

CORINTHIAN PARK, CHELTENHAM  
PROPOSED PHASE 2 DEVELOPMENT

NOISE IMPACT ASSESSMENT

**CORINTHIAN PARK, CHELTENHAM  
PROPOSED PHASE 2 DEVELOPMENT  
NOISE IMPACT ASSESSMENT**



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**AUDIT SHEET**

REVISION	DESCRIPTION	DATE	ISSUED BY	REVIEWED BY
R0	Draft report	10/10/2016	AM	
R1	Design team comments	07/11/16	AM	DM
R2	Additional comments	09/11/16	AM	DM

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## **1. INTRODUCTION**

Hoare Lea Acoustics has been instructed by Hinton Group to carry out a noise impact assessment for the proposed new Phase 2 development at Corinthian Park, Cheltenham. The development will comprise a grocery retail store, a 'drive-thru' coffee shop, office buildings and a nursery.

Pre-application consultation with Cheltenham District Council Environmental health Department has determined that it will be necessary to assess the potential noise impact of new plant installations and vehicle movements associated with the proposed development.

This report details the results of site survey work and assesses the potential noise impact of the proposed development upon nearby residential property.

## 2. SITE

The development site is located off Grovefield Way approximately 2 miles south west of Cheltenham town centre. The site is currently open land that is currently being developed for Phase 1 of the Corinthian Park scheme.

The Phase 2 site occupies the southern side of the site adjacent to North Road West.

Grovefield Way forms the eastern site boundary and provides a route between the A40 Gloucester Road and commercial district to the north and the residential conurbation to the south and east. This road is busy throughout the day but with increased flow during morning and evening peak periods.

The southern site boundary is formed by North Road West which provides local access to nearby residential properties.

The northern boundary is formed by the current Phase 1 development and beyond this lies the A40 Gloucester Road dual carriageway. That section of road adjacent to the site is elevated above site level.

The M5 motorway Junction 10 lies approximately 800m to the west of the site.

An aerial view of the site and surroundings is shown below and indicates the phase 2 site in red:



### **3. DEVELOPMENT PROPOSALS**

It is proposed that the Phase 2 site be developed to provide the following facilities:

- Retail grocery store
- Coffee shop with 'drive-thru'
- 2no office buildings
- Nursery

The grocery store building will be aligned along the southern site boundary adjacent to the road junction between Grovefield Way and North Road West with customer parking to the north and east of the building.

The delivery point and loading bay for the store will be on the western side of the building and will comprise a single enclosed dock leveller accessed from the parking area to the north. All unloading activities will, therefore, occur within the vehicle or within the building – there will be no external unloading activity. It is noted that this location is mostly screened from the adjacent residential properties on North Road West which are at a distance of approximately 60m from the loading bay.

The typical delivery schedule for this type of store comprises a single HGV main delivery per day but increasing to two deliveries per day for certain times of the year including Christmas and Easter.

External plant items will be located within a dedicated compound on the south side of the building which will be enclosed with a solid timber fence. The centre of the plant area will be approximately 18m from the nearest residential façade. The plant will comprise 3no small refrigeration/condensing units for the cold store and fridge/freezer cabinets operating on a 24hr basis and a main condensing unit which operates only during store opening hours.

It is proposed that the new store will operate between 08.00 to 22.00hrs Monday to Saturday including Bank Holidays and 10.00 to 18.00hrs on Sunday.

The coffee shop will be located at the north east corner of the site adjacent to Grovefield Way and the main site entrance. The facility will comprise a single storey building serving coffee and associated foodstuffs and will operate between 05.30 and 23.00hrs each day of the week. The coffee shop will have a single large van delivery per day.

A bin enclosure and plant enclosure will be located on the northern elevation of the coffee shop building. Plant will comprise small a/c units located at ground level.

The Nursery building will operate during the normal working day between 07.00hrs and 19.00hrs Monday to Friday.

The proposed site layout is shown at Appendix 1.

## **4. ASSESSMENT CRITERIA**

### **4.1 National Planning Policy Framework**

The National Planning Policy Framework (NPPF) 2012 sets out the Government planning policies for England and how these are expected to be applied.

Section 11, Conserving and enhancing the natural environment, para 123 of NPPF states:

'Planning policies and decisions should aim to:

- Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development
- Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions
- Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put upon them because of changes in nearby land uses since they were established
- Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason'

Reference is made to the DEFRA Noise Policy Statement for England 2010 (NPSfE). This latter document is intended to apply to all forms of noise other than that which occurs in the workplace and includes environmental noise and neighbourhood noise in all forms.

NPSfE advises that the impact of noise should be assessed on the basis of adverse and significant adverse effect but does not provide any specific guidance on assessment methods or limit sound levels. Moreover, the document advises that it is not possible to have 'a single objective noise-based measure...that is applicable to all sources of noise in all situations'. It further advises that the sound level at which an adverse effect occurs is 'likely to be different for different noise sources, for different receptors and at different times'.

In the absence of specific guidance for assessment of environmental noise within NPPF and NPSfE it is considered appropriate to base assessment on current British Standards and appropriate local or national guidance.

It is noted that NPSfE also advises that the general principle that increases in ambient noise should be 'minimised', needs to be considered in context for each site and, in this regard, states:

*'Of course, taken in isolation and to a literal extreme, noise minimisation would mean no noise at all. In reality, although it has not always been stated, the aim has tended to be to minimise noise as far as is reasonably practical... the application of the NPSfE should enable noise to be considered alongside other relevant issues and not to be considered in isolation. In the past, the wider benefits of a particular policy, development or other activity may not have been given adequate weight when assessing the noise implications.'*

#### 4.2 BS 8233:2014

BS8233:2014 'Guidance on sound insulation and noise reduction for buildings' is the current British Standard providing guidance for acoustic requirements within buildings. The Standard advises appropriate criteria and limits for different building types including dwellings.

BS8233 provides guidance regarding acceptable internal and external noise level criteria for dwellings but does not form any statutory requirement to achieve the guidance values provided therein.

The BS8233 internal design criteria for dwellings are as follows:

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living rooms	35 dB L <sub>Aeq,16hour</sub>	-
Dining	Dining Room / Area	40 dB L <sub>Aeq,16hour</sub>	-
Sleeping (daytime resting)	Bedroom	35 dB L <sub>Aeq,16hour</sub>	30 dB L <sub>Aeq,8hour</sub>

Section G1 of BS 8233 advises that sound reduction is limited to 15dB where windows are open.

#### 4.3 BS4142:2014

BS4142:2014 'Methods for rating and assessing industrial and commercial sound' is the current British Standard providing guidance for assessment of noise impact from industrial and commercial sites. In general, the likelihood of adverse impact for a particular noise source is dependent upon factors including the margin by which it exceeds the background noise level, the character of the noise and its occurrence. The Standard recommends the determination of the Rating Level of the specific source and advises a correction factor of between +3dB and +9dB if the sound has a tonal quality, is intermittent or impulsive or has any other distinct characteristics which would make it more noticeable.

The degree of impact is assessed by comparing the measured background level with the Rating Level. Where the Rating Level exceeds the background, the level of impact increases as shown below:

Comparison with background	Assessment
+0 dB or below measured background	Low impact
+ 5 dB	Adverse impact
+ 10 dB or more above measured background	Significant adverse impact

It should be noted that the assessment method applies to free field external sound levels.



#### **4.4 Pre-application consultation**

Pre-application comments received from Cheltenham District Council in September 2016 advised that it will be necessary to assess the impact of mechanical services plant and deliveries upon nearby residential properties.

## **5. MEASUREMENTS**

Measurement has been made to determine the existing noise climate at the site. Measurements were made over the period Friday 30<sup>th</sup> September to Wednesday 5<sup>th</sup> October 2016 to determine the typical ambient and background sound levels for the dwellings nearest to the site.

Continuous monitoring was carried out at two locations as follows:

- Position 1 – opposite no 11 Chalford Avenue
- Position 2 – opposite no 10 North Road West

Levels were recorded continuously in 5 minute samples to determine the equivalent continuous sound level,  $L_{Aeq}$ , the short duration maximum sound level,  $L_{Amax}$  and the background sound level,  $L_{A90}$ . It is considered that the weekend represents the quietest period of the week for the site'

The measurements positions are indicated on the plan at Appendix 1.

All measurements were made with a laboratory calibrated precision grade (Class 1) sound level meter in accordance with BS EN 60651 and BS 7445. The meter was site calibrated before and after use at each measurement position by means of a laboratory calibrated calibrator.

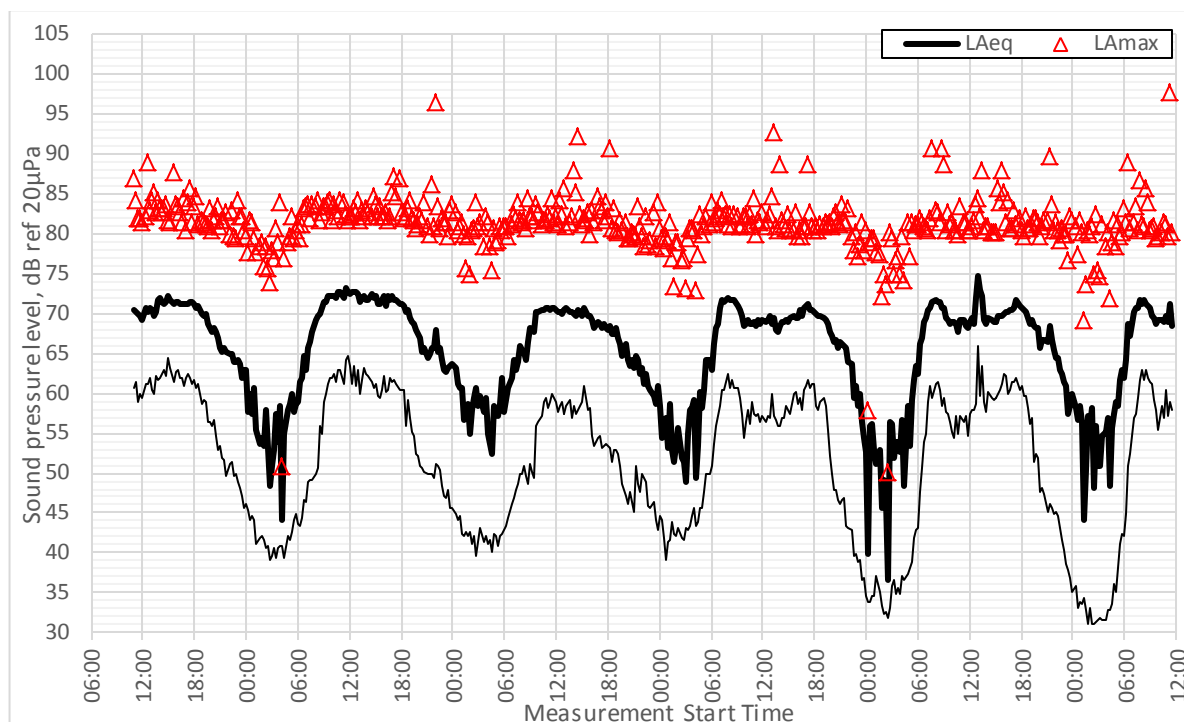
Weather conditions over the survey period were generally fine and dry with low wind speed and suitable for environmental noise measurement.

**6. RESULTS**

The results of all site measurements are tabulated at Appendix 2. Levels are shown as hourly values derived from the 5 minute samples.

Position 1 – Grovefield Way

Levels over the monitoring period are shown graphically below:



The overall sound levels at the measurement position are summarised in the following table:

<b>Period</b>	<b>L<sub>Aeq</sub> dB</b>	<b>L<sub>Amax</sub> dB</b>	<b>L<sub>A90</sub> dB</b>
Friday	70.0	88.8	58.9
Friday night	59.4	84.1	43.0
Saturday	70.7	96.2	57.5
Saturday night	60.1	83.8	43.1
Sunday	68.4	92.0	53.5
Sunday night	60.9	83.8	45.3
Monday	69.3	92.6	55.9
Monday night	59.8	81.8	37.6
Tuesday	69.6	90.5	56.4

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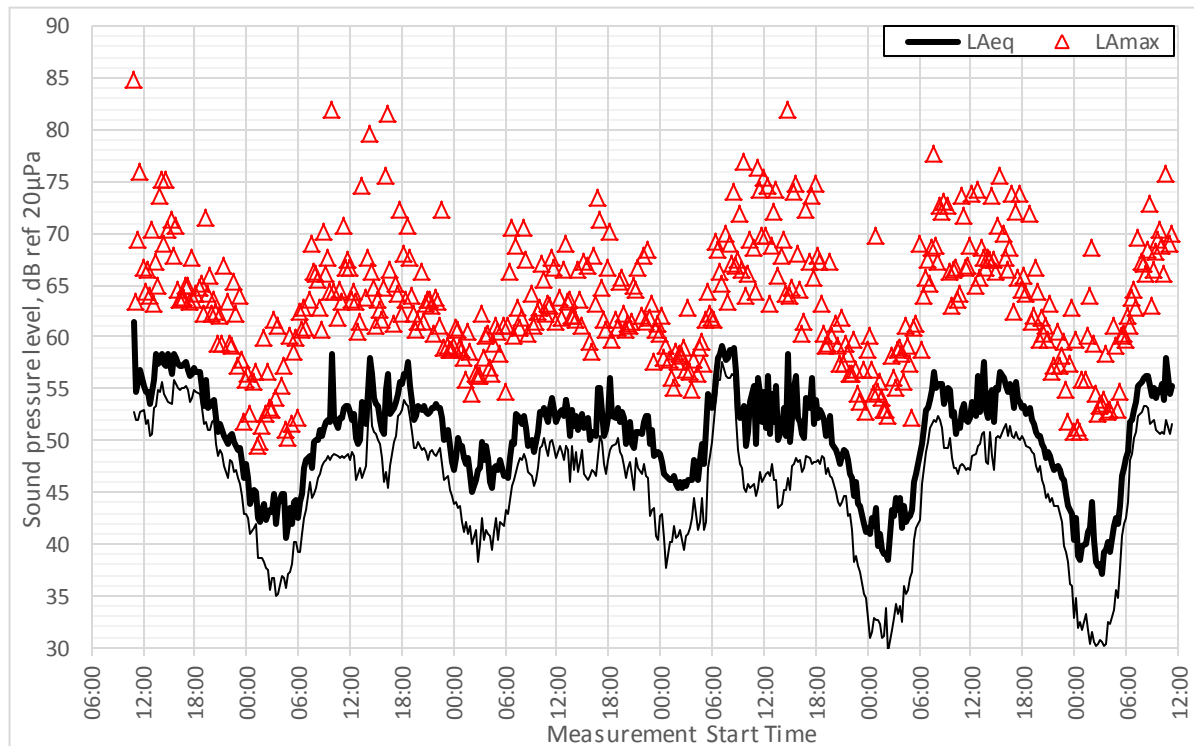


Tuesday night	60.2	88.8	36.2
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The typical lowest night time background sound level was  $L_{A90}$  32dB recorded for the early morning period on Wednesday. The typical lowest daytime background level was  $L_{A90}$  50dB recorded during Sunday morning.

Position 2 – North Road West

Levels over the monitoring period are shown graphically below:



The overall sound levels at the measurement position are summarised below:

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<b>Period</b>	<b>L<sub>Aeq</sub> dB</b>	<b>L<sub>Amax</sub> dB</b>	<b>L<sub>A90</sub> dB</b>
Friday	55.9	84.9	52.3
Friday night	44.9	64.0	39.5
Saturday	53.4	82.0	48.8
Saturday night	48.2	70.6	42.3
Sunday	52.0	73.5	47.9
Sunday night	50.4	69.2	43.3
Monday	53.8	81.9	47.2
Monday night	45.1	69.7	35.7
Tuesday	53.4	77.6	48.5
Tuesday night	44.5	68.5	35.2

The typical lowest night time background sound level was L<sub>A90</sub> 31dB recorded for the early morning period on Wednesday. The typical lowest daytime background level was L<sub>A90</sub> 46dB recorded during Tuesday morning.

## 7. NOISE IMPACT

### 7.1 Mechanical services plant

External plant for both the grocery store and the coffee shop will be located within a dedicated plant area. For the grocery store, plant will be located on the southern elevation of the building adjacent to North Road West. For the Nursery building most plant will be located internally and comprise small volume extracts and a single small AHU. There will be two small condensing units located outside the building. Plant will operate during opening hours.

At the time of preparing this report, plant details had not been finalised and, consequently, it is not possible to carry out a specific noise impact assessment. On this basis, noise limit criteria will be derived for the nearest dwellings based upon the measured background sound levels.

The nearest residential receptors for the grocery store lie to the south across North Road West at a distance of approximately 40m whilst for the coffee shop, the nearest dwellings lie to the east across Grovefield Way on Bladon Mews at a distance of approximately 50m.

The following table derives the limit sound levels for plant noise at the nearest dwellings based upon the typical lowest background sound levels.

Parameter	North Road West		Bladon Mews	
	Day	Night	Day	Night
Lowest background – $L_{A90}$	46dB	31dB	50dB	32dB
Character correction <sup>1</sup>	-3	-3	-3	-3
Limit level - $L_{Aeq}$	43dB	28dB	47dB	29dB
1. Based upon BS 4142 Annex A.1				

The calculated values above are cumulative levels to be achieved with all plant operating at rated output.

It will be necessary to review plant selections and location during the construction phase to confirm compliance with the derived limit levels and to determine where noise control measures may be required.

### 7.2 Deliveries to the grocery retail unit

The proposed store loading bay is located on the western end of the building and accessed from the car park on the northern side of the building. This arrangement screens the delivery area and delivery vehicle movement from the majority of dwellings on North Road West. There will, however, be a line of sight to the delivery bay from 10 North Road West at a distance of approximately 60m.

The standard delivery schedule for this size of store will comprise just one delivery per day but with up to two deliveries per day for certain busy periods such as Christmas and Easter.

The assessment is based on the following assumptions:

- One HGV delivery occurs within any one hour
- The visible manoeuvre distance is approximately 30m which approximates to an on-time of 15 sec at 5mph – allowing for vehicle departure would give a total vehicle movement time of 20 sec

Archive measurements have been made of HGV delivery noise at a similar sized store and these have been used as a reference source level for this assessment.

The calculated noise impact at the dwelling based on a BS4142 assessment is set out in the following table:

Calculation step	$L_{Aeq,T}$ (dB)
Delivery vehicle noise $L_{Aeq,T}$ at 2m (archive measurements)	75.1
On time correction	-22.5
<b>Specific Noise level of HGV (1hr)</b>	<b>52.6</b>
Noise character correction	+3
Distance attenuation over 60m	-29.5
Rating Level at residential facade	26.1
Lowest daytime background level $L_{A90}$	46
<b>Difference</b>	<b>-19.9</b>
<b>BS4142 Assessment</b>	<b>Low impact</b>

The assessment indicates that noise experienced at the nearest residential facade from the movement of the delivery vehicle during daytime would fall into the BS 4142 category 'low impact'. At other times of the day and other days of the week, background levels are higher and, consequently, potential noise impact would be lower than that indicated above.

Delivery vehicle movements occur for less than a minute during arrival and departure of the vehicle and, consequently, there is no potential noise impact from this source for the majority of the day.

### 7.3 Delivery vehicle reversing alarms

There are two types of HGV reversing alarm in common use - tonal (beeper) and white noise. In practice, the white noise device produces a broadband noise output that is less noticeable at distance from the source.

Manufacturer's data indicates that, for tonal alarms, the most common rating level is SWL 96-98dB. In the case of white noise alarms, the common rating level is SWL 102dB. It is assumed that the alarms will have a 1 second on/off cycle.

For the purpose of calculation, it is assumed that the alarm will operate for 10 seconds as the vehicle reverses into the bay.

The calculated noise impact at the nearest dwelling from operation of the alarm is as follows:

Parameter	Tonal	White noise
SWL	98dB(A)	102dB(A)
L <sub>Amax</sub> at 1m	87dB	91dB
Distance attenuation – 60m	-35.5dB	-35.5dB
L <sub>Amax</sub> at dwelling	51.5dB	55.5dB
On time correction	-28.5	-28.5
Level at dwelling – L <sub>Aeq(1hr)</sub>	23dB	27dB
Character correction	+6dB	+6dB
Rating Level - L <sub>Aeq</sub>	29dB	33dB
Lowest background – L <sub>A90</sub>	46dB	46dB
Difference	-17dB	-13dB
BS 4142 assessment	Low impact	Low impact

The assessment indicates that noise experienced at the nearest residential facade from the delivery vehicle reversing alarm during daytime would fall into the BS 4142 category 'low impact'. At other times of the day and other days of the week, background levels are higher and, consequently, potential noise impact would be lower than that indicated above.

#### **7.4 Coffee shop drive-thru**

The coffee shop will operate a drive-thru facility with vehicle movement in a clockwise direction around the building. The order-point is to be located on the eastern side of the building and will be screened from dwellings to the east by the building fabric whilst the collection point will be on the northern side of the building.

The nearest residential properties are located approximately 40m from the nearest section of the drive-thru roadway.

It would be expected that all vehicle movements on the drive-thru road will be at low speed and typical drive-by noise levels for a range of vehicles obtained from a large urban car park are shown below and indicate an overall mean drive-by level of L<sub>Aeq</sub> 67.2dB at a distance of 2m.



<b>Vehicle Type</b>	<b>Measured level at 2m</b>
Ford Focus (1.6 litre 4 cylinder petrol)	$L_{Aeq}$ 65dB
Mercedes A-Class (1.4 litre 4 cylinder petrol)	58.0
Ford Fusion (1.5 litre turbo-diesel)	65.8
New Ford Fiesta (1.25 litre 4 cylinder petrol)	58.6
Volvo 340 GL (1.7 litre 4 cylinder petrol)	61.7
BMW 320d (2 litre 4 cylinder turbo-diesel)	63.3
Peugeot 307 (1.9 litre turbo-diesel)	61.8
Vauxhall Corsa (1.5litre turbo-diesel)	61.8
Mean level	62.7

The extrapolated drive-by sound level at the nearest dwelling for open propagation is  $L_{Aeq}$  41.2dB. It is noted that this level is almost 10dB below the typical lowest daytime background level and is of the order of 20dB below typical daytime ambient sound levels.

The single large van delivery to the coffee shop is unlikely to have any significant noise impact at dwellings since this will occur during the noisier daytime period and be of very short duration. Any noise from vehicle movement would be expected to be fully masked by general traffic noise around the site.

## **8. DISCUSSION**

### **8.1 Existing noise climate**

The existing noise climate across the site and at the nearest dwellings is primarily determined by traffic flows on the A40 Gloucester Road dual carriageway to the north and also by traffic movement on Grovefield Way. Some additional residual noise is likely to be generated by the commercial premises to the east whilst background traffic noise from the M5 motorway will be noticeable during the evening and night time.

### **8.2 BS 8233 assessment**

Section 7 above derives noise limit levels for new plant installations associated with the development. Section 7 also determines the potential noise impact at the dwellings for delivery operations associated with the proposed grocery store and operation of the coffee shop 'drive-thru'.

The derived limit sound levels for plant noise are  $L_{Aeq}$  43dB daytime and  $L_{Aeq}$  28dB night time for dwellings on North Road West and  $L_{Aeq}$  47dB and  $L_{Aeq}$  29dB respectively for dwellings to the east on Bladon Mews.

It is noted that BS 8233 internal requirements for 'daytime resting' and 'night time sleeping' would require external levels no higher than  $L_{Aeq}$  50dB and  $L_{Aeq}$  45dB respectively when windows are open.

The limit levels for plant noise would readily achieve the BS 8233 internal requirements.

It is also noted that the limit levels readily achieve BS 8233 requirements for gardens and external amenity areas.

In the case of noise associated with grocery store deliveries, section 7 indicates that immission levels at nearby dwellings would be significantly below  $L_{Aeq}$  30dB for both vehicle movement and reversing alarms and would, therefore, satisfy BS 8233 requirements for gardens and for internal daytime resting when windows are open. It is noted that there is only a single delivery each day and that total vehicle movement for arrival and departure lasts no more than a minute with no noise impact from delivery vehicle movement for the majority of the day.

Predicted levels for vehicle movement on the coffee shop drive-thru are significantly below BS 8233 criteria for gardens and for internal 'daytime resting' when windows are open.

### **8.3 BS 4142 assessment**

Section 7 above provides limit criteria for plant noise which would enable a BS 4142 assessment of 'low impact' at the nearest dwellings.

Section 7 details the predicted noise impact of deliveries to the grocery store and assessment in accordance with BS 4142 indicates that a condition of 'low impact' would be achieved at the nearest dwellings.

## **9. CONCLUSIONS**

The survey work carried out has determined the general ambient noise climate and the lowest daytime and night time background sound levels at dwellings adjacent to the development site. The survey indicates that there are significant levels of traffic noise across the site from the A40 dual carriageway to the north, from Grovefield Way and also from the M5 motorway to the west.

Assessment in accordance with BS 4142 indicates that noise rating levels at the nearest dwellings for delivery operations to the grocery store would fall into the category of 'low impact'.

Plant installations for the development have not yet been finalised and limit sound levels to be achieved at any nearby dwelling have been derived on the basis of achieving a BS 4142 assessment of 'low impact'.

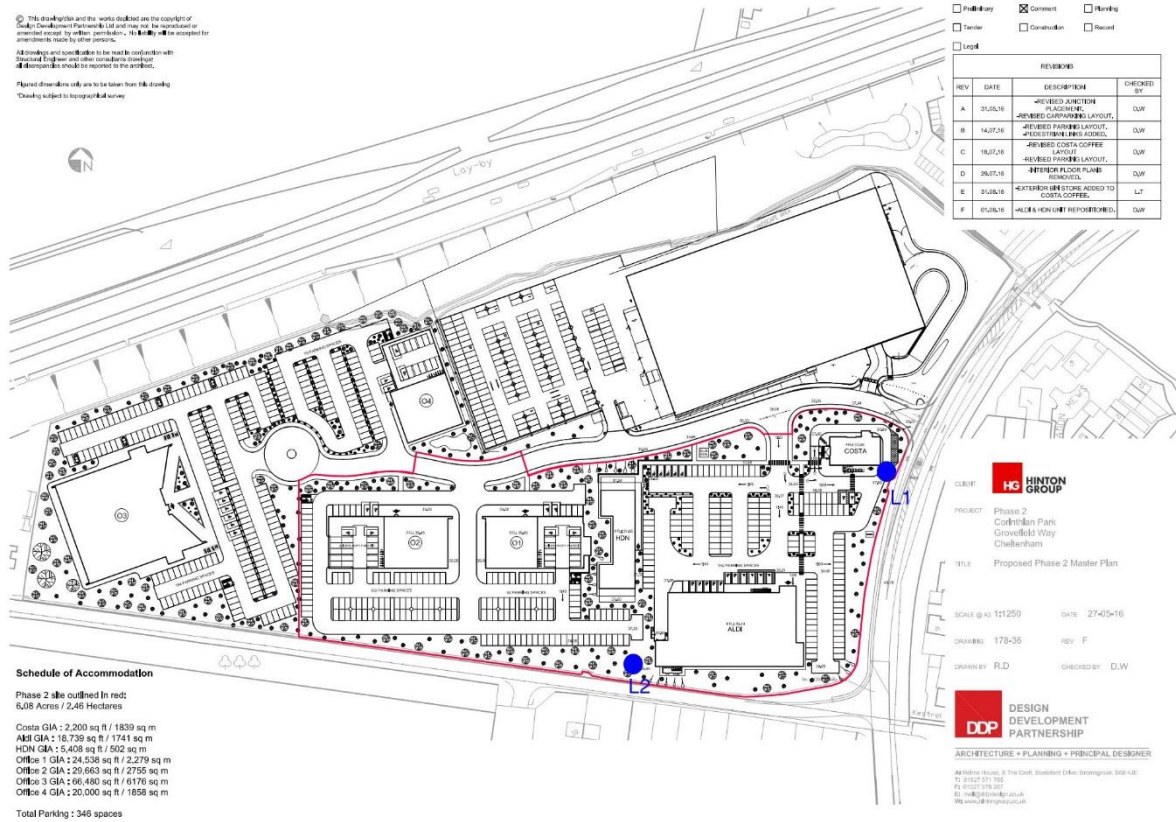
The limit levels for plant noise and calculated immission levels for delivery noise and operation of the drive-thru at the nearest dwellings would enable BS 8233 internal criteria for bedrooms and living rooms to be readily achieved when windows are open.

Given the findings noted above and that noise from activities at the development site will be below existing ambient traffic noise levels, it is considered that the proposed development is unlikely to have any significant noise impact upon adjacent dwellings on North Road West and across Grovefield Way.

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**APPENDIX 1 – Proposed site layout**



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Dimensions should be reported to the architect.  
Planned dimensions only are to be taken from this drawing.  
Drawing subject to topographical survey.

REV	DATE	DESCRIPTION	CHECKED BY
A	30/06/16	REVISED JUNCTION PLACEMENT	DUR
B	14/07/16	REVISED PARKING LAYOUT, AND COSTA UNIT LAYOUT	DUR
C	19/07/16	REVISED COSTA COFFEE LAYOUT	DUR
D	26/07/16	REMOVED FLOOR PLANE	DUR
E	30/08/16	EXTERNAL BRISTONE ADDED TO COSTA COFFEE	LT
F	01/09/16	WATER MAIN UNIT REFORMERED	DUR

**Schedule of Accommodation**  
Phase 2 site outlined in red:  
6.08 Acres / 2.46 Hectares  
Costa GIA : 2,200 sq ft / 1839 sq m  
AKI GIA : 18,739 sq ft / 1741 sq m  
HDN GIA : 5,428 sq ft / 502 sq m  
Office 1 GIA : 24,538 sq ft / 2,279 sq m  
Office 2 GIA : 29,663 sq ft / 2755 sq m  
Office 3 GIA : 16,480 sq ft / 1517 sq m  
Office 4 GIA : 20,000 sq ft / 1859 sq m  
Total Parking : 348 spaces

**CLIENT** HG HINTON GROUP

**PROJECT** Phase 2  
Corinthian Park  
Grovefield Way  
Cheltenham

**TITLE** Proposed Phase 2 Master Plan

**SCALE** @ A3 1:1250      **DATE** 27-05-16

**DRAWING** 178-36      **REV** F

**DRAWN BY** R.D      **CHECKED BY** D.W

**DDP** DESIGN DEVELOPMENT PARTNERSHIP

**ARCHITECTURE + PLANNING + PRINCIPAL DESIGNER**

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**APPENDIX 2 – MEASURED SOUND PRESSURE LEVELS**

Position 1

From	L <sub>Aeq</sub>	L <sub>Amax</sub>	L <sub>A10</sub>	L <sub>A90</sub>
11:00	70.1	86.7	74.1	60.2
12:00	70.2	88.8	74.0	60.9
13:00	70.5	85.0	74.3	61.0
14:00	71.5	83.6	75.3	62.4
15:00	71.7	87.6	75.3	62.9
16:00	71.3	84.3	75.0	61.9
17:00	71.3	85.4	75.1	61.8
18:00	70.8	84.6	74.8	60.5
19:00	69.2	82.9	73.5	57.7
20:00	67.6	83.2	71.9	55.0
21:00	65.4	82.5	69.6	51.7
22:00	64.5	82.8	68.5	50.6
23:00	63.2	84.1	66.2	47.5
00:00	60.1	81.5	59.9	45.0
01:00	57.0	79.3	52.5	42.4
02:00	54.5	78.3	50.1	40.6
03:00	54.4	80.4	49.9	40.0
04:00	56.2	83.7	50.2	40.8
05:00	58.8	81.9	57.4	43.2
06:00	62.2	82.9	62.7	44.5
07:00	66.0	83.5	69.2	48.4
08:00	69.9	83.9	74.7	52.8
09:00	71.8	83.9	76.1	60.5
10:00	72.3	83.4	76.3	62.1
11:00	72.7	84.0	76.4	63.2
12:00	72.6	82.9	76.5	62.2
13:00	72.0	84.0	75.9	61.9
14:00	72.0	84.5	75.9	61.6
15:00	71.6	83.6	75.7	60.2
16:00	71.7	82.5	75.7	61.1
17:00	71.7	87.0	75.8	61.2
18:00	70.7	83.1	75.0	58.9
19:00	68.8	84.1	73.3	54.8
20:00	66.4	83.8	70.7	51.0
21:00	65.2	86.0	69.3	49.8
22:00	66.1	96.2	69.3	50.2
23:00	63.0	82.7	65.9	46.8
00:00	62.4	83.5	64.3	44.8
01:00	58.6	81.1	57.9	42.3

**CORINTHIAN PARK, CHELTENHAM**  
**PROPOSED PHASE 2 DEVELOPMENT**  
**NOISE IMPACT ASSESSMENT**

02:00	58.7	83.8	56.2	41.4
03:00	58.8	81.9	56.9	42.0
04:00	55.4	81.3	53.1	41.3
05:00	59.2	80.8	56.9	41.9
06:00	60.1	80.9	59.1	44.2
07:00	64.4	83.7	67.1	48.3
08:00	65.4	84.2	69.0	49.8
09:00	68.6	83.5	73.2	51.7
10:00	70.4	82.5	74.8	58.0
11:00	70.7	84.3	74.8	59.1
12:00	70.2	83.9	74.3	58.5
13:00	70.4	85.6	74.7	57.9
14:00	70.1	92.0	74.2	57.9
15:00	70.1	82.6	74.0	59.3
16:00	69.1	84.6	73.5	55.1
17:00	68.4	83.7	73.1	53.7
18:00	67.8	90.5	72.4	52.7
19:00	66.6	81.5	71.2	51.2
20:00	64.7	81.1	68.9	46.8
21:00	63.7	83.3	67.1	48.1
22:00	62.0	82.0	64.4	48.5
23:00	60.0	83.8	59.9	44.7
00:00	56.8	80.4	54.5	42.4
01:00	55.0	81.1	50.5	42.2
02:00	53.4	78.7	49.6	42.2
03:00	56.2	80.5	51.4	43.5
04:00	57.3	82.2	53.6	44.6
05:00	62.5	82.1	62.8	48.3
06:00	67.0	83.7	70.1	54.4
07:00	71.4	84.1	75.8	60.2
08:00	71.8	82.3	75.9	61.3
09:00	70.0	82.1	74.3	58.0
10:00	68.8	82.3	73.1	57.3
11:00	68.8	84.3	73.1	57.1
12:00	69.3	82.5	73.4	56.9
13:00	68.5	92.6	72.4	57.4
14:00	68.9	88.6	73.0	57.0
15:00	69.4	82.5	73.3	58.8
16:00	70.1	80.6	74.0	59.1
17:00	70.8	88.5	74.4	61.1
18:00	69.9	81.0	74.0	59.1
19:00	68.8	81.2	73.1	56.3
20:00	66.6	82.6	71.4	48.0
21:00	66.0	83.4	70.7	45.7

**CORINTHIAN PARK, CHELTENHAM**  
**PROPOSED PHASE 2 DEVELOPMENT**  
**NOISE IMPACT ASSESSMENT**

22:00	62.4	83.1	64.6	41.3
23:00	57.8	81.2	54.7	37.9
00:00	54.0	80.1	44.8	34.2
01:00	51.5	79.1	43.5	35.1
02:00	51.6	80.0	41.7	32.5
03:00	54.2	79.1	47.3	35.7
04:00	55.4	81.2	47.6	36.5
05:00	60.7	81.3	57.9	40.4
06:00	66.7	81.8	69.9	48.8
07:00	70.5	90.4	74.6	58.6
08:00	71.3	90.5	75.4	60.3
09:00	69.7	88.4	73.9	57.7
10:00	68.6	81.1	73.0	55.4
11:00	68.7	83.3	73.0	56.3
12:00	70.0	83.6	74.2	58.0
13:00	72.7	87.7	76.1	62.0
14:00	69.0	80.8	73.1	59.1
15:00	69.5	87.7	73.5	60.2
16:00	70.2	84.9	74.0	61.3
17:00	71.0	82.7	74.7	61.3
18:00	70.2	81.9	74.3	59.6
19:00	68.6	81.8	73.1	54.2
20:00	66.9	81.4	71.7	48.8
21:00	66.9	89.5	71.0	45.4
22:00	63.6	81.3	67.5	43.7
23:00	59.9	82.0	59.2	38.4
00:00	58.4	81.5	56.4	34.5
01:00	54.4	80.3	45.3	33.0
02:00	55.7	82.3	44.5	31.6
03:00	53.4	80.9	43.2	31.7
04:00	55.7	81.6	47.4	33.8
05:00	60.9	81.0	60.3	39.1
06:00	66.2	88.8	68.9	47.6
07:00	70.9	86.5	75.2	58.8
08:00	71.3	85.4	75.3	62.3
09:00	69.6	80.7	73.6	60.0
10:00	69.3	81.1	73.5	57.8

Position 2

From	L <sub>Aeq</sub>	L <sub>Amax</sub>	L <sub>A10</sub>	L <sub>A90</sub>
11:00	58.0	84.9	58.0	52.4
12:00	54.6	66.6	56.7	51.8

**CORINTHIAN PARK, CHELTENHAM**  
**PROPOSED PHASE 2 DEVELOPMENT**  
**NOISE IMPACT ASSESSMENT**

13:00	56.8	70.4	59.1	53.0
14:00	57.7	75.2	59.6	54.7
15:00	57.8	71.2	60.0	54.6
16:00	57.2	64.5	59.1	55.0
17:00	56.8	67.7	58.5	54.5
18:00	56.4	65.2	58.0	54.3
19:00	54.1	71.5	55.0	51.3
20:00	52.9	63.6	54.3	50.5
21:00	50.7	66.9	52.4	47.9
22:00	50.1	65.4	51.8	47.5
23:00	48.2	64.0	50.1	45.0
00:00	46.0	56.4	48.2	42.0
01:00	43.5	56.7	45.8	39.5
02:00	43.1	59.9	46.2	37.2
03:00	43.6	61.6	46.6	35.9
04:00	43.4	57.1	46.4	36.7
05:00	43.5	60.0	45.5	39.0
06:00	45.1	62.8	46.8	40.5
07:00	48.6	69.0	50.2	44.6
08:00	50.4	66.1	52.5	46.5
09:00	51.7	70.2	54.2	48.2
10:00	54.5	82.0	54.5	48.5
11:00	53.0	70.8	56.0	48.6
12:00	52.0	66.7	54.7	47.9
13:00	51.5	74.5	53.1	47.0
14:00	56.1	79.5	57.9	52.2
15:00	52.6	63.5	54.5	49.6
16:00	54.2	81.5	54.2	46.5
17:00	54.3	72.3	56.1	51.3
18:00	56.4	70.7	58.2	53.4
19:00	53.5	67.6	55.4	50.4
20:00	53.1	66.2	55.7	49.3
21:00	52.9	63.6	55.4	48.7
22:00	53.1	72.3	55.6	48.6
23:00	49.8	59.1	52.3	45.6
00:00	48.9	60.9	51.5	43.8
01:00	48.5	60.4	51.8	41.6
02:00	46.4	58.6	49.6	40.4
03:00	48.8	62.3	52.3	41.1
04:00	46.9	60.3	50.0	40.6
05:00	47.3	61.0	50.4	41.7
06:00	48.0	70.6	49.9	44.0
07:00	51.8	68.7	54.1	47.3
08:00	51.3	70.5	52.9	48.0



**CORINTHIAN PARK, CHELTENHAM**  
**PROPOSED PHASE 2 DEVELOPMENT**  
**NOISE IMPACT ASSESSMENT**

09:00	50.0	64.2	51.9	46.5
10:00	52.7	67.1	54.7	49.5
11:00	53.1	67.6	55.4	49.4
12:00	52.5	66.5	54.9	48.7
13:00	52.7	69.0	54.9	48.5
14:00	51.7	66.5	53.9	47.8
15:00	51.6	67.2	54.1	47.1
16:00	52.2	73.5	53.3	47.3
17:00	52.7	71.2	54.1	48.7
18:00	53.5	70.2	55.1	49.1
19:00	52.5	65.7	54.9	48.8
20:00	50.7	61.5	52.9	47.1
21:00	50.5	66.6	52.7	46.9
22:00	51.7	68.4	54.5	45.9
23:00	49.4	63.2	53.0	42.0
00:00	47.6	62.0	50.8	41.0
01:00	46.2	58.5	49.3	40.7
02:00	45.7	58.9	48.9	40.5
03:00	46.0	62.8	49.0	41.5
04:00	48.2	59.5	51.0	43.1
05:00	52.6	64.3	55.3	44.9
06:00	55.7	69.2	57.0	52.9
07:00	58.3	70.0	59.8	56.4
08:00	58.3	74.0	60.1	55.2
09:00	52.7	76.9	54.9	47.4
10:00	52.9	69.3	56.0	45.6
11:00	53.7	76.4	55.6	45.8
12:00	53.9	75.4	56.2	46.6
13:00	53.4	74.2	55.8	45.9
14:00	54.6	81.9	54.9	45.2
15:00	54.0	74.7	55.8	47.2
16:00	51.3	68.1	53.8	47.6
17:00	54.0	73.6	56.6	48.1
18:00	52.9	74.7	55.1	48.1
19:00	51.4	67.2	53.2	47.3
20:00	48.8	61.2	51.1	44.8
21:00	48.7	61.8	51.4	44.1
22:00	46.0	59.8	48.9	40.4
23:00	42.8	56.9	46.2	36.3
00:00	41.8	60.0	45.2	32.0
01:00	41.2	69.7	43.6	32.1
02:00	40.4	58.2	43.4	31.6
03:00	43.8	59.0	47.9	33.6
04:00	42.5	61.0	45.7	34.8

**CORINTHIAN PARK, CHELTENHAM**  
**PROPOSED PHASE 2 DEVELOPMENT**  
**NOISE IMPACT ASSESSMENT**

05:00	45.1	61.3	47.8	39.0
06:00	50.9	69.0	53.0	46.1
07:00	54.8	77.6	56.8	51.2
08:00	55.3	72.7	57.9	51.9
09:00	54.1	73.1	56.3	49.3
10:00	51.6	66.6	54.4	47.3
11:00	52.6	73.6	54.8	47.5
12:00	53.9	74.1	55.8	48.5
13:00	55.1	68.5	57.3	49.8
14:00	53.6	73.7	56.2	48.6
15:00	55.7	75.6	58.2	50.6
16:00	55.0	73.8	57.5	51.0
17:00	54.2	73.8	56.5	50.3
18:00	53.0	71.9	55.0	49.8
19:00	51.2	66.7	53.3	48.0
20:00	49.5	61.9	51.6	46.0
21:00	48.1	63.2	50.4	44.2
22:00	46.9	60.4	49.5	42.2
23:00	43.7	62.8	46.7	37.4
00:00	40.4	59.7	43.2	33.0
01:00	40.7	64.0	43.0	31.8
02:00	40.8	68.5	42.4	30.6
03:00	38.6	58.3	41.5	30.4
04:00	41.1	61.1	44.4	33.5
05:00	45.4	60.2	48.2	38.8
06:00	50.5	63.7	52.6	45.9
07:00	54.5	69.6	56.5	51.5
08:00	56.0	72.8	58.1	52.8
09:00	54.6	69.4	56.9	51.4
10:00	55.8	75.8	57.9	51.1

## GLOSSARY OF TERMS

### Decibel (dB)

The decibel is the unit used to quantify sound pressure levels. The human ear has an approximately logarithmic response to acoustic pressure over a very large dynamic range (typically 20 micro-Pascals to 100 Pascals). Therefore, a logarithmic scale is used to describe sound pressure levels and also sound intensity and power levels. The logarithm is taken to base 10, hence, an increase of 10 dB in sound pressure level is equivalent to an increase by a factor of 10 in the sound pressure level (measured in Pascals). Subjectively, this increase would correspond to a doubling of the perceived loudness of sound.

### A-Weighting

The 'A' weighting is a correction term applied to the frequency range in order to approximate to the sensitivity of the human ear to noise. It is generally used to obtain an overall noise level from octave or third octave band frequencies. An 'A' weighted sound level is written as dB(A).

### $L_{Aeq,T}$

The A-weighted equivalent continuous sound level – the level of a notionally steady sound having the same energy as the true fluctuating sound over a specified measurement period (T).  $L_{Aeq,T}$  is used to describe many types of noise and can be measured directly with an integrating sound level meter. It is the preferred descriptor for environmental noise in accordance with BS 7445:1993.

### $L_{A90,T}$

The A-weighted noise level exceeded for 90% of the specified measurement period (T). This is generally taken to indicate the prevailing background noise level.

### $L_{Amax}$

The highest short duration A-weighted sound level recorded during a noise event.