

Technical Note Plant Noise

2 Larchwood Avenue

Havant

PO9 3QW



On Behalf of Advanced 2000 Ltd

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Project Name: McDonald's, 2 Larchwood Avenue, Havant, PO9 3QW

Project Ref: 8001

Report Title: Plant Noise Assessment

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Revision	Date	Description

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1 Executive Summary

Currently the McDonald's Restaurant at 2 Larchwood Avenue, Havant, PO9 3QW is open to the public from 6am to 11pm seven days a week, it is now proposed that the opening hours of the restaurant should be extended to 24-hours per day.

Advanced 2000 Ltd had instructed AASW Ltd to provide a Plant Noise Impact Assessment to setting out if additional mitigation would be required to ensure the operation of the roof plant does not adversely impact the residential neighbours, the closest of which are on Willowdene Close 65m to the east, to enable 24-hour a day trading.

Advanced 2000 Ltd have completed their works in September 2024, replacing the old and noisy packaged air-conditioning units with modern quiet dedicated air handling units, with separate air source heat pumps. The kitchen extract fan has also been replaced with a modern and inheritably quieter direct drive fan and a full acoustic enclosure fitted, with a 2100mm long discharge silencer. All as we had previously specified.

This report confirms that the plant can now operate, right through the night, without causing any noise impacts to the neighbours, as defined by BS4142, thus achieving the policy objectives, set out in Havant Borough Council policy CS16-High Quality Design.

2 Planning Proposal

Currently the McDonald's Restaurant is open to the public from 6am to 11pm seven days a week, it is now proposed that the opening hours of the restaurant should be extended to 24 hours per day.

3 Planning Criterion

Havant Borough Council sets out their policy objectives for noise in their policies CS16 of the Havant Borough Local Plan (Core Strategy) 201, namely;

Policy CS16 High Quality Design

Planning permission will be granted for development that is designed to a high standard, *which helps to create places where people want to live, work and relax. All development should demonstrate that its design:*

- 1. Responds to, draws inspiration from and respects local context and:*
 - a) Identifies and responds positively to existing features of natural, historic or local character within or close to the proposed development site;*
 - b) Integrates with existing local landscape features, promotes wildlife and biodiversity and/or applies characteristics of the local area into the design of a scheme wherever possible to create variety and interest;*
 - c) Uses the characteristics of the locality to help inform the design of the new development including heights, massing, existing buildings lines, plot widths and depths, materials and proportions of windows and doors;*
 - d) Is well connected to and integrates with the immediate local area and the wider area by linking to existing pedestrian and cycle routes and encouraging people to use public transport where possible; and*
 - e) The development does not cause unacceptable harm to the amenity of neighbours through smell, the loss of privacy, outlook, noise and overlooking.*
- 2. Produces a positive relationship between buildings, street and spaces both existing and proposed, where:*
 - a) The layout of the development reduces opportunities for crime and antisocial behaviour; contributes to improving community safety; and makes provision for the management and maintenance of the development;*
 - b) New streets are not dominated by vehicular traffic;*
 - c) The layout of the development is legible, meaning it is easy to orientate oneself and move through*

No numerical criteria are however provided in this policy for the definition of "cause unacceptable harm to the amenity of neighbours through, noise".

4 British Standards BS4142

BS4142:2015+A:2019 provides a method for assessing the likely impact industrial and commercial noise will have on residential neighbours that depend on the margin by which the Rating Level of the specific sound exceeds the back ground sound and the context in which the sound occurs.

The table below details the likely impact based on the excess of the background;

Difference between background sound and Rating Level	BS4142 Assessment
+10 dB	Indication of a significant adverse impact
+ 5 dB	Indication of an adverse impact
0 dB	Indication of low impact

Table 1 BS4142 impacts

BS4142 requires that character penalties, if any tonality, intermittency, impulsivity or “other characteristics” are present in the noise are added to the assessed $L_{Aeq,T}$ level of plant noise to provide a Rating Level ($L_{A,r}$).

The table below summarizes acoustic feature penalties;

Acoustic Feature	Correction dB		
	Just perceptible	Clearly perceptible	Highly perceptible
Tonality	2	4	6
Impulsivity	3	6	9
Intermittency	3		
Other characteristics	3		

Table 2 acoustic feature penalties

These penalties are additive, however the combine correction, for a clearly audible source would not be expected to be greater than 10 dB. Where the source, in this case McDonald's fans and condensers, is no louder than the background and has no readily perceptible features the Rating Level is often equal to the $L_{Aeq,T}$ level.

It is proposed that noise from McDonald's' fixed plant should be no louder than background, when assessed in accordance with BS4142 at the nearest residential neighbour.

5 On-site sound survey

An on-site sound survey was carried out by Mr Peter Ashford BSC MIOA ANC across the afternoon, evening and night from Tuesday 9th April 2024.

A logging sound level meter was set up in the wood land to the east of Larchwood Avenue, overlooking the rear gardens of the houses on Willowdene Close.

The meter was set to record sound parameters over 5 minute periods between 7pm through to 10am the following morning.

The sound meter/pre-amp/microphone were calibrated using a hand held calibrator before and after the survey, with no adverse variants being observed. Details of the equipment used are given in the table over page;

Meter Make	Model	Serial No.	Calibration Date	Calibration Certificate No.	Calibration due date
Rion	NL31	01273081	5-7-23	1129642	5-7-24
Rion	NC74	34794316	6-6-23	1145504	6-6-24

Table 3 showing measurement equipment details

The weather overnight was fine with little wind of consequence¹.

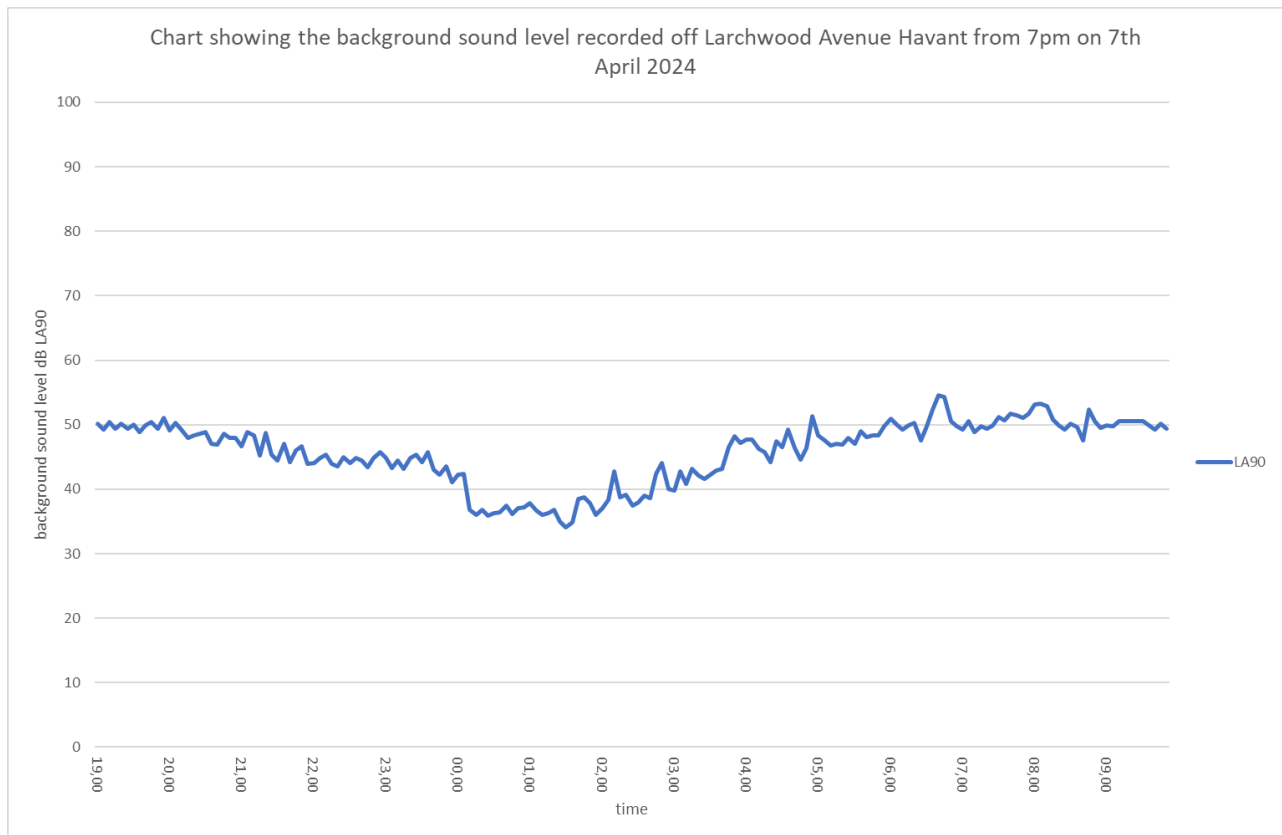
The photograph below shows the microphone weather shield, with the houses on Willowdene Close visible in the background through the trees;



Figure 1 showing location on sound monitoring equipment

¹ <https://www.timeanddate.com/weather/@2647317/historic?month=4&year=2024>

The chart below shows the background sound levels recorded;



This charts shows that;

- Across the night the lowest recorded background occurred at 1,30am with a level of 36 dB $L_{A90,15\text{minute}}$ being recorded,
- At this time the existing McDonald's Roof plant was not running,

These levels will be referred to in subsequent assessment of plant noise.

5.1 Numerical plant noise criteria

BS4142 has been updated in 2019 and the current version² provides a method of rating and assessing industrial and commercial sound affecting people inside and outside their homes, McDonald's' external fixed plant noise falls within the scope of this Standard.

BS4142 states that if the *rated level* of fixed plant noise is equal or less than the background sound level, outside at the neighbours then it will have a "*low impact (depending on context)*", with adverse impact only occurring as and when the rating level exceeds the background by 5 dB or more. If the excess is +10 dB then this is likely to be a sign of presence of a likely *significant adverse impact*.

² BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound

To ensure the operation of the roof plant will have a low impact it is recommended that plant noise is mitigated so that it does not exceed the background sound level, 1m from the nearest sensitive dwelling.

Based on the on-site survey data the lowest overnight background sound level was 36 dB $L_{A90,15\text{minute}}$ and therefore McDonald's' plant noise will need to be controlled to no more than 36 dB $L_{A,r}$ (as a *rated level* in accordance with BS4142).

6 Plant mitigation

6.1 Existing plant

The existing roof plant has now been replaced by McDonald's, like for like, as it has been in operation for over 20 years and has reached the end of its useful life.

The new plant consists of two Weatherite air handling units (type Y200) and five associated condenser units (Mitsubishi type ZM 250) replacing AHU S1 S2 & S3.

The existing RHF Ltd kitchen extract fan has been replaced with a modern direct drive Woodcock & Wilson Ltd fan.

The condensers serving the Manager's Room, Crew Room, Office and Door Air Curtain have also been replaced, as well as the toilet extract fan and an new ASHP has been attached to a new hot water tank to replace the old gas fired system.

The details of these replacement are shown at the rear of this report.

7 Fixed Plant Noise

The noise levels generated by the replacement plant have been predicted in accordance with the noise prediction framework set out in ISO 9613-2 Acoustics - Attenuation of sound during propagation outdoors - Part 2 General method of calculation, using iNoise noise modeling software. Sound levels have been calculated for each of the nearest sensitive residential neighbours.

The model takes into account the distance between the sources and the receptors, reflections from building facades, attenuation from screens as well as atmospheric attenuation. The following modelling assumptions have been relied upon;

- G = 0 (hard ground)
- Air temperature 10 oC,
- Humidity 70%,
- Downwind propagation,

7.1 Plant Mitigation

The table below details the mitigation which has been fitted to the plant;

System	Make/model	octave band DIL dB							
		63Hz dB	125Hz dB	250Hz dB	500Hz dB	1000Hz dB	2000Hz dB	4000Hz dB	8000Hz dB
E1 kit' ext' fan	900 x 900 x 2100mm long	9	20	30	50	50	35	30	28
	Acoustic enclosure R'_w	15	22	32	38	45	43	40	40

Table 4 mitigation requirements

7.2 Predicted external plant noise levels

The table below shows the predicted plant sound levels at the neighbours³;

Location	Height m	Plant noise level
		dB $L_{Aeq,T}$
3 Willowdene Close	4.5	30
4 Willowdene Close	4.5	30

Table 5 showing predicted mitigated plant noise

This shows that the highest predicted plant noise levels now outside the upper floor windows of 3 Willowdene Close but will be no higher than 30 dB $L_{Aeq,T}$.

8 BS4142 assessment of mitigated plant noise levels

8.1 BS4142 assessment of impact of plant noise

BS4142:2015+A:2019 provides a method for assessing the likely impact industrial and commercial noise will have on residential neighbours. This requires that character penalties, if any tonality, intermittency, impulsivity or "other characteristics" are present in the noise are added to the assessed $L_{Aeq,T}$ level of plant noise to provide a Rating Level.

Here the McDonald's plant will run without any tonality or discernable intermittency or impulsivity and at a level more than 10 dB below the day time background sound level and therefore will not attract any characteristic penalties. However, at night, some of the plant will run intermittently and this might be perceivable at times when the background sound level is considerably lower. Consequently, a 3 dB penalty needs to be added to the assessed $L_{Aeq,T}$ to give the Rating Level.

³ Details of full calculations can be made available upon request

Location	3 Willowdene Close
	Plant noise level
Predicted plant noise level dB	30
character penalties	
tonality	0
impulsivity	0
intermittency	0
other characteristics	3
Plant Rating Level dB $L_{A,r}$	33
Background sound level (01,30am) dB L_{A90}	36
Excess over background dB	-3
Assessed likely impact	low

Table 6 BS4142 assessment of plant noise

This shows plant noise will now have a “low impact” if it were to run 24-hours per day.

8.2 Uncertainty & its potential effect of assessment conclusion

There is a degree of uncertainty at each stage of these assessments, most will be small and not all additive, but if the uncertainty was large and the assessment conclusion was on the threshold of acceptability, then it might change the assessment outcome.

Residential neighbours existing sound climate

The magnitude of the impact of fixed plant noise on the neighbours has been based on the results of an on-site ambient noise survey, where levels were monitored in a location representative of that experienced by the neighbours.

Any on-site sound survey will only provide a snap shot of historical levels. For these levels to provide the basis upon which future impacts can be assessed, then the snap shot should, at the very least, cover the hours under assessment and during normal circumstances. Measuring next to a road which has temporary traffic lights in place may well understate sound levels when the traffic is passing freely, for example, should be avoided.

Here the survey was conducted over night, during clement weather conditions. The background sound levels did drop as low as 36 dB $L_{A90,T}$ in the small hours, a level which is comparatively low given the site's location to the road network.

Assessment of plant noise

The plant to be used on the roof of the proposed McDonald's restaurant has been tried and tested on countless other McDonald's around the country and the noise levels used in this assessment for the plant can be relied upon.

The maximum noise that all the plant running at 100% duty will create here, has been compared with the minimum representative night time background sound levels.

Practically at 2am in the morning, when the background is at its quietest, all the plant will not be running flat out. The air-conditioning fans and condensers will be ticking

over and even the main kitchen extract fan will automatically reduce in speed when there will be just a few orders being cooked.

The mitigation requirements set out in this report are therefore robust and will not be adversely effected by uncertainty.

Replacement plant details

Reference	Service	Make	Model	Indice	dBA	linear octave band centre frequency Hz							
						63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000Hz
S1	kitchen supply	Weathrite	Y200	Lw	88	83	89	85	85	81	80	76	77
S11C1, C2 & C3	S1 condensers 1,2&3	Mitsubishi	ZRP250	Lp at 1m	62	65	62	60	59	58	52	48	42
S2	GF Dining supply	Weatherite	Y120	Lw	82	78	82	79	80	77	75	72	68
S2/C1 & C2	S2 condensers 1&2	Mitsubishi	ZRP200	Lp at 1m	62	61	61	60	59	58	52	46	42
AC01/C1	Manger Rn condenser	Mitsubishi	SUZ M35FA	Lp at 1m	48	51	53	51	45	52	39	31	25
AC02/C1	Crew Rm condenser	Mitsubishi	SUZ M50FA	Lp at 1m	49	57	57	56	54	52	48	41	45
AC03/C1	Office condenser	Mitsubishi	PUZ-ZM71VHA	Lp at 1m	49	53	52	53	45	42	39	34	28
	Door Curtain condenser	Mitsubishi	PUHX-RP125R	Lp at 1m	45	52	45	45	40	39	35	27	13
E1	kitchen extract	RHF	BW10 500	induct Lw	97	104	95	100	98	84	80	77	68
				case BO Lw	89	92	79	91	86	84	78	67	54
EF/02	WC extract	Systemair	DHS 310EV	Lw	67	54	56	60	62	61	58	53	46
EF/03	Energizer (Store)	Systemair	DHS 310EV	Lw	67	54	56	60	62	61	58	53	46
HWS	ASHP	Cosmic Gas	FRYO-13PI	Lp	59	60	58	49	46	46	43	38	39