30 January 2017
TH347-01F04 Addendum to DA Acoustic Report (r5)

Lendlease
Nishi Patel
nishi.patel@lendlease.com

From: Benjamin Panarodvong [Benjamin.Panarodvong@renzotonin.com.au]

North Plot, The Darling Exchange - Addendum to SSDA10 Acoustic Report

1 Introduction

This letter provides a response to submissions and assessment of the proposed amended development in relation to the State Significant Development (SSD) Development Application (DA) for the development of the North Plot and Square in Darling Square (SSD 7021).

The SSD DA was publicly exhibited for a period of 47 days from 17 March 2016 to 2 May 2016. During this time, ten (10) submissions were received from government agencies and the City of Sydney Council.

This letter should be read in conjunction with the original assessment prepared by Renzo Tonin & Associates Pty Ltd dated 23 February 2016 to support the development of the North Plot and Square (SSD 7021). This letter should also be read in conjunction with a concurrent s96 modification application to the North-East Plot (SSD 6626), with consequential amendments to this approval proposed in order to accommodate servicing and functions generated by the North Plot.

Renzo Tonin & Associates has conducted an acoustic review and a qualitative assessment to support the State Significant Development Application SSDA10 for Stage 2 of the Darling Square development. The assessment is outlined in the **Acoustic Report.**[1]

This technical memo is an addendum to address the revised design changes and is to be read in conjunction with the original Acoustic Report submitted with the Development Application.

[1] (Our ref: *TH347-01F02 (r10) DA Acoustic Assessment, dated 23/02/2016*)

2 Proposed amended development

Since public exhibition of the proposal, generally minor amendments and improvements have been made to the proposed development. The final project design includes amendments made by Lend Lease pursuant to Clause 55 of the Environmental Planning & Assessment Regulation, including changes to address matters raised in the submissions.

The following key amendments have been made to the proposal:

- minor increase in overall site area;
- minor increase in Gross Floor Area;
- changes to the external building design including a revision of the external stair, shifting of floor plates and resultant changes of revised internal planning;
- slight adjustment to the site boundary, increasing to accommodate the revised Darling Exchange building and public domain interface enhancements;
- revisions and enhancements to the proposed public domain treatments; and
- revised loading and servicing strategy.

The final proposal seeks approval for the following key development:

- Construction and use of a six (6) storey building (known as The Darling Exchange) containing the following uses:
  - Retail tenancies/market hall (such as market stalls, food and beverage premises and bar/restaurant operations); and
  - Community uses (such as a library including IQ Hub and child care).
- Public domain improvements, including:
  - Creation of a new publicly accessible square (The Square) with space for markets, outdoor events, passive and active recreation;
  - Provision of a timber canopy extending from The Darling Exchange along the western edge of The Square;
  - Provision of two kiosk-style retail pods below the canopy;
  - Creation of Little Hay Street, a new pedestrian only laneway between the North-East Plot and South-East Plot; and
  - Completion of general interface works to connect areas of new public domain with the existing public domain.
- Remediation as may be required; and
- Extension and augmentation of physical infrastructure/utilities as required.

3 Reference design documentation

The addendum has been prepared based on the following revised design drawings.

Table 1: Architectural design documentation

Drawing no.	Drawing title	Revision	First issued date
N_AD_PS01	DRAWING LIST AND CONTEXT PLAN	D	21 Nov 2016
N_AD_PS02	SITE PLAN	D	21 Nov 2016
N_AD_P01	FLOOR PLAN GROUND	D	21 Nov 2016
N_AD_P02	FLOOR PLAN MEZZANINE	D	21 Nov 2016
N_AD_P03	FLOOR PLAN LEVEL 01	D	21 Nov 2016
N_AD_P04	FLOOR PLAN LEVEL 02	D	21 Nov 2016
N_AD_P05	FLOOR PLAN LEVEL 03	D	21 Nov 2016
N_AD_P06	FLOOR PLAN LEVEL 04	D	21 Nov 2016
N_AD_P07	FLOOR PLAN LEVEL 05	D	21 Nov 2016
N_AD_P08	FLOOR PLAN ROOF	D	21 Nov 2016
N_AD_P09	FLOOR PLAN CANOPY	D	21 Nov 2016
N_AD_P10	FLOOR PLAN ROOF LANDSCAPE PLAN	D	21 Nov 2016
N_AD_E01	ELEVATION SOUTH	D	21 Nov 2016
N_AD_E02	ELEVATION NORTH	D	21 Nov 2016
N_AD_E03	ELEVATION EAST	D	21 Nov 2016
N_AD_E04	ELEVATION WEST	D	21 Nov 2016
N_AD_E05	ELEVATIONS SIGNAGE	D	21 Nov 2016
N_AD_E06	ELEVATIONS CANOPY	D	21 Nov 2016
N_AD_S01	SECTION NORTH/SOUTH	D	21 Nov 2016
N_AD_S02	SECTION EAST/WEST	D	21 Nov 2016
N_AD_DS01	SECTION TYPICAL DETAIL	D	21 Nov 2016

4 SSDA10 acoustic assessment requirements

The **Acoustic Report** submitted with the DA assessed noise and vibration in accordance with the Secretary's Environmental Assessment Requirements (SEARs), City of Sydney (CoS) Council's Development Control Plan (DCP) 2012 and CoS Council's Standard Conditions of Consent. The revised design is therefore assessed in accordance with the same requirements, as applicable and as follows:

- Demolition and construction noise;
  - The construction noise and vibration plan, and attenuation measures, set out in Part B of the **Acoustic Report** are not affected by the revised design and therefore remain applicable.
- Operational noise emission from the site such as mechanical services, child care centre, library, retail uses and public realm; and
- Noise onto noise-sensitive uses within the proposal from external sources such as traffic.
  - The road traffic volumes, noise and the recommended glazing requirements are not affected by the revised design. See Section 4 of the Report.
  - Section 4.4.4.5 *Control of noise impacts to child care centres* of the CoS Council's DCP 2012 requires that the repeatable maximum $L_{Aeq(1hour)}$ must not exceed 40 dB(A) ($L_{eq,1hr}$) within the internal spaces of the child care centre.

5 'Operational' noise

Assessment of operational noise includes the following:

- Noise emission impacts from the proposed North Plot and Square development onto noise-sensitive receivers; and
- Road traffic noise intrusion impacts from Darling Drive, Harbour Street, Pier Street and Hay Street onto the North Plot (not applicable to the revised design).

The nearest noise-sensitive receivers external to the SICEEP development are the Novotel Rockford Hotel and Holiday Inn Hotel.

Noise management measures and controls for the various operations will need to be established to ensure noise from individual tenancies is controlled to not exceed the established noise criteria. This will need to be addressed during the detailed design of the development.

6 Response to Submissions

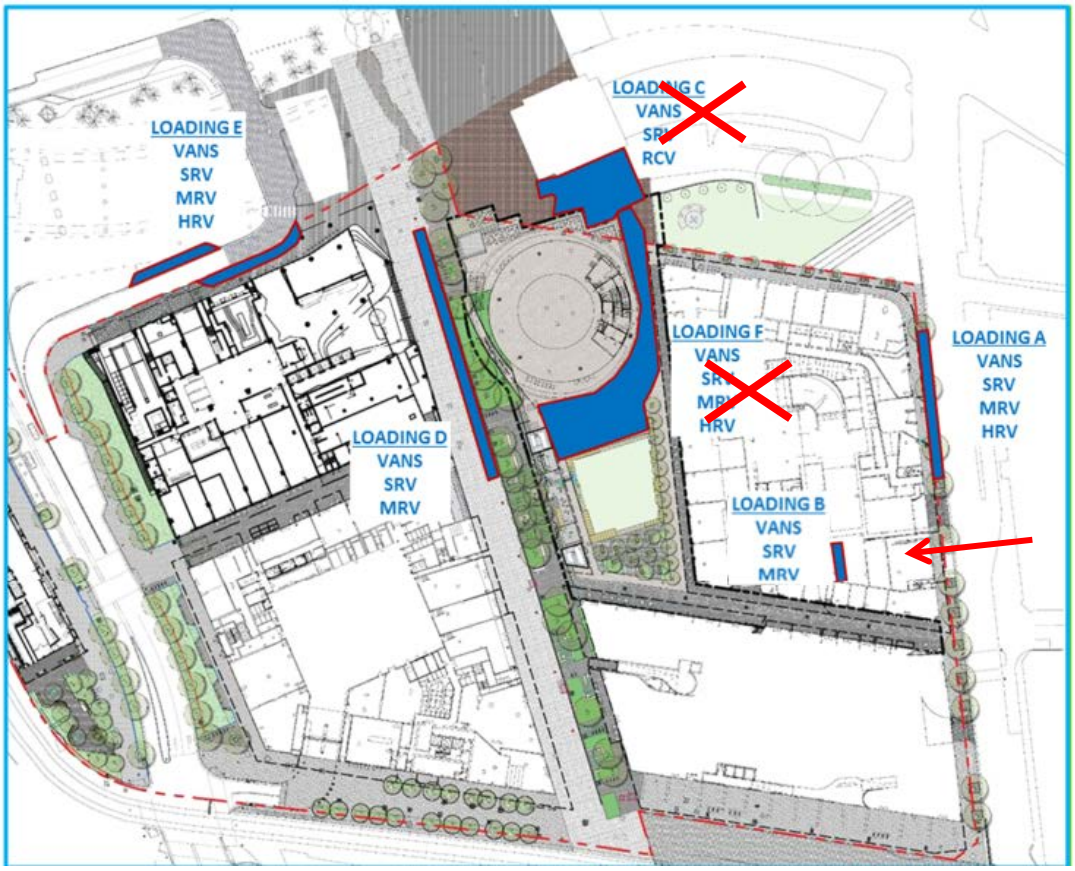
6.1 Department of Planning and Environment

The following acoustic related response to submissions queries were received from the Department of Planning and Environment during the exhibition period.

Query: *The Noise and Vibration report (Appendix P) includes a loading matrix that suggest loading times up to 8pm, however, the loading service area assessment suggests a limit of 10pm. Provide confirmation of exact expected loading times, whether any loading is proposed after events ending at 10pm in the square and how the noise from any such loading will be managed/minimised if proposed.*

Query: Confirm what additional mitigation measures can be used to reduce the impact of noise from outdoor events within the public square on residential properties.

Response: The loading strategy has been amended since the lodgement of the Development Application. Loading for the North Plot will now be serviced through the North East Plot (Loading area B) with loading for the public domain and events now occurring primarily through the boulevard (Loading Area D) with support via Theatre Access Lane (Loading Area E). This has removed loading zones F and C directly outside the North East Plot and Novotel that were identified in the original report as sensitive with regard to noise sensitive receptors.



Loading Zones C and F removed

As noted in the original report Loading Area D will also need to be managed with regard to potential impacts within the Darling Square development. In particular, the SW Plot and SE Plot will need to be considered. Medium and large scale events will require future approvals with Place Management NSW (formally known as SHFA). Attached to the detailed application on an event by event basis, there will be a specific Plan of Management provided which will deal with key acoustic mitigation measures for event types. A general Plan of Management is provided with this RTS that recommends bump out for events finishing after 10pm to occur the next morning to minimise impact on surrounding properties.

6.2 City of Sydney - Child care

The following response to submission query was received from the City of Sydney during the exhibition period.

Query: *The child care centre will require detailed review in relation to acoustic treatments between floors, sufficient and useable outdoor space capable of accreditation, solar access to outdoor space, appointment of child care centre spaces per level, and practicalities of evacuation via fire stairs and lifts. At this stage, the amount of outdoor space shown in the DA drawings (239sqm) is only sufficient for a 34-place centre as opposed to 90-place. The glazing line of the building will have to be moved dramatically.*

Response: The childcare centre has been detailed to incorporate the DCP requirements.

In respect to acoustics noise between floors is predicted to comply with the DCP requirements through the application of acoustic treatment to the underside of Level 4 concrete floor slab within the future childcare fit out application. In the original DA report a recommendation was provided to upgrade the full height glazed facade system to the childcare levels to an R_W rating of 38dB with an indicative construction of 12.76mm laminated glass to assist achieving DCP compliance. This recommendation has been incorporated into the design documentation.

During *Response to Submissions*, the design of the balustrade has been increased to 1800mm high around the childcare terrace to comply with the DCP requirements. Our original assessment in the Report assumed clear line-of-sight and no barrier between the terrace and nearest noise-sensitive receivers. This design improvement is deemed beneficial to the acoustic performance of the child care levels.

6.3 City of Sydney and SHFA - Level 5 Bar/Restaurant

The following acoustic related response to submissions items were received from the City of Sydney and SHFA during the exhibition period.

City of Sydney Query: *"… The BCA Report lodged indicates the roof level restaurant and bar could be occupied by up to 689 patrons and the child care centre, with 90 spaces, would be operating until 7.00pm…"*

and

"… In the case of the North Plot, the wind assessment recommends enclosing the affected outdoor space".

SHFA Query: *It is noted that the proposal includes a rooftop restaurant and bar in addition to community facilities and markets. This appears to be inconsistent with the original purpose of the building on the North Plot and inappropriate to the location given.*

In addressing the response to submissions items list above, the level 5 Bar / Restaurant has undergone additional acoustic modelling to assess the noise impacts within the amended design. The noise impacts predicted to comply with the established noise incorporating the recommendations and operational noise management strategies outlined below.

Specifically, the amended design on level 5 includes the following acoustic related items:

1. Rotation of core and balustrade increase to 1,800mm in height
2. Revised heating and cooling strategy / revised bar/restaurant area and fit out

Detail of the proposed changes and noise impacts are outlined below.

1. Rotation of core and balustrade increase to 1,800mm

Despite the core being rotated towards the Novotel Rockford Hotel, the revised design proposes to install 1800mm high balustrade glazing around the outdoor terrace area, providing additional noise reduction through acoustic shielding. The original assessment assumed no balustrade between the accessible outdoor terrace and nearby noise-sensitive receivers. The revised balustrade height is beneficial to the acoustic performance of Level 5 Bar/Restaurant.

2. Revised heating and cooling strategy / revised bar/restaurant area and fit out

The area and patronage on level 5 has been reduced through design improvements relating to the heating and cooling for the building. This includes the removal of VRV plantrooms located on each floor level with a centralised chiller plantroom on Level 5 and AHU plantroom on Level 1. The Level 5 plantroom perimeter is fully enclosed by the proposed development, shielding the chiller units from any nearby noise-sensitive receivers located at equal or lower height. The design change from level by level VRV plantrooms to a centralised chiller located at the roof level is therefore an improvement to the acoustic performance when assessed at the nearby sensitive receivers.

Detailed noise mitigation measures for the mechanical units to conform with the acoustic performance requirements set out in Section 3.2.1 of the **Acoustic Report** are to be addressed in the detailed design stage.

The indicative fit out for the Level 5 Bar / Restaurant has been updated and patron numbers reduced due to the centralised plant room / lifting strategy and reduced floor area with a maximum of 280 external and 120 internal patrons.

In relation to the suitability of a bar/ restaurant on Level 5 we have undertaken further modelling and incorporated additional mitigation measures to ensure compliance with the standard noise criteria set by Liquor & Gaming NSW as referenced in the original report for trading between 7:00am to 12:00am Monday to Sunday,

Existing noise environment

The Acoustic Report previously presented the measured overall noise levels from the long-term noise monitoring results (refer to Section 2.2.1 of the Acoustic Report). In order to assess the proposed Level 5 Bar/Restaurant in accordance with the noise requirements of the LGNSW, Table 2 presents the representative octave frequency band background L_{90} and ambient L_{eq} noise levels for each assessment period. Note that the measured background noise levels have been established from the long-term noise monitoring location L1.

Table 2: Long-term noise monitoring results

Descriptor	Period	Overall	Octave band centre frequency - Hz (dBZ)								
		dB(A)	31.5	63	125	250	500	1k	2k	4k	8k
L1 - Entertainment Centre - North											
L_{90} Background Noise Levels	07:00 - 18:00	61	64	64	61	60	58	57	54	43	30
	18:00 - 22:00	59	62	61	59	59	57	55	51	41	28
	22:00 - 23:00	58	62	61	58	58	56	54	49	39	28
	23:00 - 00:00	56	61	59	56	56	54	52	47	37	26
L_{Aeq} Ambient Noise Levels	Day	65	69	70	66	63	61	61	56	48	37
	Evening	62	66	66	64	60	59	58	54	45	34
	Night	59	64	63	60	59	57	56	50	40	29

Notes: Day: 07:00-18:00 Monday to Saturday and 08:00-18:00 Sundays & Public Holidays
Evening: 18:00-22:00 Monday to Sunday & Public Holidays
Night: 22:00-07:00 Monday to Saturday and 22:00-08:00 Sundays & Public Holidays
Additional time periods have been included to cover the proposed operating hours.
As required by the INP, the external ambient noise levels presented are free-field noise levels, ie. no facade reflection.

Project noise goals

The octave band noise goals for the residential receivers set out in Table 3 below have been established from measured noise levels set out in Table 2.

Table 3: Residential receiver noise goals (external), L_{10}

Assessment period	Octave band centre frequency - Hz (dBZ)								
	31.5	63	125	250	500	1k	2k	4k	8k
07:00 - 18:00	69	69	66	65	63	62	59	48	35
18:00 - 22:00	67	66	64	64	62	60	56	46	33
22:00 - 23:00	67	66	63	63	61	59	54	44	33
23:00 - 00:00	66	64	61	61	59	57	52	42	31

The established noise criteria are considered conservative as they are based on existing background noise levels and the future background noise levels with the whole Precinct active are expected to increase.

Licensed premises noise emission assessment

Noise sources

Noise emission from the Level 5 Bar/Restaurant has been assessed based on the number of patrons on the outdoor terraces and from patrons with background music internally. The source noise levels used for the predictions, presented in Table 4, were obtained from measurements of similar types of development.

Table 4: Source noise levels for licensed premises assessment

Area	Applicable noise source	Overall dB(A)	Octave band centre frequency - Hz (dBZ)								
			31.5	63	125	250	500	1k	2k	4k	8k
Bar (internal)	Internal patrons with music (L_p L_{10})	88	67	79	77	79	85	84	81	74	64
Bar (external)	Patrons with background music, per person (L_w L_{10})	85	-	79	78	77	82	81	77	70	56

The noise prediction methodology is set out in the **Acoustic Report**.

The following scenarios were assessed:

Scenario	Time Period	Outdoor area	Internal space
1	7:00am - 10:00pm	Fully occupied with a maximum of 280 patrons	Facade fully open, fully occupied with a maximum of 120 patrons
2	10:00pm - 11:00pm	Fully occupied with a maximum of 280 patrons	Facade fully closed, fully occupied with a maximum of 120 patrons
3	11:00pm - 12:00am	Smoker only areas (32 patrons on the northern side, 20 patrons on the southern side)*	Facade fully closed, fully occupied with a maximum of 120 patrons

Notes: * Only a half of the patrons is assumed to be talking at any one time with raised voice.
Patrons leaving the bars after midnight are to be advised to leave quietly and in an orderly manner, PoM.

Noise prediction results & assessment

Table 5, Table 6 and Table 7 summarise the results of the noise assessment, presenting the predicted noise emission levels at the identified assessment locations against the established noise goals. Predictions were undertaken for all identified receivers; however, results are only presented for the worst affected locations.

Table 5: Predicted noise level assessment during daytime and evening periods, L_{10}

Assessment ID	Description		Octave band centre frequency - Hz (dBZ)								
			31.5	63	125	250	500	1k	2k	4k	8k
NE Plot - West Tower (L7)	Predicted noise levels		-	60	58	57	62	60	56	46	33
	Noise goals	07:00 - 18:00	69	69	66	65	63	62	59	48	35
		18:00 - 22:00	67	66	64	64	62	60	56	46	33
SE Plot (L7)	Predicted noise levels		-	60	59	58	62	60	56	46	32
	Noise goals	07:00 - 18:00	69	69	66	65	63	62	59	48	35
		18:00 - 22:00	67	66	64	64	62	60	56	46	33
Novotel Rockford Hotel	Predicted noise levels (external)		-	61	59	59	65	64	60	53	38
	Predicted noise levels (internal)*		-	37	31	27	27	28	24	8	<0
	Internal noise criteria	All time periods	49	45	44	42	38	33	28	22	16

Note: * Calculations via facade based on measured parameters on site, including window size (1.2m x 1.4m), room size (5.0m x 3.1m) and glazing thickness of 10mm float glass in fixed frame (estimated R_W33).

Table 6: Predicted noise level assessment during the 10:00pm to 11:00pm period, L_{10}

Assessment ID	Description		Octave band centre frequency - Hz (dBZ)								
			31.5	63	125	250	500	1k	2k	4k	8k
NE Plot - West Tower (L7)	Predicted noise levels		-	59	57	56	60	58	53	44	29
	Noise goals	23:00 - 00:00	67	66	63	63	61	59	54	44	33
SE Plot (L7)	Predicted noise levels		-	60	58	57	61	59	54	44	25
	Noise goals	23:00 - 00:00	67	66	63	63	61	59	54	44	33
Novotel Rockford Hotel	Predicted noise levels (external)		-	60	58	57	62	61	57	50	34
	Predicted noise levels (internal)*		-	36	30	25	24	25	21	5	<0
	Internal noise criteria	All time periods	49	45	44	42	38	33	28	22	16

Note: * Calculations via facade based on measured parameters on site, including window size (1.2m x 1.4m), room size (5.0m x 3.1m) and glazing thickness of 10mm float glass in fixed frame (estimated R_W33).

Table 7: Predicted noise level assessment during the 11:00pm to 12:00am period, L_{10}

Assessment ID	Description		Octave band centre frequency - Hz (dBZ)								
			31.5	63	125	250	500	1k	2k	4k	8k
NE Plot - West Tower (L7)	Predicted noise levels		-	44	48	52	57	50	46	40	31
	Noise goals	23:00 - 00:00	66	64	61	61	59	57	52	42	31
SE Plot (L7)	Predicted noise levels		-	43	48	52	56	50	45	38	26
	Noise goals	23:00 - 00:00	66	64	61	61	59	57	52	42	31
Novotel Rockford Hotel	Predicted noise levels (external)		-	44	48	52	57	51	47	40	33
	Predicted noise levels (internal)*		-	20	20	20	19	15	11	<0	<0
	Internal noise criteria	All time periods	49	45	44	42	38	33	28	22	16
Note:	* Calculations via facade based on measured parameters on site, including window size (1.2m x 1.4m), room size (5.0m x 3.1m) and glazing thickness of 10mm float glass in fixed frame (estimated R_W33).										

Discussions

Based on the assessment above with the consideration that the established noise criteria is conservative, the development is deemed acceptable with the Level 5 bar during the proposed trading hours.

The proposed use of the Level 5 bar is predicted to comply with the established noise incorporating the recommendations and operational noise management strategies outlined below.

Recommendations

1. Operational management up to 10pm

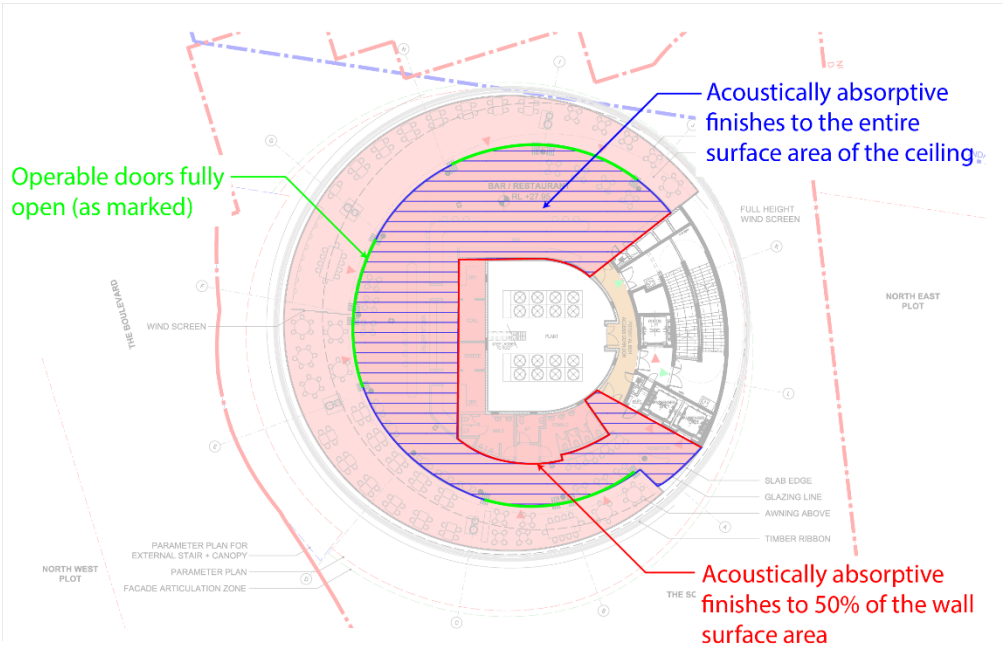
   It is recommended that the following acoustic measures are incorporated into the future fit out during detailed design to enable outdoor areas to be fully occupied up to 10pm with a maximum of 280 patrons and indoor areas to be fully occupied with a maximum of 120 patrons to ensure compliance with the CoS Council's Standard Conditions of Consent for licensed premises. We recommend the absorptive material achieve a minimum NRC rating of 0.9.

   Acoustically absorptive finishes to be applied to:

   - The entire surface area of the ceiling with the exclusion of kitchen and bathroom areas
   - Acoustically absorptive finishes should be provided to 50% of the internal wall surface area (ie. kitchens and bathroom walls)

   100% of the operable facade could be open with the implementation of sound limiting devices. If sound limiting devices are not implemented during detailed design, only 50% of the operable facade could be open.

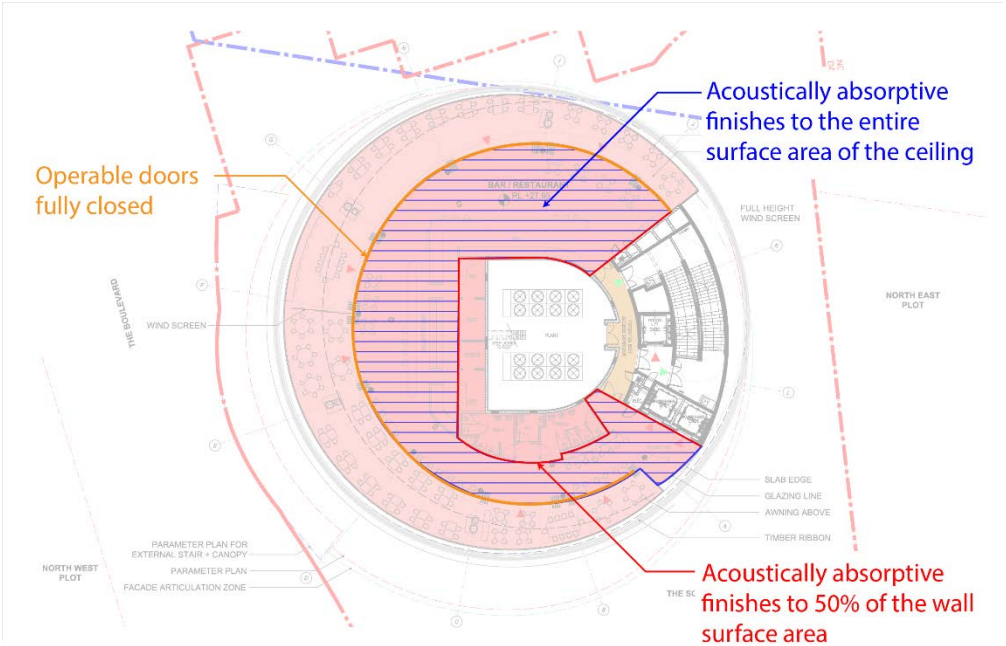
Figure 1: Up to 10pm operation



2. Operational management 10pm-11pm

Between 10pm - 11pm, operable doors are to be fully closed and outdoor areas can be fully occupied with a maximum of 280 patrons.

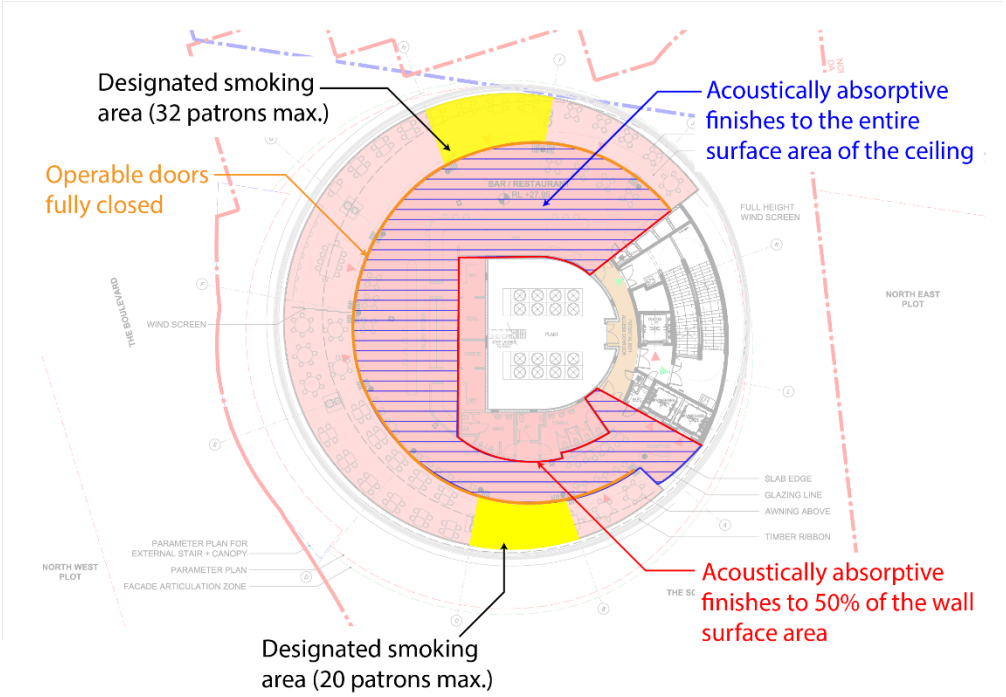
Figure 2: 10pm - 11pm operation mark-up



3. Operational management 11pm-12am

Between 11pm to 12am, no patrons are permissible on outdoor areas except for the designated smoking areas nominated in Figure 3. All doors are to be fully closed.

Figure 3: 10pm - 11pm operation mark-up



The outdoor patron capacities within the smoking zones are to be limited to 32 patrons on the northern side and 20 patrons on the southern side. Doors leading out to the outdoor terraces are to be kept closed at all times except for egress/ingress of patrons.

4. Music noise monitoring and sound system limiting devices

Where an in-house sound system is installed, it is recommended that the noise level is controlled by an RMS compressor/limiter (eg. a Galaxy Audio DS-CP22, Rane HAL, BSS Blu, Symetrix Jupiter or MediaMatrix X-Frame 88). Multi-band compression is recommended for greater control over frequency content. Alternative sound-pressure measurement/limiter devices are also available (eg. CESVA LRF-04 and LRF-05, APEX Argos and HERA). Where different noise limits are to apply at different operating times, the device should include or support multiple time-based settings. The noise limits and setting of the device should be made during acoustic compliance testing by an appropriately qualified acoustic consultant in conjunction with the system engineer/technician.

If entertainment is to require use of non-in-house sound systems, instrument amplification or acoustic instruments (ie. personal band amplification, and live drums), the above mentioned sound system limiter will not effectively control internal noise levels. A permanent sound 'monitor' device is therefore recommended to be installed (eg. Apex HERA, Peptronics Australia Model CSM-2 or Sentry Music Noise Controller). Sound monitors continuously measure sound levels using a microphone and typically display coloured light or alternative indicators to notify operators and musicians if music levels are approaching or exceed the noise limits.

Sound monitors can also include a cut-off mechanism, so that if music is continued to be played in excess of the noise limit music stops momentarily either through the removal of the source of power or the disconnection of the audio feed. Where different noise limits are to apply at different operating times, the device should include or support multiple time-based settings.

7 Conclusion

Renzo Tonin & Associates has completed a reassessment of noise to address the Response to Submissions queries regarding the proposed amended development of the North Plot and Square in Darling Square (SSD 7021). The assessment has been carried out in accordance with the policies and guidelines specified in the Secretary's Environmental Assessment Requirements (SEARs) and the City of Sydney (CoS) Council's Development Control Plan (DCP) 2012. Where relevant the report has presented recommended mitigation and management measures for the control of noise for the operational phase of the development. The report has also identified where additional detailed assessment may be required during the design development phase of the project.

Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Authorised
04.10.2016	DRAFT	0		BP	NT	
04.10.2016	Issued to Client for review and comments		1			NT
06.10.2016	Final		2	BP		NT
06.12.2016	Revised final		3	BP/DS		NT
12.12.2016	Revised final after comments		4	BP/DS		NT
30.01.2017	Amend to DoP feedback		5	BP		NT