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# Lindfield Learning Village

# Noise Impact Assessment

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# 1 INTRODUCTION

Acoustic Logic Consultancy has been engaged by the DesignInc to undertake an assessment of operational noise likely to be associated with the proposed adaptive reuse of the existing UTS Kuringgai Campus into the Lindfield Learning Village.

In this report, we will:

- Identify nearby noise sensitive receivers and operational noise sources with the potential to adversely impact nearby development.
- Identify relevant Council and EPA (SEAR) noise emission criteria applicable to the development.
- Predict operational noise emissions and assess them against acoustic criteria.
- If necessary, determine building and/or management controls necessary to mitigate potential noise impacts.

This report has been prepared to address Secretary's Environmental Assessment Requirement 11.

# 2 SITE DESCRIPTION AND PROPOSED WORKS

## 2.1 GENERALLY

Lindfield Learning Village is an adaptive reuse of the UTS Kuringgai site located at 100 Eton Road, Lindfield.

The final school population would cater for 6 Homebases; each with 350 students for a total of 2100 students from Kindergarten to Year 12 and 200 teachers. It is proposed that there would be staggered start times across the site as follows:

- 2 Homebases starting 7:30am and concluding 2:00pm;
- 2 Homebases starting 8:30am and concluding 3:00pm;
- 2 Homebases starting 9:00am and concluding 3:30pm;

The majority of the proposed outdoor play areas are to the South and East of the building, adjoining the national park or on the rooftops (see A

There are two car parks located along the eastern side of the site.

Pick up and drop offs for students are proposed along the western side of the Northern carpark, with parents walking to and from the school grounds to their cars.

There is a bus stop on Eton Road approximately 200m north of the site, which incorporates a turning circle allowing busses to drop/pick up and turn around efficiently.

The proposed redevelopment works consist of internal reconfiguration and refurbishment and minor changes to the external building shell to allow for the adaptive reuse along with landscaping and pedestrian improvements throughout the site.

The nearest noise sensitive development to the site consists of multi storey residential development located to the north east and north west of the site on Dunstan Grove and Tubbs View.

## 2.2 STAGING OF DEVELOPMENT

To address submissions from Council and RFS, and to ensure a school can open in time for Term 1 2019, the proposal has been amended as follows:

- Removal of a childcare centre from the SSD application; and
- New phasing within Construction Stage 1, detailed below.
- Construction Stage 2 is for the remainder of the development (as originally proposed).

### 2.2.1 Staging

**Construction Stage 1**

Phase 1 will comprise

- One home-base accommodating 350 students from Kindergarten to Year 12.
- All requisite technical spaces to support a full primary and secondary curriculum.
- Administration space for approximately 30-50 staff.
- Construction of a 4m wide access trail for bushfire trucks to the south of the building.
- Fencing of the green space around the perimeter of the site.
- Remediation of targeted roof areas to create additional outdoor play areas.
- Traffic and transport infrastructure associated with the parking and drop-off/pick-up area.
- Tree removal to establish a 100m APZ around the Phase 1 school.

Phases 2A and 2B:

Phase 2A includes works to deliver the remainder of the original Construction Stage 1 and Stage 2B includes works to repurpose Phase 1. Phases 2A and 2B will comprise:

- Three home-bases for approximately 1,000 students (inclusive of the 350 students in Phase 1) from K-12 in the eastern wing of the building.
- All requisite technical spaces to support a full primary and secondary curriculum for 1,000 students;
- Administration space for approximately 80 staff.
- Fencing of the green space around the perimeter of the site, if any remains to be fenced after Phase 1 fencing has been completed.
- Remediation of any targeted roof areas to create additional outdoor play areas if they have not already been remediated under Phase 1 (see Appendix 2).
- Traffic and transport infrastructure associated with the parking and drop-off/pick-up area if it has not been provided under Phase 1.

**Construction Stage 2**

Phase 3 will comprise:

- Three home-bases totalling approximately 1,100 students from K-12 in the western wing of the building.
- Additional administration space for approximately 80 staff.
- Remediation of targeted roof areas to expand outdoor play areas.

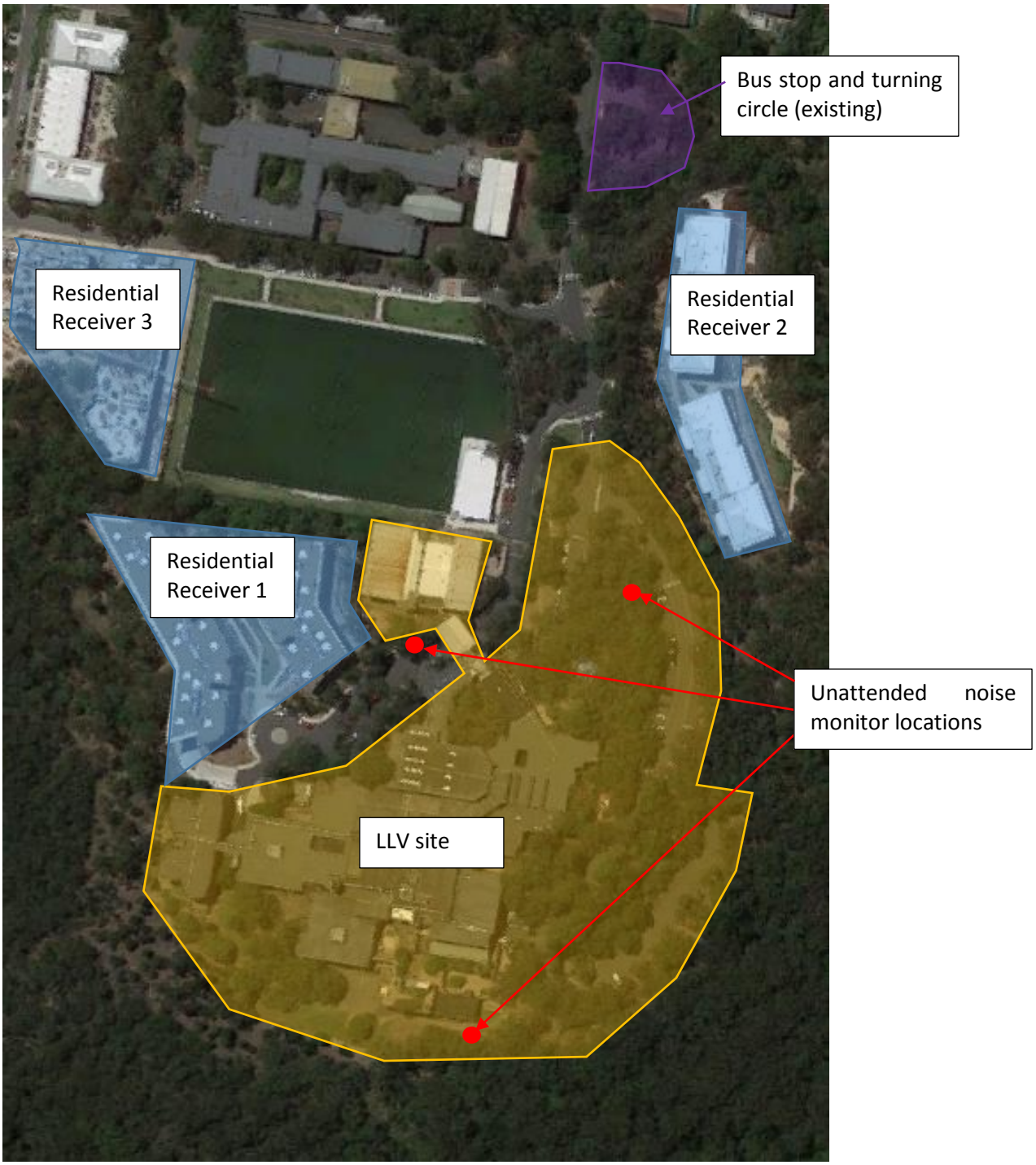



**Figure 1 - Aerial view of site and surrounding receivers**

# 3 NOISE DESCRIPTORS

Environmental noise constantly varies. Accordingly, it is not possible to accurately determine prevailing environmental noise conditions by measuring a single, instantaneous noise level.

To accurately determine the environmental noise a 15-20 minute measurement interval is utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters.

In analysing environmental noise, three-principle measurement parameters are used, namely $L_{10}$, $L_{90}$ and $L_{eq}$.

The $L_{10}$ and $L_{90}$ measurement parameters are statistical levels that represent the average maximum and average minimum noise levels respectively, over the measurement intervals.

The $L_{10}$ parameter is commonly used to measure noise produced by a particular intrusive noise source since it represents the average of the loudest noise levels produced by the source.

Conversely, the $L_{90}$ level (which is commonly referred to as the background noise level) represents the noise level heard in the quieter periods during a measurement interval. The $L_{90}$ parameter is used to set the allowable noise level for new, potentially intrusive noise sources since the disturbance caused by the new source will depend on how audible it is above the pre-existing noise environment, particularly during quiet periods, as represented by the $L_{90}$ level.

The $L_{eq}$ parameter represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the 15 minute period. $L_{eq}$ is important in the assessment of traffic noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of environmental noise.

$L_1$ levels represent is the loudest 1% noise event during a measurement period.

# 4 SURVEY OF AMBIENT NOISE

Both long term unattended noise logging and attended noise measurements were conducted to quantify the existing acoustic environmental at the site.

All monitoring and measurement locations are in the aerial photo in section 2.

## 4.1 UNATTENDED, LONG TERM NOISE LOGGING

Long term unattended noise monitoring was conducted on site from the 1st of April 2016 to the 8th April 2016.

The monitoring locations were on the North Western Boundary – adjacent to the Gymnasium; and on the South Eastern Boundary.

At the time of the installation of noise monitors, a suitable safe location was not found for unattended noise monitoring at Residential Receiver R2 at Tubbs View (a location being representative of R2 but not impacted by specific mechanical plant serving R2 and safe for the security of the monitor and for staff installing/retrieving).

However, additional supplementary noise monitoring was undertaken on site from the 6th June 2017 to the 13th June 2017, opposite the Tubbs View residential receivers (R2).

Unattended noise monitoring was conducted using an Acoustic Research Laboratories monitors set on A-weighted fast response mode. The monitors were calibrated before and after the measurements using a Rion Type NC-73 calibrator. No significant drift was recorded. In accordance with the EPA Industrial Noise Policy, periods of adverse weather have been excluded when calculating background noise levels.

During the period of unattended noise monitoring, the subject site was only partially operational (part of the library was being used for filming) and on that basis, the monitoring is representative of the background noise in the absence of noise from the use of the site.

## 4.2 RESULTS

The results of the unattended noise monitoring are shown in the following table.

**Table 1 – Unattended Monitoring Measured Noise Levels**

| Location | Time of Day | Rating Background Noise Level dB(A) $L_{90\ (15min)}$ | Period Average Noise Level dB(A) $L_{eq}$ |
|---|---|---|---|
| Gym (Receiver 1 - Dunstan Grove) | Day (7am – 6pm) | 42 | 56 $L_{eq(15hr)}$; 59$L_{eq(worst\ 1hr)}$ |
| | Evening (6pm – 10pm) | 41 | |
| | Night (10pm – 7am) | 39 | 47 $L_{eq(9hr)}$; 52$L_{eq(worst\ 1hr)}$ |
| South | Day (7am – 6pm) | 43 | 43 $L_{eq(15hr)}$; 54$L_{eq(worst\ 1hr)}$ |
| | Evening (6pm – 10pm) | 42 | |
| | Night (10pm – 7am) | 36 | 49 $L_{eq(9hr)}$; 54$L_{eq(worst\ 1hr)}$ |
| North (Receiver 2 - Tubbs View) | Day (7am – 6pm) | 44 | 51 $L_{eq(15hr)}$; 53$L_{eq(worst\ 1hr)}$ |
| | Evening (6pm – 10pm) | 42 | |
| | Night (10pm – 7am) | 38 | 47 $L_{eq(9hr)}$; 51$L_{eq(worst\ 1hr)}$ |

## 4.3 ATTENDED NOISE MEASUREMNETS

### 4.3.1 Existing Road Traffic Noise Impacts

In addition to the unattended noise logging, a series of attended noise measurements were made surrounding the site in order to quantify existing traffic noise levels. These measurements were made during the morning peak hour on the 1st of April 2016.

Additional attended noise measurements were also undertaken outside of peak hour, at each unattended noise monitor location and at the residential receivers at Tubbs View (R2).

**Table 2 – Attended Traffic Noise Monitoring Measured Noise Levels**

| Location | Time of Day | Measured Noise Level dB(A) $L_{eq}$ |
|---|---|---|
| Eton Road near Tubbs View 3m from kerb | 7:45am | 58db(A)$L_{eq(15min)}$ (51dB(A) at façade of Tubbs View apartments façade) |
| 107 Abingdon Street, in line with west façade of 64 Abingdon | 8:05 am, 8:21am | 54db(A)$L_{eq(15min)}$ |

### 4.3.2 Supplementary Attended Background Noise Measurements.

Supplementary background noise measurements were made to ensure that the logger measured background noise levels (reported in table 1) were not affected by any on-site activity during the logging period.

Further supplementary attended measurements at all three logging locations were also conducted between 3pm and 5pm on 8/9/2017. Measurements were made using a Norsonic 140 Type 1 Sound Analyser and the results of the measurements (and comparison against long term logging data in table 1) is presented below:

**Table 3 – Measured Background Noise Levels (Short Term Attended Noise Measurements)**

| Location | Time Period | Background Noise Level - Long Term Noise Monitoring* dB(A)$L_{90}$ | Background Noise Level - Short Term Noise Monitoring dB(A)$L_{90}$ |
|---|---|---|---|
| Gym (Receiver 1 - Dunstan Grove) | Daytime (7am-6pm) | 42 | 43 |
| South | Daytime (7am-6pm) | 43 | 45 |
| North (Receiver 2 - Tubbs View) | Daytime (7am-6pm) | 44 | 44 |

*As per table 1.

Attended measurements were made and a visual inspection confirmed no activity on site. Background noise levels equal to or even slightly higher than the background noise levels measured by the loggers were measured. The long term logging data is therefore appropriate for use in setting noise emission goals.

# 5 NOISE EMISSION CRITERIA

There are no mandatory EPA or similar acoustic criteria applicable to the acoustic assessment of schools.

The following noise controls provide some guidance in noise emission assessment:

- The Kuringgai Planning Scheme Ordinance PART IIID UTS Ku-ring-gai Campus site and Draft LEP 2013.
- The Association of Australian Acoustical Consultants (AAAC) guidelines for outdoor play areas for child care centres.
- EPA Industrial Noise Policy (applicable for plant/equipment noise)
- EPA Road Noise Policy (for the assessment of noise as a result of traffic generation by the site).

We note that the above criteria are not strictly applicable to school developments, and are useful as a guideline only. In our experience it is extremely common in the assessment of noise generation by schools that strict compliance with acoustic guidelines (in particular noise from playgrounds and during pick up/drop off) is not achieved (and for schools located in residential areas, it is in fact generally not achievable). Where relevant, this will be discussed in more detail below.

An outline of relevant acoustic criteria is presented below.

## 5.1 KURINGGAI COUNCIL

### 5.1.1 The Kuringgai Planning Scheme Ordinance and Draft LEP 2013

The Kuringgai Planning Scheme Ordinance requires application of the SEPP (Infrastructure) 2007. In respect of acoustics, the relevant section of the SEPP (Infrastructure) 2007 Clause 102 relates to road traffic noise intrusion into the educational establishment. Application of the SEPP (Infrastructure) 2007 internal noise goals is mandatory when a site is adjacent to or with line of sight to a roadway carrying in excess of 40,000 vehicles per day and hence does not apply to the subject site.

There are no further specific acoustic requirements under the Ordinance.

### 5.1.2 Kuringgai Council Draft LEP 2013

The Kuringgai Council Draft LEP 2013 does not nominate any specific acoustic requirements.

## 5.2 EPA INDUSTRIAL NOISE POLICY

Noise sources covered by this code will include noise from internal areas/classrooms and mechanical services noise. Both the Intrusiveness and the Amenity criteria (as set out below) must be complied with.

### 5.2.1 INP - Intrusiveness Assessment

Intrusiveness criteria permit noise generation to be no more than 5dB(A) above existing background noise levels. The criteria are as follow:

**Table 4 – EPA Intrusiveness Criteria**

| Location | Time of Day | Background noise Level - dB(A)$L_{90}$ | Intrusiveness Noise Objective dB(A)$L_{eq(15min)}$ (Background + 5dB) |
|---|---|---|---|
| Residential Receivers 1–(Dunstan Grove) and 3 (Shout Ridge) | Day Time (7am – 6pm) | 42 | 47 |
| | Evening (6pm-10pm) | 41 | 46 |
| | Night (10pm – 7am) | 39 | 44 |
| Residential Receiver 2 – Tubbs View | Day Time (7am – 6pm) | 44 | 49 |
| | Evening (6pm-10pm) | 42 | 47 |
| | Night (10pm – 7am) | 38 | 43 |

### 5.2.2 INP - Amenity Assessment

The Amenity criteria set additional criteria based on the land use of the noise sensitive receivers.

Amenity criteria are as follows:

**Table 5 – EPA Amenity Criteria**

| Receiver Location | Land Type | Time of Day | Amenity Noise Objective dB(A)$L_{eq(Period)}$ |
|---|---|---|---|
| All Potentially Affected Residential Properties | Suburban | Day Time (7am – 6pm) | 55-60 |
| | | Evening (6pm – 10pm) | 45-50 |
| | | Night (10pm-7am) | 40-45 |

## 5.3 OUTDOOR PLAY AREAS

Outdoor play areas are not typically assessed with reference to the same acoustic criteria as other noise sources. Guidelines for outdoor play areas are generally less stringent than requirements imposed for other noise sources (such as mechanical plant noise). This is because:

- Noise from play areas is typically limited to day time periods, and for relatively restricted periods of time.
- Noise from children playing is typically not considered to be as intrusive as noise sources such as industrial noise.
- There is limited scope to provide mitigation treatments. Solid boundary fencing, for example, while it may provide some acoustic benefit, will often have a significant visual impact (particularly if on a street frontage) and will provide little to no benefit in the event that adjacent development is anything other than a single level residence.
- The community benefit/importance in providing outdoor activity areas in schools is balanced against the noise impact.

Relevant published acoustic guidelines include the AAAC guidelines for child care centres, which recommend a "background+10dB(A)" noise emission goal for use of outdoor areas, provided it is limited to no more than 2 hours per day.

As the published noise emission guidelines are applicable to childcare centres, they are therefore useful more as guidance (opposed to a mandatory guideline). Decisions of the Land and Environment Court reflect this position that even if strict compliance is not achieved, the noise is not necessarily excessive/offensive (see *Pedavoli v Meriden*).

However, for assistance, a background +10dB(A) noise emission guideline is presented below.

**Table 6 – Playground Day Time Noise Emission Goals (Background+10dB(A))**

| Noise Receiver | Background Noise Level – dB(A)$L_{90}$ | Background+10dB(A) noise emission goal |
|---|---|---|
| Gym<br>(Receiver 1 - Dunstan Grove) | 42 | 52 |
| North<br>(Receiver 2 - Tubbs View) | 44 | 54 |

## 5.4 NOISE FROM INCREASED TRAFFIC GENERATION ON PUBLIC STREETS/DROP OFF ZONE

For land use developments with the potential to create additional traffic on public streets the development should comply with the EPA Road Noise Policy.

Noise levels generated by traffic should not exceed the noise levels set out in the table below when measured at a nearby property.

**Table 7 – Criteria for Traffic Noise Generated by New Developments**

| Road Type | Time of day | Permissible Noise Generation |
|---|---|---|
| Local Road | Day (7am to 10pm) | 55 dB(A)$L_{eq(1hr)}$ |
| | Night (10pm to 7am) | 50 dB(A)$L_{eq(1hr)}$ |

However, if existing noise levels exceed those in the table above, section 3.4 of the Road Noise Policy is applicable, which states that an increase in the existing noise level of 2dB(A) would be considered a barely perceptible increase to the average person.

It is noted that the subject site is operating in caretaker mode only and as such, the current traffic flows are not representative of what was experienced when the University was operational.

Notwithstanding, the existing night time traffic noise levels at both unattended noise monitoring locations and the daytime levels at the gym monitor already exceed the goals nominated in table 5.

## 5.5 SLEEP DISTURBANCE GUIDELINES

## 5.6 SLEEP AROUSAL ASSESSMENT

Potential sleep arousal impacts should be considered for noise generated before 7am or after 10pm.

Short duration, intermittent noise events (such as cars driving into the car park) are typically assessed for potential sleep disturbance.

Potential impacts are assessed using the recommended procedure in the Application Notes to the EPA Industrial Noise Policy. As recommended in the Application Notes, when assessing potential sleep arousal impacts, a two stage test is carried out:

- Step 1 - An “emergence” test is first carried out. That is, the $L_1$ noise level of any specific noise source should not exceed the background noise level ($L_{90}$) by more than 15 dB(A) outside a resident’s bedroom window between the hours of 10pm and 7am. If the noise events are within this, then sleep arousal impacts are unlikely and no further analysis is needed. This is consistent with the Noise Guide for Local Government. The guideline level is set out below.

**Table 8 – Sleep Arousal (Emergence Criteria)**

| Location | Background Noise Level (5am-7am) dB(A)$_{L90}$ | Emergence Level dB(A) $L_{1(1min)}$ |
|---|---|---|
| Gym (Receiver 1 - Dunstan Grove) | 39 | 54 |
| North (Receiver 2 – Tubbs View) | 38 | 53 |

- Step 2 - If there are noise events that could exceed the emergence level, then an assessment of sleep arousal impact is required to be carried out taking into account the level and frequency of noise events during the night, existing noise sources, etc. This test takes into account the noise level and number of occurrences of each event with the potential to create a noise disturbance. As is recommended in the explanatory notes of the EPA Industrial Noise Policy, this more detailed sleep arousal test is conducted using the guidelines in the EPA Road Noise Policy. Most relevantly, the Road Noise Policy states:

  *For the research on sleep disturbance to date it can be concluded that:*

  - *Maximum internal noise levels below 50-55dB(A) are unlikely to awaken people from sleep.*
  - *One to two noise events per night with maximum internal noise levels of 65-70dB(A) are not likely to affect health and wellbeing significantly.*

The internal noise level guidelines have also been adopted in this assessment.

# 6 NOISE EMISSION ASSESSMENT

An assessment of operational noise emissions is presented below. The following noise sources are assessed:

- Noise from the outdoor play areas.
- Noise from internal (classroom/hall) areas
- Noise created on public roads as a result of traffic generated by the site.
- Noise from mechanical plant, PA system and school bells.

## 6.1 NOISE FROM THE PLAYGROUNDS

Noise emissions from the use of the outdoor play areas is predicted at nearby residences based on the following assumptions/information:

- At the subject site, the main play areas are to the south and east of the school buildings and on the rooftops (see Appendix 2 for roof top areas).
- Considering the staggered starts and breaks, there could be up to 1500 children participating in play at any one time throughout the day.
- The average sound power generated by children during active/ambulatory play is 81dB(A)$L_{eq}$, per child, and assuming that one in two children are generating noise at any one time. This sound power has been determined based on:
    - Long term noise logging of existing playground noise at another school site (Manlyvale Public School).
    - Measurements of playground noise generated at other primary schools (Trinity Grammar School at Strathfield, Erskineville Primary School at Erskineville).

With respect to the noise emission predictions, we note:

- There are numerous outdoor play areas within the grounds of the school – some on natural ground and others within courtyards and/or rooftop spaces that are partially or fully open to the sky. Children will also be permitted to play within nominated indoor areas during breaks. The South Western play areas are nearest the residential receivers opposite on Dunstan Grove (Receiver 1), whilst the North Eastern play areas (including the rooftop play area for the childcare centre) are proximate to Residential Receiver 2 at Tubbs View. Noise emissions will be predicted at both of these locations.
- The population in each zone has been calculated assuming approximately 10$m^2$ per child. Taking into consideration the areas within the security fencing; this correlates to approximately 1500 school children playing outside at any one time; plus a possible 100 at the childcare centre. This presents a conservative approach as some children would be absent, or in the library, canteen etc.

Noise emissions will be predicted and compared both to a “Background+10dB(A)” noise emission goal and to existing noise levels.

Predicted noise levels are as follows:

**Table 9 – Predicted Noise Emission from Playground to Residential Receivers**

| Noise Receiver | Predicted Noise Emission Following Expansion - dB(A)$L_{eq}$ | "Background+10dB(A) noise emission goal – dB(A)$L_{eq}$ |
|---|---|---|
| Receiver 1 (Dunstan Grove Apartments) | 65* | 52 |
| Receiver 2 (Tubbs View Apartments) | 62 | 54 |

*Predicted noise level following completion of Stage 2. Noise generated by the Stage 1 playgrounds alone will be less than 57dB(A).

With respect to the above:

- Residential Receiver 1 (Apartments to the West of Site):
    - Noise emissions are predicted to exceed a background + 10dB(A) noise emission guideline.
    - Noise impacts to these receivers could be reduced by approximately 3dB(A) by limiting student access to the fenced area adjacent to the woodworking rooms; however given the limited access to outdoor play areas on natural ground level, this may present an unreasonable restriction.
- Residential Receiver 2:
    - Noise emissions are predicted to exceed a background + 10dB(A) noise emission guideline.
    - Noise impacts to these receivers could be reduced by introducing screening planting to the North East corner, which would encourage quiet play in this zone rather than active (running etc) play which tends to be louder.
- Given the potential exceedances in noise goals, noise mitigation techniques should be adopted:
    - AAAC guidelines recommend that the Background+10dB(A) noise goal only be adopted for 2 hours per day.
    - Given the potential exceedances, careful management of the playgrounds should be implemented (to ensure that the duration of use of the playground is reasonable). In particular, use of playgrounds for physical education or after school hours activities should be carefully managed with respect to duration (given that the "background+10dB(A) guideline is typically recommended for no more than 2 hours per day, after which a "background+5dB(A)" goal is typically adopted).
    - On the Western boundary, vegetation/planting along the site boundary should be considered. While screening vegetation will not provide much acoustic benefit in itself, it is likely to result in noisy activities (running etc) being located away from the western property boundary (closest to residences) and therefore providing acoustic benefit as a result of the additional distance. This will potentially reduce noise emissions a further 1-2dB(A) compared to the levels predicted in table 7.

These recommendations are discussed in more detail in section 7.

- Outside of the acoustic treatment and management controls detailed in section 7, there is little scope to further reduce noise emissions:
    - The site has finite access to suitable outdoor play areas on natural ground. Restricting access to the Western play areas could have a detrimental impact on students' access to active play. Given the multi-storey nature of the residential receivers; acoustic screening is not a practical solution.

While it is acknowledged that the proposed playground layout results in non-compliances with (non-mandatory) acoustic guidelines, in our opinion it is still in keeping with typical school design in the Kuringgai Council local government area.

We note that a similar level of acoustic separation between playgrounds and residences also occurs at Lindfield Public School, Chatswood Primary School, Chatswood High School, Killara Public School and St Ives Preparatory School (all of which have playgrounds or sports courts with residential receivers overlooking the play areas).

The proposal is, in our opinion, as reasonable balance between the school's needs (to provide suitable outdoor play space for the students) competing acoustic impacts and is not out of keeping to similar school development in the Kuringgai Council local government area.

### 6.2 NOISE FROM USE OF CHARLES BEAN OVAL

It is proposed that the school would utilise the existing Charles Bean Oval for sporting activities. The Oval is an all-weather synthetic soccer field, which can be booked through the Council. The Council nominated hours are 8am to 9:30pm Monday to Friday, 8am to 9pm Saturday and 9am to 6pm Sundays. As with other members of the community, the school will be able to book times on the oval. This would include Physical Education classes, sports training and occasional competition. Noise emitted to the neighbours would depend on the number of participants and the activities being undertaken.

Noise emission calculations are based on the following:

- General play: population 200 students distributed evenly over the Oval. Sound Power level 78dB(A) per person – predicted level to nearest receivers' adjacent on Shout Ridge is 59dB(A) $L_{eq}$ and 58dB(A) $L_{eq}$ to the Dunstan Grove receivers to the south.

- Sports Gameplay (e.g. soccer/hockey): population 60 students distributed evenly over the Oval. Sound Power level 84dB(A) per person – predicted level to nearest receivers' adjacent on Shout Ridge is 60dB(A) $L_{eq}$ and 60dB(A) $L_{eq}$ to the Dunstan Grove receivers to the south.

Noise emissions from use of the Charles Bean Oval have been predicted above. Noise emissions exceed a background + 10dB(A) level. The oval is an existing feature, designed for Sporting activities and available for hire from the Ku-ring-gai Council. To minimise noise emissions from school use of the sporting activities as much as practical, activities are to be planned to maximise the distance to the residential receivers. This would include locating spectators on the Eastern sideline when possible and when that is impractical, to the Northern sideline (as these are the locations with greatest distance to receivers). If the whole field is not required, activity shall be conducted in the centre of the oval and in the Eastern half (when practical). These management controls will reduce noise to neighbours by up to 5dB.

## 6.3 NOISE FROM INTERNAL AREAS (CLASSROOMS, GYM AND AUDITORIUM)

Being an internal area, noise from a classrooms/gymnasium/auditorium should comply with a "background +5dB(A)" noise emission goal at nearby residences (as noise from internal areas is more controllable that noise from a playground).

Noise emissions from normal use of the classrooms, with windows open for natural ventilation are predicted to comply with a background + 5dB(A) goal.

### 6.3.1 Gymnasium Noise

We note:

- While the gym was approved and operated prior to the construction of the apartments to the west, potential after-hours use of the gym to ensure no adverse noise impact is discussed below.

- We note that there is a ventilation louvre located at low level on the western façade of the gym which faces the apartments to the west, creating a potential weak point with respect to noise emissions.

- In order to reduce noise emissions via the louvre, it is recommended to construct a solid screen externally, in front of the louvre (breaking the line of site from the louvre to the apartments. Screen height should be no less than 2m, and spaced no more than 1m from the louvre.

- The screen should be constructed of minimum 6mm thick fc sheet or heavier material. The face of the screen facing the louvre is to be lined with noise absorptive material suitable for external use (50mm thick Echosoft or equal).

With respect to predicted noise emissions:

- A typical sound pressure level within a gymnasium (competitive sports – whistle and moderate vocal noise from participants) is 80dB(A)$L_{eq}$.

- Provided that the noise screen referred to above is implemented, the noise level at the eastern façade of the apartments west of the site would be 46dB(A)$L_{eq}$, which is compliant with daytime and evening time acoustic criteria.

- It is recommended that the gym is not used prior to 7am or after 10pm.

### 6.3.2 Auditorium

Noise emissions from after hours use of the auditorium will comply with the EPA Industrial Noise Policy. The bounding walls and roof to the auditorium are concrete/masonry. The roof top vents are for smoke exhaust only and are closed with metal fire dampers during typical use. Further, there are rooms separating the auditorium from the eastern façade (the façade closest to the residences).

We respect to predicted noise levels at nearby residences

- Assuming a sound pressure level within the auditorium of 95dB(A) (loud, amplified music – a worst case scenario use of the space), the predicted noise level at the nearest residence (top floor of the apartment building to the west) would be approximately 40dB(A) and compliant with the noise emission goals in tables 4 and 5 of the amended acoustic assessment for day/evening and night time periods.

- It would necessary that management require that patrons remain within internal areas after a function except when walking to their cars.

- Outdoor areas on the site should not be available for use after 6pm.

## 6.4 VEHICLE NOISE.

### 6.4.1 Noise Generated by additional traffic on public roads / drop off zone

Noise created as a result an increase in traffic on public roads is assessed with reference to the EPA Road Noise Policy, which targets a noise level of 55dB(A)$L_{eq(1hr)}$ as a result of noise from road traffic generated by the development (see table 6).

The Lindfield Learning Village Transport Assessment by Arup nominates 10 parking spaces for student kiss and ride drop off and an additional 10 spaces for dropping of younger children. These are proposed to be located within the northern carpark area, with minor alterations to allow for a turning head. Outside of school drop off and pickup times, these spaces would be available for visitor parking.

Based on the predictions from Arup of peak hour generation of 796 trips in and 761 trips out in the morning peak hour (and lesser impact in the afternoon peak), the predicted peak hour noise level at the worst affected residential receivers on Eton Road (which have a shorter setback than Tubbs View) of 64-67dB(A) $L_{eq\ (worst\ 1hr)}$. Based on vehicle movement numbers, the noise created by cars alone (excluding the contribution of vocal noise from children as is required by the EPA Road Noise Policy guidelines) is 64-67dB(A)$L_{eq(1hr)}$, which exceeds EPA Road Noise Policy guideline of 55dB(A)$L_{eq}$.

Noise Level from buses idling at the bus stop impacting Tubbs View is 68dB(A) $L_{eq}$ per bus. On that basis, it is recommended that buses are not queued in proximity of the bus stop, but arrive in time to pickup and then depart immediately. On that basis, the impacts to Tubbs View residents would be less than 65dB(A) $L_{eq\ (worst\ 1hr)}$.

With the first staggered start to commence at 7:30am and with the childcare centre to accept children from 6:30am, there will be vehicle movements prior to 7am and so still within the "night time" period (10pm – 7am). The existing worst 1hr noise level overnight already exceeds the EPA guideline. On that basis, noise from traffic generated by a development would typically be limited to existing plus 2dB i.e. 56dB(A) $L_{eq\ (worst\ 1hr)}$ on Eton Road.

Assuming 25% of the first two homebases and the childcare centre arriving between 6:30 and 7am (remainder would arrive after 7am), the predicted noise level at the nearest residential receivers from early morning vehicle movements is 61dB(A) $L_{eq(worst\ 1hr)}$. This exceeds the EPA noise guideline and so on that basis, it could be acoustically advantageous to advise staff and students to arrive after 7am whenever practical to limit night time impacts. However, the staggered starts have been proposed to mitigate traffic flow impacts and increasing the period over which the student drops occur will decrease the instantaneous noise level at any particular time and also alleviate potential traffic delays.

Assuming some of the night time drop-offs would use the short stay parking spaces (which are approximately 22m from Tubbs View residents); the peak noise level within the nearest residential dwellings would be less than 50dB(A)$L_{Max}$ internally and so not likely to cause an awakening.

Some mitigation in noise generation can be achieved through relocation of the area where students queue before being taken to the bus stop. By moving the queue further within the school grounds (as opposed to directly at the existing bus stop which is in close proximity to residences), noise impacts can be marginally reduced. This is recommended if practicable.

While, strictly speaking, vehicle noise is predicted to exceed EPA guidelines (and would have exceeded when UTS was operational), in our experience almost any moderately size school located in a residential area will exceed EPA guidelines with respect to noise generated by the pick-up/drop off period. However, we note there are no feasible means employ a different pick up/drop off strategy which would have a noticeably quieter noise generation.

In our opinion the noise impact is reasonable in that it is not out of keeping with typical school development.

### 6.4.2 After Hours use of the Car Parks

- There are approximately 150 vehicle spaces on site, divided between two on-grade car parks (on the eastern side of the site) and an underground car park (on the western side of the site).

- The underground car park (approximately 70 cars) would not be accessible to the public during after-hours use of the site.

- As such, only the two on-grade car parks would be available for after-hours use (approximately 80 spaces). This car park is accessed via a driveway passing by Tubbs View apartments.

- Assuming a sound power of 82dB(A)$L_{eq}$ per car (typical for a car driving at 10km/h), and all 80 cars leaving the site in a 30 minute period (as may be the case after a function/concert), the noise level at the Tubbs View apartments is predicted to be 42dB(A)$L_{eq(15min)}$, and is compliant with the day, evening and night time noise emission goals in tables 4 and 5.

### 6.4.3 Car Park Use and Sleep Disturbance Assessment

- Momentary peak noise events are assessed with reference to EPA Sleep Disturbance Guidelines for sites used after 10pm.

- Typical EPA assessment practice recommends an initial test that the momentary ($L_{1(1min)}$) peak noise event not exceed background noise levels by more than 15dB(A).

- As noted in table 1, the night time background noise level at Tubbs View is 38dB(A)$L_{90}$, making a noise emission goal of 53dB(A)$L_{1(1min)}$ (see table 8).

- With respect to typical peak noise events (doors closing/cars starting), we note that the nearest parking space to the Tubbs View apartments as approximately 23m away. Assuming a sound power level of a door close/car start of 90dB(A)$L_{1(1min)}$ (typical in our experience), the noise level will be 54B(A)$L_{1(1min)}$ at the nearest window in the Tubbs View apartments. This is inaudibly louder than the 53dB(A) target, and applies only to the closest 4 parking spaces, The remaining spaces in the car park will be 53dB(A) or quieter.

- Given that a completely full car park after 10pm would be infrequent, a 1d(A) exceedance for 4 parking spaces is negligible.

- Further, with an *external* noise level of 54dB(A)$L_{1(1min)}$ from a car start/door close, the *internal* noise level within an apartment (windows open) would be approximately 44dB(A)$L_{1(1min)}$. Based on the sleep disturbance probabilities from Appendix B of the EPA document Environmental Criteria for Road Traffic Noise, the probability of sleep disturbance as a result of a 44dB(A)$L_{1(1min)}$ noise event is 0%.

## 6.5 NOISE FROM MECHANICAL PLANT, PUBLIC ADDRESS SYSTEM AND SCHOOL BELL

Detailed acoustic design of mechanical plant cannot be undertaken at approval stage, as plant selections and locations are not finalised. However, detailed acoustic assessment of all ventilation or other plant items should be undertaken at CC stage, once equipment items are selected and location is finalised.

In regard to the school bell/PA system, the system should minimise noise spill to adjacent properties

- Speaker positioning/selection:
    - Speaker location and direction can be used to reduce noise spill to neighbouring properties while still maintaining suitable noise levels within the school grounds (typically 70-75dB(A)).
    - Broadly speaking, more speakers, closer to the noise receiver is a more effective way to provide coverage of the external areas while reducing noise spill to neighbouring properties.
    - Similarly, highly directional speakers (angled downwards) will also reduce noise spill. Speakers with a drop of at least 5dB(A) for mid-frequencies noise for each 10 degrees in the horizontal plane outside of the coverage area should be considered.
- Use of a noise limiter system:
    - By limiting the maximum possible signal sent to a speaker, this can reduce intermittent increased noise generation as a result of the system user excessively raising their voice or holding the microphone too close. The schools currently engaged contractor would most likely be above to provide such as system.
    - In all likelihood, the limiter system would require that the system be installed, and volume adjusted such that the School was satisfied that a sufficient noise level has been reached in the assembly area, and the noise limit then set based on that.

It is typical practice that a condition of consent be imposed requiring that plant and equipment be designed such that compliance with the EPA Industrial Noise Policy be achieved.

It would be expected that any new equipment would consist of air-conditioning plant, with the loudest likely plant consisting of packaged air-conditioning units (as it would be unlikely that cooling towers or air cooled chlllers would be required). There is nothing about the subject site that indicates that compliance with these requirements is not achievable. The site area is large, and there are typically moderate separations between the site buildings and nearby residences.

# 7 RECOMMENDATIONS

We recommend the following acoustic treatments/management controls are implemented to mitigate acoustic impact as much as practicable:

- Outdoor play areas - Intensive use (recess, lunch, school sport) of outdoor play areas on Dunstan Grove should not exceed 2 hours per day.

- Relocation of the student queuing area for buses further within the school grounds should be considered to reduce noise impact on the residences at Tubbs View.

- Detailed acoustic review of all external plant items should be undertaken following equipment selection and duct layout design. All plant items will be capable of meeting noise emission requirements of Council and the EPA Industrial Noise Policy, with detailed design to be done at CC stage. This should include detailed acoustic review of any proposed PA system (speaker location, directionality, noise limiter etc).

- Auditorium:

    - Management require that patrons remain within internal areas after a function except when walking to their cars.

    - Outdoor areas on the site should not be available for use after 6pm.

    - Auditorium should have a noise limited for any amplified music system, limited to 93dB(A)$L_{eq(15min)}$.

- Gymnasium:

    - In order to reduce noise emissions via the louvre, it is recommended to construct a solid screen externally, in front of the louvre (breaking the line of site from the louvre to the apartments. Screen height should be no less than 2m, and spaced no more than 1m from the louvre.

    - The screen should be constructed of minimum 6mm thick fc sheet or heavier material. The face of the screen facing the louvre is to be lined with noise absorptive material suitable for external use (50mm thick Echosoft or equal).

    - It is recommended that the gym is not used prior to 7am or after 10pm.

- Car Parks:

    - Underground car park is not to be used by the general public after 6pm.

# 8 NOISE INTRUSION ASSESSMENT

Compliance with the SEPP (infrastructure) 2007 is required through the SEARs. In respect of acoustics, the relevant section of the SEPP (Infrastructure) 2007, Clause 102, relates to road traffic noise intrusion into the educational establishment. Application of the SEPP (Infrastructure) 2007 internal noise goals is mandatory when a site is adjacent to or with line of sight to a roadway carrying in excess of 40,000 vehicles per day and hence does not apply to the subject site.

Notwithstanding the above, in accordance with Australian Standard AS2107:2016, application of an internal noise goal of 35-45dB(A) $L_{eq\ 15hour)}$ would is appropriate for teaching spaces. Given the environmental noise impacts on the site are relatively minor, compliance with these internal noise goals would be readily achievable with 6mm float glass without acoustic seals which would need to be closed to comply with the project internal noise goals but which could be openable for natural ventilation.

# 9 CONSTRUCTION NOISE AND VIBRATION

The majority of works will be conducted behind a closed façade, however there are some external alterations/refurbishments required including alterations to the landscaping and roadways.

Noise from construction shall be managed in accordance with the EPA Interim Construction Noise Guideline and Australian Standard AS2436.

Construction vibration shall be managed in accordance with the EPA Assessing Vibration: A Technical Guideline and DIN4150-3.

## 9.1 EPA CONSTRUCTION NOISE GUIDELINE

The EPA Interim Construction Noise Guideline (ICNG) assessment requires:

- Determination of noise generation goals (based on ambient noise monitoring).
- Review of operational noise levels at nearby development.
- If necessary, recommendation of noise controls strategies in the event that compliance with noise emission goals is not possible.

EPA guidelines adopt differing strategies for noise control depending on the predicted noise level at the nearest residences:

- *"Noise affected" level*. Where construction noise is predicted to exceed the "noise effected" level at a nearby residence, the proponent should take reasonable/feasible work practices to ensure compliance with the "noise effected level". For residential properties, the "noise effected" level occurs when construction noise exceeds ambient levels by more than 10dB(A)$L_{eq(15min)}$.
- "*Highly noise affected level".* Where noise emissions are such that nearby properties are "highly noise effected", noise controls such as respite periods should be considered. For residential properties, the "highly noise effected" level occurs when construction noise exceeds 75dB(A)$L_{eq(15min)}$ at nearby residences.

In addition to the above goals for residential receivers, the ICNG nominates a Management Level of 45dB(A) $L_{eq(15min)}$ internally for School Classrooms and 70dB(A) $L_{eq(15min)}$ at commercial receptor facades (typical office, retail).

A summary is presented below.

**Table 3 – Noise Management Levels - residential**

| Location | "Noise Affected" Level - dB(A)$L_{eq(15min)}$ | "Highly Noise Affected" Level - dB(A)$L_{eq(15min)}$ |
|---|---|---|
| Residential Receiver 1 | 52 | 75 |
| Residential Receiver 2 | 54 | |

**Table 4 – Noise Management Levels – other receivers**

| Location | Noise Management Level - dB(A)$L_{eq(15min)}$ |
|---|---|
| School Receivers | 45 internally |
| Commercial Receivers | 70 at façade |

Based on these criteria the following procedure will be used to assess noise emissions:

- Predict noise levels produced by typical construction activities at the sensitive receivers.
- If noise levels exceed "background + 5 or 10 dB(A)" noise goal at residential receiver locations, investigate and implement all practical and cost effective techniques to limit noise emissions.
- For the school receivers, a 45dB(A)$L_{eq\ (15min)}$ *internal* criterion has been adopted at all times, in accordance with the EPA Interim Construction Noise Guideline.
- For the commercial receivers, a 70dB(A)$L_{eq\ (15min)}$ criterion has been adopted at all times, in accordance with the EPA Interim Construction Noise Guideline.
- If the noise goal is still exceeded after applying all practical engineering controls to limit noise emissions investigate management and other techniques to mitigate noise emissions.

## 9.2 AS2436

Section 3 of AS 2436 states that care shall be taken in applying criteria that normally would be used to regulate noise emitted from industrial, commercial and residential premises to construction, particularly for those activities which are transitory and of short duration. For the control and regulation of noise from construction sites AS2436 nominates the following:

- That reasonable suitable noise criterion is established.
- That all practicable measures be taken on the building site to regulate noise emissions, including the siting of noisy static processes on parts of the site where they can be shielded, selecting less noisy processes, and if required regulating construction hours.
- The undertaking of noise monitoring where non-compliance occurs to assist in the management and control of noise emission from the building site.

## 9.3 VIBRATION

Vibration caused by construction at any residence or structure outside the subject site must be limited to:

- For structural damage vibration, German Standard DIN 4150-3 *Structural Vibration: Effects of Vibration on Structures; and*

- For human exposure to vibration, the evaluation criteria presented in the British Standard BS 6472:1992 *Guide to Evaluate Human Exposure to Vibration in Buildings (1Hz to 80Hz)* for low probability of adverse comment

The criteria and the application of this standard are discussed in separate sections below.

### 9.3.1 Structure Borne Vibrations

German Standard DIN 4150-3 (1999-02) provides vibration velocity guideline levels for use in evaluating the effects of vibration on structures. The criteria presented in DIN 4150-3 (1999-02) are presented in Table 4.

It is noted that the peak velocity is the absolute value of the maximum of any of the three orthogonal component particle velocities as measured at the foundation, and the maximum levels measured in the x- and y-horizontal directions in the plane of the floor of the uppermost storey.

**Table 5 – DIN 4150-3 (1999-02) Safe Limits for Building Vibration**

| TYPE OF STRUCTURE | | PEAK PARTICLE VELOCITY ($mms^{-1}$) | | | |
|---|---|---|---|---|---|
| | | **At Foundation at a Frequency of** | | | **Plane of Floor of Uppermost Storey** |
| | | **< 10Hz** | **10Hz to 50Hz** | **50Hz to 100Hz** | **All Frequencies** |
| 1 | Buildings used in commercial purposes, industrial buildings and buildings of similar design | 20 | 20 to 40 | 40 to 50 | 40 |
| 2 | Dwellings and buildings of similar design and/or use | 5 | 5 to 15 | 15 to 20 | 15 |
| 3 | Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (e.g. buildings that are under a preservation order) | 3 | 3 to 8 | 8 to 10 | 8 |

### 9.3.2 Assessing Amenity

Department of Environment and Conservation NSW "Assessing Vibration: A Technical Guideline" (Feb 2006) is based on the guidelines contained in BS 6472:1992. This guideline provides procedures for assessing tactile vibration and regenerated noise within potentially affected buildings.

The recommendations of this guideline should be adopted to assess and regulate vibration within the excavation/construction site.

**Table 6 – DECCW Recommended Vibration Criteria**

| | | RMS acceleration ($m/s^2$) | | RMS velocity (mm/s) | | Peak velocity (mm/s) | |
|---|---|---|---|---|---|---|---|
| Place | Time | Preferred | Maximum | Preferred | Maximum | Preferred | Maximum |
| Continuous Vibration | | | | | | | |
| Residences | Daytime | 0.01 | 0.02 | 0.2 | 0.4 | 0.28 | 0.56 |
| Offices | | 0.02 | 0.04 | 0.4 | 0.8 | 0.56 | 1.1 |
| Workshops | | 0.04 | 0.08 | 0.8 | 1.6 | 1.1 | 2.2 |
| Impulsive Vibration | | | | | | | |
| Residences | Daytime | 0.3 | 0.6 | 6.0 | 12.0 | 8.6 | 17.0 |
| Offices | | 0.64 | 1.28 | 13.0 | 26.0 | 18.0 | 36.0 |
| Workshops | | 0.64 | 1.28 | 13.0 | 26.0 | 18.0 | 36.0 |

## 10 ACTIVITIES TO BE CONDUCTED AND THE ASSOCIATED NOISE SOURCES

Typically, the most significant sources of noise or vibration generated during a construction project will be demolition, excavation and piling. As there is no extensive demolition associated with the project, the excavation of trenches and erection of poles will be the main sources of noise generation. Equipment associated with these works and associated noise levels are as follows:

**Table 5 - Sound Power Levels of the Proposed Equipment**

| EQUIPMENT /PROCESS | SOUND POWER LEVEL dB(A) |
|---|---|
| 12T Truck | 108 |
| Excavator with bucket (Up to 30t) | 114 |
| Hydraulic Hammering | 120 |
| Bobcat / Dozer D9 / Roller | 105 |
| Road Saw | 105 |
| Angle Grinder | 114 |
| Electric Saw | 111 |
| Mobile Crane | 113 |

The noise levels presented in the above table are derived from the following sources, namely:

- Table A1 of Australian Standard 2436-2010.
- Data held by this office from other similar studies.

Noise levels take into account correction factors (for tonality, intermittency where necessary).

# 11 CONSTRUCTION NOISE AND VIBRATION ASSESSMENT AND RECOMMENDATIONS

A complete construction noise and vibration management plan should be prepared after the appointment of the builder as a thorough assessment of construction impacts must consider the particular methodologies to be employed (which will vary).

Noise emissions from internal works are unlikely to exceed the “noise affected” level at the nearest residential receivers given they will occur behind a closed façade. Noise emissions from external works proximate to residential receivers will exceed the “highly noise affected” level at the residents from time to time i.e. concrete sawing/angle grinder within 20m of a residential receiver. On that basis, residents should be notified of the likely noise levels, the duration of works and contact details for the site. In addition, it may be appropriate to apply respite periods, however this should be considered on a case by case basis. This should be detailed in a Construction Noise and Vibration Management Plan, prepared prior to commencement of on site works.

Vibration impacts from the required construction works are not likely to create significant vibration at the neighbouring residents; although the proposed works should still be reviewed in detail after appointment of the builder.

# 12 CONCLUSION

Noise emissions associated with the proposed Lindfield Learning Village at Eton Road, Lindfield have been assessed with reference to relevant EPA and Council acoustic guidelines.

An analysis of playground noise and noise created by traffic generation indicate that noise emissions generated by the school exceed non-mandatory acoustic. However:

- The layout of the school (position of playgrounds relative to residences) is not out of keeping with typical school design in residential areas and

- Acoustic treatment (where practicable) and noise management controls have been recommended in section 7 of this report to ensure that the amenity of nearby residents is protected as much as practicable while avoiding outcomes which will have significant visual impacts (noise screens or similar).

An analysis of noise from classrooms indicates that compliance with noise emission goals for the site is achievable.

Detailed acoustic assessment and quantitative assessment of noise from outdoor areas, the auditorium, gymnasium, car parks has been undertaken and where necessary, noise management treatments have been recommended.

Provided that the acoustic treatments recommended in sections 7 and 11 of this report are adopted, noise impacts associated with the site will be suitably management.

As such, the reporting requirements of SEAR 11 is satisfied.

Please contact us should you have any further queries.

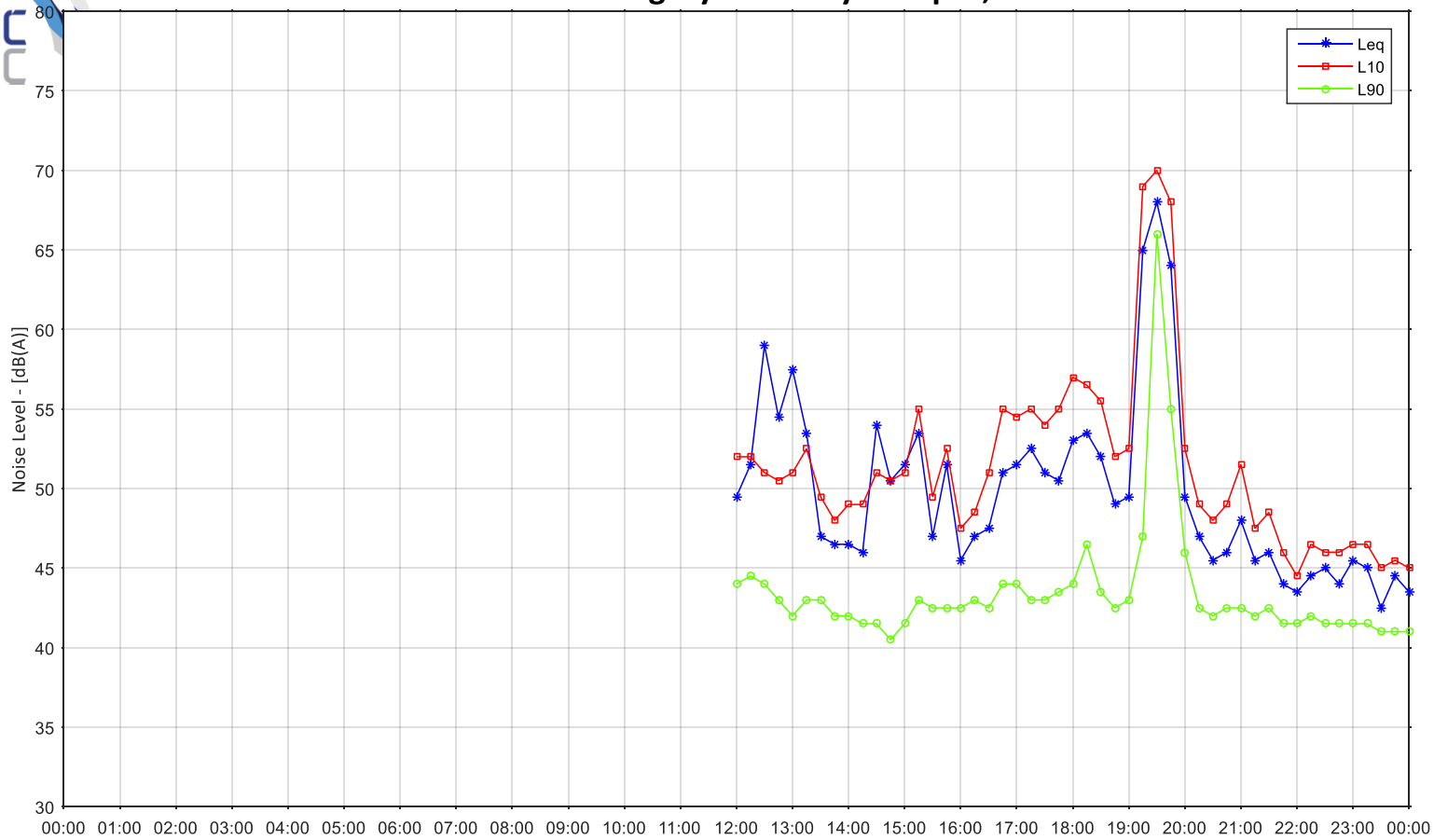
Yours faithfully,

Acoustic Logic Consultancy Pty Ltd
Thomas Taylor

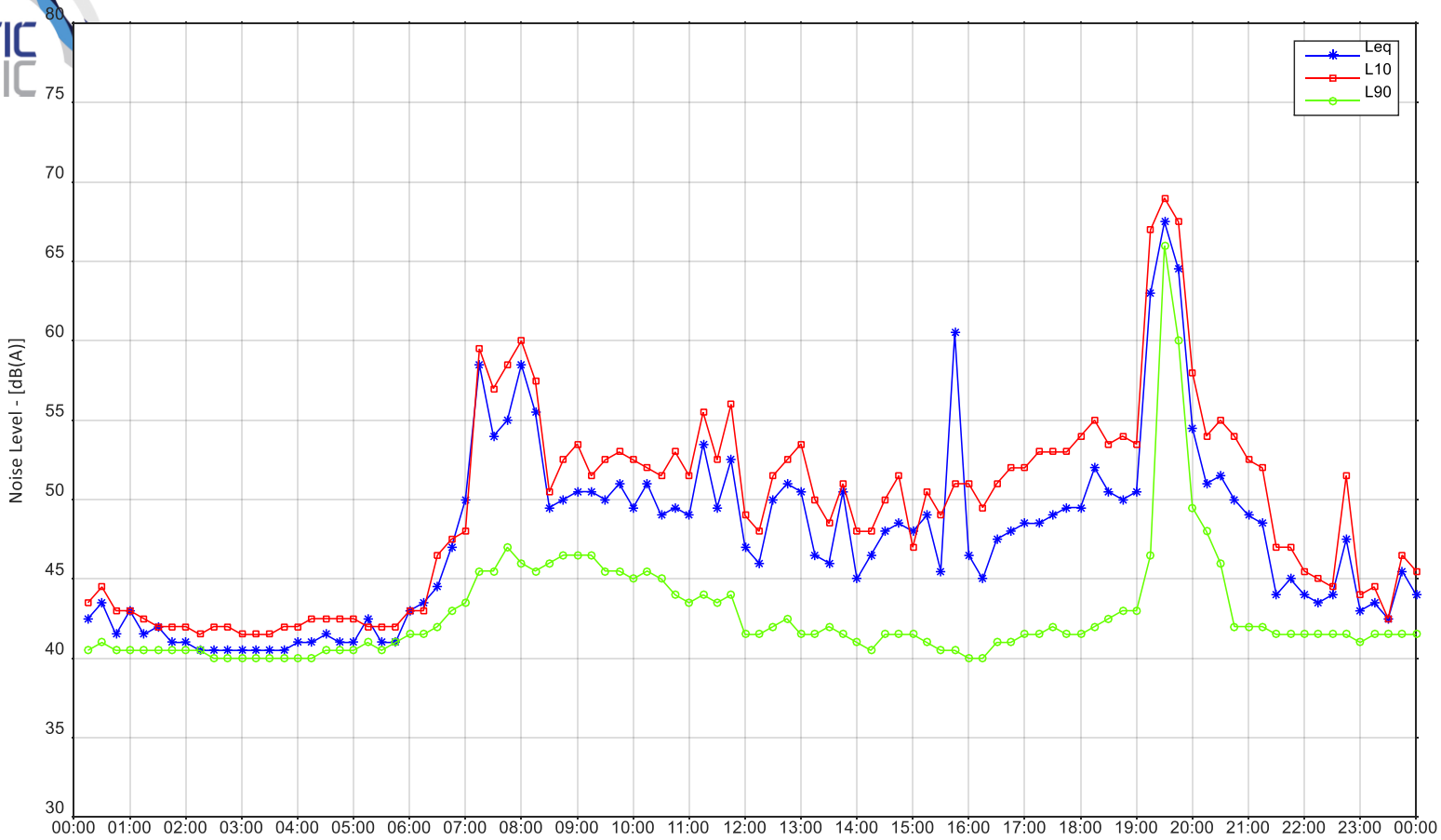
# Appendix 1

# Noise Logging Data

# Lindfield Learning Gym: Friday 01 April, 2016



# Lindfield Learning Gym: Saturday 02 April, 2016



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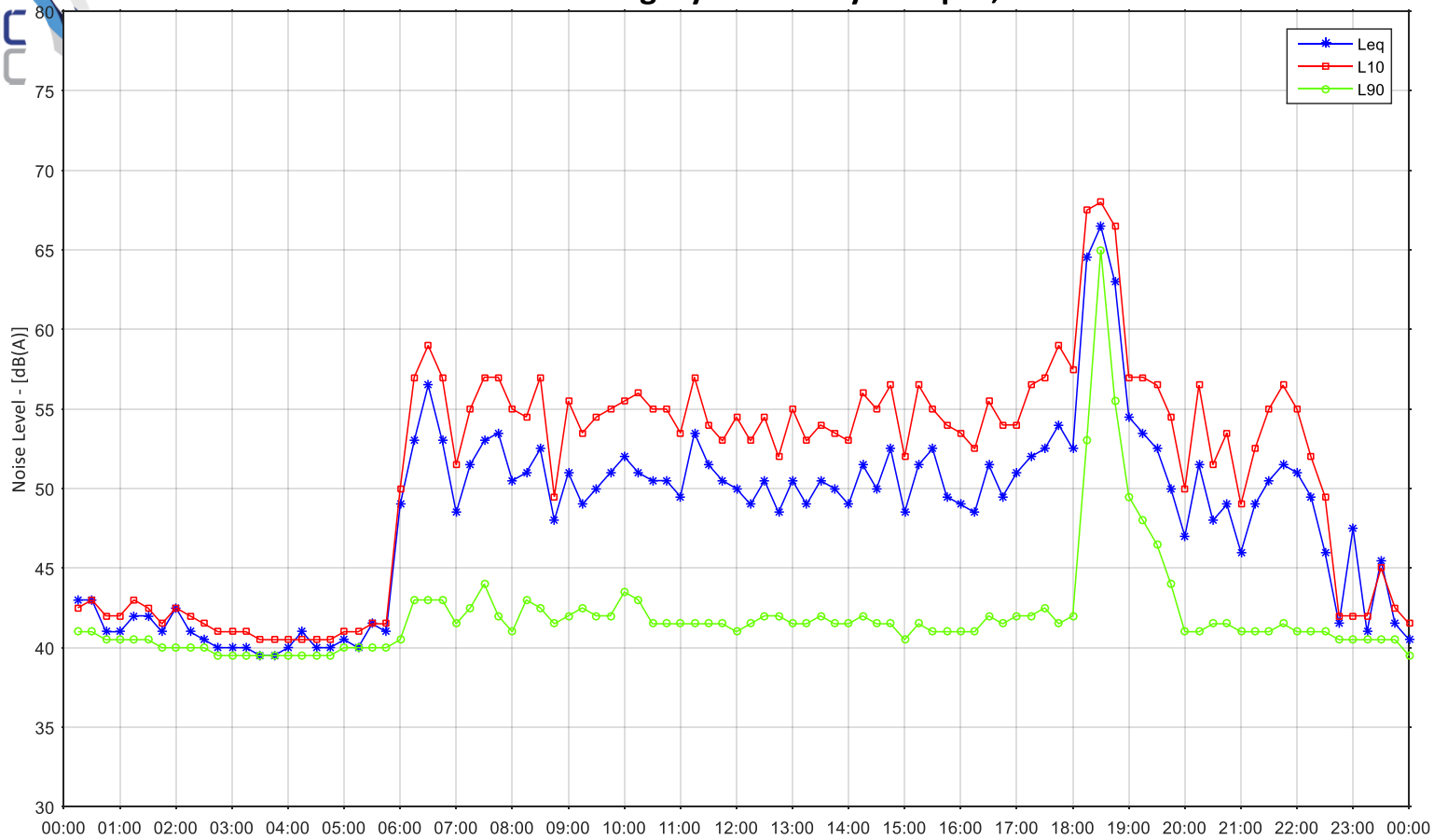

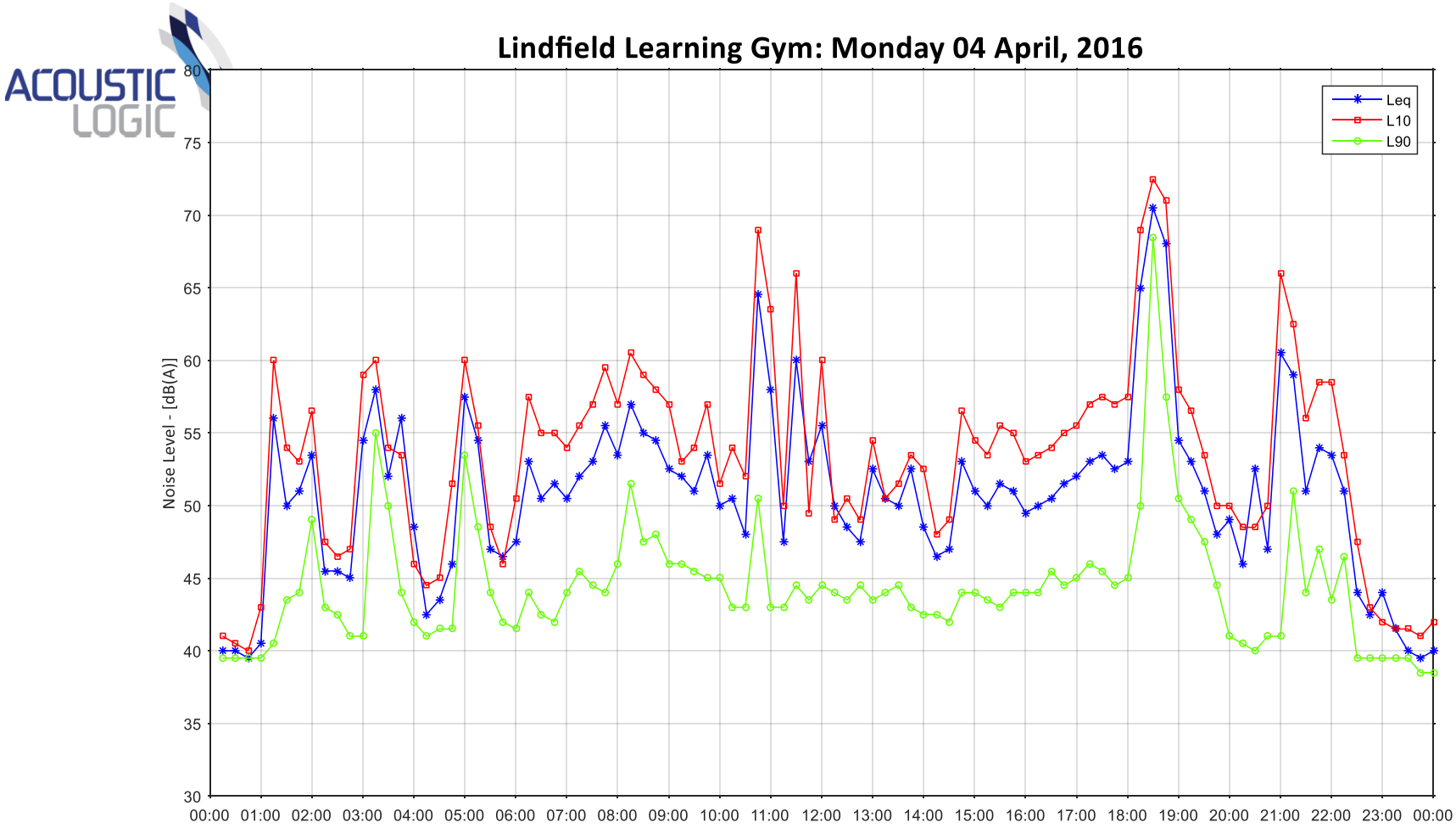
Lindfield Learning Gym: Monday 04 April, 2016
Noise Level - [dB(A)]
80
75
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00:00
01:00
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Leq
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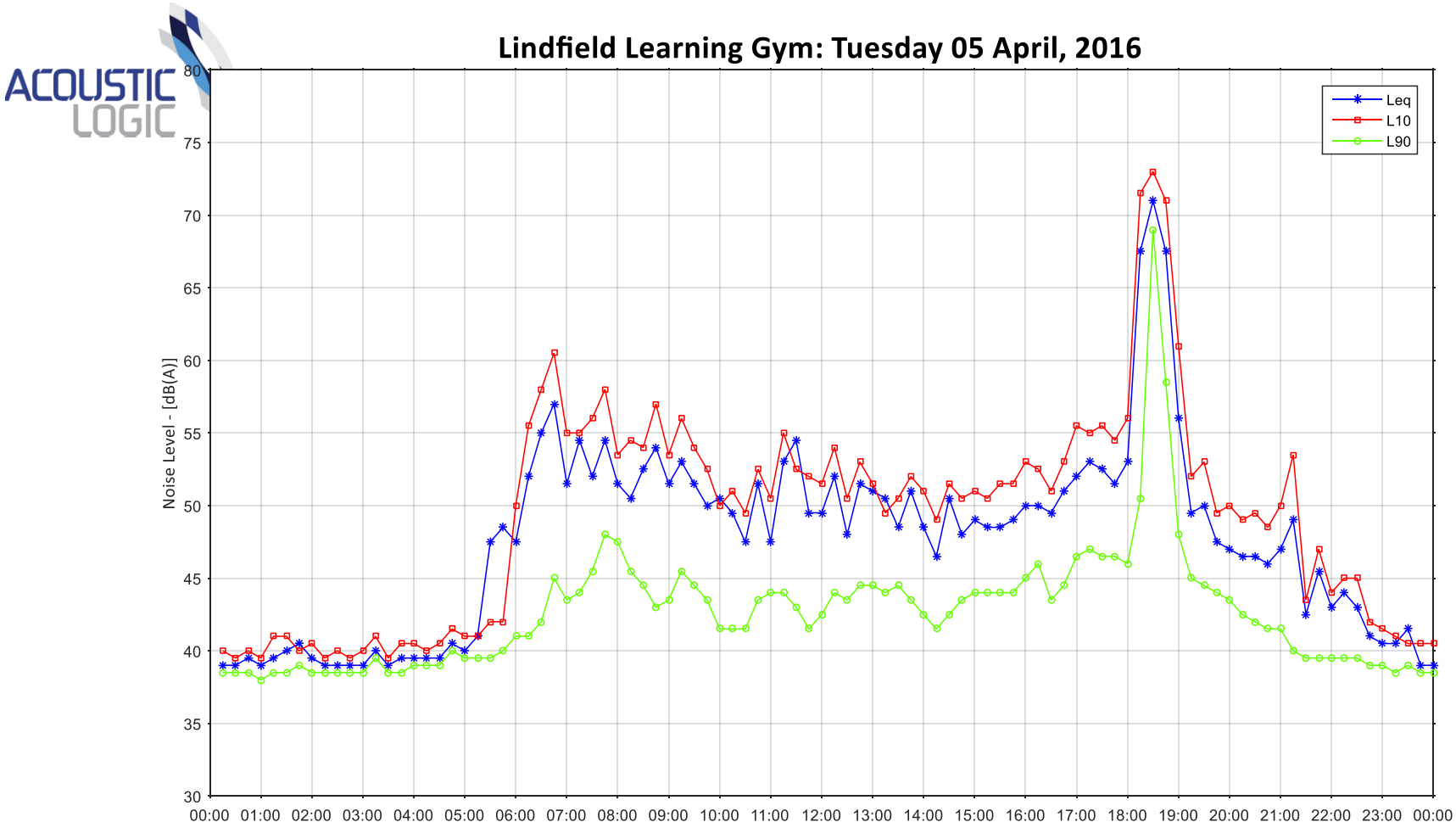
Lindfield Learning Gym: Tuesday 05 April, 2016
Noise Level - [dB(A)]
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01:00
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04:00
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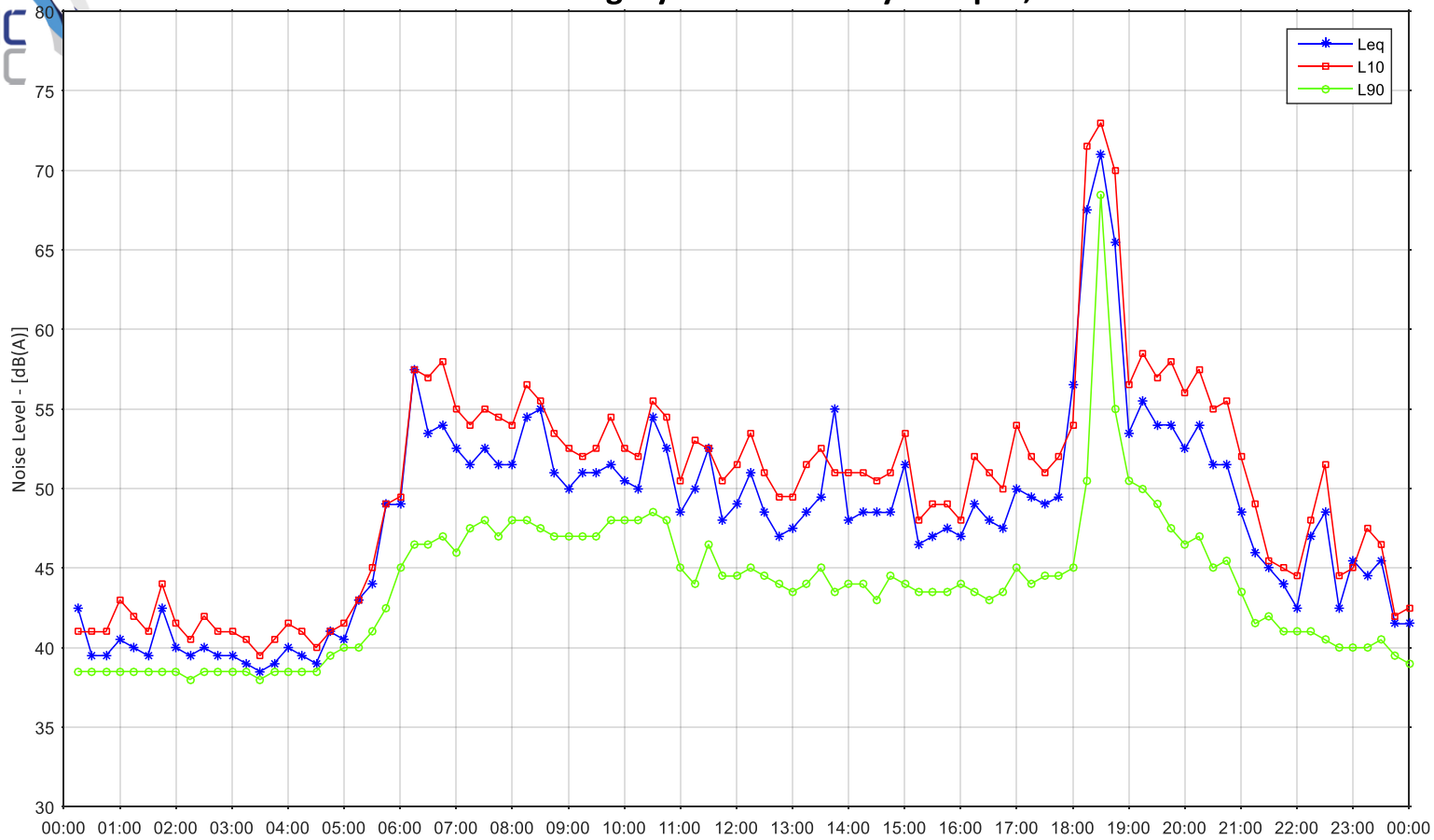
# Lindfield Learning Gym: Wednesday 06 April, 2016



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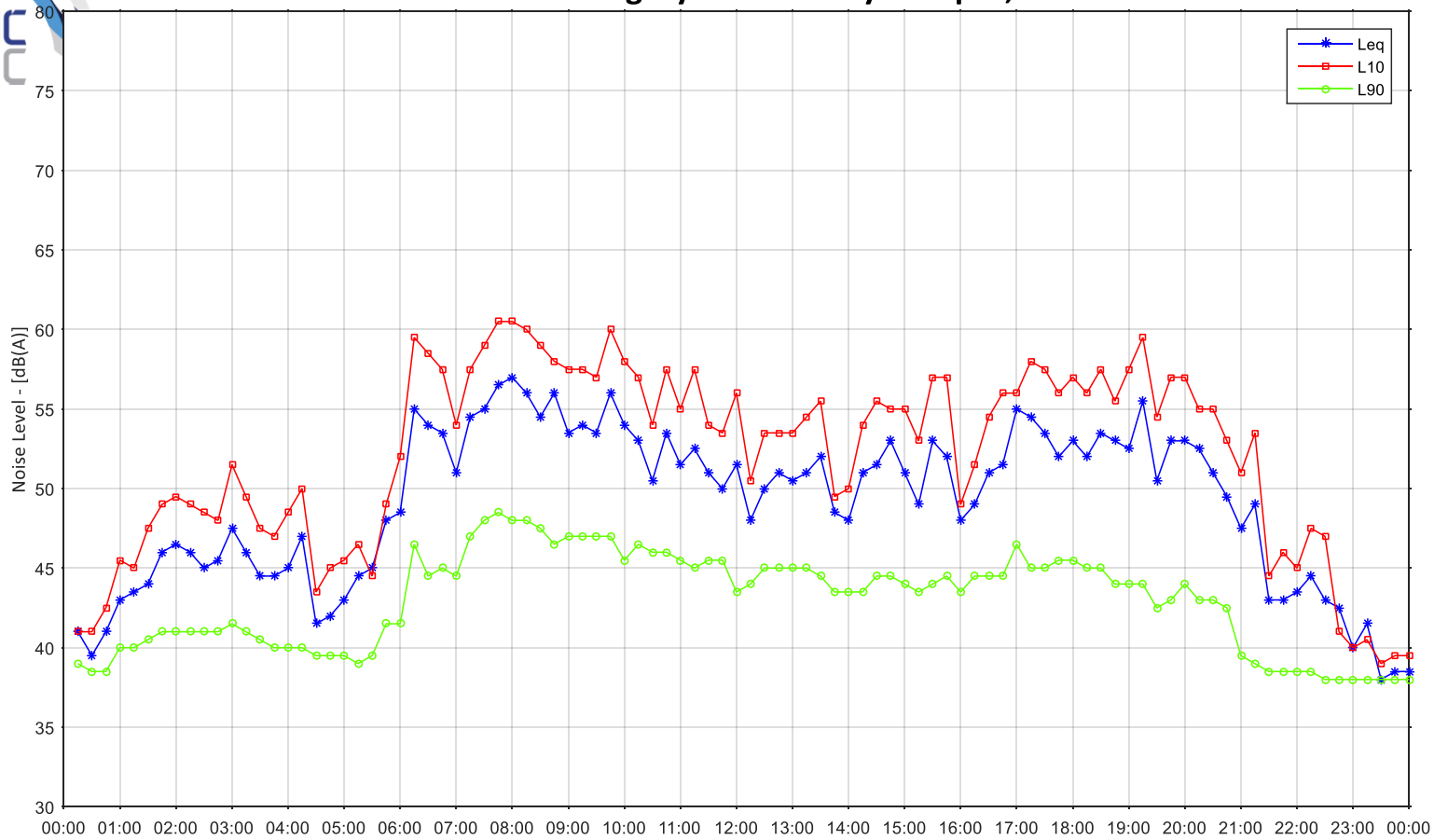

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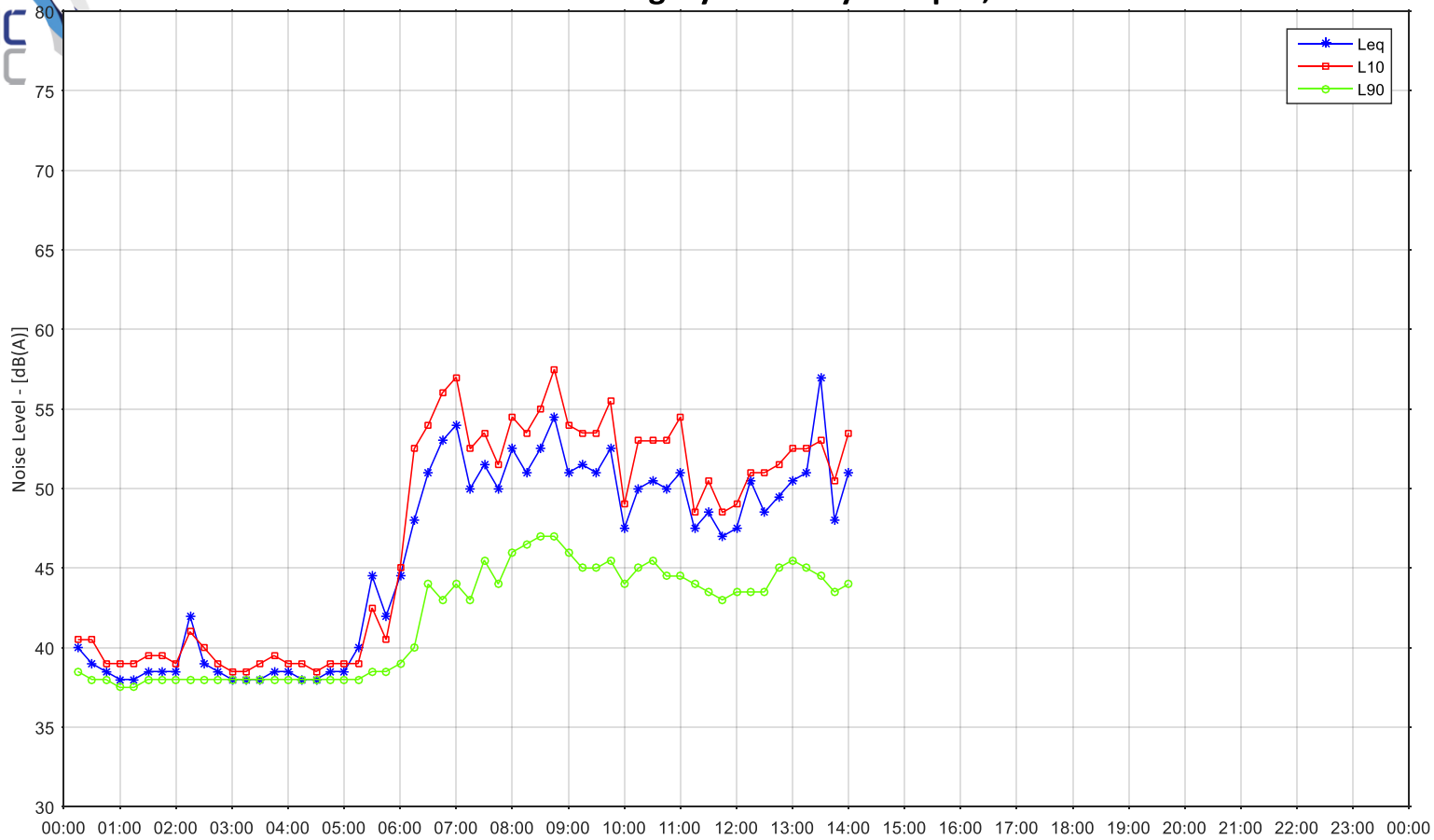
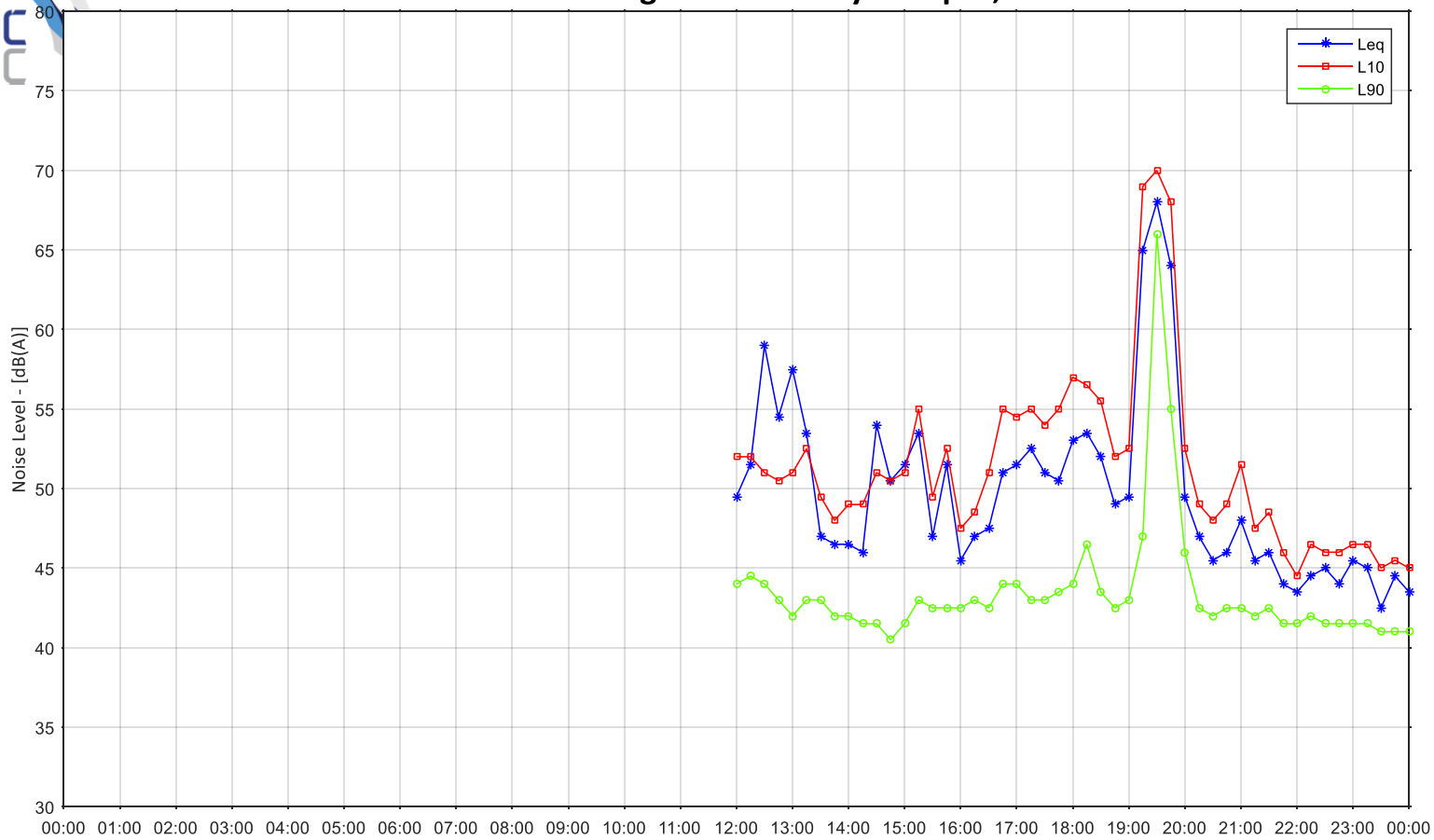


# Lindfield Learning South: Friday 01 April, 2016



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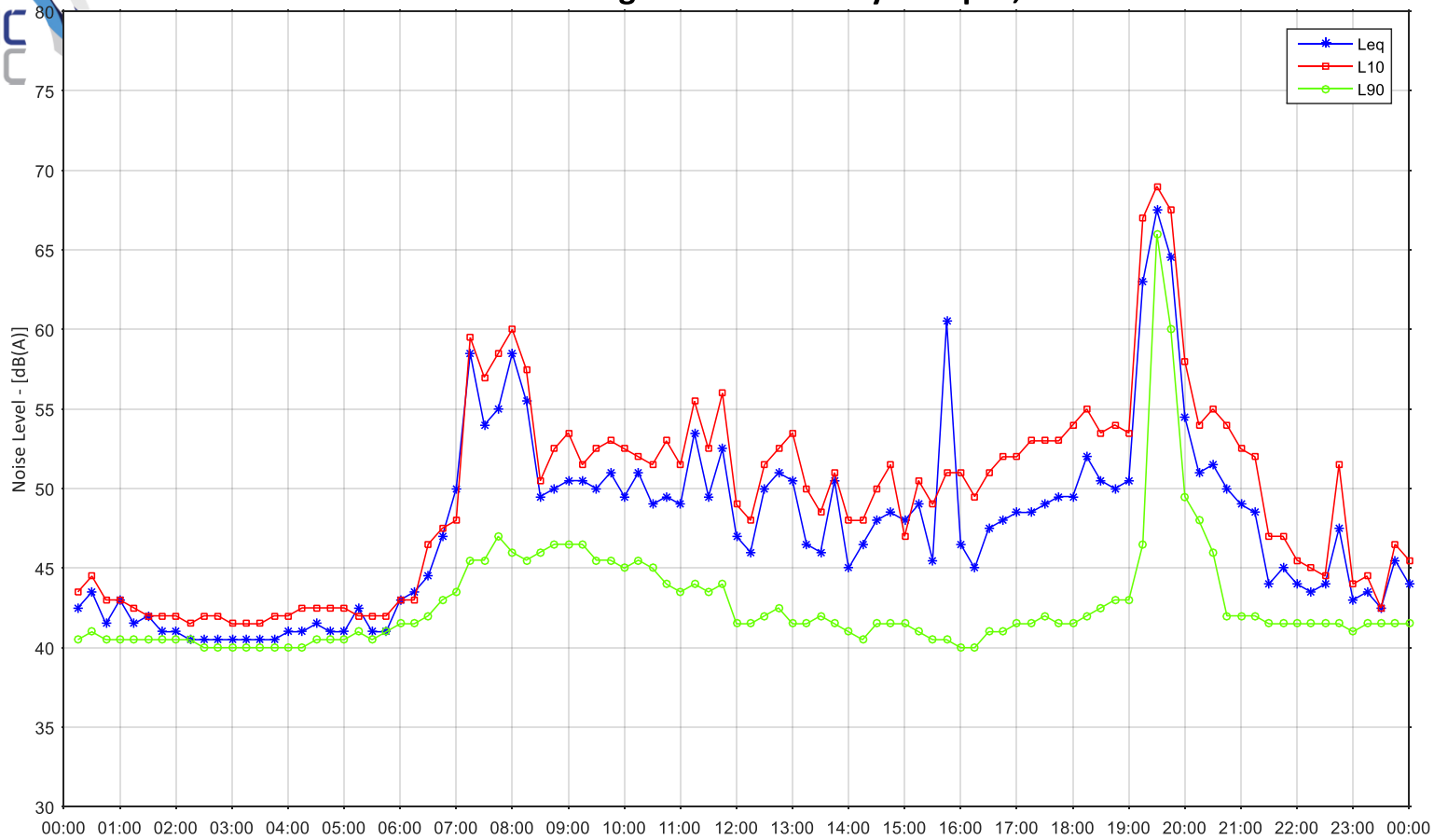

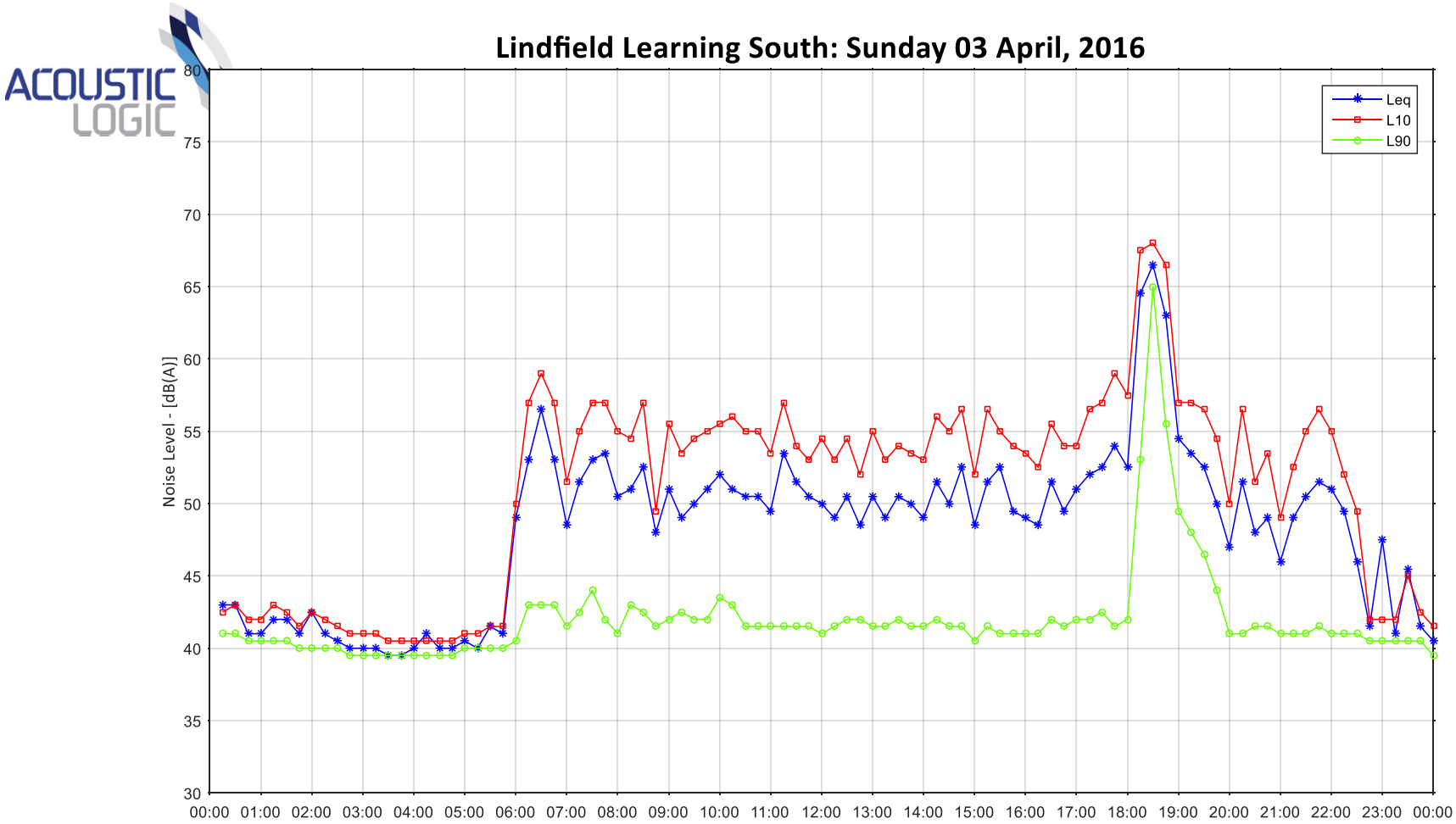
Lindfield Learning South: Sunday 03 April, 2016
Noise Level - [dB(A)]
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01:00
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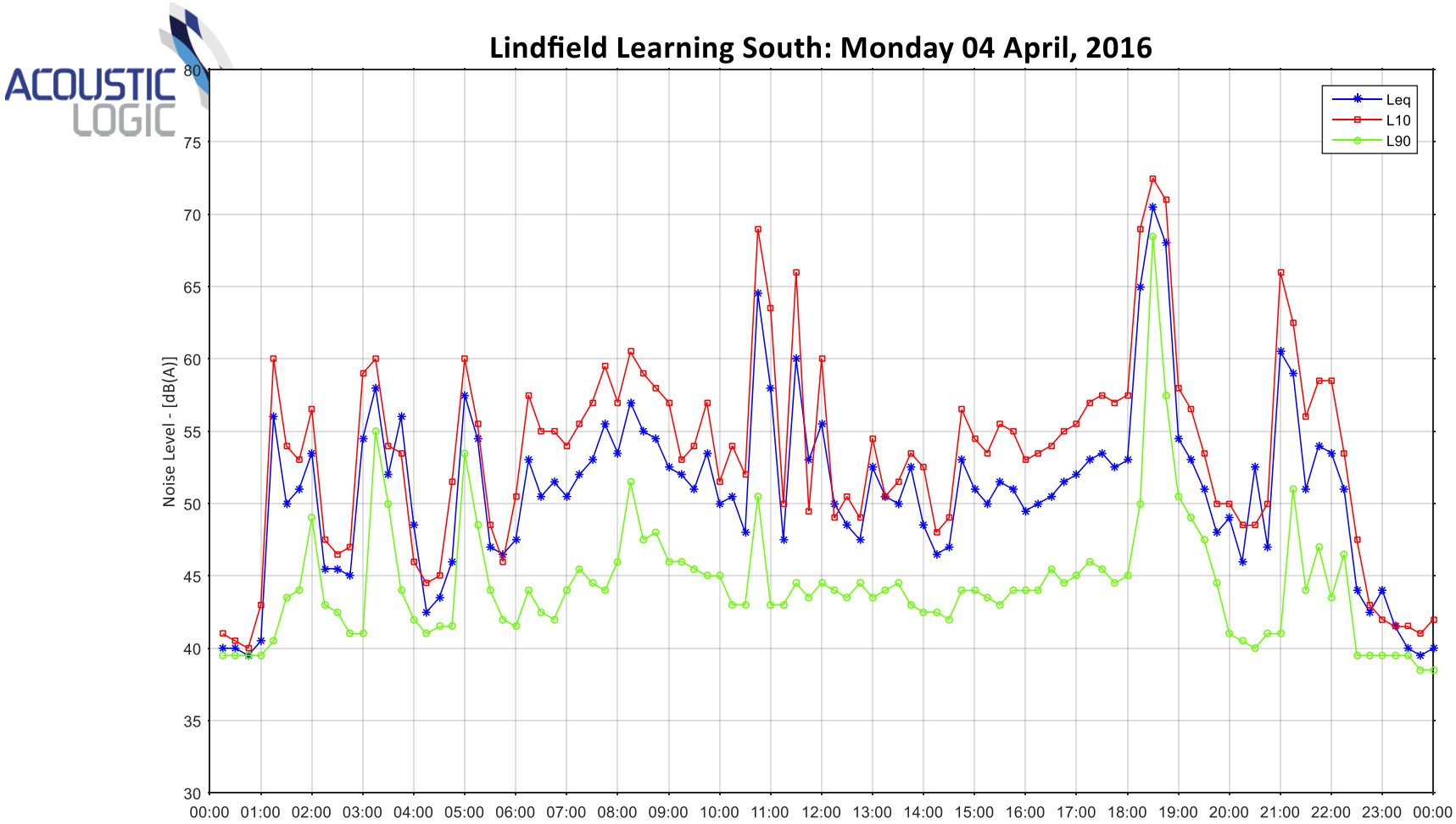
Lindfield Learning South: Monday 04 April, 2016
Noise Level - [dB(A)]
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01:00
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16:00
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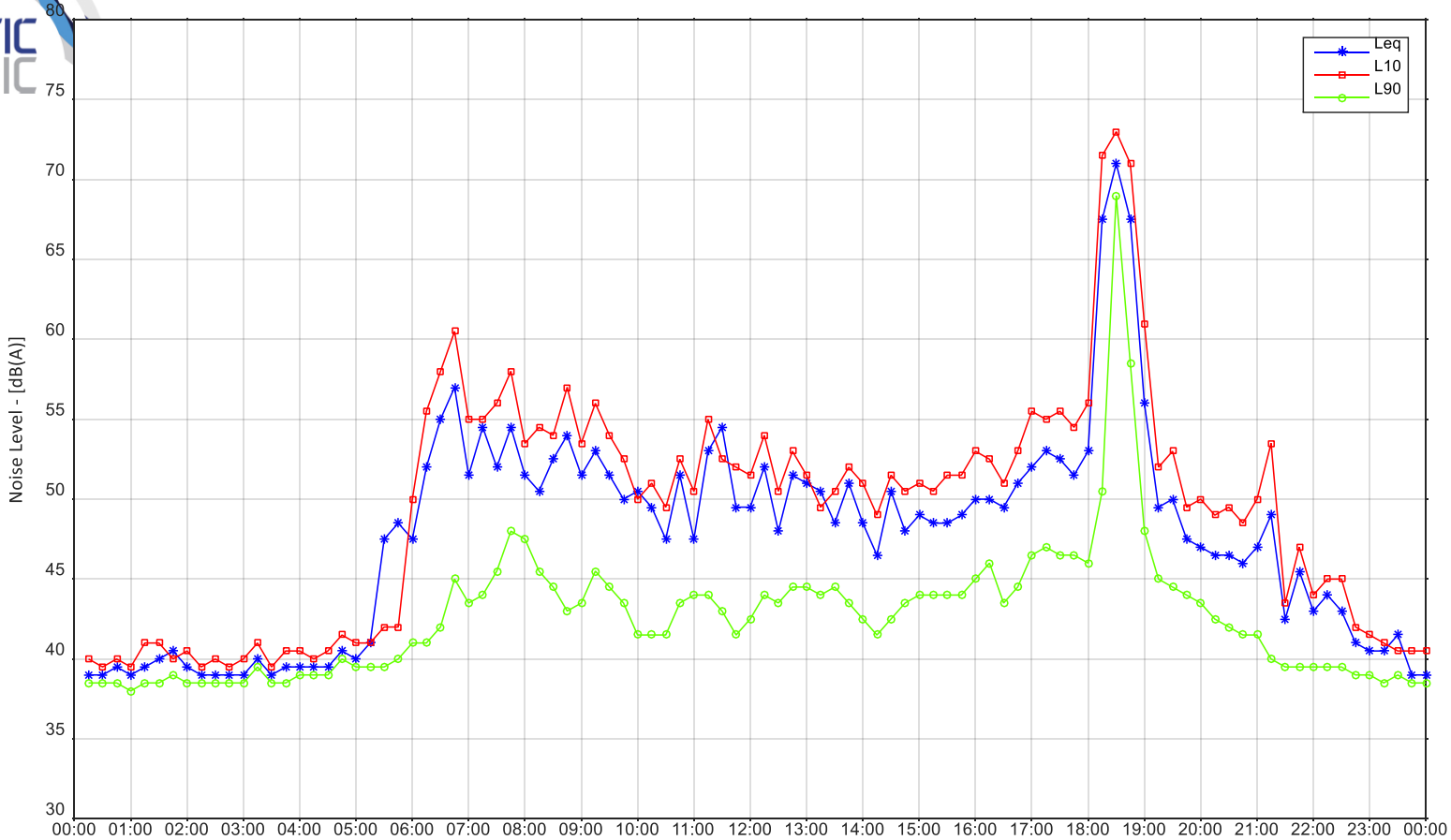
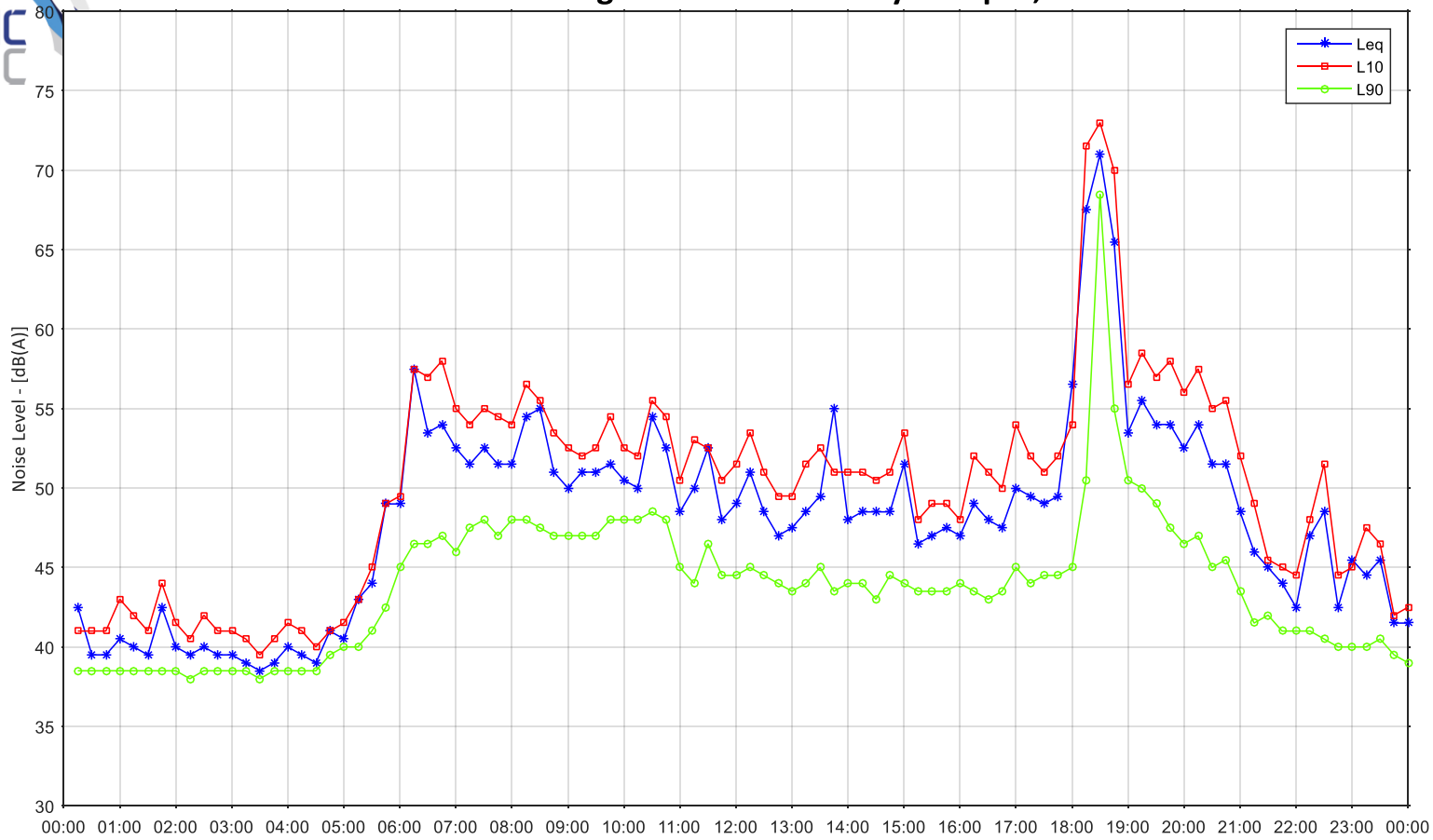
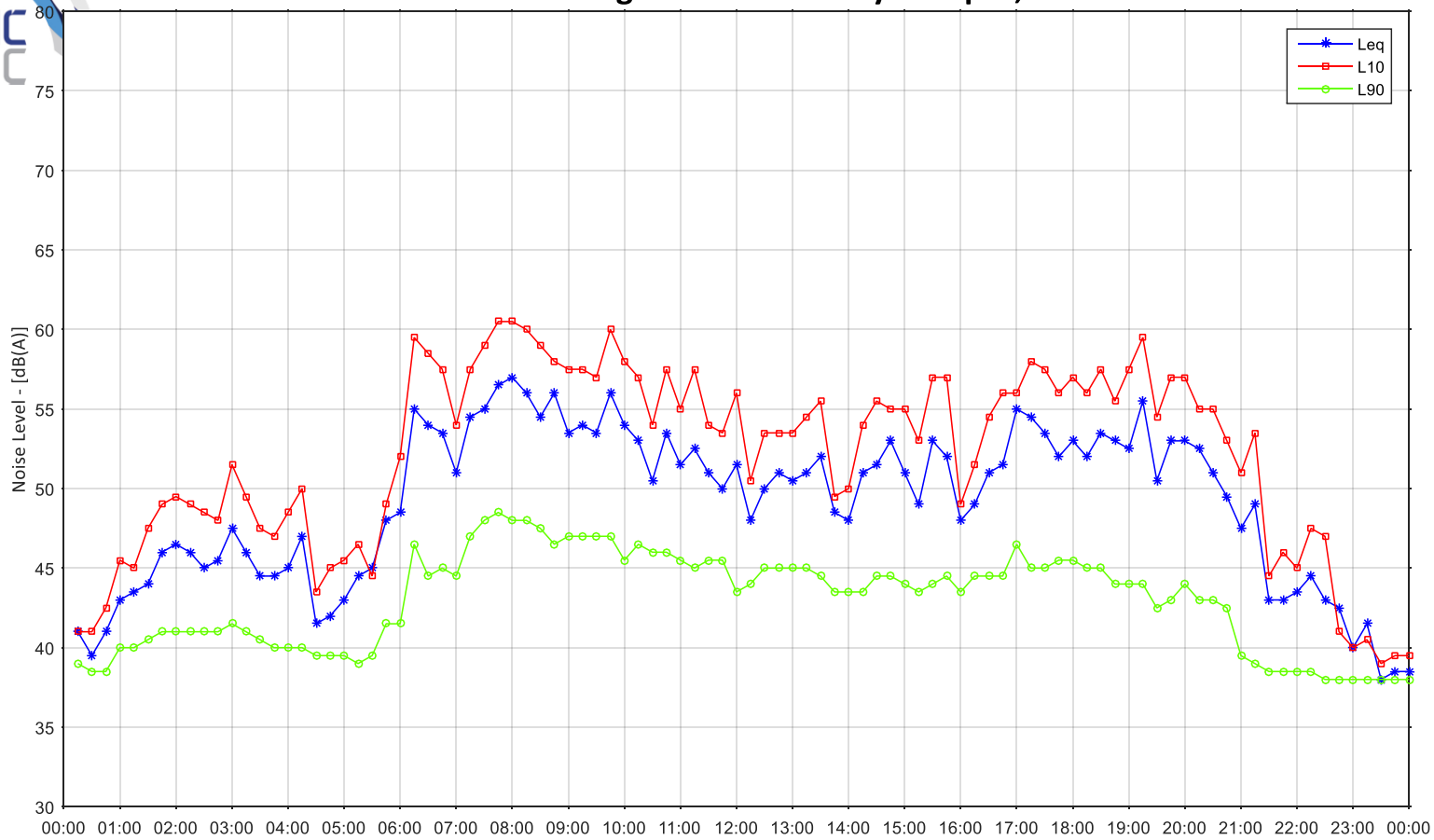
# Lindfield Learning South: Tuesday 05 April, 2016



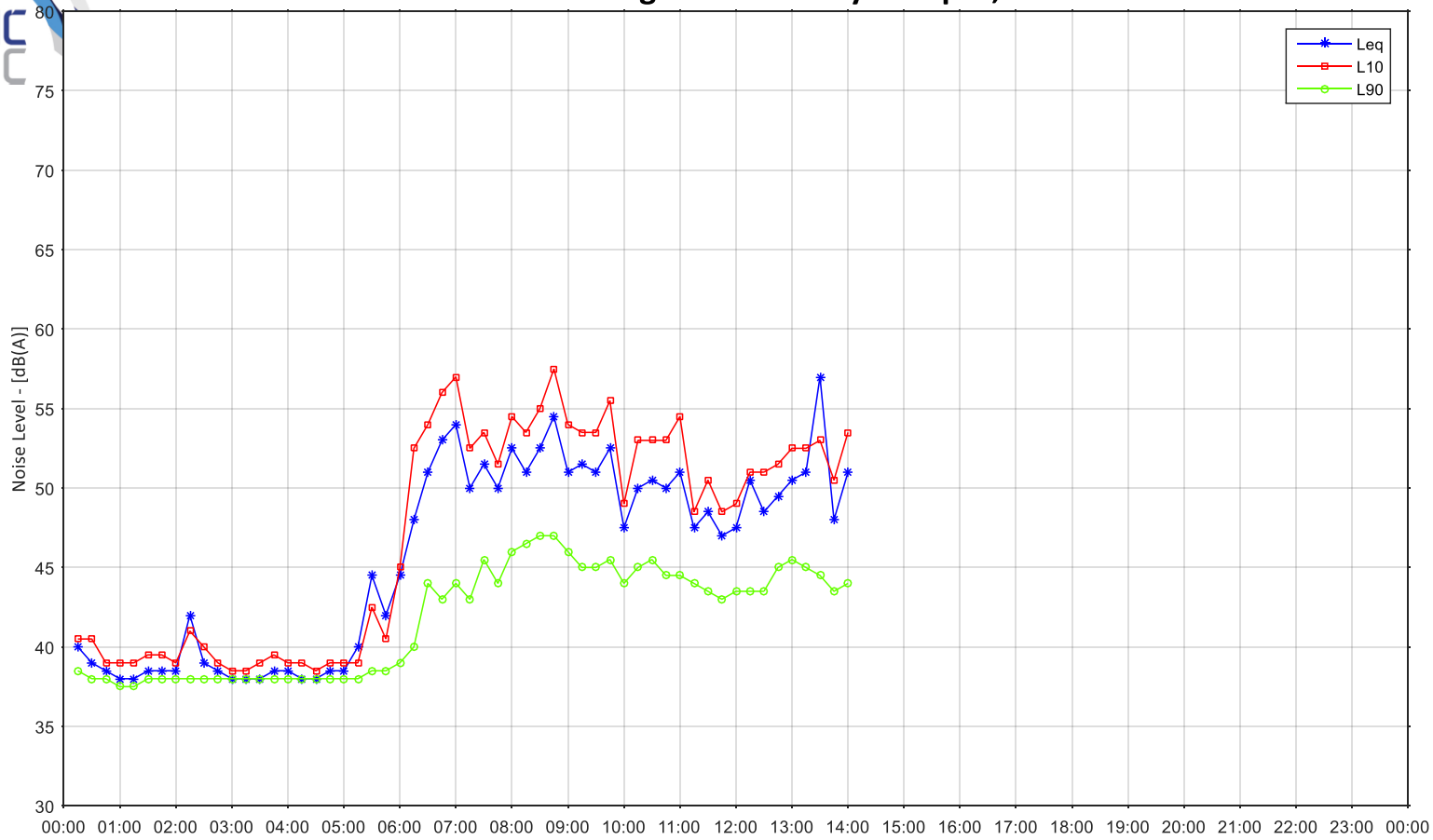
# Lindfield Learning South: Wednesday 06 April, 2016



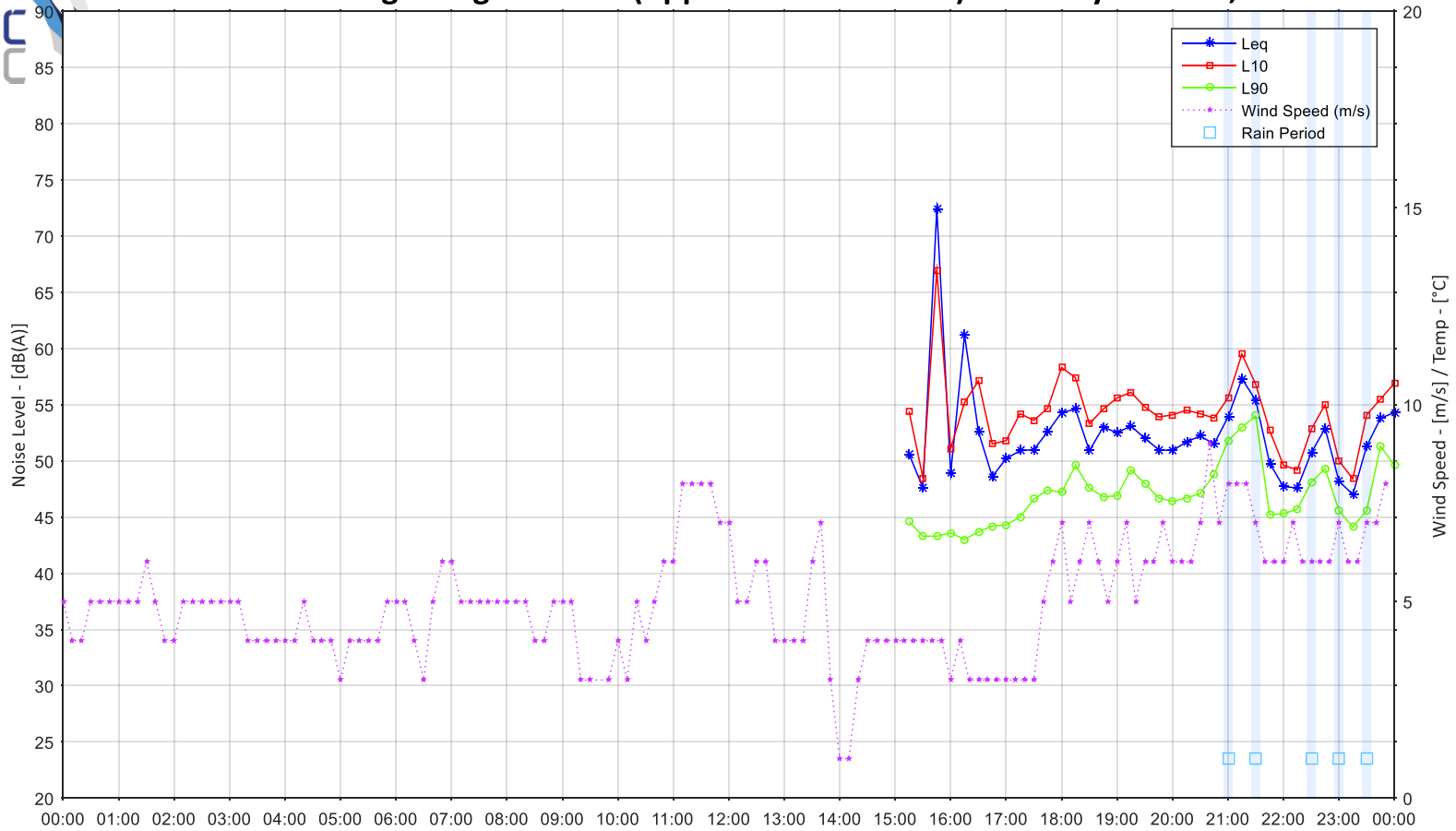
# Lindfield Learning South: Thursday 07 April, 2016



# Lindfield Learning South: Friday 08 April, 2016

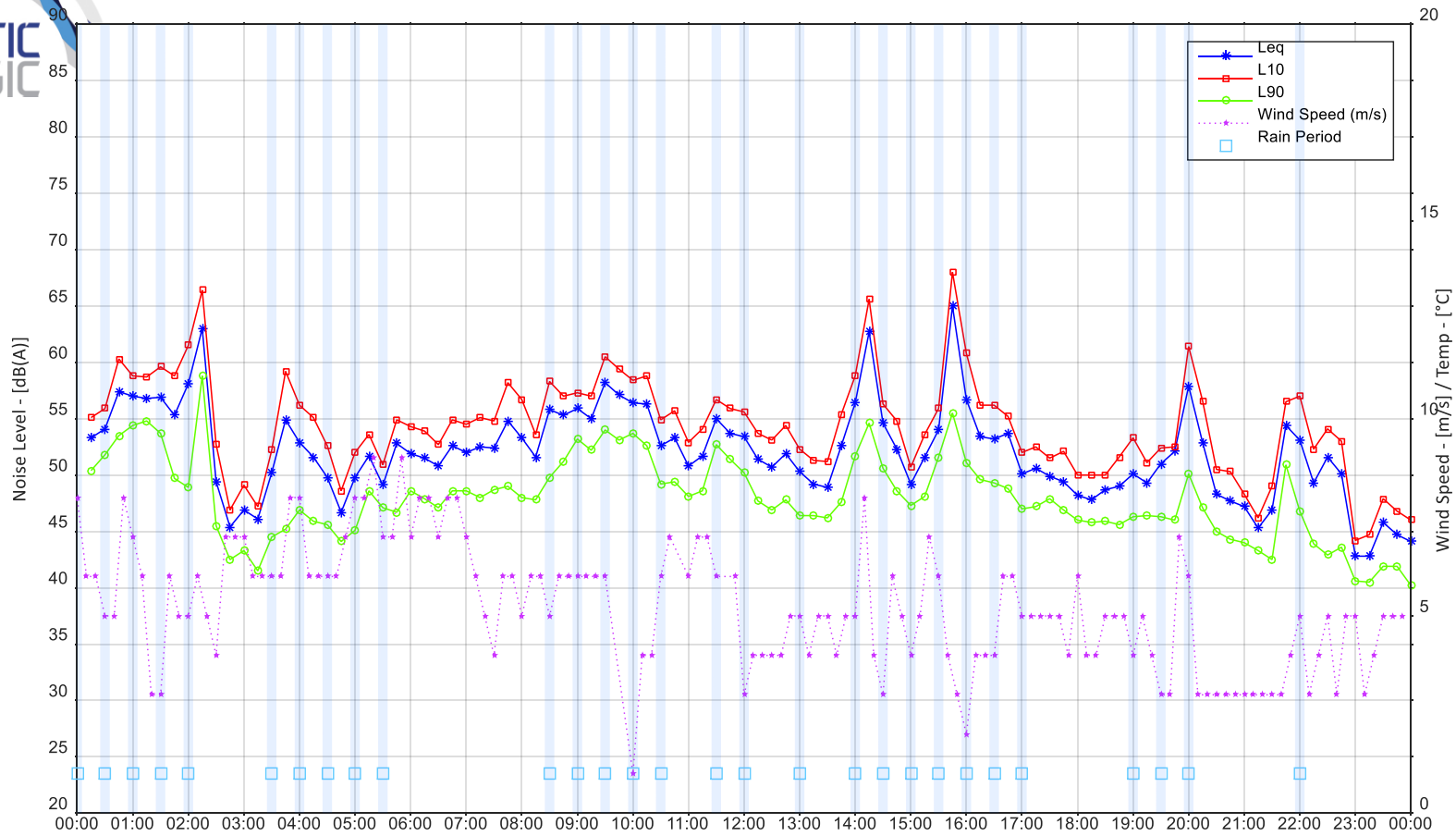


# Lindfield Learning Village - North (opposite Tubbs View): Tuesday 06 June, 2017

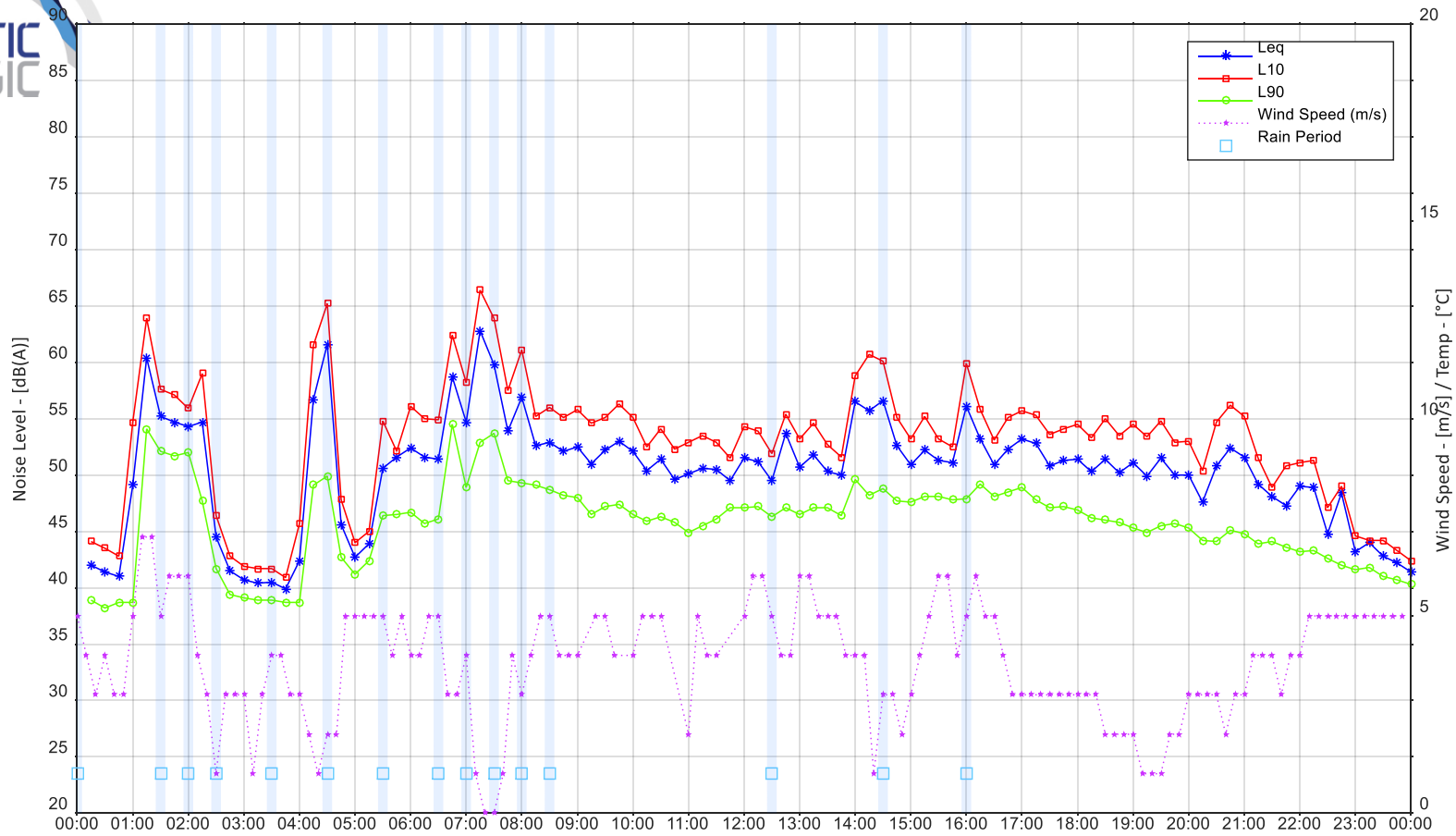



- Rain Period

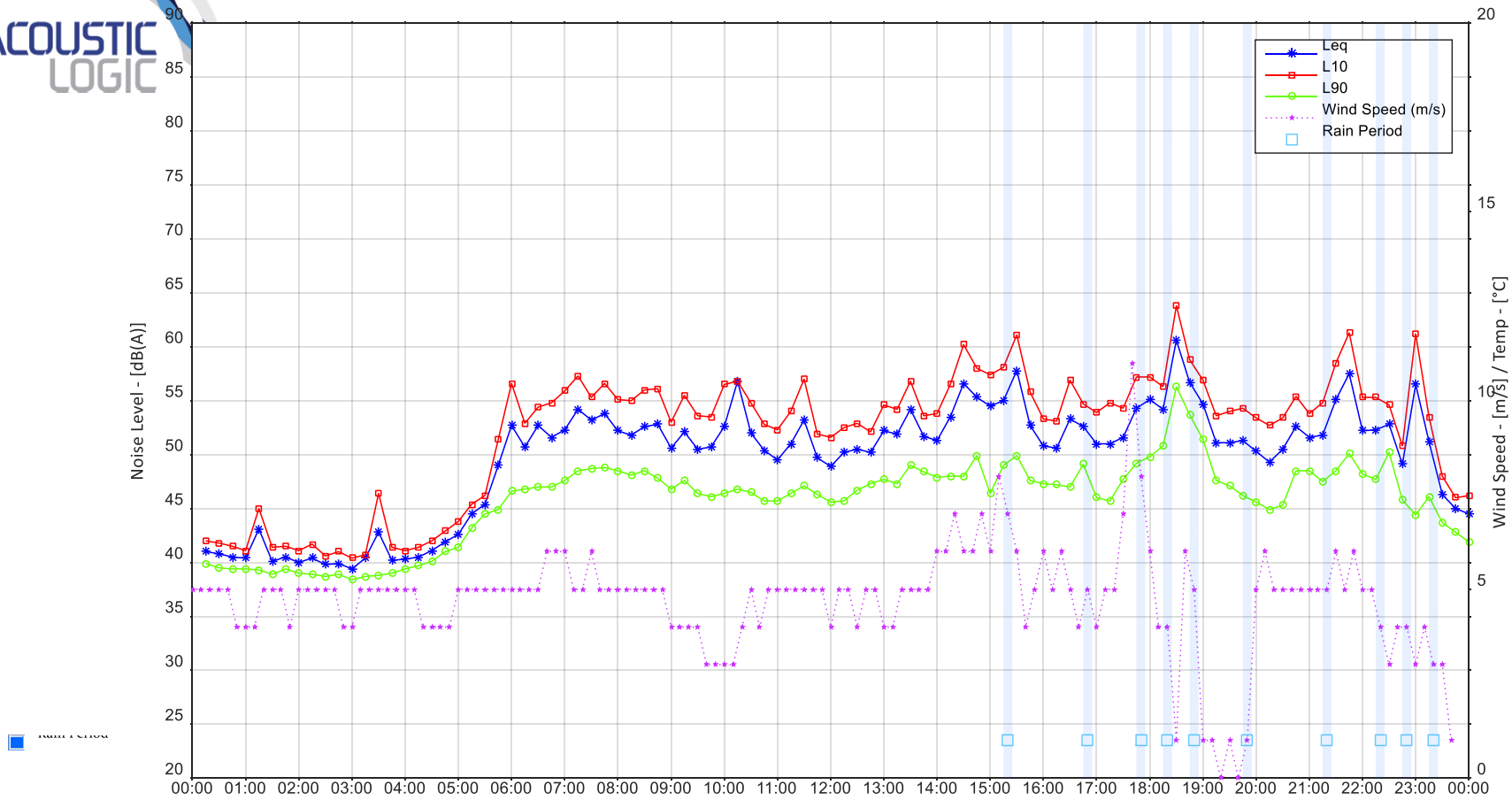
# Lindfield Learning Village - North (opposite Tubbs View): Wednesday 07 June, 2017



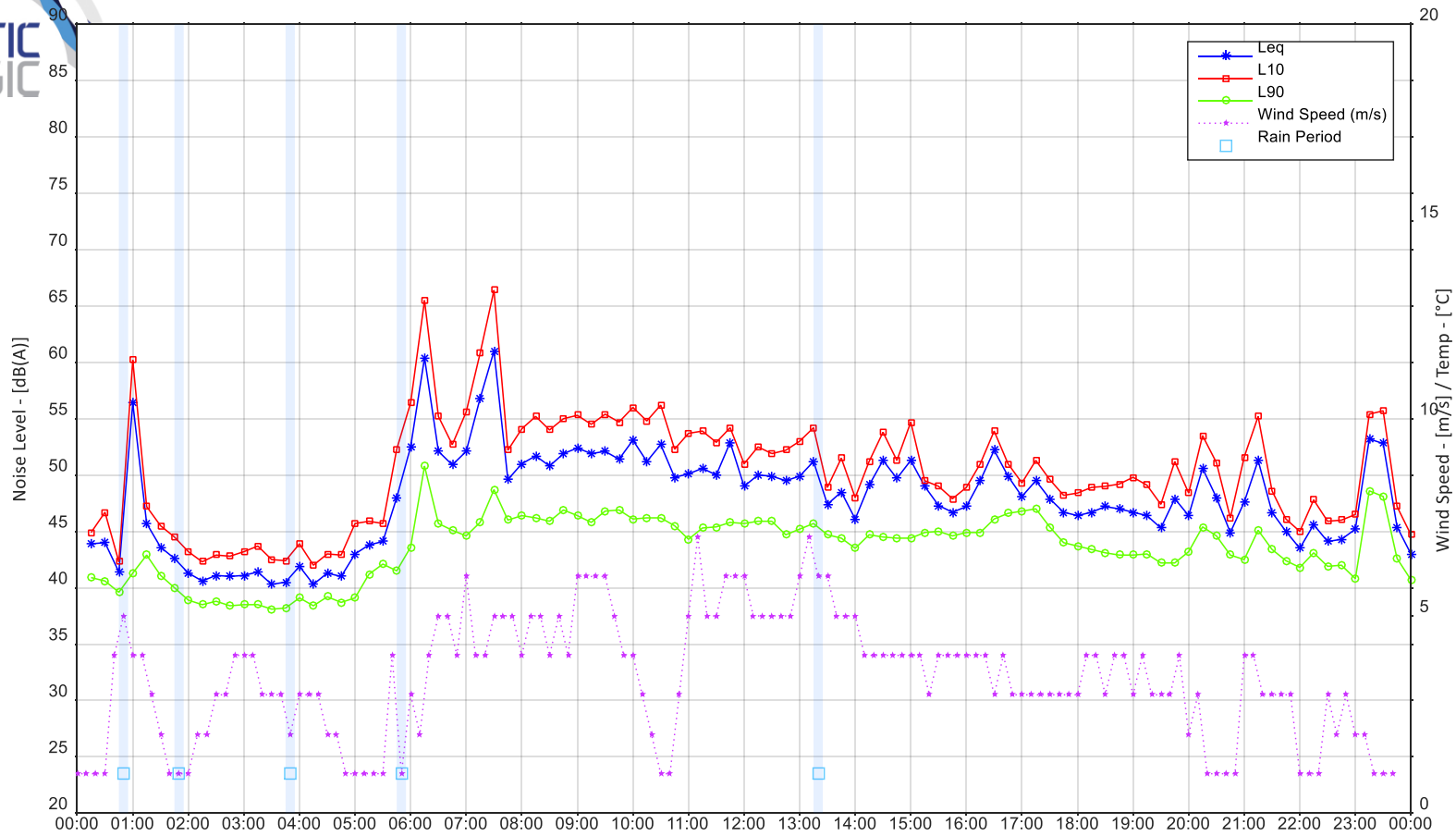
# Lindfield Learning Village - North (opposite Tubbs View): Thursday 08 June, 2017



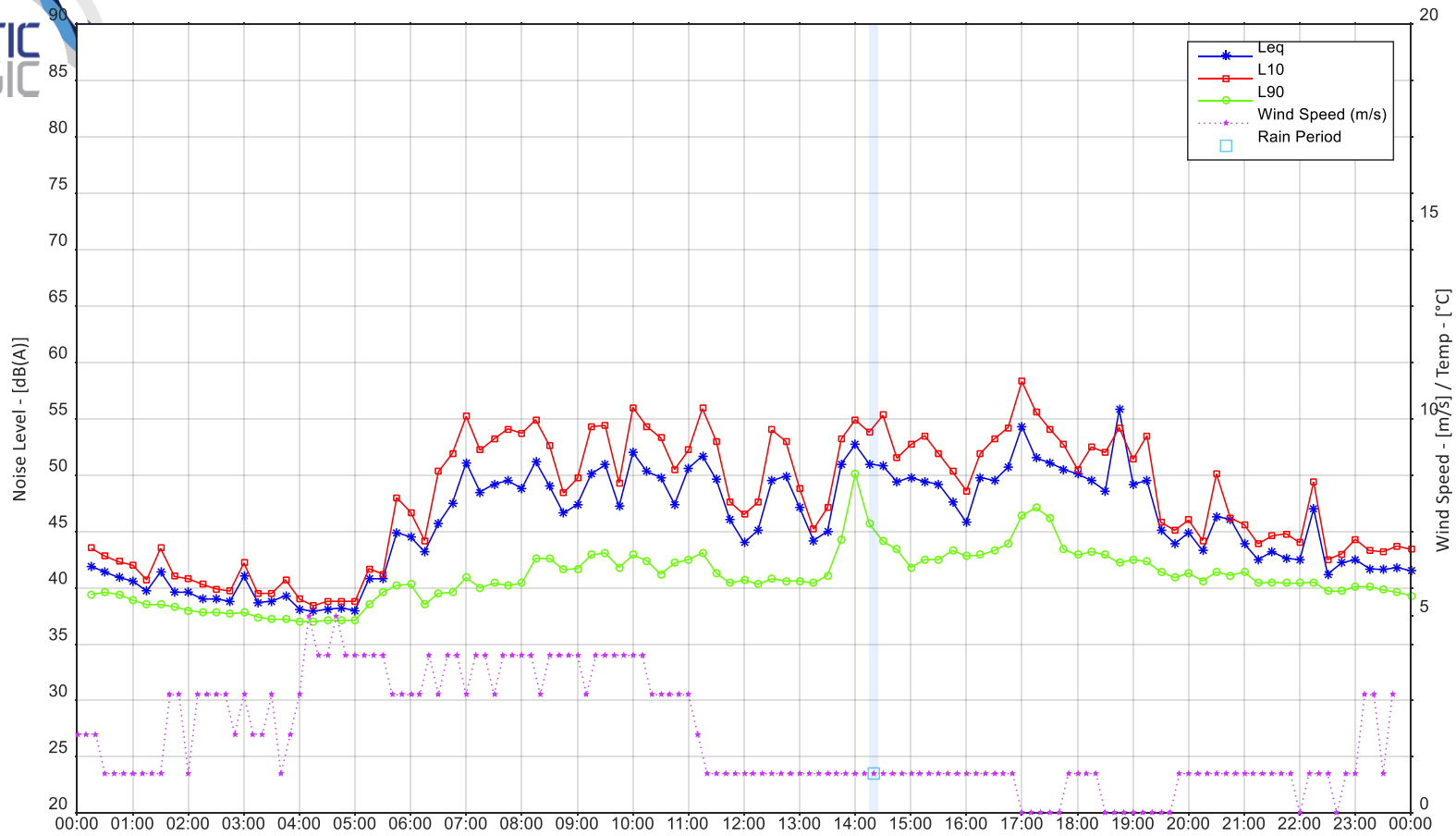
# Lindfield Learning Village - North (opposite Tubbs View): Friday 09 June, 2017



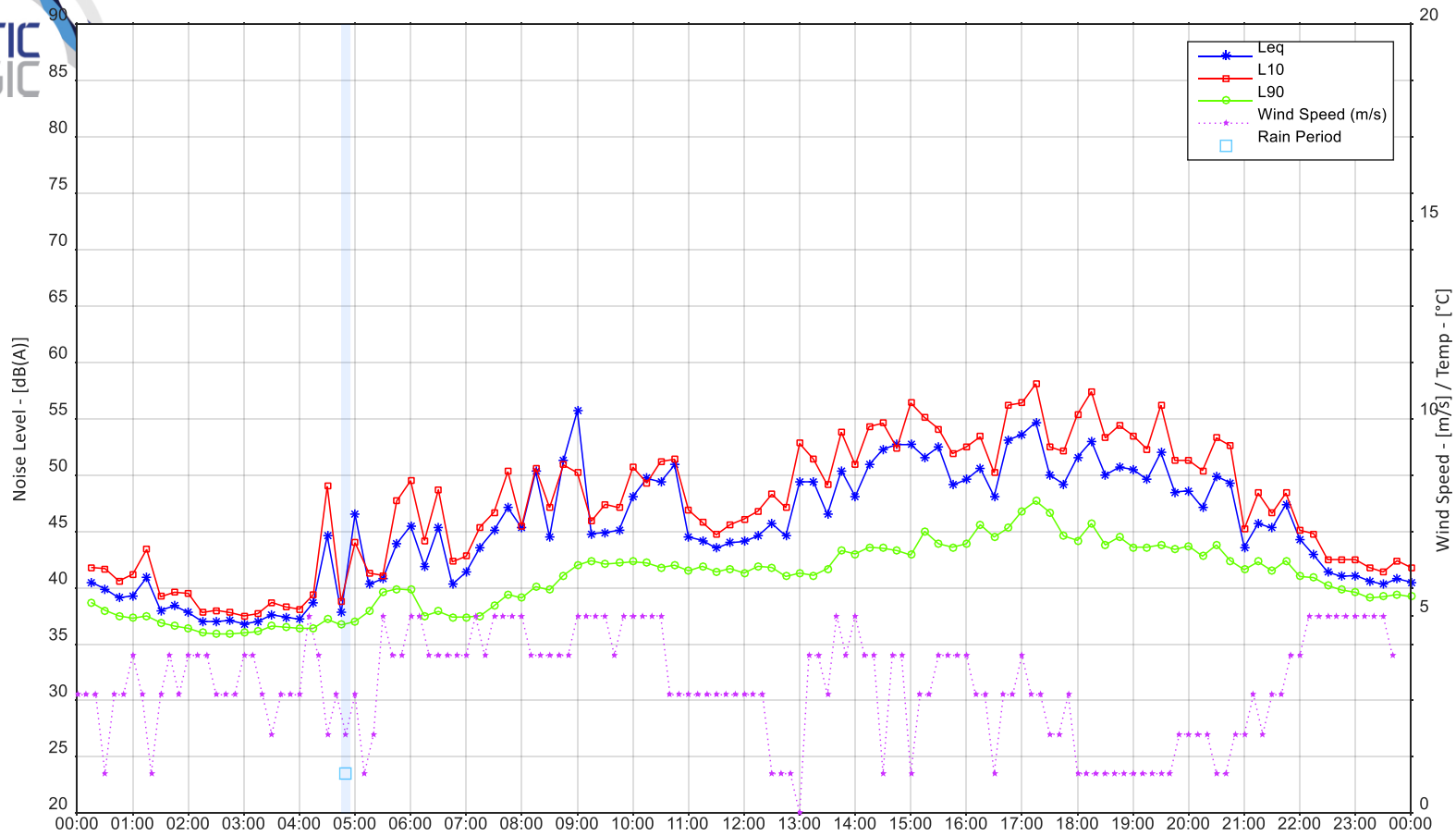
# Lindfield Learning Village - North (opposite Tubbs View): Saturday 10 June, 2017



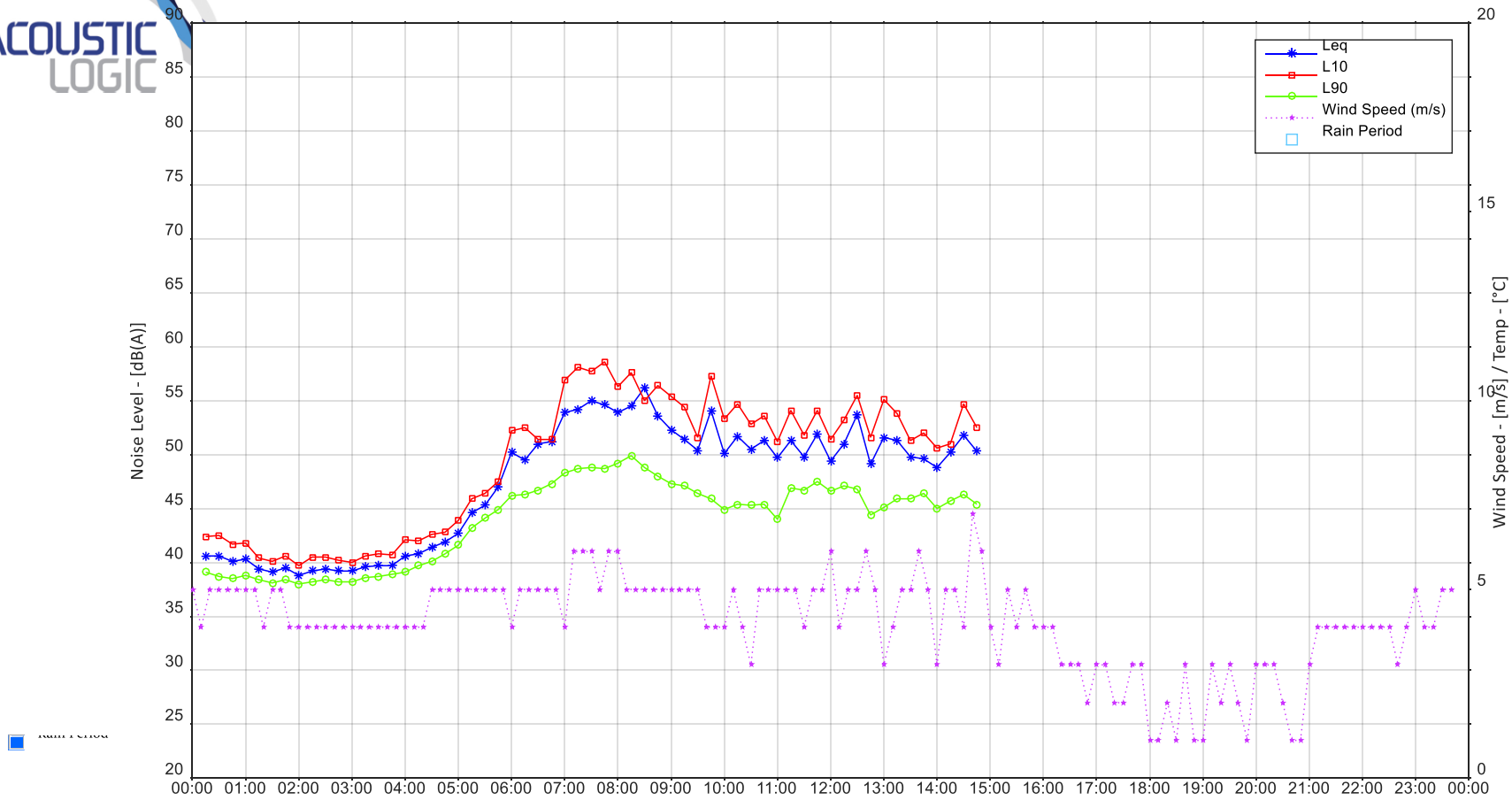
# Lindfield Learning Village - North (opposite Tubbs View): Sunday 11 June, 2017



# Lindfield Learning Village - North (opposite Tubbs View): Monday 12 June, 2017

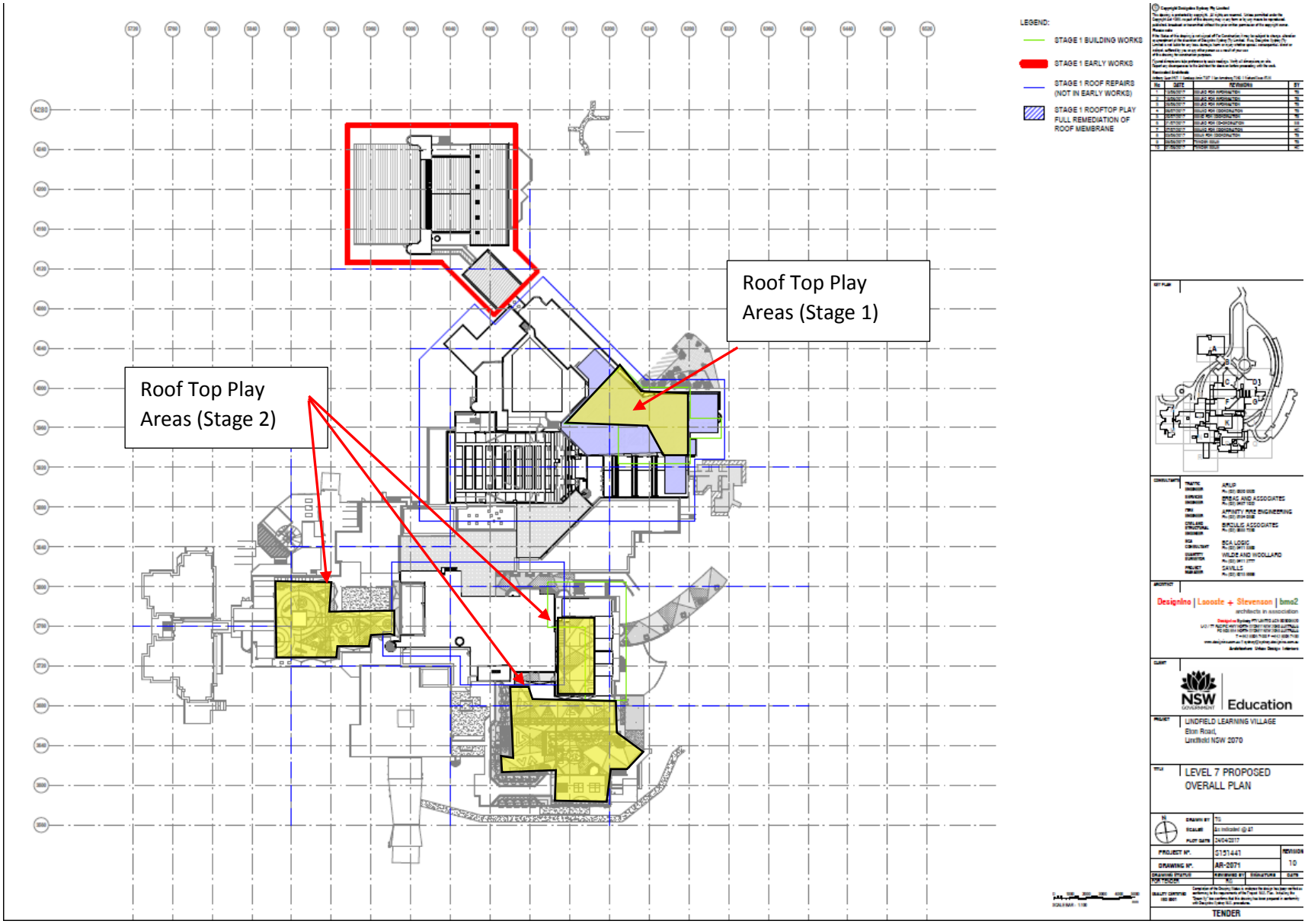


# Lindfield Learning Village - North (opposite Tubbs View): Tuesday 13 June, 2017



# Appendix 2

# Outdoor Play Areas (Roof Tops)


Roof Top Play Areas (Stage 1)
Roof Top Play Areas (Stage 2)
LEGEND:
STAGE 1 BUILDING WORKS
STAGE 1 EARLY WORKS
STAGE 1 ROOF REPAIRS (NOT IN EARLY WORKS)
STAGE 1 ROOFTOP PLAY FULL REMEDIATION OF ROOF MEMBRANE
Designinc | Loosle + Stevenson | bmo2
architects in association
NSW GOVERNMENT Education
LINDFIELD LEARNING VILLAGE
Elton Road,
Lindfield NSW 2070
LEVEL 7 PROPOSED OVERALL PLAN
G1571441
AR-2071
10
TENDER

# Appendix 3

## Gymnasium Photo

## (Showing Louvre to Western Façade)