Attachment A6

Acoustic Impact Assessment
187 Thomas Street, Haymarket

Greaton Developments

187 Thomas Street, Haymarket

Noise Impact Assessment

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Document Control

Project Name	**187 Thomas Street, Haymarket**
Project Number	19087
Document Type	Noise Impact Assessment
Reference Number	19087_301019_Noise Impact Assessment_BW_R0
Attention	Peter Jones

Revision	Date	Reference Number	Drafted By	Approved By
0	30/10/2019	19087_301019_Noise Impact Assessment_BW_R0	BW	BW
1	11/11/2019	19087_301019_Noise Impact Assessment_BW_R1	BW	BW
2	28/02/2020	19087_301019_Noise Impact Assessment_BW_R2	BW	BW

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1 Executive Summary

This report details the Noise Impact Assessment which has been undertaken for the planning proposal request and indicative reference scheme for187 Thomas Street, Haymarket development.

An acoustic assessment of noise levels undertaken at the site and the resulting building constructions to ensure internal noise levels of the City of Sydney Council DCP and the Australian Standard AS2107:2016 are achieved. The recommended building façade constructions to ensure the relevant internal noise levels are achieved include the following:

Façade Type	Levels	Room Type	Recommended Glass Construction	Minimum Façade Acoustic Performance[1]
Glass Façade Elements	All	Hotel Rooms	10.38mm laminated	Rw 35
		Commercial Offices	10.38mm laminate	Rw 35
		Retail Areas	6.38mm Laminated	Rw 30
		Common Areas	6.38mm Laminated	Rw 30
Other Façade Elements	All	All	Light weight or masonry elements	Rw 50
	Note 1: *The acoustic performance of the external façade includes the installed glazing and frame including (but not limited to) the façade systems seals and frame. All external glazing systems are required to be installed using acoustic bulb seals.*			

External noise emission criteria for the future design of the project have been assessed based on the EPA's Noise Policy for Industry and the City of Sydney Council requirements and the following noise emission criteria is required to be complied with for the operation of services on the site.

Location	Time of Day	Recommended Amenity Noise Level L_{Aeq}, dB(A)	Project Amenity Noise Level, $L_{Aeq, (15\ min)}$ [1] (dBA)	Measured $L_{A90, 15\ min}$ (RBL) [2] (dBA)	Measured $L_{Aeq, period}$ Noise Level (dBA)	Intrusive $L_{Aeq, 15\ min}$ Criterion for New Sources (dBA)
Urban residences	Day	58	**58**	58	61	63
	Evening	48	**48**	55	60	60
	Night[4]	43	**48**[5]	54	58	59
Commercial	When in use	**63**	**63**	N/A	N/A	N/A

Note 1: Project Amenity Noise Levels corresponding to "Urban" areas, recommended noise levels.

Note 2: L_{A90} Background Noise or Rating Background Level including façade corrections

Note 3: Project Noise Trigger Levels are shown in bold

Note 4: Noise from the operation of residential condensers are to be inaudible within a neighbouring residential premises during night time hours

Note 5: Project amenity noise levels based in the measured L_{Aeq} existing noise levels minus 10 dB

Details of the selected mechanical equipment (including source noise levels) and the resulting acoustic treatments to ensure the relevant noise level criteria is achieved will be provided as part of the development application and/or CC submission of the project. Possible acoustic treatments may include the following:

a. Internal acoustic lining of ductwork.
b. Acoustic silencers to fans.
c. Vibration isolation to services equipment.
d. Time control or Variable Speed Drives to equipment.
e. Acoustic Screening.
f. Other acoustic treatments specific to the selected plant and equipment once selected.

An assessment of the proposed operation of the external terrace on level 4 has been undertaken and providing the following acoustic treatments and controls are included in the design and operation of the building resulting noise impacts to surrounding receivers will be acceptable:

1. No playing of amplified speech or music will be undertaken on the external terrace.
2. The opening hours of the terrace will be limited to include day and evening hours only including 7am to 10pm on any given day of the week.
3. Acoustic absorption to the underside of the building structure above the terrace will be included. Absorption will be included to approximately 40% of the soffit above and include a material or construction with a minimum NRC of 0.6.

2 Introduction

White Noise Acoustics has been engaged to undertake the Noise Impact Assessment of the proposed indicative reference scheme for a mixed use (retail, commercial and hotel) development located at 187 Thomas Street, Haymarket.

The proposal seeks to amend planning controls applying to the Site to allow a future development that will comprise an integrated community and destination for the innovation and technology sectors in the form of a vertical innovation village with an overall maximum height of 49 storeys (RL 209.80) and approximate commercial GFA of 51,700m^2.

Within a hybrid tower the concept will deliver approximately 51,700m^2 of GFA to a maximum height of RL 207. As illustrated in the reference scheme the hybrid tower will comprise flexible interconnected floorplates of approximately: 1000m^2 on the ground level; 1,700m^2 within the podium; 610 - 760m^2 within the void tower; 1,200m^2 within the low and high rise tower; and 900m^2 GFA within the sky rise tower thereby catering to the full range of enterprises within the sector.

Key components of the reference scheme for the hybrid tower include:

- Innovation tech hub (approximately 8,600m^2 GFA) within the basement, podium and void tower with lobby off Valentine Street including:
    - tech workshop with shared equipment, facilities and services (including education, business support, programming, safety management and training)
    - co-working space for the innovation industries that utilise provided technology and equipment, that changes in space and floor plate design to accommodate growing businesses, and
    - terrace on Level 4 of the Void Tower providing an indoor / outdoor workspace
    - facilities and services shared with the tech hotel.
- Commercial office space (approximately 33,100m2 GFA) for the corporate tech sector within the low and high rise tower with lobby off Quay Street
- 4 star Tech Hotel (approximately 9,800m2 GFA / 234 keys with 26 rooms per floor) within the sky rise tower with sky lobby, pool and bar with drop off and lobby off Thomas Street
- Meeting, forum, gym, pool, hospitality and other spaces integrated throughout the building and shared (and co-managed) between the innovation hub, commercial tenancies and tech hotel
- A retail offering of approximately 220m2 GFA, including food and beverage which will be located on the ground level
- Upgraded (and widened) through site connection connecting Thomas Street to the west with George Street to the east via an activated retail arcade connection
- Redeveloped public space on Thomas, Quay and Valentine Street including an expanded pedestrian plaza at the corner of Thomas and Quay Streets and widening of the Valentine Street footpath

- Integration with the proposed Quay Street public domain works to accommodate increased pedestrian movement from existing and future pedestrian connections to various modes of transport, and
- Five (5) basement levels beneath the building with access off Thomas Street in the north west of the site.

The proposed basement levels will provide:

- Reduced car park provision totalling 79 car parking spaces (including 23 small car spaces,2 car share spaces and 1 electric charging station)

(Note: maximum parking allowed 107 spaces however reduced provision proposed as transport demand strategy. 86 spaces currently provided on site)

- 14 motorbike parking spaces
- 382 bicycle parking spaces for staff and visitors as well as end of trip (EoT) facilities
- Hotel back of house areas
- loading dock and waste storage room, and
- plant and equipment areas.

This assessment includes the acoustic investigation into the potential for noise impacts from the operation of the completed project as well as potential noise impacts from existing noise sources within the vicinity of the site which predominantly includes traffic noise from surrounding roadways and general city hum.

The report also addresses the potential impact of the outdoor terrace on Level 4 on adjacent residence at 743-755 George Street and located to the east of the site.

2.1 Development Description

The 187 Thomas Street, Haymarket site is located on the southern side of Thomas Street within the city block bound by George Street to the east, Valentine Street to the south and Quay Street to the west. The surrounding receivers to the site include commercial receivers to the north and east, residential receiver to the east as well as student housing opposite on Quay Street to the west.

The site location is detailed in Figure 1 below.

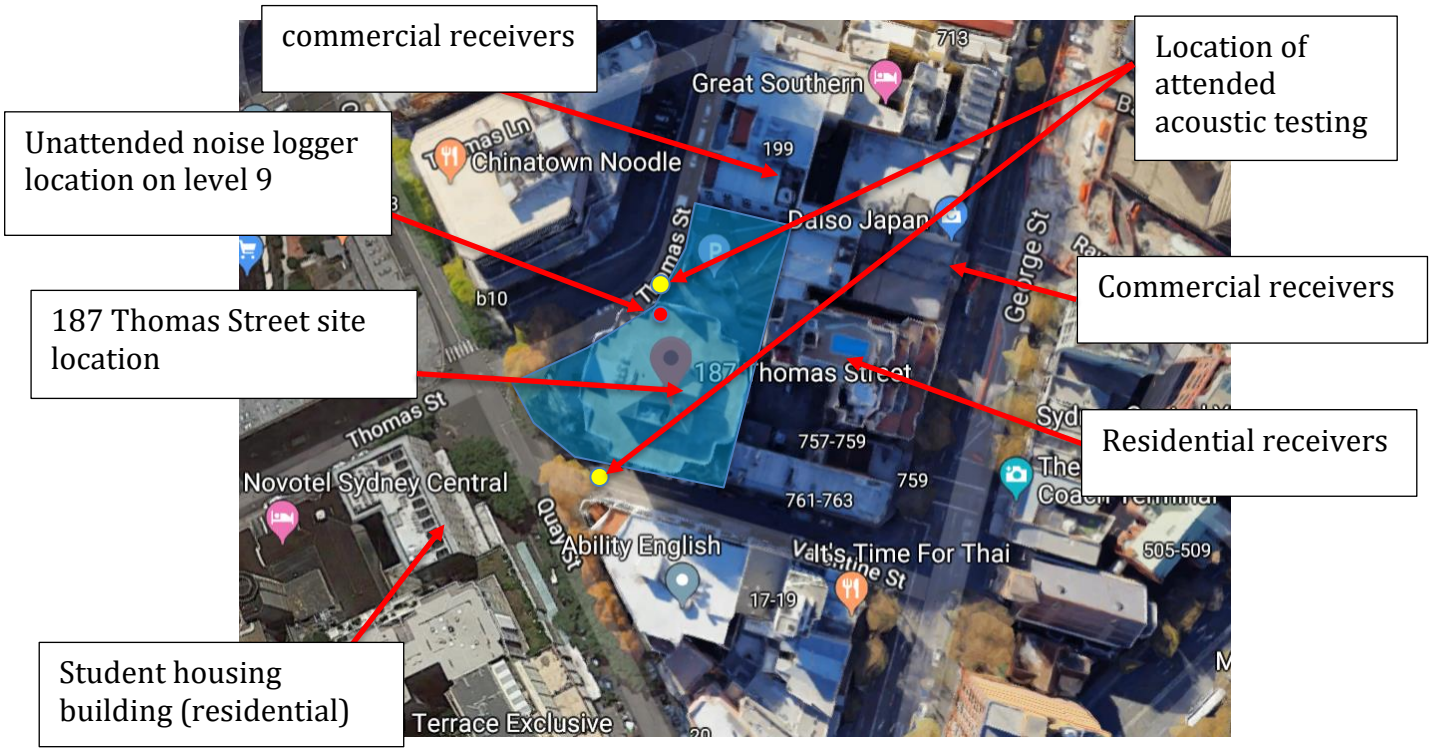


Figure 1 – 187 Thomas Street, Haymarket Site Location

3 Proposed Development

The proposed project is located at 187 Thomas Street, Haymarket.

The proposed development includes the uses as detailed in section 2 above.

The site is located within the City of Sydney Council area.

The site is located on Thomas Street which is not defined as a busy road carrying over 40,000 Annual Average Daily Traffic (AADT) number, nor carries over 20,000 AADT as defined in Map 16 of the RTA's *Traffic Volume Maps for Noise Assessment for Buildings on Land Adjacent to Busy Roads*.

See the Figure below which includes the site location included on Map 16 as detailed above.

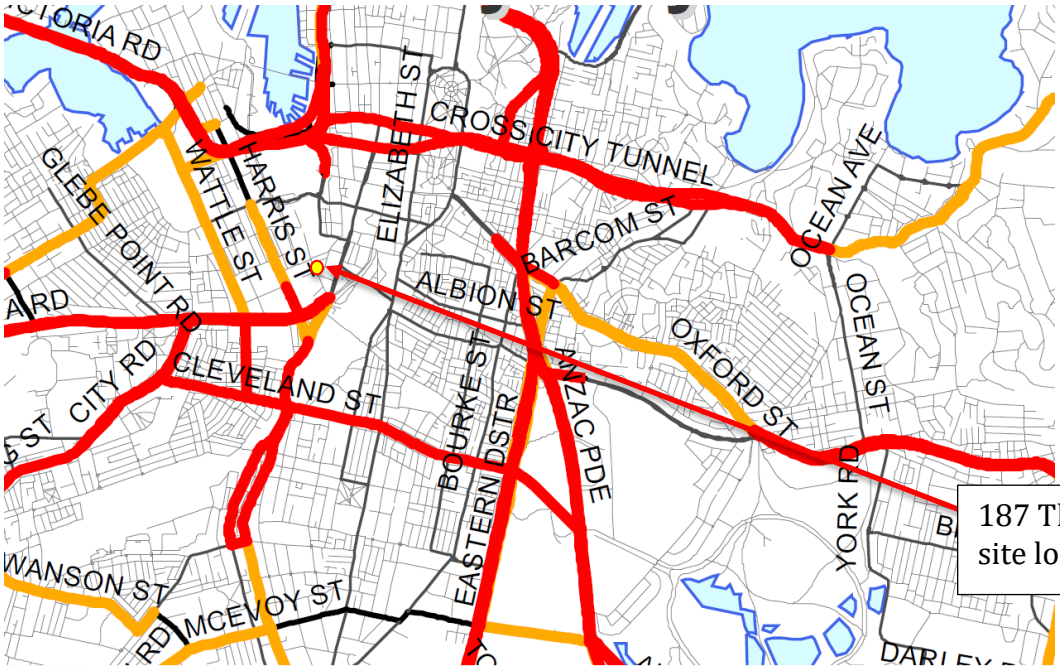


Figure 2 – Site Location of Map 16 of the RTA's *Traffic Volume Maps for Noise Assessment for Buildings on Land Adjacent to Busy Roads*

4 Existing Acoustic Environment

The 187 Thomas Street, Haymarket site is located to the eastern side of Thomas Street which would be classified as a *Urban* area. The existing noise levels at the site are predominantly as a result from traffic noise within the vicinity of the site within the CBD including George Street. Surrounding roadways include high traffic flow volumes including use by heavy vehicles). Existing receivers within the vicinity of the site include residential receivers to the east, student housing (considered residential) opposite Quay Street to the west and commercial/retail to the north and east.

As part of this assessment an acoustic survey of the existing acoustic environment at the site was undertaken. The survey included attended noise level measurements at the site, during various times of the day on the 29th August, 2019.

Attended noise level testing was conducted using a Bruel and Kjaer 2236C type meter. The meter was calibrated before and after testing and no significant drift was recorded.

Long term unattended Noise logging was undertaken using a ARL EL-215 type noise monitor with serial number 396932 and calibration with calibration number C19465 between the 4th and the 11th November 2019. The noise logger was located on level 9 of the building on an external roof (see figure 1 for location) to the north of the exiting building. The logger was positioned such that it was in a free field location and façade corrects were not required to be applied. See figure below for logger location.

Unattended noise logging has been undertaken in compliance with the requirements of the EPA. All periods of inclement weather have not been included in the assessment of background noise level at the site.

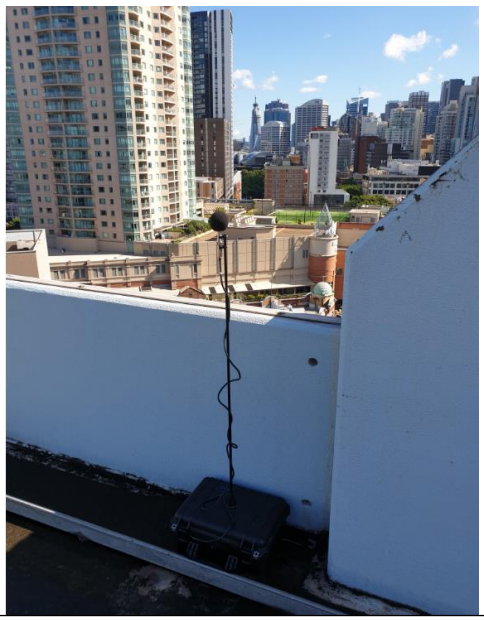


Figure 2 – Noise Logger Location on Level 9 of the Existing Building

4.1 Noise Survey Results

The attended and unattended noise locations represent locations such that suitable noise levels for the assessment of background noise levels ($L_{90\,(t)}$) as well as the impact from traffic movements ($Leq_{(t)}$) can be assessed. The results of the acoustic survey are detailed in the tables below which have been used as the basis of this assessment.

Table 1 – Results of the Attended Noise Survey at the Site

Measurement Location	Time of Measurement	$L_{Aeq,\ 15min}$ dB(A)	$L_{A90,\ 15min}$ dB(A)	Comments
Attended noise measurement location, Thomas Street	2.30pm to 2.45pm	67	54	Noise level at the site dominated by vehicle movements on surrounding roadways
Attended noise measurement location, Quay Street	3.50pm to 4.05pm	68	53	

Table 2 – Results of the Noise Logging at the Site

Measurement Location	Time of Measurement	Maximum Repeatable $L_{Aeq\ (worst\ 1\ hour)}$ dB(A)	Representable Background noise Level (RBL) $L_{A90,\ 15min}$ dB(A)
Noise logger location, see figure 1 above	Day	61	58
	Evening	60	55
	Night	58	54

Based on the results of the noise logging undertaken at the site there is a contribution of noise on the background levels at the existing site from plant and equipment, including equipment from neighbouring buildings. Based on the findings of this report and the existing noise levels at the site the following has been undertaken as part of this assessment:

1. Background noise levels have been based on periods when plant was not operational including the attended noise levels conducted at the site, therefore the more stringent background noise levels have been used on the development of noise emission criteria for the future project.

2. Internal noise level assessment includes all noise sources within the vicinity of the site, such that the resulting internal noise level will be compliant with relevant noise level criteria regardless of the source of the noise.

5 Internal Noise Level Criteria

Internal noise levels within the future occupancies have been based on the relevant noise levels as detailed within the Australian Standard AS2107:2000 *Acoustics - Recommended design sound levels and reverberation times for building interiors*, the Department of Planning *Development Near Rail Corridor and Busy Roads – Interim Guideline* (DNRCBR) and the City of Sydney Council requirements as detailed in *Sydney DCP 2012-December 2012 Section 4, Development Types.*

5.1 Department of Planning *Development Near Rail Corridor and Busy Roads – Interim Guideline*

The DNRCBR includes the following requirements for the relevant design of internal areas of residential developments near busy roads, including the following:

> ***For Clauses 87 (Rail) and 102 (Road):***
> *If the development is for the purpose of a building for residential use, the consent authority must be satisfied that appropriate measures will be taken to ensure that the following LA_{eq} levels are not exceeded:*
> - *in any bedroom in the building: 35dB(A) at any time 10pm–7am*
> - *anywhere else in the building (other than a garage, kitchen, bathroom or hallway): 40dB(A) at any time.*

The recommended levels for various areas of the project are detailed in the following table. The recommended noise levels for residential dwellings near major roadways detailed within AS2107:2016 and DNRCBR have been used as the basis of this assessment.

Table 3 - Design Recommended Internal Sound Levels Department of Planning and AS2107:2016

Type of Occupancy/Activity	Design sound level maximum
Common areas (e.g. foyer, lift lobby)	55 $L_{Aeq\ 15\ hour}$
Hotel - Living areas	40 $L_{Aeq\ 24\ hour}$
Hotel - Sleeping areas (night time)	35 $L_{Aeq\ 9\ hour}$[1]
Commercial areas	45 $L_{Aeq\ 15\ hour}$
Toilets	55 $L_{Aeq\ 15\ hour}$
Note 1: The relevant time period for bedrooms include the period of 10pm to 7am	

5.2 City of Sydney Council DCP

the City of Sydney Council requirements as detailed in *Sydney DCP 2012- December 2012 Section 4, Development Types,* includes the following requirements for internal noise levels from environmental noise sources within Section 4.2.11.1 *Acoustic privacy* of the DCP:

> *(7) The repeatable maximum LAeq (1 hour) for residential buildings and serviced apartments must not exceed the following levels:*
>
> *(a) for closed windows and doors:*
>
> *(i) 35dB for bedrooms (10pm-7am); and*
>
> *(ii) 45dB for main living areas (24 hours).*
>
> *(b) for open windows and doors:*
>
> *(i) 45dB for bedrooms (10pm-7am); and*
>
> *(ii) 55dB for main living areas (24 hours).*
>
> *(8) Where natural ventilation of a room cannot be achieved, the repeatable maximum LAeq (1hour) level in a dwelling when doors and windows are shut and air conditioning is operating must not exceed:*
>
> *(a) 38dB for bedrooms (10pm-7am); and*
>
> *(b) 48dB for main living areas (24 hours).*
>
> *(9) These levels are to include the combined measured level of noise from both external sources and the ventilation system operating normally.*

For the purpose of this assessment the detailed noise levels of the City of Sydney DCP for residential projects has been used to assess suaitble noise levels with the proposed hotel rooms within the project.

5.3 Project Internal Noise Level Criteria

Based on the requirements of the standards detailed above the relevant internal noise level criteria is detailed in the table below.

Table 4 – Resulting Project Internal Noise Level Criteria

Type of Occupancy/Activity	Governing Standard	Design sound level maximum
Common areas (e.g. foyer, lift lobby)	AS2107:2016	55 $L_{Aeq\ 15\ min}$
Hotel - Living areas	Department of Planning	40 $L_{Aeq\ 24\ hour}$
Hotel - Sleeping areas (night time)	City of Sydney Council	35 $L_{Aeq\ (1\ hour)}$[1]
Retail Areas	AS2107:2016	50 $L_{Aeq\ 15\ min}$
Commercial Offices	AS2107:2016	45 $L_{Aeq\ 15\ min}$
Toilets	AS2107:2016	55 $L_{Aeq\ 15\ min}$
Note 1: The relevant time period for bedrooms include the period of 10pm to 7am		

6 Environmental Noise Intrusion Assessment

This section of the report details the assessment of environmental noise intrusion into the proposed development and the recommended acoustic treatments to ensure the recommended internal noise levels detailed in the Sections above (including traffic noise intrusion) are achieved.

Internal noise levels within the future areas of the development will result from the noise intrusion into the building through the external façade including glass, masonry and other façade elements. Typically, the acoustic performance of building elements including the relatively light weight elements of the building façade, including glass and/or plasterboard constructions, will be the determining factors in the resulting internal noise levels.

Calculations of internal noise levels have been undertaken based on the measured traffic and calculated aircraft environmental noise levels at the site and the characteristics of the building, including window openings, buildings constructions and the like.

6.1 External Glass Elements

The recommended acoustic constructions to the buildings external façade glass elements are detailed in the table below to ensure the recommended internal noise levels detailed above are achieved, with the façade building openings closed.

Table 5 – External Glass Acoustic Requirements

Façade Orientation	Levels	Room Type	Recommended Glass Construction	Minimum Façade Acoustic Performance[1]
All Orientations	All	Hotel Rooms	10.38mm laminated	Rw 35
		Commercial Offices	10.38mm laminate	Rw 35
		Retail Areas	6.38mm Laminated	Rw 30
		Common Areas	6.38mm Laminated	Rw 30
Note 1: *The acoustic performance of the external façade includes the installed glazing and frame including (but not limited to) the façade systems seals and frame. All external glazing systems are required to be installed using acoustic bulb seals.*				

The recommended glass constructions detailed in the table above include those required to ensure the acoustic requirements of the project are achieved. Thicker glazing may be required to achieve other project requirements such as structural, thermal, safety or other requirements and is to be advised by others.

6.2 External Building Elements

The proposed external building elements including masonry or concrete external walls and roof are acoustically acceptable without additional acoustic treatment.

Any light weight external pasteboard walls should be constructed from a construction with a minimum acoustic performance of Rw 50.

6.3 External Roof

The required external roof and ceiling constructions for the project are required to include the following:

1. Concrete external roof construction – no additional treatments required;

6.4 External Opening and Penetrations

All openings and penetrations are required to be acoustically treated such that the performance of the building construction is not compromised. This may require lining of duct work behind mechanical service openings/grills, treatments to ventilation opening and the like.

7 External Noise Emission Assessment

This section of the report details the relevant noise level criteria for noise emissions generated on the site once completed.

The relevant authority which provides the required noise level criteria for noise levels generated on the site includes the NSW Environmental Protection Authority's (EPA) Noise Policy for Industry (NPI) and the City of Sydney Council DCP.

7.1 NSW Environmental Protection Authority, Noise Policy for Industry

The NSW Environmental Protection Authority (EPA) Noise Policy for Industry (NPfI), previously Industrial Noise Policy, details noise criteria for the control of noise generated from the operation of developments and the potential for impact on surrounding receivers.

The NPI includes both intrusive and amenity criteria which are summarised below.

1. Intrusive noise level criteria, The NPfI states the following:

   'The intrusiveness of an industrial noise source may generally be considered acceptable if the level of noise from the source (represented by the LAeq descriptor), measured over a 15minute period, does not exceed the background noise level by more than 5 dB when beyond a minimum threshold. This intrusiveness noise level seeks to limit the degree of change a new noise source introduces to an existing environment.'

2. Amenity noise level criteria, The NPfI states the following:

   'To limit continuing increases in noise levels from application of the intrusiveness level alone, the ambient noise level within an area from all industrial noise sources combined should remain below the recommended amenity noise levels specified in Table 2.2 where feasible and reasonable. The recommended amenity noise levels will protect against noise impacts such as speech interference, community annoyance and some sleep disturbance.'

   Project amenity noise level for industrial developments = recommended amenity noise level (Table 2.2) minus 5 dB(A)

   Where the resultant project amenity noise level is 10 dB or more lower than the existing industrial noise level. In this case the project amenity noise levels can be set at 10 dB below existing industrial noise levels if it can be demonstrated that existing industrial noise levels are unlikely to reduce over time.

The LAeq is determined over a 15-minute period for the project intrusiveness noise level and over an assessment period (day, evening and night) for the project amenity noise level. This leads to the situation where, because of the different averaging periods, the same numerical value does not necessarily represent the same amount of noise heard by a person for different time periods. To standardise the time periods for the intrusiveness and amenity noise levels, this policy assumes that the LAeq,15min will be taken to be equal to the LAeq, period + 3 decibels (dB), unless robust evidence is provided for an alternative approach for the particular project being considered.

Project amenity noise level (ANL) is urban ANL (Table 2.1) minus 5 dB(A) plus 3 dB(A) to convert from a period level to a 15-minute level (dB = decibel; dB[A] = decibel [A-weighted]; RBL = rating background noise level).

Noise level used in the assessment of noise emission from the site have been based on the noise level survey conducted at the site and detailed in this section of the report.

Consequently, the resulting noise level criteria are summarised in the table below. The criteria are nominated for the purpose of determining the operational noise limits for the operation of the site including mechanical plant associated with the development which can potentially affect noise sensitive receivers and operational noise levels from the future tenancies. For each assessment period, the lower (i.e. the more stringent) of the amenity or intrusive criteria are adopted. The calculated *Project Amenity Noise Level* includes either the Recommended Amenity Noise Level minus 5 dB(A) plus 3 dB(A) (for a 15minum period) or the measured existing Leq noise level – 10 dB if this is greater as determined by the NPfI.

The resulting project noise emission criteria is detailed in the table below, including criteria highlighted in the **bold text**.

Table 6 – External Noise Level Criteria in Accordance with the NSW NPfI

Location	Time of Day	Recommended Amenity Noise Level L_{Aeq}, dB(A)	Project Amenity Noise Level, $L_{Aeq, (15\ min)}$ [1] (dBA)	Measured $L_{A90, 15\ min}$ (RBL) [2] (dBA)	Measured $L_{Aeq, period}$ Noise Level (dBA)	Intrusive $L_{Aeq, 15\ min}$ Criterion for New Sources (dBA)
Urban residences	Day	58	**58**	58	61	63
	Evening	48	**48**	55	60	60
	Night[4]	43	**48**[5]	54	58	59
Commercial	When in use	**63**	**63**	N/A	N/A	N/A

Note 1: Project Amenity Noise Levels corresponding to "Urban" areas, recommended noise levels.

Note 2: L_{A90} Background Noise or Rating Background Level including façade corrections

Note 3: Project Noise Trigger Levels are shown in bold

Note 4: Noise from the operation of residential condensers are to be inaudible within a neighbouring residential premises during night time hours

Note 5: Project amenity noise levels based in the measured L_{Aeq} existing noise levels minus 10 dB

1. Project amenity noise level (ANL) is urban ANL (Table 2.1) minus 5 dB(A) plus 3 dB(A) to convert from a period level to a 15-minute level (dB = decibel; dB[A] = decibel [A-weighted]; RBL = rating background noise level).

2. The LAeq is determined over a 15-minute period for the project intrusiveness noise level and over an assessment period (day, evening and night) for the project amenity noise level. This leads to the situation where, because of the different averaging periods, the same numerical value does not necessarily represent the same amount of noise heard by a person for different time periods. To standardise the time periods for the intrusiveness and amenity noise levels, this policy assumes that the LAeq,15min will be taken to be equal to the LAeq, period + 3 decibels (dB), unless robust evidence is provided for an alternative approach for the particular project being considered.

7.2 Noise Impact Assessment

An assessment of noise generated on the site has been undertaken in this section of the report. The assessment of noise levels generated on the site are summarised below:

1. Mechanical Services Equipment –Detailed selections of the proposed mechanical plant and equipment to be used on the site are not available at this time. All future plant and equipment are to be acoustically treated to ensure the noise levels at all surrounding receivers comply with noise emission criteria detailed within this report. Experience with similar projects indicated that it is both possible and practical to treat all mechanical equipment such that the relevant noise levels are achieved. Examples of the possible acoustic treatments to mechanical equipment includes the following:
    a. Basement Supply and Exhaust Fans – location of fans within the building and treated using internally lined ductwork or acoustic silencers.
    b. General supply and exhaust fans – general exhaust and supply fans such as toilet, kitchen, lobby and other small mechanical fans can be acoustically treated using acoustic flex ducting or internal lined ducting.
    c. Condensing equipment – treatment of condensers including screen and the like will be possible to ensure compliance with the noise emission criteria.

Details of the selected mechanical equipment (including source noise levels) and the resulting acoustic treatments to ensure the relevant noise level criteria is achieved will be provided as part of the CC submission of the project. Possible acoustic treatments may include the following:

a. Internal acoustic lining of ductwork.
b. Acoustic silencers to fans.
c. Vibration isolation to services equipment.
d. Time control or Variable Speed Drives to equipment.
e. Acoustic Screening.
f. Other acoustic treatments specific to the selected plant and equipment once selected.

2. Level 4 external terrace – The proposed development includes an open terrace area located on level 4 of the project as detailed in the figure below.

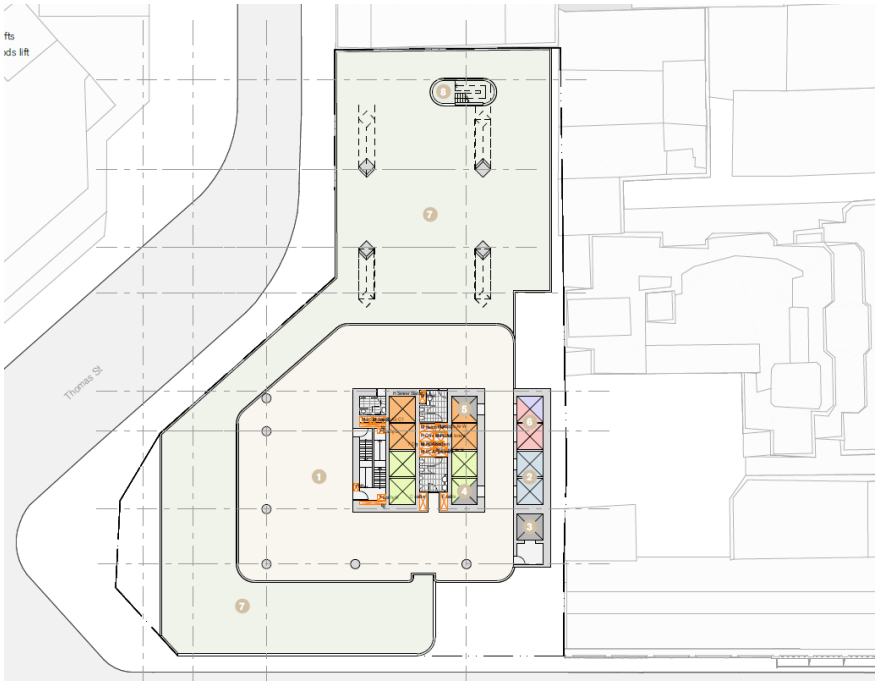


Figure 2 – Proposed Level 4 External Terrace

The proposed external terrace will be used for an external outdoor workspace including passive activities.

To ensure noise levels associated with activities undertaken within the outdoor workspace does not generate noise levels which will negatively impact on the surrounding residential receivers (including those located within 743-755 George Street to the east of the development) the following acoustic mitigations will be included in the design and operation of the building:

a. No playing of amplified speech or music will be undertaken on the external terrace.
b. The opening hours of the terrace will be limited to include day and evening hours only including 7am to 10pm on any given day of the week.
c. Acoustic absorption to the underside of the building structure above the terrace will be included. Absorption will be included to approximately 40% of the soffit above and include a material or construction with a minimum NRC of 0.6.

Base on the proposed operation of the terrace and the existing noise levels at the site (including general hum from the surrounding roadways and the like) the resulting noise generated from the use of the terrace will comply with the relevant noise emission criteria detailed in Section 7 of this report and will not negatively impact on the acoustic amenity of surrounding receivers.

8 Conclusion

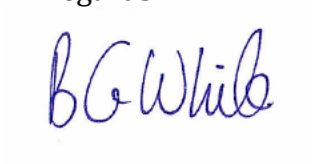
This report details the Noise Impact Assessment of the proposed development at 187 Thomas Street, Haymarket including retail, commercial and hotel areas.

This report details the required acoustic constructions of the building's façade, including external windows, to ensure that the future internal noise levels comply with the relevant noise levels of the Australian Standard AS2107:2016, the Department of Planning *Development Near Rail Corridors and Busy Roads – Interim Guideline* and the City of Sydney Council DCP. Providing the recommended constructions detailed in this report are included in the construction of the project the required internal noise levels will be achieved.

External noise emissions from the site have been assessed and detailed in accordance with the NSW Environmental Protection Authorities Noise Policy for Industry (previously the Industrial Noise Policy) and the City of Sydney Council noise emission criteria. The future design and treatment of all building services associated with the project can be acoustically treated to ensure all noise emissions from the site comply with the EPA NPfI and City of Sydney Council criteria. Details of the equipment and associated acoustic treatments will be provided as part of the CC submission of the project.

For any additional information please do not hesitate to contact the person below.

Regards



Ben White
Director
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9 Appendix A – Glossary of Terms

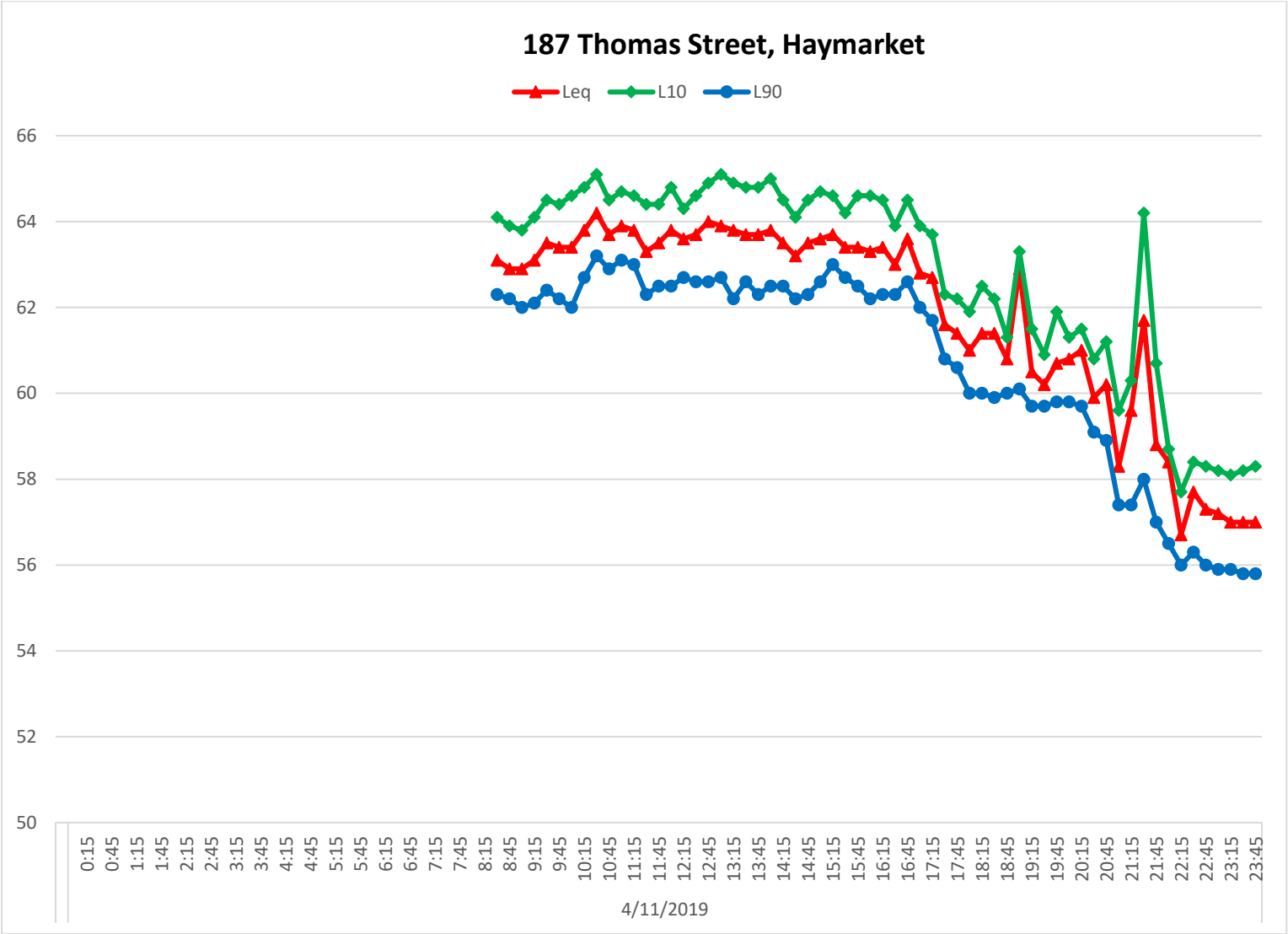
Ambient Sound	The totally encompassing sound in a given situation at a given time, usually composed of sound from all sources near and far.
Audible Range	The limits of frequency which are audible or heard as sound. The normal ear in young adults detects sound having frequencies in the region 20 Hz to 20 kHz, although it is possible for some people to detect frequencies outside these limits.
Character, acoustic	The total of the qualities making up the individuality of the noise. The pitch or shape of a sound's frequency content (spectrum) dictate a sound's character.
Decibel [dB]	The level of noise is measured objectively using a Sound Level Meter. The following are examples of the decibel readings of every day sounds;

0dB	the faintest sound we can hear
30dB	a quiet library or in a quiet location in the country
45dB	typical office space. Ambience in the city at night
60dB	Martin Place at lunch time
70dB	the sound of a car passing on the street
80dB	loud music played at home
90dB	the sound of a truck passing on the street
100dB	the sound of a rock band
115dB	limit of sound permitted in industry
120dB	deafening

dB(A)	*A-weighted decibels* The ear is not as effective in hearing low frequency sounds as it is hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter. The sound pressure level in dB(A) gives a close indication of the subjective loudness of the noise.
Frequency	Frequency is synonymous to *pitch*. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Loudness	A rise of 10 dB in sound level corresponds approximately to a doubling of subjective loudness. That is, a sound of 85 dB is twice as loud as a sound of 75 dB which is twice as loud as a sound of 65 dB and so on
L_{Max}	The maximum sound pressure level measured over a given period.
L_{Min}	The minimum sound pressure level measured over a given period.
L_1	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L_{10}	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L_{90}	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L_{90} noise level expressed in units of dB(A).
L_{eq}	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
Background Sound Low	The average of the lowest levels of the sound levels measured in an affected area in the absence of noise from occupants and from unwanted, external ambient noise sources. Usually taken to mean the L_{A90} value
Ctr	A frequency adaptation term applied in accordance with the procedures described in ISO 717.
dB (A)	'A' Weighted overall sound pressure level

Noise Reduction	The difference in sound pressure level between any two areas. The term “noise reduction” does not specify any grade or performance quality unless accompanied by a specification of the units and conditions under which the units shall apply
NR Noise Rating	Single number evaluation of the background noise level. The NR level is normally around 5 to 6 dB below the “A” weighted noise level. The NR curve describes a spectrum of noise levels and is categorised by the level at 1000 Hz ie the NR 50 curve has a value of 50 dB at 1000 Hz. The NR rating is a tangential system where a noise spectrum is classified by the NR curve that just encompasses the entire noise spectrum consideration.
R_w	Weighted Sound Reduction Index - Laboratory test measurement procedure that provides a single number indication of the acoustic performance of a partition or single element. Calculation procedures for Rw are defined in ISO 140-2:1991 “Measurement of Sound Insulation in Buildings and of Building Elements Part 2: Determination, verification and application of precision data”.
R'_w	Field obtained Weighted Sound Reduction Index - this figure is generally up to 3-5 lower than the laboratory test determined level data due to flanked sound transmission and imperfect site construction.
Sound Isolation	A reference to the degree of acoustical separation between any two areas. Sound isolation may refer to sound transmission loss of a partition or to noise reduction from any unwanted noise source. The term “sound isolation” does not specify any grade or performance quality and requires the units to be specified for any contractual condition
Sound Pressure Level, L_P dB	A measurement obtained directly using a microphone and sound level meter. Sound pressure level varies with distance from a source and with changes to the measuring environment. Sound pressure level equals 20 times the logarithm to the base 10 of the ratio of the rms sound pressure to the reference sound pressure of 20 micro Pascals.
Sound Power Level, L_W dB	Sound power level is a measure of the sound energy emitted by a source, does not change with distance, and cannot be directly measured. Sound power level of a machine may vary depending on the actual operating load and is calculated from sound pressure level measurements with appropriate corrections for distance and/or environmental conditions. Sound power levels is equal to 10 times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power of 1 picoWatt
Speech Privacy	A non-technical term but one of common usage. Speech privacy and speech intelligibility are opposites and a high level of speech privacy means a low level of speech intelligibility. It should be recognised that acceptable levels of speech privacy do not require that speech from an adjacent room is inaudible.
Transmission Loss	Equivalent to Sound Transmission Loss and to Sound Reduction Index in terminology used in countries other than Australia. A formal test rating of sound transmission properties of any construction, by usually a wall, floor, roof etc. The transmission loss of all materials varies with frequency and may be determined by either laboratory or field tests. Australian Standards apply to test methods for both situations.

10 Appendix B – Noise Logger Data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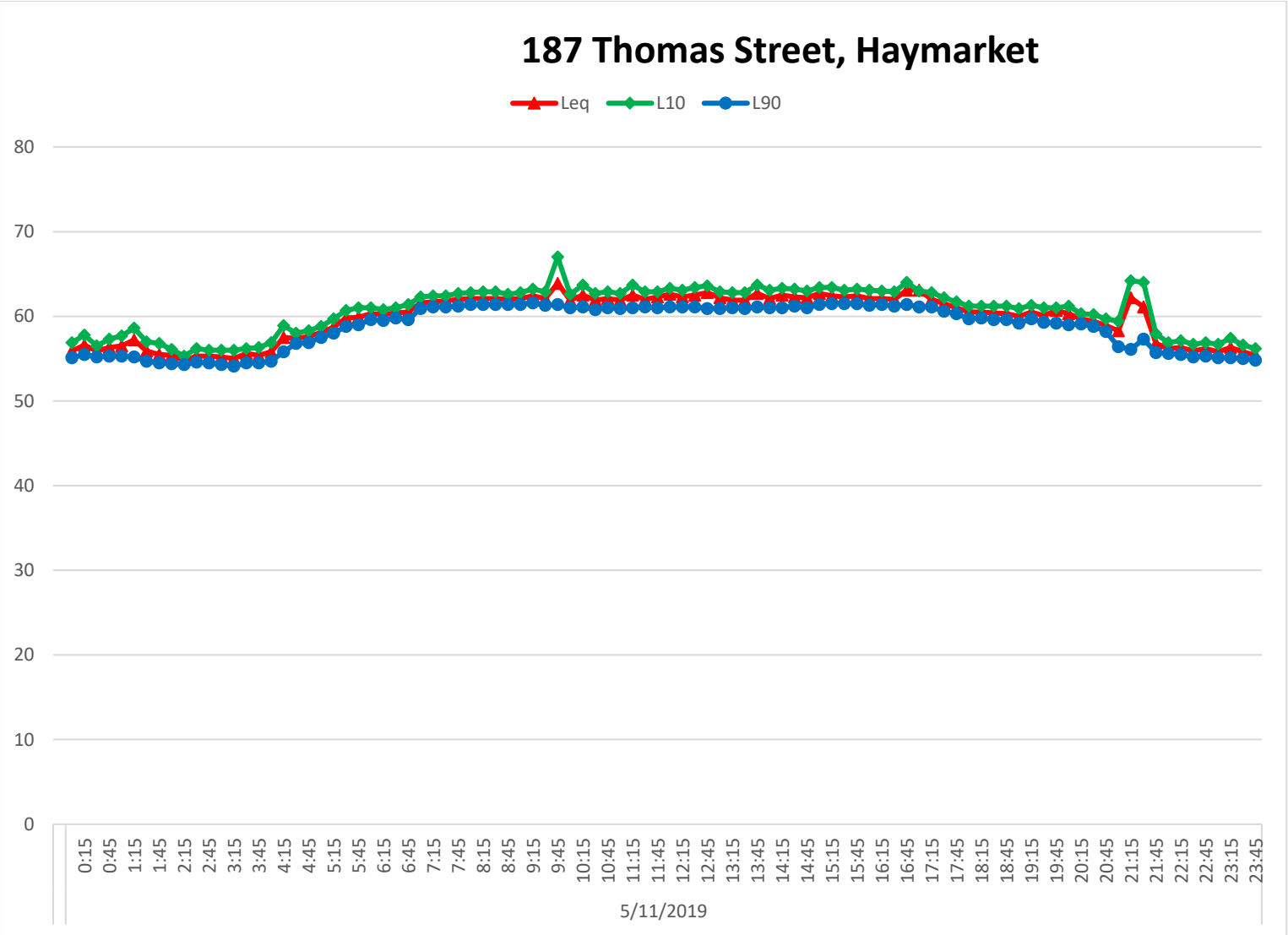
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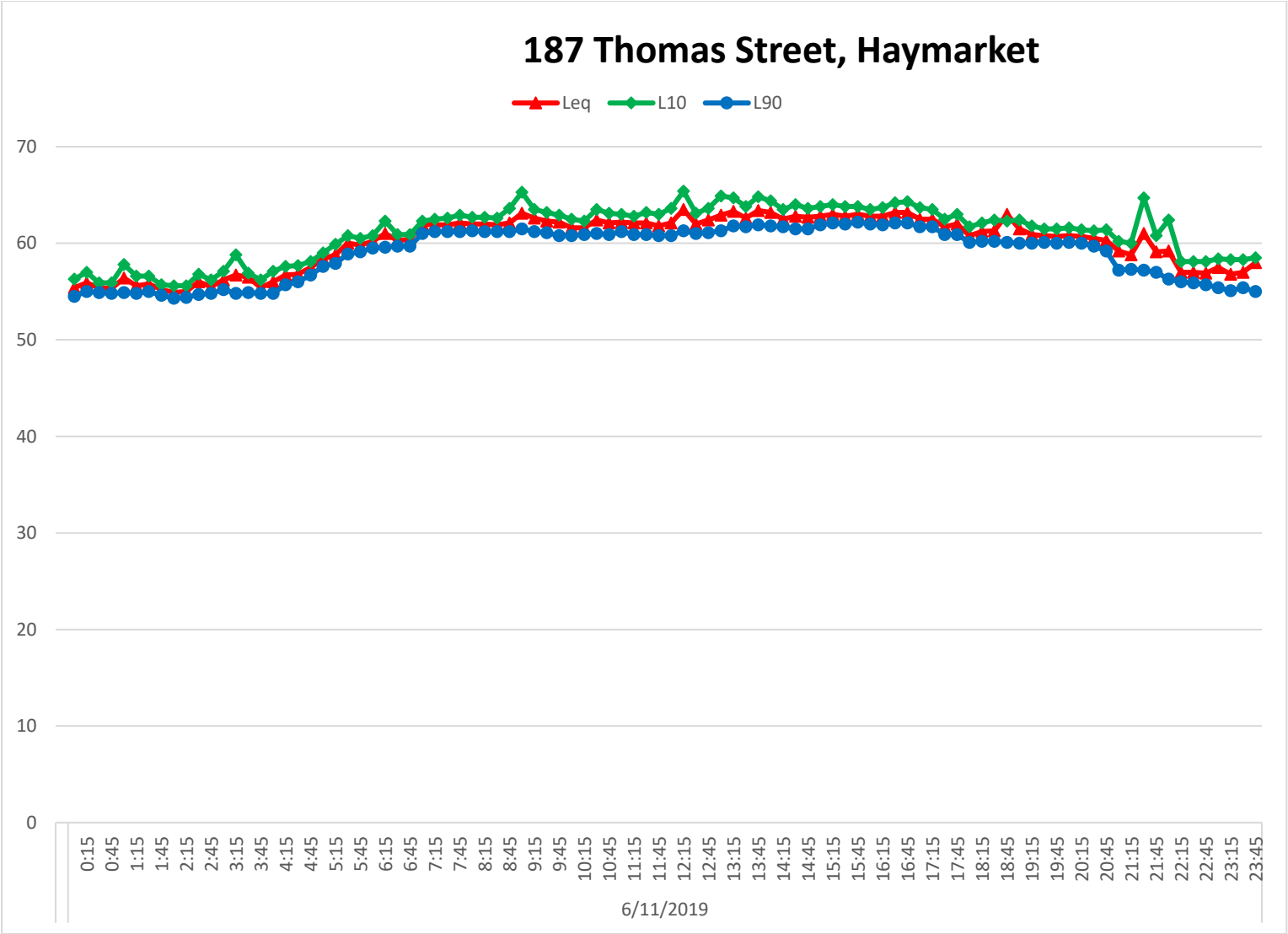
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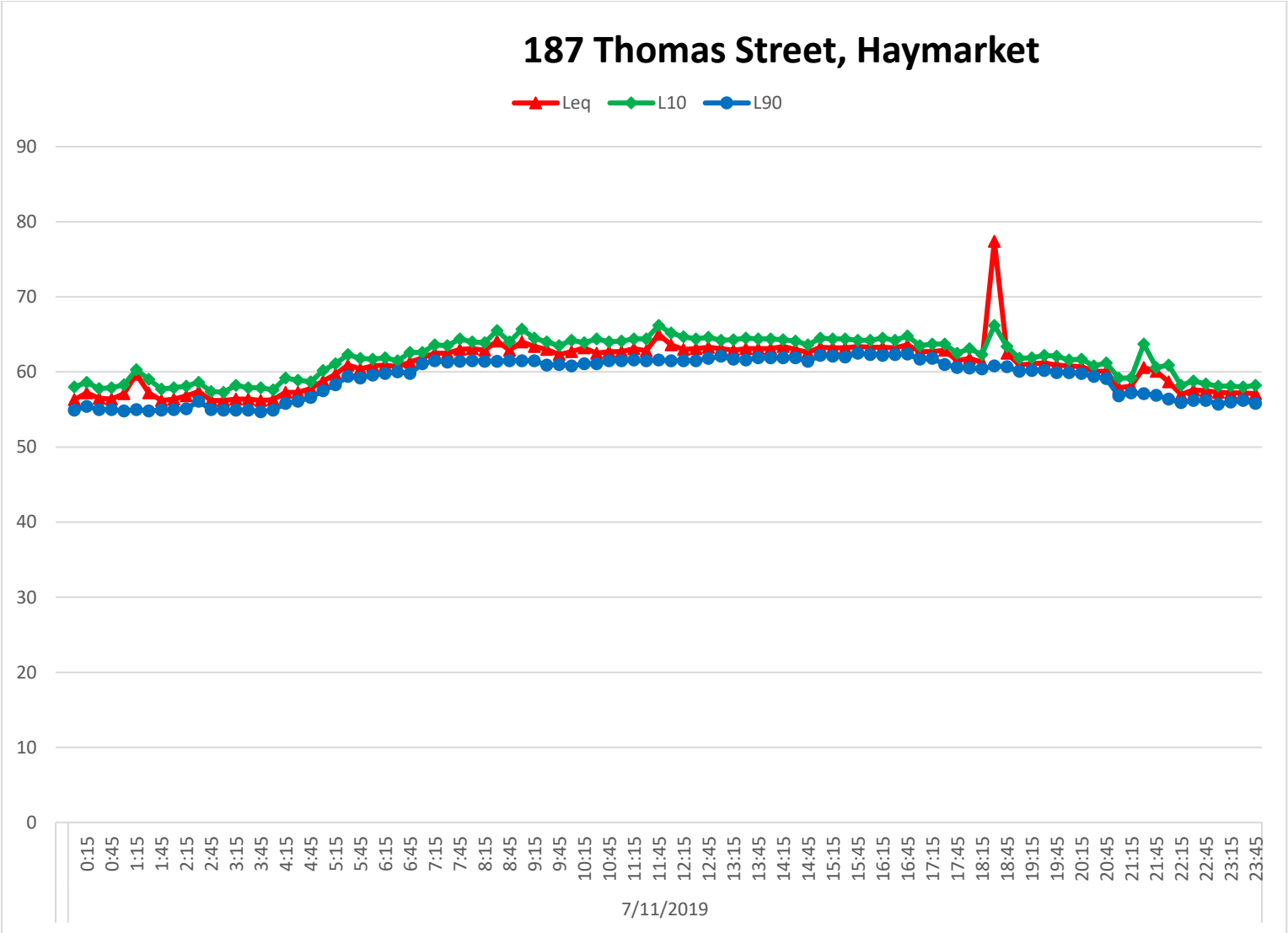
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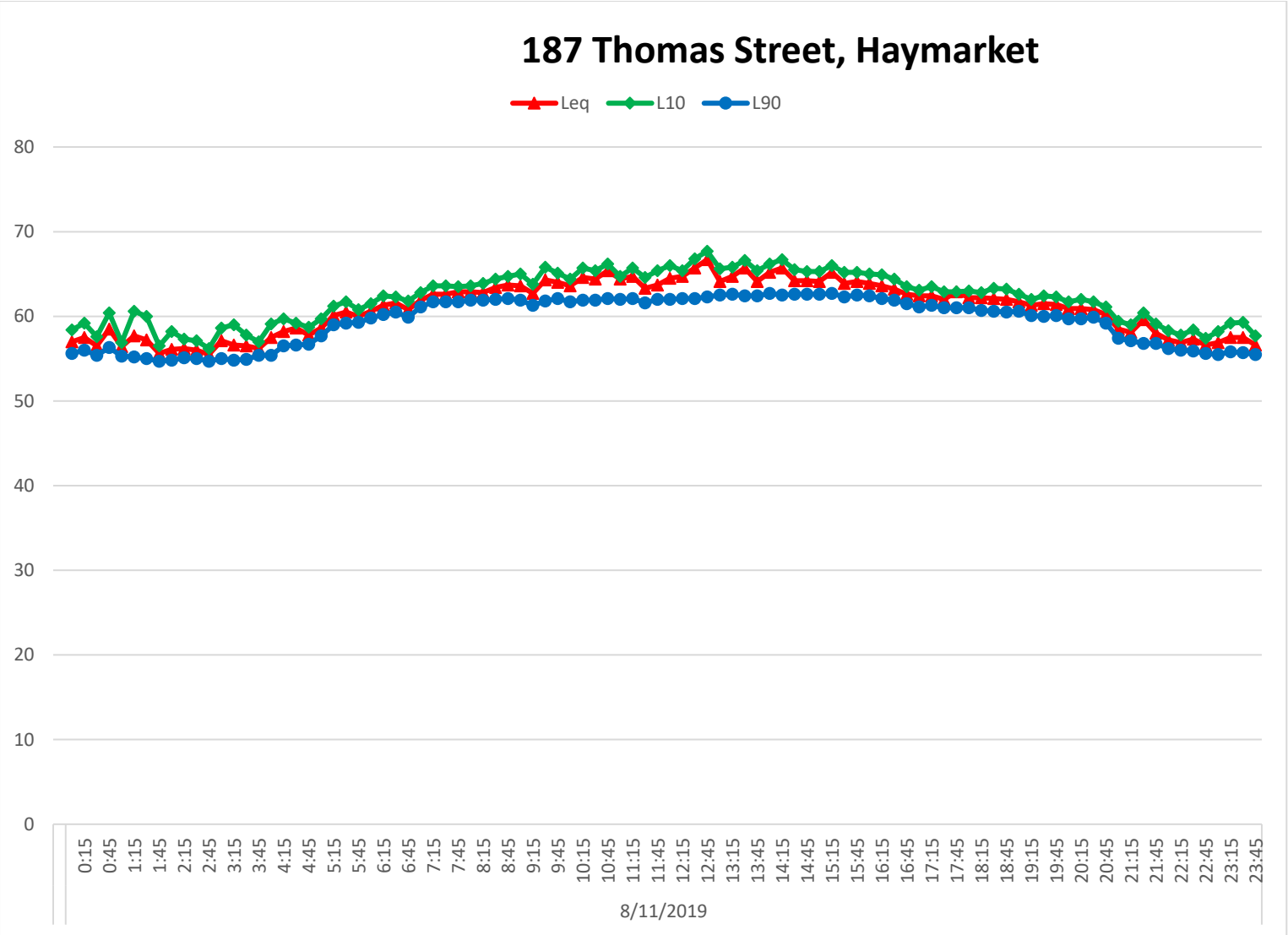
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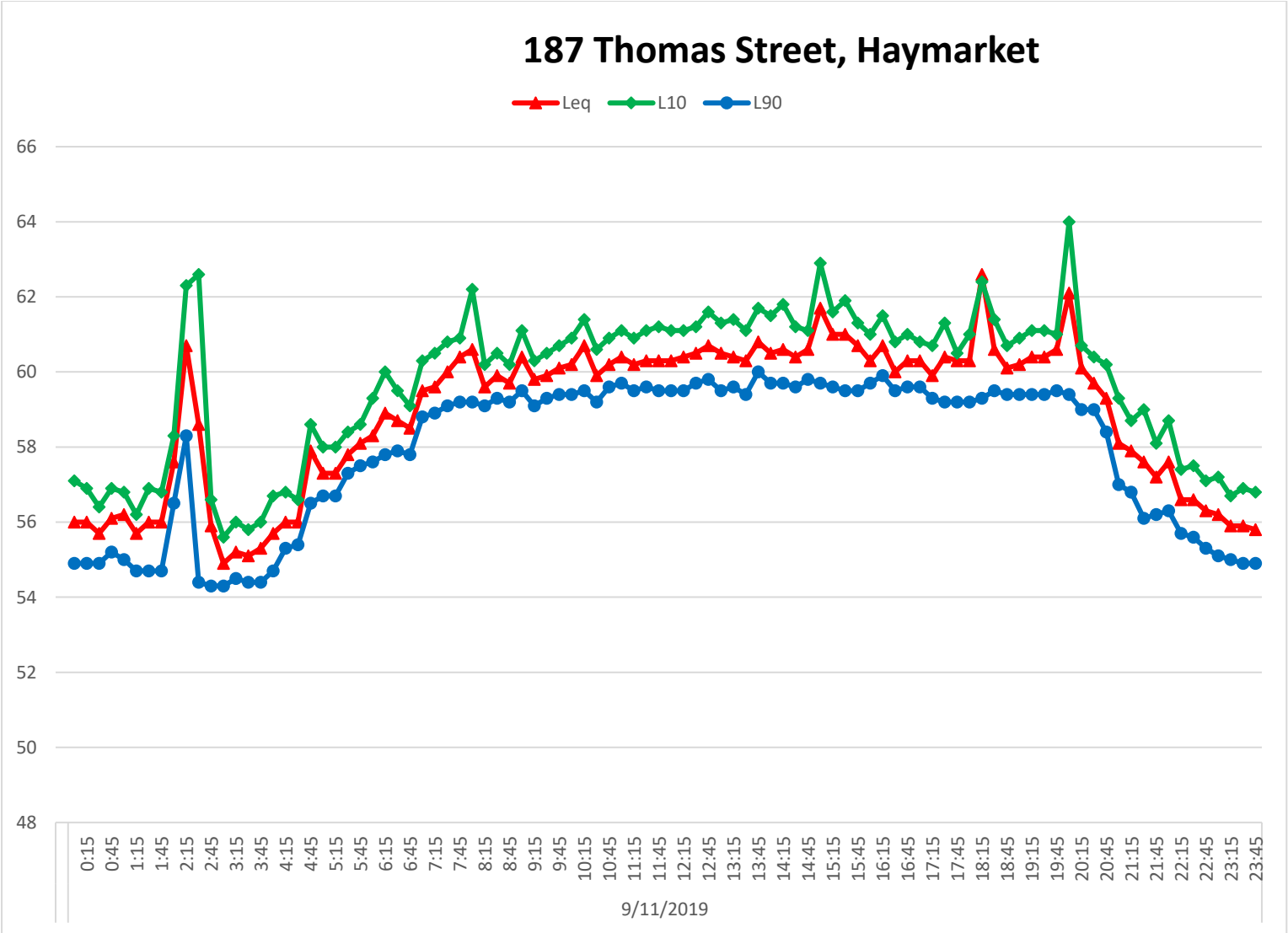
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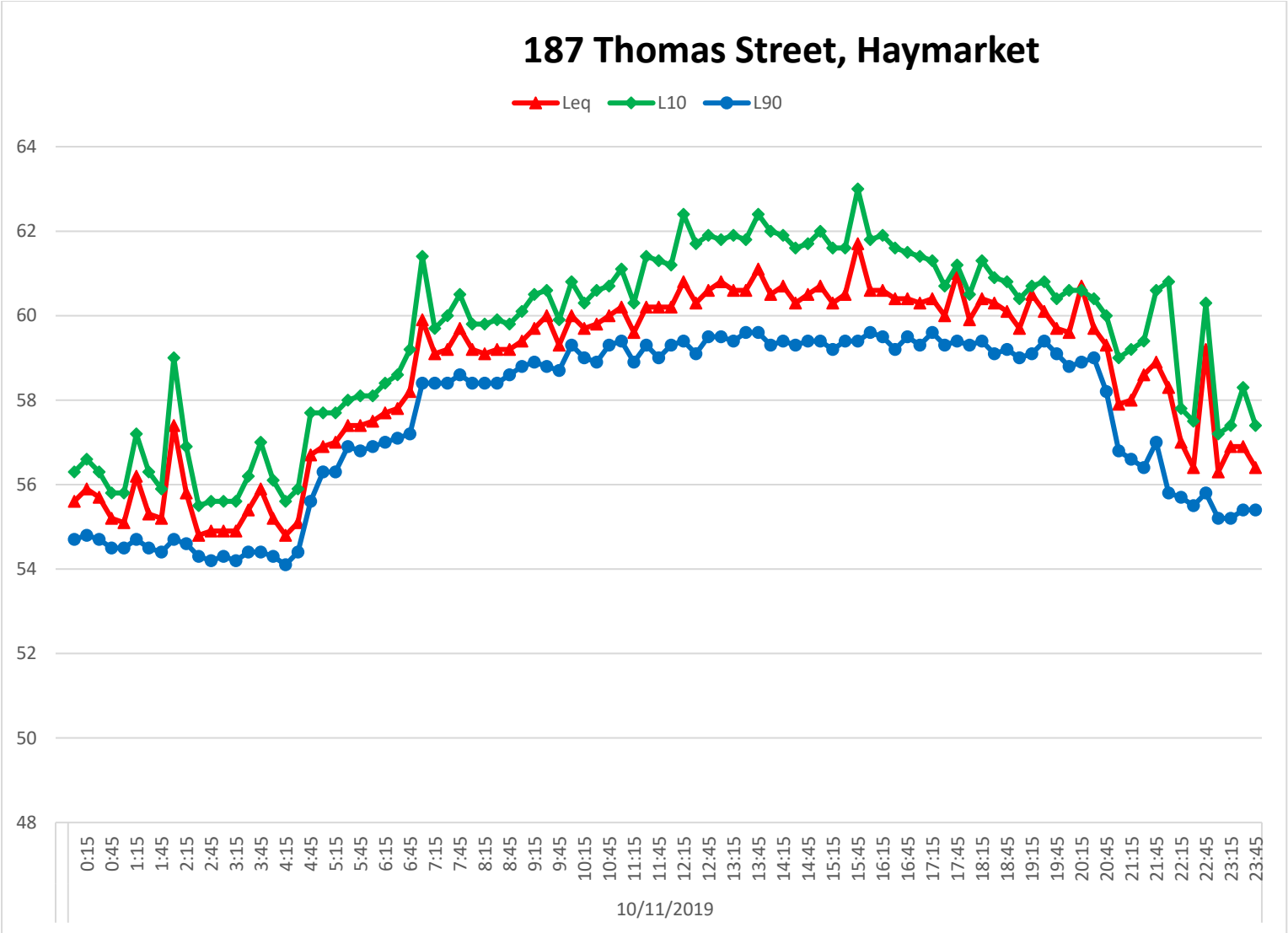
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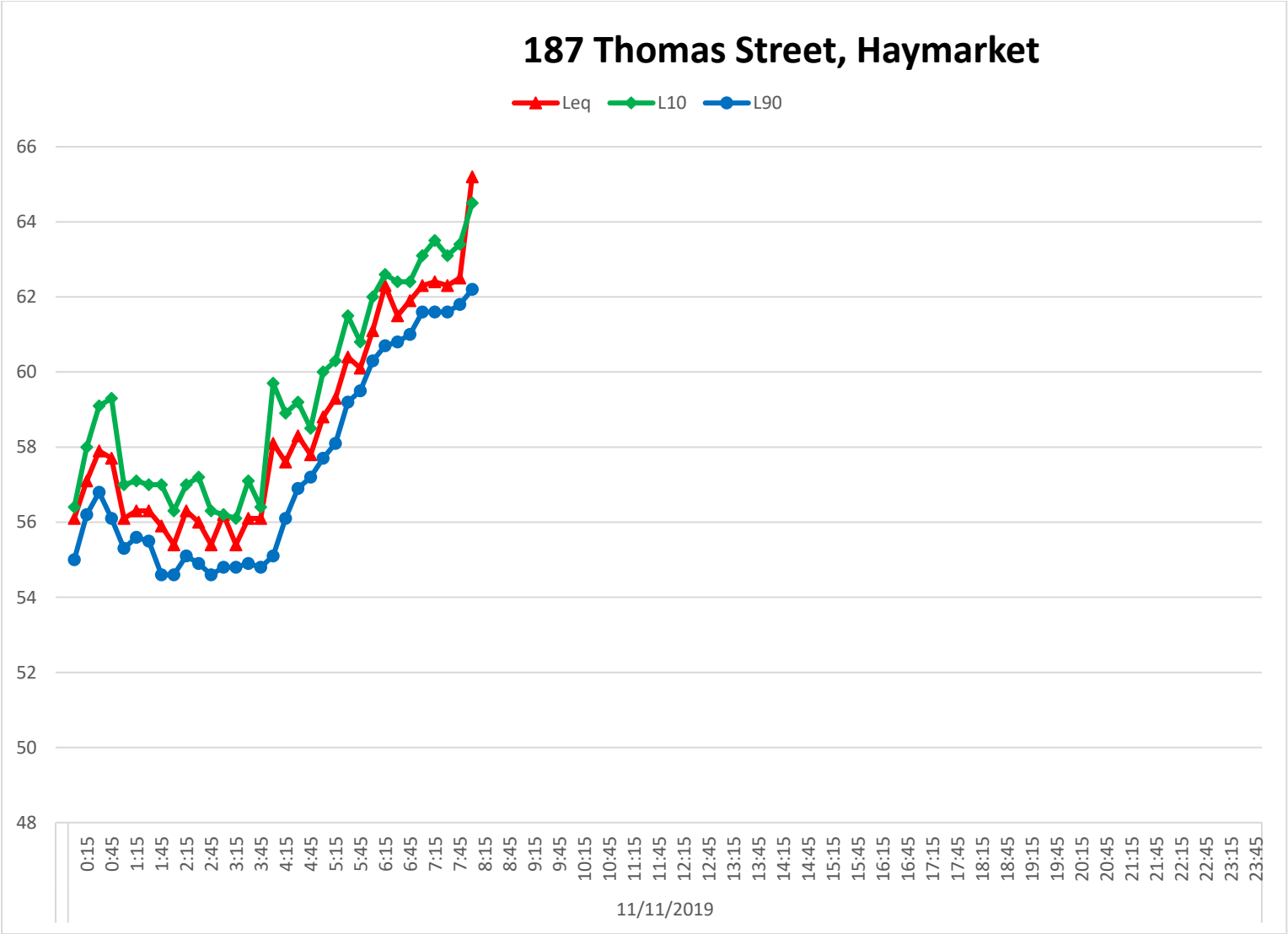
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