedback / matters raised	Council Responses and changes made
Ara Institute of Canterbury	<p>1. Ara adopts a neutral position regarding the extension of the Outer Noise Insulation Area, The revised proposed Area would include all Ara properties within High Street, the student accommodation on St Asaph St, and the northern portion of the City Campus.</p>	<p>Acknowledged.</p>
	<p>2. Some sensitive activities would be required to attenuate noise effects through building design solutions. However the way the proposed rule is drafted is that noise exposure levels only apply to bedrooms and habitable spaces (specified spaces within residential or guest accommodation units),but not to education activities.</p> <p>Ara opposes any amendments to the Christchurch District Plan that would require noise attenuation for education activities.</p>	<p>Ara is correct in pointing out that while Rule 6.1.6.2.9 appears to apply to all sensitive activities in the Central City, in fact the body of the rule applies only to bedrooms and other habitable spaces.</p> <p>This means that the rule would not apply to any new spaces used for education activities.</p>
Roman Catholic Bishop of the Diocese of Christchurch and Catholic Education Office	<p>3. The submission states that the rule would apply to sensitive spaces including habitable spaces in residential units, office spaces, educational spaces and possibly places of worship.</p>	<p>While Rule 6.1.6.2.9 appears to apply to all sensitive activities in the Central City, in fact the body of the rule applies only to bedrooms and other habitable spaces.</p> <p>This means that the rule would not apply to any new spaces used for education activities, nor to any new places of worship.</p>
	<p>4. It is noted that there is a proposed façade reduction requirement which is similar to that for noise sensitive activities near roads and railways in Rule 6.1.7.2.1 of the</p>	<p>Rule 6.1.6.2.9 was introduced into the District Plan by the Christchurch Central Recovery Plan. It is primarily directed at protecting residential amenity including sleep</p>

Organisation	Summary of feedback / matters raised	Council Responses and changes made
	<p>District Plan. There is concern that the rule will overdesign for sites on the edges of the designation; and that educational spaces do not in large measure operate for instruction in the evenings and on weekends when concerts are taking place.</p> <p>It is therefore considered that the rule would be unreasonable and impracticable.</p>	<p>from the effects of noisy Central City activities. It is acknowledged that educational spaces do not generally operate in the evening and on weekends when concerts and other noisy Central City activities are a concern.</p> <p>Rule 6.1.7.2.1 has a different coverage for a different type of noise (traffic noise), and is currently being separately reviewed and simplified through Plan Change 5E.</p>

CMUA – Summary of issues raised in public written comments on CMUA proposal February 2021 and Council responses

NB Submissions may have covered several themes, but have generally been summarised here under their primary theme (with some exceptions).

Colour key: Fewer restrictions on noise generally

More concerts or later finishing times

More restrictions on noise eg lower noise levels or fewer concerts

Other matters suggested to be covered

Insulation costs

Monitoring locations

Bass limit

Individuals or Organisation	Summary of feedback / matters raised	Council Responses and changes made
Numerous respondents	<p>1. There should be fewer restrictions on noise – either more lenient or no noise restrictions.</p> <p>While many respondents commented on the proposed noise limits, this was often a generic response rather than a specific view that for example 80dB LAeq outside the CMUA would be acceptable.</p> <p>Eg:</p>	<p>In New Zealand, the most common maximum noise level from stadia at the boundary with residential zones is 75 dB LAeq, and the most common number of loud concerts permitted per year is 6. Council's proposal as it went out to public consultation in early 2021 was for 15 concerts per year of up to 80 dB LAeq i.e. it was clearly very enabling by comparison.</p> <p>The view of planning staff is that the proposal would be closer to meeting Council's multiple strategic objectives (including its responsibility to its communities under the LGA,</p>

Individuals or Organisation	Summary of feedback / matters raised	Council Responses and changes made
	<p>“Do not impose noise restrictions! You’ll end up with a useless stadium nobody will want to have a concert at because of the restrictions. If the council has any sense at all and wants to actually make money off the stadium and have the local people think that they are being listened to for once then these conditions shouldn’t get across the line.”</p> <p>“Encourage a vibrant central city by removing all noise restrictions in the central city. If someone chooses to live in the central city they have no right to complain about noise from the central city. There are plenty of suburbs where there is little noise.”</p>	<p>its objectives in the Christchurch Central Recovery Plan and elsewhere of encouraging more people to live in the Central City, and its duty under section 16 of the RMA to avoid the emission of noise which exceeds a reasonable level), if the proposal was amended to reduce the number of concerts at 80 dB LAeq to 6, with 9 further concerts at 75 dB LAeq provided for.</p> <p>Expert acoustic advice is that even this overall amount of noise per year, if this number of concerts eventuated, represents a noise “burden” for surrounding land uses, and a large amount of noise in a residential context. It can be noted from the bar graph analysis of written comments from the public, that those living outside the Central City were more likely to want fewer or no noise restrictions, than those respondents from inside the Central City.</p> <p>However, the context of regeneration and the economic and social benefits of a financially viable arena for Christchurch, and for the cultural and sporting identity of the City, do set Christchurch apart from other New Zealand contexts, and it is considered that the amended proposal with fewer concerts of up to 80 dB LAeq represents an appropriate balance between the interests of all parties in this context.</p> <p>One element of the originally proposed noise restrictions, the proposed bass limit, was in fact removed in the final proposal – see item 13 below.</p>

Individuals or Organisation	Summary of feedback / matters raised	Council Responses and changes made
		<p>As well, some design changes adopted including the introduction of a solid wall on the north side of the CMUA, resulted in fewer residential properties being subject to a requirement to provide additional noise insulation (for new buildings) which is also a decrease in restriction for noise management reasons.</p>
Central City Business Association	<p>2. Seek an increase in noise limits from 80 dB LAeq outside the CMUA to 90 dB LAeq and from 105 dB LAeq inside the CMUA to 120 dB LAeq (this latter figure inside would actually result in 95 dB LAeq outside).</p>	<p>These are higher noise levels than considered necessary by the potential venue operator or concert promoters. These levels (higher than 105 dB LAeq inside the CMUA) are considered on both acoustic and planning grounds to be unacceptable and unnecessarily loud, both inside the CMUA and in view of the number of people living in close proximity to the CMUA.</p>
Numerous respondents	<p>3. Later finishing time. Many people suggested 12pm or 1am as finishing times, with some qualifying this to relate to weekends or the summer season where concerts could start later to maximise the enjoyment of stage lighting.</p>	<p>No change. Certainty and uniformity around when events will cease is potentially the single most important factor contributing to community acceptance of noise. Concerts being permitted to continue until 11.30pm or midnight is uncommon around New Zealand, and only occurs in locations which are further from large numbers of residents. The potential venue operator and concert promoters do not consider later finishing times to be necessary.</p> <p>A proportion of concert goers will move from the Arena into the City Centre when concerts finish, which will benefit local hospitality businesses. This is recognised in the submission by Hospitality NZ which supports 11pm as fair</p>

Individuals or Organisation	Summary of feedback / matters raised	Council Responses and changes made
		and reasonable and notes the possibility of local hospitality venues seeing increased patronage after events.
Numerous respondents	4. Allow more than 15 concerts per year. A number of respondents wanted there to be no limit on the number of concerts allowable per year.	<p>There was extensive consideration of concert number options by staff and Councillors. Number caps have been proposed primarily to reassure residents that concerts will not take place constantly, or even especially frequently. It also has to be remembered that “quiet” concerts generating less than 90 dB LAeq inside the Arena would not count towards this tally, so it relates to loud concerts only.</p> <p>A position of up to 6 louder concerts of up to 80 dB LAeq outside the Arena and up to 9 less loud concerts of up to 75 dB LAeq outside the Arena was finally reached by Council, based on a balancing up of all of Council’s objectives for the Central City and for the CMUA. This is generous by comparison with other venues in New Zealand and is unlikely to be a competitive disadvantage with other stadia.</p> <p>The potential venue operator does not consider it necessary to allow more than 15 loud concerts, and this number is significantly higher than the concert numbers that the CMUA business case was based on. Even if there were no cap on number of concerts, the reality is that it would still be a challenge to attract a high number of large concerts per year to Christchurch.</p>

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A few respondents	<p>5. Noise restrictions in the proposal are too lenient, and those living in the immediate vicinity of the CMUA are being ignored.</p> <p>“I wish to point out that noise from central city carries extensively & surprisingly. This may be partly due to wind direction etc. On a number of occasions I have thought that there was a big party happening at a nearby property (even next door) - the sound is so loud - only to discover that it is actually coming from a concert in the centre.</p> <p>“I believe the noise limits proposed are too high and not acceptable for inner city living. “The Council and developers are promoting living in the city so why make this even more unattractive by loud events. 70-75 dBA Lmax, in inner-city areas, night-time noise limits are usually set at 55 to 60 dBA. This exceeds normally acceptable noise limits for residential areas. Please ensure the stadium has sufficient noise insulation to keep the majority of the noise in so concert goers can enjoy”.</p>	<p>See above, where a modified proposal has been put forward based on reducing the number of the loudest concerts of up to 80 dB LAeq from 15 to 6.</p> <p>As a result of continued concerns about the” acoustically transparent” proof of concept design of the building, the contractor and their design team were asked to consider in more detail any practicable ways to mitigate noise breakout from the CMUA.</p> <p>An option of a solid lightweight wall on the northern façade, rather than EFTE, has now been adopted as part of the design. This has the potential to decrease noise emitted to the north by between two and three decibels and therefore to shrink noise contours slightly in this direction, which will mean residents to the north are exposed to slightly less noise. While noise being emitted to the south will increase slightly (because of revised assumptions about the roof eg that it will be essentially flat rather than slightly tilted to the north), this is an area with fewer residents. Overall these design changes mean that fewer properties used for residential purposes will be affected by high noise levels.</p>
Fletchers	<p>6. Seek a maximum of 6 concerts per year at 65 dB LAeq outside the CMUA and 90 dB LAeq outside.</p>	<p>This would allow only very quiet concerts of up to 90 dB LAeq inside the CMUA, i.e. it would rule out any drum and bass, rock or pop concerts.</p>

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		The Council's assessment is that this is not appropriate as it would essentially undermine the viability of the CMUA as a concert venue.
Transitional Cathedral	<p>7. Holy times should be respected including Christmas, Holy Week and Easter and no concerts held at these times. Prayer times and Sunday services are particularly sensitive times of the week. The Transitional Cathedral has no noise insulation and will be unusable when events or rehearsals are taking place.</p> <p>8. Cathedral should be involved in the Noise Management Plan for this project.</p>	It is appropriate that the Cathedral be involved in the drafting of the Noise Management Plan and/or in the Noise Liaison Committee, not least because it is a very near neighbour.
Some respondents	9. Other matters that were suggested should be covered in the noise management proposals included: set- up and takedown noise prior to and following concerts; rules for practices and sound checks; noise from rubbish trucks and catering trucks; mitigating noise during construction, notification to residents of large scale excavations, truck movements etc.	These are matters of detail which it is difficult to prescribe rules for at this time. Some of them are specifically mandated to be covered in the Noise Management Plan for the CMUA. This needs to be submitted as part of the outline plan documentation for the CMUA, and can be updated subsequently as a result of experience in operating concerts.
Fletchers and a few other respondents	10. Costs of additional insulation are much higher than the proposal states and will not be "modest". Developers are being asked to fund a good public outcome, which is unreasonable and unacceptable.	Acoustic insulation costings are very dependent on assumptions about base materials used, and the typology, design and orientation of buildings to the noise source. The proposal report quoted figures provided by Otakaro for several different dwelling typologies.

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		<p>Fletchers disputed elements of the costs of insulation quoted but did not provide alternative costings. Putting aside debate about costs, occupiers of new units in the East Frame will benefit from improved acoustic insulation standard not only in respect of the CMUA but in respect of Central City noise generally.</p>
CDHB	<p>11. Further monitoring locations would be beneficial around the CMUA, e.g. potentially three extra external locations to cover the possibility of noise distribution being altered through a different configuration for the CMUA or the operation of future sound systems.</p>	<p>The finalised proposal includes a revised condition on locations for loggers/compliance points, which specifies that other than the northwest corner of Hereford and Barbadoes Streets, there shall be at least three further noise loggers located at other compliance points that collectively provide coverage of noise emissions to the west, south and east sides of the Arena.</p>
Acoustics consultant	<p>12. 105 dB inside CMUA is very loud and this level would need to be used responsibly with a high quality audio design system to protect the auditory health of concert audiences and staff.</p> <p>13. Delete bass limit. Such a limit would need to be set at a reasonable distance from the Arena (eg 2 km) so as not to pull the achievable A weighted value down. Monitoring would need to be considered more carefully.</p>	<p>This ties in with other acoustic advice to Council, that while 105 dB LAeq is preferred by many promoters and concert goers, in practice such high noise levels are less common than they once were. However the potential venue operator wishes to maintain the flexibility to go up to these noise levels at times during some concerts, as some promoters and acts want very loud noise.</p> <p>With regard to the proposed bass limit, this was deleted in the final proposal. No other large stadia in New Zealand have bass level limits at this time, and consequently the introduction of a bass limit here could act as a comparative disadvantage. It was not favoured by promoters and acoustic advice to council questioned</p>

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		the practicality of measuring bass levels within a central city environment.