Twickenham Station,

Twickenham

Addendum to the Noise and Vibration Chapter

(Chapter 10)

1. NOISE AND VIBRATION CHAPTER ADDENDUM NOTE

1.1 This addendum note has been prepared to respond to the London Borough of Richmond upon Thames' EIA Regulation 19 Request, in relation to the proposed development at Twickenham Station.

1.2 In relation to Noise and Vibration, the EIA Regulation 19 Request stated:

"The London Borough of Richmond upon Thames understands that discussions have been taking place with the Environmental Health department and further information is forthcoming. This information is understood to be an update on the acoustic report and a noise model requested several weeks ago however at the time of writing no new information was produced to the planning authority. As such the following concerns still stand:

1) PPG24 – it is noted from the report that the short method was used to determine the NEC categories. A requirement for longer term measurements are undertaken in order to establish more accurate ambient and background noise data. Therefore we require measurements to undertaken over at least 24-hour period for a weekday, under typical operating conditions of the road and rail network. Also in order to determine the lowest background noise levels in order to determine mechanical services max thresholds measurements should be undertaken over a weekend period to include a Sunday (day, evening and night).

2) The PPG24 assessment must also include the nighttimes LMAX levels from train movements and indicate if this a determining factor as (1Night-time noise levels (23.00 - 07.00)**:** sites where individual noise events regularly exceed 82 dB LAmax (S time weighting) several times in any hour should be treated as being in NEC C, regardless of the LAeq,8h (except where the LAeq,8h already puts the site in NEC D).

3) Mechanical Services- the London Borough of Richmond upon Thames acoustic design criteria for this site is a BS4142 rating level of -5 (-10if any tonal or discreet component) and must also comply with BS8233 good criteria.

4) PA Noise – The acoustic report to demonstrate the affect of PA announcements on the proposed development, bearing in mind the content of such noise no just the absolute level is required. Where appropriate an intelligent PA system should be employed.

5) 10.7.2 Vibration- Details of the vibration magnitude with height to be included in the report and the types of mitigation that maybe required to mitigate this.

6) 10.7.2 Point 4- LMax levels included in order to determine the necessary mitigation.

7) A noise model shall be provided which includes horizontal and vertical grid noise contours to demonstrate the affect of transportation noise on new and existing residential receptors with and without the proposed development in place. The London Borough of Richmond upon Thames uses Bruel & Kjaer Predictor noise modelling software, we would ideally want the model in a format that can be imported into predictor.

8) Sound Insulation between commercial to residential units – London Borough of Richmond upon Thames design standards – Approved Doc E plus 5 to 10.

9) Kitchen Extraction – Odour risk assessment and mitigation is required as set out by DEFRA.

10) Construction- The acoustic report should include the assessment methodology detailed within Bs5288 2009 in order to determine the underlying ambient levels, the predicted significance

thresholds and if the predicted construction and vibration thresholds will be exceeded. If this is the case what mitigation as detailed within BS5288 will be employed including the use of noise insulation grants?"

1.3 The comments/points are considered in the following sections.

Point 1: Further noise monitoring

1.4 Continuous 48-hour noise monitoring was carried out at a location overlooking the station car park with a direct line of sight to the railway and at a location reasonably representative of the exposure of the proposed residences within the adjacent area of the existing car park area. The SLM (sound level meter) was secured within the station office mess room with a 2 m microphone boom projecting from the façade at first floor level (Monitoring Location 7; See Fig. XX). Weather conditions at the time of the monitoring were light – moderate south-westerly breezes with occasional rain showers. The results of the 48-hour monitoring are given in the appended traces (See Appendix XX) and are summarised (in terms of PPG24) in Table 1-1 below:

Table 1-1 Summary of the Results of the 48 hour Monitoring 19 – 21 June 2011

TIME PERIOD			Average Noise Levels ($L_{A(eq)}$ $dB_{(A)}$)	Noise Exposure Category
Sunday 19 June 2011	12:35 - 23:00	Day-time	61.8	B
Monday 20 June 2011	23:00 – 07:00	Night-time	55.4	B
	07:00 – 23:00	Day-time	62.3	B
Tuesday 21 June 2011	23:00 – 07:00	Night-time	56.2	B
	07:00 - 12:38	Day-time	62.1	B

Point 2: Night-time LMAX Levels

1.5 From the continuous trace for $L_{(A)MAX}$ it is apparent that there are no regular night-time exceedences of 82 $dB_{(A)}$, (where regular night-time exceedence of 82 $dB_{(A)}$ would place the location in NEC C, regardless of other result, under the terms of PPG24.).

Point 3: Permissible noise levels of mechanical services

1.6 The London Borough of Richmond upon Thames acoustic design criteria for this site is a BS4142 rating level of –5 (-10 if any tonal or discreet component) and must also comply with BS8233 "good" criteria.

1.7 The rating level is relative to lowest background noise level at the façade of the nearest residential receptor. In this case, the nearest residential receptor is likely to be the proposed residences to be located within the existing station car park.

1.8 From the 48-hour continuous monitoring trace for $L_{(A)90}$, the lowest background noise level would appear occur between late Sunday night and early Monday morning. Further examination of the trace shows a distinct flat-bottomed trough between 01:00 and 03:00 hours on Monday morning, The data for this two hour period was subject to analysis and gave a $L_{(A)90}$ for the period of 36.6 $dB_{(A)}$. The $L_{(A)90}$ calculated from the data for the same period (01:00 – 03:00 hours) on the "weekday" (Tuesday morning) was 40.8 $dB_{(A)}$.

1.9 The selection and location of the mechanical plant can be planned to achieve the required criteria.

Point 4: Public announcements at the station

1.10 Railway companies have a statutory duty to provide their passengers with information adequate to protect safety, comfort and convenience whilst travelling. Some of this information is provided by public address (PA) systems on railway stations. The PA system particularly benefits passengers unable to read the visual displays.

1.11 The majority of complaints about railway station PA systems are from passengers and relate to audibility and clarity of the announcements. However, the PA systems are also a significant source of complaints from nearby residents and may be considered a source of noise pollution in residential areas. The London Underground stations appear to be a larger source of complaint than the overground (conventional) railway stations. As a result, London Underground has drafted the '*Manual of Good Practice for Public Address Noise Management*' (October 2007). A small number of London railway stations have been the source of the majority of the complaints from nearby residents, however, Twickenham station is not one of these.

1.12 As part of this assessment, the station was visited and the use of the PA system was investigated. Noise measurements were taken at set distances from the PA speakers on the platforms. Other sources of railway noise were also noted, and measured.

1.13 Other sources of noise noted included the arrival and departure of the rolling stock, responses received on the station "help-point" speaker, internal train PA sytems and some trains had an audible warning in the form of a sounder "bleep" when the doors were operating.

1.14 The PA system at Twickenham railway station is used, almost exclusively, for public safety and security announcements. Train movement information for passengers is provided by visual displays. Any train running announcements are set at a lower volume than the safety and security announcements. Manual operation is only used for emergencies, incidents and passenger direction when there are major events (usually rugby) at nearby Twickenham Stadium. "Normal Volume" and Long Zone are only used on major Rugby days and are reduced at other times.

1.15 The safety and security announcements are digital recordings designed for audibility and clarity at relatively low noise outputs. The announcements are scheduled at 15 minutes (safety) and 30 minutes (security). The regular safety and security announcements are not played before 07:00 hours or after 22:00 hours.

1.16 During the observation period, one individual used the help-point on the platform, and the noise level of the response was noted.

1.17 In one instance, it was noted that the PA system within a train was operated when the doors were open, although it is understood that, as recommended by the *Manual of Good Practice*, this usually avoided.

1.18 The noise measurements were taken on a weekday afternoon (26 April 2011) between 14:00 and 15:00 hours. The weather was clear, cool and dry with light southerly winds. $L_{(A)eq}$ and $L_{(A)90}$ (background) were measured at 54 and 48 $dB_{(A)}$ respectively during the monitoring.

1.19 The noise measurements taken at the station and the probable impact at the nearest proposed residences are summarised in Table 1-2 below:

Table 1-2 Noise Measurements Summary

Noise source	Measured noise level ($dB_{(A)}$)	At a distance from noise source	Apparent noise at source (SWL) ($dB_{(A)}$)	Noise level at nearest proposed residential façade ($dB_{(A)}$)
Station PA speaker	61	4 m	81	51
Train door sounder	69	6 m	93	60
Station help-point	64	4 m	84	54
Trains arriving	72	6 m	85	52
Trains standing	65	6 m	78	45
Trains leaving	68	6 m	81	48

1.20 The nearest proposed residential facades are 13.5 m from the PA loudspeakers and 17.5 m from a train standing at the nearest platform. If the bedrooms within the residences are confined to the first floor and above, the line of sight to the PA speakers will be obstructed by the platform roof, and the noise impacts will be reduced accordingly. However the line of sight to the train door sounders will not be obstructed, except for the section of the residential façade opposite the platform roof and above second floor level.

1.21 For design purposes, we have taken a worse case as a resident requiring to sleep during the day when the PA system is operating. The critical noise level at the façade facing towards the railway line would appear to be 60 $dB_{(A)}$ (from the train door sounders).

1.22 Standard thermal double glazing will provide adequate attenuation to permit a noise level within bedrooms of less than 30 $dB_{(A)}$ $L_{(A)eq}$. However, the critical case will be during hot weather when windows are left open. The attenuation provided by an open window will be between 12 and 15 $dB_{(A)}$ (although this can be improved by certain arrangements of side opening bay window). It is therefore recommended that the bedrooms in the south side of the proposed residences overlooking the railway should include acoustic ventilation with an attenuation of not less than 30 $dB_{(A)}$ at the appropriate frequencies, to provide an alternative to opening windows.

1.23 Station managers have received feedback from neighbouring residents and have been proactive in trying to limit the impact of PA noise on local residents. The only outstanding issue relates to occasions after a major event at Twickenham Stadium when the PA system has to operate at a louder volume. It important to ensure that the volume is lowered to normal immediately afterwards.

1.24 Generally, it is concluded that the station PA system complies with the requirements of the London Underground *Manual of Good Practice for Public Address Noise Management*, except

for occasions after a major event on at Twickenham Stadium or during other unusual incidents when louder manual announcements are required.

Point 5: Vibration magnitude with height in the proposed building

1.25 There is a possible risk that, if the dynamic frequency of the proposed tall building is within the range of vibration frequencies produced by the passing trains, vibration could be amplified with height.

1.26 It is marginal whether the proposed building at Twickenham Station is a "tall building". The definition would usually be a building projecting significantly above the surrounding buildings in the area. In this case, the proposed building will be less than 30 m above ground level at the railway and will be some two floors lower than the neighbouring Regal House. However, it will be taller than most of the surrounding buildings. The building will not appear to be a tall building in terms of being slender in height/width ratio from any viewpoint.

1.27 The vibration frequencies produced by the trains as measured at the site were found to be within the range of 10 to 20 Hz and typically around 15 Hz. This is a low frequency for the dynamic response of a building and would suggest a lack of stiffness, with long, minimally-braced spans, wide thin slabs and large deflections under load. However, the structural engineers (Waterman Structures Consulting Engineers) have designed a stiff (largely concrete) building structure, with large damping mass and overall deflection limited to <30 mm at the highest point of the building under maximum wind load. An initial estimation of first mode dynamic response frequency for the building suggests orders of magnitude greater than the vibration frequency produced by the passing trains.

Point 6: L_{max} and necessary mitigation

1.28 This is addressed at 1.5 above and the $L_{(A)max}$ trace from the 48 hour monitoring provides the required data for any necessary mitigation measures.

Point 7: Noise Model

1.29 The model has been commissioned and is currently under development. We believe that the results of the noise modelling will tend to confirm the conclusions of the original noise assessment.

Point 8: Sound Insulation between commercial and residential units

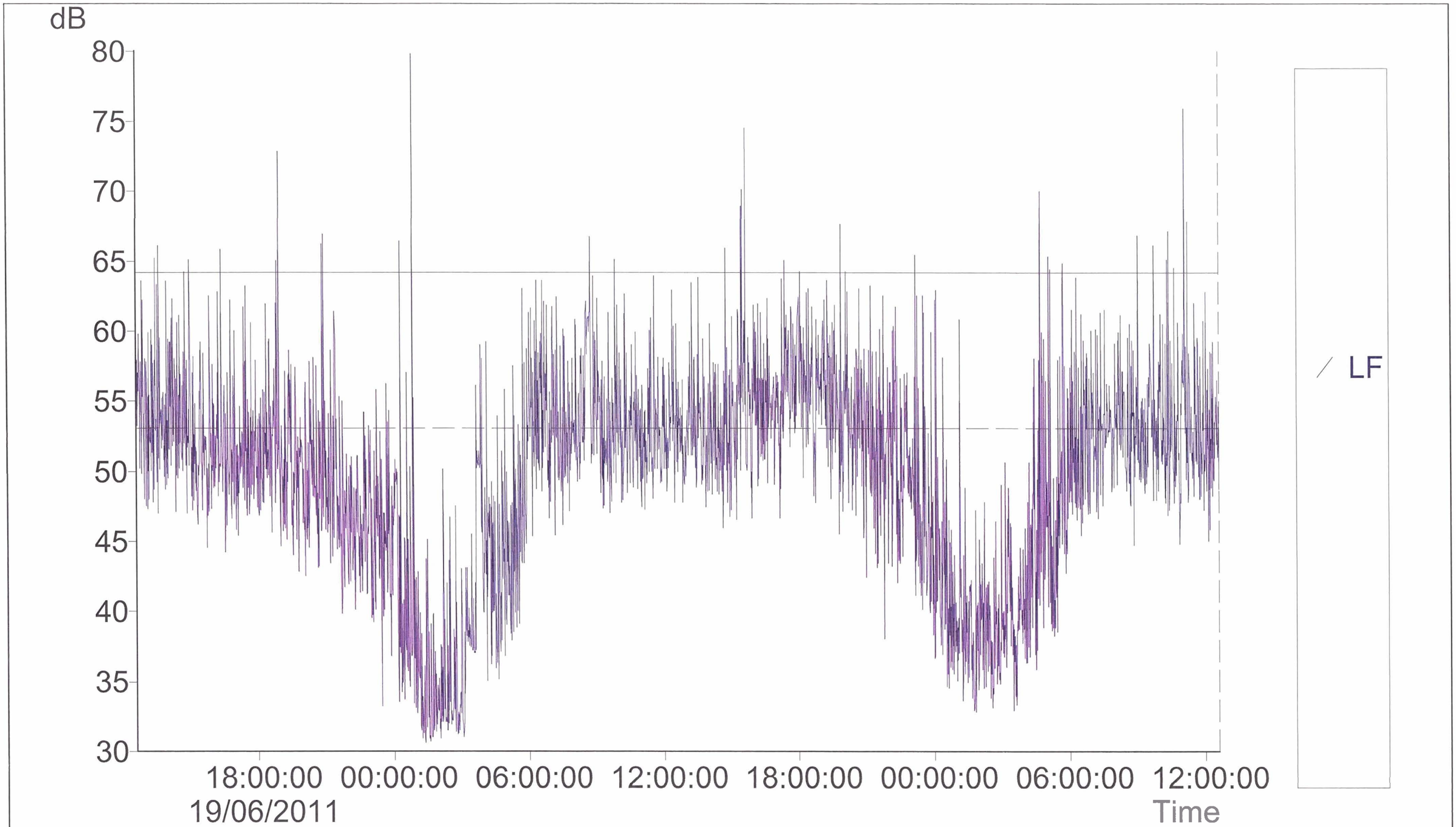
1.30 Once the wall construction details are known, this can be reviewed by the acoustic specialist and, where not relying on upgraded Robust Details, may be subject to post-construction testing to ensure compliance with the London Borough of Richmond upon Thames design standards (Approved Doc E plus 5 – 10).

Point 9: Kitchen Extraction

1.31 The location and nature of any proposed kitchen ventilation is not yet established. Once these details are known, the appropriate assessment may be carried out. In due course the Odour and Noise Assessment will be carried out based on '*Guidance on the Control of Odour and Noise from Commercial Kitchen Exhaust Systems*' (defra, 2005).

Point 10: Construction noise

1.32 As this is a particularly significant area of potential impact for existing receptors in the vicinity and it intended to incorporate this into the noise model (see 1.29 above). The data from the Site Preparation and Construction Chapter (Chapter 6) has been used as the basis for the assessment to BS 5228-1:2009 to provide the model input.



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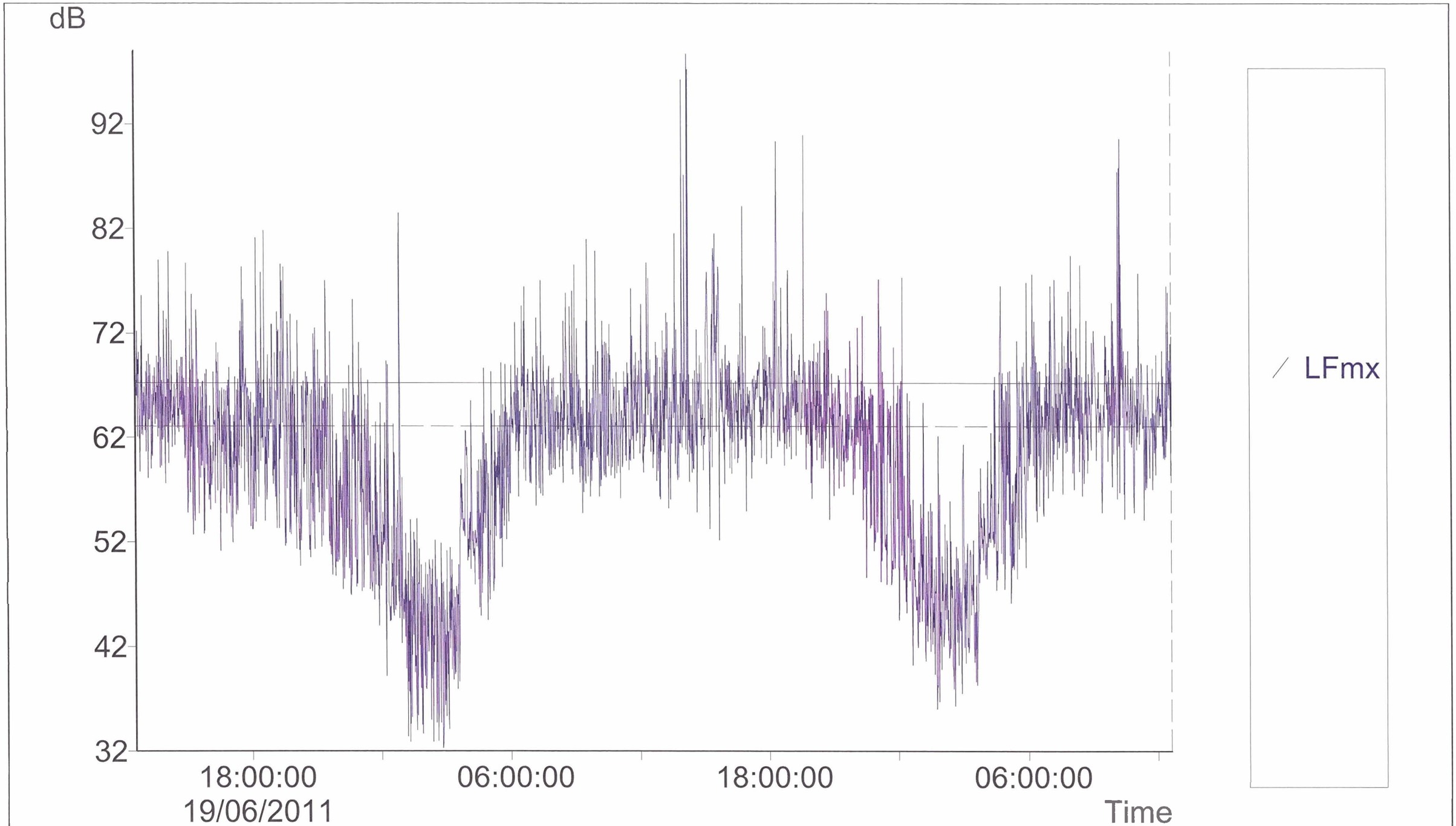
- LZF -



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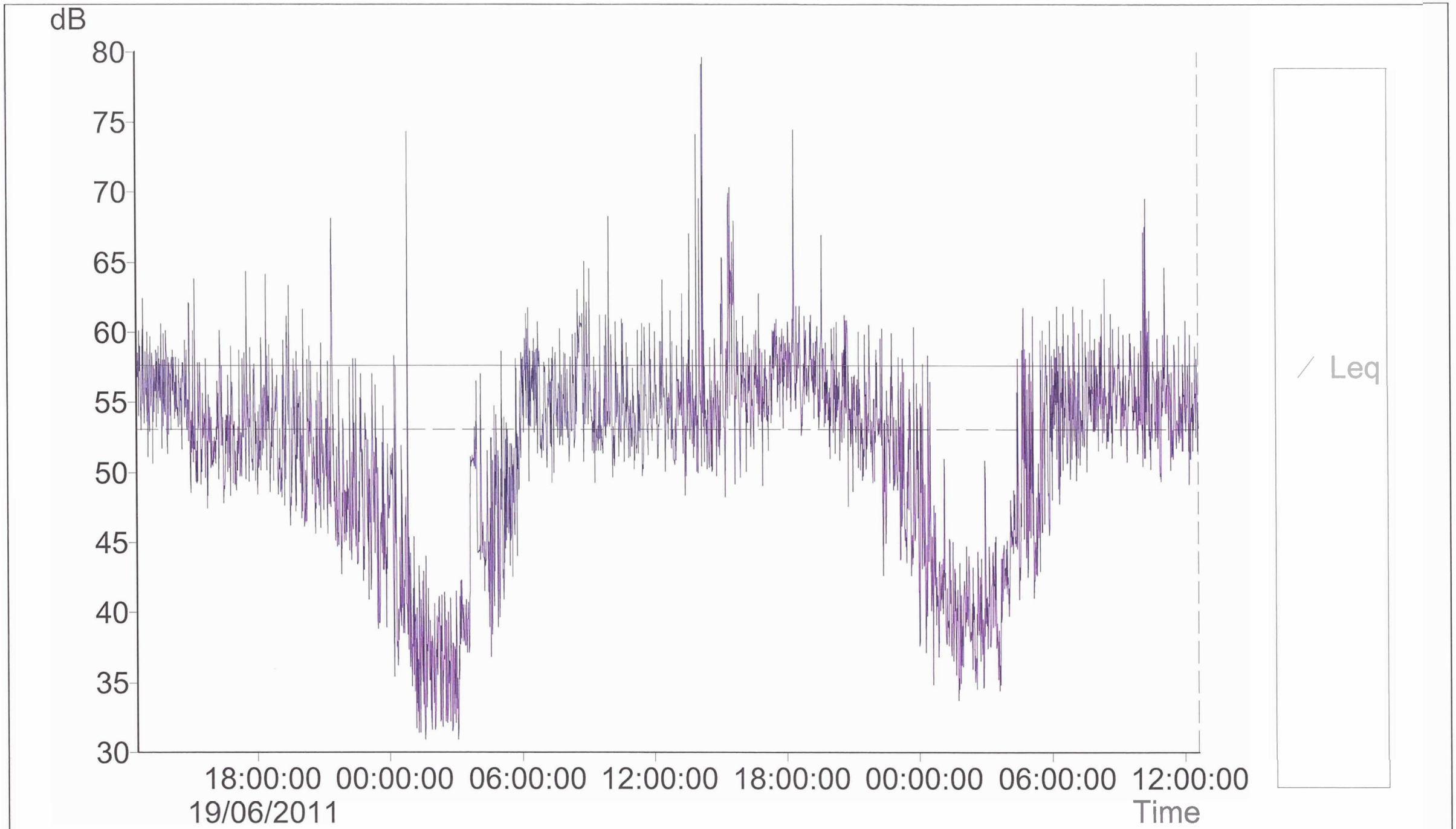

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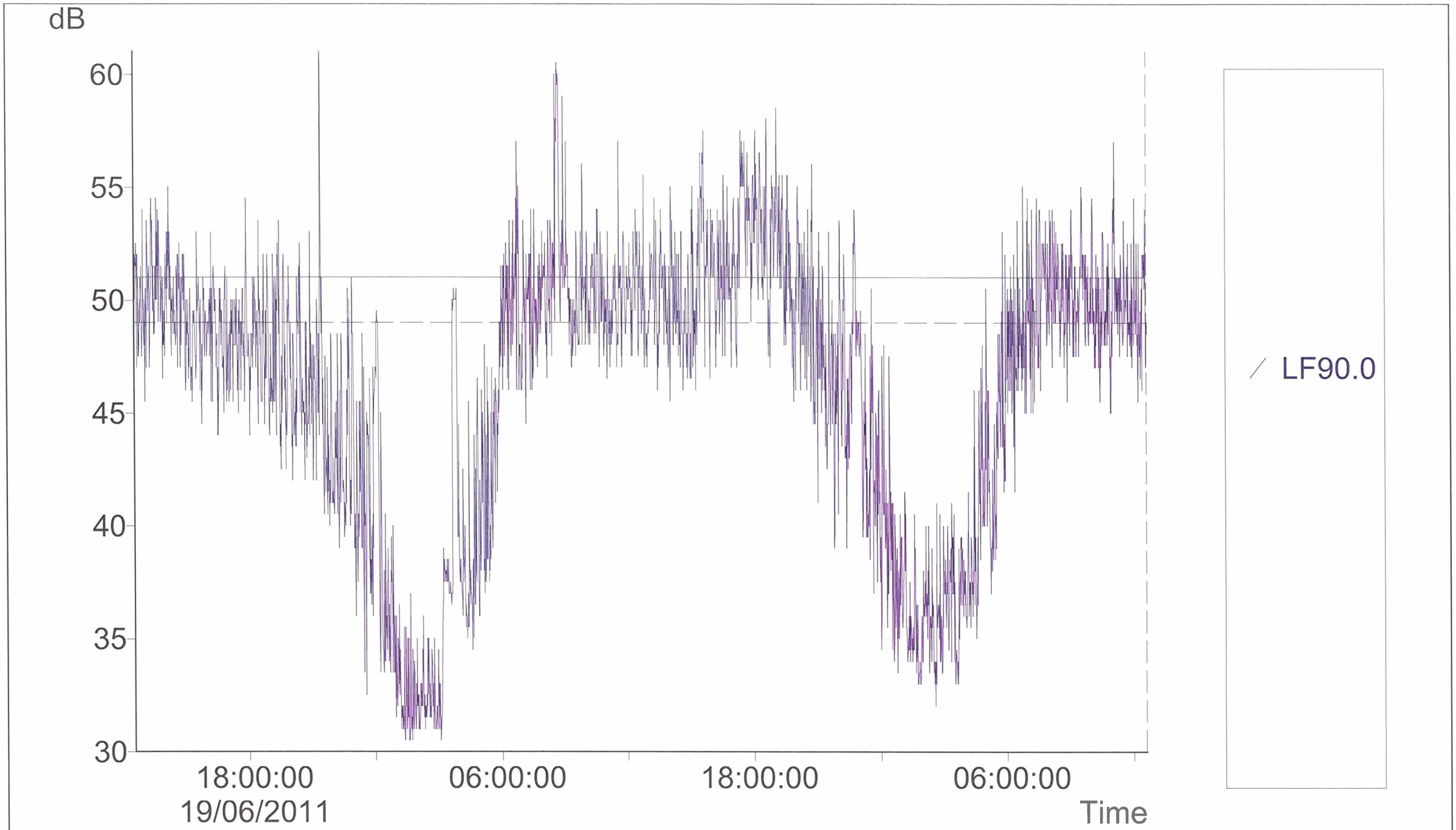

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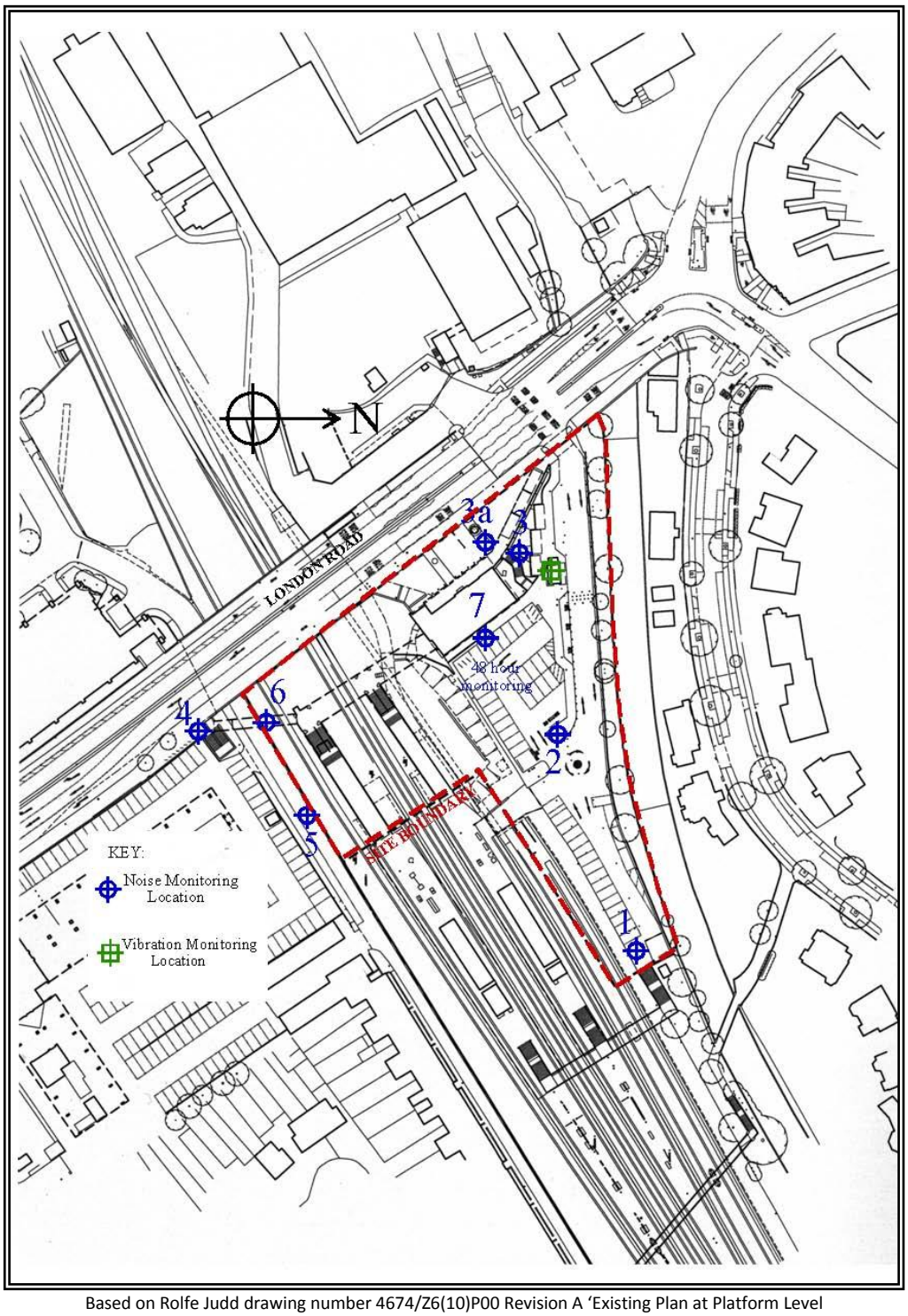
- LZF90.0 -

Figure XX Noise Monitoring Locations



Based on Rolfe Judd drawing number 4674/Z6(10)P00 Revision A 'Existing Plan at Platform Level Ground Floor' May 2010

Note: Drawing Not to Scale