**Before Independent Hearing Commissioners**
**At Lower Hutt**

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| Under | the Resource Management Act 1991 (the Act) |
| In the matter of | a notice of requirement for a designation by Wellington Water Limited ('WWL'), on behalf of Hutt City Council ('HCC'), in accordance with section 168A of the Act, for the construction, operation and maintenance of a water supply reservoir at Summit Road, Fairfield, Lower Hutt. |

# Statement of evidence of Leonard Michael Terry for Wellington Water Limited (Noise/Vibration)

Dated 14 November 2024

DENTONS
40 Bowen Street
PO Box 10246
Wellington 6011

P +64 4 472 7877
F +64 4 472 2291
DX SP26517

Solicitor: E Hudspith/B Attwood
Email: Ezekiel.Hudspith@dentons.com/Ben.Attwood@dentons.com

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# Statement of Evidence of Leonard Michael Terry

## 1 Introduction

1.1 My full name is Leonard Michael Terry.

1.2 I am a Senior Acoustic Engineer at WSP New Zealand Limited. I have been in this position since January 2023. I am responsible for undertaking acoustic noise and vibration assessments to determine potential impacts and effects to the environment.

1.3 This evidence relates to a notice of requirement ('**NOR**') for a designation issued by Hutt City Council ('**HCC**'), in accordance with section 168A of the Resource Management Act 1991 ('**RMA**'), for the construction, operation and maintenance of the proposed Eastern Hills Reservoir adjacent to the existing Naenae Reservoir at Summit Road, Fairfield, Lower Hutt ('**Project**'). In particular, my evidence relates to construction noise and vibration matters.

1.4 I have been appointed to provide evidence by Wellington Water Limited.

1.5 I became involved with the Eastern Hills Reservoir project in 2023 to assess the construction noise and vibration effects. I have been acting as the lead Acoustic Engineer for the Project since this time.

1.6 I prepared the Construction Noise and Vibration Assessment for the Project, which is Appendix H of the Assessment of Environmental Effects (**'AEE'**). I also adopt the content of the 24 June 2024 letter sent by **Ms Cathy Crooks** in response to HCC's section 92 request regarding noise and vibration.

## 2 Qualifications and experience

2.1 I hold the qualifications of a Bachelor of Science with Honours in Audio and Music Technology, from the University of the West of England. I have been a member of the Institute of Acoustics since 2017 and a member of the Acoustical Society of New Zealand since 2023.

2.2 I have worked as an Acoustic Engineer on environmental and building acoustic projects for 8 years in the United Kingdom, South-East Asia and New Zealand, with 2 of those years of experience within New Zealand. I have been involved in a wide variety of environmental noise assessment projects in New Zealand. These include notices of requirement and resource consent applications. In particular, I have undertaken construction noise and vibration assessments, prepared and

executed construction noise and vibration management plans ('**CNVMP**'), undertaken monitoring, analysis and reporting of construction noise and vibration in the water and infrastructure sector.

2.3 I have been involved with a number of relevant projects across New Zealand including:

a Drury West Transmission Sewer: A resource consent application for a new wastewater gravity pipeline in Drury West. I prepared the Construction Noise and Vibration Assessment and Management Plan.

b Various culvert renewals for Auckland Council Healthy Waters programme: A resource consent application for renewal works of a culvert in Auckland, adjacent to existing dwellings. I prepared the Construction Noise and Vibration Assessment and Management Plan.

c Willis Street Wastewater Interceptor Repair: Emergency repair works to wastewater infrastructure in Wellington Central Zone. Works were required to be completed during nighttime and I worked with the project team to prepare and implement a Construction Noise Management Plan .

d Underground Cable Joint Bay Repairs: High-priority repair works to underground electricity transmission infrastructure, being undertaken at several locations in Auckland. I prepared and executed the Construction Noise and Vibration Management Plan, which was a designation condition requirement, and continue to work as lead Acoustic Engineer for the project.

e Hinepare Hostel Demolition: I coordinated and managed the noise and vibration monitoring for demolition of the old nurses' hostel in Napier.

f Northern Interceptor Pipeline and Chamber Upgrade: Extension of the existing pipeline, and installation of a new discharge chamber, gravity line and confluence chamber at the Rosedale Wastewater Treatment Plant. I prepared the Construction Noise and Vibration Management Plan.

## 3 Code of Conduct

3.1 While the NOR is not before the Environment Court, I have read and am familiar with the Code of Conduct for Expert Witnesses in the current Environment Court Practice Note (2023). I have complied with the Code in the preparation of this evidence and will follow it when presenting evidence at the hearing.

3.2 The data, information, facts and assumptions I have considered in forming my opinions are set out in my evidence to follow. The reasons for the opinions expressed are also set out in my evidence.

3.3 Unless I state otherwise, my evidence is within my area of expertise, and I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

## 4 Scope of evidence

4.1 My evidence addresses the following:

a Assessment methodology;

b The existing noise environment;

c Noise and vibration effects;

d Conditions;

e Response to submissions;

f Response to Section 42A Officer's Report ('**Officer's Report**').

## 5 Executive summary

5.1 Once constructed, operation of the proposed reservoir is expected to produce negligible levels of noise, and the Project has no fixed mechanical equipment to consider in terms of noise emissions. Therefore, I do not expect any adverse noise and vibration effects due to operation of the reservoir, and it is anticipated that it will comply with relevant HCC District Plan noise limits.

5.2 A Construction Noise and Vibration Assessment has been prepared based on information received during the early contractor involvement (**'ECI'**) stage, which provided inputs to the AEE. The assessment was undertaken in accordance with the HCC District Plan and relevant standards including NZS 6803:1999 Acoustics – Construction Noise, DIN 4150-3:2016-12 and BS 5228-2:2009+A1:2014.

5.3 Based on the assessment results with no mitigation measures, several exceedances of the noise criteria were predicted, therefore mitigation measures are proposed to reduce the adverse noise effects as far as practicable.

5.4 The proposed mitigation measures are referred to within the proposed NOR Conditions (condition 18 to 24) and include the development and implementation

of a  CNVMP which shall be certified by HCC prior to the commencement of works. Physical mitigation measures that are included within the assessment, and shall therefore be included in the management plan, include a 3 m barrier around the reservoir site boundary which shall be maintained for the duration of the project, and specific noise barriers around equipment near to Balgownie Grove, as indicated in the Construction Noise and Vibration Assessment.

5.5 In addition to physical mitigation measures, the CNVMP is also required to contain procedures for communications and engagement with the community, a complaint handling protocol, education and training of workers, and managerial measures to minimise noise and vibration to the environment and associated effects.

5.6 With the implementation of the mitigation measures, I predict adverse noise effects to be present for piling activities. Piling activities are expected to occur intermittently across a two to three week period during the daytime. The quantity of dwellings where noise levels are predicted to exceed the limits are:

a Eight dwellings are predicted to receive a perceptible or obvious increase (4 to 6 dB above the daytime limit) in the level of noise, which is likely to cause some temporary adverse effects and noise complaints.

b Five dwellings are predicted to receive an obvious increase in the level of noise (8 to 13 dB above the daytime limit), which is likely to cause temporary adverse effects and noise complaints.

5.7 I predict adverse noise effects to be present during two separate occurrences of night-time concrete pouring activities. Based on information provided by the contractor, I note that optimal concrete pouring conditions are generally in cold to mild and wet weather; therefore, I reasonably expect that most residents are likely to have their windows closed during cold or wet conditions which will act as a form of noise mitigation at the receiving location. Additionally, setting out enhanced communication with residents is key to ensuring that adverse impacts are minimised via managerial means.

5.8 During the night-time concrete pour, I predict that site access road noise levels at dwellings may be up to 34 dB greater than the night-time construction noise limit and will be readily perceptible, with high potential to cause sleep disturbance at dwellings along the road. Dwellings within 30 m from heavy vehicle passes on the public road are likely to exceed the night--time maximum noise level limit. Therefore, adverse noise impacts will be present, and the most affected receptors

are located on the site access at Summit Road. These noise effects will occur on two of the four nights of which there are planned night-works (when concrete pouring occurs).

5.9 I predict that dwellings located along the site access roads at Tilbury Street and Summit Road may receive noise levels up to 79 dB $L_{Aeq,1h}$, during peak daytime heavy vehicle movements. I predict that site access road noise levels may be approximately 20 to 30 dB greater than the predicted baseline road traffic noise levels that are currently experienced.

5.10 I predict that no dwellings lie within the nominated construction vibration stand-off distances, for all vibratory construction activities, therefore minor or cosmetic building damage to dwellings is not predicted to occur. However, I predict the vibration amenity limit may be exceeded at some dwellings, requiring prior notification to those affected properties, per the CNVMP.

5.11 Despite the predicted effects, I consider that the adverse impacts can be mitigated with the implementation of a CNVMP. This plan shall include physical and managerial mitigation measures including 3 m site boundary barriers to minimise noise to the environment and associated effects, procedures for communications and engagement with the community, a complaint handling protocol, and education and training of workers.

## 6 Assessment methodology

### Operational Noise

6.1 The proposed reservoir is a static water holding structure with a series of valves enclosed in concrete housing. In my view, the reservoir and valves are expected to produce negligible levels of noise and the Project has no fixed mechanical equipment to consider in terms of noise emissions. Therefore, I consider the Project operation to comply with the operational HCC District Plan noise limits, which are 50 dB $L_{Aeq}$ during the daytime (7.00am – 10.00pm), and 40 dB $L_{Aeq}$ during the night-time (10.00pm – 7.00am).

### Construction Noise and Vibration

6.2 I have assessed the construction noise and vibration effects for the Project based on early contractor involvement construction methodology documentation, which was used to populate Appendix D – Construction Methodology of the AEE. This included a description of construction activities, specific equipment to be used on

site, the approximate location of equipment on the site, the number of vehicle movements on site access roads, and the construction programme.

6.3 Prior to undertaking the assessment, I reviewed the HCC District Plan to determine appropriate construction noise criteria, which meet the objectives and policy requirements of the plan in relation to construction noise. I undertook the noise assessment in accordance with the procedure and guidance set out in New Zealand Standard NZS 6803:1999 Acoustics – Construction noise.

6.4 The HCC District Plan does not include any vibration criteria; therefore, I have proposed guideline construction vibration criteria in accordance with German Standard DIN 4150-3:2016-12 Vibration in buildings – Part 3: Effects on structures, and British Standard BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 2 Vibration. I consider reference to these documents to be industry best practice when assessing vibration effects in New Zealand.

6.5 Using the provided information a Construction Noise and Vibration Assessment was undertaken by myself, supported by my team.

6.6 I oversaw the selection of representative sound levels for items of equipment from a sound level database. The equipment selection was applied to specific construction activities for each stage of construction, as described in the Noise and Vibration Assessment (Appendix H of the AEE, section 5.1 and Appendix B).

6.7 I oversaw the preparation of a 3D noise prediction model, using SoundPLAN (version 8.2) modelling software. The environmental noise propagation was set to predict the attenuation of noise in accordance with ISO 9613-2:1996 Acoustics – Attenuation of Sound During Propagation Outdoors – Part 2: General Method of Calculation.

6.8 Noise levels from site access roads were assessed separately from activities within the site boundary in accordance with the methodology provided in Annex D of NZS 6803:1999 Acoustics – Construction noise.

6.9 Vibration calculations were undertaken based on the methodology outlined in the Waka Kotahi New Zealand Transport Agency's State Highway Construction and Maintenance Noise Vibration Guide, version 1.1, dated August 2019. The vibration prediction method is based on hard soil conditions and slab-on-grade foundation type for all adjacent properties, as a worst-case assessment.

6.10 Separate noise scenarios were simulated for six situations occurring in chronological order of construction, making assumptions about the likely equipment in use and activities taking place at each stage. I consider this assessment methodology to provide representative snapshots of noise through the construction programme based on the stages of construction. This included construction activities operating concurrently in different areas of the site, such as pipeline and reservoir construction activities occurring at the same time. I used a one-hour assessment period and predicted noise levels at the façade of noise sensitive receptor properties, in accordance with the NZS 6803:1999 Acoustics – Construction noise standard.

6.11 Based on the assessment results and assuming no mitigation measures, several exceedances of the acoustic criteria were predicted, for works being undertaken within the site boundary and for site access roads. This triggered a requirement to mitigate construction activities as far as reasonably practical, in line with the objectives and policies of the HCC District Plan.

6.12 I took an iterative engineering approach via acoustic re-modelling to provide mitigation recommendations to minimise construction noise and vibration emissions. The proposed mitigation measures are discussed in paragraph 8.20.

## 7 The existing noise environment

7.1 I undertook a desktop assessment of baseline road traffic noise levels for Tilbury Street, Waddington Drive, Summit Road and Balgownie Grove.

7.2 Traffic noise predictions were undertaken using publicly available road traffic data from “mobileroad.org” and the Construction Transport Assessment (Appendix N to the AEE) in accordance with the Calculation of Road Traffic Noise[1] (1988) guidance, modified for New Zealand conditions.

7.3 I predict that road traffic noise levels at 10 m from the road to be in the region of 59 to 61 dB $L_{Aeq,\ 24hr}$ along Tilbury Street and Waddington Drive, and less than or equal to 50 dB $L_{Aeq,24hr}$ along Summit Road and at Balgownie Grove.

[1] **DoT, U. K. (1988). Department of Transport. Calculation of Road Traffic Noise (CRTN). London: Department of Transport, Welsh Office, HMSO**

## 8 Noise and vibration effects

### Operational noise

8.1 I do not expect there to be any adverse noise and vibration effects due to operation of the reservoir.

### Construction noise

8.2 As noted in paragraph 6.3 and 6.4, I have applied noise and vibration criteria based on the relevant guidance and standards The criteria are:

a Daytime construction noise limit at receptor façade – 70 dB $L_{Aeq,1hr}$ and 85 dB $L_{Amax;}$

b Night-time construction noise limit at receptor façade – 45 dB $L_{Aeq,1hr}$ and 75 dB $L_{Amax;}$

c Construction vibration limit relating to minor damage to buildings – 5 mm/s PPV (Peak Particle Velocity);

d Daytime vibration threshold relating to subjective impacts – 1 mm/s PPV; and

e Night-time vibration threshold relating to subjective impacts – 0.3 mm/s PPV

8.3 Construction noise and vibration effects in the assessment have been separated into two categories, since noise produced by vehicles using site access roads (such as Tilbury Street and Summit Road) is not expressly required to be assessed. However, for the purpose of this Project we have included noise from site access roads within the assessment of effects:

a Noise and vibration effects from activities occurring within the construction site boundary.

b Noise and vibration effects from activities occurring on site access roads, which fall outside the construction site boundary.

8.4 Based on the six modelled situations within the construction site boundary, I have predicted average and maximum noise levels for unmitigated and mitigated scenarios. My numerical predictions are provided in **Appendix 1**, which is referenced from Section 6 of the Noise and Vibration Assessment. My assessment of effects is provided in Section 7 of the Noise and Vibration

Assessment, which also presents 2D noise contours for each situation. The noise contours are provided in **Appendix 2**. The assessment findings are summarised below in paragraphs 8.5 to 8.17, the proposed mitigation is discussed in paragraph 8.20.

8.5 During the 'Site Establishment' stage, I predicted that time-average noise levels would exceed the noise limit by 1 dB $L_{Aeq}$ at one dwelling, without mitigation[2]. I consider that a 1 dB exceedance is likely to be imperceptible by the untrained human ear; therefore, I determine an exceedance of this magnitude to be negligible. The proposed mitigation set out at paragraph 8.20 results in predictions achieving the daytime criteria.

8.6 During the 'Earthworks for Reservoir' stage, I predict that no dwellings will exceed the noise limits without mitigation, however it is proposed that the 3 m site boundary barrier mitigation remains in place for the whole duration of excavation activities. As such this stage is predicted to comply with the daytime limits .

8.7 During the 'Pipeline and Reservoir Construction – With Piling' phase, I predict that noise levels will exceed the limits at up to 29 dwellings without mitigation, and with the incorporation of the 3 m site boundary barrier mitigation, I predict noise levels to reduce by up to 5 dB. Once mitigation measures are applied, I predict noise levels to exceed at up to 25 dwellings. This is due to the height of the piling head being above acoustic site hoardings and therefore providing less noise reduction than if the equipment was fully screened. These activities are expected to occur intermittently across a two to three week period during the daytime. Details of the exceedances at dwellings are:

a 12 dwellings are in the range of 1 to 3 dB above the criteria, which is likely to be an imperceptible to barely perceptible difference to the untrained ear.

b Eight dwellings are in the range of 4 to 6 dB above the criteria, which is a perceptible or obvious increase in the level of noise; some temporary adverse effects and noise complaints may be expected.

c Five dwellings are in the range of 8 to 13 dB above the criteria, which is an obvious increase in the level of noise; likely to cause temporary adverse effects and noise complaints.

8.8 Noise prediction contours indicating the location of piling exceedances, as described in paragraph 8.7b and 8.7c, are presented in **Appendix 2**. The affected

[2] **I predicted an unmitigated noise level of 71 dB $L_{Aeq}$ and the limit is 70 dB $L_{Aeq}$.**

receptors are principally located at Balgownie Grove, Waddington Drive, Summit Road and Farrelly Grove, and a couple of exceedances are predicted for fringe receptors at McEnroe Grove.

8.9 I predict that noise effects due to piling will remain post-mitigation to a minor to more than minor level. However I consider that piling activities are being undertaken for a short-duration as an aspect of the overall construction programme (i.e. two to three weeks). Therefore, whilst noise effects will be present during piling, in my view this activity can be reasonably mitigated with the adoption of a construction noise and vibration management plan, and close community engagement with the nearest affected properties.

8.10 During the 'Pipeline and Reservoir Construction – No Piling' stage, I predict that noise levels will exceed the limits at up to 5 dwellings without mitigation. With mitigation this is reduced to a negligible exceedance of 1 dB at one dwelling. These effects are predicted to be minor.

8.11 During the 'Pipeline Construction – Night Works Dewatering and Overpumping' stage, I predict that noise levels at up to 16 dwellings will exceed the criteria without mitigation. With the incorporation of the 3 m site boundary barrier mitigation and pump enclosures, all dwellings are predicted to be compliant with the criteria. These effects are predicted to be less than minor.

8.12 During the 'Reservoir Construction – Night-time Concrete Pouring' stage, I predict that exceedances of the criteria will be present in the wider area, specifically at the bottom of the valley to the north-east of the site, and in Tilbury Street, Summit Road and Farelly Grove to the west, as presented in **Figure 6.1** of the Noise and Vibration Assessment which is reproduced below. In my opinion the presence of exceedances does not necessarily mean that adverse noise effects are significant, such as at the bottom of the valley to the north-east of the site.

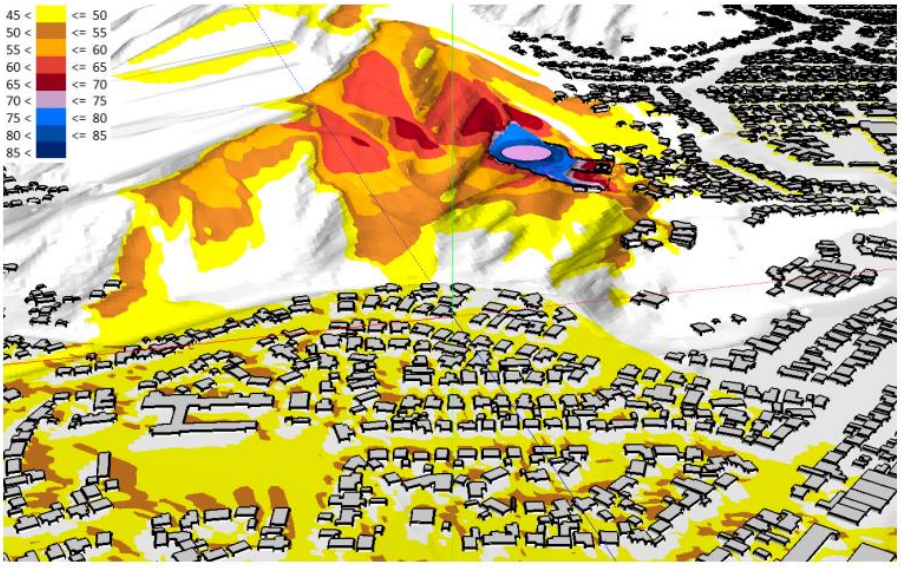



Figure 6.1: 3D aerial view of noise model results during Situation E looking South

8.13 Based on information that I received from the contractor at the ECI stage, I note that optimal concrete pouring conditions are generally in cold to mild and wet weather. I understand that to achieve a high-quality finish, the contractor would avoid pouring concrete during hot weather period. Therefore, I reasonably expect that most residents are likely to have their windows closed during cold or wet conditions, as there is less likelihood for overheating at this time. Based on this condition I have assessed the predicted noise levels within wider context and note that it is possible for adverse effects to begin to occur when external noise levels at the dwelling façade are above 50 dB $L_{Aeq}$. My assumption is that a typical New Zealand housing stock façade achieves 20 dB of sound reduction with closed windows, rather than 15 dB for an open window, therefore allowing a higher external noise level to achieve an acceptable internal noise level for sleep. I have derived that acceptable sleeping conditions would constitute a noise level of 30 dB $L_{Aeq}$, in accordance with the night-time internal noise level criteria provided in the WHO guidelines for community noise (1999) and NZS 2107:2016 Acoustics – Recommended design sound levels and reverberation times for building interiors.

8.14 Adverse noise impacts will, however, be present during the night-time concrete pour, and the worst affected receptors are located on the site access at Summit Road which is described further in paragraph 8.15 below. In summary, adverse noise effects will occur on two of the four nights of which there are planned night-works; One night will be when concrete pouring occurs (the night when the effects will be present) and one night will be used for post-tensioning the slab (no high-noise equipment is required), this will be repeated on two occasions, for the base slab and the roof slab. The effects on these nights are predicted to be more than minor.

8.15 I assessed the ‘Site Access Road’ separately to activities within the site boundary. Tilbury Street and Summit Road are the primary access roads that lead to the site entrance. Waddington Drive and Balgownie Grove will also be used to access the bottom of the valley and stream. During the earthworks stage, which is expected to span a duration of 9-10 months, I predict time-average daytime noise levels during peak heavy vehicle movements at Tilbury Street and Summit Road to be in the range of 74 to 79 dB $L_{Aeq,1h}$, and in the range of 69 to 76 dB $L_{Aeq,1h}$ at Waddington Drive and Balgownie Grove. My predicted noise levels also apply to pipeline and reservoir construction works during peak heavy vehicle movements which are expected to be undertaken concurrently and will last up to 9 months. The predicted site access road noise levels are approximately 20 to 30 dB greater than the predicted baseline road traffic noise

levels that are currently experienced. I consider the effects of this activity to cause potential disruption to residents' amenity during most stages of construction; therefore, effects are predicted to range from minor to more than minor.

8.16 In my opinion, the best practicable steps to mitigate noise from site access roads is to adopt managerial methods, for example avoiding harsh engine braking, ensuring vehicles and equipment are properly operated and well serviced, training drivers on the effects of their activities for residents, and implementing a community engagement and complaints process to ensure all residents and complaints are heard and actioned.

8.17 During the two separate nights of concrete pouring, I predict that site access road noise levels at dwellings along Tilbury Street and Summit Road may be up to 34 dB greater than the night-time construction noise limit and will be readily perceptible, with potential to cause sleep disturbance at dwellings along the road. Dwellings within a distance of 30 m from heavy vehicle passes are predicted to exceed the maximum noise level night-time limit. This is proposed to be mitigated through the implementation of the CNVMP, providing prior notification to the residents of the works that are to be undertaken, setting out enhanced communication with residents, providing a complaints process, and considering the requirements for temporary relocation, which in my opinion would not be unreasonable to provide to residents living along the site access road. I consider the effects of this activity to have potential for sleep disturbance on two nights; therefore, effects on these nights are predicted be more than minor.

**Construction vibration**

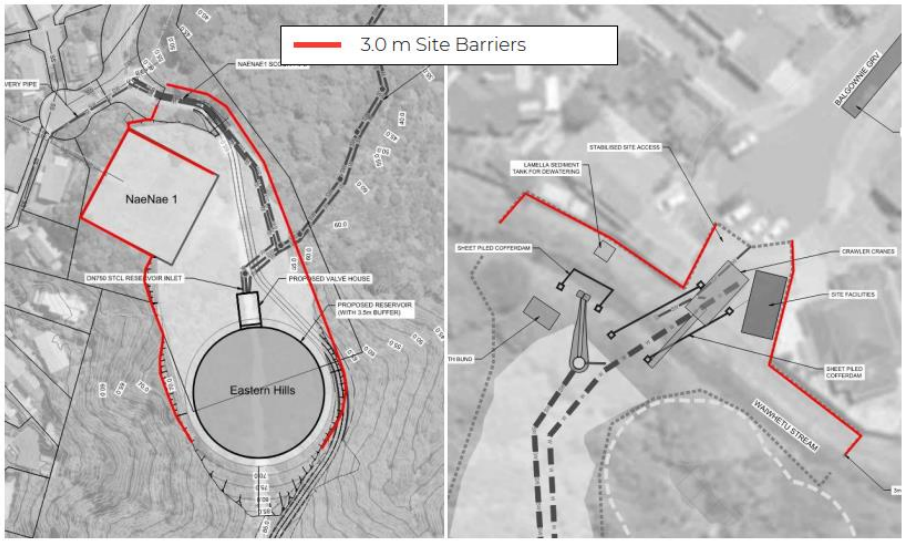
8.18 The construction vibration assessment determines the standoff distances required for specific items of equipment to remain within the required standards. The term 'standoff distance' refers to the distance in which equipment should be operated away from sensitive receptors, in order to not exceed the vibration limits. Vibratory rolling, sheet piling, and excavation are predicted to produce the highest levels of vibration, and hence the largest stand-off distance applies, whereas rotary piling methods produce lower levels of vibration. The required piling method is dependent on ground conditions which will be determined during the ground investigations; however, the assessment has assumed sheet piling in hard ground conditions as a worst-case scenario.

8.19 I predict that no noise sensitive receptors lie within the nominated construction vibration stand-off distances for all vibratory construction activities, therefore

cosmetic building damage to dwellings is not predicted to occur. However, I predict the vibration amenity limit may be exceeded at some dwellings, as part of the CNVMP prior notification to those affected properties will be required. Overall, I consider these effects following mitigation will be reasonable and minor.

**Acoustic mitigation**

8.20 The assessment indicates that specific physical mitigation measures are required, this includes physical mitigation measures in the form of 3 m barriers to block the line of sight between source and receiver, appropriate equipment selection, operation and siting, and acoustic enclosures to be installed around the pumps and generators next to Balgownie Grove. **Figure 8.1** of the Noise and Vibration Assessment presents the location of acoustic barriers to be installed, as reproduced below.




Acoustic site hoarding location at Reservoir

Acoustic site hoarding location on Balgownie Cres

Figure 8.1: Acoustic site barriers for construction noise mitigation

8.21 A 3D aerial view of the barrier locations is provided in **Figures 8.2** and **8.3** of the Noise and Vibration Assessment, as reproduced below.

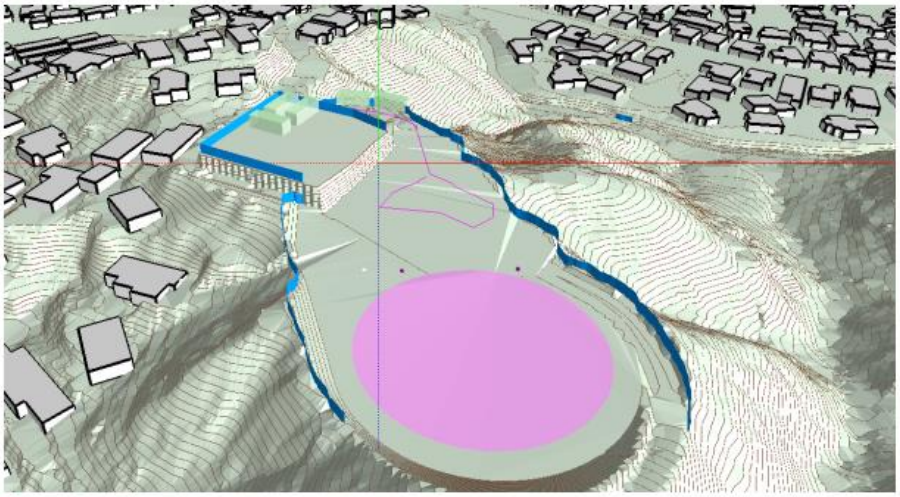


Figure 8.2: 3D aerial view of noise model looking North

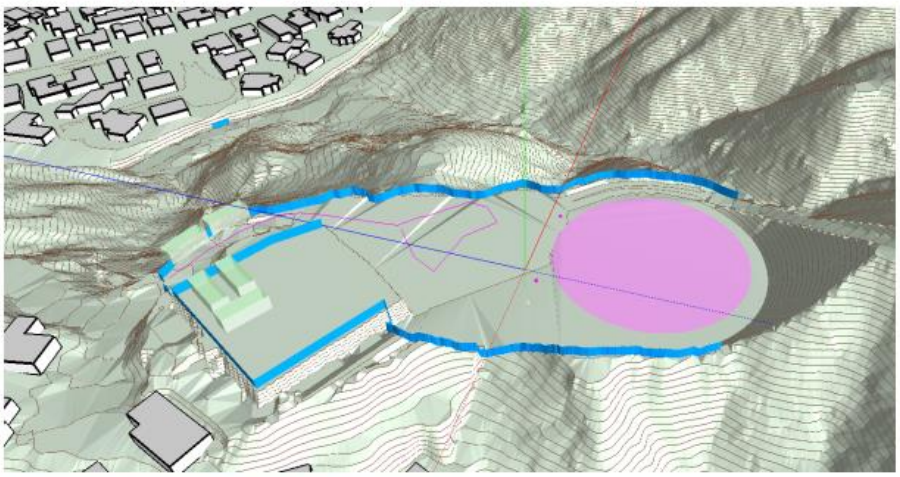


Figure 8.3: 3D aerial view of noise model looking East

## 9 Conditions

9.1 A condition is proposed that a CNVMP shall be implemented, in accordance with Annex E2 of NZS 6803:1999 Acoustics – Construction Noise and Policy 14C 1.1(g) of the HCC District Plan. I consider this condition is appropriate to manage effects.

## 10 Response to submissions

10.1 I have reviewed the submissions that comment on matters relevant to my evidence. I respond to the key matters raised below.

**Response to R Parry's submission**

10.2 I have reviewed the submission provided by R Parry and consider that their submission makes reference to six items that are pertinent to noise:

a Their view on the recommended upper limits for construction noise, as presented in Table 2 of NZS 6803:1999 Acoustics - Construction Noise, states that the standard allows for astonishing levels or sound which is not considered to be appropriate for people that work from home.

b Their concern regarding potential harm to human health, wildlife and pets, for noise levels that exceed 85 dBA.

c The specific construction noise effects that are to be experienced at their property, which is stated to be 250 m distance from the construction site.

d Their concern that noise mitigation and management of construction sites in general does not adhere to the applicable standard, in practice.

e Their request to provide restricted hours of operation for noise-producing machinery, so residents can plan activities around noise emissions, and to provide noise insulation for residents within 750 m.

10.3 My response to R Parry's submission is provided below for each of the items listed above:

a The recommended upper limits that are provided in Table 2 of NZS 6803:1999 Acoustics – Construction Noise are written into national standards, and these noise level thresholds are widely accepted to be applicable for the temporary noise effects of construction noise. For the Project, I have adopted a daytime average noise limit of 70 dB $L_{Aeq}$ which applies to activities taking place over a long duration (greater than 20 weeks); this is 5 dB lower than the 'typical duration' noise limit of 75 dB $L_{Aeq}$. The condition of consent for a CNVMP is a principal mitigation measure to be adopted for the site.

b Regarding health effects of noise, I refer to the Health and Safety in Employment Regulations 1995 and WorkSafe New Zealand, which provides general noise exposure recommendations for workers. Although this threshold applies to employers to protect its employees, the permanent hearing damage thresholds also apply to any person in general. The regulations and guidance indicate that a daily 8-hour exposure of continuous

noise levels of 85 dBA, constitutes a threshold for hearing damage to occur. For the Project, the applicable daytime recommended upper limits (70 dB $L_{Aeq,T}$) fall below the hearing damage threshold. The highest predicted construction noise levels are for sheet piling, which are predicted to be up to 83 dB $L_{Aeq,1hr}$ with mitigation, during a worst-case 1-hour period. It is not expected that construction activities will be produceing a constant level of noise in excess of 85 dBA for a continuous 8-hour period, at a single receiving position. As such, I anticipate that the daily exposure threshold of 85 dBA will not be exceeded for residents or members of the public visiting the area.

c The dwelling at 35 Woodvale Grove (R. Parry's residence) is indicated to fall outside of the predicted noise contours and below the noise limit thresholds for all construction activities as indicated in **Appendix 2**, with exception to the proposed night-time works which is predicted to be up to 5 dB above the limit, in the region of 45 to 50 dB $L_{Aeq}$.

d A condition is proposed for a CNVMP to be developed in accordance with Annex E2 of NZS 6803:1999 Acoustics - Construction Noise and Policy 14C 1.1(g) of the HCC District Plan. This plan shall be followed at all stages of construction and will include procedures for communications and engagement with the community, a complaint handling protocol, education and training of workers, managerial and physical mitigation measures to minimise noise to the environment.

e A CNVMP will be developed and followed and the Contractor will follow this plan, including to limit the normal hours of operation to be from 7:00 am till 6:00pm Monday to Saturday, with noisy activities restricted prior to 7.30am. The CNVMP will determine the best practicable mitigation measures for the site.

**Response to F & P Clarke's submission**

10.4 I have reviewed the submission provided by F & P Clarke which makes reference to general disruption from noise during construction.

10.5 The submitters address is located at 10 Balgownie Grove, which is included as a receptor in my assessment. I predict that noise levels will exceed the daytime limit during piling activities. As noted within the assessment, specific physical and managerial measures will be implemented to mitigate noise effects at this receptor, including a 3 m barrier between the piling locations and 10 Balgownie

Grove, and therefore I consider that noise levels have been mitigated using the best practicable option.

## 11 Response to Section 42A Officer's Report

11.1 I have reviewed the evidence statement of Mr Stephen Charles Arden for the Hutt City Council. I agree with their conclusion that there are no obvious noise or vibration matters which would preclude the confirmation of the NoR. Furthermore, I agree with Mr Arden's assessment that the matters raised by the submitters have been addressed within my noise and vibration assessment, and measures are proposed to limit the noise and vibration effects.

## 12 Conclusions

12.1 Once constructed, operation of the proposed reservoir is expected to produce negligible levels of noise, and the Project has no fixed mechanical equipment to consider in terms of noise emissions. Therefore, I do not expect any adverse noise and vibration effects due to operation of the reservoir, and it is anticipated that it will comply with relevant HCC District Plan noise limits.

12.2 I have concluded that with the implementation of mitigation measures, adverse noise effects are predicted to be present at certain receptors for piling activities and night-time works.

12.3 Nighttime noise effects will occur on two of the four nights of which there are planned night-works. The worst affected dwellings are those located along site access roads at Tilbury Street and Summit Road and construction related noise is predicted to be readily perceptible, with the potential to cause sleep disturbance at dwellings along the site access road.

12.4 I consider that no dwellings lie within the nominated stand-off distances for all activities, therefore cosmetic building damage to dwellings is not predicted to occur. However, I predict the vibration amenity limit may be exceeded at some dwellings, as part of the CNVMP prior notification to those affected properties will be required.

12.5 In my view, the adverse impacts can be reasonably mitigated with the implementation of a CNVMP. This plan will be required to include physical and managerial mitigation measures including a 3 m tall site boundary barrier, to minimise noise to the environment and associated effects, procedures for

communications and engagement with the community, a complaint handling protocol, and education and training of workers.

**Leonard Michael Terry**
**14 November 2024**

# Appendix 1 – Construction Noise Assessment Results

Situation A - Site Establishment

Table 6.1: Predicted average noise levels for Situation A

| NSR ADDRESS | AVERAGE NOISE LEVEL AT RECEPTOR ($L_{Aeq,1hr}$) | | ACHIEVES CRITERIA (70 DB $L_{Aeq}$) WITH MITIGATION? |
|---|---|---|---|
| | UN-MITIGATED | MITIGATED | |
| 49C Tilbury Street, Fairfield, Lower Hutt | 71 | 60 | Yes |

Situation B – Earthworks for Reservoir

- No NSRs predicted to exceed noise limit for works within site boundary

Situation C – Pipeline and Reservoir / Valvehouse Construction – With Piling

Table 6.2: Predicted average noise levels for Situation C

| NSR ADDRESS | AVERAGE NOISE LEVEL AT RECEPTOR ($L_{Aeq,1hr}$) | | ACHIEVES CRITERIA (70 DB $L_{Aeq}$) WITH MITIGATION? |
|---|---|---|---|
| | UN-MITIGATED | MITIGATED | |
| 10 Balgownie Grove, Naenae, Lower Hutt | 79 | 76 | No |
| 11 Balgownie Grove, Naenae, Lower Hutt | 82 | 78 | No |
| 2 Balgownie Grove, Naenae, Lower Hutt | 85 | 80 | No |
| 3 Balgownie Grove, Naenae, Lower Hutt | 76 | 74 | No |
| 4 Balgownie Grove, Naenae, Lower Hutt | 78 | 75 | No |
| 5 Balgownie Grove, Naenae, Lower Hutt | 91 | 82 | No |
| 6 Balgownie Grove, Naenae, Lower Hutt | 89 | 83 | No |
| 7 Balgownie Grove, Naenae, Lower Hutt | 82 | 79 | No |
| 9 Balgownie Grove, Naenae, Lower Hutt | 72 | 72 | No |
| 10 Farrelly Grove, Fairfield, Lower Hutt | 73 | 72 | No |
| 2 Farrelly Grove, Fairfield, Lower Hutt | 71 | 66 | Yes |
| 9 Farrelly Grove, Fairfield, Lower Hutt | 73 | 73 | No |
| 33 Summit Road, Fairfield, Lower Hutt | 75 | 75 | No |
| 31 Summit Road, Fairfield, Lower Hutt | 76 | 76 | No |
| 35 Summit Road, Fairfield, Lower Hutt | 74 | 74 | No |
| 46 Waddington Drive, Naenae, Lower Hutt | 72 | 72 | No |
| 26 Waddington Drive, Naenae, Lower Hutt | 73 | 71 | No |
| 28 Waddington Drive, Naenae, Lower Hutt | 79 | 76 | No |
| 32 Waddington Drive, Naenae, Lower Hutt | 79 | 76 | No |
| 34 Waddington Drive, Naenae, Lower Hutt | 74 | 72 | No |
| 36 Waddington Drive, Naenae, Lower Hutt | 72 | 72 | No |
| 40 Waddington Drive, Naenae, Lower Hutt | 72 | 71 | No |
| 25 McEnroe Grove, Naenae, Lower Hutt | 72 | 71 | No |
| 27 McEnroe Grove, Naenae, Lower Hutt | 74 | 73 | No |
| 35 Waddington Drive, Naenae, Lower Hutt | 74 | 72 | No |
| 37 Waddington Drive, Naenae, Lower Hutt | 75 | 73 | No |
| 39 Waddington Drive, Naenae, Lower Hutt | 72 | 70 | Yes |
| 41 Waddington Drive, Naenae, Lower Hutt | 71 | 70 | Yes |
| 43 Waddington Drive, Naenae, Lower Hutt | 71 | 70 | Yes |

## Situation D – Pipeline and Reservoir / Valvehouse Construction – No Piling

Table 6.3: Predicted average noise levels for Situation D

| NSR ADDRESS | AVERAGE NOISE LEVEL AT RECEPTOR ($L_{Aeq,1hr}$) | | ACHIEVES CRITERIA (70 DB $L_{Aeq}$) WITH MITIGATION? |
|---|---|---|---|
| | UN-MITIGATED | MITIGATED | |
| 2 Balgownie Grove, Naenae, Lower Hutt | 73 | 69 | Yes |
| 5 Balgownie Grove, Naenae, Lower Hutt | 78 | 70 | Yes |
| 6 Balgownie Grove, Naenae, Lower Hutt | 77 | 71 | No |
| 7 Balgownie Grove, Naenae, Lower Hutt | 73 | 70 | Yes |
| 31 Summit Road, Fairfield, Lower Hutt | 71 | 70 | Yes |

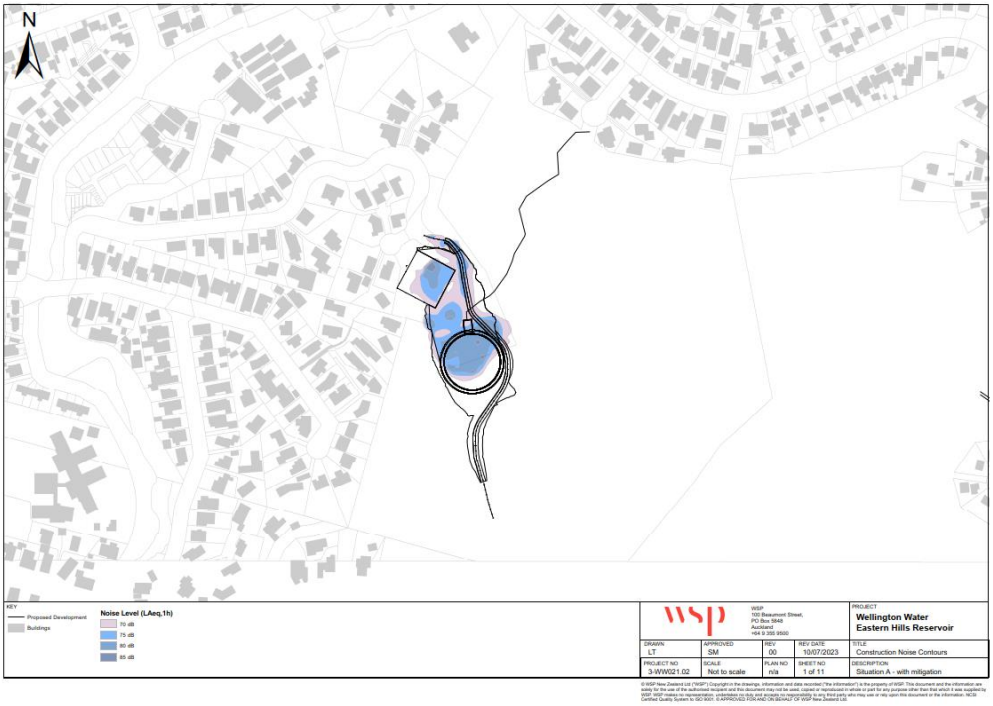
## Situation D-2 – Overpumping and Dewatering Night Works

Table 6.4: Predicted average noise levels for Situation D-2

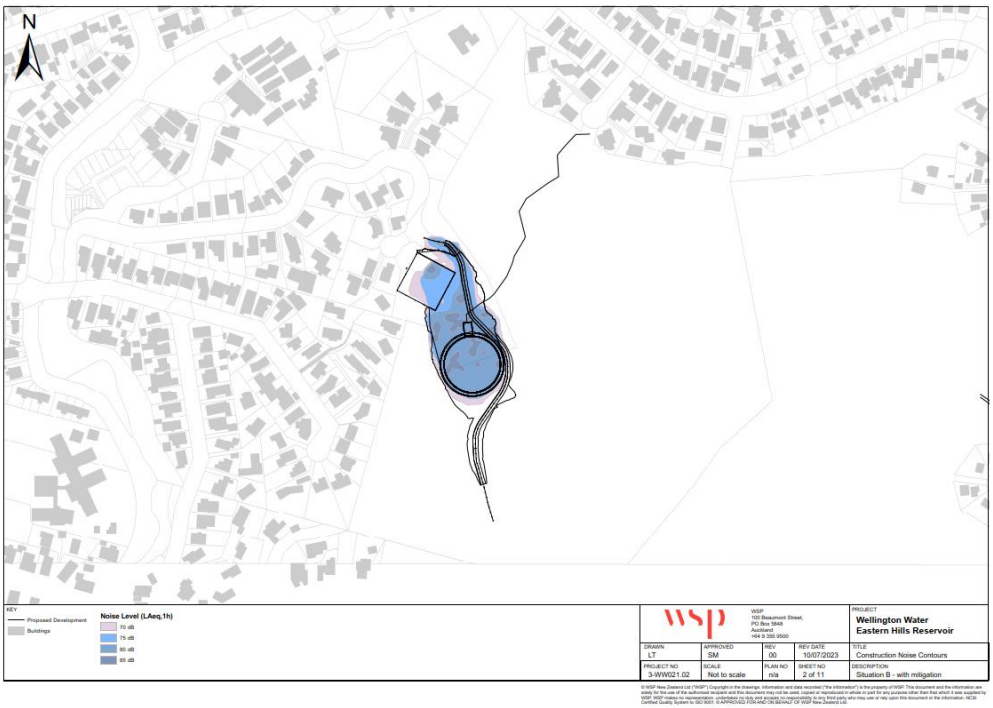
| NSR ADDRESS | AVERAGE NOISE LEVEL AT RECEPTOR ($L_{Aeq,1hr}$) | | ACHIEVES CRITERIA (45 DB $L_{Aeq}$) WITH MITIGATION? |
|---|---|---|---|
| | UN-MITIGATED | MITIGATED | |
| 10 Balgownie Grove, Naenae, Lower Hutt | 50 | 35 | Yes |
| 11 Balgownie Grove, Naenae, Lower Hutt | 47 | 35 | Yes |
| 2 Balgownie Grove, Naenae, Lower Hutt | 56 | 34 | Yes |
| 3 Balgownie Grove, Naenae, Lower Hutt | 48 | 31 | Yes |
| 4 Balgownie Grove, Naenae, Lower Hutt | 52 | 33 | Yes |
| 5 Balgownie Grove, Naenae, Lower Hutt | 63 | 38 | Yes |
| 6 Balgownie Grove, Naenae, Lower Hutt | 73 | 45 | Yes |
| 7 Balgownie Grove, Naenae, Lower Hutt | 68 | 43 | Yes |
| 9 Balgownie Grove, Naenae, Lower Hutt | 47 | 33 | Yes |
| 10 Farrelly Grove, Fairfield, Lower Hutt | 53 | 41 | Yes |
| 9 Farrelly Grove, Fairfield, Lower Hutt | 53 | 42 | Yes |
| 33 Summit Road, Fairfield, Lower Hutt | 55 | 44 | Yes |
| 29 Summit Road, Fairfield, Lower Hutt | 48 | 37 | Yes |
| 31 Summit Road, Fairfield, Lower Hutt | 58 | 45 | Yes |
| 35 Summit Road, Fairfield, Lower Hutt | 52 | 41 | Yes |
| 36 Waddington Drive, Naenae, Lower Hutt | 50 | 32 | Yes |

## Appendix 2 – Construction Noise Contours (with mitigation)

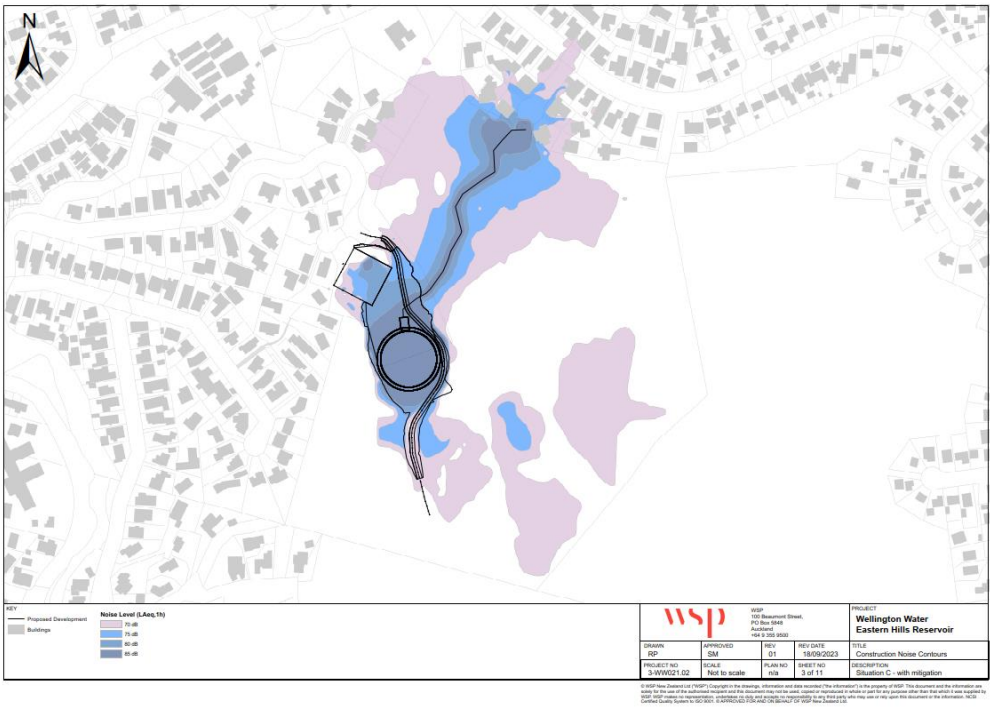
Situation A - Site Establishment



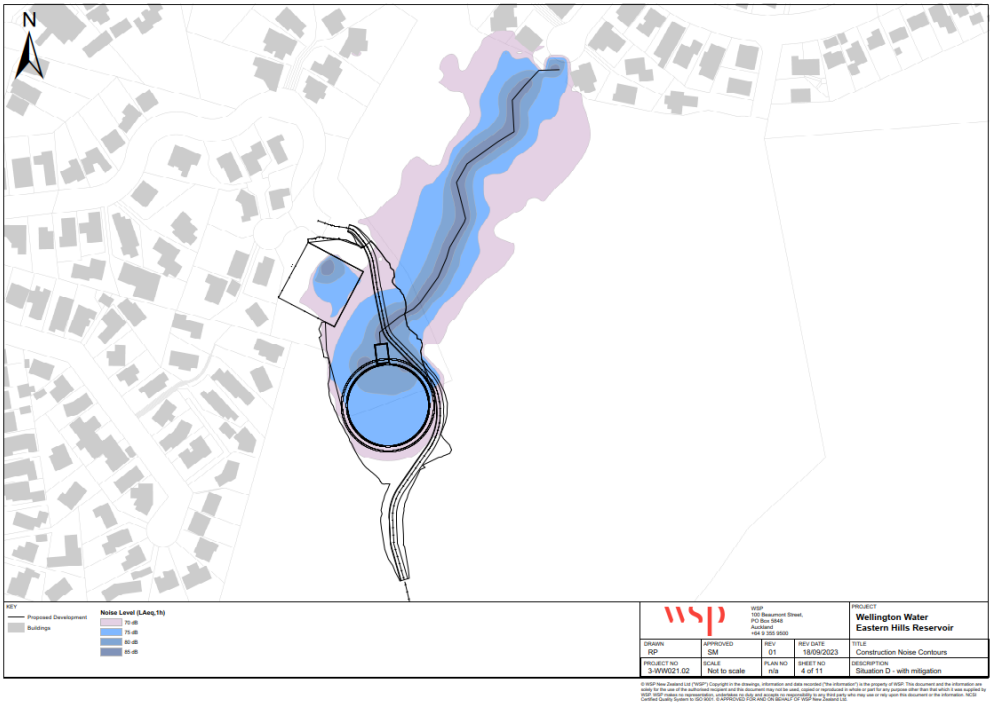

Situation B – Earthworks for Reservoir



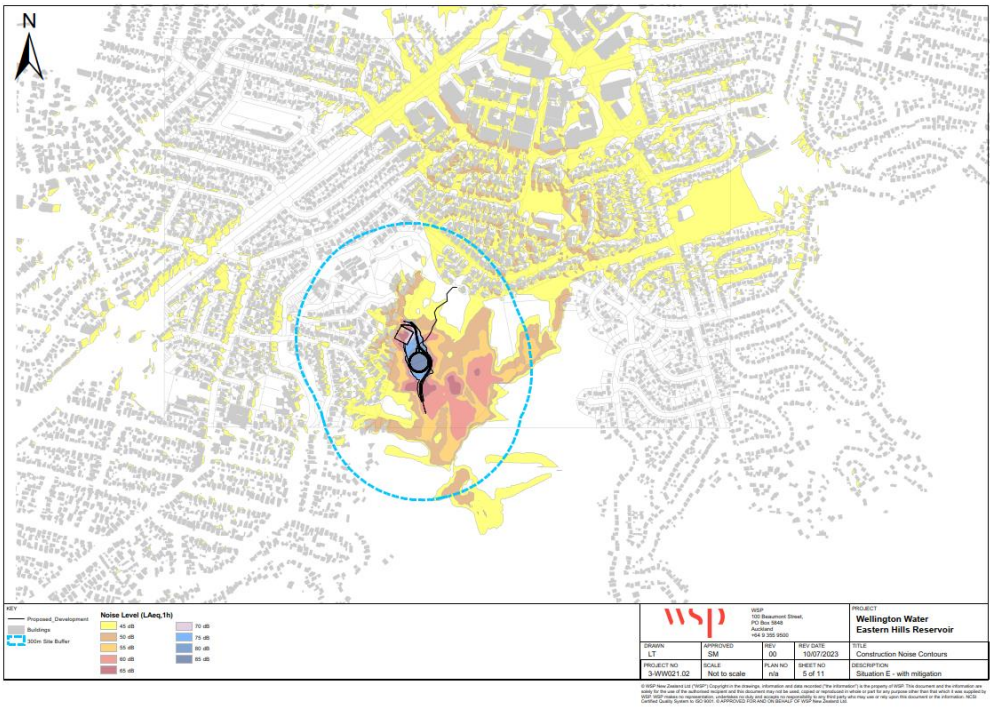
Situation C – Pipeline and Reservoir / Valvehouse Construction – With Piling



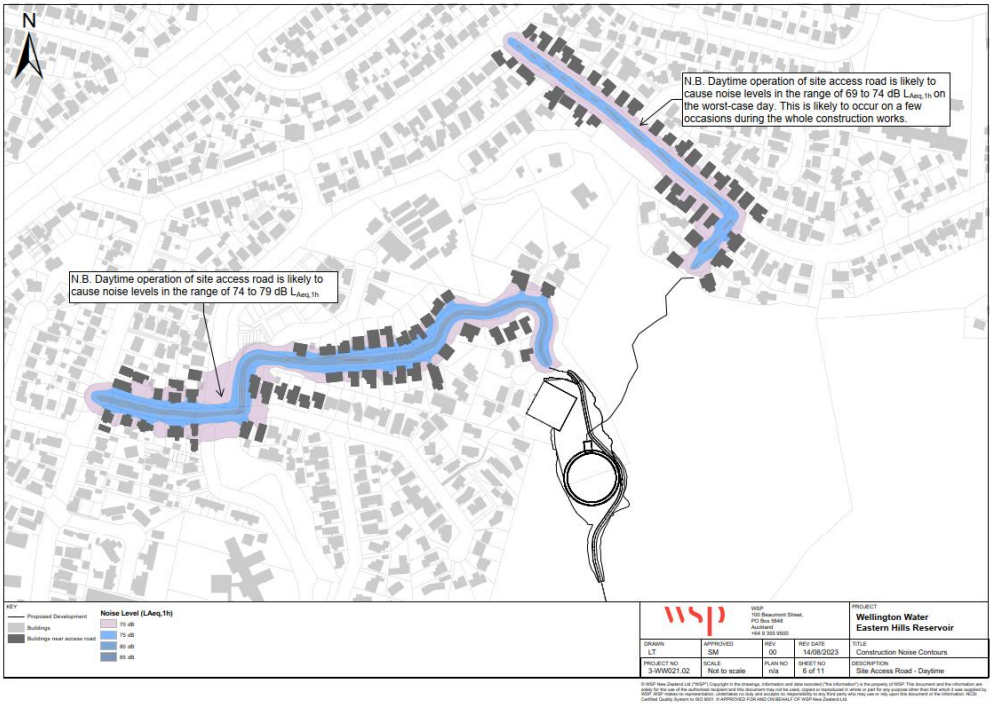

Situation D – Pipeline and Reservoir / Valvehouse Construction – No Piling



Situation E – Night-time concrete pouring




Site Access Road - Daytime



Site Access Road – Night-time