Technical Memorandum

PLANS AND DOCUMENTS referred to in the PDA DEVELOPMENT APPROVAL
Approval no: DEV2020/1124
Date: 22 December 2021
Queensland Government

Enquiries: Rodrigo Olavarria / Michael Lanchester
Project No: 45289

To: Leo Mewing – Mewing Planning Consultants Pty Ltd

From: Rodrigo Olavarria – Stantec Australia Pty Ltd

Date: 16 November 2020

Subject: 12-18 Thompson Street Material Change Use under PDA Development Permit
Acoustic Aspects

Leo,

Stantec Australia Pty. Ltd. (Stantec) have been engaged by Gansons Pty Ltd, Ganboys Pty Ltd and Ganbros Pty Ltd to provide an acoustic report in support a material change application of use for Tower 1 and PDA preliminary approval for the Masterplan pertaining a development to be located at 16 Thompson Street, Bowen Hills. Stantec prepared the acoustic report prepared to address the requirements for operational noise impacts in the Bowen Hills Priority Development Area (PDA)

Stantec assessed the noise impacts in acoustic report 45289-AC-RE-001_002 - *16 Thompson Street Tower 1 and Masterplan Noise Impact Assessment report*, dated 20 April 2020.

Economic Development Queensland (EDQ) have received feedback from the Queensland Department of Transport and Main Roads (TMR) in relation to the impacts onto the development from rail noise. The noise components of the TMR feedback are addressed in the sections below, which are to be read as an addendum to the Stantec acoustic report.

1. TMR feedback

The feedback from TMR is reproduced below from e-mail by EDQ of 19 October 2020:

1. *The submitted Noise Impact Assessment has not adequately demonstrated that the proposed development can achieve the relevant railway noise criteria. In particular, the report does not provide adequate details of the rail noise modelling undertaken or the calculation of the intrusive rail noise levels.*

   Response Required:

   The applicant is therefore required to provide a revised Noise Impact Assessment with a revised acoustical assessment that addresses the following:

   (a) The revised report must be based on architectural drawings of an adequate level of detail for proposed Towers 1-4. These should show the layout of the noise sensitive uses (childcare centre, health care services and hospital uses) on the site, including the internal floor plan of the buildings and intended finished levels. The plans on which the report is based should be included as an attachment in the report.

   (b) in accordance with the Queensland Rail Code of Practice – Railway Noise Management, calculate the single event maximum sound pressure level as the arithmetic average of maximum levels from the highest 15 single events over a given 24 hour period. Any assumptions regarding the LAmax must be clearly stated including the height of the main noise source above ground, actual source noise level, location and strength assumptions.

   (c) Revise the noise monitoring undertaken to ensure the location selected is fully exposed to the railway corridor (no shielding is present), that is, worst case rail noise exposure for future buildings. Noise measurements and monitoring should be conducted over a two day period, preferably on

highest trafficked days. Timetable information for passenger rail can be obtained from the railway manager (Queensland Rail).

(d) state the rail traffic movements (passenger, freight) used to generate the Leq (24hr) and LAmax level predictions.

(e) describe the modelling methodology used to prepare the assessment, including the choice of model, how the LAmax noise levels have been calculated, the number of assumed train pass-bys per day and verification of the accuracy of the model, including whether measured data was used.

(f) demonstrate that the development can achieve all the relevant noise criteria:

For all facades of the child care centre, health care services and hospital:

- *≤65 dB(A) Leq (1 hour) façade corrected (maximum hour during opening hours)*
- *≤87 dB(A) (single event maximum sound pressure level) façade corrected*

For all outdoor play areas for the child care centre and outdoor areas for passive recreation for health care services and hospital:

- *≤62 dB(A) Leq (12 hour) free field (between 6am and 6pm)*
- *≤84 dB(A) (single event maximum sound pressure level) free field*

Internal railway noise criteria

- *≤45 dB(A) single event maximum sound pressure level for sleeping rooms in a child care centre and ward areas in a hospital*
- *≤50 dB(A) single event maximum sound pressure level for indoor play areas in a child care centre and patient care/ treatment areas (other than wards) in a hospital.*

These noise criteria are set out in the Department of Transport and Main Roads Development Affected by Environmental Emissions from Transport Policy, Version 4 (October 2017), which is available at: https://www.tmr.qld.gov.au/business-industry/Technical-standards-publications/Development-on-Land-Affected-by-Environmental-Emissions. It is noted that the internal railway noise criteria for a child care centre, health care services and hospital are not dealt with by Mandatory Part 4.4 of the Queensland Development Code.

Provide a table in the report that summarises the predicted noise levels at each room, level and façade of the noise sensitive uses. Compliance with the internal railway noise criteria will need to be addressed for all rooms, not just those rooms which exceed the external noise criteria. Provide full details of the calculations of the intrusive noise in the three most affected rooms in each building.

(g) Re-assess the noise mitigation measures required to meet the relevant railway noise criteria in light of the above requirements. The location and height of any proposed noise barriers should be clearly shown on a proposal plan. The height of any proposed noise barrier should take into account the varying topography of the land and the proposed finished levels of the development. Confirm whether the height of the noise barrier is 1.2m or 1.5m. The recommendations should include building attenuation treatments to address internal railway noise.

2. Comments

The following comments are made in relation to the TMR feedback:

TMR response required Submit a revises Noise report that addresses the following	Stantec response
1.a The revised report must be based on architectural drawings of an adequate level of detail for proposed Towers 1-4. These should show the layout of the noise sensitive uses (childcare centre, health care services and hospital uses) on the site, including the internal floor plan of the buildings and intended finished levels. The plans on which the report is based should be included as an attachment in the report.	The site is affected by two aspects of transportation noise: 1. Road traffic noise from the inner-city bypass (ICB); and 2. Railway corridor noise, 55m from the site and shielded by the elevated road structure of the ICB. The ICB is under the control of Council and TMR have no responsibility for the assessment of noise emissions from this road. It is understood that EDQ have not made any request within the RFI with respect to transportation noise. It is further understood that the request from TMR relates only to railway noise. As noted above the railway is located a minimum 55m away and is largely shielded by the elevated ICB road structure. Detailed architectural drawings for Tower 2-4 are not available at this stage. Tower 1 is greater than 100m from the railway. The location of the uses within Tower 1 (i.e. the internal floor plan with finished levels) have not been defined. The same applies for Tower 2-4 which are currently at Masterplan stage. Thus, the intent of the acoustic report was to demonstrate feasibility of Tower 1 and the overall Masterplan by providing recommendations for the future layout of uses to protect these against dominate road traffic noise from the Inner-city Bypass (ICB). Section 6.3 of the acoustic report states: *Analysis of the noise data showed that acoustic treatment will be required to be applied to Building 2-4 facades, where healthcare uses are introduced facing the ICB. Road traffic noise intrusion from the ICB of up to 32 dBA will be required.* *Alternative options to manage the noise levels include:* • *Placement of heath care uses facing away from the ICB;* • *High performance façade glazing systems;* • *corridors around the perimeter of health areas to achieve noise limits inside patient care and other areas using glazing systems with a lower acoustic performance.* Note the 32dBA road traffic noise attenuation was determined from the noise monitoring conducted at 10m from the closest ICB lane, as shown below.

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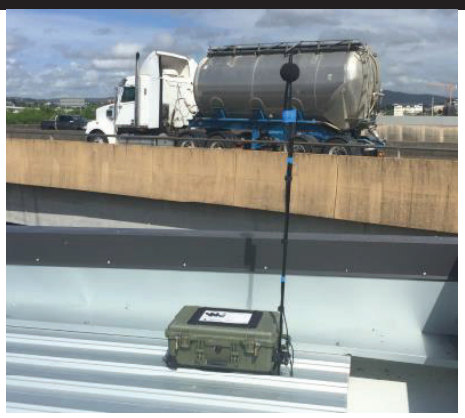
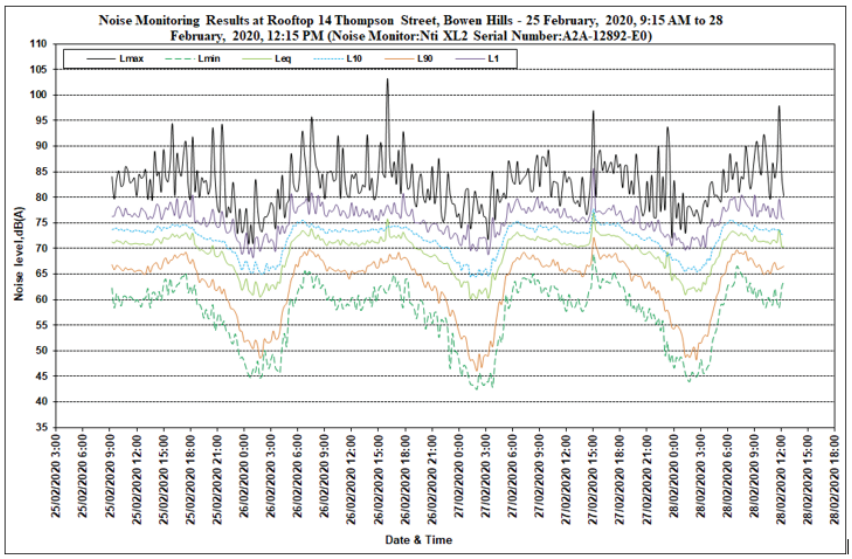
	  In addition to the Medical uses, the application included a childcare centre use which has been removed from the development application since the issue of the acoustic report.
1.b in accordance with the Queensland Rail Code of Practice – Railway Noise Management, calculate the single event maximum sound pressure level as the arithmetic average of maximum levels from the highest 15 single events over a given 24 hour period. Any assumptions regarding the LAmax must be clearly stated including the height of the main noise source above ground, actual source noise level, location and strength assumptions.	The rail noise Single Event Maximum (SEM) based on measurements cannot be determined on site because rail noise events cannot be determined above road traffic. L_{Amax} noise levels on site are caused by road traffic noise events, including motorbikes and trucks (as shown on the time trace in the image below and also audible in the site recordings). From the audio recorded at this location rail noise was inaudible in the presence of road traffic noise.  In the presence of dominant road traffic noise, the L_{Amax} can only be determined via detailed noise prediction, which has not been conducted as part of the noise impact report due to inability to validate measurements. Notwithstanding this, a simplified rail noise assessment is presented in Section 1.f below.

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1.c Revise the noise monitoring undertaken to ensure the location selected is fully exposed to the railway corridor (no shielding is present), that is, worst case rail noise exposure for future buildings. Noise measurements and monitoring should be conducted over a two day period, preferably on highest trafficked days. Timetable information for passenger rail can be obtained from the railway manager (Queensland Rail).	Monitoring at a location on site that is fully exposed to rail noise to allow for the rail noise exposure of future buildings is impractical, as this would require the location of a microphone using an elevated platform which must be secured several stories high to allow for a reading of unscreened rail noise to be conducted. This would have introduced a series of safety measures to be introduced, which were outside the scope of the study, the purpose of which was to demonstrate feasibility in the presence of the dominant transportation source, i.e. road traffic. Even if monitoring were feasible, there is no guarantee that a clear reading of rail noise would be obtained, as can be concluded from the assessment presented in Section 1.f below. Rail noise monitoring would only be useful in this case to validate a rail noise model used to predict noise levels onto the building facades, if rail noise was higher than the maximum levels generated by road traffic, which is not the case. Note that a timetable was obtained from Queensland Rail as part of the assessment. No trains were detectable in the audio recordings above road traffic at the time of the reported trains.
1.d state the rail traffic movements (passenger, freight) used to generate the Leq (24hr) and LAmax level predictions.	Refer to Section 1.f below for the number of trains required to exceed noise limits.
1.e describe the modelling methodology used to prepare the assessment, including the choice of model, how the LAmax noise levels have been calculated, the number of assumed train pass-bys per day and verification of the accuracy of the model, including whether measured data was used.	Refer to Section 1.f below for a simplified method of assessment.
1.f demonstrate that the development can achieve all the relevant noise criteria: For all facades of the childcare centre, health care services and hospital: • ≤65 dB(A) Leq (1 hour) façade corrected (maximum hour during opening hours)	The childcare centre use has been removed from the development application since the issue of the acoustic report. Thus, the assessment of noise intrusion onto this use is no longer required. Only medical uses require assessment. To demonstrate feasibility, conservative basic calculations can be conducted based on acoustic information provided by Queensland Rail rollingstock: A calculation was conducted as part of this memorandum to estimate the L_{Amax} noise levels using first principle formulae for the following assumptions: **1.** QR National general freight/grain/coal/cattle train L_{Amax} is 85 dBA at 25m, as per ROLLINGSTOCK NOISE_QRNational.doc (reproduced in

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• ≤87 dB(A) (single event maximum sound pressure level) façade corrected For all outdoor play areas for the child care centre and outdoor areas for passive recreation for health care services and hospital: • ≤62 dB(A) Leq (12 hour) free field (between 6am and 6pm) • ≤84 dB(A) (single event maximum sound pressure level) free field Internal railway noise criteria • ≤45 dB(A) single event maximum sound pressure level for sleeping rooms in a childcare centre and ward areas in a hospital • ≤50 dB(A) single event maximum sound pressure level for indoor play areas in a childcare centre and patient care/ treatment areas (other than wards) in a hospital. These noise criteria are set out in the Department of Transport and Main Roads Development Affected by Environmental Emissions from Transport Policy, Version 4 (October 2017), which is available at: https://www.tmr.qld.gov.au/business-industry/Technical-standards-publications/Development-on-Land-Affected-by-Environmental-Emissions. It is noted that the internal railway noise criteria for a child care centre, health care services and hospital are not dealt with by Mandatory Part 4.4 of the Queensland Development Code. Provide a table in the report that summarises the predicted noise levels at each room, level and façade of the noise sensitive uses. Compliance with the internal railway noise criteria will need to be addressed for all rooms, not just those rooms which exceed the external noise criteria. Provide full	2. **Table** 1 at the end of this memorandum). We have used these values understanding this is acceptable according to Section 4.1.2 of the TMR Interim Guideline that states that where measurements are not possible, reference may be made to verified Queensland network or manufacturer supplied rail noise levels; 3. The L_{Amax} occurs at a specific point in time; therefore, it is identifiable as a point source. 4. Distance between closest rail line and the most exposed façade: 56m, as shown on the image below. This is conservative. The distance will increase as the receptor is located on upper floors; 5. There is direct line of sight between rail lines and receptors, i.e. ICB does not exist. This is also conservative; 6. The is no atmospheric sound attenuation. This is also conservative. In view of the above, the noise level from a freight train at the closest distance is calculated as follows: $L_{Amax,56m} = L_{Amax,25m} – 20*\log (25/56) = 78$ dBA The façade corrected value is 80.5 dBA This noise level is 6.5 dBA less than the applicable noise limit. The Single Event Maximum sound pressure level for outdoor areas for passive recreation for health care services would also be met, based on the above noise prediction. Using Notch 8 (unlikely full power scenario) of 91 dBA L_{Amax} at 25m, the noise level at the receptors increases to 84 dBA for such an events. This is still below the outdoor noise limits and below the L_{Amax} values generated by road traffic.  A calculation can also be conducted to estimate the $L_{Aeq,24hr}$ using the QR tested Sound Exposure Level (SEL) of freight trains. Assuming that freight trains are clearly audible above road traffic and each emit 90 dBA SEL at 25m distance, the estimated number of freight train movements required to meet the 65 dBA $L_{Aeq,24hr}$ noise limit is 248 trains. This far exceeds the maximum number of 15 freight trains per day reported by QR during the monitoring period. Where

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details of the calculations of the intrusive noise in the three most affected rooms in each building.	a distance of 56m is considered, the number of trains doubles considering a line source propagation. A 73 dBA max $L_{Aeq,24hr}$ façade corrected due to road traffic was measured at the monitoring location (worst-case future exposed façade location), between 7am-6pm (typical healthcare operating hours). Assuming 3 dBA per doubling of distance from road traffic line source, a sensitive receptor is to be located in excess of 70m elevation for road traffic to be approximately of equal contribution to rail noise. At this elevation rail noise will not exceed 65 dBA $L_{Aeq,24hr,}$ as discussed above; therefore, road traffic noise will continue to be the controlling noise source on the upper levels of buildings.
1.g Re-assess the noise mitigation measures required to meet the relevant railway noise criteria in light of the above requirements. The location and height of any proposed noise barriers should be clearly shown on a proposal plan. The height of any proposed noise barrier should take into account the varying topography of the land and the proposed finished levels of the development. Confirm whether the height of the noise barrier is 1.2m or 1.5m. The recommendations should include building attenuation treatments to address internal railway noise.	The noise mitigation measures stated in the acoustic report are maintained, which are as follows and are to be confirmed during Detailed Design for the attenuation of road traffic noise. Road traffic noise intrusion up to 32 dBA will be required. Alternative options to reduce the noise levels include: • Placement of heath care uses facing away from the ICB; • High performance façade glazing systems; • Corridors around the perimeter of health areas to achieve noise limits inside patient care and other areas using glazing systems with a lower acoustic performance. Our report did not mention a noise barrier. This comment by TMR appears to be erroneous.

It is further noted that the application has been made to Economic Development Queensland (EDQ) within the Bowen Hills Priority Development Approval (PDA) Development permit for Material Change for the following uses:

- Office;
- Research and Technology Industry;
- Health Care Service;
- Hospital;
- Food and Drink Outlet;
- Shop; and
- Showroom

A masterplan / plan of development comprising four buildings (including Tower 1) has also been made containing of mix uses including:

- Health care;
- Food and drink outlet;
- Retail; and
- Office.

An application for residential use has not been made for permanent or temporary accommodation; therefore, impacts to noise during the night time period will be limited to the potential use of the health care/hospital use for overnight stay, which can be managed to compliant noise levels by implementing the recommendations provided in the acoustic report and reproduced in this memorandum.

Based on the noise assessments provided in the acoustic report and the further review provided in this memorandum, it is advised that Tower 1 and the Masterplan can be designed to mitigate the noise impacts from transportation noise, including rail; therefore, the project is considered feasible from a noise intrusion perspective.

We hope this memorandum provides further clarification of the transportation noise impacts expected onto the project. Should you have any queries, please do not hesitate to contact the undersigned on (07) 3811 4500.

Regards,

Rodrigo Olavarria (Author)
Senior Acoustic Engineer for **Stantec**

Michael Lanchester (Reviewer)
Acoustics Section Manager (QLD) for **Stantec**

Table 1 QR National rail stock noise levels

QR TRAIN TYPE	TRACK	SPEED (km/h) OR NOTCH SETTING	Lmax @ 25 m (dB(A))	SEL @ 25 m (dB(A))
3 Car EMU	Jointed	80	85	88
6 Car EMU	Jointed	80	86	91
3 Car SMU/IMU	Jointed	80	82	85
6 Car SMU/IMU	Jointed	80	83	88
3 Car IMU	CWR (Continuous Welded Rail)	140	86	89
6 Car IMU	CWR	140	88	93
Railmotor (2 car)	Jointed	80	80	83
ICE (6 car)	Jointed	80	83	88
General Freight/Grain/Coal/Cattle wagons	Jointed	80	85	90 (for 150 m consist length)
Long Distance Passenger wagons	Jointed	80	80	85 (for 150 m consist length)
Steam locomotive (Blue) – No cars	Jointed	55	81	84
Steam locomotive (Brown) – 7 cars	Jointed	45	90	92
Steam locomotive (Bayer-Garrett) – 11 cars	Jointed	60	85	92
"Current – generation" Diesel-electric locomotives (1500/1700/2100/2400 class)	Jointed	Notch 1 Notch 2 Notch 3 Notch 4 Notch 5 Notch 6 Notch 7 Notch 8 (Add 3 dB(A) for two locos)	74 76 78 80 83 86 89 91	75 (@80 km/h) 77 (@80 km/h) 79 (@80 km/h) 82 (@80 km/h) 85 (@80 km/h) 88 (@80 km/h) 91 (@80 km/h) 94 (@80 km/h)
3900 Class Electric Locomotives	Jointed	Notch 1 Notch 2 Notch 3, 4 Notch 5, 6 Notch 7, 8 (Add 3 dB(A) for two locos)	76 77 78 79 80	77 (@80 km/h) 78 (@80 km/h) 79 (@80 km/h) 80 (@80 km/h) 82 (@80 km/h)