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ENVIRONMENT

HB (South Caldecotte) Ltd
South Caldecotte,
Milton Keynes

Noise Impact Assessment

NTS2682

ENVIRONMENT

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South Caldecotte,
Milton Keynes

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Notice

EXECUTIVE SUMMARY

BWB Consulting Ltd is appointed by HB (South Caldecotte) Ltd to undertake an environmental noise assessment for a proposed commercial/industrial development at South Caldecotte in Milton Keynes

A baseline noise survey was undertaken at the Site in September 2018. The survey, and subsequent assessment work, have been undertaken in accordance with current standards and guidance.

Noise limits for fixed plant and equipment to meet have been set based on the results of the baseline noise survey.

Noise level predictions have been undertaken to establish noise levels at the nearest noise sensitive receptors. Assessing these predictions in accordance with BS4142:2014, it has been identified that noise generated by HGV movements and delivery activity is below the level at which it would have a low impact at all existing sensitive receptors.

Development generated road traffic noise on the local road network has also been assessed using available traffic data and has identified impacts of no greater than minor/low.

It is therefore considered that, at this stage, no noise mitigation is warranted.

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1. INTRODUCTION

Appointment & Background

1.1 BWB Consulting Ltd is appointed by HB (South Caldecotte) Ltd to undertake an environmental noise assessment for a proposed commercial/industrial development at South Caldecotte, Milton Keynes.

1.2 This assessment has been undertaken based on the results of a baseline noise survey on the Site. The results of the survey have been assessed in accordance with current standards and guidance.

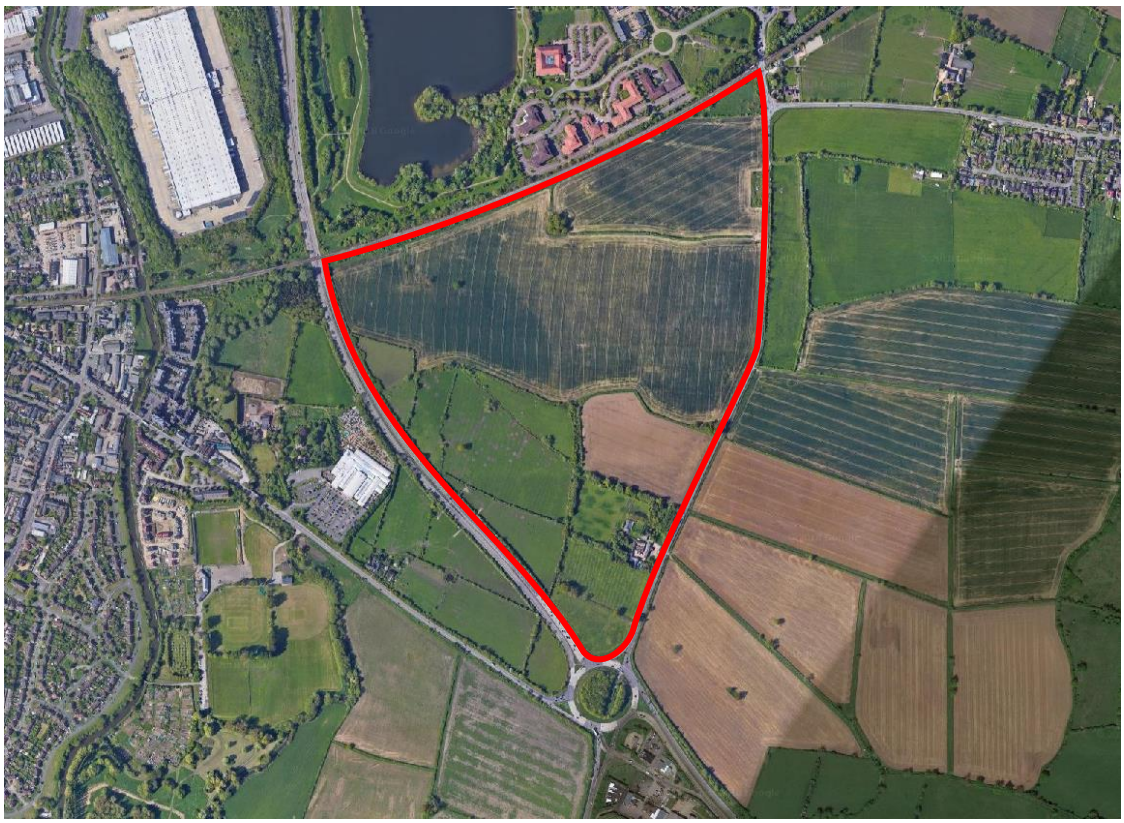
1.3 This report is necessarily technical in nature, so to assist the reader, a glossary of acoustic terminology can be found in **Appendix A**.

Site Setting

1.4 The site currently comprises arable land. To the north the site is bounded by the Marston Vale railway line with Caldecotte Lake and commercial buildings off Caldecotte Lake Drive beyond. To the east the site is bounded by V10 Brickhill Street, with arable land and residential dwellings off Station Road and Greenways beyond. To the south the site is bounded by Kelly's Kitchen Roundabout, with arable land and commercial units beyond. To the west the site is bounded by the A5, with arable land and commercial units beyond.

1.5 **Figure 1.1** below shows the Site location.

Figure 1.1: Site Location

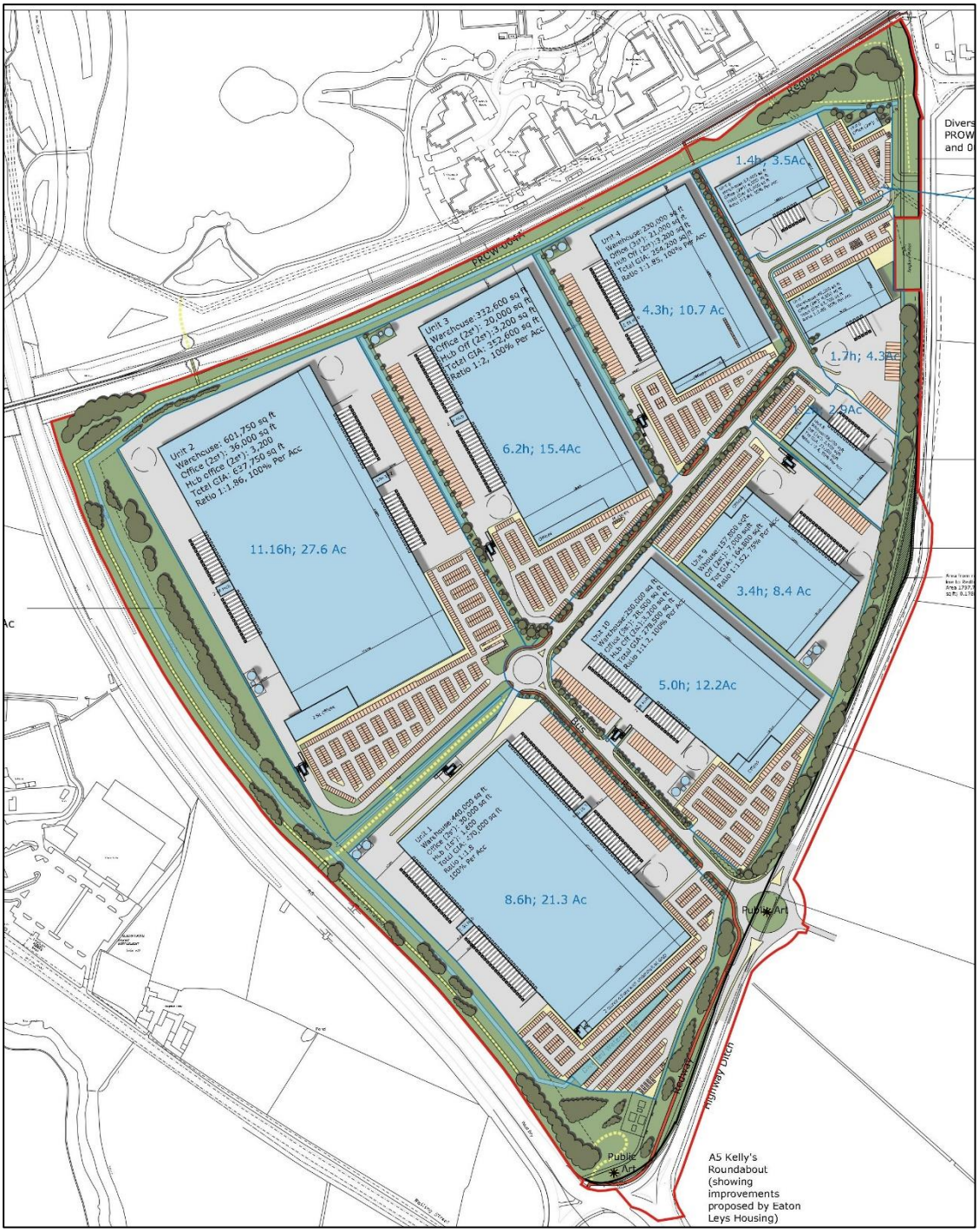


Proposed Development

1.6 The proposed development comprises the creation of a commercial/industrial warehousing development comprising 9No. units.

1.7 An indicative site plan is provided below in **Figure 1.2**.

Figure 1.2: Indicative Site Plan



Existing Sensitive Receptors

1.8 Details of the existing receptors to be considered within the assessment are detailed below in **Table 1.1** and shown in **Appendix C**.

Table 1.1: Existing Sensitive Receptors

ESR	Receptor Type	Address	Grid Coordinates		Bearing from site	Distance from site boundary
			Easting	Northing		
ESR1	Residential	Millward Drive, MK2 2BW	488477	234234	West	300m
ESR2	Residential	Belvedere Lane, MK17 9JH	488705	233981	West	200m
ESR3	Public Open Space	Caldecotte Lake, MK7 8HP	488963	234500	North	50m
ESR4	Employment	Caldecotte Lake Drive, MK7 8LG	489233	234630	North	50m
ESR5	Residential	Station Rd, MK17 9JN	489654	234740	North East	25m
ESR6	Residential	Greenways, MK17 9JP	490033	234572	East	400m

1.9 An impact may be experienced at other receptors, but this is likely to be equal to or less than those stated above.

2. STANDARDS AND GUIDANCE

National Planning Policy Framework (NPPF)

2.1 Published in July 2018, this document sets out the Government's planning policies for England and supersedes the previous NPPF published in 2012. It makes the following reference to noise in the section entitled *Conserving and enhancing the natural environment*:

"170. Planning policies and decisions should contribute to and enhance the natural and local environment by:

[…]

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans."

2.2 It also makes the following references to noise in the Section entitled *Ground conditions and pollution*:

"180. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life[60];

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

[60] See Explanatory Note to the Noise Policy Statement for England (Department for Environment, Food & Rural Affairs, 2010)."

And

"182. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent

of change') should be required to provide suitable mitigation before the development has been completed."

BS 8233:2014: Guidance On Sound Insulation And Noise Reduction For Buildings

2.3 This standard provides guidance for the control of noise in and around buildings. The guidance provided within the document is applicable to the design of new buildings, or refurbished buildings undergoing a change of use, but does not provide guidance on assessing the effects of changes in the external noise levels to occupants of an existing building.

2.4 The guidance provided includes appropriate internal and external noise level criteria which are applicable to dwellings for steady external noise sources. It is stated that it is desirable that the internal ambient noise level does not exceed the following criteria set out in **Table 2.1** below:

Table 2.1: Summary of internal ambient noise levels to be achieved in habitable rooms

Activity	Location	Internal noise level criteria ($L_{Aeq,T}$, dB)	
		Daytime (07:00 - 23:00hrs)	Night-time (23:00 - 07:00hrs)
Resting	Living room	35	-
Dining	Dining room/area	40	-
Sleeping (daytime resting)	Bedroom	35	30

2.5 Whilst BS 8233:2014 recognises that a guideline value may be set in terms of SEL or L_{AFmax} for the assessment of regular individual noise events that can cause sleep disturbance during the night-time, a specific criterion is not stipulated. Accordingly, reference has been made in this assessment to the World Health Organisation (WHO) 1999: *Guidelines for Community Noise*.

2.6 With respect to external amenity space such as gardens and patios it is stated that it is desirable that the noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. It is then confirmed that higher external noise criteria may be appropriate under certain circumstances such as within city centres urban areas, and locations adjoining the strategic transportation network, where it may be necessary to compromise between elevated noise levels and other factors such as convenience of living, and efficient use of land resource.

World Health Organisation (WHO) 1999: Guidelines for Community Noise

2.7 As with the 'good' and 'reasonable' criteria in BS 8233, the L_{AFmax} criterion in BS 8233 is largely concordant with the World Health Organisation (WHO) guidance: 1999: *Guidelines for community noise*. This document draws upon guidance from Vallet and Vernay, which states:

"For good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{AFmax} more than 10-15 times per night."

BS 4142: 2014 Methods for Rating and Assessing Industrial and Commercial Sound

2.8 This standard describes methods for rating and assessing the following:

- Sound from industrial and manufacturing processes;
- Sound from fixed installations which comprise mechanical and electrical plant and equipment;
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train movements on or around an industrial and/or commercial site.

2.9 The methods use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident. The Standard advises the purpose of the methodology includes the assessment of sound from any plant and activities associated with existing industrial and/or commercial uses at proposed residential dwellings.

2.10 If appropriate, the specific sound level of the source ($L_{Aeq,T}$) is corrected, by the application of one or more corrections for acoustic features such as tonal qualities and/or distinct impulses, to give a 'rating' level ($L_{Ar,T}$). The Standard effectively compares and rates the difference between the rating level of the specific sound and the typical background sound level ($L_{A90,T}$) in the absence of the specific sound.

2.11 The Standard advises that the time interval ('T') of the background sound measurement should be sufficient to obtain a representative or typical value of the background sound level at the time(s) the source in question operates or is proposed to operate in the future.

2.12 Comparing the rating level with the background sound level, BS 4142 states:

> *"Typically, the greater this difference, the greater the magnitude of impact.*
>
> *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
>
> *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
>
> *The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."*

The Design Manual for Roads and Bridges (DMRB): Volume 11: Environmental Assessment

2.13 Section 3 Part 7 of this document is pertinent to noise and vibration and was first published by the Department of Transport in 1993 with subsequent amendments, the latest of which is November 2011 (reference HD213/11 Revision 1). This document sets out procedures for undertaking the environmental assessment of new road schemes, including the assessment of noise impacts from road traffic. In particular, Section 3 Part 7 describes a method for assessing the severity of a noise impact, in terms of the number of people who will be bothered by any noise increases/decreases due to a new road scheme. When undertaking a DMRB assessment, the methodology contained within the Department for Transport 1988 document *Calculation of Road Traffic Noise* (CRTN) should be used to calculate levels of road traffic noise.

2.14 Although the DMRB strictly applies to new road schemes, the principles of the approach contained within the document can also be applied to the assessment of noise from road traffic in general. The Proposed Development has the potential to affect road traffic noise levels along existing roads, hence there is a need for such an assessment.

2.15 The DMRB assessment methodology suggests that the magnitude of noise changes from a project should be classified into levels of impact. Section 3 Part 7 considers how the magnitude of change can be affected by whether a noise level change occurs in the short term (e.g. as a result of a sudden opening of a scheme), or in the long term (e.g. gradually over time, such as that associated with natural traffic growth).

2.16 The example classification scale for short term changes is the most stringent and is presented in **Table 2.2** below:

Table 2.2: Classification of magnitude of noise changes in the short term

Noise change ($L_{A10,18hour}$, dB)	Magnitude of change
0	No change
0.1 to 0.9	Negligible
1.0 to 2.9	Minor / low
3.0 to 4.9	Moderate / medium
≥ 5.0	Major / high

Consultation with Milton Keynes Council

2.17 At the outset of the project consultation was undertaken with Gillian Clarke by email dated 20 September 2018 outlining the proposed survey and assessment methodologies as follows.

- We will undertake a noise survey to determine the existing noise environment at the nearest noise sensitive receptors. Measurements will be taken either over an unattended midweek 24-hour period, or over shorter-term, attended periods representative of daytime and night-time periods, depending on site security.

- We will use traffic data provided by the project transport consultant and information on building uses to assess the operational phase noise levels from changes in road traffic, proposed HGV haulage routes and operational noise (or the setting of plant noise limits), where appropriate.
- The assessment will consider the noise targets provided in BS8233: 2014: *Guidance on sound insulation and noise reduction for buildings*, World Health Organisation (WHO):1999: *Guidelines of Community Noise*, the Design Manual for Roads and Bridges (DMRB), BS4142: 2014: *Methods for rating and assessing industrial and commercial sound* and any local criteria that will be agreed with MKC.
- Where appropriate, outline noise mitigation measures will be considered to reduce the noise to within acceptable levels at the nearest existing dwellings.
- The findings of the assessment will be presented in a standalone noise assessment report.

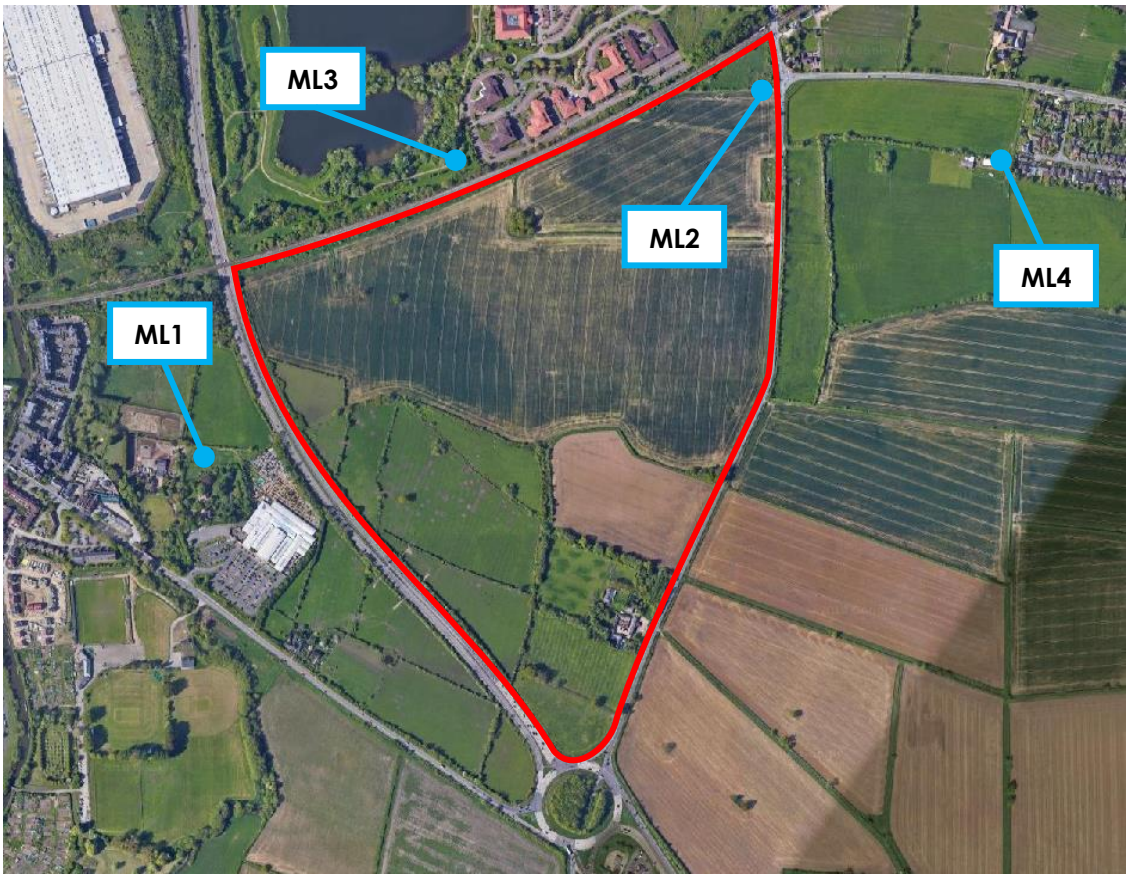
2.18 A response was received on 25 September 2018 confirming that Milton Keynes Council are in agreement with our proposed methodology.

3. BASELINE NOISE SURVEY

Survey Methodology

3.1 A baseline noise survey has been undertaken to determine the prevailing noise climate at the nearest noise sensitive receptors relative to the Site. During the survey, monitoring was undertaken at the measurement locations (MLs) as identified in **Figure 3.1** below.

Figure 3.1: Noise Monitoring Locations



3.2 ML1 was chosen to be representative of existing baseline noise levels at the nearest dwellings to the western site boundary. Noise monitoring at this position was carried out over a 24hr period. Road traffic on the A5 was the main source of noise at ML1 throughout the day and night. Any noise from the nearby Dobbies Garden Centre was not audible above the level of road traffic noise at any time, and noise from passing trains was audible at a low level in the evening and night.

3.3 ML2 was chosen to be representative of existing baseline noise levels at the nearest dwellings to the north eastern site boundary. Noise monitoring at this position was carried out over a 24hr period. Road traffic on Brickhill Street was the main source of noise at ML2 throughout the day and night. Noise from passing trains was clearly audible at this position, with the majority of trains stopping at Bow Brickhill station.

3.4 ML3 was chosen to be representative of existing baseline noise levels at the office buildings and Caldecotte Lake to the north of the site. Attended noise monitoring was

carried out at this position between 11:00hrs and 14:00hrs. Distant road traffic on the A5 was the main source of noise at ML3 throughout the daytime, with noise from passing trains on the elevated railway being clearly audible. Occasional faint noise from car movements at the Business Park was also noted.

3.5 ML4 was chosen to be representative of existing baseline noise levels at dwellings further to the east of the site, and well away from road traffic noise on Brickhill Street, the A5 and noise from passing trains. Noise monitoring at this position was carried out over a 24hr period. Road traffic on Station Road and Brickhill Street were the main sources of noise at ML4 throughout the day and night. Noise from passing trains was faintly audible.

Measurement Equipment

3.6 Noise measurements were carried out using Class 1, precision integrating sound level meters (including pre-amplifier and microphone, see **Table 3.1**) calibrated within the preceding 12 months. Prior to and following the noise measurements acoustic field calibration of the sound level meters and microphones used for the measurements was carried out using an acoustic calibrator that itself had been calibrated within the preceding 12 months. No significant drift (i.e. >0.1dB) in the field-calibrated noise level was observed. All noise measurements were carried out with a suitable windshield fitted to the measurement microphone at all times.

Table 3.1: Noise monitoring equipment

Position	Equipment	Make & Model	Serial Number	Calibration due Date
1	Sound Level Meter	Rion NL-52	01076305	24/4/2020
	Pre-Amplifier	Rion NH-25	76522	
	Microphone	Rion UC-59	13184	
2	Sound Level Meter	Rion NL-52	01076306	26/6/2020
	Pre-Amplifier	Rion NH-25	76523	
	Microphone	Rion UC-59	12355	
3	Sound Level Meter	NTi XL2-TA	A2A-11111-E0	5/9/2019
	Pre-Amplifier	NTi MA220	6908	
	Microphone	NTi MC230	A14423	
4	Sound Level Meter	Rion NL-52	01076307	29/1/2020
	Pre-Amplifier	Rion NH-25	76524	
	Microphone	Rion UC-59	12357	
All	Calibrator	Larson Davis CAL200	14154	6/9/2019

Meteorological Conditions

3.7 At the start of the survey, the air temperature was 16°C, increasing, with a slight southern breeze (<1m/s), reducing into the night to around 6°C with the slight southern breeze remaining. The temperate increased to around 18°C the following day, with a calm

breeze (<3m/s), from the southeast. There was little or no cloud cover throughout the survey.

3.8 Weather conditions during the survey are therefore considered to be suitable for environmental noise monitoring and subsequent assessment of the measured noise data.

Survey Results

3.9 A summary of daytime and night time noise levels at each position is presented below in **Tables 3.2 – 3.5**. Full results are provided in **Appendix D**.

Table 3.2: Representative daytime and night time noise levels at ML1

Period		Sound Pressure Levels		
		dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}
Daytime Survey 1(11:00hrs - 23:00hrs)[1]	Range	55 - 64	50 - 61	65 - 82
	Mode	-	54[2]	-
Night Time[1] (23:00hrs – 07:00hrs)	Range	47 - 61	38 - 59	57 - 70
	Mode	-	40[3]	-
Daytime Survey[1] (07:00hrs – 11:00hrs)	Range	53 - 63	49 - 60	72 - 81
	Mode	--	54[3]	

[1] Daytime T=1hr, Night-time T=15min
[2] mode of measured 1hr values
[3] mode of measured 15-min values

Table 3.3: Representative daytime and night time noise levels at ML2

Period		Sound Pressure Levels		
		dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}
Daytime Survey [1](11:00hrs - 23:00hrs)[1]	Range	55 - 59	48 - 54	67 - 84
	Mode	-	49[2]	-
Night Time[1] (23:00hrs – 07:00hrs)	Range	46 - 62	38 - 59	60 - 79
	Mode	-	40[3]	-
Daytime Survey[1] (07:00hrs – 11:00hrs)	Range	56 - 63	51 - 61	70 - 80
	Mode	-	50[3]	-

[1] Daytime T=1hr, Night-time T=15min
[2] mode of measured 1hr values
[3] mode of measured 15-min values

Table 3.4: Representative daytime and night time noise levels at ML3

Period		Sound Pressure Levels		
		dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}
Daytime Survey 1(11:00hrs - 23:00hrs)[1]	Range	54 - 55	50 - 51	80
	Mode	-	50[2]	-

[1] T=1hr,
[2] mode of measured 1hr values

Table 3.5: Representative daytime and night time noise levels at ML4

Period		Sound Pressure Levels		
		dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}
Daytime Survey 1(11:00hrs - 23:00hrs)[1]	Range	44 - 51	41 - 49	59 - 75
	Mode	-	42[2]	-
Night Time[1] (23:00hrs – 07:00hrs)	Range	38 - 55	35 - 54	48 - 72
	Mode	-	37[3]	-
Daytime Survey[1] (07:00hrs – 11:00hrs)	Range	48 - 58	44 - 57	63 - 73
	Mode	-	42[3]	

[1] Daytime T=1hr, Night-time T=15min

[2] mode of measured 1hr values

[3] mode of measured 15-min values

4. NOISE ASSESSMENT

Fixed Building Services Plant Noise Assessment

4.1 It is anticipated that there may be fixed plant and equipment associated with the Proposed Development that may have the potential to generate noise. However, at this stage details of the proposed type, number and precise location of any such plant or the nature of its operation are not available. In the absence of detailed information, it is appropriate to specify suitable noise control limits to which any plant should conform. These limits should include any appropriate corrections for acoustic characteristics, in accordance with BS 4142.

4.2 It is considered that the rating level of fixed plant noise sources should not exceed the prevailing background sound level when measured at the nearest ESRs. The cumulative effect of all external plant should be specified so that the rating level is less than or equal to the lowest prevailing background noise level.

4.3 Noise from external plant on the development site should achieve the following noise level limits, shown in **Table 4.1**.

Table 4.1 – Noise limits from fixed plant

Receptor	Rating level limit to be achieved at the receptor (dB L_{Aeq})	
	Daytime	Night-time
ESR1	54	41
ESR2	54	41
ESR3	55	-
ESR4	55	-
ESR5	52	41
ESR6	42	35

4.4 The above rating level limits apply at least 3.5 metres from the façade of the receptor, i.e. in free-field conditions.

4.5 In accordance with BS 4142, the assessment of plant noise emissions should include appropriate rating corrections for tonal, irregular or intermittent plant where applicable, before comparison with the above limits.

4.6 Once the detailed nature of such future uses is confirmed, noise from any fixed plant can be considered to ensure that the above limits can be met.

4.7 It should be noted that the derived rating level limits would be applicable to the total noise from the simultaneous operation of all external plant serving the proposed development. As such, noise emissions from individual items of plant will need to be lower than the given limit, although the exact limit for each individual item of plant will

be dependent upon its type, noise characteristics, location etc. This issue is best addressed during the detailed design stage.

Delivery Noise Assessment

Noise Modelling

4.8 In order to predict the noise levels from the proposed development site at the ESRs, a detailed acoustic model of the site has been generated in order to calculate the noise propagation across the site. This noise model was generated applying the following methodology:

- The model was generated using the PC based CadnaA® noise modelling package;
- For industrial/commercial noise sources, the noise model was set to apply the noise prediction methodology set out in ISO 9613-2: Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation;
- Noise from HGV movements and deliveries were included in the model using noise data from a library of historical measurement data, which has been collected during surveys undertaken at similar developments. The noise levels used within the assessment are presented in **Tables 4.2 and 4.3.**

Table 4.2 – Summary of historic loading and unloading noise data used in assessment

Description	SEL at 10m (dBA)
HGV Arriving/Departing	87
Loaded trolley being wheeled	75
Trolley being unloaded (by hand)	57
Empty trolley being wheeled	73
Cumulative	**87**

Table 4.3 – Summary of historic HGV passby noise data used in assessment

Description	$L_{Aeq, 6secs}$ at 5m
HGV Passby	73

- Noise from loading and unloading activities have been derived from the cumulative SEL level shown in **Table 4.2** and have been included in the model as a point source at a height of 1.5m;
- Noise from HGV passbys have been derived from the noise level shown in **Table 4.3**. The noise levels have been corrected for time based on the assumed

number of HGV passbys associated with each unit. These have been included in the model as a line source at a height of 0.5m;

- Receptors have been modelled in free field conditions, at a height of 1.5m during the daytime, and 4m at night;
- To reflect the local ground cover, ground absorption was set to G = 1 (100% acoustically absorptive ground);
- An indicative development layout was incorporated into the noise model in order to account for screening provided by the development itself; and
- The number of deliveries assumed within the assessment have been calculated using the opening year development generated HGV traffic data at the site access link (V10 Brickhill Street), and the number of proposed delivery bays at each unit. These are shown below in Table **4.4**.

Table 4.4 – Assumed number of deliveries

Unit	Number of daytime deliveries (per hour)	Number of night-time deliveries (per 15 minutes), rounded up
Unit 1	14	4
Unit 2	11	3
Unit 3	6	2
Unit 4	4	1
Unit 5	1	1
Unit 7	1	1
Unit 8	2	1
Unit 9	3	1
Unit 10	4	1

4.9 Activities associated with deliveries to the proposed development have been assessed in accordance with BS 4142.

4.10 The noise level from operations at the proposed development site have been modelled at the ESRs, using the methodology described above. Noise from HGVs arriving and departing and noise associated with unloading operations have been included within the assessment.

4.11 The assessment is based on the following assumptions:

- Deliveries can occur anytime in a 24-hour period.
- Deliveries are evenly distributed over each assessment period.
- Each delivery includes two movements along the internal haulage route, and one loading/unloading event.

Based on the above historic noise data and assumptions outlined above, the specific sound levels have been calculated, taking into account losses associated with screening and distance, at the nearest noise sensitive receptors. The specific sound levels have then been assessed in accordance with BS 4142 as outlined in **Tables 4.5** to **4.8**.

Residential Receptors

Table 4.5 – BS 4142 Assessment of delivery activity - ESR1

Description	Daytime (07:00 – 23:00) Sound Levels (dB)	Night-time (23:00 – 07:00) Sound Levels (dB)	Relevant BS 4142 Clause
Specific sound level (Daytime: $L_{Aeq,1hour}$ Night-time: $L_{Aeq,15mins}$)	32	35	7.3.5
Acoustic feature correction	0[1]	0[1]	9.2
Rating level (Daytime: $L_{Ar,1hour}$ Night-time: $L_{Ar,15mins}$)	32	35	9.2
Background sound level (Daytime: $L_{A90,1hour}$ Night-time: $L_{A90,15mins}$)	54[2]	41[3]	8
Excess over background	-22	-8	-
BS 4142 impact	**Low impact**	**Low Impact**	-
Commentary	[1]The assessment shows that noise from haulage routes to Units 1 & 2 will provide the highest impact at ESR1. As these haulage routes run parallel with existing road traffic on the A5, it is unlikely that residents will be able to discern on-site movements from traffic movements on the A5. Therefore, no acoustic feature correction has been applied. [2]based on mode of $L_{A90,1hr}$ levels between 07:00 – 23:00, ML1 [3]based on mode of $L_{A90,15\text{-}minute}$ levels between 23:00 – 07:00, ML1		

Table 4.6 – BS 4142 Assessment of delivery activity – ESR2

Description	Daytime (07:00 – 23:00) Sound Levels (dB)	Night-time (23:00 – 07:00) Sound Levels (dB)	Relevant BS 4142 Clause
Specific sound level (Daytime: $L_{Aeq,1hour}$ Night-time: $L_{Aeq,15mins}$)	28	32	7.3.5
Acoustic feature correction	0[1]	0[1]	9.2
Rating level (Daytime: $L_{Ar,1hour}$ Night-time: $L_{Ar,15mins}$)	28	32	9.2
Background sound level (Daytime: $L_{A90,1hour}$ Night-time: $L_{A90,15mins}$)	54[2]	41[3]	8
Excess over background	-26	-9	-
BS 4142 impact	**Low impact**	**Low Impact**	-
Commentary	[1]The assessment shows that noise from haulage routes to Units 1 & 2 will provide the highest impact at ESR1. As these haulage routes run parallel with existing road traffic on the A5, it is unlikely that residents will be able to discern on-site movements from traffic movements on the A5. Therefore, no acoustic feature correction has been applied. [2]based on mode of $L_{A90,1hr}$ levels between 07:00 – 23:00, ML1 [3]based on mode of $L_{A90,15\text{-}minute}$ levels between 23:00 – 07:00, ML1		

Table 4.7 – BS 4142 Assessment of delivery activity – ESR5

Description	Daytime (07:00 – 23:00) Sound Levels (dB)	Night-time (23:00 – 07:00) Sound Levels (dB)	Relevant BS 4142 Clause
Specific sound level (Daytime: $L_{Aeq,1hour}$ Night-time: $L_{Aeq,15mins}$)	26	31	7.3.5
Acoustic feature correction	+3[1]	+3[1]	9.2
Rating level (Daytime: $L_{Ar,1hour}$ Night-time: $L_{Ar,15mins}$)	29	34	9.2
Background sound level (Daytime: $L_{A90,1hour}$ Night-time: $L_{A90,15mins}$)	51[2]	41[3]	8
Excess over background	-22	-7	-
BS 4142 impact	**Low impact**	**Low impact**	-
Commentary	[1]+3 dB penalty applied for specific sound feature characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment. [2]based on mode of $L_{A90,1hr}$ levels between 07:00 – 23:00, ML2 [3]based on mode of $L_{A90,15\text{-}minute}$ levels between 23:00 – 07:00, ML2		

Table 4.8 – BS 4142 Assessment of delivery activity – ESR6

Description	Daytime (07:00 – 23:00) Sound Levels (dB)	Night-time (23:00 – 07:00) Sound Levels (dB)	Relevant BS 4142 Clause
Specific sound level (Daytime: $L_{Aeq,1hour}$ Night-time: $L_{Aeq,15mins}$)	25	29	7.3.5
Acoustic feature correction	+3[1]	+3[1]	9.2
Rating level (Daytime: $L_{Ar,1hour}$ Night-time: $L_{Ar,15mins}$)	28	32	9.2
Background sound level (Daytime: $L_{A90,1hour}$ Night-time: $L_{A90,15mins}$)	42[2]	35[3]	8
Excess over background	-14	-3	-
BS 4142 impact	**Low impact**	**Low impact**	-
Commentary	[1]+3 dB penalty applied for specific sound feature characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment. [2]based on mode of $L_{A90,1hr}$ levels between 07:00 – 23:00, ML4 [3]based on mode of $L_{A90,15\text{-}minute}$ levels between 23:00 – 07:00, ML4		

4.12 The assessments show that noise associated with HGV movements and deliveries is below the measured background noise level during the both the daytime and night-time period at all residential ESRs.

Caldecotte Lake

4.13 Although Caldecotte Lake is not a residential receptor, given that there is a footpath around the lake it may be used as public outdoor amenity space and therefore warrants some consideration. To understand the potential noise impact of the scheme on the lake area, the daytime rating level predicted at ML3 has been compared against the daytime background sound level, and external noise guidance from BS8233.

Table 4.9 – Assessment of delivery activity – ESR3

Rating Level (Daytime, $L_{Ar,1hour}$)	Background sound level (Daytime, $L_{A90,1hour}$)	"Desirable" external noise level as stated in BS8233:2014
35[1]	55[2]	50
[1] Specific sound level +3dB correction for characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment. [2] Based on mode of $L_{A90,1hr}$ levels between 11:00 – 14:00, ML3.		

4.14 The assessment has shown that noise associated with HGV movements and deliveries is at a level which is below the measured daytime background noise level at the lake. Furthermore, the rating level at the public open space is well below the guideline daytime "desirable" noise level for external amenity space as stated in BS8233:2014. Therefore, it is considered that there should be no adverse impact on this area from development generated noise.

Employment Receptors to the North

4.15 In order to determine the likely noise impact onto the office buildings to the north of the Site, the predicted daytime rating level at the worst affected location has been compared against the prevailing daytime background noise level at ML3.

Table 4.10 – Assessment of delivery activity – ESR4

Rating Level (Daytime, $L_{Ar,1hour}$)	Background sound level (Daytime, $L_{A90,1hour}$)
37[1]	55[2]
[1] Specific sound level +3dB correction for characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment. [2] Based on mode of $L_{A90,1hr}$ levels between 11:00 – 14:00, ML3.	

4.16 The assessment has shown that noise associated with HGV movements and deliveries is at a level which is below the measured daytime background noise level at the employment receptors on Caldecotte Lake Drive, indicating that users of the offices inside the buildings are unlikely to experience an adverse impact from noise generated by the Site during typical office hours.

Summary

4.17 As noise generated by HGV movements and delivery activity is below the level at which it would have a low impact at all nearest noise sensitive receptors, it is considered that no mitigation is required at this stage.

4.18 It is also important to note that it is unlikely that all units will operate for the whole 24-hour period. Therefore, it is possible that the impact at all ESRs will be less than those stated above.

Development Generated Road Traffic Noise Assessment

4.19 Noise generated by additional road traffic movements on the local road network have been assessed in accordance with CRTN calculation procedures and compared with the classification scale for short term changes outlined in DMRB.

4.20 Calculations have been undertaken for the assessment year 2023 both with and without the proposed development. Road traffic speeds have been applied based on the speed limits applicable to each link. The traffic data supplied has included for other committed developments for the assessment year, and are detailed within the Transport Assessment.

4.21 The predicted changes in road traffic noise levels are shown in **Table 4.11**.

Table 4.11 – Opening year (2023) road traffic BNLs, daytime 18-hour, dB(A)

Road link	2023 no development (BNL)	2023 with development (BNL)	Increase in noise due to the development (dB)
V10 Brickhill Street - Site Access	73.7	75.1	+1.4
A5 South of Kelly's Kitchen Roundabout	77.6	77.7	+0.2
A4146 South of Kelly's Kitchen Roundabout	76.9	77.0	+0.1
Watling Street	47.1	49.9	+2.8
A5 Northwest of Caldecotte Roundabout	79.9	80.0	+0.1
Bletcham Way at Fenny Lock Roundabout	64.3	64.5	+0.2
A5 North of Kelly's Kitchen Roundabout	80.1	80.2	+0.1
A4146 Bletcham Way West of Walton Park Roundabout	55.4	55.7	+0.3
V10 Brickhill Street North of Walton Park Roundabout	65.9	66.0	+0.2
A4146 Bletcham Way East of Walton Park Roundabout	77.5	77.7	+0.1
V10 Brickhill Street North of Tilbrook Roundabout	76.8	76.9	+0.1
Caldecotte Lake Drive	41.5	41.8	+0.3
Station Road	58.9	59.0	+0.2

4.22 The above assessment indicates that during the daytime, the greatest predicted road traffic noise level increase is +2.8 dB on Watling Street.

4.23 Comparing this increase in road traffic noise level with the classification scale for short term changes outlined in the DMRB, the predicted magnitude of change can be classified as minor/low.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 BWB Consulting Ltd is appointed by HB (South Caldecotte) Ltd to undertake an environmental noise assessment for a proposed commercial/industrial development at South Caldecotte in Milton Keynes

5.2 A baseline noise survey was undertaken at the Site in September 2018. The survey, and subsequent assessment work, have been undertaken in accordance with current standards and guidance.

5.3 Noise limits for fixed plant and equipment to meet have been set based on the results of the baseline noise survey.

5.4 Noise level predictions have been undertaken to establish noise levels at the nearest noise sensitive receptors. Assessing these predictions in accordance with BS4142:2014, it has been identified that noise generated by HGV movements and delivery activity is below the level at which it would have a low impact at all existing sensitive receptors.

5.5 Development generated road traffic noise on the local road network has also been assessed using available traffic data and has identified impacts of no greater than minor/low.

5.6 It is therefore considered that, at this stage, no noise mitigation is warranted.

APPENDICES

APPENDIX A: Glossary of Terms

Noise

Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source.

The most widely used weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq}, L_{A90} etc., according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions.

Acoustic Terminology

Term	Description
dB (decibel)	The scale on which sound pressure level is expressed. Sound pressure level is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2x10-5Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' - weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
$L_{Aeq,T}$	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A - weighted fluctuating sound measured over that period.
L_{Amax}	L_{Amax} is the maximum A - weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L_{10} and L_{90}	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{10} is the level exceeded for 10% of the time, and the L_{90} is the level exceeded for 90% of the time.
Free-field Level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally as measured outside and away from buildings.
Façade Level	A sound field determined at a distance of 1m in front of a large sound reflecting object such as a building façade.

APPENDIX B: Indicative Site Plan

Ref:

Site	GIA (ft²)	NDA (ac)	Plot Density (%)
Unit 1	473,200	27.13	51.2
Unit 2	615,400	21.2	52.1
Unit 3	369,708	15.87	53.5
Unit 4	254,200	10.68	54.7
Unit 5	61,400	3.47	40.7
Unit 6 (office)	10,400	1.22	19.7
Unit 7	53,700	4.33	28.5
Unit 8	49,800	2.87	39.9
Unit 9	164,800	8.39	45.2
Unit 10	278,500	12.24	52.3
Total	**2,331,108**	**107.40**	49.9
	Total	**139.9**	

Revisions:

P1: 07/06/19 kbl Masterplan updated, drawing number P005 updated to PAS 1192 standard.
P2: 24/06/19 kbl Client / team comments.
P3: 27/06/19 kbl Client comments.
P4: 02/07/19 kbl Redline updated.
P5: 04/07/19 kbl Redline updated.

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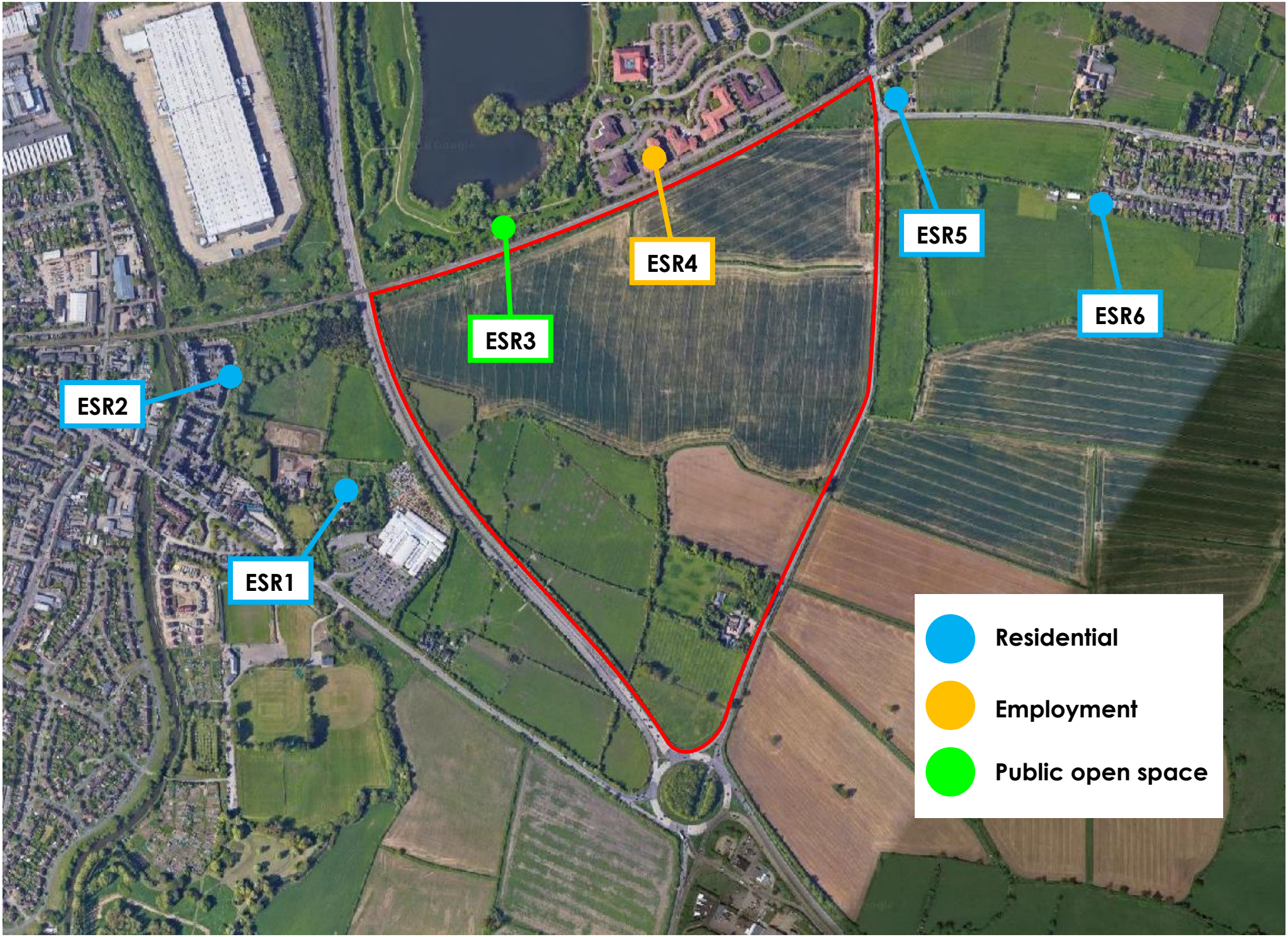
South Caldecotte

Drawing Name:
Indicative Masterplan 23

Drawing Status:	PLANNING
Suitability:	S2
Rev:	P5
SGP Project:	16-048
Drawn:	KBL
Team:	IY
Date:	13/11/2018
Scale:	1:2500@ A1

Drawing Number:
16-048-01-SGP-XX-00-DR-A-1006-P5

APPENDIX C: Existing Sensitive Receptors


ESR1
ESR2
ESR3
ESR4
ESR5
ESR6
Residential
Employment
Public open space

APPENDIX D: Full Survey Results

Octave-band Measurement Data

Start Time	Period (T)	ML 1			ML 2			ML 3			ML 4		
		dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}	dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}	dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}	dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}
11:00	15min	58.6	54.7	66.5	54.8	48.0	68.0	58.1	51.9	79.9	48.6	44.2	66.4
11:15	15min	57.8	53.6	77.7	54.1	48.9	71.0	54.6	52.2	62.5	46.9	44.4	58.1
11:30	15min	58.4	53.4	81.6	55.0	48.8	67.2	55.6	50.5	75.7	46.4	43.7	60.5
11:45	15min	57.8	54.4	65.8	55.2	49.0	69.0	53.4	51.1	62.3	46.0	43.2	59.3
12:00	15min	57.8	53.7	66.2	58.4	50.1	81.4	57.7	50.6	80.1	46.5	43.3	62.6
12:15	15min	57.6	52.8	71.5	55.3	47.8	74.7	52.6	49.5	68.0	44.8	41.9	62.8
12:30	15min	57.0	53.6	66.5	54.6	49.3	67.9	54.1	48.8	75.2	44.0	41.5	60.2
12:45	15min	58.4	54.0	70.4	55.2	49.3	68.4	52.9	49.2	70.6	46.4	41.8	66.0
13:00	15min	58.2	54.0	67.8	55.3	47.2	71.6	56.8	47.7	80.1	43.9	40.9	60.5
13:15	15min	58.6	54.5	71.6	54.6	48.0	67.0	52.4	49.6	62.6	44.4	40.9	65.7
13:30	15min	58.4	54.6	66.9	55.2	49.8	65.9	55.8	51.6	75.7	45.7	42.3	58.4
13:45	15min	58.6	54.6	71.6	55.2	48.9	67.8	53.2	50.5	68.5	43.7	41.2	57.6

Start Time	Period (T)	ML 1			ML 2			ML 3			ML 4		
		dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}	dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}	dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}	dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}
14:00	15min	59.5	55.8	70.2	54.4	47.0	69.4	-	-	-	44.6	40.8	62.4
14:15	15min	59.8	55.9	66.8	54.3	47.6	66.7	-	-	-	45.3	42.6	57.9
14:30	15min	58.5	54.1	66.7	55.8	50.8	72.4	-	-	-	45.7	42.9	55.4
14:45	15min	59.1	55.4	66.6	55.3	49.7	72.6	-	-	-	44.7	41.6	57.1
15:00	15min	59.5	55.9	69.6	54.8	49.6	66.1	-	-	-	46.2	41.9	69.0
15:15	15min	57.0	52.9	67.7	55.4	49.9	66.0	-	-	-	54.2	44.0	75.0
15:30	15min	58.9	54.3	74.6	56.3	49.2	74.6	-	-	-	47.1	44.4	60.4
15:45	15min	60.8	56.3	75.5	55.5	49.5	77.7	-	-	-	45.6	42.8	60.1
16:00	15min	59.3	56.4	65.7	55.8	50.9	70.2	-	-	-	46.5	40.3	67.1
16:15	15min	61.7	58.0	68.3	55.6	50.6	66.2	-	-	-	46.2	42.5	60.0
16:30	15min	62.0	58.1	69.6	57.0	53.4	72.3	-	-	-	46.6	44.0	59.0
16:45	15min	63.5	60.5	70.7	56.2	49.8	73.3	-	-	-	44.9	41.9	59.9
17:00	15min	64.2	61.6	69.6	56.8	52.7	64.5	-	-	-	45.6	42.6	59.4

Start Time	Period (T)	ML 1			ML 2			ML 3			ML 4		
		dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}	dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}	dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}	dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}
17:15	15min	64.1	61.4	69.8	57.3	53.5	69.9	-	-	-	45.5	41.9	70.1
17:30	15min	64.0	61.1	69.1	56.2	49.5	71.8	-	-	-	43.4	40.9	66.4
17:45	15min	63.4	60.7	68.0	57.3	53.4	70.0	-	-	-	45.6	42.9	56.5
18:00	15min	62.8	60.2	68.4	57.8	51.4	74.2	-	-	-	48.6	46.5	65.1
18:15	15min	62.6	59.8	67.8	57.4	54.0	64.9	-	-	-	50.7	49.0	58.7
18:30	15min	62.4	59.9	73.4	57.1	52.9	68.5	-	-	-	51.1	49.7	56.3
18:45	15min	62.1	59.5	67.1	58.0	54.5	72.3	-	-	-	51.8	50.5	58.1
19:00	15min	62.7	59.0	81.9	58.5	53.9	74.3	-	-	-	50.5	49.2	59.2
19:15	15min	61.9	58.9	68.4	58.6	54.0	65.7	-	-	-	49.2	47.8	54.7
19:30	15min	59.8	55.7	68.9	58.9	54.9	66.7	-	-	-	48.6	47.0	52.6
19:45	15min	58.4	54.6	66.1	58.4	54.0	70.1	-	-	-	48.1	46.3	53.2
20:00	15min	57.6	53.9	64.1	58.1	53.7	67.3	-	-	-	48.6	46.5	53.9
20:15	15min	57.8	53.9	67.0	57.8	53.1	67.1	-	-	-	48.2	46.3	53.2

Start Time	Period (T)	ML 1			ML 2			ML 3			ML 4		
		dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}	dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}	dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}	dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}
20:30	15min	57.6	53.5	66.3	57.2	52.5	65.1	-	-	-	50.5	47.5	61.7
20:45	15min	57.9	53.9	65.1	56.9	52.9	65.1	-	-	-	49.3	47.3	54.8
21:00	15min	56.5	52.9	65.4	58.9	52.8	77.5	-	-	-	50.8	47.8	67.8
21:15	15min	56.3	52.1	63.9	56.7	50.6	65.3	-	-	-	47.5	44.5	54.0
21:30	15min	57.2	52.1	66.0	55.4	50.0	66.0	-	-	-	47.1	45.2	53.1
21:45	15min	56.8	52.1	65.9	58.3	50.4	83.5	-	-	-	49.4	45.1	64.7
22:00	15min	55.7	51.6	62.5	57.5	50.5	77.5	-	-	-	48.1	45.1	61.7
22:15	15min	56.0	52.4	62.8	55.4	49.3	64.7	-	-	-	47.6	45.3	54.9
22:30	15min	54.2	48.3	64.7	55.1	46.3	68.1	-	-	-	46.4	43.3	55.5
22:45	15min	54.0	48.6	64.1	52.8	46.0	62.5	-	-	-	43.9	39.7	51.8
23:00	15min	52.6	47.3	63.4	53.9	47.8	67.2	-	-	-	44.9	42.2	52.7
23:15	15min	52.4	46.9	60.4	52.8	44.9	71.3	-	-	-	44.6	42.0	50.9
23:30	15min	52.9	47.8	61.9	53.0	45.5	65.4	-	-	-	45.1	41.3	53.9

Start Time	Period (T)	ML 1			ML 2			ML 3			ML 4		
		dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}	dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}	dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}	dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}
23:45	15min	50.5	44.4	61.9	50.4	41.7	66.1	-	-	-	42.2	38.2	54.4
00:00	15min	50.9	45.2	62.1	50.6	41.3	64.9	-	-	-	42.4	37.4	54.3
00:15	15min	50.0	44.1	60.0	50.2	40.5	64.2	-	-	-	40.9	35.7	49.9
00:30	15min	47.3	40.5	57.2	47.8	37.8	64.5	-	-	-	40.7	35.3	66.0
00:45	15min	48.2	41.7	59.7	47.9	38.1	78.3	-	-	-	38.3	34.9	51.5
01:00	15min	48.6	40.9	59.3	46.1	39.0	59.5	-	-	-	40.0	35.2	50.7
01:15	15min	50.5	43.1	60.6	49.1	41.1	63.2	-	-	-	42.9	37.1	59.0
01:30	15min	47.6	41.4	59.2	49.9	39.0	62.7	-	-	-	40.5	35.3	53.9
01:45	15min	47.9	39.5	59.6	47.9	39.3	64.9	-	-	-	39.5	35.7	48.3
02:00	15min	46.5	40.2	58.3	46.0	38.6	61.2	-	-	-	38.8	35.1	52.8
02:15	15min	48.0	40.8	59.6	48.3	39.3	63.1	-	-	-	41.0	36.6	52.4
02:30	15min	47.3	38.4	59.6	47.3	37.7	64.1	-	-	-	41.3	35.6	50.4
02:45	15min	47.6	40.8	57.8	48.0	39.7	63.8	-	-	-	41.8	37.4	49.4

Start Time	Period (T)	ML 1			ML 2			ML 3			ML 4		
		dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}	dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}	dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}	dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}
03:00	15min	47.7	38.5	59.0	48.2	39.7	63.1	-	-	-	40.4	36.4	49.5
03:15	15min	48.2	39.7	60.3	50.8	39.6	67.8	-	-	-	42.3	36.8	50.3
03:30	15min	47.4	39.9	58.3	46.5	38.4	62.4	-	-	-	39.1	35.3	51.4
03:45	15min	48.7	42.6	58.9	50.3	41.3	65.1	-	-	-	42.4	37.2	71.6
04:00	15min	48.2	42.9	57.4	47.5	40.0	62.5	-	-	-	41.8	38.2	49.9
04:15	15min	50.4	45.7	63.2	50.5	43.2	63.8	-	-	-	44.3	40.5	54.4
04:30	15min	51.0	45.4	59.3	50.7	42.4	63.2	-	-	-	45.0	40.3	53.3
04:45	15min	51.0	45.5	59.9	50.4	42.8	62.5	-	-	-	45.0	41.5	55.0
05:00	15min	53.2	49.1	61.5	54.4	48.8	64.5	-	-	-	47.5	44.9	56.2
05:15	15min	54.2	50.1	61.5	54.9	49.6	66.2	-	-	-	49.1	45.2	55.0
05:30	15min	55.7	51.8	61.8	56.9	51.5	65.9	-	-	-	50.9	48.4	55.8
05:45	15min	56.0	52.9	62.8	57.9	54.1	66.7	-	-	-	50.7	48.6	55.4
06:00	15min	55.5	53.1	61.9	57.6	54.4	69.3	-	-	-	52.1	49.9	58.3

Start Time	Period (T)	ML 1			ML 2			ML 3			ML 4		
		dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}	dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}	dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}	dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}
06:15	15min	58.0	54.1	70.1	58.0	54.4	70.1	-	-	-	52.5	50.6	57.3
06:30	15min	59.5	56.2	70.2	59.7	56.3	67.4	-	-	-	55.3	53.7	64.0
06:45	15min	61.1	58.5	67.8	61.8	58.6	79.3	-	-	-	54.4	52.9	61.6
07:00	15min	62.1	58.9	76.4	62.9	60.5	80.0	-	-	-	55.3	54.0	60.9
07:15	15min	63.7	60.5	77.0	63.0	61.6	66.9	-	-	-	57.5	55.8	64.6
07:30	15min	63.9	61.2	69.7	62.3	60.7	69.3	-	-	-	58.4	57.7	60.4
07:45	15min	62.6	59.8	66.8	62.2	60.4	78.6	-	-	-	58.7	57.9	62.2
08:00	15min	62.5	59.9	66.2	59.5	57.3	72.0	-	-	-	59.3	58.3	62.2
08:15	15min	60.2	57.8	65.1	60.0	56.8	74.2	-	-	-	59.0	57.8	66.9
08:30	15min	59.5	56.5	72.9	59.9	58.0	70.3	-	-	-	57.9	56.9	61.6
08:45	15min	59.0	56.3	73.4	59.8	57.0	74.7	-	-	-	56.9	54.4	62.8
09:00	15min	58.8	54.8	80.5	58.1	54.8	67.7	-	-	-	54.2	53.2	57.9
09:15	15min	56.7	53.3	74.4	58.3	54.7	69.7	-	-	-	53.4	51.8	60.7

Start Time	Period (T)	ML 1			ML 2			ML 3			ML 4		
		dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}	dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}	dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}	dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB L_{AFmax}
09:30	15min	54.3	50.3	67.7	57.3	53.4	66.4	-	-	-	51.1	47.5	58.4
09:45	15min	53.0	49.1	60.3	57.6	53.0	68.4	-	-	-	48.2	44.6	63.4
10:00	15min	52.5	49.0	64.1	56.9	51.8	71.0	-	-	-	46.1	43.9	61.4
10:15	15min	52.9	48.5	71.9	56.1	51.2	67.7	-	-	-	45.9	43.2	63.1
10:30	15min	53.1	48.9	66.1	55.7	50.4	65.0	-	-	-	48.9	42.9	72.8
10:45	15min	52.8	48.4	72.4	57.1	51.0	68.4	-	-	-	49.1	44.6	71.9

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