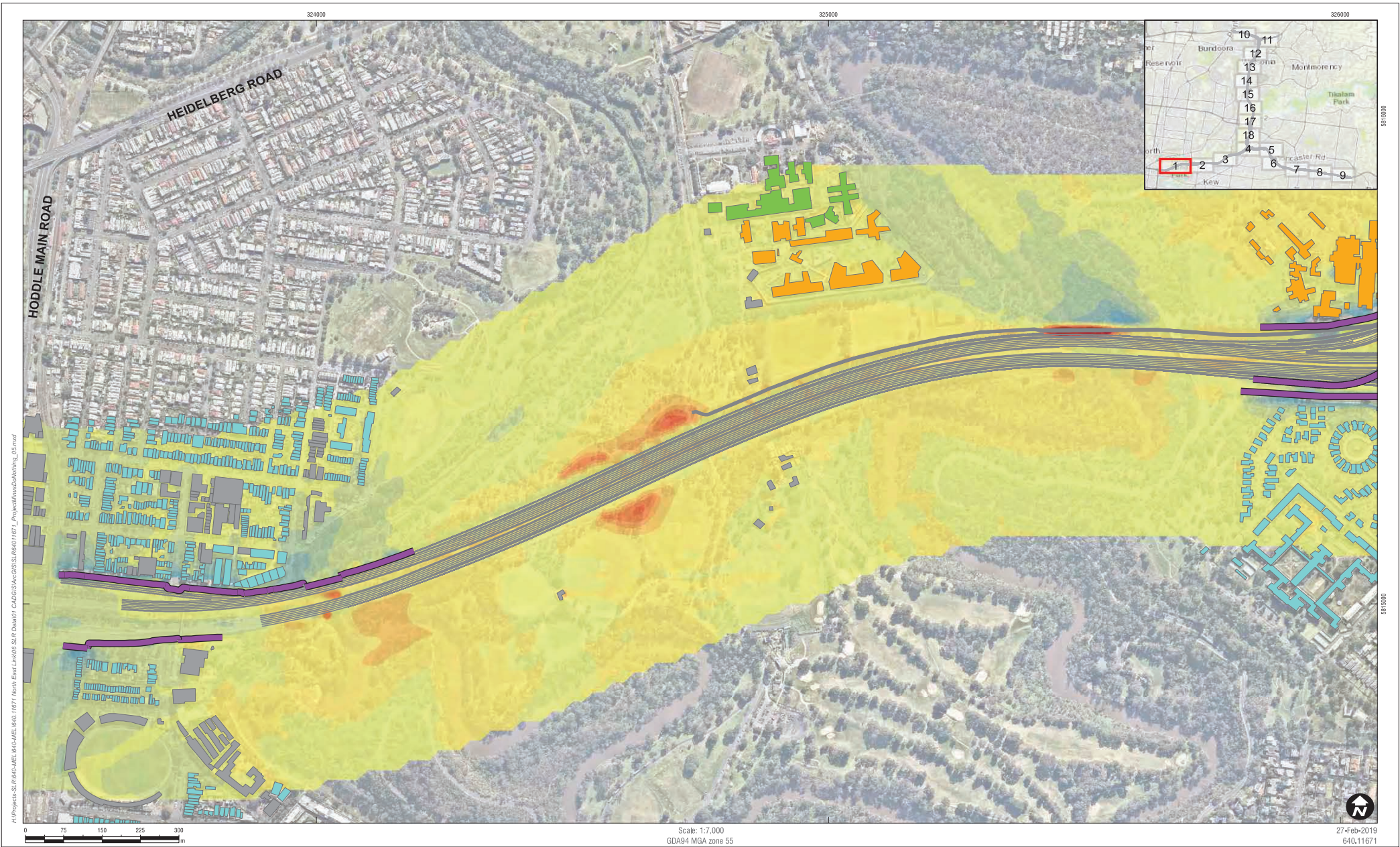

Appendix L Predicted change in traffic noise level 2036 (traffic on all roads)

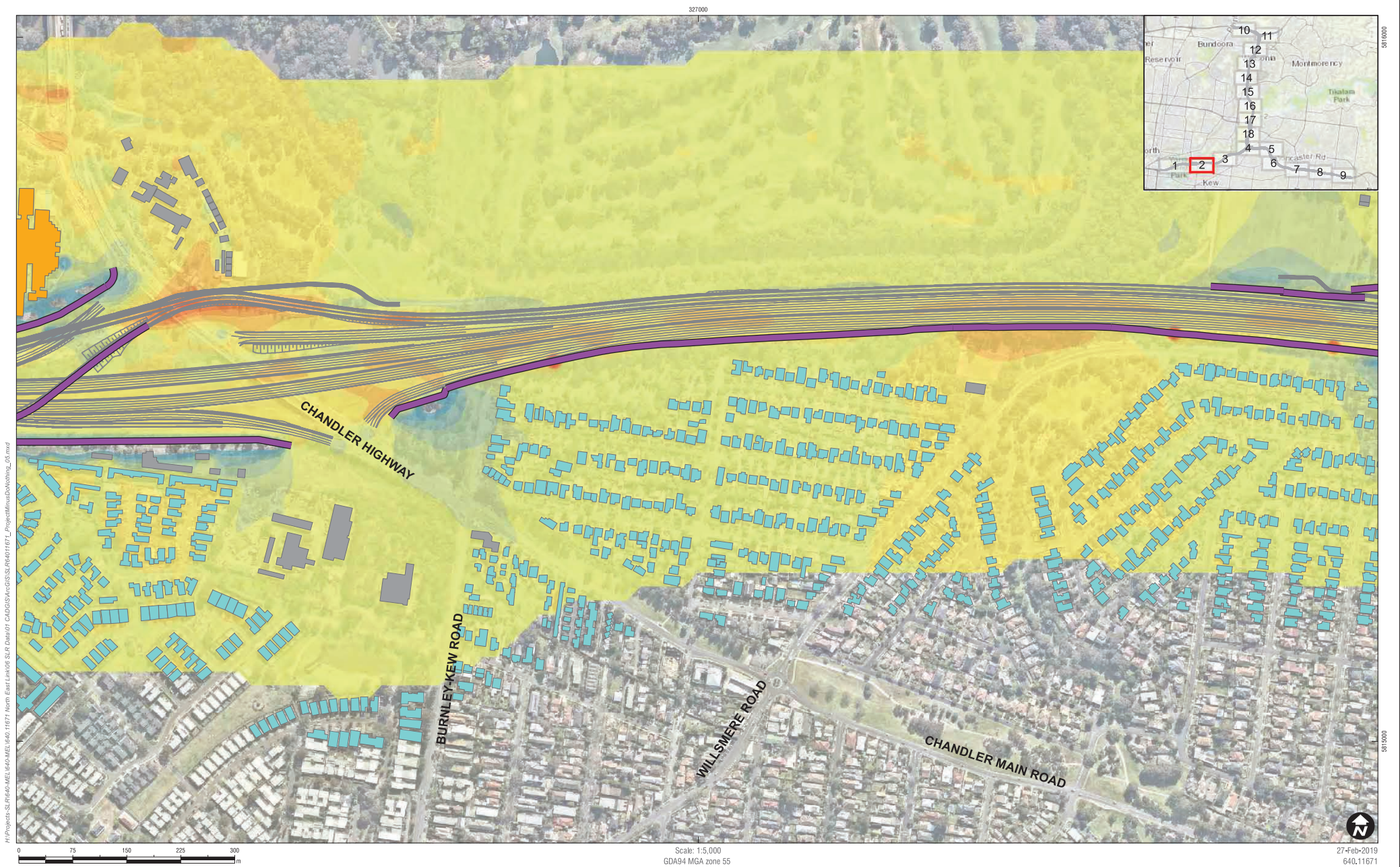


LEGEND

| | | | | | | | | | | | |
|--|---------------------------------|--|------------------------------------|--|--------------------------|--|-----------|--|--------|--|---------|
| | Noise Walls | | Religious Building | | Aged Care | | -8 to -6 | | 0 to 2 | | 8 to 10 |
| | Hospital | | Library / Museum / Advisory Centre | | Non Assessable Buildings | | -6 to -4 | | 2 to 4 | | > 10 |
| | School / University / Preschool | | Residential Building | | | | -4 to -2 | | 4 to 6 | | |
| | | | | | | | -2 to 0 | | 6 to 8 | | |
| | | | | | | | < -10 | | | | |
| | | | | | | | -10 to -8 | | | | |

2036, Difference in Noise Levels
with/without Project from All Roads

FIGURE L1



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LEGEND

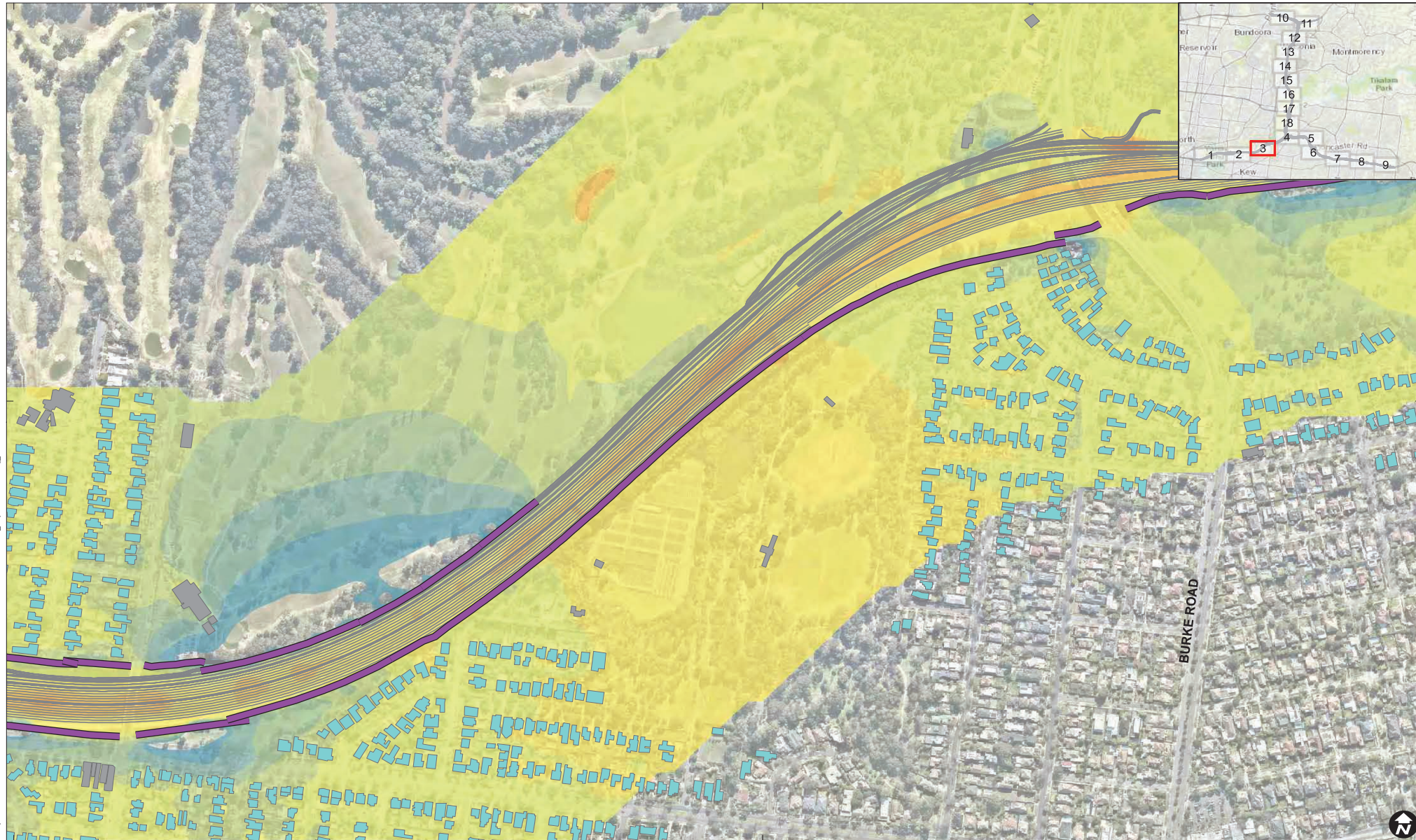
- | | | | | |
|---------------------------------|------------------------------------|--------------------------|-----------|---|
| Noise Walls | Building Type | Religious Building | Aged Care | Noise Level Difference (dBA) < -10 -10 to -8 -8 to -6 -6 to -4 -4 to -2 -2 to 0 0 to 2 2 to 4 4 to 6 6 to 8 8 to 10 > 10 |
| Hospital | Library / Museum / Advisory Centre | Non Assessable Buildings | | |
| School / University / Preschool | Residential Building | | | |
| | | | | |

2036, Difference in Noise Levels with/without Project from All Roads

FIGURE L2

328000

329000



0 75 150 225 300
m

Scale: 1:5,000
GDA94 MGA zone 55

27-Feb-2019
640,11671

LEGEND

| | | | | | | | |
|---------------------------------|------------------------------------|--------------------------|-----------|-------------------------------------|----------|--------|---------|
| Noise Walls | Building Type | Religious Building | Aged Care | Noise Level Difference (dBA) | -8 to -6 | 0 to 2 | 8 to 10 |
| Hospital | Library / Museum / Advisory Centre | Non Assessable Buildings | | | -6 to -4 | 2 to 4 | > 10 |
| School / University / Preschool | Residential Building | | | < -10 | -4 to -2 | 4 to 6 | |
| | | | | -10 to -8 | -2 to 0 | 6 to 8 | |

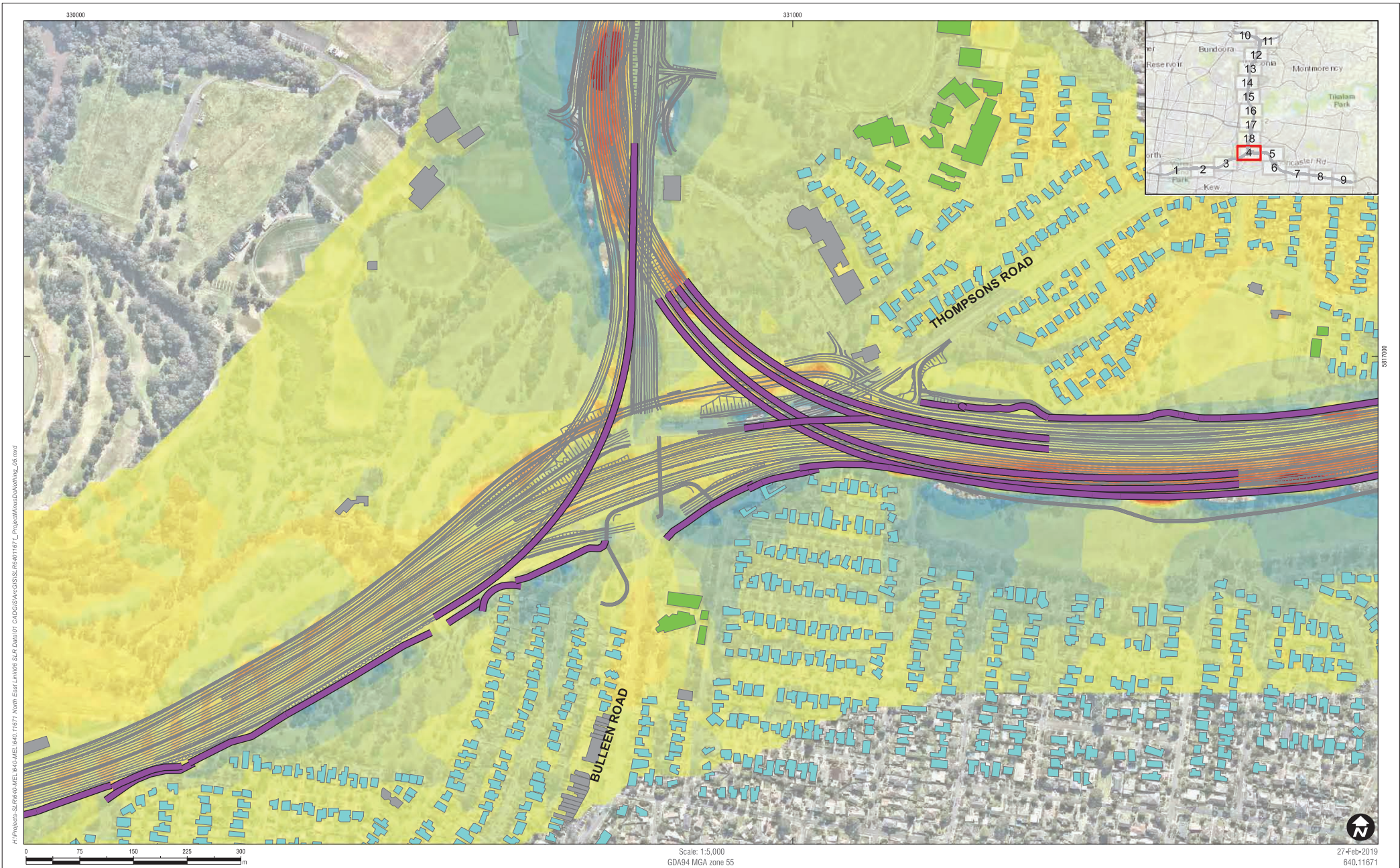
**2036, Difference in Noise Levels
with/without Project from All Roads**

FIGURE L3

Sheet Size : A3



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Sheet Size : A3

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LEGEND

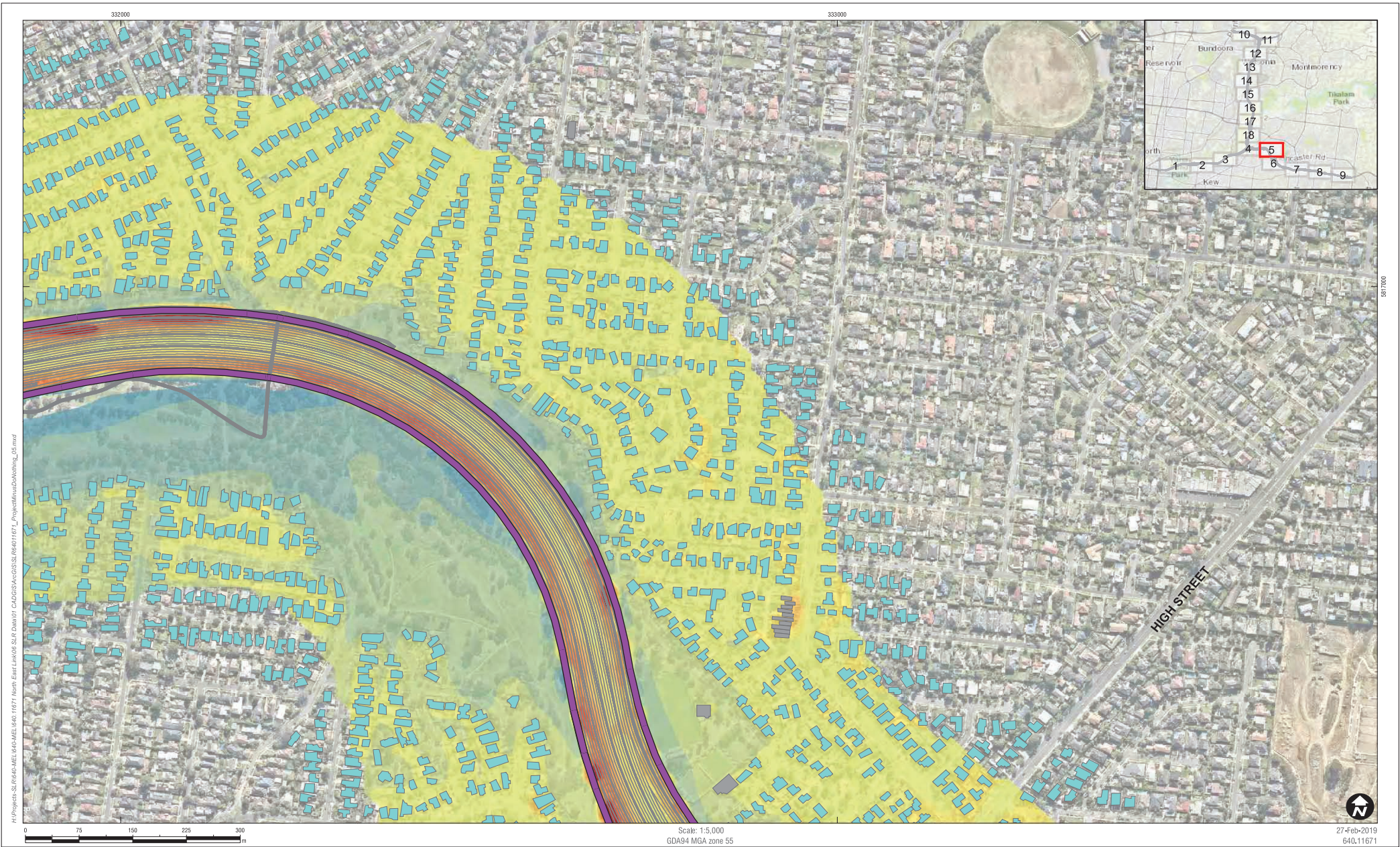
| | |
|--|---|
| <ul style="list-style-type: none"> Noise Walls Hospital School / University / Preschool | <p>Building Type</p> <ul style="list-style-type: none"> Religious Building Library / Museum / Advisory Centre Residential Building Aged Care Non Assessable Buildings |
|--|---|

Noise Level Difference (dBA)

| | | |
|--|---|---|
| <ul style="list-style-type: none"> < -10 -10 to -8 | <ul style="list-style-type: none"> -8 to -6 -6 to -4 -4 to -2 -2 to 0 | <ul style="list-style-type: none"> 0 to 2 2 to 4 4 to 6 6 to 8 8 to 10 > 10 |
|--|---|---|

2036, Difference in Noise Levels with/without Project from All Roads

FIGURE L4



Sheet Size : A3

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LEGEND

Noise Walls

- Noise Walls

Building Type

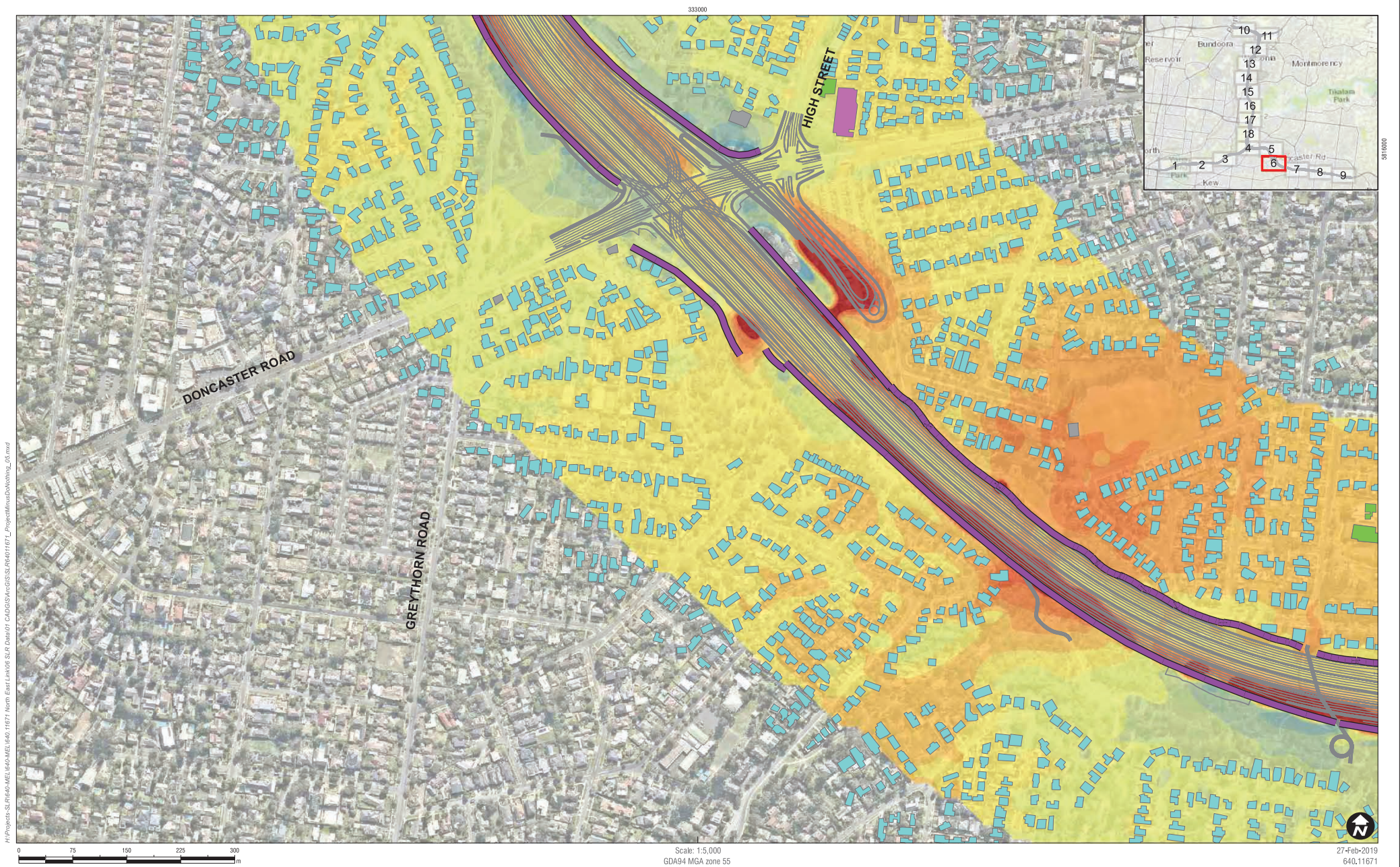
- Hospital
- School / University / Preschool
- Religious Building
- Library / Museum / Advisory Centre
- Residential Building
- Aged Care
- Non Assessable Buildings

Noise Level Difference (dBA)

- < -10
- 10 to -8
- 8 to -6
- 6 to -4
- 4 to -2
- 2 to 0
- 0 to 2
- 2 to 4
- 4 to 6
- 6 to 8
- 8 to 10
- > 10

2036, Difference in Noise Levels with/without Project from All Roads

FIGURE L5



LEGEND

Noise Walls

Building Type

Hospital

School / University / Preschool

Religious Building

Library / Museum / Advisory Centre

Residential Building

Aged Care

Non Assessable Buildings

Noise Level Difference (dBA)

< -10

-10 to -8

-8 to -6

-6 to -4

-4 to -2

-2 to 0

0 to 2

2 to 4

4 to 6

6 to 8

8 to 10

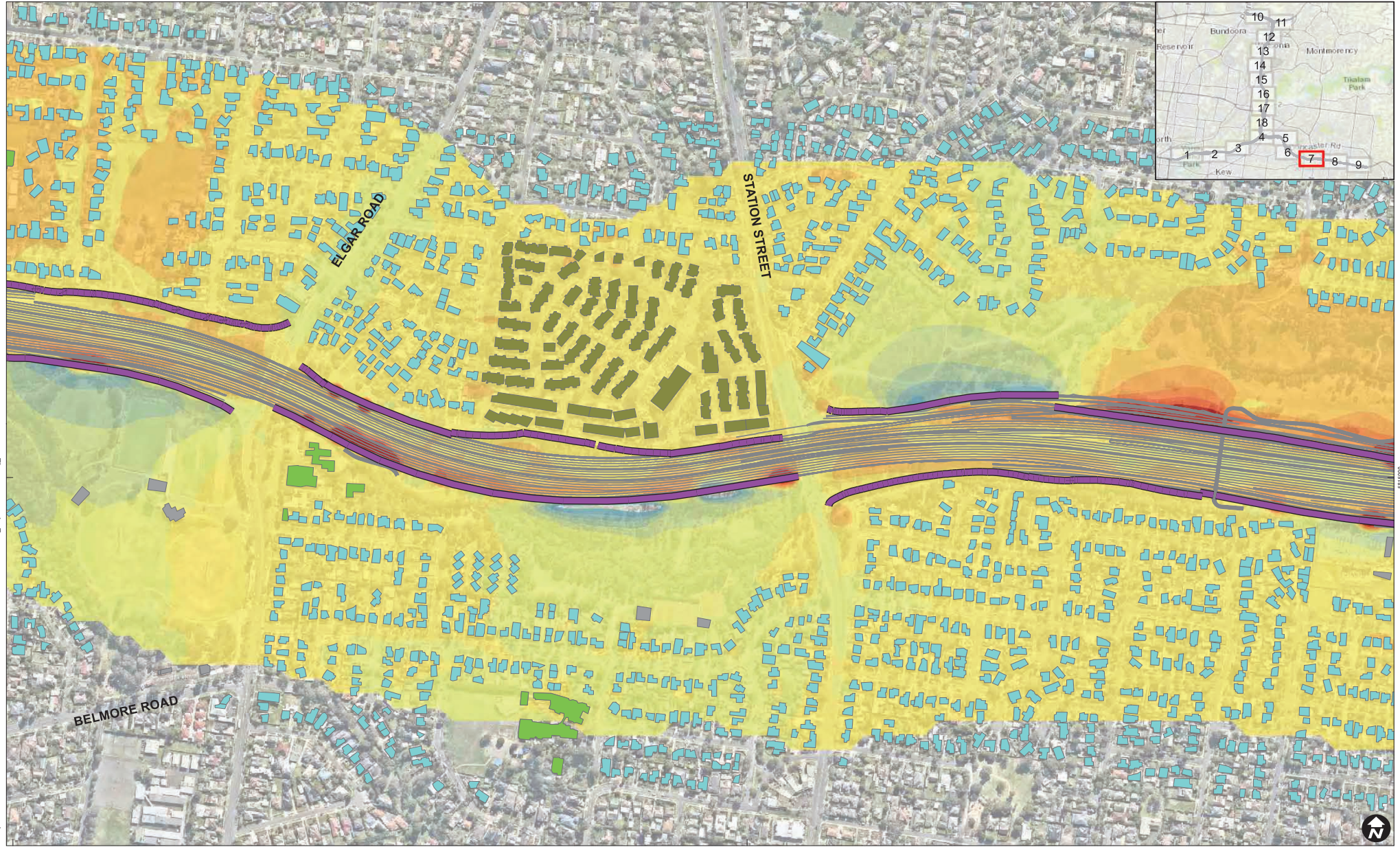
> 10

2036, Difference in Noise Levels with/without Project from All Roads

FIGURE L6

334000

335000



0 75 150 225 300
m

Scale: 1:5,000
GDA94 MGA zone 55

27-Feb-2019
640,11671

LEGEND

Noise Walls

Building Type

Hospital
School / University / Preschool

Religious Building

Library / Museum / Advisory Centre

Residential Building

Aged Care

Non Assessable Buildings

**Noise Level
Difference (dBA)**

< -10
-10 to -8

-8 to -6
-6 to -4
-4 to -2
-2 to 0

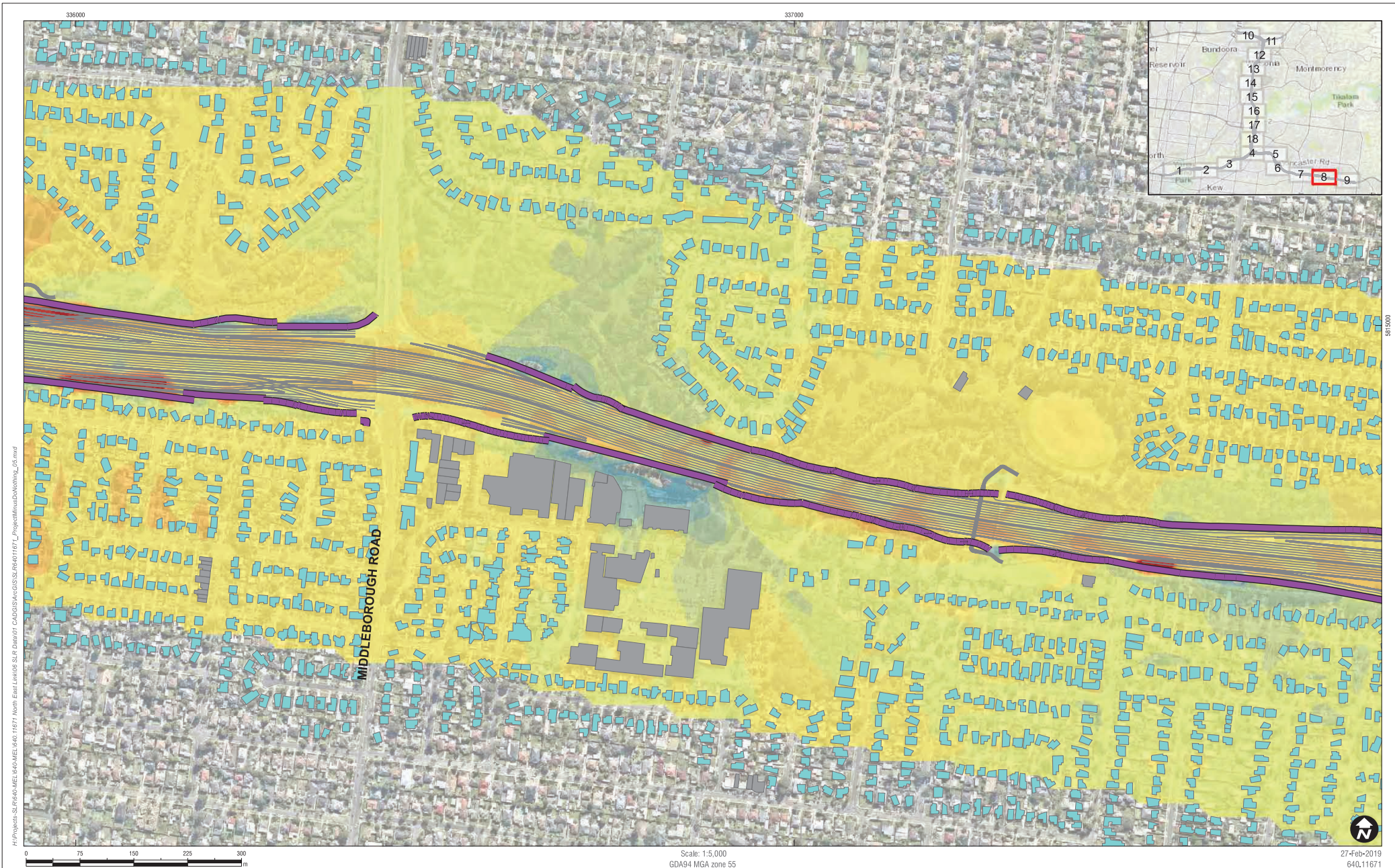
0 to 2
2 to 4
4 to 6
6 to 8

8 to 10
> 10

**2036, Difference in Noise Levels
with/without Project from All Roads**

FIGURE L7

H:\Projects\SLR\640-MEL\640-MEL-11671 North East Link\05 SLR Data\01 CAD\GIS\Map\GIS\SLR\64011671_Legend\Map\05.mxd



LEGEND

Noise Walls

Building Type

Hospital

School / University / Preschool

Religious Building

Library / Museum / Advisory Centre

Residential Building

Aged Care

Non Assessable Buildings

Noise Level Difference (dBA)

< -10

-10 to -8

-8 to -6

-6 to -4

-4 to -2

-2 to 0

0 to 2

2 to 4

4 to 6

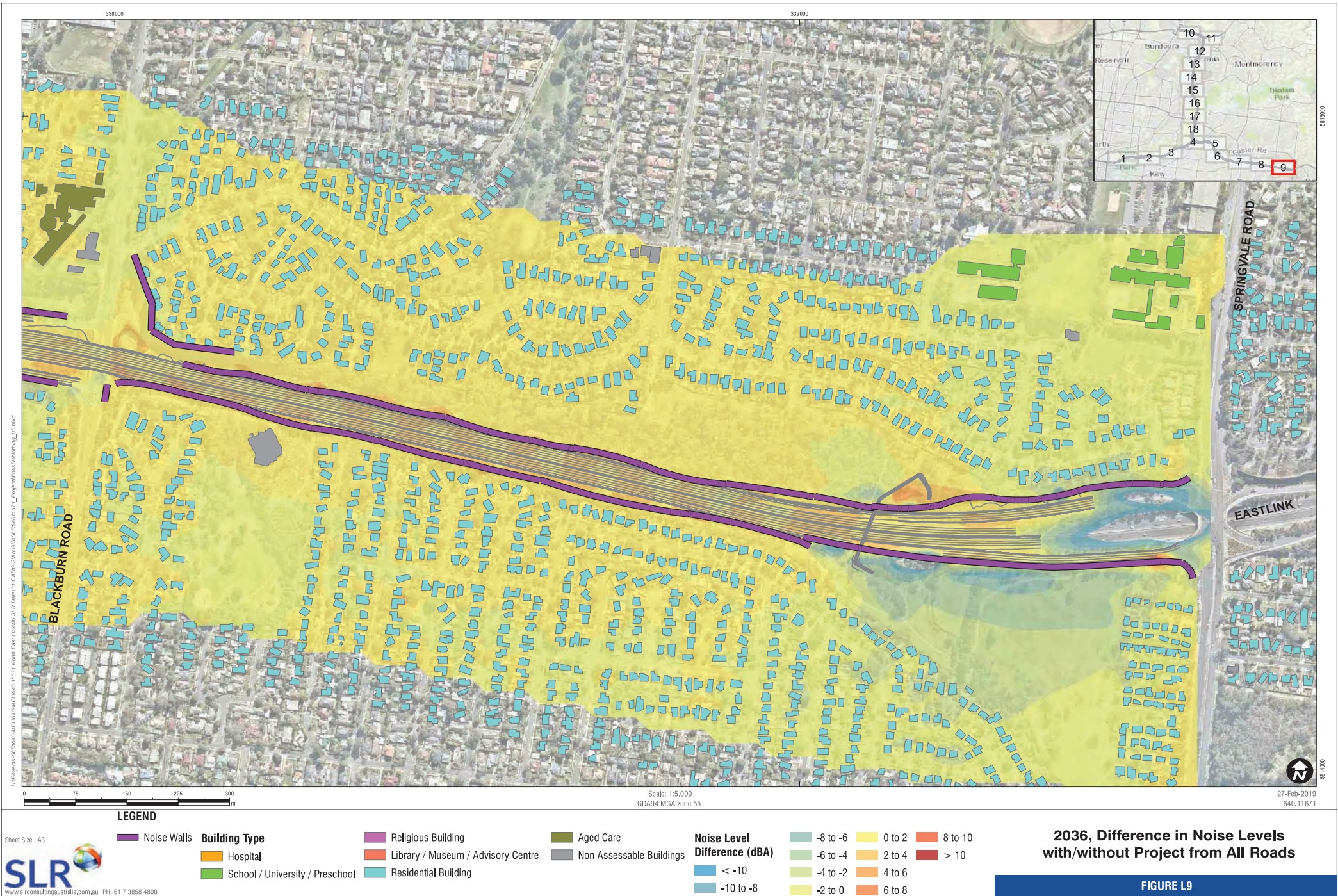
6 to 8

8 to 10

> 10

2036, Difference in Noise Levels with/without Project from All Roads

FIGURE L8



H:\Projects\SLR\640-MEL\640-MEL-11671 North East Link\06 SLR Data\07 CAD\GIS\arcGIS\SLR\640-MEL-11671_Proposed\MapDocs\fig_L9.mxd

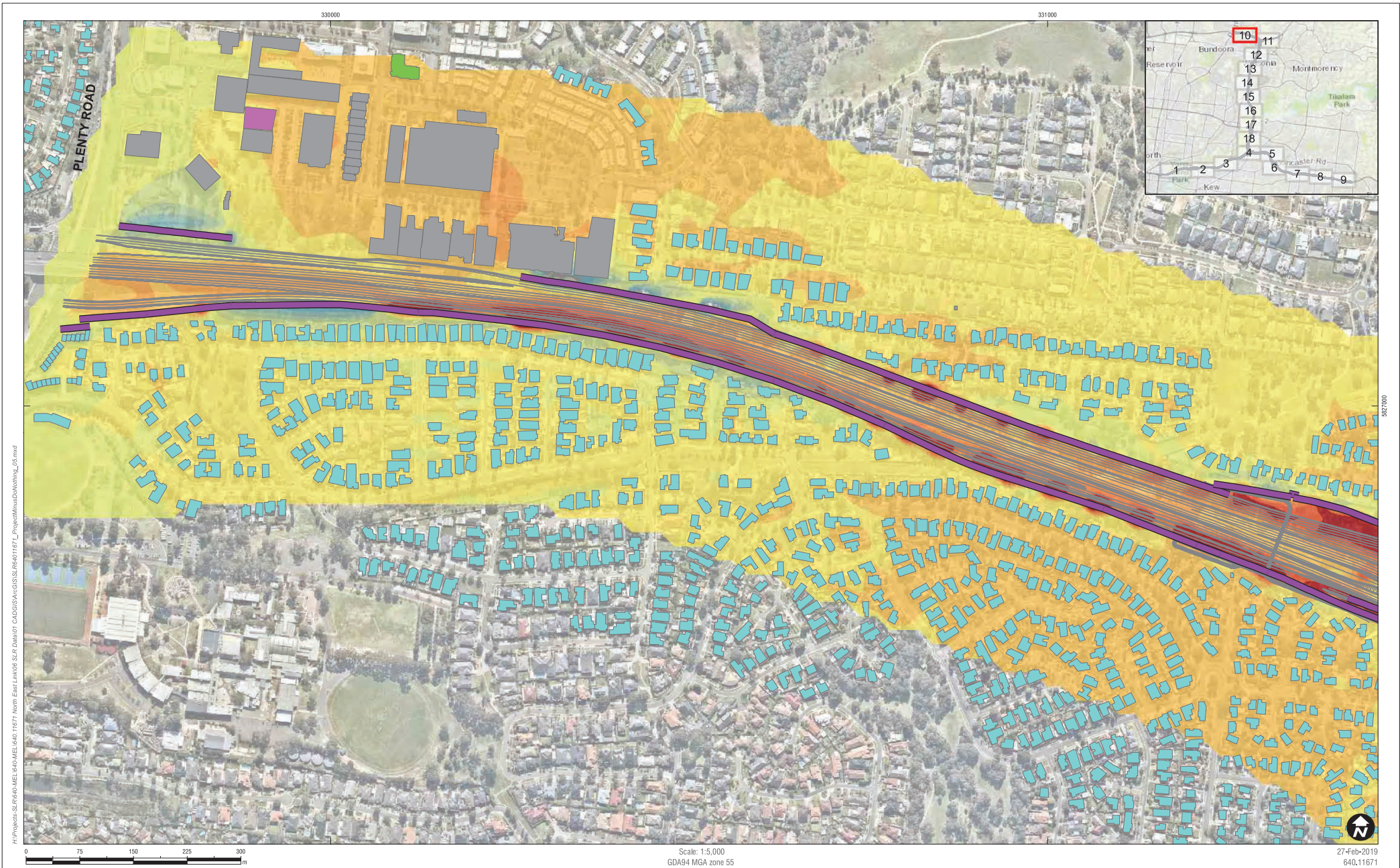
Scale: 1:5,000
GDA94 MGA zone 55

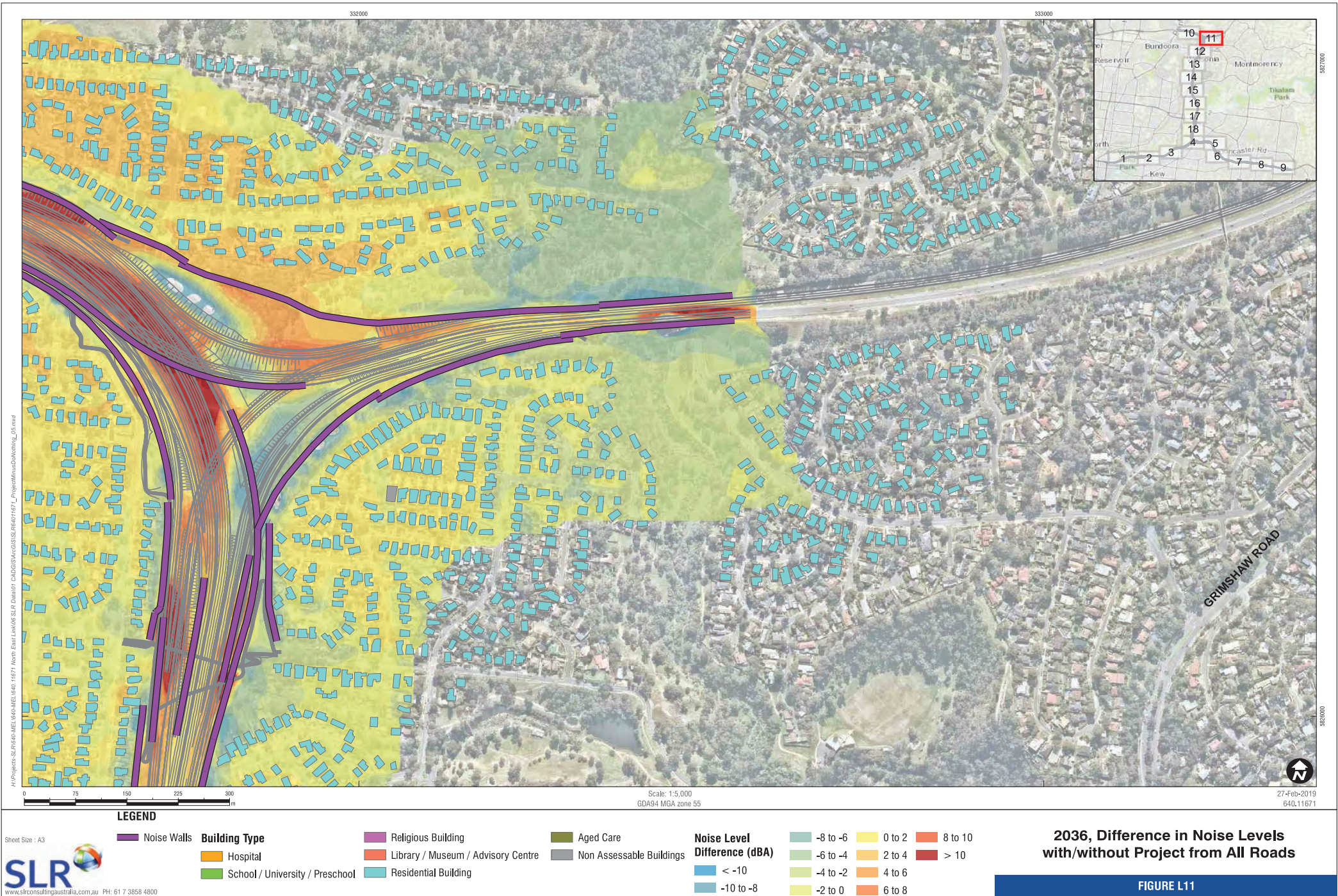
27-Feb-2019
640,11671

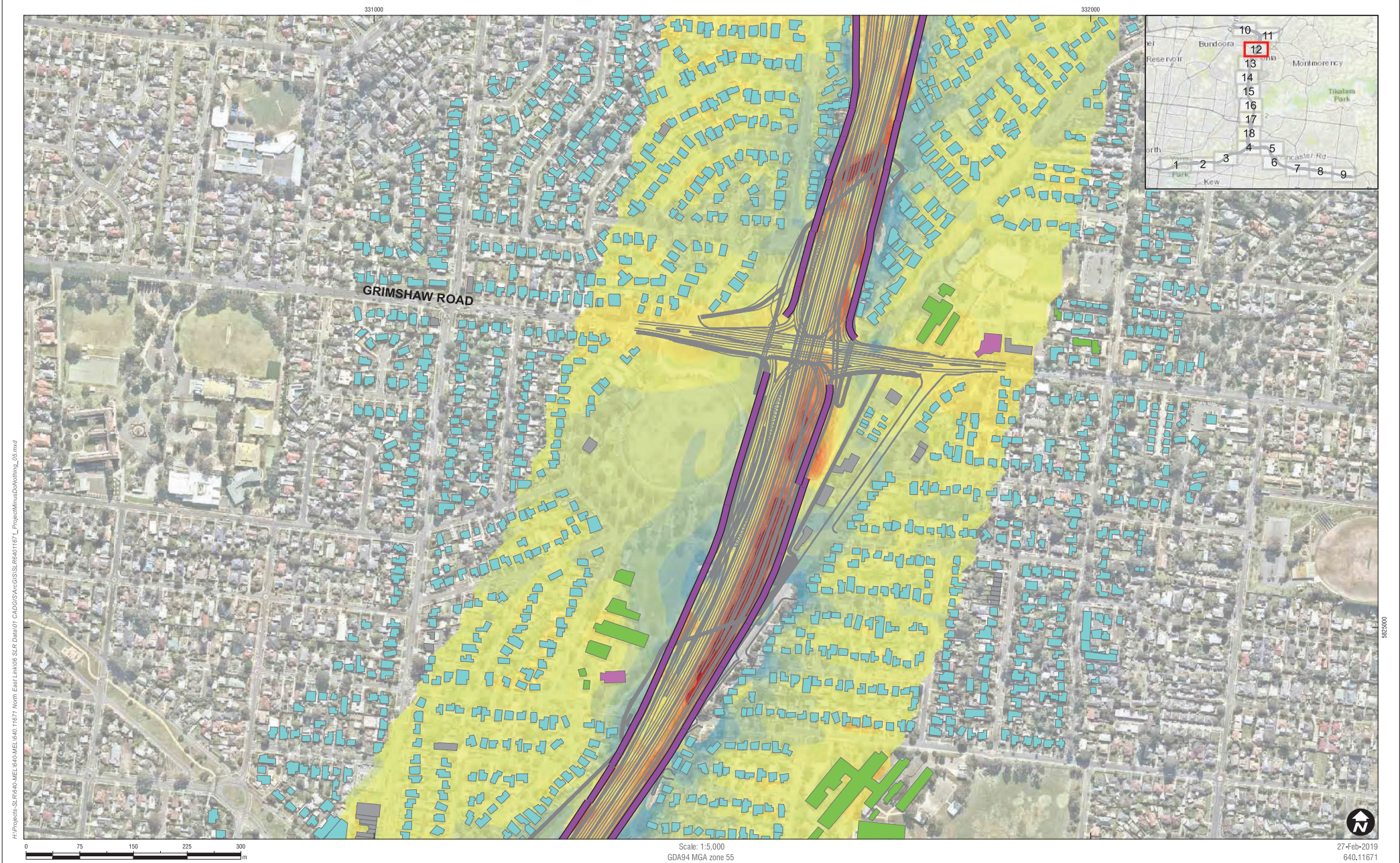
Sheet Size : A3

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LEGEND

Noise Walls

Building Type

Hospital

School / University / Preschool

Religious Building

Library / Museum / Advisory Centre

Residential Building

Aged Care

Non Assessable Buildings

Noise Level Difference (dBA)

< -10

-10 to -8

-8 to -6

-6 to -4

-4 to -2

-2 to 0

0 to 2

2 to 4

4 to 6

6 to 8

8 to 10

> 10

2036, Difference in Noise Levels with/without Project from All Roads

FIGURE L12

H:\Projects\SLR\640\MEL\640\MEL\640\11671 North East Link\06 SLR Data\07 CAD\GIS\arcGIS\SLR\640\11671_Proposed\Map\Docting_05.mxd



Scale: 1:5,000
GDA94 MGA zone 55

LEGEND

Noise Walls

Building Type

Hospital

School / University / Preschool

Religious Building

Library / Museum / Advisory Centre

Residential Building

Aged Care

Non Assessable Buildings

Noise Level Difference (dBA)

< -10

-10 to -8

-8 to -6

-6 to -4

-4 to -2

-2 to 0

0 to 2

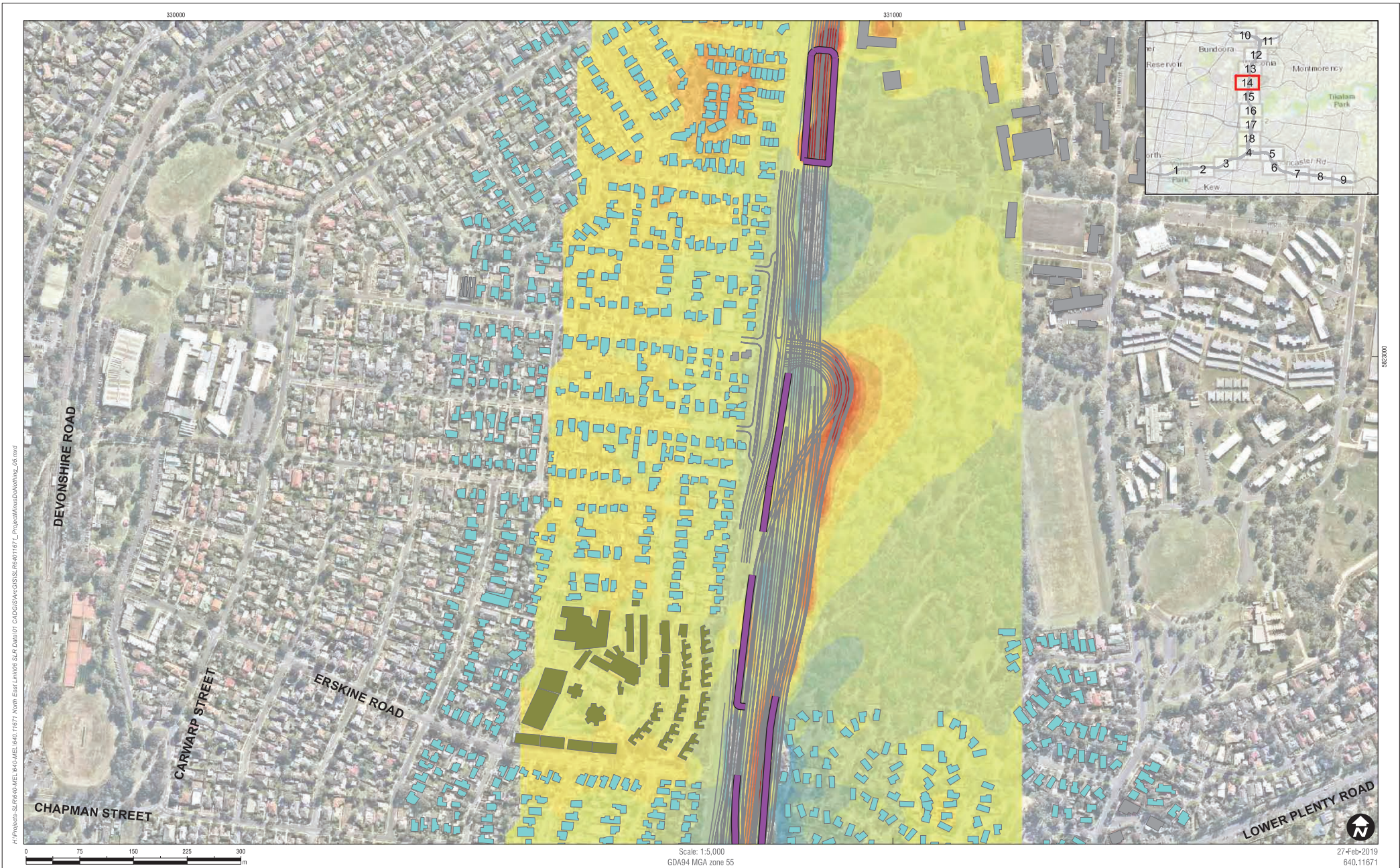
2 to 4

4 to 6

6 to 8

8 to 10

> 10



LEGEND

Noise Walls

Building Type

Hospital

School / University / Preschool

Religious Building

Library / Museum / Advisory Centre

Residential Building

Aged Care

Non Assessable Buildings

Noise Level Difference (dBA)

< -10

-10 to -8

-8 to -6

-6 to -4

-4 to -2

-2 to 0

0 to 2

2 to 4

4 to 6

6 to 8

8 to 10

> 10

2036, Difference in Noise Levels with/without Project from All Roads

FIGURE L14



Sheet Size : A3

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LEGEND

Noise Walls

Building Type

- Religious Building
- Hospital
- School / University / Preschool
- Religious Building
- Library / Museum / Advisory Centre
- Residential Building
- Aged Care
- Non Assessable Buildings

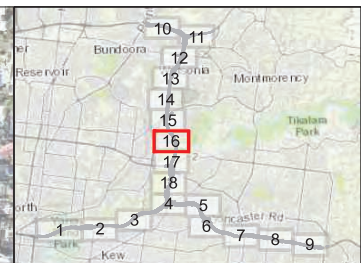
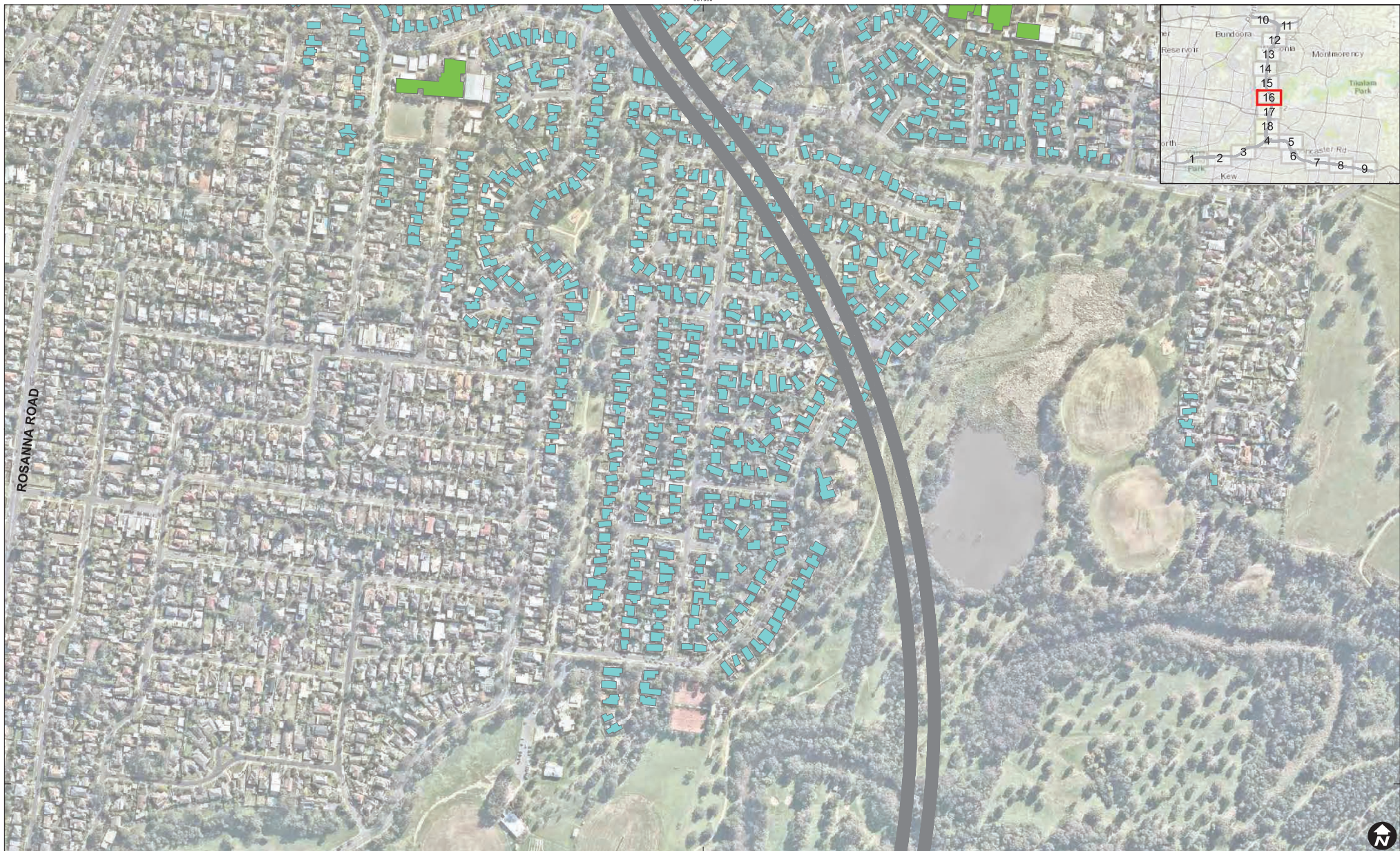
Noise Level Difference (dBA)

- < -10
- 10 to -8
- 8 to -6
- 6 to -4
- 4 to -2
- 2 to 0
- 0 to 2
- 2 to 4
- 4 to 6
- 6 to 8
- 8 to 10
- > 10

2036, Difference in Noise Levels with/without Project from All Roads

FIGURE L15

H:\Projects\SLR\640-MEL\640-MEL-640-11671_North East Link\640-MEL-640-11671_CADD\GIS\ArcGIS\SLR\640-11671_Project\Mapas\Bokaling_06.mxd



Scale: 1:5,000
GDA94 MGA zone 55

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640.11671

LEGEND

Noise Walls

Building Type

Hospital

School / University / Preschool

Religious Building

Library / Museum / Advisory Centre

Residential Building

Aged Care

Non Assessable Buildings

Noise Level Difference (dBA)

< -10

-10 to -8

-8 to -6

-6 to -4

-4 to -2

-2 to 0

0 to 2

2 to 4

4 to 6

6 to 8

8 to 10

> 10

Sheet Size : A3



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2036, Difference in Noise Levels
with/without Project from All Roads

FIGURE L16



0 75 150 225 300
m

Scale: 1:5,000
GDA94 MGA zone 55

27-Feb-2019
640,11671

LEGEND

Noise Walls

Building Type

Hospital

School / University / Preschool

Religious Building

Library / Museum / Advisory Centre

Residential Building

Aged Care

Non Assessable Buildings

Noise Level Difference (dBA)

< -10

-10 to -8

-8 to -6

-6 to -4

-4 to -2

-2 to 0

0 to 2

2 to 4

4 to 6

6 to 8

8 to 10

> 10

**2036, Difference in Noise Levels
with/without Project from All Roads**

FIGURE L17

H:\Projects\SLR\640-MEL\640-MEL-11671\North East Link\06 SLR Data\07 CAD\GIS\arcGIS\SLR\640-MEL-11671_Proposed\Noise\Noise_05.mxd



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LEGEND

Noise Walls

Building Type

Hospital

School / University / Preschool

Religious Building

Library / Museum / Advisory Centre

Residential Building

Aged Care

Non Assessable Buildings

Noise Level Difference (dBA)

< -10

-10 to -8

-8 to -6

-6 to -4

-4 to -2

-2 to 0

0 to 2

2 to 4

4 to 6

6 to 8

8 to 10

> 10

2036, Difference in Noise Levels with/without Project from All Roads

FIGURE L18

Appendix M Peer review report

NORTH EAST LINK

Peer Review - Surface Noise & Vibration

NORTH EAST LINK PROJECT

DOC. REF: V019-02-L PEER REVIEW – SURFACE NOISE & VIBRATION
(R0)
4 MARCH 2019

| | |
|--------------------|---|
| Document | North East Link |
| Subject | Peer Review - Surface Noise & Vibration |
| Instructions | North East Link Project |
| Document Reference | V019-02-L Peer Review - Surface Noise & Vibration (r0).docx |
| Date of Issue | 4 March 2019 |

1 INTRODUCTION & DOCUMENT SCOPE

1. On behalf of North East Link Project (NELP), I have been engaged to peer review the North East Link (Project) Environmental Effects Statement (EES) in relation to the specialist study of Surface Noise & Vibration.
2. I have reviewed the EES document titled *Surface Noise and Vibration Impacts Assessment*, prepared by SLR Consulting Australia Pty Ltd, dated February 2019 (Document Ref: 640-11671-R01, v2.0), herein after referred to as the Technical Report.
3. At the time of writing, I understand that other technical reports, a main report and map books are being drafted for exhibition as part of the EES and therefore this review is limited to the Technical Report only. I have also been provided a summary spreadsheet of predicted traffic volumes and vehicle mixes prepared for the Project to assist in my review, as I determined it to be critical to my technical analysis.
4. The scope and purpose of my review is to:
 - a. Identify any material concerns with the methodologies, recommendations and results presented in the Technical Report;
 - b. Confirm if the relevant policies, regulations and guidelines have been considered;
 - c. Assess the Project risk and whether the Environmental Performance Requirements (EPR's) mitigate the risks and/or are consistent with the findings of the Technical Report, relevant policies and current best practices for major projects; and
 - d. Provide additional recommendations for consideration by NELP and independent advisors, should the Project be referred to an inquiry committee.
5. My areas of expertise include project work during design and construction phases on previously approved road infrastructure projects as well as expert testimony at planning & advisory panels.
6. I have not independently carried out road traffic noise modelling and I am reliant on the information provided in the Technical Report and accept it as being accurate and in accordance with the relevant prediction algorithms, unless specifically noted as being a concern in this review.

7. As part of this study, I peer reviewed draft documentation prepared by SLR Consulting for this Project and I have provided earlier comments to the authors and NELP which have been considered in the Technical Report.
8. This document summarises only matters that I consider to remain as material or which still require clarification based on the latest Technical Report.
9. In my opinion, the EPR's form the most critical component of the EES, given they provide the framework for design changes as well as clearly define how the noise targets are enforced during construction and after completion. Therefore, an examination of the proposed noise and vibration EPRs has been a focus of my peer review. I have been provided with the Environmental Management Framework chapter of the EES to assist my review. A summary of the relevant EPRs and my review of each is set out in Section 4.

2 CRITERIA & APPLICATION OF POLICY

2.1 Scoping Requirements

10. The Minister's Project Scoping Requirement is clearly stated in the Technical Report as:

To minimise adverse air quality, noise and vibration effects on the health and amenity of nearby residents, local communities and road users during both construction and operation of the Project.

and

Analyse potential for noise levels to be exceeded during the day and night time periods and compare predicted traffic noise levels in 2026 and 2036 to the criteria under the VicRoads Traffic Noise Reduction Policy 2005 (or any subsequent updates to this policy) and relevant criteria from the World Health Organization Night Noise Guidelines for Europe 2009.

11. The Technical Report references all relevant noise policies and currently accepted noise & vibration targets for Victorian road projects and construction, and provides recommended targets consistent with those policies. Analysis and recommendations are also made in the Technical Report to minimise noise impacts which fall outside of policy assessment. On this basis, it is my opinion that the Technical Report adequately addresses the Minister's Project Scoping Requirements.

2.2 Operational Noise

12. Operational traffic noise targets for the Project are primarily based on the *VicRoads Traffic Noise Reduction Policy* (VicRoads Policy). However there are some differences between the Project EPRs and that which would be required in compliance with Policy only.
13. While the Technical Report has not provided a direct comparison of Project vs Policy performance, the Project EPRs in principle result in a better noise outcomes than would be achieved by Policy only.
14. In my view, the key benefits which the EPRs provide in comparison to might otherwise occur in accordance with Policy are:
 - a. Existing freeways (M80 and Eastern) are treated like new project alignments, and are therefore subject to the 63dBA noise criteria. These roads would otherwise not meet the 'road upgrade' criteria of the Policy, and therefore not be subject to consideration of attenuation;
 - b. Existing freeway noise barriers will be upgraded in advance of their design life in some areas of the M80 and Eastern Freeways, given they would not otherwise meet the 'retrofit' criteria in accordance with Policy; and
 - c. Re-distributed traffic in areas outside of the main Project alignment have been considered. Generally, this is not required under Policy.
15. I agree with the noise targets recommended in the Technical Report. Given the VicRoads Policy has not been updated at the time of writing and the Project criteria is equivalent or better than required by Policy, it is my opinion that this component satisfies the Scoping Requirements.
16. The Technical Report provides an analysis of night time traffic noise predictions in Section 9.8. While no specific criteria for night time traffic noise have been applied or recommended through EPR's, the Scoping Requirements do not require it and I note that, to my knowledge, no such criteria have been applied to other road projects. I agree with the Technical Report that it is unreasonable to set the aspirational targets of the WHO Guidelines as performance requirements, in particular given the areas are already subjected to significant levels of traffic noise and the Project is generally akin to a road upgrade design. For these reasons, I am of the view that analysis within the Technical Report is sufficient with respect to the WHO Guidelines.
17. Fixed infrastructure noise targets are in accordance with State Environment Protection Policy No. N-1. I agree that this is the correct policy that applies.

2.3 Construction Noise & Vibration

18. Construction noise and vibration targets have been based on several guidelines and standards. Given there are no legislated quantitative noise and vibration limits for construction in Victoria, I agree that it is appropriate to reference a selection of best practice guidelines. Similar precedents have been applied on other large Victorian infrastructure projects in the past. I am satisfied with the guidelines referenced in the Technical Report given that they:
 - a. Recommend prescriptive levels of management action; and
 - b. Are consistent with, or better than, other approved major infrastructure projects in Victoria.
19. Given construction noise and vibration control can be cascading (including exemptions, management actions and stop work limits), the effectiveness of how actions are applied for major projects particularly relies on how the EPR is worded. I discuss this matter later in this document.

3 METHODOLOGIES, MODELLING & RISK ANALYSIS

20. I agree that the noise study area for reference design presented in the Technical Report is appropriate (350-400m).
21. Baseline noise and vibration monitoring has been carried out to both set noise amenity criteria and calibrate predictive noise models. I agree that this methodology is appropriate.
22. I am satisfied that the number and locations of baseline monitoring sites was adequate for the purposes of the study. It is also expected that further baseline monitoring will occur on behalf of the awarded contractor for the Project.
23. Operational traffic noise assessments and predictions have been based on the Calculation of Road Traffic Noise (CRTN) algorithm. I agree that this is the correct methodology and is consistent with the requirements of the VicRoads Policy.
24. Holistically, it is stated in the Technical Report that the majority of residential dwellings will result in no net noise change or a reduction in noise as a result of the Project proceeding. I concur that on balance and numerically, this is a positive result with respect to noise impacts. This is consistent with my initial high-level review of the Project alignment, given large sections of the Project are more representative of a road duplication / upgrade and therefore most of the dwellings along the alignment are already exposed to appreciable levels of traffic noise.

25. Fixed infrastructure and construction noise predictions have been based on the ISO 9613 algorithm. I agree that this is an appropriate modelling methodology for these environmental noise sources.
26. In my opinion, the modelling assumptions and corrections applied in the Technical Report are reasonable and consistent with normal practices carried out on other projects. The uncertainties referred to are also within a reasonable degree of accuracy, in particular given the noise related EPR's fall back to performance outcomes after completion and therefore any residual risk is placed on NELP and/or the awarded contractor. Future traffic noise modelling is also noted to be based on the upper range predictions provided by the traffic engineer – this provides some inherent conservatism in the traffic noise predictions. Beyond this, I am comfortable that the accuracy of the noise modelling would also be subject to additional risk analysis by both NELP and/or the awarded contractor, given the EPR's set post construction noise limits which I interpret as being a requirement of the construction contract. In practice, this typically results in overdesign being implemented by the contractor's acoustic engineer in future modelling to lower the risk of any non-compliances after project opening.
27. Under Table 7-1, SNV16, engine brake noise is considered to be a 'medium' risk. There are no methodologies that I am aware of to accurately predict and quantify the level of noise from trucks engine brakes, nor is it prescribed by any policy. It is acknowledged that engine brake noise is a key concern and the technical report provides commentary on this under Section 9.12. I agree with the qualitative assessment provided in the Technical Report that more free flowing traffic would be expected to result in fewer truck engine brake events overall in the community. I am not aware of any specific noise studies carried out regarding engine braking through other road tunnel projects in Victoria, however I also agree that it is reasonable to assume that the portals cuttings will help minimise the level of such events. It is acknowledged that engine braking cannot be eliminated entirely in practice as part of the design, but management measures are recommended in the Technical Report including adequate signage. I note that these recommendations have not been included in the NV EPR's.

4 ENVIRONMENTAL PERFORMANCE REQUIREMENTS

4.1 NV1

| NV1 | <p data-bbox="351 488 582 510">Achieve traffic noise objectives</p> <p data-bbox="351 519 973 542">Design and construct the works to meet the following LA10 traffic noise objectives.</p> <table border="1" data-bbox="351 548 1324 1176"> <thead> <tr> <th data-bbox="351 548 478 582">Aspect</th><th data-bbox="478 548 1324 582">External traffic noise levels</th></tr> </thead> <tbody> <tr> <td data-bbox="351 582 478 929">External traffic noise levels</td><td data-bbox="478 582 1324 929"> <p data-bbox="486 593 1085 616">(a) Traffic noise from North East Link Project Roads* must be no greater than:</p> <ul data-bbox="518 627 1109 694" style="list-style-type: none"> – 63 dBA measured between 6 am and midnight at Category A buildings** – 63 dBA measured between 6 am and 6 pm at Category B buildings**. <p data-bbox="486 705 1053 728">(b) For Category A and Category B buildings on non-Project Roads which:</p> <ul data-bbox="518 739 1252 817" style="list-style-type: none"> – directly intersect with North East Link project roads, and – where total traffic noise for the design year and with Project exceeds the thresholds listed in paragraph (a) <p data-bbox="518 828 1316 918">The combined noise from North East Link Project Roads and non-Project Roads must not be more than 2 dBA higher than the predicted traffic noise level under the design year "do nothing" scenario. Non-Project Roads must be modelled for a distance of 100 m from the intersection with North East Link Project Roads or to the first traffic intersection (whichever is the lesser).</p> </td></tr> <tr> <td data-bbox="351 929 478 1176">Applies at</td><td data-bbox="478 929 1324 1176"> <p data-bbox="486 940 1316 1064">The noise criteria in paragraphs (a) and (b) above are to apply to the lowest habitable level of Category A buildings and Category B buildings at both the year of opening and 10 years thereafter (the design year). For the purposes of this EPR, Category A buildings and Category B buildings to be considered are those that are either existing or known to have planning approval prior to exhibition of the North East Link Environment Effects Statement.</p> <p data-bbox="486 1075 1316 1164">Where external traffic noise cannot be mitigated through project design solutions to meet the criteria outlined in paragraphs (a) and (b), at-property treatments may be required. At-property treatments would be undertaken with reference to section 7.3 of the NSW Road and Maritime Services document "Noise Mitigation Guidelines 2015 - Roads and Maritime Services", and in consultation with the owner of the relevant building.</p> </td></tr> </tbody> </table> <p data-bbox="343 1220 1343 1321">* Project Roads are defined to be the M80 Ring Road (east of Plenty Road), the Greensborough Bypass (west of the Plenty River bridge and up to the M80 interchange with North East Link), the upgrade of the Eastern Freeway (between Hoddle Street and Springvale Road) and the new North East Link freeway (connecting the M80 Ring Road to the Eastern Freeway), including all access ramps.</p> <p data-bbox="343 1332 798 1355">** Category A Buildings and Category B Buildings means:</p> <ul data-bbox="375 1366 1343 1442" style="list-style-type: none"> – Category A Buildings: - Residential dwellings, aged persons homes, hospitals, motels, caravan parks and other buildings of a residential nature – Category B Buildings: - Schools, kindergartens, libraries and other noise-sensitive community buildings | Aspect | External traffic noise levels | External traffic noise levels | <p data-bbox="486 593 1085 616">(a) Traffic noise from North East Link Project Roads* must be no greater than:</p> <ul data-bbox="518 627 1109 694" style="list-style-type: none"> – 63 dBA measured between 6 am and midnight at Category A buildings** – 63 dBA measured between 6 am and 6 pm at Category B buildings**. <p data-bbox="486 705 1053 728">(b) For Category A and Category B buildings on non-Project Roads which:</p> <ul data-bbox="518 739 1252 817" style="list-style-type: none"> – directly intersect with North East Link project roads, and – where total traffic noise for the design year and with Project exceeds the thresholds listed in paragraph (a) <p data-bbox="518 828 1316 918">The combined noise from North East Link Project Roads and non-Project Roads must not be more than 2 dBA higher than the predicted traffic noise level under the design year "do nothing" scenario. 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|-------------------------------|--|--------|-------------------------------|-------------------------------|---|------------|---|
| Aspect | External traffic noise levels | | | | | | |
| External traffic noise levels | <p data-bbox="486 593 1085 616">(a) Traffic noise from North East Link Project Roads* must be no greater than:</p> <ul data-bbox="518 627 1109 694" style="list-style-type: none"> – 63 dBA measured between 6 am and midnight at Category A buildings** – 63 dBA measured between 6 am and 6 pm at Category B buildings**. <p data-bbox="486 705 1053 728">(b) For Category A and Category B buildings on non-Project Roads which:</p> <ul data-bbox="518 739 1252 817" style="list-style-type: none"> – directly intersect with North East Link project roads, and – where total traffic noise for the design year and with Project exceeds the thresholds listed in paragraph (a) <p data-bbox="518 828 1316 918">The combined noise from North East Link Project Roads and non-Project Roads must not be more than 2 dBA higher than the predicted traffic noise level under the design year "do nothing" scenario. Non-Project Roads must be modelled for a distance of 100 m from the intersection with North East Link Project Roads or to the first traffic intersection (whichever is the lesser).</p> | | | | | | |
| Applies at | <p data-bbox="486 940 1316 1064">The noise criteria in paragraphs (a) and (b) above are to apply to the lowest habitable level of Category A buildings and Category B buildings at both the year of opening and 10 years thereafter (the design year). For the purposes of this EPR, Category A buildings and Category B buildings to be considered are those that are either existing or known to have planning approval prior to exhibition of the North East Link Environment Effects Statement.</p> <p data-bbox="486 1075 1316 1164">Where external traffic noise cannot be mitigated through project design solutions to meet the criteria outlined in paragraphs (a) and (b), at-property treatments may be required. At-property treatments would be undertaken with reference to section 7.3 of the NSW Road and Maritime Services document "Noise Mitigation Guidelines 2015 - Roads and Maritime Services", and in consultation with the owner of the relevant building.</p> | | | | | | |

28. I agree with the design noise level of 63dB(A). I note that while LA10 is referred to in the introduction text of NV1, the complete noise metric is not stated clearly in the EPR and while commonly taken to mean L_{10,18-hr} 63dB(A), I recommend that the full descriptor is added to the EPR to avoid confusion later, in particular given there may be updates to road traffic noise policies between now and project completion.
29. I am satisfied that NV1 captures cumulative noise impacts that may occur at dwellings which are not primarily impacted by the main road corridor (e.g. local road). Given the EPR refers to 'non-project roads', this reasonably responds to impacts that can occur as a result of redistributed traffic outside of the Project alignment. There may be some benefits to the community with this EPR that would not otherwise be achieved by the VicRoads Policy.

30. NV1 applies to traffic conditions 10 years after opening of the Project. I am satisfied that this is consistent with other VicRoads projects. The West Gate Tunnel Project has a design year of 20 years after opening however I do not consider that normal practice.
31. NV1 only applies to the lowest habitable level of sensitive receptors. I agree that this is consistent with the general definitions of the VicRoads interpretation to the Policy (refer to VicRoads Road Design Note 06-01). However, how mitigation is considered, interpreted and applied to existing multi-storey developments (with separate sole-occupancy units) under Policy and public private partnership projects has been a matter of debate for other major road projects including the recently approved West Gate Tunnel Project, Tulla Widening Project and cancelled East West Link Project. My opinion is that existing multi-storey developments of this type should be considered for at dwelling noise attenuation (where external levels are >63dBA), with the exception that any multi storey buildings already exposed to existing traffic noise >63dBA should only be considered where noise levels increase by 2dBA or more and the level that would have prevailed if the Project was not approved. In practice, this is likely only relevant to the Project if multi-storey residential buildings exist between the M80 and Eastern Freeway sections. I am not aware of any but recommend that this is confirmed by NELP and SLR.
32. NV1 provides a rational response to 'agent of change' issues including potential land use conflicts and developments approved or exhibited prior to exhibition of the Project. It is my view that this is consistent with how the VicRoads Policy interprets 'agent of change' and I consider this part of the EPR to be a significant improvement over similarly approved EPR's for the West Gate Tunnel Project.
33. I am satisfied that the EPR responds to practical mitigation requirements for dwellings which do not meet the external noise objectives. Reference to the NSW Roads and Maritime document provides a framework for the process of delivering mitigation to individual property dwellings, in particular given that document assists in the definition of what is considered feasible and reasonable which in my experience have been the subject of ambiguity on other projects.

4.2 NV2

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| NV2 | <p>Monitor traffic noise</p> <p>Traffic noise monitoring must be carried out for at least the following time periods:</p> <ul style="list-style-type: none"> • Baseline traffic noise must be re-verified after project award and prior to construction works • Traffic noise must be re-measured within six months of project opening during normal traffic flows (outside school or public holidays). For the purpose of determining compliance, the measurements conducted after project opening must be adjusted to the 10 year traffic flows. • Traffic noise must be re-measured 10 years after project opening <p>All traffic noise monitoring must be undertaken in accordance with the VicRoads Traffic Noise Measurement Requirements for Acoustic Consultants – September 2011, to verify conformance with the external traffic noise objectives set out in EPR NV1.</p> <p>Remedial action must be taken as soon as practicable in the event that the measured traffic noise levels demonstrate that the external traffic noise objectives set out in EPR NV1 are not met.</p> |
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34. I am satisfied that NV2 provides a reasonable measurement requirement to confirm compliance with NV1. However, NV2 does not specifically state how many locations would require measurement. In my experience though, it is normal practice to carry out measurements at locations which are consistent with all pre-construction monitoring carried out.
35. Importantly, NV2 requires adjustment of measurement results to the 10-year design period so that non-compliances are recognised earlier.
36. NV2 refers to remedial action being required should noise levels exceed the criteria. I am satisfied that this EPR results in a safeguard for the community that the Project criteria will be committed to, regardless of any modelling or design inaccuracies. This also means that associated risks with noise modelling and other non-acoustic inputs can be managed at NELP and/or the road contractors discretion, without significant consequence to the noise criteria committed to in NV1.

4.3 NV3

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| NV3 | <p>Minimise construction noise impacts to sensitive receptors</p> <p>Construction noise and vibration must be managed in accordance with the Construction Noise and Vibration Management Plan (CNVMP) required by EPR NV4.</p> <p><u>Non-residential sensitive receptors</u></p> <p>For sensitive land uses (based on AS/NZS 2107:2016) implement management actions as per EPR NV4 if construction noise is predicted to or does exceed the internal and external noise levels below, and a noise sensitive receptor is adversely impacted. If construction exceeds the noise levels below:</p> <ul style="list-style-type: none"> • Consider the duration of construction noise • Consider the existing ambient noise levels • Consult with the owner or operator of the noise sensitive receptor • Consider any specific acoustic requirements of land uses listed below |
|-----|--|

to determine whether a noise sensitive receptor is adversely impacted.

| Land use | Construction noise management level, L_{Aeq} (15 min) applies when properties are in use |
|---|---|
| Classrooms in schools and other educational institutions | Internal noise level 45 dB(A) |
| Hospital wards and operating theatres | Internal noise level 45 dB(A) |
| Places of worship | Internal noise level 45 dB(A) |
| Active recreation areas characterised by sporting activities and activities which generate their own noise, making them less sensitive to external noise intrusion | External noise level 65 dB(A) |
| Passive recreation areas characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example reading, meditation | External noise level 60 dB(A) |
| Community centres | Depends on the intended use of the centre. Refer to the recommended maximum internal levels in AS/NZS 2107:2016 for specific uses |
| Industrial premises | External noise level 75 dB(A) |
| Offices, retail outlets | External noise level 70 dB(A) |
| Other noise sensitive land uses as identified in AS/NZS 2107:2016 | Refer to the noise levels in AS/NZS 2107:2016 |

Residential receptors

For residential dwellings, management actions must be implemented as per EPR NV4 if noise from construction works during normal working hours is predicted to or does exceed the noise management levels for normal working hours below.

Noise from construction works during weekend/evening work hours and the night period must meet the weekend/evening and night period noise guideline targets in the table below unless they are Unavoidable Works.

| Time of day | Construction noise guideline targets |
|-------------|--------------------------------------|
|-------------|--------------------------------------|

| | |
|--|--|
| <p>Normal working hours: 7am – 6pm Monday to Friday 7am – 1pm Saturday</p> | <p>Noise affected: Background LA90+10 dB Highly noise affected: 75 dB(A) Source: NSW Interim Construction Noise Guideline (ICNG) Chapter 4.1.1 Table 2. The noise affected level represents the point above which there may be some community reaction to noise. The highly noise affected level represents the point above which there may be strong community reaction to noise.</p> |
| <p>Weekend/evening work hours: 6pm – 10pm Monday to Friday 1pm – 10pm Saturday 7am – 10pm Sunday and public holidays</p> | <p>Noise level at any residential premises not to exceed background noise (LA90) by: 10 dB(A) or more for up to 18 months 5 dB(A) or more after 18 months Source: EPA Publication 1254 Section 2</p> |
| <p>Night period: 10pm – 7am Monday to Sunday</p> | <p>Noise inaudible within a habitable room of any residential premises Source: EPA Publication 1254 Section 2 and EPA Publication 480 Section 5</p> |

Note: Where any reference is made to the rating background level (RBL) or background LA90; the 'average background' over the assessment period as per Victorian noise policy practices is to be used. This applies to all receptors and all time periods.

Unavoidable Works

Unavoidable Works may include:

- The delivery of oversized plant or structures that police or other authorities determine require special arrangements to transport along public roads
- Emergency work to avoid the loss of life or damage to property, or to prevent environmental harm
- Maintenance and repair of public infrastructure where disruption to essential services and/or considerations of worker safety do not allow work within standard hours
- Tunnelling works including mined excavation elements and the activities that are required to support tunnelling works (i.e. spoil treatment facilities)
- Road and rail occupations or works that would cause a major traffic hazard
- Other works where a contractor demonstrates and justifies a need to operate outside normal working hours and exceed the noise guideline targets such as work that once started cannot practically be stopped.

37. I am satisfied that NV3 sets objective and reasonable noise triggers to implement management actions for non-residential premises.
38. The EPR is generally consistent with other approved major infrastructure projects in Victoria.
39. I note that noise assessment triggers for night (10pm-7am) works in particular have often been the subject of conjecture on other infrastructure projects. Commitment is provided in the EPR to enforce the evening and night works to EPA 1254 and EPA Publication 480 respectively. This implies that management actions are irrelevant for these periods unless the works are defined as 'unavoidable'.
40. I note that commitment to EPA Publication 480 in particular would result in a more stringent requirement and higher amenity outcome than approved on other recent infrastructure projects. I note that this does not imply inaudibility however in practice I expect would often result in inaudibility inside dwellings where windows are closed. It also does not prohibit unavoidable works being applied for which would emit levels higher than background noise.

41. Overall, I am of the view that this strikes the correct balance between protection of the most sensitive amenity period (night) and necessary intrusive construction during the night period where rationale is verified.
42. I note that NV3 requires an Independent Environmental Auditor (IEA) to review works which are proposed to be unavoidable. In my view, this is an important link with respect due diligence and therefore I consider NV3 is sufficient when read in conjunction with NV4.

4.4 NV4

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| NV4 | Implement a Construction Noise and Vibration Management Plan (CNVMP) to manage noise and vibration impacts |
| | <p>Prepare, implement and maintain a Construction Noise and Vibration Management Plan (CNVMP) in consultation with EPA Victoria and relevant councils. The CNVMP must comply with and address the Noise and Vibration EPRs, be informed by the noise modelling and monitoring results and must include (but not be limited to):</p> <ul style="list-style-type: none"> • Identification of noise and vibration sensitive receptors along the project alignment, including habitat for listed threatened fauna, likely to be impacted by the project • Construction noise and vibration targets as per EPRs NV3, NV5, NV8, NV9, NV10, NV11 and NV12, including any details of conversions between alternative metrics • Details of construction activities and an indicative schedule for construction works, including the identification of key noise and/or vibration generating construction activities that have the potential to generate airborne noise and/or surface vibration impacts on surrounding sensitive receivers • How construction noise (including truck haulage) and vibration would be minimised (see EPR T2) • A requirement for preliminary tests using the actual equipment to validate modelling for vibration and regenerated noise and review, with predictions to be remodelled as necessary and confirm prevention/mitigation/remediation measures confirmed • Management actions and notification and mitigation measures to be implemented with reference to the Appendix B and Appendix C of the New South Wales Roads and Maritime Services Construction Noise and Vibration Guideline 2016 (CNVG) • Any processes and measures to be implemented as part of the Communications and Community Engagement Plan including measures concerning complaints management (see EPR SC2) • Requirements to assess and manage vibration impacts to scientific or medical establishments to the higher of ambient levels or ASHRAE VC Standards (as defined in the 2015 handbook), or manufacturers equipment levels (unless by agreement with occupant) • Measures to ensure effective monitoring of noise and vibration associated with construction with consideration to the construction noise and vibration targets • Measures to minimise noise and vibration impacts from temporary traffic diversions and altered access to parking facilities • The Unavoidable Works that would be undertaken, including their location, timing and duration. The CNVMP must either include a clear rationale for defining works or a list of the type of planned works that constitute Unavoidable Works and response strategies to mitigate the impacts of these Unavoidable Works, with reference to EPA Victoria Publication 1254 Noise Control Guidelines and Appendix B and Appendix C of the CNVG. The Independent Environmental Auditor must verify that the proposed Unavoidable Works meet the definition of Unavoidable Works for each instance they are undertaken. Details of Unavoidable Works must be made publicly available. For emergency Unavoidable Work, a rationale must be provided to the satisfaction of the Independent Environmental Auditor as soon as practicable. |

43. I am satisfied that NV4 provides reasonable guidance and a framework for the awarded road contractor to follow.
44. NV4 somewhat relies on the wording of EPR SC2 and EPR T2, as follows:

SC2

Implement a Communications and Community Engagement Plan

Prior to construction, prepare and implement a Communications and Community Engagement Plan to engage the community and potentially affected stakeholders and communicate progress of construction activities and operation. The plan must include:

- A process for identifying community issues and the recording, management and resolution of complaints from affected stakeholders consistent with Australian Standard AS/NZS 10002:2014 Guidelines for Complaint Management in Organisations
- Approach to stakeholder identification
- Enquiry management and record keeping approach and procedures including making available a 24 hour telephone number, postal address, and an email address and publishing these on the project website
- Approach to communicating and engaging with the community and potentially affected stakeholders in relation to:
 - Construction activities including temporary facilities and impacts that may affect the community, businesses or individual stakeholders (e.g. dust, noise, vibration and light) and relevant mitigation (e.g. relocations policy)
 - Changes to transport conditions and relevant mitigation (e.g. road closures, detours).

- Identifying how stakeholders can access information on environmental performance that is to be made publicly available
- Incident and emergency communications, including notification methods and timeframes in the event of a major incident or overrun
- Approach and processes to ensure that the workforce has appropriate community awareness and sensitivity
- Innovative communications tools and methods to enhance the project's ability to effectively communicate and engage with the community and stakeholders
- Approach to engaging with local schools to provide education opportunities on project activities
- Approach to making relevant project information available to the community with specific consideration to vulnerable groups (including culturally and linguistically diverse groups)
- How it will evaluate the effectiveness of the communication and engagement under the Communications and Community Engagement Plan.

The Communications and Community Engagement Plan must consider and where appropriate address matters of interest or concern to the following stakeholders:

- Municipalities
- Recreation, sporting and community groups
- Potentially affected residents and property owners
- Potentially affected business
- Other public facilities in proximity
- Religious and worship groups
- Vulnerable groups.

T2

Transport Management Plan(s) (TMP)

Prior to commencement of relevant works, develop and implement Transport Management Plan(s) (TMP) to minimise disruption to affected local land uses, traffic, car parking, public transport (rail, tram and bus), pedestrian and bicycle movements and existing public facilities during all stages of construction.

The TMP must be informed and supported by an appropriate level of transport modelling and must include:

- Requirements for maintaining transport capacity in the peak periods
- Requirements for limiting the amount of construction haulage during the peak periods
- A monitoring program to assess the effectiveness of the TMPs on all modes of transport
- Where monitoring identifies adverse impacts, practicable mitigation measures
- Consideration of construction activities for other relevant major projects occurring concurrently with construction activities for North East Link and potentially impacting modes of transport in the same area
- Potential routes for construction haulage and construction vehicles travelling to and from the project construction site, recognising sensitive receptors and avoiding the use of local streets where practicable
- Suitable measures, developed in consultation with emergency services, to ensure emergency service access is not inhibited as a result of project construction activities
- Provision of alternative parking where practicable to replace public and commuter parking lost as a result of project construction activities
- Requirements to minimise impacts on local streets, community and commercial facilities by providing parking for construction workers at construction compounds where practicable
- Measures to ensure connectivity and safety for all transport network users during construction
- Consultation with VicRoads and relevant transportation authorities.

A TMP may be split into precincts where appropriate but must consider other precinct TMPs through the Transport Management Liaison Group as per EPR T3.

TMPs must be submitted to the relevant authority for approval.

45. In my view, SC2 and T2 state reasonable management practices where they relate noise and vibration. In conjunction with the NV EPRs, I am satisfied with SC2 and T2.
46. As discussed in paragraph 42, unavoidable works require evidence of rationale and review by the IEA. This safeguards the community regarding decisions on potentially intrusive works during the most sensitive periods. I note that the IAC for the Melbourne Metro Rail Project raised similar concerns regarding how such works are rationalised and also recommended review by an IEA. I am satisfied that that this NV4 sets out adequate controls to address this concern.

4.5 NV5

NV5

Establish vibration guidelines to protect utility assets

Prior to construction undertake condition assessments of above and below ground utility assets (EPR GM3) and consult with asset owners to establish and agree construction vibration guidelines to maintain asset integrity. In all cases the asset owner's criteria takes precedence.

Where construction vibration guidelines are not proposed by the asset owner, reference should be made to the relevant sections of German Standard DIN 4150 – Part 3 – Structural Vibration in Buildings – Effects on Structures (2016) for guideline assessment procedures for buried pipework or underground infrastructure. The integrity of the asset should be reviewed and assessed (by the contractor, in conjunction with the asset owner) to confirm these values are appropriate. If necessary, based on this assessment, limits must be reduced to the level necessary to maintain asset integrity.

Monitor vibration levels during construction to demonstrate compliance with agreed vibration guidelines. Identify contingency measures to be implemented if guidelines are not met. Where necessary rectify any defects that are attributable to the project.

An overview of the key vibration guidelines values is presented below. In all cases, the supporting documentation within the Standard which describes, clarifies and sometimes modifies the tables below must be considered.

Table 2 Guideline values for v_i , max, for evaluating the effects of short-term vibration on the lining of underground cavities

| Line | Lining material | Guideline values for v_i , max in mm/s perpendicular to lining surface |
|------|--|--|
| 1 | Reinforced or sprayed concrete, tubbing segments | 80 |
| 2 | Concrete, stone | 60 |
| 3 | Masonry | 40 |

Note: The guideline values were measured during nearby mine blasting operations and apply only to the lining of underground structures, but not to any associated installations.

Table 3 Guideline values for v_i , max, for evaluating the effects of short-term vibration on buried pipework

| Line | Lining material | Guideline values for v_i , max in mm/s perpendicular to lining surface |
|------|---|--|
| 1 | Steel, welded | 100 |
| 2 | Vitrified clay, concrete, reinforced concrete, prestressed concrete, metal (with or without flange) | 80 |
| 3 | Masonry, plastics | 50 |

47. I am satisfied that NV5 references the correct standard for asset protection from vibration impacts.
48. Importantly, it provides a framework for:
 - a. Allowance for asset owners to set reasonable limits depending on the integrity of the asset, given age and existing wear can vary; and
 - b. Standard and well recognised criteria where asset sensitivity is otherwise undefined.

4.6 NV6

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| NV6 | <p>Design permanent tunnel ventilation system to meet EPA requirements for noise</p> <p>Design and implement the permanent tunnel ventilation system to achieve compliance with State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade) No. N-1 and in accordance with the Works Approval. Provide detailed design to the satisfaction of EPA Victoria prior to commencement of the works permitted by the Works Approval.</p> |
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49. I am satisfied that NV6 references the correct policy for noise emission from fixed infrastructure.
50. Given this NV6 requires EPA signoff, it provides an additional safeguard for design approval.

4.7 NV7

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| NV7 | <p>Monitor noise from tunnel ventilation system</p> <p>Measure noise from the permanent tunnel ventilation system on commencing road operation and monitor noise from the tunnel ventilation system post opening of the North East Lin, as agreed with EPA Victoria, to verify compliance with State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade) No. N-1. Identify and implement contingency measures to be implemented if noise level targets are not met.</p> |
|-----|---|

51. Similar to paragraph 36, I am satisfied that NV7 ensures that the proposed targets will be complied with via on-site measurements after construction. In practice, this should result in any non-compliances being rectified early rather than reliance on community noise complaints to initiate investigations.

4.8 NV8

NV8

Minimise construction vibration impacts on amenity

Implement management actions if the following guideline target levels for continuous vibration from construction activity to protect human comfort of occupied buildings (including heritage buildings) are not achieved (levels are calculated from the British Standard BS6472-1:2008 Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting.).

| Type of space occupancy | Vibration Dose Values (m/s ^{1.75}) | | | |
|---|--|---------------|---------------------|---------------|
| | Day (7am to 10pm) | | Night (10pm to 7am) | |
| | Preferred Value | Maximum Value | Preferred Value | Maximum Value |
| Residential | 0.2 | 0.4 | 0.1 | 0.2 |
| Offices, schools, educational institutions, places of worship | 0.4 | 0.8 | 0.4 | 0.8 |
| Workshops | 0.8 | 1.6 | 0.8 | 1.6 |

Notes

- The Guideline Targets are non-mandatory; they are goals that should be sought to be achieved through the application of practicable mitigation measures. If exceeded then management actions would be required
- The Vibration Dose Values may be converted to Peak Particle Velocities within a noise and vibration construction management plan.

52. I am satisfied that NV8 references the correct standard for vibration impacts regarding amenity during construction.

53. I note however that 'continuous vibration' can have a particular definition under some vibration standards and may imply that short duration and/or intermittent vibration is ignored. I note that vibration from construction typically follows an intermittent profile and that the VDV assessment is best suited for intermittent or varying vibration profiles. For this reason, it may be beneficial to delete reference to 'continuous'.

4.9 NV9

NV9

Minimise construction vibration impacts on structures

Construction vibration targets for structures based on German Standard DIN 4150 – Part 3 – Structural Vibration in Buildings – Effects on Structures (2016) must be adopted. All sections of the German Standard DIN 4150 – Part 3 – Structural Vibration in Buildings – Effects on Structures (2016) standard apply, noting the guideline levels detailed in Section 5 and Section 6 (and any references sections).

An overview of the key vibration guidelines values is presented below. In all cases, the supporting documentation within the Standard which describes, clarifies and sometimes modifies the tables below must be considered.

Table 1 — Guideline values for vibration velocity, v_i , max, for evaluating the effects of short-term vibration on structures

| Type of structure | | Guideline values for v_i , max in mm/s | | | | |
|-------------------|--|---|----------------|---------------------|---|--|
| | | Foundation, all directions, $i = x, y, z$, at a frequency of | | | Topmost floor, horizontal direction, $i = x, y$ | Floor slabs, vertical direction, $i = z$ |
| | | 1 Hz to 10 Hz | 10 Hz to 50 Hz | 50 Hz to 100 Hz (a) | All frequencies | All frequencies |
| Column Line | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | Buildings used for commercial purposes, industrial buildings, and buildings of similar design | 20 | 20 to 40 | 40 to 50 | 40 | 20 |
| 2 | Residential buildings and buildings of similar design and/or occupancy | 5 | 5 to 15 | 15 to 20 | 15 | 20 |
| 3 | Structures that, because of their particular sensitivity to vibration, cannot be classified under lines 1 and 2 and are of great intrinsic value (e.g. listed buildings) | 3 | 3 to 8 | 8 to 10 | 8 | 20 (b) |

Note: Even if guideline values as in line 1, columns 2 to 5, are complied with, minor damage cannot be excluded.

- (a) At frequencies above 100 Hz, the guideline values for 100 Hz can be applied as minimum values.
 (b) Paragraph 2 of 5.1.2 must be observed.

Table 4 — Guideline values for v_i max, for evaluating the effects of long-term vibration on buildings

| Type of building | | Guideline values for v_i max, in mm/s | |
|------------------|--|--|---|
| | | Topmost floor, horizontal direction, all frequencies | Floor slab, vertical direction, all frequencies |
| Column Line | 1 | 2 | 3 |
| 1 | Buildings used for commercial purposes, industrial buildings, and buildings of similar design | 10 | 10 |
| 2 | Residential buildings and buildings of similar design and/or occupancy | 5 | 10 |
| 3 | Structures that, because of their particular sensitivity to vibration, cannot be classified under lines 1 and 2 and are of great intrinsic value (e.g. listed buildings) | 2.5 | 10 (a) |

Note: Even if guideline values as in line 1, column 2, are complied with, minor damage cannot be ruled out

(a) section 6.1.2 must be observed

54. I am satisfied that NV9 references the correct standard for vibration impacts on structures during construction.

4.10 NV10

| | | |
|---|--|--|
| NV10 | Minimise impacts from ground-borne (internal) noise | |
| | Implement management actions in consultation with potentially affected land owners to protect amenity at residences where the following ground borne noise guideline targets based on Section 4.2 of the New South Wales Interim Construction Noise Guidelines are exceeded during construction. | |
| | Time of Day | Internal noise level measured at the centre of the most affected habitable room |
| | Evening (6pm to 10pm) | $L_{Aeq}(15 \text{ minute}) = 40\text{dBA}$ |
| | Night (10pm to 6am) | $L_{Aeq}(15 \text{ minute}) = 35\text{dBA}$ |
| Notes | | |
| 1 Levels are only applicable when ground borne noise levels are higher than airborne noise levels. | | |
| 2 Management actions include community consultation to determine acceptable level of disruption and provision of respite accommodation in some circumstances. | | |

55. I am satisfied that NV10 references reasonable structure-borne noise criteria and management protocols.

4.11 NV11

| NV11 Minimise amenity impacts from blast vibration Implement management actions if the following vibration values are not achieved. Blasting activities must comply with Australian Standard AS2187.2-2006, Explosives – Storage and use Part 2 – Use of explosives for all blasting. | | |
|--|--------------------------------|--|
| Category (as defined in AS 2187.2-2006) | Type of blasting operations | Peak component particle velocity (mm/s) |
| Sensitive site | More than 20 blasts | 5mm/s for 95% blasts per year 10mm/s maximum (unless by agreement with occupier) |
| Sensitive site | Less than 20 blasts | 10mm/s maximum (unless by agreement with occupier) |
| Non-sensitive site (with occupants) | All blasting | 25mm/s maximum value (unless by agreement with occupier). |
| Scientific equipment | All blasting | Existing ambient levels or ASHRAE VC Standards (as defined in the 2015 handbook) (whichever is the higher) or manufacturers equipment levels (unless by agreement with occupier) |

56. I am satisfied that NV11 references the correct standard for vibration impacts from blasting.

4.12 NV12

| NV12 Minimise amenity impacts from blast overpressure Implement management actions if the following overpressure values are not achieved. Blasting activities must comply with Australian Standard AS2187.2-2006, Explosives – Storage and use Part 2 – Use of explosives for all blasting. | | |
|--|-----------------------------|---|
| Category (as defined in AS 2187.2-2006) | Type of blasting operations | Peak Overpressure Value (dBL) |
| Sensitive Site | More than 20 blasts | 115 dBL for 95% blasts 120 dBL maximum (unless by agreement with occupier) |
| | Less than 20 blasts | 120 dBL for 95% blasts 125 dBL maximum (unless by agreement with occupier) |
| Occupied non-sensitive sites such as factories and commercial premises | All blasting | 125 dBL maximum (unless by agreement with occupier). For sites containing equipment sensitive to vibration, the vibration should be kept below manufacturers specification or levels that can be shown to adversely affect the equipment operation |

57. I am satisfied that NV12 references the correct standard for overpressure impacts from blasting.

4.13 NV13

| |
|---|
| NV13 Noise mitigation – noise walls Construction of permanent noise attenuation must, where feasible, be installed in advance of adjacent works. |
|---|

58. I am satisfied with the intent of NV13, that it attempts to limit the temporary increase of existing road noise to residents when existing noise walls are demolished.

59. I note that there is additional commentary in the Technical Report on this matter under Section 8.6, which has not been considered in the EPR. In my opinion, NV13 would carry more weight where the suggestions of Section 8.6 are integrated into the EPR, including provisions for temporary noise walls where new permanent noise walls significantly exceed the estimated programme of delivery.

4.14 NV14

| | |
|------|---|
| NV14 | Reduce impacts from engine brake noise Opportunities to encourage heavy vehicle drivers to reduce use of engine brakes must be considered, where practicable. |
|------|---|

60. Refer to paragraph 27 for my commentary on engine brake noise.
61. In my opinion, it would be beneficial if certain management opportunities were actually referenced in NV14, including the use of signage prohibiting exhaust brakes.

5 CONCLUSION

62. Based on my review of the Technical Report to be submitted as part of the EES, I am generally satisfied with the methodologies, modelling, results and technical commentary presented by the author.
63. The Technical Report sets targets which are generally consistent with policy requirements, best practice and precedent.
64. I am generally satisfied with the EPRs however I have made minor recommendations to limit ambiguity and with regard to matters of due diligence.

Signed and dated this date



Darren Tardio
Director
Enfield Acoustics Pty Ltd

4 March 2019

Appendix A: CV

CURRICULUM VITAE

Darren Tardio

Director of Enfield Acoustics Pty Ltd



Qualifications & Associations

- B Mus (Eng. & Tech.)
- MAAS, Australian Acoustical Society

Summary

Darren is a founding Director and Noise & Vibration Engineer at Enfield Acoustics Pty Ltd. He completed his Bachelor Degree in 2004. His undergraduate thesis researched the inaudible (infrasound and ultrasound) frequency spectrum and its effects on reproduction equipment and the subjective quality of the listener.

With over 13 years of professional acoustic consulting experience, Darren has been involved in many key local and overseas projects related to noise and vibration. Darren's professional career has demonstrated the ability to project manage large commercial projects in utilities, buildings and infrastructure as well as carry out complex environmental noise impact assessments. His hands-on approach has required travel to all major cities in Australia as well as the Middle East, including work on the world's tallest building, the Burj Khalifa.

Darren has worked extensively on projects relating to:

- Environmental noise studies for industrial and infrastructure projects
- Expert Witness for VCAT, Legal and Panel Hearings
- Industrial and Environmental Noise Control for Power Stations, Petrochemical, Water Treatment, Mining, Quarries, etc.
- Aero-acoustic (wind noise) testing and mitigation of noisy building facades
- Expert in BCA acoustics issues
- Site inspections of acoustic works and workmanship defects during construction
- Laboratory sample testing for manufacturers
- Community noise disputes
- Building and ground vibration analysis
- Human comfort vibration and structure-borne noise

Recent Experience

Environment, Infrastructure, Planning and Legal

West Gate Tunnel Project, EES Review and Panel Hearing for MCC; East West Link Project, EES Review for MVCC; Tulla Widening Project, EES Review for MVCC; Webb Dock Tender EES for John Holland; Kilmore Bypass Route Selection and EES for VicRoads; Murray River Crossing for VicRoads; Thompsons Road Duplication Project for VicRoads; Western Highway duplication, Burrumbeet to Beaufort; Dingley Bypass; Geelong Ring Road for Fulton Hogan; Calder Freeway for Fulton Hogan; Regional Rail Link Package G for UGL/Manidis Roberts; Melbourne Metro Early Works Package for John Holland; Hobart Airport STARs flight path EES review; VicRoads Land, Pakenham Bypass; Tylden Quarry Expansion for Fulton Hogan; Amendment C109 Panel Hearing, Hobsons Bay; Ballarto Road Concrete Batching Plant, Clyde; Mt Ridley Cleanfill, Yuroke; Boral Clayton Concrete Plant; Boral Quarries, Deer Park; Melbourne Regional Landfill EES Review; Tea Tree Quarry, Tasmania; Fonterra Dennington; Fonterra Cobden; Western Speedway, Hamilton; Fonterra Altona.

Building Acoustics, Facades & Mechanical Services

Melbourne Quarter, Batmans Hill; Burj Khalifa, Dubai; Nazareth College, Noble Park; Westfield Cinemas, North Lakes; Broadmeadows Childrens Court; Camberwell Kindergarten; GTV9, Richmond; HM@S Apartments, Port Melbourne; Department of Environment and Primary Industries offices, Warrnambool; Hampton on Hampton Apartments, Hampton; La Trobe University, Bundoora; Constance Apartments, Hawthorn; Kew Circle Apartments, Kew; 26-28 Wilson Street, South Yarra; McKinnon Kindergarten, McKinnon; Martha's Point Retirement Village; AFL Victoria offices, Visy Park; 105 Ormond Esplanade; 5-7 Wilson Street, South Yarra; 108 Glen Iris Road apartments; 101 Collins Street offices, Melbourne; 25-29 Wilson Street, South Yarra; 54-56 Chapel Street, St Kilda; V6 Concavo, Docklands; 108 Maribyrnong Road apartments, Moonee Ponds; Docklands Square Library, Docklands; EXO, Docklands; Forte Living, Docklands; Serrata, Docklands

Vibration & Structural Damage

Goodlife, Camberwell; Richmond Terminal Power Station, transmission tower structural damage; Webb Dock, Port Melbourne; Regional Rail Link; Bosch Automotive Shaker Laboratory; 313 Victoria Street Woolworths, Abbotsford



Music Noise

Queenscliff Music Festival; The Pier Hotel, Port Melbourne; Iddy Biddy, St Kilda; Alphington Rehearsal Studios; Mothers Milk, Brighton; The Penny Black, Brunswick; The George Basement, St Kilda; Branch Bar, St Kilda; Purepop, St Kilda; The Mint Bar, Melbourne; City of Port Phillip Noise Management and Application Plans; Tanglewood Festival

Research & Development Studies

Melbourne Zoo, noise & vibration induced animal behaviour; Hollowcore Concrete, impact sound insulation; Rehau wastewater pipe sound insulation; Duratray / AngloAmerican mining, Hunter Valley; Knauf Auralisation study

Professional History

- 2018 – Founder & Director, Enfield Acoustics
- 2016 – Founder & Director, Octave Acoustics
- 2013 – Senior Acoustic Consultant, Renzo Tonin & Associates
- 2011 – Project Engineer, Renzo Tonin & Associates
- 2006 – Project Engineer, VIPAC Engineers & Scientists

Publications & AIA CPD Presentations

Darren has published papers for national and international conferences and journals on the topics of noise.

These include:

- “Plenum Effect of Ceiling Space on the Assessment of Noise Levels”, 37th International Congress and Exposition of Noise Control Engineering, Shanghai, China, Oct, 2008, D Tardio and X Li.
- “Investigation into the Airborne Flanking Sound Transmission Paths of Wastewater Pipes and Acoustic Lagging”, Acoustics 2012, Australian Acoustical Society Annual Conference, Fremantle, WA, November 2012, D Tardio and P Tommasini
- “Effect of Singing on Respiratory Function, Voice and Mood after Quadriplegia: A Randomized Controlled Trial”, The National Center for Biotechnology Information, 2012, J Tamplin et al. (contributor)
- “Sound of Architecture”, Architectural CPD 2014, Talking Brand, D Tardio and M Micallef
- “A case study in the isolation of flanking noise in prefabricated timber construction and buildings relying on load bearing internal timber cladding” Acoustics 2018, Australian Acoustical Society Annual Conference, Adelaide, SA, November 2018, T Murray, D Tardio, A Lloyd

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