[Project name]

Noise mitigation plan (operational road-traffic)

[date]

[Version]

### Revision schedule

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Rev. No | Date | Description | Prepared by | Reviewed by | Approved by |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

(Waka Kotahi NMP template v2.0)

**Template explanatory notes** (to be deleted)

This is a template for a noise mitigation plan (NMP) detailing mitigation measures for operational road-traffic noise.

A NMP must contain comprehensive project and location specific details of noise mitigation. A NMP must not just repeat or reaffirm generic/standard information. A NMP is partly a design report and must not defer provision of mitigation details to other processes or documentation. If details of mitigation are not available when the NMP is first prepared then placeholders must be included and the NMP must be updated when the information is available.

A NMP is not written for the general public or a lay reader, and for brevity it must not include basic explanation or discussion of acoustics terms, standards, assessment and criteria. A NMP must not set or justify criteria, but must document how specified criteria are achieved.

A NMP serves multiple functions:

* It is a design report for operational noise mitigation measures, and must be used as the primary reference in relation to these measures by the project team during construction.
* It must demonstrate compliance with Waka Kotahi *P40 Specification for road-traffic noise mitigation* and any project-specific requirements (eg Principal's/minimum requirements) and designation conditions. If applicable, it should be submitted to the regulatory authority as part of the outline plan process.
* It must record the justification for and authorisation of any changes to noise mitigation, including full details of any assessment/evaluation of options for mitigation that is changed.
* It provides a long-term reference document for the asset owner (together with a post-construction review report) so it is clear what noise mitigation has been implemented, why it was implemented and how it must be maintained.

An initial NMP must be prepared prior to construction and it must be updated to reflect the as-built noise mitigation. Additional interim revisions to a NMP should be made if the noise mitigation design changes.

The content of this template must be expanded and adjusted as required to address all relevant requirements.

An acoustics specialist must be responsible for the preparation of an NMP. Information is required from a range of other disciplines and the acoustics specialist must collate the required inputs from the wider project team.

**Disclaimer**

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# Introduction

This noise mitigation plan (NMP) sets out details of measures to control adverse noise effects from operational road-traffic. It documents how criteria set previously (section 2) will be achieved. This NMP is written for a professional audience and not a lay reader.

## Project details

|  |  |
| --- | --- |
| Parameter | Value |
| Client | [XX] |
| Project name | [XX] |
| Project description | [Brief outline of project location, extent and nature of works.] |
| Contract number | [XX] |
| Contractor | [XX] |

## Previous noise assessment

|  |  |
| --- | --- |
| Parameter | Value |
| Date of assessment | [XX] |
| Consultant responsible | [XX] |
| Documentation of assessment | [File references and dates of noise assessment report and relevant evidence presented at RMA hearings.] |
| NoR recommendation and decision | [File references and dates of RMA recommendations/decisions on Notices of Requirements confirming or altering the findings of the noise assessment.] |
| Relevant earlier work and/or other requirements | [File references and dates of any earlier noise assessments, report, and relevant evidence presented at RMA hearings.] |

## Personnel

The noise mitigation design and this NMP have been prepared under the direction of the following individuals. The acoustics specialist has qualifications and experience meeting the requirements of Waka Kotahi *P40 Specification for road-traffic noise mitigation*.

|  |  |
| --- | --- |
| Specialist | Name/company |
| Acoustics | [XX] |
| Pavements/surfacing | [XX] |
| Urban/landscape design | [XX] |
| Structural engineer (noise barriers) | [XX] |
| Planning (statutory approvals) | [XX] |
| Traffic modeller | [XX] |

# Criteria

## Designation conditions

|  |  |  |
| --- | --- | --- |
| Number | Requirement | Addressed in section of this NMP |
|  | [Insert all designation conditions relating to operational noise.] |  |
|  |  |  |

Designation condition [XX] refers to selected options for noise mitigation. These are set out in:

* [File reference and date of relevant noise assessment report or reference to figures/schedules included in conditions.]

The main aspects of the selected options are summarised in the tables below, together with the resulting numbers of protected premises and facilities (PPFs) in each NZS 6806 category.

**Selected options – low-noise road surfaces**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Start chainage | End chainage | Length (m) | Lanes | Surface type | Depth (mm) | Aggregate size (mm) | Void content (%) |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

**Selected options – noise barriers**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Start chainage | End chainage | Length (m) | Road direction | Barrier type | Height (m) |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

**Selected options – building-modification mitigation**

|  |  |
| --- | --- |
| PPF reference | PPF address |
|  |  |
|  |  |

**Selected options – number of PPFs in NZS 6806 categories**

|  |  |
| --- | --- |
| NZS 6806 category | Number of PPFs |
| Category A |  |
| Category B |  |
| Category C |  |

## P40 specification

|  |  |  |
| --- | --- | --- |
| P40 section | Requirement | Addressed in section of this NMP |
| 3 | Suitably qualified professionals | 1.3 |
| 4.1 | Computer noise models | 3 |
| 5 | Noise barriers | 4 |
| 6 | Road surfacing | 5 |
| 7 | Road environment | 7 |
| 8 | Public engagement | 8 |
| 10 | Post-construction review | 9 |

## Contract

The following sets out Principal’s/Minimum Requirements that relate to noise mitigation. Subsequent notices varying those requirements are also listed.

|  |  |  |
| --- | --- | --- |
| Clause/notice reference | Requirement | Addressed in section of this NMP |
|  | [Insert all PRs/MRs and notices relating to operational noise.] |  |
|  |  |  |

## Property agreements

Specific agreements have been made with respect to individual properties, affecting noise mitigation, as set out below.

|  |  |  |
| --- | --- | --- |
| Property | Requirement | Addressed in section of this NMP |
|  | [Insert clauses of property agreements relating to operational noise.] |  |
|  |  |  |

# Modelling

Computer noise modelling has been undertaken to demonstrate that detailed development of the road alignment and noise mitigation remains consistent and compliant with the designation conditions and other requirements set out in section 2.

The noise model includes the structural noise mitigation detailed in sections 4 and 5.

## Input parameters

**Model details**

|  |  |
| --- | --- |
| Parameter | Value |
| Operator | [XX] |
| Calculation date | [XX] |
| Software and version | [XX] |
| Algorithm | CRTN[Detail any variations from the CRTN method.] |
| Parameter | *L*Aeq(24h)*(converted from L*A10(18h) *by a -3 dB correction – [Detail how this correction is implemented (such as added to the surface correction within the modelling software)])* |
| Ground absorption | [XX] |
| Road gradients | Automatic calculation from earthworks/lane contours(correction disabled for downhill sections of roads when traffic lanes are in one direction) |
| Terrain screening | Automatic calculation from earthworks/terrain contours |
| Reception point | Free-field equivalent *[Detail how reception points are located relative to building façades within the model (e.g. +0.01 m from façade, 1 m in from corners) and details of the façade correction applied, if any]* |
| Receiver height | 1.5 m ground floor, 4.5 m first floor, +3 m for any subsequent floorResults stated for most exposed façade to the project |
| Contour grid | 1.5 m height[XX] m resolution |
| Earthworks contours | [XX] m height resolution[File references and dates of earthworks GIS files imported to noise model.] |
| Terrain contours (beyond earthworks boundary) | [XX] m height resolution[File references and dates of terrain GIS files imported to noise model.] |
| Building geometry | Single storey buildings modelled as 5 m uniform heightKnown two storey buildings modelled as 7.5 m uniform height[File references and dates of building outline GIS files imported to noise model.] |
| Road alignments | Each road section modelled is listed in the table below.Roads defined by centre lines and widths.Each two-lane carriageway modelled as a separate road, with traffic direction set in the model (for gradient calculation).Crawler lanes and ramps modelled as separate roads.Local roads with one lane in each direction modelled as a single (two lane) road.[File references and dates of road centreline and width GIS files imported to noise model.] |
| Bridges | All bridges modelled with solid [XX] metre tall safety barriers on each edge.[Detail any settings made so that sound is not modelled as passing through bridge decks.] |
| Safety barriers | [File references and dates of safety barrier top edge polyline GIS files imported to noise model.] |
| Noise barriers | [File references and dates of noise barrier top edge polyline GIS files imported to noise model.] |
| Traffic data | Year of traffic forecasts for noise modelling: [XX]([XX] years after the assumed opening year of [XX])[File references and dates of traffic model/data.]Annual average daily traffic (AADT), percentage of heavy vehicles and speed, imported as attributes to each road centre line. Values set out in table below.24h AADT values entered in CRTN as 18h values (approximately +0.2 dB conservative). |
| Road surfaces | Correction determined in accordance with the Waka Kotahi *Guide to assessing road-traffic noise* |

**Road details**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Road section | Number of lanes | Width (m) | AADT (vpd) | Heavies (%) | Speed (km/h) | Road surface | Surface correction (dB) |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

## Results

Predicted road-traffic noise levels for the construction design are shown in the table below, together with results from the previous noise assessment (‘NoR design’). Noise contours and PPFs are also shown in the plans in appendix A.

The cells are colour coded according to the NZS 6806 category: category A – green, category B – orange, and category C - red. The same colour coding is used on the plans in appendix A. Barriers shielding a PPF are also listed.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| PPF reference | PPF address | Criteria | NoR design (dB) | Construction design (dB) | Noise barrier reference |
|  |  | [new/altered] |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

**Number of PPFs in NZS 6806 categories**

|  |  |  |
| --- | --- | --- |
| NZS 6806 category | NoR design | Construction design |
| Category A |  |  |
| Category B |  |  |
| Category C |  |  |

## Compliance assessment

|  |  |
| --- | --- |
| Parameter | Value |
| Changes to design | [Summarise and explain reasons for any changes to the NoR design road alignment and selected noise mitigation set out in Section 2. This can cross reference to explanations for individual mitigation types in the following sections.] |
| Changes to NZS 6806 categories | [Based on the values in the tables above, summarise changes in NZS 6806 categories from the NoR design and any changes in level greater than +3 dB (regardless of whether there is a change in category).] |
| Assessment of changes | [Detail any reassessment of noise mitigation / BPO. Details of mitigation options evaluated, and assessment matrices are to be appended to this NMP.] |
| Authorisation of changes | [Detail any authorisations for changes in selected options and/or NZS 6806 categories. Documentation of approvals is to be appended to this NMP.] |
| Compliance with conditions/criteria | [Confirm compliance with requirements in Section 2 and detail any issues arising.] |

# Noise barriers

## Locations

Noise barriers will be installed as set out in the following table. Where a noise wall will be built on top of a noise bund, each component is listed separately. The barrier extents are shown on the plans in appendix A and the detailed location plans are included in appendix B. All heights for noise walls are above the local ground level.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Barrier reference | Start chainage | End chainage | Length (m) | Road direction | Barrier type | Height (m) |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

[Summarise any changes from the selected options and cross reference to section 3.3 for details of approvals for changes.]

## Design details

Construction drawings (plans and elevations) for the noise barriers are included in appendix B.

|  |  |
| --- | --- |
| Parameter | Value |
| Acoustics performance | [Set out the acoustics rating of the barriers.]Acoustics test certificates for the noise barriers are in appendix C. |
| Design life | [Set out details of the design life of the barriers and maintenance programme to achieve the P40 50 year requirement.] |
| Top edges | [Set out details of top edges confirming compliance with P40 horizontal and step geometry requirements.] |
| Landscaping/planting | [Detail landscape/planting associated with barriers.]Landscaping and planting associated with noise barriers are shown on the plans in appendix B. |
| Stormwater/services | [Set out details of any stormwater/service penetrations/underpasses and analysis of acoustics effect.] |
| Safety barriers | [Set out details of safety barriers in relation to protecting in front of noise barriers and maintenance access between noise and safety barriers.] |
| Clearance | [Set out details of clearance of barrier from traffic and any over-dimension route requirements.] |
| Coatings/artwork | [Detail paint, graffiti or other coatings and artwork, including maintenance requirements.]Barrier coatings and artwork are shown on the elevations in appendix B. |
| Statutory approvals | [Set out statutory approvals for the barriers.] |

## Programme

|  |  |  |  |
| --- | --- | --- | --- |
| Barrier reference | Programmed barrier installation date | Date earthworks or other major construction starts in this area | Comments (reasons if barrier is not to be installed in advance of earthworks) |
|  |  |  | [Reasons if barrier is not to be installed in advance of earthworks.] |
|  |  |  |  |

# Road surfaces

## Locations

Low-noise road surfaces will be installed as set out in the following table. The extents of low-noise surfaces are shown on the plans in appendix D.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Start chainage | End chainage | Length (m) | Lanes | Surface type | Depth (mm) | Aggregate (mm) | Voids (%) | Surface correction (dB) |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

[Summarise any changes from the selected options and cross reference to section 3.3 for details of approvals for changes.]

## Surface features

|  |  |
| --- | --- |
| Parameter | Value |
| Service covers and drainage | There will be no service covers or drainage covers within any traffic lanes. |
| Traffic calming / speed control | There will be no vertical deflection speed control devices or periodic transverse road markings.[Detail any cross-disciplinary assessment into whether vertical deflection devices would be installed and mitigation considered.][Detail assessment of noise effects if vertical deflection devices are installed.] |
| Audio tactile profile marking (ATPM) | The locations and types of ATPM are shown on the plans in appendix D. Ribbed ATPM will not be installed in any other location.[Detail the assessment of noise effects from ribbed ATPM.][Set out ATPM details (such as positioning being outside the painted edge lines).] |
| Surface joints | Acceptable areas for transverse surface joints between paving runs are shown on the plans in appendix D. Transverse surface joints will not occur in other areas. |
| Mechanical joints | Locations of mechanical joints in road surfaces are shown on the plans in appendix D.[Add a schedule of mechanical joints, including distances to nearby PPFs (within 200m).][Detail how joints will be treated to reduce noise (such as selection of low-noise types, inclusion of sound absorbing cavity linings, closure of the cavity under the joint and noise reducing surface plates on modular joints).][Specify acceptable tolerance in changes in surface longitudinal profile along vehicle wheel paths approaching, passing over and leaving joints.] |
| Tining | There will be no transverse tining of the road surface. |

## Programme

|  |  |  |  |
| --- | --- | --- | --- |
| Surface type/location | Programmed surfacing date | Programmed date of road opening | Comments (including thickness measurement) |
|  |  |  | [Reasons if surface is not to be laid before road first opens.][Detail thickness measurement of LN surfaces.] |
|  |  |  |  |

# Building modification

## Locations

Building modification will be investigated for PPFs as detailed in the following table. These PPFs are identified on the plans in appendix A.

|  |  |  |
| --- | --- | --- |
| PPF reference | PPF address | Mitigation type |
|  |  |  |
|  |  |  |

[Summarise any changes from the selected options and cross reference to section 3.3 for details of approvals for changes.]

## Implementation

|  |  |
| --- | --- |
| Parameter | Value |
| Building modification manager | [Person who will liaise with residents, instruct consultants/contractors and manage entry and mitigation agreements.] |
| Acoustics specialist making inspections/tests | [XX] |
| Building professional making inspections | [XX] |
| Contractors installing treatments | [List primary companies undertaking works, or where many are involved cross reference appendix E] |
| Timeframe for initial contacts | [XX] |
| Timeframe for inspections | [XX] |
| Timeframe for implementation | [XX] |
| Status record | The schedule in appendix E records the status of the implementation of treatment for each PPF, and provides references for all relevant documents. |

# Road environment

## Locations

Areas were the road geometry or layout may give rise to increased braking or acceleration sounds and areas where visual screening by planting could reduce perceived noise effects are listed in the following table and shown on the plans in appendix F.

|  |  |  |
| --- | --- | --- |
| Reference | Location | Road environment treatment |
|  |  |  |
|  |  |  |

## Design details

|  |  |
| --- | --- |
| Parameter | Value |
| Braking and acceleration | [Detail road environmental design features to encourage gradual braking and acceleration.]Road environmental design features to encourage gradual braking and acceleration are shown on the plans in appendix F. |
| Visual screening (Landscape designer) | [Detail planting/landscape design to provide visual screening.]Planting and landscaping to provide visual screening to reduce perceived noise is shown in the drawings in appendix F. |

## Programme

|  |  |  |  |
| --- | --- | --- | --- |
| Road environmental treatment | Programmed implementation date | Programmed date of road opening | Comments |
|  |  |  | [Reasons if implementation (including planting to effective heights) is not to be achieved before road first opens.] |
|  |  |  |  |

# Public engagement

|  |  |
| --- | --- |
| Parameter | Value |
| Stakeholder engagement manager | [XX] |
| Potential noise sensitive locations | All noise-sensitive locations within 2 km of the project that may experience an increase of 1 dB or more (temporary or permanent), or a change in road-traffic noise characteristics, are listed in the schedule and shown on plans in Appendix G.  |
| Community information | Appendix H contains community information on noise effects in accordance with P40. |
| Timeframe for initial provision of information | [Within three months prior to construction.] |
| Timeframe for provision of follow-up information | [Within one month prior to road opening.] |

# Post construction review

|  |  |
| --- | --- |
| Parameter | Value |
| Acoustics specialist making post construction review | [XX] |
| Timeframe for modelling as-built project | [XX] |
| Timeframe for inspection of noise barriers | [XX] |
| Timeframe for inspection of road environment treatments | [XX] |
| Noise monitoring locations and timeframe | [XX] |
| Pavements/surfacing specialist | [XX] |
| Contractor installing thickness measurement reflectors prior to surfacing and undertaking thickness measurements of LN surface types | [XX] |
| Timeframe for inspection of surfaces and surface features | [XX] |
| Timeframe for submission of post construction review report | [XX] |

# Certification

## Certification

|  |  |
| --- | --- |
| Certifier (acoustics specialist) | [XX] |
| Certification statement | I have overseen the road-traffic noise mitigation design in accordance with the Waka Kotahi *P40 Specification for road-traffic noise mitigation*. In my opinion the noise mitigation documented in this noise mitigation plan complies with all project requirements, adequately addresses both average road-traffic noise levels and specific noises from individual vehicles, and represents the best practicable option. I have submitted a set of electronic input and output files for the computer noise model with this noise mitigation plan. |
| Signature |  |
| Date | [XX] |

## Peer review

|  |  |
| --- | --- |
| Peer reviewer | [XX] |
| Summary of qualifications and experience (P40 section 3) | [XX] |
| Residual issues and comments | [XX] |
| Peer review statement | I have conducted a peer review of this road-traffic noise assessment in accordance with the Waka Kotahi *P40 Specification for road-traffic noise mitigation*. Subject to the above comments, in my opinion the noise mitigation documented in this noise mitigation plan complies with all project requirements, adequately addresses both average road-traffic noise levels and specific noises from individual vehicles, and represents the best practicable option. |
| Signature |  |
| Date | [XX] |

# Appendix A: Noise contour plans

# Appendix B: Noise barrier details

# Appendix C: Noise barrier acoustics certificates

# Appendix D: Road surface noise features

# Appendix E: Building treatment status

|  |  |
| --- | --- |
| PPF reference | Value |
|  | [Date and file reference of initial contact with owner.][Date and file reference of entry agreement for acoustics/building assessment.][Date and file reference of acoustics/building assessment report.][Date and file reference of treatment offer/options to owner.][Date and file reference of treatment acceptance (or refusal) including encumbrance.][Summary of agreed treatments.][Date and file reference of instructions to contractor for treatment installation.][Date and file reference of treatment completion and owner sign-off.][Explanation of any delays preventing treatment prior to construction works or road operation.] |
|  |  |

# Appendix F: Road environment noise features

# Appendix G: Noise sensitive locations

|  |  |  |  |
| --- | --- | --- | --- |
| Reference | Address | Effect | Timeframe |
|  |  | [XdB increase / change in sound character] | [x months during construction / permanent] |
|  |  |  |  |
|  |  |  |  |

# Appendix H: Community information