RBA ACOUSTICS

8 IMPERIAL SQUARE

Acoustic Assessment Report

Reference: 12823.RP01.AAR.1
Prepared: 29 June 2023
Revision Number: 1

8 Imperial Square Ltd
8 Imperial Square
Cheltenham
GL50 1QB

8 IMPERIAL SQUARE

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Revision	Comment	Date	Prepared By	Approved By
0	First issue of report	29 June 2023	James Melville	Torben Anderson
1	Updated following comments from Lisa Inzani of Poppleston Allen	29 June 2023	James Melville	Torben Anderson

Terms of contract:

RBA Acoustics Ltd has prepared this report in accordance with our Scope of Work. RBA Acoustics Ltd shall not be responsible for any use of the report or its contents for any purpose other than that for which it was provided. Should the Client require the distribution of the report to other parties for information, the full report should be copied. No professional liability or warranty shall be extended to other parties by RBA Acoustics Ltd without written agreement from RBA Acoustics Ltd.

The recommendations within this report relate to acoustics performance only and will need to be integrated within the overall design by the lead designer to incorporate all other design disciplines such as fire, structural integrity, setting-out, etc. Similarly, any sketches appended to this report illustrate acoustic principles only and again will need to be developed in to full working drawings by the lead designer to incorporate all other design disciplines.

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Contents

1. INTRODUCTION

8 Imperial Square Ltd, is looking to operate as a private members club and has applied for a Premises Licence for 8 Imperial Square to allow the provision of Recorded Music playback within its internal spaces. As part of the proposed operation, there will also be a designated external terrace to the front of the premises.

Recorded Music will be played up to a volume that allows people within the Premises to communicate.

We understand the premises has applied for a Premises Licence to operate Monday to Sunday with the following operating hours:

Sale of Alcohol, Films, Live Music, Recorded Music, Performance of Dance, Anything of a Similar Description to Music and Dance

- Monday to Saturday: 10:00 hours to 02:00 hours
- Sunday: 10:00 hours to 00:00 hours

Late Night Refreshment

- Monday to Saturday: 23:00 hours to 02:00 hours
- Sunday: 23:00 hours to 00:00 hours

Opening Hours

- Monday to Saturday: 08:00 hours to 02:30 hours
- Sunday: 08:00 hours to 00:30 hours

RBA Acoustics has been appointed to undertake an impact assessment of the noise emitted from the use of the proposed front external terrace, patron dispersal and music breakout from the premises.

Noise associated with the premises has been assessed and compared with the existing noise levels at the site. This report presents the results of the noise assessment.

In summary, our report confirms that subject to appropriate conditions and management control measures, the proposed operation of the 8 Imperial Square scheme will not lead to any adverse noise impact on nearby residents.

2. SITE DESCRIPTION

8 Imperial Square is located within the Centre of Cheltenham off Imperial Square (A46). The nearest noise sensitive locations to the premises are 11 Imperial Square and flats associated with Imperial Gate. 11 Imperial Square is located approximately 20m south-east of the premises along the same row of terraces. Imperial Gate is a block of residential flats which is located approximately 16m to the northeast of the rear of the premises along Imperial Lane.

During our time on site in the evening (18:00 – 23:00), it was noted prevailing noise environment to the front of the building was dominated by traffic noise from passenger vehicles along Imperial Square. It is likely that the same noise climate persists into to the late night-time period.

To the rear of the site, along Imperial Lane, the noise climate was dominated by screened road traffic movements from the nearby road network, as well as birdsong and noise from seagulls.

The premises and surroundings are illustrated on the site plan attached in Figure 1 (Appendix C).

3. ENVIRONMENTAL NOISE SURVEY

3.1 Survey Methodology

Monitoring of the prevailing background noise was undertaken over the following period:

22:30 Tuesday 20th June to 10:00 Wednesday 21st June 2023.

As the survey was unattended it is not possible to comment with certainty regarding meteorological conditions throughout the entire survey period. However, based on observations during the site visits and weather reports for the area, conditions were generally considered suitable for obtaining representative noise measurements, being predominantly dry with little wind.

Measurements were made of the L_{A90}, L_{Amax} and L_{Aeq} noise levels over sample periods of 15 minutes.

3.2 Measurement Location

To determine the existing noise climate around the site measurements were undertaken at the following location.

Measurement Position 1 – 8 Imperial Square – The microphone was positioned on the external terrace at the first-floor level of the premises. The microphone was secured to the edge of first-floor terrace via a bracket and positioned approximately 3.5m from the façade of the building away from any reflective surfaces. The microphone position is therefore considered free-field.

The noise climate was noted to consist primarily of road traffic noise from Imperial Square as well as from bird noise.

The measurement position is also illustrated on the site plan attached in Figure 1 (Appendix C).

Only one measurement position was undertaken along the Imperial Square facing façade as this position was considered relevant for the purpose of the patron noise front external terrace assessment.

No measurements were undertaken along the Imperial Lane facing façade as there is to be no patron noise associated with the rear of the premises.

3.3 Instrumentation

For information regarding the equipment used for the measurements please refer to Appendix B.

The sound level meter was calibrated both prior to and on completion of the survey with no significant calibration drift observed.

3.4 Results

The noise levels measured are shown as time-histories on the attached Graphs 1-3 (Appendix C).

The typical L_{A90} and the period averaged L_{Aeq} noise levels measured are summarised in Table 1 along with typical L_{AFmax} levels measured during the night time.

Table 1 – Measured Levels

Measurement Period	Typical $L_{A90,15min}$ (dB)	L_{Aeq} (dB)	Typical $L_{AFmax,15min}$ (dB)
Daytime (07:00 – 23:00)	56	58	N/A
Night-time (23:00 – 07:00)	38	50	71

4. CRITERIA

With regards to the assessment of noise impact on neighbouring amenity due to the change of use of the premises, we have considered the following documents and policies in assessment.

4.1 National Planning Policy Framework

The current National Planning Policy Framework (NPPF), February 2019, sets out the Government's planning policies for England. In respect of noise, Paragraph 180 of the NPPF states the following:

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason"

4.2 Noise Policy Statement for England (NPSE)

The NPSE seeks to clarify the underlying principles and aims in existing policy documents, legislation and guidance that relate to noise. The statement applies to all forms of noise, including environmental noise, neighbour noise and neighbourhood noise.

The statement sets out the long-term vision of the government's noise policy, which is to "promote good health and a good quality of life through the effective management of noise within the context of policy on sustainable development".

This long term vision is supported by three aims:

- Avoid significant adverse impacts on health and quality of life;
- Mitigate and minimise adverse impacts on health and quality of life; and
- Where possible, contribute to the improvements of health and quality of life.

The long-term policy vision and aims are designed to enable decisions to be made regarding what is an acceptable noise burden to place on society.

The Explanatory Note within the NPSE provides further guidance on defining "significant adverse effects" and "adverse effects" using the following concepts:

- No Observed Effect Level (NOEL) – the level below which no effect can be detected. Below this level no detectable effect on health and quality of life due to noise can be established;
- Lowest Observable Adverse Effect Level (LOAEL) – the level above which adverse effects on health and quality of life can be detected; and
- Significant Observed Adverse Effect Level (SOAEL) – the level above which significant adverse effects on health and quality of life occur.

The three aims can therefore be interpreted as follows:

- The first aim is to avoid noise levels above the SOAEL;
- The second aim considers situations where noise levels are between the LOAEL and SOAEL. In such circumstances, all reasonable steps should be taken to mitigate and minimise the effects. However, this does not mean that such adverse effects cannot occur; and
- The third aim considers situations where noise levels are between the LOAEL and NOEL. In these circumstances, where possible, reductions in noise levels should be sought through the pro-active management of noise.

The NPSE recognises that it is not possible to have single objective noise-based measures which define the SOAEL, LOAEL and NOEL and that are applicable to all sources of noise in all situations. The levels are likely to be different for different noise sources, receptors and at different times of the day.

4.3 Planning Practice Guidance (2014)

The national Planning Practice Guidance (PPG) "advises on how planning can manage potential noise impacts in new development" and provides guidelines that are in line with the NPPF.

The PPG states that local planning authorities should take account of the acoustic environment and in doing so consider:

- Whether or not a significant adverse effect is occurring or likely to occur;
- Whether or not an adverse effect is occurring or likely to occur; and
- Whether or not a good standard of amenity can be achieved.

(Paragraph: 003 Reference ID: 30-003-20190722 Revision date: 22 07 2019)

This guidance introduced the additional concepts of NOAEL (No Observed Adverse Effect Level), and SOAEL (Significant Observed Adverse Effect Level) which can be seen in Table 3 below.

Factors to be considered in determining whether noise is a concern are identified including the absolute noise level of the source, the existing ambient noise climate, time of day, frequency of occurrence, duration, character of the noise and cumulative effects (004 Reference ID: 30-004-20190722 Revision date: 22 07 2019).

With particular regard to mitigating noise effects on residential development the PPG highlights that effects may be partially off set if residents have access to a relatively quiet façade as part of their dwelling or a relatively quiet amenity space (private, shared or public) (011 Reference ID: 30-011-20190722 Revision date: 22 07 2019).

Table 2 – Planning Practice Guidance

Perception	Examples of Outcomes	Increasing Effect Level	Action
No Observed Effect Level			
Not noticeable	No effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid through use of appropriate mitigation whilst taking into account the social and economic benefit
Unacceptable Observed Adverse Effect Level			
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent through use of appropriate mitigation

4.4 WHO Environmental Noise Guidelines

To put the predicted levels into context, it is important to consider the recommendations stated in the World Health Organisation (WHO) document "Environmental Noise Guidelines for the European Region" 2018. This document sets out to define "recommended exposure levels for environmental noise in order to protect population health". The guidance documents relates specifically to external noise levels, and recommends that "all CNG (WHO Community Noise Guidelines, 1999) indoor guideline values and any values not covered by the current guidelines (such as industrial noise and shopping areas) should remain valid". We therefore make reference to the WHO Community Noise Guidelines for recommendations on internal noise levels.

The WHO document "Guidelines for Community Noise" describes guideline levels that are "essentially values for the onset of health effects from noise exposure". A table of guideline values is included, relating to adverse health effects, referred to as any temporary or long term deterioration in physical, psychological, or social functioning that is associated with noise exposure. The following is an extract from the Table 4.1: Guideline values for community noise in specific environments during the daytime period (07:00 – 23:00 hours), as stated in the WHO document.

Table 3 – Guideline Values for Community Noise

Specific Environment	Critical Health Effect(s)	L_{Aeq} (dB)	Period (hours)
Outdoor living area	Serious annoyance, daytime and evening	55	Daytime (07:00 – 23:00)
	Moderate annoyance, daytime and evening	50	Daytime (07:00 – 23:00)
Dwelling, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	Daytime (07:00 – 23:00)

4.5 Institute of Environment Management & Assessment (IEMA) and Institute of Acoustics Guidelines on Noise Impact Assessment

When assessing the subjective impact of any development it is important to consider the specific circumstances of the site. The characteristics of the various sources must therefore be considered in addition to factors common to all noise impact assessments such as existing background noise level comparisons.

The Institute of Environmental Management and Assessment (IEMA) document "Guidelines on Noise Impact Assessment" gives guidance as to how basic noise changes may be categorised.

Table 4 has been adopted to categorise the difference between the measured levels as identified in the guidelines published jointly by the IOA and IEMA. This identifies the impact of different levels of noise above the prevailing background noise.

Table 4 – Significance of Noise Level Change

Noise Change (dBA)	Category
0.1-2.9	Slight Impact
3.0 – 4.9	Moderate Impact
5.0 – 9.9	Substantial Impact
10.0 and above	Severe Impact

4.6 Subjective Impact

In addition to the comparison of the difference in background noise levels, in line with the above guidelines, it is important to understand the potential subjective effect of such changes in the noise level. Table 5 compares the generally accepted subjective response of typical subjects to variations in sound pressure level.

Table 5 – Subjective Response to Noise Levels

Change in Sound Level (dB)	Change in Power		Apparent Change in Loudness
	Decrease	Increase	
3	1/2	2	Just Perceptible
5	1/3	3	Clearly Noticeable
10	1/10	10	Half or Twice as Loud
20	1/100	100	Much Quieter or Louder

4.7 Summary

Based on the above guidance, we consider it appropriate that the following increases of the existing measured background noise levels due to activities as a result of the change of use of the premises will fall in the following effect level categories.

Table 6 – Categorisation of Effect Level Categories

Background Noise Level Increase $L_{eq,\ T}$ (dBA)	Effect(s)	NPSE Assessment	Subjective Response
0.1 – 2.9	Slight/Not Significant	No Observed Adverse Effect	Imperceptible
3.0 – 4.9	Moderate	Lowest Observed Adverse Effect	Perceptible
5.0 – 9.9	Substantial	Significant Observed Adverse Effect	Clearly Noticeable
10.0 and above	Very Substantial	Unacceptable Adverse Effect	Twice as Loud

5. MUSIC NOISE BREAKOUT ASSESSMENT

5.1 Criteria

There is no specific guidance for music noise breakout from bar/entertainment venues.

Therefore, would expect that achieving inaudibility at the nearest noise sensitive receptors would be considered to be acceptable.

5.2 Airborne Music Noise Breakout

Measurements and observations of airborne noise breakout through the external façade of 8 Imperial Square, impacting on the nearby noise sensitive properties, 11 Imperial Square and Imperial Gate, were undertaken during the site tests. The details of the tests undertaken for each area are presented in the following sections.

Internal Music Levels

In order to obtain measurements at nearby receivers of a worst-case scenario music at maximum possible level the audio system could tolerate without distorting through all speakers in all spaces across the premises.

It was observed on site that the largest speaker systems, and thus the highest music levels, were located within the Main Salon on the first Floor Level (overlooking Imperial Square) and the "Sophie" Suite on the Second Floor (Overlooking Imperial Lane).

The measured internal music noise levels within spaces within 8 Imperial Square are presented in Table 7 below:

Table 7 – Measured Internal Music Levels

Location	Measure Internal Music Level (dB) at 1/1-Octave Band Centre Frequency (Hz)							dBA
	63	125	250	500	1000	2000	4000	
Upper Ground Floor	68	74	72	69	70	67	61	**74**
First Floor	73	83	77	74	78	71	65	**80**
Second Floor	80	78	79	79	81	82	75	**86**

The above internal music levels were considered to be uncomfortable on all levels of the premises with conversation being extremely difficult with the need to shout to communicate. Its likely the levels used during our measurements is in excess of a suitable level for the use of the spaces.

11 Imperial Square

11 Imperial Square is noted to be the nearest noise sensitive receptor to Imperial Square facing facade of the premises.

With the electroacoustic system operating as detailed in Table 7 subjectively it was noted that music noise breakout at the façade of the receptor location was barely audible at low frequencies (63Hz) with music noise at other frequencies being inaudible.

Imperial Gate

11 Imperial square is noted to be the nearest noise sensitive receptor to Imperial Square rear facing facade of the premises.

With the electroacoustic music system operating as detailed in in Table 7 subjectively it was noted on site that music noise breakout at the receptor location was audible at the majority of frequencies against the prevailing background noise climate.

5.3 Music Noise Transfer

It was not possible to liaise with the residents of 11 Imperial Square and agree for access to be granted to their property in order to take measurements of any potential music noise transfer to their property.

As a compromise we were able to gain access to the property at 6 Imperial Square at the first-floor level.

Given this property is closer to the premises than the residential receptor at 11 Imperial Square it can be considered that any music noise transfer observed is representative of a worst-case assessment.

Objectively, the measurements taken are inconclusive regarding any change in levels due to music noise operation and subjectively the music noise transfer was inaudible.

5.4 Discussion

With music in all rooms operating at maximum volume levels, noise break-out was audible at the nearest noise sensitive receptors.

Either the installation of a noise control limiter (which could be set and calibrated in cooperation with the local authority), the installation of secondary glazing to the existing windows or a combination of the two would be expected to allow the criteria to be met at the nearest noise sensitive receptors.

Our assessment of noise transfer through the buildings structure to 11 Imperial Square found that music noise from the premises was inaudible and is therefore considered to be acceptable.

6. ASSESSMENT OF PATRON NOISE

A cumulative assessment has been carried out to determine the impact of noise generated by taxi drop-offs and patron speech in the front external terrace, which are both located outside of the premises along Imperial Square. A 3D Environmental Noise Model has been produced to provide a detailed cumulative impact assessment.

6.1 3D Environmental Noise Model

An environmental noise model of the site, including all proposed buildings and existing surrounding buildings, has been produced using the CadnaA platform.

The software allows the site topography, existing buildings and sound sources to be built into the model such that the propagation of sound sources (i.e. guest speech noise) can be simulated and predicted at the nearest noise-sensitive façades. The existing buildings are subsequently built into the model and calculations using the methodology outlined in ISO 9613 are undertaken to predict façade incident noise levels at all floor heights.

A render showing the CadnaA noise model is provided in Figure 4.

6.2 Assumptions Used in Assessment

Assessment Locations

The nearest residential properties receptors to the front of the 8 Imperial Square premises are understood to be the first-floor windows belonging to 11 Imperial Square.

The main dispersal route for patrons is along Imperial Square facing elevation. Additionally, patrons will also make use of the front external terrace also along the front elevation of the premises.

The proposed operation sets out that there will be no patron activity to the rear, nor will the rear be usable as an exit unless in an emergency.

The attached Site Plan shown in Figure 1 shows the location of the assessment location. These are also shown on the 3D render of the environmental noise model in Figure 4.

Hours of Use of Designated Front External Terrace

In our assessment we have assumed the front external terrace is used by customers up to 02:00 hours when in operation.

Acoustic Model Settings

Our environmental noise model has assumed the following:

- Customer speech noise has been modelled at a 1.5m height which is considered typical of a person standing for a worst-case assessment.
- Ground absorption has been set as acoustically hard ground for the surrounding site for a worst- case assessment.
- Individual point sources, representative of each person, have been used for the extent of the designated front external terrace to the front of site.

Noise Level Data Used in Assessment

The following noise data has been used to assess the cumulative noise impact generated by future activities associated with the new premises:

Patron Speech Noise

The speech noise levels used in the acoustic model are based on a single person speaking at raised conversation level and source of the noise data is also presented below.

It should be noted, the speech noise data used correlates well with noise data published in other documents and is widely used for these types of assessment. In addition, we would note the data used in our assessment correlates well with speech noise levels previously measured by RBA Acoustics.

We understand that the maximum capacity of the front external terrace is 8 people at one time after 22:00 hours. Of those 8 persons we assume that half of them i.e. 4 customers, will be speaking at any one time, as not all people are expected to talk simultaneously. This is based on the fact that one person would typically be listening to another during a conversation. To provide some margin of safety, we have assumed that those persons speaking will do so using a raised voice.

As part of the premises proposed operation, security staff will be positioned externally and will provide supervision of the proposed front external terrace and of patron dispersal to reinforce the need for respectful behaviour. As such, we consider that using noise data for raised voices provides a worst-case assessment.

Table 10 – Noise Data of Speech Used in Acoustic Model

Parameter	Sound Power Level (dB) at Octave Band Centre Frequency (Hz)								Overall L_{wA} (dB)
	63	125	250	500	1k	2k	4k	8k	
1No. person speaking at raised conversation level [1]	48	59	70	75	72	64	57	48	**75**

REFERENCE USED FOR NOISE DATA:

[1] ANSI 3.5-1997 (1997). American National Standard – Methods for Calculation of the Speech Intelligibility Index

Noise Generated by Taxi Pick-up/Drop-offs

This number of taxi pick-up/drop off events is based the following assumptions, as confirmed by venue management:

- Not all patrons will use taxis to depart from the premises i.e. some will travel by foot or via public transport.
- A majority of patrons who do leave via taxi will leave in groups of 2 or 3.
- Taxis may pull up to the premises until 20:00 hours.
- After 20:00 Patrons will be asked to walk to the nearby Taxi Rank on The Promenade.

Given that taxi drop offs and pick-ups will cease to serve the area directly outside the front premises after 20:00 hours we would expect the level of impact before this time to be minimal given that the access road is used for vehicle movements on a regular basis during the daytime period due to the adjacent offices and workspaces.

Therefore, we have excluded noise generated by Taxi Pick-up/Drop-offs from our assessment. However groups of patrons exiting the premises will be modelled.

In regards to, patrons exiting the premises, we have assumed a 2No. groups of patrons leaving the premises at once in a 5 minute period.

One group will travel along the footpath directly outside 8 Imperial Square toward the taxi rank on The Promenade and the other along the footpath directly passing outside 11 Imperial Square. Given the majority of patrons will exit towards the taxi rank this is considered a worst case approach.

6.3 Results of Assessment

The results produced by our 3D environmental noise model, predicted at the 11 Imperial Square receptor, are presented below.

Patron Noise – Front external terrace and Dispersal

Table 11 presents the results of our patron noise assessment:.

Table 11 – Predicted Noise Increase at 11 Imperial Square

Activity	Existing $L_{Aeq,T}$ (dB) (22:00 – 02:00 hours)	Predicted $L_{Aeq,5min}$ (dB)	Resultant $L_{Aeq,\ 5minutes}$ (dB)	Noise Level Increase (dB)
Cumulative level of 8No. patrons in front external terrace and 2No. groups of 3No. patrons speaking whilst leaving the premises (raised conversation level)	47	46	49	+2

6.4 Discussion of Results

Significance of Noise Level Change and Noise Policy Statement for England Effect Level

When comparing the increase in noise level change to the IEMA guidelines summarised in Table 3 of this report, the worst-case subjective significance of the worst-case 2 dBA change at 11 Imperial Square is considered a "Slight Impact". However, this would fall into the "No Observed Adverse Effect Level" NPSE category which can be seen in Table 5.

Subjective Response to Apparent Change of Loudness

When assessing the worst-case 2 dBA noise level increase to the subjective response of the apparent change of loudness as shown in Table 6 of this report, the change in loudness would not be discernible.

7. CONCLUSION

RBA Acoustics have undertaken an assessment of potential entertainment and patron noise sources to the prevailing background noise levels measured at the nearby noise sensitive premises.

Predicted noise levels have then been determined at the nearest residential receptors and subsequently compared against a series of criteria proposed as being appropriate for the assessment of noise from licensed premises.

The results of our assessment can be summarised as follows:

- Noise associated with patron dispersal from premises along Imperial Square will lead to no adverse noise impact to the worst affected residential receptors.
- Noise associated with a maximum of 8No. patrons using the front external terrace along Imperial Square after 22:00 hours will lead to no adverse noise impact to the worst affected residential receptors.
- The venue proposes to have door staff constantly monitoring the proposed front external terrace and patron dispersal, to reinforce the need for respectful behaviour. As such, the raised-voices noise data used in our assessment is anticipated to provide a worst-case scenario.
- Based on our assessment of Music Noise Breakout we anticipate that music noise breakout to nearby receptors can be controlled by simply limiting music levels to suitable levels. If internal music levels are desired to be higher than the level set during the limiting exercises then secondary glazing could be installed so an increased internal music level can be permitted without adversely affecting the nearest noise sensitive properties
- Based on our assessment of Music Noise Breakout from 8 Imperial Square we have recommended that a limiter setting exercise is carried out in collaboration with the Local Authority in order to control music noise breakout out to the nearest receptors.

With the above in mind, our assessment demonstrates that, subject to appropriate conditions and management control measures, the proposed operation of the 8 Imperial Square scheme will not lead to any adverse noise impact on nearby residents.

Appendix A – Acoustic Terminology

A-weighting (e.g. dB(A))	A correction applied across the frequency bands to take into account the response of the human ear, and therefore considered to be more representative of the sound levels people experience.
DeciBel (dB)	Unit used for many different acoustic parameters. It is the logarithmic ratio of the level being assessed to a standard reference level.
L_{eq}	The level of a notional steady sound which, over a stated period of time, *T*, would have the same acoustic energy as the fluctuating noise measured over that period. Typically used to represent the average or ambient noise level.
$L_{Aeq,T}$	The A-weighted level of a notional steady sound which, over a stated period of time, *T*, would have the same acoustic energy as the fluctuating noise measured over that period. Typically used to represent the average or ambient noise level.
L_{An} (e.g. L_{A10}, L_{A90})	The sound level exceeded for n% of the time. E.g. L_{A10} is the A-weighted level exceeded for 10% of the time and as such can be used to represent a maximum level. Similarly, L_{A90} is the level exceeded for 90% of the measurement period, and is often used to describe the underlying background noise.
$L_{Amax,T}$	The instantaneous maximum A-weighted sound pressure level which occurred during the measurement period, *T*. It is commonly used to measure the effect of very short duration bursts of noise, e.g. sudden bangs, shouts, car horns, emergency sirens etc. which audibly stand out from the ambient level.
Octave band	A frequency band in which the upper limit of the band is twice the frequency of the lower limit.
1/3 Octave band	A frequency band which is one-third of an octave band.

Appendix B – Instrumentation

The following equipment was used for the measurements.

Table B1 – Equipment Calibration Details

Manufacturer	Model Type	Serial No.	Calibration	
			Certificate No.	Valid Until
Norsonic Type 1 Sound Level Meter	Nor140	1406969	U38863	01 September 2023
Norsonic Pre Amplifier	1209	21204		
Norsonic ½“ Microphone	1225	285599	38862	01 September 2023
Norsonic Sound Calibrator	1251	34966	U38861	01 September 2023

Appendix C – Graphs and Site Plans

8 Imperial Square

L_{Aeq} Time History

Measurement Position 1

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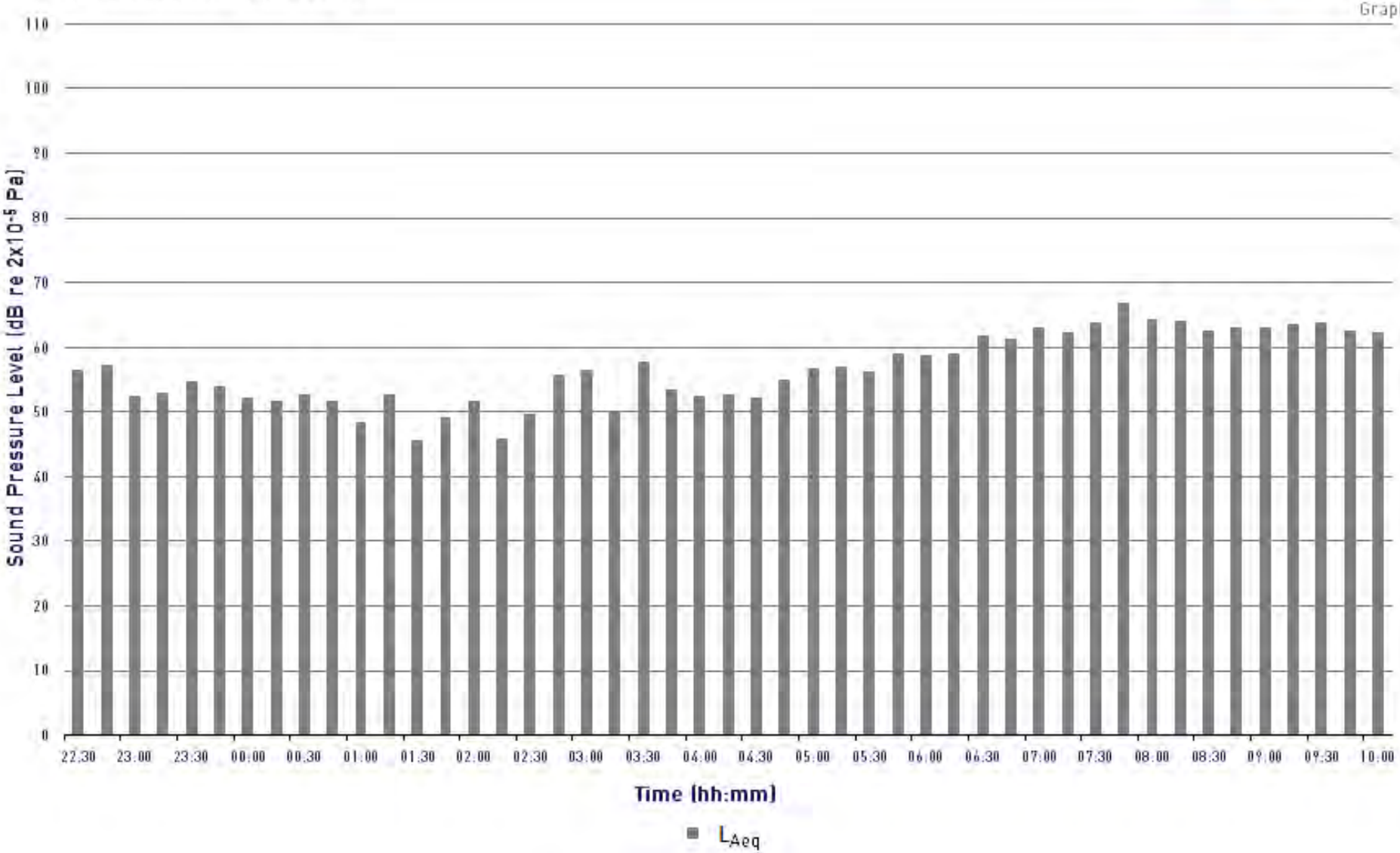
Project:

Graph 1



8 Imperial Square

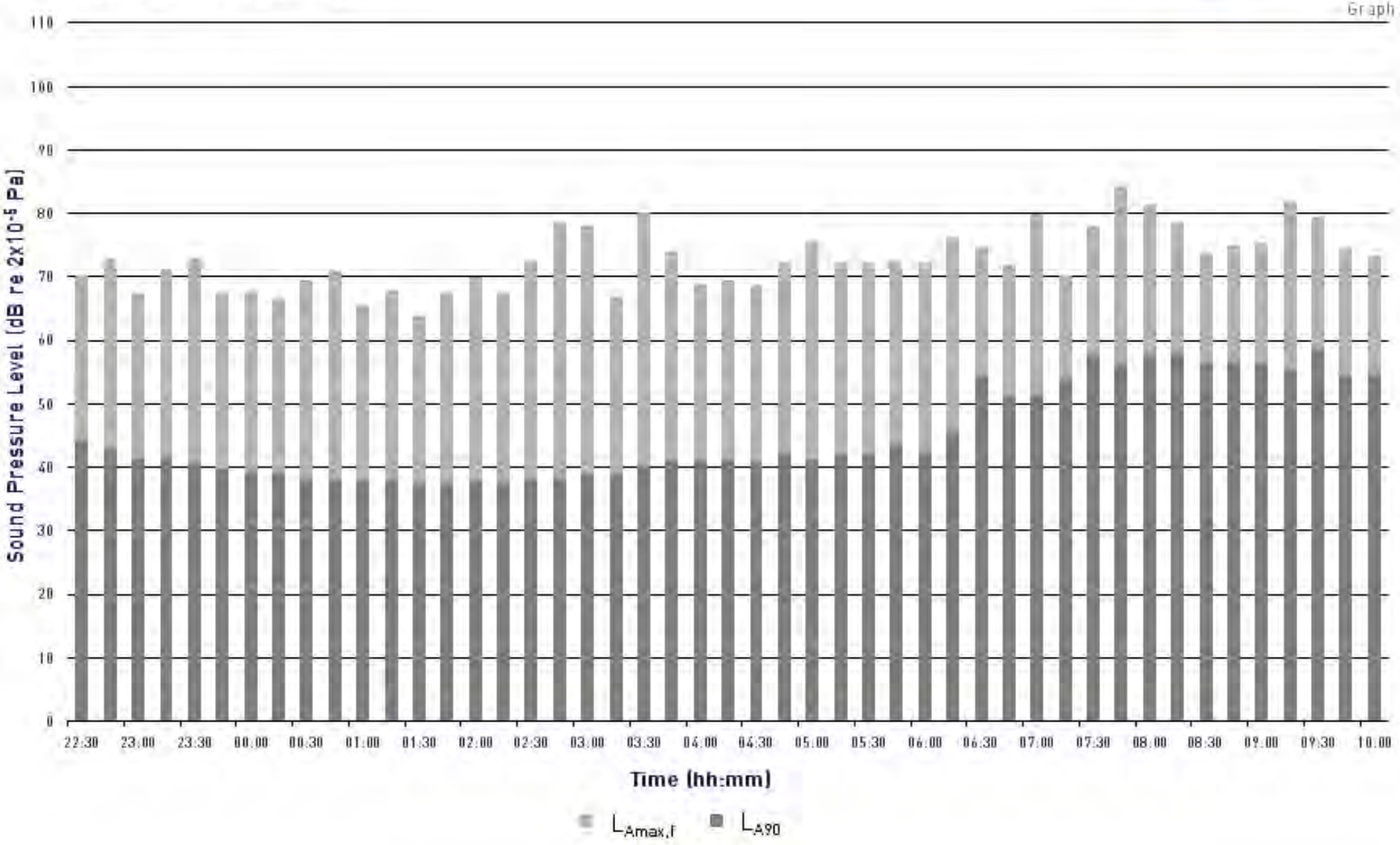
$L_{Amax,f}$ and L_{A90} Time History

Measurement Position 1

RBA ACOUSTICS

Project:

Graph 2



8 Imperial Square

$L_{A90,15\,minutes}$ Histogram

Measurement Position 1

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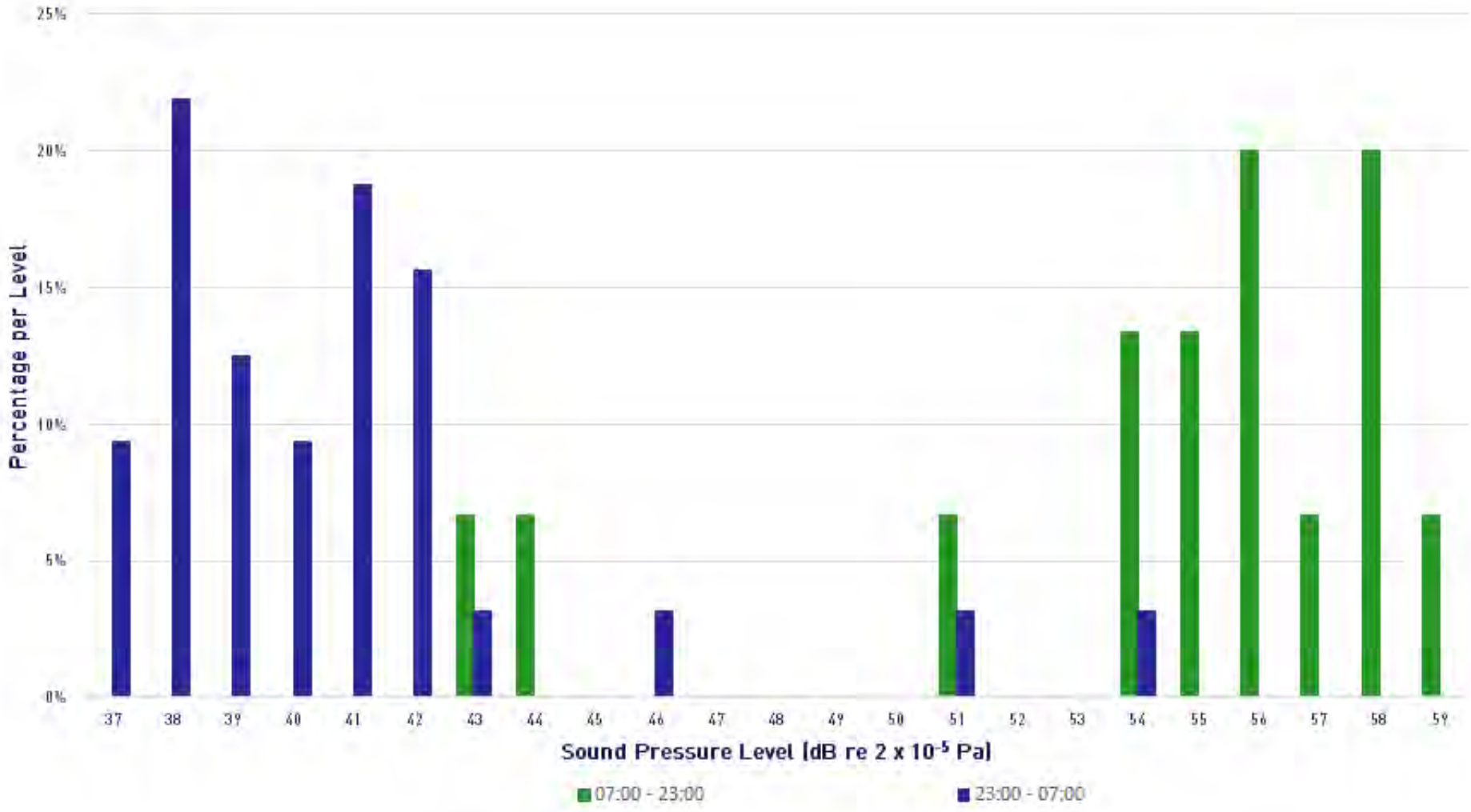
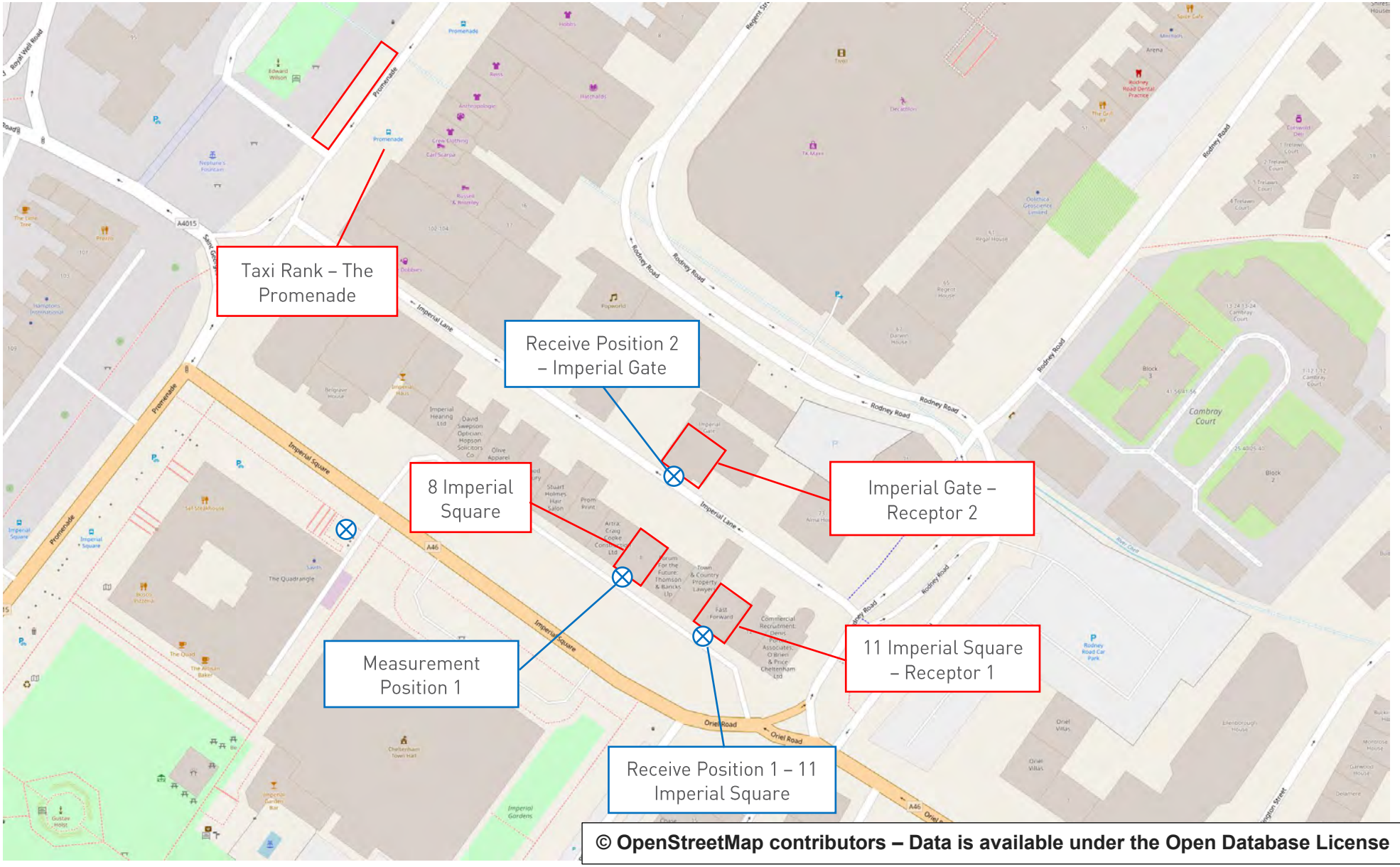
Project:

Graph 3





8 Imperial Square

Site Plan

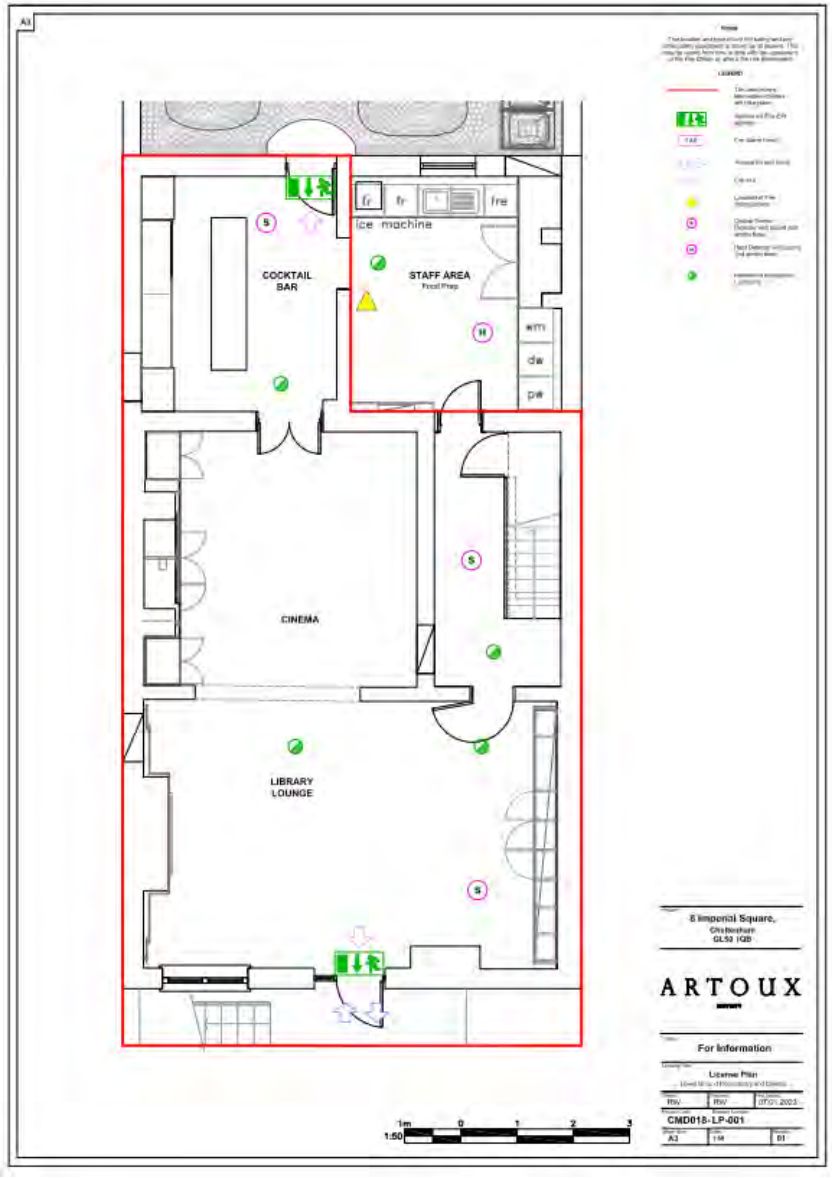
Project 12823

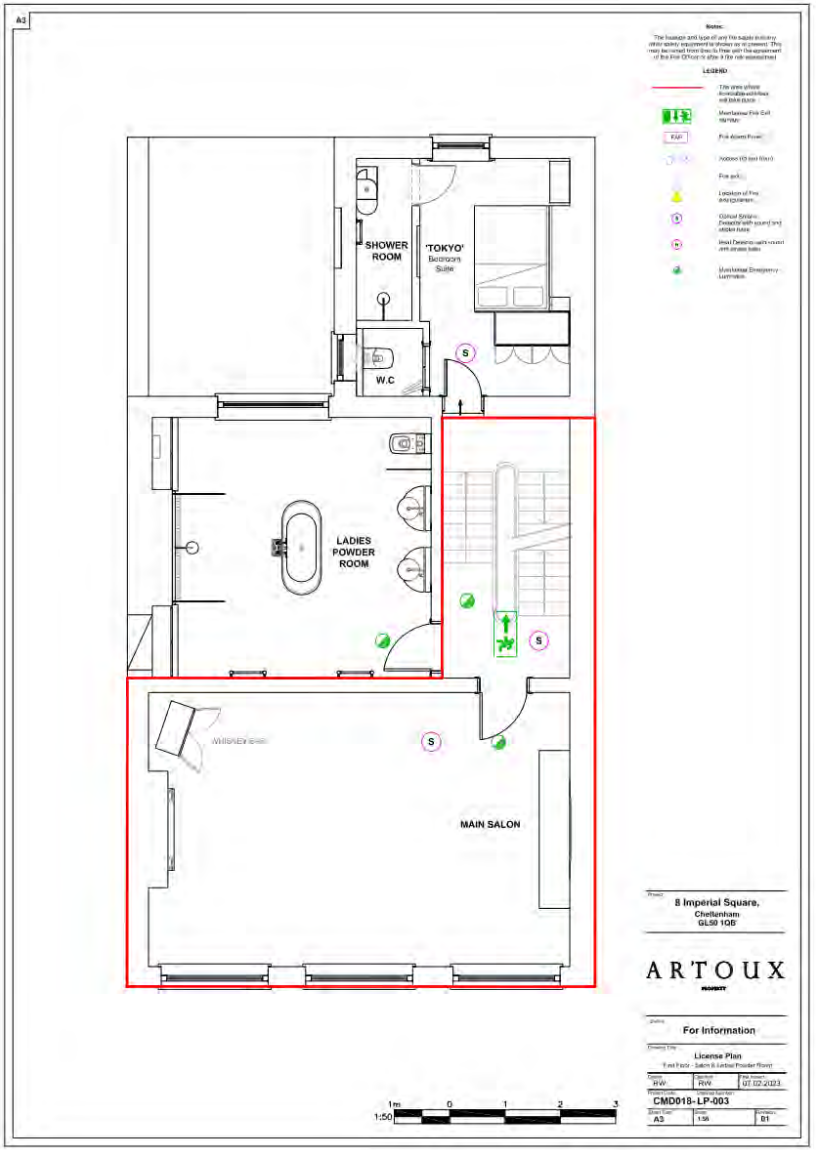
Figure 1

29 June 2023

Not to Scale

RBA ACOUSTICS





8 Imperial Square

Lower & Upper Ground Floor Layouts

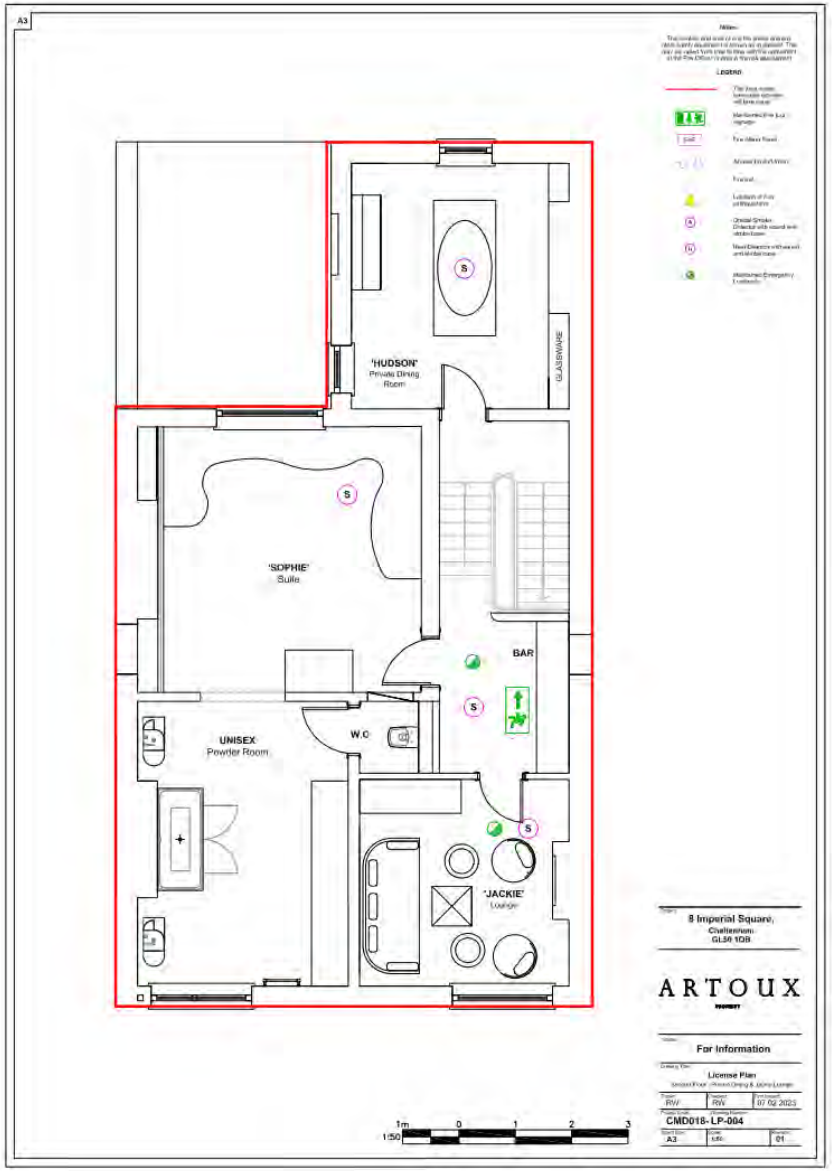
Project 12823

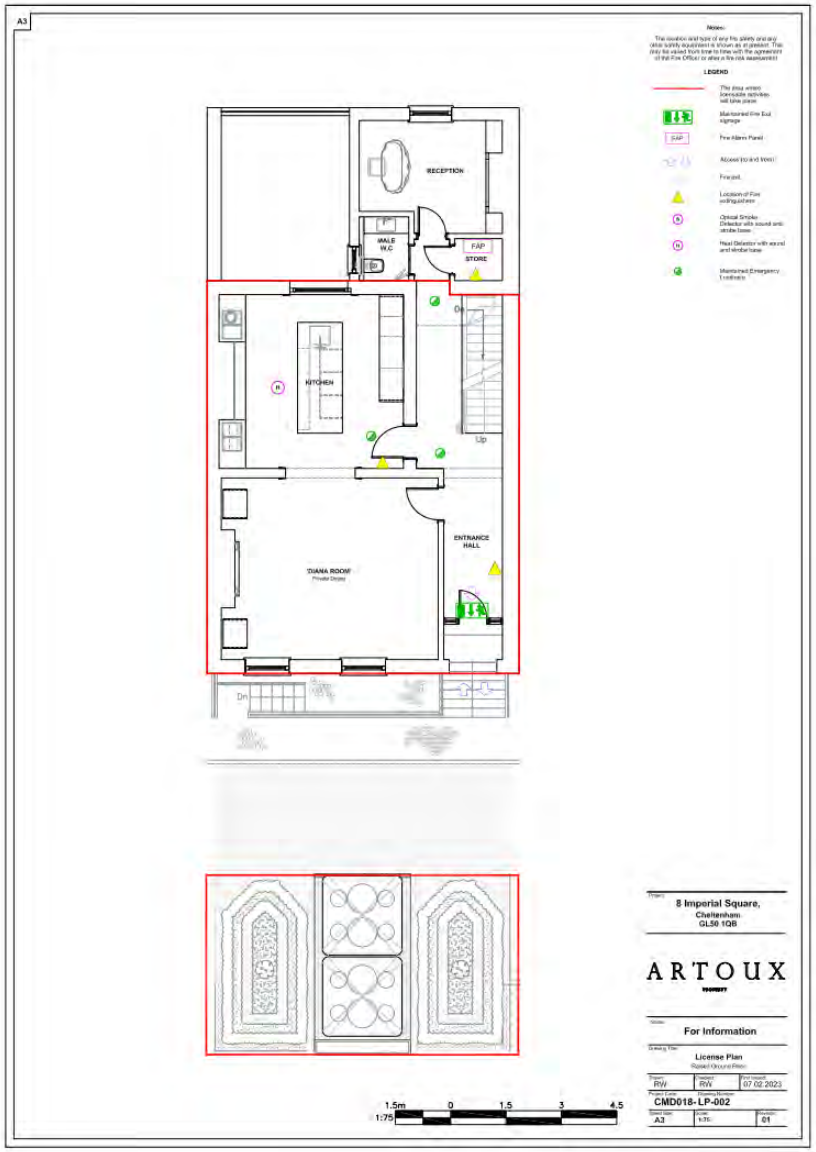
Figure 2

29 June 2023

Not to Scale

RBA ACOUSTICS





8 Imperial Square

First and Second Floor Layouts

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Figure 3

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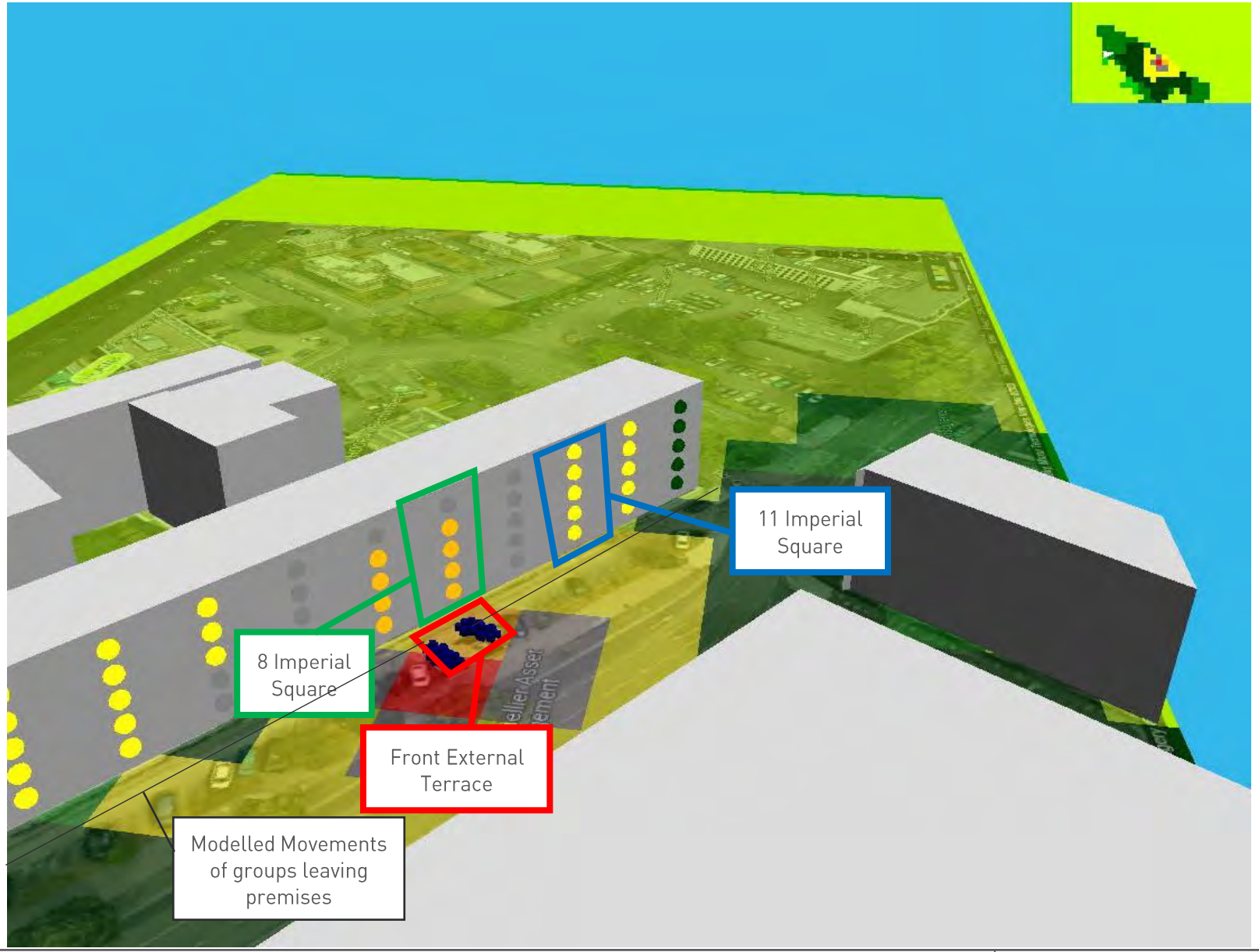

8 Imperial Square

Screenshots From 3D Acoustic Model

Project 12823

Figure 4

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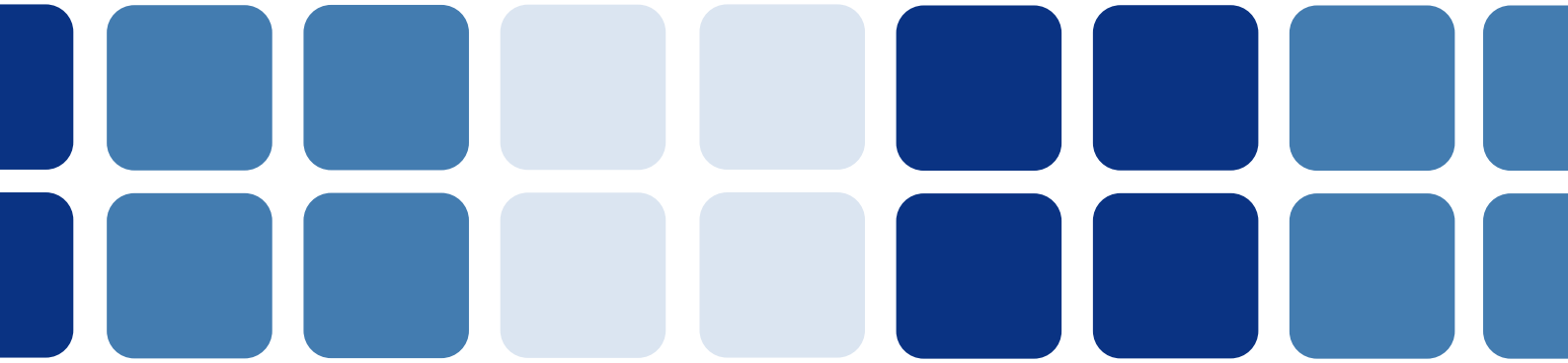

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