Bullsbrook Road Substation

Noise Assessment Report

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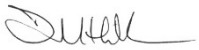
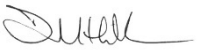
		Signature			
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1. Introduction

Arup has produced this report on behalf of Colt Data Service Ltd. to support a planning application for the redevelopment of Unit 1 Heathrow Interchange and development of a substation located in the Brook Industrial Estate, Hayes, in the London Borough of Hillingdon (LBH).

The objective of this report is to assess the operational noise impact from the proposed substation development at the nearest noise sensitive receptors.

This substation development follows the London 4 Datacentre that included a noise assessment report performed by RF Environmental in 2022 to support planning for the development. RF Environmental's report can be accessed through the LBH website at: London Borough of Hillingdon - Planning. The results from this survey have been included below, together with a series of short term measurements taken by Arup.

The closest residential receptors are located approximately 215m to the east on Bankside and Cherry Avenue, with new residential dwellings currently being constructed on the Southall Gasworks site approximately 350m to the south-east.

On the eastern side of the Grand Union Canal is housing, the Blair Peach Primary School, and public allotments. Immediately south of the site on the southern side of Beaconsfield Road is Hayes and Yeading Football Club, the Guru Nanak Sikh Academy, playing fields, and the Nanaksar Primary School. Located to the west and south-west are the West London Film Studios.

The ambient sound climate in the immediate vicinity of the site is influenced by road traffic sound, pedestrian sound, sound from pupils in the playgrounds at the nearby schools and occasional aircraft noise due to the proximity to Heathrow airport.

A plan of the site and immediate area can be seen below in Figure 1.

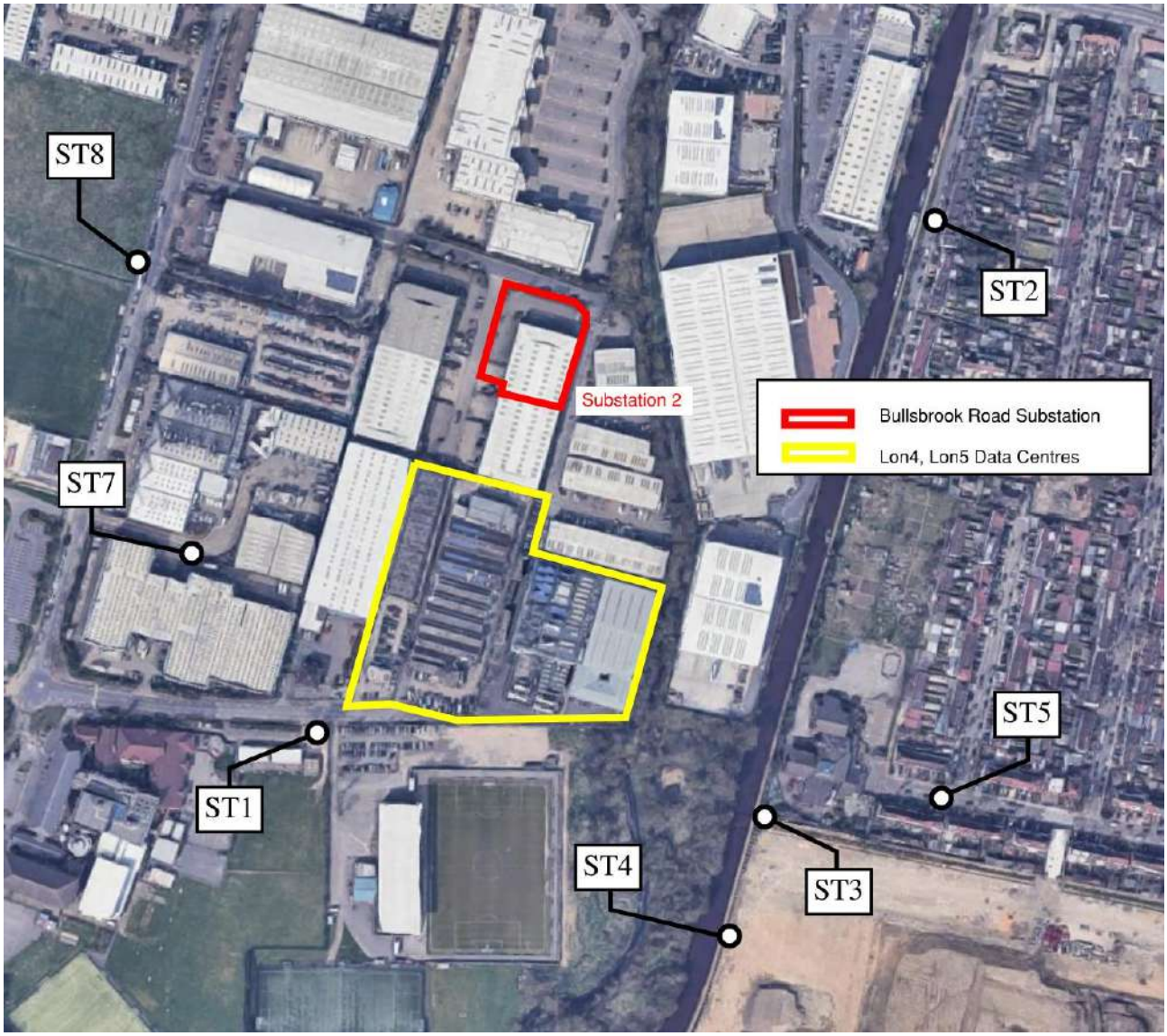

Figure 1 - Location of proposed development site and baseline noise measurement locations.

2. Environmental sound level survey

2.1 Survey Methodology

An attended survey was carried out by Nastassia Somikava and Ryan van Wensveen of Arup on 2nd July 2024. Attended daytime measurements were undertaken during good meteorological conditions of wind speed not greater than 4m/s and zero precipitation.

$L_{Aeq,T}$, L_{A10}, L_{A90} and L_{Amax} values were measured. Octave band spectra were recorded at all locations to assess the noise emission from local plant and other sources. All broadband measurements were A-weighted and used a fast time constant (0.125s).

2.2 Measurement equipment

The sound level meter and microphone are Class 1 conforming to BS EN 61672-1:2013. The calibration of the sound level meter and microphone was checked before and after use to confirm that there was no significant drift in meter response. This verification indicated that there was less than 0.3dB variation between checks. The meter is calibrated annually, and this calibration conforms to international standards.

2.3 Measurement methodology

The sound level meter was mounted on a tripod with the microphone set approximately at 1.2m-1.5m above local ground level under acoustically free-field conditions (i.e. at least 3.5m from any reflective surface other than the ground). A windshield was fitted to the microphone to minimise the effects of wind-induced noise across the microphone diagram.

The survey was carried out to establish the baseline sound levels between 10:00 and 15:00 on Tuesday 2 July 2024. This time is considered to be representative of the typical sound levels to which sensitive receptors (including residential premises) would be exposed during daytime.

The sound level meter was set to record over 15 minutes at locations ST1, ST2, ST3, ST4, ST5, ST7 and ST8.

2.4 Measurement Locations

A description of the measurement locations and its perceived sound climate is described in Table 1 with photographs of the measurement locations in Figure 1 below.

Location	Description of Measurement Location	Description of Sound Climate
ST1	The attended sound level meter was located on Beaconsfield Road. This location is considered to be representative of the Guru Nanak School, West London Film studios, and noise sensitive receptors to the west of the site.	The sound climate was dominated by noise from construction site, plant noise from studios building and local school as well as local traffic, which was predominantly construction related vehicles at the time of measurements.
ST2	This location at the Hillingdon Trail is considered to be representative of the nearest residential noise sensitive receptors to the east of the site on Bankside.	The sound climate was dominated by local road traffic and distant construction noise.
ST3	Location ST3 on the Hillingdon Trail to the east of the site is representative of the Blair Peach Primary School.	The dominant sound sources were distant construction works to the east and to the west of the school and distant road traffic.
ST4	The sound level meter was located on the Hillingdon Trail to the east of the site at a location representative of the future developments in this area.	The dominant sound sources were distant construction works to the east and west of the measurement location and distant road traffic.

Location	Description of Measurement Location	Description of Sound Climate
ST5	The sound level meter was located on Beaconsfield Road in the residential areas to the east of the Blair Peach Primary School.	The dominant sound sources were local traffic and distant construction works to the west of the measurement location.
ST7	Location ST7 was on Loverose Way, outside the West London Film Studios, to the west of the site.	The dominant sound sources were occasional local traffic and plant noise from local commercial building and studios.
ST8	This location was on Springfield Road outside the West London Film Studios, to the west of the site.	The dominant sound sources were road traffic, distant construction and plant associated with commercial buildings nearby.

Table 1 – Description of Arup unattended noise survey measurement locations

Location ST1 – View to the west

Location ST2 – View to the south

Location ST3 – View to the north

Location ST5 – View to the west

Location ST4 – View to the south

Location ST7 – View to the east

Location ST8 – View to the south

Figure 2 - Photographs of baseline measurement locations.

2.5 Measurement results

The results of the Arup survey are shown in Table 2 with the unattended RF Environmental survey results in Table 3 below.

Location	Time		Wind		Sound Level, dB (A)				Comments
	Start	Finish	Speed ms^{-1}	Dir	L_{eq}	L_{max}	L_{10}	L_{90}	
ST1	13:45	14:00	3	SSW	56.9	73.5	58.4	51.6	Noise from construction site; plant noise from studios and school; local traffic; a number of construction vehicles passing; noise from idling car engine.
ST2	12:04	12:19	4	SSE	49.3	69.4	50.7	45.0	Road traffic noise; distant construction noise; trees rustling; bird vocalisation; distant tonal noise from construction site.
ST3	10:55	11:10	4	SSE	51.5	74.5	53.8	45.9	Distant construction noise from east and west construction sites (hammering, sawing, shouts); bird vocalisation; pedestrians passing, cyclists passing.
ST4	10:35	10:50	4	SE	49.8	63.2	51.5	47.1	Noise from construction site (signal, hammering); pedestrians passing, distant children shouts; bird vocalisation; distant train noise, plane noise, distant road noise
ST5	11:21	11:36	4	SSE	50.6	67.2	52.1	45.1	Noise from local traffic; distant construction noise from east and west construction sites; distant road noise
ST7	14:30	14:45	2	S	58.5	76.0	61.0	52.0	Occasional cars passing; plant noise from warehouses and studios, lorry passing; hissing noise from the plant located at studios entrance.
ST8	12:47	13:02	2	S	64.3	82.9	68.4	49.3	The dominant source of noise is road traffic noise; distant construction noise; occasional noise from local traffic; audible plant noise; lorries passing.

Table 2 - Summary of Arup attended sound level measurement results on July 2 2024

Date	Measured Sound Levels, dB					
	Daytime (07:00 - 23:00)			Night-time (23:00 - 07:00)		
	$L_{Amax,F}$	$L_{Aeq,16hr}$	$L_{A90,16hr}$	$L_{Amax,F}$	$L_{Aeq,8hr}$	$L_{A90,8hr}$
Average (13/04/21 to 17/04/21)	68 (66-71)	51	44	62 (59-67)	53	44
Average (Spurious data excluded) (13/04/21 to 17/04/21)	68 (66-71)	51	44	60 (59-60)	51	43

Table 3 - Summary of RF Environmental's unattended measurements at the southeast corner of the London 4 site (LT1)

The full tabulated data from RF Environmental's report is reproduced below.

Monitoring Location	Date	Start Time (hh:mm)	Dur. (mins)	Measured Sound Levels, dB			Observations
				$L_{Amax,F}$	$L_{Aeq,T}$	$L_{A90,T}$	
ST1	13/04/2021	10:52	15	94.7	61.8	50.5	Outside Guru Nak Sikh School. Trolleys moving in/out of film studio. Generator on construction site. Car passes. Impact wrench on construction site
ST2		11:19	15	70.0	47.6	44.2	Near closest residential on Bankside. People walking past, talking. Distant road traffic.
ST3		11:37	15	67.7	49.2	43.9	On footpath adjacent to Blair Peach Primary School. Some sound from school playground.
ST3		12:08	15	73.3	51.4	45.0	Outside Blair Peach school. As above.
ST2		12:30	15	76.8	52.1	42.9	Outside residential at Bankside. People on barge talking. Lorry idling opposite, across the canal.

Monitoring Location	Date	Start Time	Duration	Measured Sound Levels, dB			Observations
				$L_{Amax,F}$	$L_{Aeq,T}$	$L_{A90,T}$	
ST2	21/04/2021	12:41	00:15:00	62.2	48.5	45.7	Bankside. People walking on footpath.
ST3		13:01	00:15:00	80.8	59.3	48.3	Outside school. Pupils in playground. Dominant sound source.

Monitoring Location	Date	Start Time (hh:mm)	Dur. (mins)	Measured Sound Levels, dB			Observations
				$L_{Amax,F}$	$L_{Aeq,T}$	$L_{A90,T}$	
ST4	05/01/2022	23:00	15	81.5	53.7	49.9	Canal side, adjacent to Gas Works Construction site. Continuous plant sound, noted to be an almost 'hissing' sound from the Gas Works Development site, dominated the $L_{A90,T}$ sound levels at this location during this period ~ 49 dB (A). Prior to the measurement, the consultant tried to investigate the source of the sound, but due to the construction site being closed during the night-time period, they were unable to identify the exact sound source but noted the source to be located towards the east of the construction site; Continuous road traffic sound from the A312 and A4020 also contributed to the $L_{A90,T}$ background sound levels at this location; distant aircraft rumble from Heathrow was observed for approximately 30 seconds during the period. This is likely to be due to a grounded aircraft due to no airborne aircrafts observed; there were 5 no. train passing at speed on the railway line to the south that influenced the ambient $L_{Aeq,T}$ sound levels ~ 57 dB (A) and last approximately 10 seconds per pass by; wildlife also contributed to the ambient $L_{Aeq,T}$ and $L_{Amax,F}$ sound levels.
ST2		23:20	15	69.1	48.7	46.2	Bankside. Plant sound was not audible at this location and the background sound was driven by road traffic mainly on the A4020 but also A312 ~45 dB $L_{A90,T}$; Wildlife throughout the period, aircraft rumble from Heathrow for approximately 20 seconds. As per the previous period, this is likely to be due to a grounded aircraft as no airborne aircraft was observed; 3 no. train passes to the south contributed to the ambient $L_{Aeq,T}$ sound levels; nearby door slams were also heard.
ST6		23:39	15	71.4	54.1	46.0	Woodlands Road. Distant road traffic on the A4020 was main sound source driving the background sound levels at this location, approximately 44 dB $L_{A90,T}$. Woodlands Road, and the surrounding roads, are one way streets and local vehicle passes (10 in total) were noted during this period; during periods of low residual sound, the plant sound observed to be present on the Gas Works site was just audible.

Monitoring Location	Date	Start Time (hh:mm)	Dur. (mins)	Measured Sound Levels, dB			Observations
				$L_{Amax,\,F}$	$L_{Aeq,T}$	$L_{A90,T}$	
ST5	05/01/2022	00:04	15	62.9	46.8	45.1	Beaconsfield Road adjacent to Cherry Avenue. The plant sound from the Gas Works site is audible and contributes to the background sound $L_{A90,\,T}$; road traffic from the A312 is higher and continuous in this location and the road traffic on the A4020 also contributes ~44 dB; Local vehicle passes (4 in total) contributes to the ambient $L_{Aeq,T}$ sound levels; distant train is also heard ~ 47 dB (A).
ST4		00:22	15	74.4	49.7	46.6	The continuous sound from the Gas Works site is still audible at this location but is noted to be approximately 3 dB lower than the previous measurement resulting in the distant road traffic from the A312 and A4020 being more prominent; 2 no train passes lasting for approximately 10 seconds each ~ 47 dB; 1 no. engineering train pass at minute 9 for approximately 40 seconds 48 dB (A); Distant aircraft rumble noted at minute 10 for 2 minutes; Distant PA system audible, possibly from Southall Station; wildlife sound still present and contributing to the ambient sound.
ST2		00:50	15	64.6	47.1	44.6	Road traffic on the A4020 noted to be sightly lower during this measurement but still dominates the background sound; distant PA system and 1 no. train pass can be heard; wildlife also contributes.
ST6		01:09	15	74.4	54.5	42.4	Road traffic is noted to be lower due to less traffic on the A4020; A total of 6 car passes on Woodlands Road contributes to the ambient environment; sound from Gas works not audible.
ST5		01:25	15	62.8	46.2	43.6	Distant road traffic dominates background sound environment, however the traffic on the A4020 is noticeably lower during this period; Sound from plant on the Gas Works site is no longer audible; 1 no train pass in distance; 2no. local vehicle passes.

Monitoring Location	Date	Start Time (hh:mm)	Dur. (mins)	Measured Sound Levels, dB			Observations
				$L_{Amax,F}$	$L_{Aeq,T}$	$L_{A90,T}$	
ST4	05/01/2022	01:43	15	73.7	47.6	43.9	Plant sound from Gas Works site is much lower and just audible; Distant road traffic is now the dominating sound source contributing to the $L_{A90,T}$ sound levels which is noted to mainly be from the A312 ~ 43-44 dB; 1 no. train pass in period 47 dB $L_{Aeq,T}$; Nearby swans in canal influence $L_{Aeq,T}$ and $L_{Amax,F}$ sound levels.
ST2		02:03	15	62.9	46.1	43.1	Road traffic dropped off more during this measurement period but still dominates the background sound; 1 no. train pass heard is distance; wildlife.
ST6		02:21	15	70.0	50.7	43.1	Road traffic is noted to be lower due to less traffic on the A4020; 3 local car passes on Woodlands Road; nearby baby crying for 2 minutes of period; Sound from Gas Works not audible.
ST5		02:38	15	71.7	45.1	40.8	Distant road traffic dominates background; no local traffic passes noted in this period, Distant PA system audible for 5 seconds; Gas Works sound is not audible.
ST4		02:55	15	65.5	49.0	45.9	Gas Works sound is now very low and just audible; distant road traffic has increased and is still the sound source mainly influencing the background $L_{A90,T}$; Distant PA system audible; wildlife.

3. Environmental noise criteria

3.1 Environmental Protection Act (1990)

The Environmental Protection Act describes the duty of the Local Authority to take steps to abate any noise impact, including that from a construction site, deemed to be causing a statutory nuisance. Noise is outlined in Part III of the Act in relation to noise as a nuisance or that is prejudicial to health.

3.2 Noise Policy Statement for England, DEFRA 2010

The Government's policy on noise is set out in the Noise Policy Statement for England (NPSE). It sets out the long-term vision of promoting good health and a good quality of life through the management of noise. The aims of the policy are to:

> "Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development."

This is achieved through three particular targets:

- avoid significant adverse impacts on health and quality of life;
- mitigate and minimise adverse impacts on health and quality of life; and
- where possible, contribute to the improvement of health and quality of life.

Particularly in relation to the second target, the explanatory notes of the NPSE state that:

> "All reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development."

The NPSE sets out concepts to be used in assessing the above aims:

- No Observed Effect Level (NOEL). This is the level of noise exposure below which no effect at all on health and quality of life can be detected;
- Lowest Observed Adverse Effect Level (LOAEL). This is the level of noise exposure above which adverse effects on health or quality of life can be detected; and
- Significant Observed Adverse Effect Level (SOAEL). This is the level of noise exposure above which significant adverse effects on health and quality of life occur.

Significant adverse impacts occur at and above the SOAEL. Adverse impacts occur between the LOAEL and the SOAEL.

3.3 National Planning Policy Framework, 2023

The National Planning Policy Framework (NPPF) constitutes guidance for local planning authorities and decision makers when drawing up plans and as a material consideration in determining applications. Its core principle is to conserve and enhance the natural environment, which means that if the adverse impacts of a development are outweighed by the benefits, when assessed as a whole, then the development should be approved. Local policy should reflect this principle and therefore the local planning authority has a key role in determining within its Local Plan and noise policies, what is acceptable in terms of any adverse noise effects within its area.

The NPPF sets out the Governmental requirements for the planning system in England and must be considered in conjunction with local development plans during planning decision-making process. In reference to noise, the Framework states (Section 185):

> "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:

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

3.4 Planning Practice Guidance for Noise (PPG-N), 2014 (updated 2019)

This Government guidance from the Ministry of Housing, Communities & Local Government aims to clarify how the NPPF and NPSE policies should be interpreted, and to guide local planning authorities and all other interested parties as to where to find relevant information.

As part of the assessment procedure there is a requirement that significant effects should be described and measures to control them identified. The relevant methods adopted for the assessment of each source of noise are summarised below.

The noise exposure hierarchy proposed in PPG-N is summarised in Table 4.

Perception	Examples of outcomes	Increasing effect level	Action
Not present	No effect	No observed effect	No specific measures required
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life	No observed adverse effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed adverse effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature	Significant observed adverse effect	Avoid

	awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.		
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

Table 4: Noise exposure hierarchy

PPG-N does not provide numerical values for the different effect levels, noting that in some circumstances adverse effects are defined in terms of a combination of more than one factor such as noise exposure, the number of occurrences of the noise in a given time period, the duration of the noise and the time of day the noise occurs.

Consideration should also be given to whether adverse effects that could occur to occupants within a building could be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time. In both cases a suitable alternative means of ventilation and cooling is likely to be necessary.

Environmental assessment policy for noise and vibration and Government noise policy are interlinked but separate processes. The term 'significant' has different meanings in Government noise policy and environmental assessment policy terms. A 'likely significant effect' would be reported in an environmental assessment where a SOAEL is exceeded. However, depending on the context, an environmental assessment may also report a likely significant effect where the exposure is between the LOAEL and SOAEL in terms of policy. This could be in response to matters such as the magnitude of noise change caused by the development, the number of receptors affected, the duration of the effect etc.

It therefore remains for professional practitioners to carefully consider the PPG-N noise exposure hierarchy and where appropriate seek to align it with environmental assessment policy significance criteria, having regard to British Standards, World Health Organization guidance, and other relevant sources of information. These are described in the following sections.

3.5 London Plan (March 2021)

Policy D14 of the London Plan5 sets out the following aims to help manage noise:

1) avoiding significant adverse noise impacts on health and quality of life
2) reflecting the Agent of Change principle as set out in Policy D13 Agent of Change
3) mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on existing noise-generating uses
4) improving and enhancing the acoustic environment and promoting appropriate soundscapes (including Quiet Areas and spaces of relative tranquillity)
5) separating new noise-sensitive development from major noise sources (such as road, rail, air transport and some types of industrial use) through the use of distance, screening, layout, orientation, uses and materials – in preference to sole reliance on sound insulation
6) where it is not possible to achieve separation of noise-sensitive development and noise sources without undue impact on other sustainable development objectives, then any potential adverse effects should be controlled and mitigated through applying good acoustic design principles

7) promoting new technologies and improved practices to reduce noise at source, and on the transmission path from source to receiver.

3.6 Local Authority Requirements

Overview

The development site is located in the London Borough of Hillingdon. However, a number of the nearest noise sensitive receptors, including all of the residential receptors, are located on the London Borough of Ealing. Noise guidance for these two local authorities is set out below.

3.7 London Borough of Hillingdon's Local Plan

Policy EM8: Land, Water, Air and Noise of the Hillingdon Local Plan states:

> *"The Council will investigate Hillingdon's target areas identified in the Defra Noise Action Plans, promote the maximum possible reduction in noise levels and will minimise the number of people potentially affected. The Council will seek to identify and protect Quiet Areas in accordance with Government Policy on sustainable development and other Local Plan policies. The Council will seek to ensure that noise sensitive development and noise generating development are only permitted if noise impacts can be adequately controlled and mitigated."*

3.8 London Borough of Hillingdon's Noise Supplementary Planning Document – 2006

The London Borough of Hillingdon's Noise Supplementary Planning Document (April 2006) states the following with respect to plant noise emissions:

> *"British Standard 4142:1997 gives advice on measuring and assessing the noise from machinery or plant, and is relevant if surrounding residential areas might be affected. Developments with a BS4142 assessment of marginal significance or above would not ordinarily be permitted. Consequently, the development should be controlled such that the rating level of the noise form the proposed development determined according to BS4142 is at least 5dB below the background noise level LA90,T. Ideally, the assessment of noise should give a positive indication that complaints are unlikely."*

3.9 London Boroughs of Hillingdon, Hounslow and Richmond Upon Thames Noise Supplementary Planning Document – 2016

Since the publication of the Hillingdon 2006 Supplementary Planning Document, the London Boroughs of Hillingdon, Hounslow and Richmond Upon Thames produced a Supplementary Planning Document in 2016 titled: Development Control for Noise Generating and Noise Sensitive Development.

This Supplementary Planning Document was produced by the three London Boroughs in order to address common noise issues affecting all three Boroughs and assist in providing a consistent approach to development where noise is an issue. This SPD supplements each Borough's Local Plan by providing interpretation of national planning and noise policy in a local context along with advice on the technical requirements that the Boroughs regard as relevant to meeting those requirements.

In relation to industrial and commercial developments, SPD refers to British Standard 4142:2014. Methods for rating and assessing industrial and commercial sound to guide planning application assessments.

Furthermore, Table 2 of the SPD specifies external noise standards. These noise standards have been extracted from the SPD and are presented below in Table 6.

Table 2: New Industrial and Commercial Development - External Noise Standards

Noise Impact From Relevant Proposed Industrial Or Commercial Premises Or Plant	Development Outcome
Rating Level (LAr,Tr) is at least 5 dB(A) below the Background Level LA90	Normally acceptable
Rating level (LAr,Tr) is no more than 5 dB(A) above the Background Level LA90	Acceptable only if there are overriding economic or social reasons for development to proceed
Rating level (LAr,Tr) is more than 5 dB(A) above the Background Level LA90	Normally unacceptable

Table 5 – New industrial and commercial development – External noise standards – Extracted from the Boroughs' SPD

In addition to assessment of external noise, the SPD also refers to the guidance on suitable internal noise levels found in Table 4 of BS8233:2014.

A revision of BS4142 has been issued subsequent to the issue the Noise Supplementary Planning Document. As such, the fixed plant and/or equipment required for the operational phase of the development will be assessed in accordance with BS4142:2014+A1:2019 Method for Rating and Assessing Industrial and Commercial Noise, at the nearest residential receptors.

3.10 Local Authority Contact

A letter outlining the proposed methodology for the noise assessment and proposed sound level monitoring locations was submitted to the LBH on 25th June 2024. A response from LBH has not yet been received.

3.11 London Borough of Ealing Local Plan

Policy 4.11: Noise and Vibration of the Ealing Local Plan states:

> *"Development generating noise or vibration will not be permitted where it would cause noise or vibration above acceptable levels, particularly where it would harm existing or proposed noise sensitive development, unless this can be satisfactorily attenuated."*

3.12 London Borough of Ealing Noise & Vibration Supplementary Planning Guidance – 2014

The London Borough of Ealing's Supplementary Planning Guidance 2014 states:

> *"When considering proposals that will either generate noise or vibration and/or developments that are sensitive, developers and planners are required to consider the detailed criteria and measurements contained within this guidance. The information relates to Policy 4.11: Noise and Vibration contained within Chapter 4: Urban Design, in the Adopted 2004 Plan for the Environment."*
>
> *"When considering new developments care is to be taken to ensure that the potential or existing noise/vibration levels in the area are acceptable. As appropriate, attenuation against noise and vibration may be required. Such attenuation can be achieved in a number of ways through land use, the design of the building and the use of rooms. However where appropriate standards cannot be achieved, planning permission will normally be refused."*
>
> *"The detailed criteria and measurements used within this document are complex. However information regarding the planning requirements for noise and vibration must be readily available, hence the preparation of this supplementary planning guidance. It should therefore be used by individuals and organisations making planning applications in a noisy location or for uses that may generate noise. Detailed information relating to the measurement of sound and other relevant background information can be found in the Appendices."*

"In relation to major industrial noise sources, the supplementary planning guidance refers to British Standard 4142:1997. Methods for rating and assessing industrial and commercial sound to guide planning application assessments and specifies the following criteria:

> *The rating noise level of the noise emitted from the proposed development, determined by the procedure at BS 4142 1997, should be at least 5 dB(A) below the background LA90,1hr noise level, measured or calculated at 3.5 m from ground floor facades and1m from upper floor facades at the nearest affected premises."*

Since the publication of the supplementary planning guidance, a new version of BS 4142 was published and came into effect on 31 October 2014. Subsequent updates were made to the standard in 2019.

3.13 British Standard BS4142:2014+A1 2019.

British Standard BS4142:2014 + A1:2019 *Methods for rating and assessing industrial and commercial sound* provides a methodology to assess the noise from Proposed Development at nearby residential receptors.

This standard describes the process for obtaining the rating level for a new "specific" industrial or commercial sound source, which considers both the sound level and the character of the sound. This is practically achieved by adding penalties, where appropriate, to the sound level to account for potentially distracting or annoying characteristics of the sound.

Additionally, BS4142 describes the process for obtaining a representative background sound level (L_{A90}) at the residential receptors. This process is based on undertaking measurements at the receptor locations, including measurement of the L_{A90}. BS4142 stipulates that measurement instrumentation should conform to Class 1 standards, in accordance with BS EN 61672-1 Electroacoustics – Sound Level Meters Part 1 Specification. The measurements should be analysed to determine a typical background level for the relevant time periods. An example method is provided based on statistical analysis of the measured data using a histogram to illustrate the distribution of measured L_{A90} values.

BS4142 provides some guidance on suitable measurement time intervals for establishing a representative background sound level. It states:

- *"Ensure that the measurement time interval is sufficient to obtain a representative value of the background sound level for the period of interest. This should comprise continuous measurements of normally not less than 15 min intervals, which can be contiguous or disaggregated."*
- *"The monitoring duration should reflect the range of background sound levels for the period being assessed. In practice, there is no 'single' background sound level as this is a fluctuating parameter. However, the background sound level used for the assessment should be representative of the period being assessed."*

The assessment methodology within BS4142 is centred around the relationship between the calculated rating level for the new source, and the representative background level at the receptor:

- *"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."*
- *"Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night."*

3.14 Building Bulletin 93: Acoustic design of schools: performance standards, 2015 (BB93)

Section 1.1 of BB93 provides performance standards for new school buildings in accordance with the Building Regulations.

The overall objective of BB93 is to provide conditions in school which;

- Facilitate clear communication of speech between teacher and student, and between students; and
- Do not interfere with study activities.

The performance standards are based on indoor ambient noise levels (IANL) in unoccupied spaces.

3.15 Summary of Criteria for the Environmental Noise Assessment

Considering the standards and guidelines criteria discussed above, the noise impact assessment at residential receivers is to be undertaken in accordance with BS 4142:2014+A1:2019 to achieve a rating level of at least 5dB below the background sound level.

For the school receptors, the development noise will be assessed against the design criteria set out in BB93. The calculated sound levels from the development will be assessed against these IANL criteria, with a target of ensuring that the sound levels do not exceed the criteria.

Based on the attended and unattended monitoring outlined in Section 2 of this report, background sound levels of 41dB $L_{A90,T}$ during the night and 44 dB $L_{A90,T}$ during the day are considered worse-case values to be used in the assessment.

4. Environmental Noise Modelling

The final details for all substation equipment in not yet known. However, for assessment purposes, an unweighted octave band source spectrum with a sound power level of 83 dBA has been modelled in SoundPlan for each of the transformers to predict A-weighted octave band sound levels at the nearest noise sensitive receptors.

The surrounding buildings including the London 4 data centre currently under construction have been used in the noise modelling. Future buildings surrounding the substation as a part of the Colt development site may provide additional screening to the substation. However, as a reasonable worst-case scenario, these future building have not been included in the noise modelling scenario assessed.

A plan of the site and immediate area showing the predicted noise levels can be seen below in figure 3.

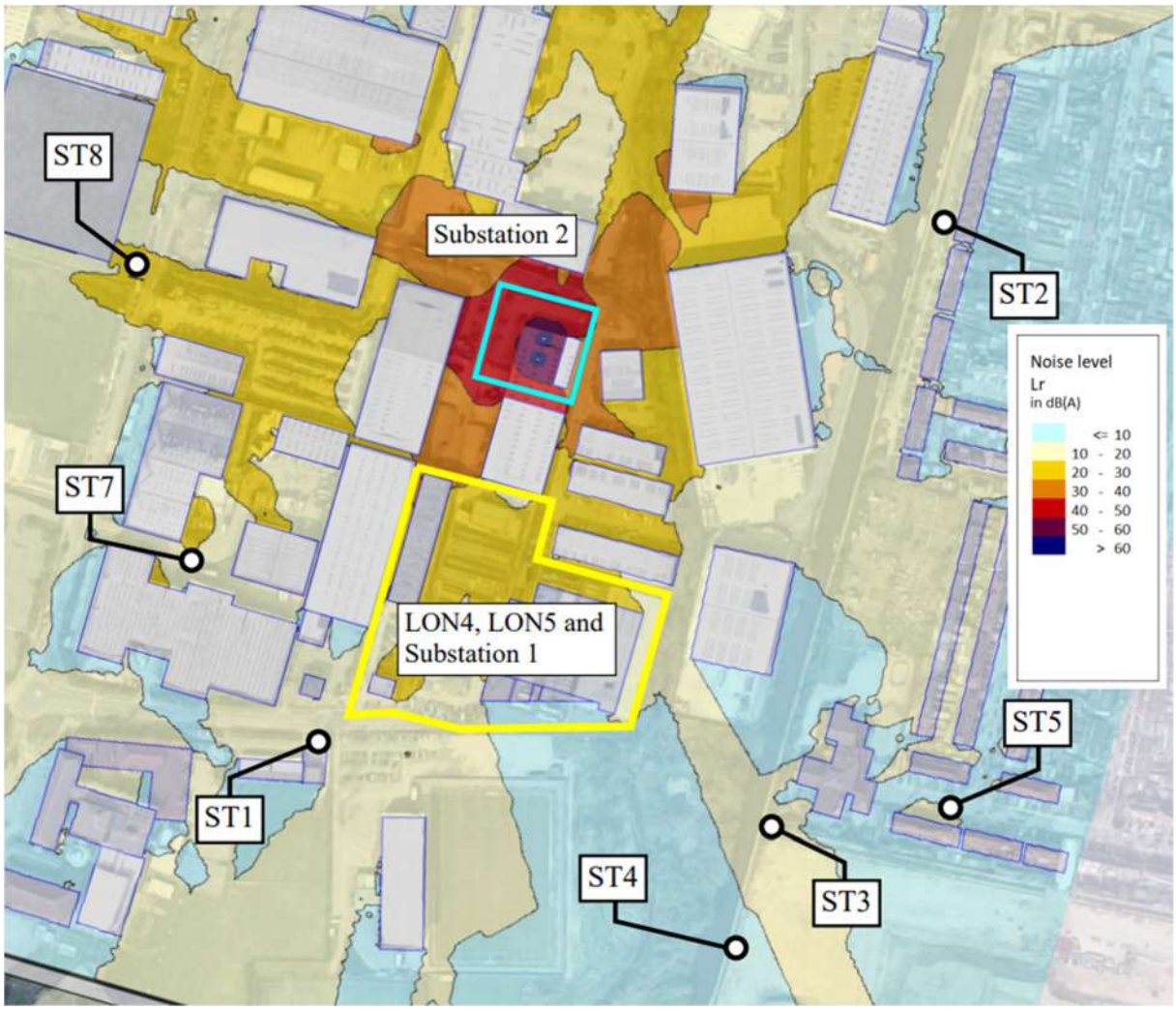

Figure 3 – Plan of the site showing predicted noise levels from Substation 2

5. Results

The specific sound levels from the substation are calculated to be at least 15 dB below the lowest measured ambient $L_{Aeq,15min}$ sound levels during the daytime and night-time periods.

Providing a +2 dB correction for the risk of audible tones that may be perceptible at the receptor locations, the calculated rating levels at the nearest residential receptors are at least 15 dB below the background sound levels during the daytime and night-time periods. According to BS4142:2014+A1:2019, it is unlikely that the substation sound source will have an adverse impact. LBH's criteria is achieved at all residential receptors.

Assuming a 15dB reduction from outdoor to indoor sound levels through a partially open window, the predicted indoor daytime sound levels at Blair Peach Primary School, Guru Nank Sikh Academy and Nanaksar Primary School are at least 15dB below the BB93 criteria for new build classrooms and SEN classrooms.

5.1 Uncertainty

The prediction uncertainty and background sound level uncertainty are considered to be typical for environmental noise assessments and would be in the range of +/- 3dB. In each case, reasonable worst-case assumptions have been taken. The amount that the predicted levels are below the assessment criteria is much larger than this assessment uncertainty.

6. Conclusions

Arup was appointed to undertake a noise impact assessment for the proposed development site for Colt Substation 2, Hayes, within the London Borough of Hillingdon.

The existing sound environment has been established, which is considered representative of the development site and surrounding area, through unattended and attended sound monitoring. Computer sound modelling software has been used to predict the substation sound levels at the nearest noise sensitive receptors.

The computer sound model was used to calculate the specific sound levels of the substation, at the school receptors. The results indicate that the BB93 internal noise criteria for school classrooms will not be exceeded, even where classroom windows are open for ventilation purposes. An assessment has also been undertaken at the nearest residential receptors, using the principles of BS 4142:2014+A1:2019. Rating levels have been calculated and assessed against background sound levels. The assessment of the substation indicates that the rating levels, without additional mitigation, are at least 15 dB lower than the background sound levels at the nearest residential receptors during the daytime and night-time periods. According to BS4142:2019, it is unlikely that the substation sound source will have an adverse impact. The predicted rating levels also achieve London Borough of Hillingdon's preferred noise criteria of at least 5 dB below the background sound level.

Appendix A

Acoustic terminology

Acoustic terminology

Decibel (dB)

The ratio of sound pressures which we can hear is a ratio of 10^6:1 (one million:one). For convenience, therefore, a logarithmic measurement scale is used. The resulting parameter is called the 'sound pressure level' (L_p) and the associated measurement unit is the decibel (dB). As the decibel is a logarithmic ratio, the laws of logarithmic addition and subtraction apply.

dB(A)

The unit used to define a weighted sound level, which correlates well with the subjective response to sound. The 'A' weighting follows the frequency response of the human ear, which is less sensitive to low and very high frequencies than it is to those in the range 500Hz to 4kHz.

In some statistical descriptors the 'A' weighting forms part of a subscript, such as L_{A10}, L_{A90}, and L_{Aeq} for the 'A' weighted equivalent continuous sound level.

Equivalent continuous sound level

An index for assessment for overall sound exposure is the equivalent continuous sound level, L_{eq}. This is a notional steady level which would, over a given period of time, deliver the same sound energy as the actual time-varying sound over the same period. Hence fluctuating levels can be described in terms of a single figure level.

Frequency

Frequency is the rate of repetition of a sound wave. The subjective equivalent in music is pitch. The unit of frequency is the hertz (Hz), which is identical to cycles per second. A 1000 Hz is often denoted as 1 kHz, e.g. 2 kHz = 2000 Hz. Human hearing ranges approximately from 20 Hz to 20 kHz. For design purposes the octave bands between 63 Hz to 8 kHz are generally used. The most commonly used frequency bands are octave bands, in which the mid frequency of each band is twice that of the band below it. For more detailed analysis, each octave band may be split into three third-octave bands or in some cases, narrow frequency bands.

Where there are no flanking routes to modify the performance the results are described by $L_{nT,w}$.

Maximum sound level

The maximum sound level identified during a measurement period. Experimental data has shown that the human ear does not generally register the full loudness of transient sound events of less than 125ms duration and fast time weighting (F) has an exponential time constant of 125ms which reflects the ear's response. Slow time weighting (S) has an exponential time constant of 1s and is used to allow more accurate estimation of the average sound level on a visual display.

The maximum level measured with fast time weighting is denoted as $L_{Amax,F}$. The maximum level measured with slow time weighting is denoted $L_{Amax,S}$.

Sound power level

The sound power level (L_w) of a source is a measure of the total acoustic power radiated by a source. The sound power level is an intrinsic characteristic of a source (analogous to its volume or mass), which is not affected by the environment within which the source is located.

Sound pressure level

The sound power emitted by a source results in pressure fluctuations in the air, which are heard as sound.

The sound pressure level (L_p) is ten times the logarithm of the ratio of the measured sound pressure (detected by a microphone) to the reference level of 2 x 10^{-5}Pa (the threshold of hearing).

Thus L_p (dB) = 10 log $(P1/P_{ref})^2$ where P_{ref}, the lowest pressure detectable by the ear, is 0.00002 pascals (i.e. $2x10^{-5}$ Pa).

The threshold of hearing is 0 dB, while the threshold of pain is approximately 120 dB. Normal speech is approximately 60 dBL_A and a change of 3 dB is only just detectable. A change of 10 dB is subjectively twice, or half, as loud.

Statistical sound levels

For levels of sound that vary widely with time, for example road traffic sound, it is necessary to employ an index which allows for this variation. The L_{10}, the level exceeded for 10% of the time period under consideration, and can be used for the assessment of road traffic sound (note that L_{Aeq} is used in BS 8233 for assessing traffic sound). The L_{90}, the level exceeded for 90% of the time, has been adopted to represent the background sound level. The L_1, the level exceeded for 1% of the time, is representative of the maximum levels recorded during the sample period. A weighted statistical sound levels are denoted L_{A10}, dBL_{A90} etc. The reference time period (T) is normally included, e.g. $dBL_{A10, 5min}$ or $dBL_{A90, 8hr}$.

Rating sound level

The rating sound level, $L_{Ar,Tr}$, is defined in BS4142:2014+A1:2019 as the sound level (L_{Aeq}) produced by the specific sound source being assessed plus any adjustment for characteristic features of the sound. Attention-catching characteristics such as tonality or impulsivity are penalised using this method of assessment.

Typical levels

Some typical dB(A) sound levels are given below:

Sound Level, dB(A)	Example
130	Threshold of pain
120	Jet aircraft take-off at 100m
110	Chain saw at 1m
100	Inside disco
90	Heavy lorries at 5m
80	Kerbside of busy street
70	Loud radio (in typical domestic room)
60	Office or restaurant
50	Domestic fan heater at 1m
40	Living room
30	Theatre
20	Remote countryside on still night