



WATSON MOSS GROWCOTT acoustics Pty Ltd
SUITE 7, 696 HIGH STREET, KEW EAST
VICTORIA, AUSTRALIA 3102
TELEPHONE: (03) 9859 9447
FACSIMILE: (03) 9859 5552
EMAIL: reception@wmgacoustics.com.au
PO BOX 201, KEW EAST, 3102

MELBOURNE METRO RAIL PROJECT EES

Review of Noise and Vibration Aspects in Relation to 'The Botanica', 400 St Kilda Road

Prepared for:
Owners Corporation 348427V of 400 St Kilda Rd
C/-
Planning & Property Partners Pty Ltd
Duckboard House
Level 2, 91-93 Flinders Lane
Melbourne VIC 3000

Ref. 11908-1ng.docx
12 August 2016



STATEMENT

- (a) Name and address
- NEVILLE A. J. GODDARD
 - Suite 7, 696 High Street, East Kew in the State of Victoria
- (b) Qualifications, experience and area of expertise:
- Qualifications: B.Eng. (Mech.) (Hons) Swinburne 1987
 - Professional Affiliations:
 - i) Member, Engineers Australia.
 - ii) Member, Australian Acoustical Society.
 - 28 years' experience in acoustics and noise control consulting, including noise assessments and provision of noise control advice in commerce, trade, industry and transport.
 - Areas of expertise:
Assessment of industrial noise emission in accordance with State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade) No. N-1 (SEPP N-1), assessment of environmental noise in terms of EPA guidelines and policies, and development of noise control solutions. This expertise has been developed over many years' experience applying the EPA noise assessment procedures and liaison with the EPA to clarify application of the Policies in different situations.
- (c) Expertise to make this report:
- Knowledge of noise assessment procedures together with familiarity with the project documentation gained through review.
- (d) There is no private or business relationship between me and the party for whom the report has been prepared, other than the business relationship that necessarily exists in relation to the preparation of this report.
- (e) Instructions that define the scope of the report:
- I was instructed in writing by Planning & Property Partners Pty Ltd to consider documents provided to me, consider and formulate my own opinions with respect to the appropriateness of the relevant documentation in respect of acoustic and vibration considerations that affect 'The Botanica', 400 St Kilda Rd, and prepare a report setting out conclusions reached and the basis upon which those conclusions have been reached.
- (f) The facts, matters and all assumptions upon which the report proceeds:
- These are covered in the report Ref 11908-1ng, of which this statement forms part.
- (g) Documents and other materials taken into account in preparing report:
- Melbourne Metro Rail Project EES including Appendices
- (h) I was assisted in conducting the review by Douglas Growcott of Watson Moss Growcott Acoustics Pty Ltd.
- (i) Statement of opinion:
- See body of report for summary of opinion.
 - The reports contain no provisional opinions.
 - To the best of my knowledge there are no questions relevant to the report that fall outside my expertise.
 - I do not believe the report to be incomplete or inaccurate in any respect.
- (j) I have made all the inquiries that I believe are desirable and appropriate and that no matters of significance which I regard as relevant have to my knowledge been withheld from the Panel.

Neville Goddard

Neville Goddard



Table of Contents

1. INTRODUCTION.....	4
2. CONSTRUCTION STAGE: AIRBORNE NOISE	4
2.1 Standards and Criteria.....	4
2.2 Prediction Methodology and Results	5
2.3 Mitigation and Assessment of Impact.....	7
2.3.1 Unavoidable Works Continuing 24 Hours per Day.....	7
2.3.2 Truck and Other Mobile Equipment Noise	8
2.3.3 Other Opportunities for Noise Mitigation	8
2.3.4 Additional Mitigation Measures.....	8
3. CONSTRUCTION STAGE: GROUND BORNE NOISE AND VIBRATION.....	9
3.1 Standards and Criteria.....	9
3.2 Prediction Methodology and Results	9
3.3 Mitigation and Assessment of Impact.....	9
4. OPERATIONAL STAGE: AIRBORNE RAIL NOISE	10
4.1 Standards and Criteria.....	10
4.2 Prediction Methodology and Results	10
4.3 Mitigation and Assessment of Impact.....	10
5. OPERATIONAL STAGE: FIXED INFRASTRUCTURE AIRBORNE NOISE	10
5.1 Standards and Criteria.....	10
5.2 Prediction Methodology and Results	10
5.3 Mitigation and Assessment of Impact.....	10
6. OPERATIONAL STAGE: GROUND BORNE NOISE AND VIBRATION	11
6.1 Standards and Criteria.....	11
6.2 Prediction Methodology and Results	11
6.3 Mitigation and Assessment of Impact.....	11
7. DISCUSSION	11
8. OVERVIEW	12



1. INTRODUCTION

The proposed Melbourne Metro Rail Project is a major infrastructure project with the potential to create significant impacts at locations in the vicinity of the project for an extended period of time, both during construction and ongoing operation once complete.

The EES for the project has considered the following noise and vibration issues:

1. Airborne Construction and Operational Noise generated above the ground.
2. Ground borne Construction and Operational Noise radiated by building surfaces resulting from construction and operational processes which generate vibration which will be transferred into the ground and into foundations of nearby buildings.
3. Ground Borne Construction and Operational vibration transferred into buildings where the residual magnitude of vibration in nearby building will be sufficient to create feelable vibrations in the buildings as well as the possibility of creating superficial damage.

The EES document doesn't provide definitive design details or in detail management protocols to ensure that the project will minimize potential impacts.

The EES document sets design objectives and on occasions criteria for assessing the above effects.

'The Botanica', 400 St Kilda Rd, is located adjacent to the proposed site of the future Domain Station to be created as part of the project, making this location one of the key focal points of construction activity for the project.

The Botanica principally contains some 58 dwellings accommodating many residents. It also includes two commercial properties at 398 and 402 St Kilda Rd.

Watson Moss Growcott Acoustics Pty Ltd has been instructed by Planning & property Partners Pty Ltd, acting for the Owners Corporation of 400 St Kilda Rd, to consider documents relating to the project, consider and formulate opinions with respect to the appropriateness of the relevant documentation in respect of acoustic and vibration considerations that affect 'The Botanica', 400 St Kilda Rd, and prepare a report setting out conclusions reached and the basis upon which those conclusions have been reached.

2. CONSTRUCTION STAGE: AIRBORNE NOISE

2.1 STANDARDS AND CRITERIA

The review of the EES documentation has indicated that the adopted standards and criteria are generally appropriate.

There is some concern in relation repeated references in the EES to the EPA 1254 Guidelines that allow for 'unavoidable works' to continue through the night if required without noise restrictions.

It is highly likely that what the EPA had in mind when they adopted this was an occasional concrete pour that would continue overnight, not works continuing for weeks or significantly longer. It would not be reasonable in my opinion to rely upon such an exemption for a project of this nature in the circumstances, taking the duration and intensity of works into account.



2.2 PREDICTION METHODOLOGY AND RESULTS

The review of the EES documentation has indicated that the prediction methodology is generally appropriate, which provides some confidence in the results.

However, some of the source noise data appear to be unrealistically low.

In the tabulation of source noise levels, the following items have been assigned sound power levels that in the experience of WMG Acoustics are approximately 10dB too low:

- Material delivery trucks, listed with a sound power level of 95dB(A), which in WMG's experience would typically be closer to 105dB(A) sound power level.
- Spoil trucks, listed with a sound power level of 91dB(A), which in WMG's experience would typically be closer to 105dB(A) sound power level.
- Loaders/backhoe listed with a sound power level of 96dB(A), which in WMG's experience would typically be closer to 105dB(A) sound power level.

The noise level of delivery and spoil trucks is very relevant to the impact at 400 St Kilda Rd, due to the intensive activity that will occur at the Domain site, as evidenced by the following extract from page 8-49 of the Transport section of the EES:

Activity at this site would extend for a period of around four years with 24-hour, 7-day operations and an average of approximately 100 truck trips each day for spoil removal and materials and equipment delivery related to the construction of Domain station. Peak activity is expected to be higher at around 140 truck movements per day.

In addition to this, the proposed Domain (only) TBM launch site would generate an average of 140 truck movements per day over two years. If the option of Domain and Fawkner Park is used for the TBM launch sites, associated truck trips would reduce to 70 truck movements per day as some trips would occur at Fawkner Park (refer to Section 8.8).

With such a large number of truck movements per day in close proximity of 400 St Kilda Rd, under-stating the sound power level of each truck by something in the order of 10dB could have a significant impact on the predicted noise levels.

Appendix A of the Noise and Vibration Technical Appendix includes the predicted daytime construction noise levels displayed in Figure A.35, included below, on which 400 St Kilda Rd has been indicated.

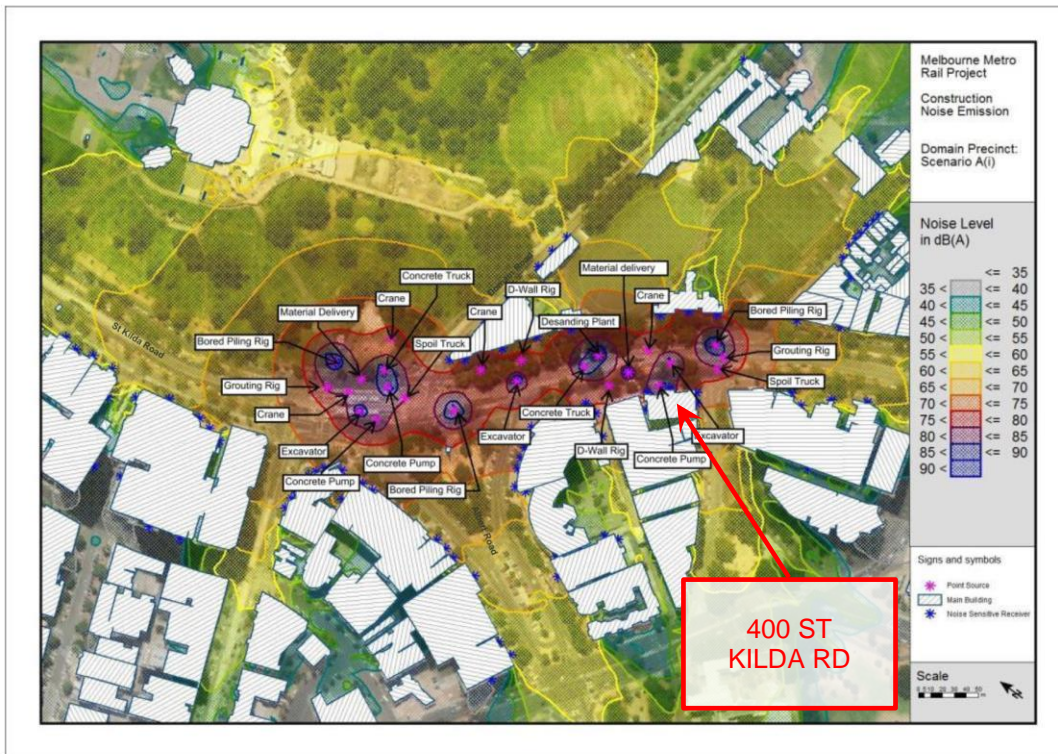


Figure A.35: Domain Station Precinct - Scenario A(i) - Predicted Noise Levels at 1.5 m above ground - construction activities to be undertaken during Normal Working Hours



It is true that the EPA 1254 Guideline does not place restrictions on noise levels at residential premises arising from construction during normal working hours, but this figure indicates that the St Kilda Rd façade of 400 St Kilda Rd will be exposed to levels above 80dB(A).

There has not been a good indication given of the duration per working day or in terms the number of days, weeks or months that noise levels of this magnitude would be present.

In section A.5.7 in relation to Precinct 7, Domain Station, it is noted that in the vicinity of Domain Station the average noise levels during the day period were measured to be 64 dBLA_{eq} and 59 dBLA_{eq} during the day and night periods respectively at 1-29 Albert Road.

It is stated that:

Initially construction would be undertaken during Normal Working Hours and Guideline Noise Levels do not apply. It is predicted that, with barriers up to a height of 6 m, construction noise levels would generally be similar to baseline average noise levels at sensitive receivers. There would, however, be residential locations on higher floors which would overlook the construction work sites and therefore would not benefit from the mitigation provided by the barriers. At time the construction noise levels are predicted to be marginally higher than the existing noise levels at these locations.

This understates the impact that will occur at 400 St Kilda Rd: Figure A35 indicates levels above 80dB(A) on the façade of 400 St Kilda Rd. 6m high barriers reduce the resultant noise level at 1.5m above the ground, but 400 St Kilda Rd comprises 9 levels – anything above the first two levels will receive negligible attenuation from a 6m high barrier and be exposed to 80dB(A)+, which is very different to the 64dB(A) L_{eq} during the day baseline level, not ‘marginally higher’.

To put noise levels above 80dB(A) in context, an eight-hour equivalent continuous A-weighted sound pressure level (LAeq,8h) of 85 dB(A) is the maximum daily occupational noise exposure level in the National Standard for Occupational Noise [NOHSC:1007 (2000)].

Such high noise levels would have a significant impact on residents, so it is important that the expected duration of this stage is made clear in order to fully understand the magnitude of the impact and assist residents in making decisions regarding actions that may be taken.

2.3 MITIGATION AND ASSESSMENT OF IMPACT

2.3.1 Unavoidable Works Continuing 24 Hours per Day

There is reference in Appendix A of the Noise and Vibration component of the EES to an expectation of work occurring outside normal working hours for a period of four to five weeks twice over the construction period.

Acoustic attenuation sheds are described and figure A.37 below shows acoustic attenuation sheds in place for unavoidable works to be undertaken 24 hours per day, but there is a lack of clarity regarding how/where these sheds fit in with the excavation of the entire Domain site, which would presumably precede the installation of the sheds.

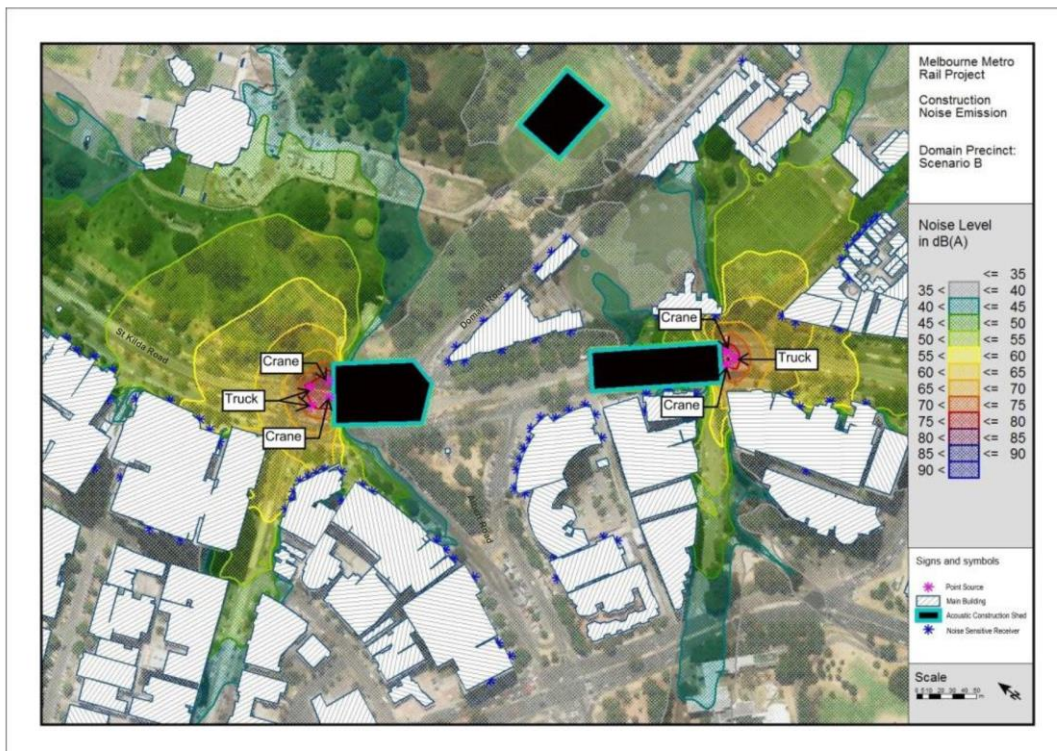


Figure A.37: Domain Station Precinct - Scenario B - Predicted Noise Levels at 1.5 m above ground - construction activities to be undertaken over 24 hours Unavoidable Works. Note: locations of sheds are indicative only.



2.3.2 Truck and Other Mobile Equipment Noise

It is considered that the full extent of truck noise impacts has not been acknowledged by the EES. A significant aspect of truck noise mitigation is source noise control, ensuring that trucks make no more noise than absolutely necessary in carrying out their tasks.

Despite the fact that the EES noise data for trucks understates the noise contribution of trucks, there is the potential for truck noise to be an even more significant issue than it need be if trucks are allowed to work on the project making more noise than necessary.

Two significant components of this are exhaust noise and reversing beepers.

Trucks when new are required to have effective exhaust mufflers. However, by neglect or modification a proportion of trucks operating on our roads produce significantly higher than is necessary for efficient operation.

Conventional reversing beepers have the potential to cause annoyance to residents and contribute to exceedance of recommended noise levels at the residential locations around the construction sites, due to the highly distinctive character and on-off nature of the noise.

Considerations in relation to reversing beepers apply to all mobile equipment operating at the construction sites, as well as trucks.

The following are recommended for adoption as part of a construction management plan:

- **Trucks accessing the construction site and all mobile equipment operating at the construction site** must be fitted with the 'new generation' broadband reverse alarms, which vary their noise output according to the ambient noise level. These reversing alarms should be selected for the lowest noise level consistent with safe operation. Trucks or other equipment with conventional reversing beepers will be refused access to the site.
- Product stockpiles and travel routes within the site should be configured so as to minimise need for trucks to reverse.
- Contractors wishing to be part of the project must provide evidence that trucks to be used on the project comply with the EPA in-service noise requirements, with respect to exhaust noise.

2.3.3 Other Opportunities for Noise Mitigation

In a situation such as the Domain Station construction site overlooked by the elevated residential premises at 400 St Kilda Rd where there are limitations in the extent to which noise can be attenuated along the path from where it is generated to the receptor locations, it is critical to pursue all possible means of reducing noise emission at the source.

It should be a project requirement to use low-noise technology such as electrically powered cranes and other such equipment wherever possible, rather than simply accepting the way things have been done in the past.

2.3.4 Additional Mitigation Measures

The EES includes provision for additional mitigation measures under circumstances when significant construction noise and vibration impacts cannot reasonably and feasibly be controlled.



When reasonable and feasible mitigation measures do not achieve compliance with the construction Guideline Targets or when no limits apply then Additional Mitigation Measures may be appropriate to manage impact. There is no guidance in Victoria with respect to Additional Mitigation Measures, however guidance is provided in Construction Noise Strategy PE-ST-157/1.0 2011 prepared by the NSW Transport Construction Authority.

The Additional Mitigation Measures include:

- x Alternative accommodation (AA)*
- x Monitoring (M)*
- x Individual briefings (IB)*
- x Letter box drops (LB)*
- x Project specific respite offer (RO)*
- x Phone calls (PC)*
- x Specific notifications (SN)*

All of these 'additional mitigation measures' except Alternative Accommodation and Project Specific Respite Offers (whatever form that might actually take) are really no more than appropriate actions to take in conducting a major project that could reasonably be expected to impact significantly on residents.

With the predicted high noise levels at 400 St Kilda Rd, a more specific framework around the provision of alternative accommodation, or upgrades to the building itself, needs to be developed as a priority, as it is highly likely that it will be relevant to at least some of the residents of the building, particularly those overlooking St Kilda Rd.

3. CONSTRUCTION STAGE: GROUND BORNE NOISE AND VIBRATION

3.1 STANDARDS AND CRITERIA

The review of the EES documentation has indicated that the adopted standards and criteria are generally appropriate.

3.2 PREDICTION METHODOLOGY AND RESULTS

During the construction stage it is expected that airborne construction noise will be of greater significance at 400 St Kilda Rd, dominating the environment. However, it has been identified that there will be periods when activities such as rockbreaking works are taking place in close proximity of the residents (within 20m during the day or 40m at night), that the maximum guideline targets will be exceeded.

Appendix B of the Noise and Vibration section of the EES identifies that at times vibration will be more than two times the maximum guideline targets and ground borne noise more than 10dB above the night criterion, but there is no clear indication as to how long these circumstances would prevail for.

3.3 MITIGATION AND ASSESSMENT OF IMPACT

Section B.6.7 discusses a number of mitigation measures to reduce the predicted exceedances of the target criteria. It is critical that these mitigation measures are adopted in a management plan in order to protect those most impacted by the project.



4. OPERATIONAL STAGE: AIRBORNE RAIL NOISE

4.1 STANDARDS AND CRITERIA

The review of the EES documentation has indicated that the adopted standards and criteria are generally appropriate.

4.2 PREDICTION METHODOLOGY AND RESULTS

It is a reasonable conclusion that airborne rail noise will not be a significant factor at 400 St Kilda Rd.

4.3 MITIGATION AND ASSESSMENT OF IMPACT

Given that it has been reasonably predicted that airborne operational rail noise will not be a factor in the vicinity of Domain Station and will therefore not adversely impact on 400 St Kilda Rd, no mitigation measures are required.

5. OPERATIONAL STAGE: FIXED INFRASTRUCTURE AIRBORNE NOISE

5.1 STANDARDS AND CRITERIA

The review of the EES documentation has indicated that the adopted standards and criteria are generally appropriate.

5.2 PREDICTION METHODOLOGY AND RESULTS

The EES acknowledges that equipment selections have not been made which would allow indicative noise control requirements to be defined, but anticipates that compliance with the use of conventional sound attenuation technology.

However, given that things such as ventilation systems are likely to be of significant magnitude it should be a priority sooner rather than later to do at least some preliminary equipment selections and sound power level determinations to work through the noise attenuation sufficiently to gain an appreciation of the magnitude of sound attenuation required, and the feasibility of incorporating this into the spatial allowances that have been made for the project.

5.3 MITIGATION AND ASSESSMENT OF IMPACT

The project should not underestimate the magnitude of the task in appropriately attenuating noise associated with fixed infrastructure.



6. OPERATIONAL STAGE: GROUND BORNE NOISE AND VIBRATION

6.1 STANDARDS AND CRITERIA

The review of the EES documentation has indicated that the adopted standards and criteria are generally appropriate.

6.2 PREDICTION METHODOLOGY AND RESULTS

A thorough process of obtaining source data from the existing Melbourne Underground Rail Loop has been undertaken, with equally thorough investigations to enable estimation of vibration propagation through the ground and transmission into buildings, leading to estimates of likely vibration and ground borne noise at locations where they may be perceived by residents.

These investigations have led to a conclusion that 'very high attenuation' track isolation will be required in the section of the project passing 400 St Kilda Rd.

6.3 MITIGATION AND ASSESSMENT OF IMPACT

The EES has foreshadowed likely forms of rail isolation in the vicinity of 400 St Kilda Rd in principle. However, given the potential significance of this issue in terms of impact and the difficulty in rectification if it is not got right initially, further work to validate the predictions and verify the effectiveness of proposed isolation solutions is required.

The opportunity will be available once the excavation for the Domain Station is in place to conduct vibration transmission testing at the actual site in order to confirm assumptions regarding transmissibility to the building at 400 St Kilda Rd.

7. DISCUSSION

Overlaying all of the foregoing is a concern that there is no clear indication of projected time frames for the different components of the project and the associated impacts.

For a noise sensitive location such as 400 St Kilda Rd located in extremely close proximity to one of the major focal points of activity during the construction phase, it would be reasonable to have a projected time line defining the nature of works and an indication of the associated impacts to assist decision-making by the occupants.



8. OVERVIEW

Review of the Melbourne Metro Rail Project EES documents has indicated that overall the standards and criteria adopted are reasonable and there has been a thorough attempt to identify and quantify the range of likely adverse impacts for those living and working in the vicinity of the project.

It has become apparent that the issue with the greatest impact on the residents of 400 St Kilda Rd will be airborne noise during construction.

Very high noise levels have been identified as impinging on the St Kilda Rd façade of 400 St Kilda Rd at some stages of the project, in the order of the occupational noise exposure limit. However, there is a lack of information as to how long the highest level of noise exposure is likely to continue.

Mitigation of airborne construction noise is discussed, but overall I am of the view that the documents do not accurately convey the full extent of the impact that airborne construction noise would have on the residents of 400 St Kilda Rd.

There is a need for far more detailed examination and explanation regarding the time frames over which the elevated noise levels will occur, and development of defined frameworks for the implementation of additional mitigation measures such as alternative accommodation.

A handwritten signature in black ink that reads "Neville Goddard".

NEVILLE GODDARD
WATSON MOSS GROWCOTT
Acoustics Pty Ltd