HEPWORTH
ACOUSTICS
Noise and Vibration Consultants

**PROPOSED FREE SCHOOL**

**HEATHGATE HOUSE, TWICKENHAM**

**NOISE ASSESSMENT**

**On behalf of:**

**JLL**

Report No. 31627.1v1
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# PROPOSED FREE SCHOOL
# HEATHGATE HOUSE, TWICKENHAM

## NOISE ASSESSMENT

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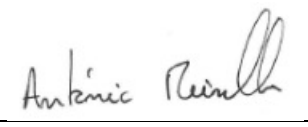

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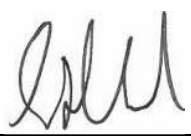

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## 1.0 INTRODUCTION

1.1 Hepworth Acoustics Limited has been commissioned by JLL to carry out a noise assessment of the proposed free school development at Heathgate House, The Green, Twickenham, TW2 6QF.

1.1 The assessment report has been commissioned in connection with the planning application for the proposed development.

1.2 The noise assessment has included:

i) A site inspection and review of proposed layout drawings;

ii) A noise survey at the site to assess ambient and background noise levels during the daytime;

iii) Outline recommendations of appropriate noise mitigation measures for the proposed school, where necessary;

iv) An assessment of the noise impact from the proposed development on the nearest residential properties;

v) Recommendations for appropriate noise criteria from proposed mechanical services plant associated with the development at existing and proposed residences.

1.3 Noise levels referred to in the text have been rounded to the nearest whole decibel (dB), as fractions of dBs are imperceptible. The various noise units and indices referred to in this report are described in Appendix I.

## 2.0 DESCRIPTION OF THE SITE

2.1 The proposed development site is located on The Green and extends to Colne Road to the rear. The site adjoins residential properties to the west and east, although there is a vacant site currently under development to the east / north-east boundary of the site.

2.2 The site is currently occupied by a vacant three storey office building fronting The Green, and a car park to the rear, accessed via Colne Road.

2.3 The Green is well trafficked, whilst Colne Road is mainly used for residential access.

2.4 The proposed development comprises the change of use and refurbishment of the existing building to receive a primary school, from Foundation to Year 6, with a capacity of up to 420 students, in addition to around 30 staff members.

2.5 The proposal further includes for external play area to the rear, which includes a separate nursery/reception years' play area.

2.6 The proposed site plan is shown in Figure 1.

## 3.0 ACOUSTIC CRITERIA

3.1 The National Planning Policy Framework (NPPF) 2012 provides some general guidance to local authorities on taking noise in to account in planning policies and decisions. This includes guidance that local authorities should 'aim to avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development'.

3.2 No specific guidance is given in the NPPF on acoustic criteria, therefore, the guidance discussed below has been used to determine acceptable noise criteria.

**BB93 Acoustic Design of Schools**

3.3 Building Bulletin 93 (BB93) provides a regulatory framework for the acoustic design of schools, including the upper limit for indoor ambient noise levels. The criteria are summarised in Table 1.

**Table 1 BB93 Recommended Acoustic Design Criteria**

| Location | Upper limit for indoor ambient noise level |
|---|---|
| Primary school: classrooms, class bases, general teaching areas, small group room; music classroom, | 35 dB $L_{Aeq,30min}$ |
| Classrooms designed specifically for use by hearing impaired pupils | 30 dB $L_{Aeq,30min}$ |
| Assembly halls, multi-purpose halls | 35 dB $L_{Aeq,30min}$ |
| Atria, circulation spaces used by pupils, dining rooms | 45 dB $L_{Aeq,30min}$ |
| Interviewing, counselling, medical rooms | 35 dB $L_{Aeq,30min}$ |
| Kitchens and toilets* | 50 dB $L_{Aeq,30min}$ |
| Offices, staff rooms* | 40 dB $L_{Aeq,30min}$ |
| Corridors and stairwells* | 45 dB $L_{Aeq,30min}$ |

* Advisory level

3.4 This assessment includes subsequent recommendations to ensure $L_{Aeq,30min}$ indoor noise levels within the type of rooms identified in Table 1 do not exceed the recommended upper limit during the operational period (09:00-16:30 hours), with windows closed and adequate ventilation provided.

**BS 4142: 1997**

3.5 BS4142: 1997*'Method for rating industrial noise affecting mixed residential and industrial areas'* provides guidance in assessing potential noise impact from industrial type noise sources.

3.6 BS 4142: 1997 requires the noise from the equipment (in $L_{Aeq}$) to be compared with the background noise level ($L_{A90}$) in the absence of the equipment noise. A +5dB 'acoustic feature' penalty is added for any plant which gives rise to intermittent, tonal or impulsive noise.

3.7 BS 4142: 1997 states that if the noise rating level exceeds the $L_{A90}$ background noise level by 10dB or more then complaints would be likely. An excess of 5dB over the background noise level is viewed as being 'of marginal significance'. A noise rating level of 10dB below the background noise is a positive indication that complaints will be unlikely.

## 4.0 NOISE SURVEYS

4.1 A brief survey of prevailing external ambient noise levels has been undertaken at the site. Existing noise levels were measured at a location representing the most exposed proposed residential façade to The Green, Location 1 shown in Figure 1, and to the rear of the site, Location 2 shown in Figure 1.

4.2 15 minute samples were recorded in rotation between the two locations between 08:00 hours and 10:40 hours of Thursday 5 June 2014.

4.3 Individual sample noise measurements were carried out using a Brüel & Kjær 2260 'Type 1' Sound Analyser (serial no. 2520468). The calibration level of both meters was checked before and after the survey with a Brüel & Kjaer Type 4203 sound calibrator (serial no. 1771163) with no variation in level observed. The measurement microphone was mounted at approximately 1.5m above ground level. A windshield was fitted to the microphone during all noise measurements. At Location 1 the microphone was located 1m laterally from the building facade, therefore not in fee-field conditions. Accordingly, a -3dB façade correction is applicable to the measured noise levels to determine the equivalent free-field values. At Location 2 the microphone was in free-field conditions.

4.4 The dominating noise source at the site was steady road traffic noise on The Green and more intermittent road traffic noise at Colne Road at the back of the site. Occasional rail and aircraft noise was also noted. At Location 2, noise from nearby construction sites was also noted at times.

4.5 The weather conditions were dry and mainly calm, but with occasional wind gusts with wind speed below 5m/s.

4.6 The results of the attended noise survey are detailed in Appendix II and are summarised in Table 2 below.

**Table 2 – Summary of measured background noise levels (dB) – Wednesday 12th June 2012**

| Location | Measurement period | | Noise level | | |
|---|---|---|---|---|---|
| | | | $L_{Amax}$ | $L_{Aeq}$ | $L_{A90}$ |
| 1* | Between 08:00-10:00 hours on Thursday 5 June 2014 | Range | 78-92 | 65-69 | 61-62 |
| | | Mean | 87 | 67 | 62 |
| 2 | Between 08:17-10:22 hours on Thursday 5 June 2014 | Range | 69-77 | 56-59 | 45-46 |
| | | Mean | 75 | 58 | 46 |

* Includes for a -3dB facade correction

4.7 It is noted that traffic was queuing during the 08:00-09:00 hours peak hour at The Green, but was flowing freely from about 09:30 hours. Although this did not have a significant effect on measured $L_{Amax}$ noise levels at Location 1, an increase of approximately 4dB in measured $L_{Aeq}$ noise levels was noted, i.e. average 65 dB $L_{Aeq}$ 08:00-09:00 hours and 69 dB $L_{Aeq}$ 09:49-10:40 hours.

## 5.0 ASSESSMENT AND RECOMMENDED MITIGATION MEASURES

**Indoor ambient noise levels**

5.1 It is considered that, subject to careful design, adequate sound insulation measures can be readily incorporated within the scheme in order that indoor ambient noise levels do not exceed the recommended BB93 upper limits.

5.2 The principal method of noise mitigation will be appropriately specified glazing and ventilation systems. The precise specification of the external building fabric is not known. However, site inspection indicates that this is standard brick and block masonry construction on the ground and first floor levels and concrete cladding at second floor level. The existing windows include double glazing systems, which appears to be standard thermal double glazing (i.e. 4-12-4). Typically thermal glazing provides the Sound Reduction Indices (SRIs) set out in Table 3, which have been considered in the assessment.

**Table 3: Typical Thermal Glazing SRIs**

| | **Hz Octave Band Centre Frequency** | | | | | |
|---|---|---|---|---|---|---|
| | **125** | **250** | **500** | **1k** | **2k** | **4k** |
| dB SRI | 24 | 20 | 25 | 35 | 38 | 35 |

5.3 It is further noted that the existing windows do not include trickle vents, which has been also considered in the assessment.

5.4 Considering the above, it is predicted that the upper limit for indoor ambient noise levels will not be exceeded at the majority of the proposed areas, with the exception of the nursery and classrooms with windows on the front elevation. It is therefore recommended that the existing glazing to these areas is upgraded to provide the minimum Sound Reduction Indices (SRIs) set out in Table 4. This can either be done by replacing the existing double glazing, for which the minimum SRIs presented in Table 4 are typically achieved using a system comprising one 6mm glass pane and a laminated 6.4mm glass pane on a minimum 12mm air gap (i.e. minimum 6-12-

$6.4_{laminated}$, or by installing a secondary window. The secondary window should be of 6mm glass, with an air gap of at least 63mm to the existing window.

**Table 4: Minimum Glazing SRIs – Zone A**

| | **Hz Octave Band Centre Frequency** | | | | | |
|---|---|---|---|---|---|---|
| | **125** | **250** | **500** | **1k** | **2k** | **4k** |
| dB SRI | 24 | 25 | 31 | 42 | 44 | 49 |

**External Play Areas**

5.5 There is no government recommended objective method of assessing noise levels from external playground areas. The approach adopted has been to assess predicted noise levels outside the nearest residences to determine any influence from the proposed playground areas and to assess the impact of any change in existing noise levels.

5.6 We have predicted noise levels from the proposed playground areas outside the nearest and most exposed residences, i.e. residential properties off Knowle Road. The assessment has been undertaken using reference noise levels measured by Hepworth Acoustics Ltd at a similar play area in Edenbridge, Kent whilst occupied by 25 children, as shown in Table 5 below.

**Table 5 – Summary of measured play area noise levels (dB)**

| **Date** | **Description** | **Noise level** |
|---|---|---|
| 5 March 2009 | 25 children at 5m | 72 dB $L_{Aeq}$ |

5.7 Predicted noise level at a central garden position of the nearest residential property off Knowle Road playground area, assuming a capacity of up to 420 children, is shown in Table 6. Predicted noise levels take account of attenuation provided by distance and screening by intervening structures.

**Table 6 – Predicted noise levels from proposed Key Stage 1&2 playground area at the nearest garden (dB)**

| Parameter | Predicted noise level |
|---|---|
| | $L_{Aeq}$ |
| 25 children at 5m | 72 |
| Interpolated noise level for 420 children at 5m | 84 |
| Distance attenuation of 25m from a central playground location to a garden central location | -14 |
| Screening by intervening structures | -10 |
| **Noise level at receiver position** | 60 |

5.8 Similarly, predicted noise level at the nearest residential first floor windows to the rear of the residences off Knowle Road playground area, assuming a capacity of up to 420 children, is shown in Tables 7. Predicted noise levels take account of attenuation provided by distance, screening by intervening structures and façade reflections.

**Table 7 – Predicted noise levels from proposed Key Stage 1&2 playground area at the nearest residential window (dB)**

| Parameter | Predicted noise level |
|---|---|
| | $L_{Aeq}$ |
| 25 children at 5m | 72 |
| Interpolated noise level for 450 children at 5m | 84 |
| Distance attenuation of 30m from a central playground location to a garden central location | -16 |
| Screening by intervening structures | -10 |
| Façade reflection | +3 |
| **Noise level at receiver position** | 59 |

5.9 To allow for a robust assessment it has been assumed in the following calculation that the playground area could potentially be used up to two hours on any school day, which corresponds to an overall daytime noise level of 51 dB $L_{Aeq,16hrs}$ at the nearest garden and 50 dB $L_{Aeq,16hrs}$ at the nearest residential window.

5.10 Although $L_{Aeq,16hrs}$ daytime noise levels have not been measured at the nearest residential properties, assuming the lowest daytime noise level measured at Location 2 as presented in Table 2, i.e. 56 dB $L_{Aeq}$, to be representative of daytime noise levels it is calculated that the overall daytime noise level including the playground area noise level contribution will be 57 dB $L_{Aeq,16hrs}$ at a central garden position and 58dB $L_{Aeq,16hrs}$ at the nearest residential windows of the properties off Knowle Road.

5.11 It is therefore concluded that there will be an increase of 1dB and 2 dB in daytime noise levels at the nearest garden and residential windows from the use of the proposed playground.

5.12 To put this in perspective, it is commonly accepted that a change of less than 3 dB(A) is not perceptible under normal conditions.

5.13 It is therefore predicted that there will be no significant noise impact to residents from the use of the proposed playground areas.

**Student drop-off**

5.14 We have been provided with a transport assessment for the proposed development, which has been carried by Robert West. It is anticipated that the development could generate up to 108 vehicle movements at the peak hour from pupils and staff travelling to school by car. Furthermore, it is noted that the student drop-off/pick-up area will at Colne Road.

5.15 Although the assessment does not include for data of the existing flows on the surrounding highways, brief traffic counts during the daytime noise survey indicate that during the peak hour, i.e. 08:00-09:00 hours, existing flows are in the region of 125 vehicle movements at Colne Road and 860 vehicle movements at The Green. The anticipated increase in traffic numbers will lead to an increase in noise levels below 3dB at Colne Road and below 1dB at The Green.

5.16 As mentioned before, it is commonly accepted that a change of less than 3 dB(A) is not perceptible under normal conditions.

5.17 It is therefore predicted that there will be no significant noise impact to residents from student drop off/collection from the proposed school.

**Mechanical services plant**

5.18 The results of the noise survey indicate that the lowest daytime background noise levels throughout the survey was 45 dB $L_{A90}$.

5.19 With reference to the requirements set out in Section 3.0, we recommend that the cumulative $L_{Aeq}$ noise level from proposed mechanical services plant at the nearest existing and proposed residence should not exceed 15 dB below the lowest measured $L_{A90}$ background noise level measured at Location 7. Based on the lowest measured $L_{A90}$ level of 45 dB, cumulative noise

from all mechanical services plant should not exceed 30 dB $L_{Aeq}$ at the nearest residence during the daytime period.

5.20 Although not known at this stage, it is possible that some plant will be required to operate continuously. Although no night-time noise levels have been measured, it is considered that an $L_{Aeq}$ noise level limit of 25dB will be sufficiently low as not to give rise to complaints at the nearest residential properties, although people might still notice it when background noise levels are at their lowest. Based on the lowest attenuation provided by an open window commonly accepted to be in the region of 10dB, the noise rating level inside the nearest habitable room would not exceed 20dB, which is 10dB below the 30dB lower limit suggested for good sleeping conditions within bedrooms. It is therefore recommended that cumulative noise from all mechanical services plant should not exceed 25 dB $L_{Aeq}$ at the nearest residence during the night-time period.

5.21 The full proposed plant details and operating times are yet to be finalised. To prevent noise impacts arising existing residences, it is recommended that the above criterion is adopted which is based on worst-case conditions and accounts for any potential tonal or intermittent plant noise.

## 6.0 SUMMARY AND CONCLUSIONS

6.1 A noise impact assessment has been undertaken of the proposed free school development at Heathgate House, The Green, Twickenham, TW2 6QF.

6.2 A brief daytime noise survey has been undertaken at the site.

6.3 Appropriate noise mitigation measures have been recommended for the proposed development which will ensure that indoor noise levels will meet the recommended acoustic criteria based on the guidelines set out in BB93.

6.4 The potential noise impact from the development has been assessed from the main potential noise sources at the proposed site.

6.5 It has been predicted that the use of the external playground areas and student drop off/collection will not result in any unacceptable noise impact to residents in Knwole Road and Colne Road.

6.6 Appropriate noise criteria for proposed mechanical services plant at the site have been recommended in line with the BS4142 assessment of 'complaints will be unlikely'.

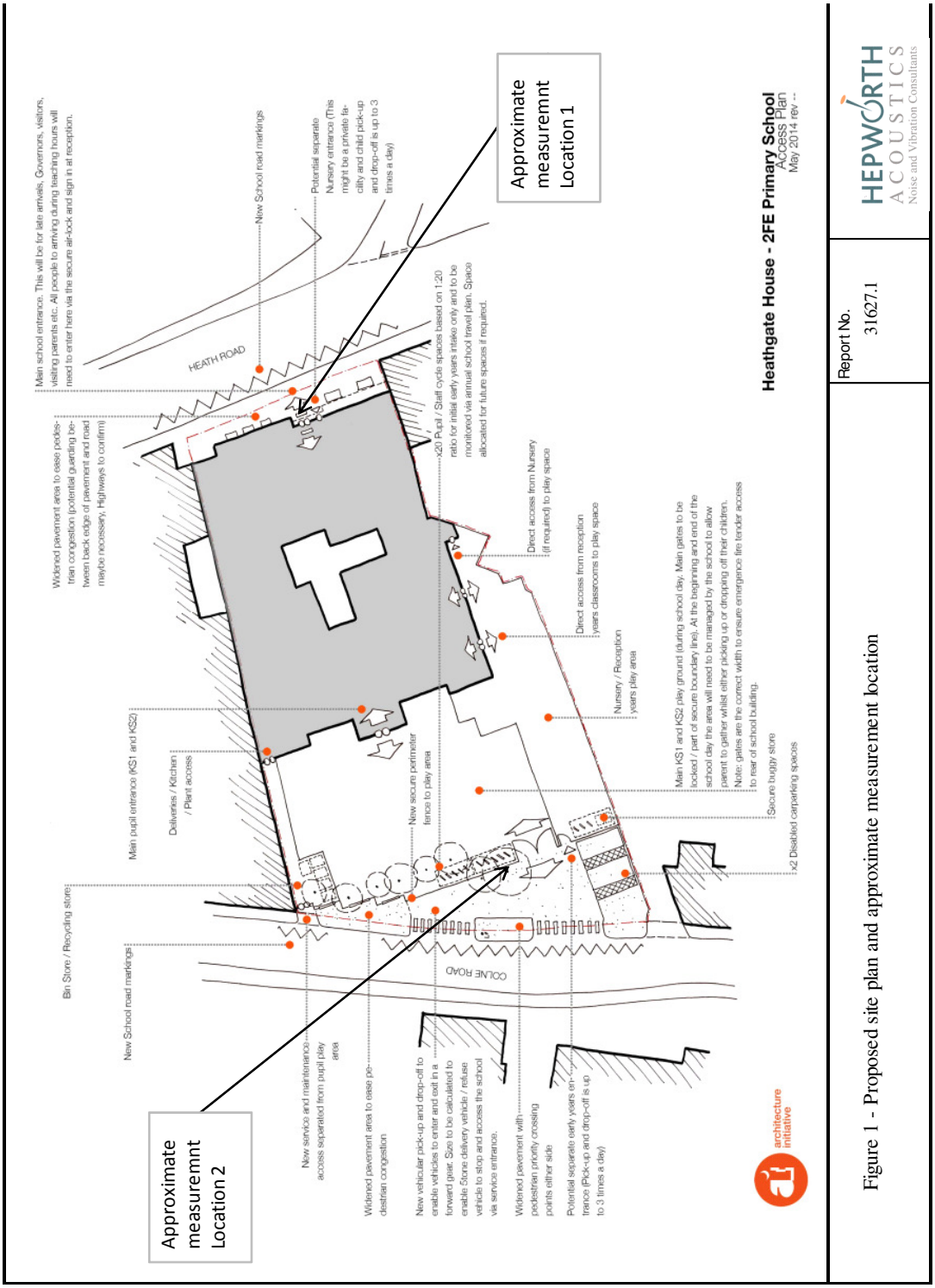


Figure 1 - Proposed site plan and approximate measurement location

## Appendix I – Noise Units and Indices

### a) Sound Pressure Level and the decibel (dB)

A sound wave is a small fluctuation of atmospheric pressure. The human ear responds to these variations in pressure, producing the sensation of hearing. The ear can detect a very wide range of pressure variations. In order to cope with this wide range of pressure variations, a logarithmic scale is used to convert the values into manageable numbers. Although it might seem unusual to use a logarithmic scale to measure a physical phenomenon, it has been found that human hearing also responds to sound in an approximately logarithmic fashion. The dB (decibel) is the logarithmic unit used to describe sound (or noise) levels. The usual range of sound pressure levels is from 0 dB (threshold of hearing) to 120 dB (threshold of pain).

### b) Frequency and hertz (Hz)

As well as the loudness of a sound, the frequency content of a sound is also very important. Frequency is a measure of the rate of fluctuation of a sound wave. The unit used is cycles per second, or hertz (Hz). Sometimes large frequency values are written as kilohertz (kHz), where 1 kHz = 1000 Hz.

Young people with normal hearing can hear frequencies in the range 20 Hz to 20,000 Hz. However, the upper frequency limit gradually reduces as a person gets older.

### c) Glossary of Terms

When a noise level is constant and does not fluctuate over time, it can be described adequately by measuring the dB(A) level. However, when the noise level varies with time, the measured dB(A) level will vary as well. In this case it is therefore not possible to represent the noise climate with a simple dB(A) value. In order to describe noise where the level is continuously varying, a number of other indices, including statistical parameters, are used. The indices used in this report are described below.

$L_{Aeq}$ This is the A-weighted 'equivalent continuous noise level' which is an average of the total sound energy measured over a specified time period. In other words, $L_{Aeq}$ is the

level of a continuous noise which has the same total (A-weighted) energy as the real fluctuating noise, measured over the same time period. It is increasingly being used as the preferred parameter for all forms of environmental noise.

$L_{Amax}$ This is the maximum A-weighted noise level that was recorded during the monitoring period.

$L_{A10}$ This the A-weighted noise level exceeded for 10% of the time period. $L_{A10}$ is used as a measure of traffic noise.

$L_{A90}$ This is the A-weighted noise level exceeded for 90% of the time period. $L_{A90}$ is used as a measure of background noise.

## Appendix II – Results of Noise Surveys

Dates: Thursday 5 June 2014

Equipment: Bruel & Kjaer 2260 Type 1 integrating sound level meter

Weather: Dry and calm. Occasional wind gusts below 5 m/s

***Short term Noise Measurements***

| Location | Time Start | Time Finish | Noise levels (dB) | | |
|---|---|---|---|---|---|
| | | | $L_{Amax}$ | $L_{Aeq}$ | $L_{A90}$ |
| 1 | 08:00 | 08:15 | 78.7 | 67.6 | 62.6 |
| 2 | 08:17 | 08:32 | 69.4 | 56.1 | 45.8 |
| 1 | 08:35 | 08:50 | 83.5 | 68.4 | 61.8 |
| 2 | 08:52 | 09:11 | 77.3 | 59.1 | 46.0 |
| 1 | 09:14 | 09:3+ | 80.7 | 68.7 | 61.6 |
| 2 | 09:31 | 09:46 | 74.2 | 56.6 | 45.6 |
| 1 | 09:49 | 10:04 | 94.9 | 72.0 | 61.8 |
| 2 | 10:07 | 10:22 | 74.2 | 57.5 | 45.0 |
| 1 | 10:25 | 10:40 | 84.7 | 71.5 | 60.8 |