Virtus HoldCo Ltd

VIRTUS DATACENTRES HAYES CAMPUS LON2

Noise Report

RP AC 01
MAY 2023

INTERNAL

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DATE: MAY 2023

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Noise Report

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QUALITY CONTROL

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CONTENTS

APPENDICES

APPENDIX C

LIMITATIONS TO THIS REPORT

1 INTRODUCTION

1.1 BACKGROUND

A new emergency generator has been installed at a data centre building at Hayes known as LON2 in addition to eight existing generators at the site. The generators are only used to supply power in the event of a mains power failure. However, each generator will be tested once a month. All generators are housed in the main building.

This report, which is intended to be appended to the environmental permit application for the generator, details the best available techniques (BAT) that have been employed to reduce the noise impact of the generator, and presents a noise appraisal that estimates the noise levels expected to occur at nearby noise sensitive locations during testing.

1.2 SUMMARY OF PROPOSALS

The existing generators are Mitsubishi S16R2-PTAW units, and are consented under a separate permit. The new generator that is the subject of this permit application is an MTU 16V4000G24F DS2500.

The generators at the site are tested in isolation (one at a time) so noise levels produced during testing would not necessarily be increased as a result of the new generator being added, assuming that they produce similar noise levels. Furthermore, the nearest noise sensitive receptors are over 400 m from the site, which provides a substantial amount of sound attenuation.

On this basis, a full noise assessment (e.g. using the BS 4142 methodology) is not considered necessary in this instance. A simple assessment is presented herein, which uses baseline and source noise measurements as its basis. The assessment illustrates the levels of sound that could be expected during testing, at the nearest receptors.

A technical glossary is provided in Appendix A.

A site plan showing the location of LON2, noise survey location and the nearest residential properties can be found in Appendix B. It can be seen from this figure that they are over 400 m from the site, in east and west directions.

Limitations of this report are presented in Appendix C.

2 POLICY AND REQUIREMENTS

2.1 ENVIRONMENT AGENCY REQUIREMENTS

DATA CENTRE FAQ HEADLINE APPROACH

The Environment Agency's *Data Centre FAQ Headline Approach*[1] document states that no special treatment is required for data centre noise, compared to any other sources that are the subject of a permit application:

"1.10.6 Noise

Generally same rules acceptable for planning though clearly noise control is a BAT issue within the permit application. See https://www.gov.uk/government/publications/environmental-permitting-h3-part-2-noise-assessment-and-control"

2.2 ENVIRONMENT AGENCY GUIDANCE: *NOISE AND VIBRATION MANAGEMENT: ENVIRONMENTAL PERMITS*

2.2.1. The Environment Agency's environmental permitting guidance is published online in a publication entitled Noise and Vibration Management: Environmental Permits (2021)[2] and supersedes the previous H3[3] guidance.

The document outlines the operator's responsibilities to use 'best available techniques' (BAT)[4] to prevent or minimise noise pollution.

[1] *Data Centre FAQ Headline Approach*, DRAFT version 10.0 H. Tee 01/06/18 – Release to Industry, Environment Agency, 11/01/2019
[2] *Noise and Vibration Management: Environmental Permits* (2021), Environment Agency. Available at: https://www.gov.uk/government/publications/noise-and-vibration-management-environmental-permits/noise-and-vibration-management-environmental-permits
[3] *Horizontal Guidance for Noise Part 2 – Noise Assessment and Control* (version 3, June 2004), Environment Agency
[4] In this report, Best Available Techniques (BAT) are as defined in the Industrial Emissions Directive 2010/75/EU (Integrated Pollution Prevention and Control)

3 BEST AVAILABLE TECHNIQUES

Best available techniques (BAT) have been employed in the design of the data centre and associated generator plant, to reduce the noise impact of the generator at residential properties. These can be summarised as follows:

- The site is located in a predominantly industrial area, to avoid having noise-sensitive land uses immediately adjacent, and so that existing noise levels at nearby noise sensitive locations are not excessively low
- The site has two connections to the National Grid, which will reduce the likelihood of power failures, and thereby reduce the likelihood of the generator being required to operate in a genuine emergency scenario
- The generator is installed inside the LON2 data centre building, using the building envelope itself as well as surrounding buildings to provide as much acoustic screening as possible between the generator and the receptors
- The generator includes sound attenuation measures to reduce the radiated sound levels, including attenuators on the air inlet and outlet, and the flue
- The generator testing regime is such that generators are each tested individually and for only short periods (i.e. the total number of generators does not increase the amount of noise produced at any one time)
- Generators will only be tested during the daytime, when residual and background sound levels are naturally higher
- ‘On-load’ tests will be carried out in the middle of the day when background sound levels are at their highest

To demonstrate the sound impact associated with the proposed generator, a noise appraisal has been carried out.

4 ENVIRONMENTAL NOISE SURVEY

4.1 OVERVIEW

Noise surveys have been undertaken at and around the development site, as follows:

- A baseline environmental noise survey to establish the background and residual sound levels at existing noise sensitive receptors; and
- A sound source survey to determine the sound levels of a generator.

4.2 BASELINE NOISE SURVEY

An environmental noise survey was carried out at locations that are representative of the closest noise-sensitive receptors, between approximately 08:50 and 12:00 on 17 August 2022.

POSITIONS

Sound level monitoring was carried out at the following position:

1. Adjacent to residential receptors at Watersplash Lane, UB3 4QS to the west of the site. The microphone was installed on a tripod, approximately 1.5 metres above the ground, in free-field conditions more than 1m from a façade.

The position is indicated on the site plan in Appendix B.

MEASUREMENT EQUIPMENT

The following equipment was used to carry out the measurements.

Table 4-1 – Sound measurement equipment

Position	Equipment Description	Manufacturer & Type No.	Serial No.	Calibration Date
1	Sound level meter	01 dB-Metravib DUO	10328	18 October 2021
	Pre-amplifier	01 dB Metravib PRE 22	10233	
	Microphone	GRAS 40CD	154531	
	Calibrator	01 dB-Stell CAL 21	34134166	4 February 2022

The sound level meter had been calibrated to traceable standards at a laboratory within two years, and the calibrator within one year. The calibration of the measurement chain was verified using the field calibrator before and after the survey. No deviation greater than 0.1 dB was found to have occurred. The microphone was fitted with the standard manufacturer supplied windshield.

EXISTING SOUNDSCAPE

The soundscape at the measurement position can be described as follows:

1. Road traffic noise from A312 was the dominant noise source. Local road noise also audible. Occasional plant noise from the east. Planes to and from Heathrow were audible but not dominant. No sound was attributable specially to LON2.

Foliage was present close (within 10 m) to the monitoring location. However, wind speed was less than 1.5 m/s and foliage movement did not affect measurements.

WEATHER CONDITIONS

The weather during the baseline survey was fine and dry throughout. Wind speeds were less than 1.5 m/s.

RESULTS

The generator will only be tested during daytime hours of 07:00 – 19:00. Therefore, measurements were made during daytime hours only. The measured background sound levels at the receptor location are shown in Table 4-2.

Table 4-2 – Summary of baseline sound levels (free-field)

Location	Time	Sound level measurements, dB	
		$L_{Aeq,1hour}$	$L_{A90,1hour}$
Watersplash Lane	09:52 – 10:52	55	53
	10:52 – 11:52	54	53
	11:52 – 12:52	55	53

4.3 SPECIFIC SOURCE SOUND LEVEL MEASUREMENTS

SPECIFIC SOURCE DETAILS

The existing eight generators at LON2 are installed in the data centre building on the ground floor, and the new one will be installed alongside them. Whist sound power level data are available from the manufacturer for the generator by itself, no data are supplied for the attenuation equipment that is fitted to it. Sound level measurements have therefore been made on-site that can be used to calculate the propagation of sound from the generators.

The generators that are part of this assessment are:

MTU 16V4000G24F DS2500 set, running at 2,500 RPM

The generator supply air enters via a large louvre at the 'front' end. The flue exits via the roof. Personnel were unable to access the flue termination during the noise survey.

Methodology

The source sound level survey was carried out on 17 August 2022. Generators are located inside the data centre, so measurements were made outside the data centre approximately 8m from the louvre whilst one generator was operational for off-load testing.

Weather Conditions

The weather during these measurements was dry, cloudy (100 % cloud coverage), and 20º C. There was a south-westerly wind of around 2 m/s, but lower wind speeds were present at the microphone due to sheltering provided by the layout of the plant and existing buildings.

Measurement Equipment

The sound measuring equipment used for measurement of the generator was the same as summarised in Table 4-1.

The sound level meter had been calibrated to traceable standards at a laboratory within two years, and the calibrator within one year. The calibration of the measurement chain was verified using the field calibrator before and after the survey. No deviation greater than 0.1 dB was found to have occurred. The microphones were supported on tripods and fitted with windshields.

Soundscape during Specific source measurements

The generator was the dominant sound source.

Results

Due to the high noise levels from the generator and the relatively low level of residual noise, it was not possible to carry out a residual sound level correction. The noise level presented is, therefore, representative of the noise source alone.

Table 4-3 – Generator Specific source measurements (free-field L_{eq} at 8 m), dB L_{eq}

Location	Time	Noise measurements
		$L_{Aeq,15min}$
8m from louvre externally	09:52 – 10:52	76

4.4 NOISE PREDICTION

Using a simple point source distance calculation, it is possible to estimate the noise level at the nearest receptors as presented in Table 4-4.

Table 4-4 – Estimated noise level at nearest representative receptors

Receptor (distance to LON2)	Predicted noise level (L_{Aeq})
R1 - Watersplash Lane (490m East)	40 dB
R2 - Wentworth Road (410m West)	41 dB

It should be noted that the estimated noise levels do not account for any screening attenuation from surrounding buildings which, it is anticipated, would further reduce the noise by around 10dB.

4.5 DISCUSSION

The estimated noise levels at R1 and R2 are 40 dB and 41 dB L_{Aeq} respectively. It is anticipated that, with the inclusion of attenuation due to intervening buildings between source and receptor locations, an additional 10 dB attenuation is likely resulting in a noise level of 31 dB at nearby receptors.

A noise level of 31 dB L_{Aeq} at receptors is more than 20dB below both the lowest measured noise levels of 54 dB L_{Aeq} and 53 dB L_{A90} during the baseline noise survey.

A noise level at the receptors of 31 dB is more than 10 dB below the lowest measured ambient and background noise levels and is, therefore, not audible at the receptor. Indeed, even without considering additional attenuation provided by intervening buildings, a noise level of 41 dB at receptors is more than 10 dB below the lowest measured ambient and background noise levels.

5 CONCLUSION

A single new emergency generator has been installed at Hayes LON2 to accompany eight existing generators. Generators are only used to supply power in the event of a mains power failure. However, each generator will be tested individually, once a month.

This report details the best available techniques (BAT) that have been employed to reduce the noise impact of the new generator, and a noise appraisal carried out to determine the possible impact.

Ambient noise levels at measured nearby receptors, and source noise levels have been measured for a LON2 generator. Using these measurements, generator noise levels have been estimated at nearby receptors.

It is concluded that the noise level of the new generator at the nearest noise-sensitive receptors would be more than 20 dB below the existing ambient noise level. It is, therefore, considered proportionate to scope out any detailed noise assessment of the LON2 additional generator at nearby receptors.

Appendix A

TECHNICAL GLOSSARY

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.

Terminology relating to noise

Terminology	Description
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20μPa (20^{x10-6} Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1 / s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m.
Façade	At a distance of 1m in front of a large sound reflecting object such as a building façade.
Octave Band	A range of frequencies whose upper limit is twice the frequency of the lower limit.

Appendix B

SITE PLAN


R1 - Watersplash Ln
Noise monitoring location
R2 - Wentworth Rd
LON2 Site
Tesco Extra
Tesco Petrol Station
Lidl
Hayes Rd
Toolstation Heathrow
Darussalam Masjid & Cultural Centre
Western International Market
Southall Ln
EVCargo Global Forwarding
Wentworth Rd
Fresh Produce and Groceries uk
River Crane
The Pkwy
Jaystar International
London Airlinks Golf Course

Appendix C

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