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42 High Street, Teddington

Construction Noise Management Assessment

18799-CNMA-01 RevA

30 January 2024

Issued For:

Unicode Developments

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Report by	Checked by
John Smethurst MIOA	**Duncan Martin MIOA**

1.0 INTRODUCTION

Clement Acoustics Ltd has been instructed by Unicode Developments to produce a construction noise impact assessment for the proposed demolition of existing building and construction of a new build mixed used development at 42 High Street, Teddington TW11 8EW.

The proposed schedule of works is anticipated to include demolition, ground works, construction and landscaping. This document aims to set noise criteria and recommended limits for any noisy works associated with the development and provides a management plan to mitigate any identified impact.

It should be noted that Clement Acoustics first carried out this construction management assessment for this site in 2018. We have been informed that the proposed construction for this application remains the same as previous with no significant changes. Therefore, the assessment and recommendations remain the same. It is also understood that there has not been any significant changes to the local infrastructure, therefore, the previous environmental noise survey is considered to be still representative and valid.

2.0 SITE LOCATION

The site consists of a former commercial unit (formerly a bank) on the end of a parade with residential flat above. The site is located on a street corner on a predominantly commercial road (High Street).

Proposals are to demolish the existing building and construct a mixed-use development consisting of a ground floor commercial unit with residential flats above.

The most affected noise sensitive premises have been identified as the residential property directly adjacent to the west (Receiver 1) and the residential property to the south on Cedar Road (Receiver 2). Locations are shown in the attached indicative site plan, 18799-SP1.

3.0 BASELINE ENVIRONMENTAL NOISE SURVEY

3.1 Procedure

Measurements were undertaken as shown on indicative site drawing 18799-SP1. The choice of this position allowed the collection of representative noise data in relation to the site.

The microphone was mounted on the roof of the existing building at the location shown on indicative site plan 18799-SP1. The position was considered to be free-field, and a correction for reflections has therefore not been applied. Noise levels at the monitoring position were dominated by road traffic noise from surrounding roads during the installation and collection of equipment.

Continuous automated monitoring was undertaken for the duration of the survey, being four days between 15:05 on 20 September and 17:00 on 24 September 2018.

Weather conditions were generally dry with light winds, therefore suitable for the measurement of environmental noise.

Background noise levels at the monitoring positions consisted of road traffic noise during installation and collection of equipment.

The measurement procedure generally complied with BS7445:1991. *Description and measurement of environmental noise, Part 2- Acquisition of data pertinent to land use*.

3.2 Equipment

The environmental noise equipment calibration was verified before and after use and no abnormalities were observed.

The equipment used was as follows.

- 1 No. Svantek Type 977 Class 1 Sound Level Meter,
- Norsonic Type 1251 Class 1 Calibrator.

4.0 EXISTING AMBIENT NOISE LEVELS

The measured noise levels are shown as a time history in Figure 18799-TH1, with ambient and background noise levels summarised in Table 4.1.

	Average ambient noise level $L_{Aeq: 5min}$	Minimum background noise level
Daytime (07:00 - 23:00)	58 dB(A)	45 dB(A)
Night-time (23:00 - 07:00)	54 dB(A)	42 dB(A)
Operating Hours (08:00 – 18:00)	58 dB(A)	47 dB(A)

Table 4.1: Baseline Ambient and Background Noise Levels

5.0 ASSESSMENT OF PROPOSED FIXED PLANT

It is understood that the development on completion will include the installation of fixed plant (cooling and air handling systems) to serve the proposed commercial unit. A separate assessment based on the requirements of BS 4142:2014 '*Methods for rating and assessing industrial and commercial sound*' [BS 4142], incorporating any specific requirements of the Local Authority will be carried out once suitable plant units have been selected.

Although plant is typically installed externally, noise emissions are predictable and can be effectively controlled through careful design, incorporating mitigation measures such as attenuators and enclosure as necessary.

We would recommend that for any additional proposed plant installation subsequent to build and fit out, a noise assessment should be undertaken prior to installation, to ensure necessary mitigation measures are incorporated into the design.

A suitable criterion for plant noise emissions is recommended as follows:

> *"The 'A' weighted sound pressure level from the plant, when operating at its noisiest, shall not at any time exceed a value of 10 dB below the minimum external background noise, at a point 1 metre outside any window of any residential property."*

6.0 SOUND INSULATION BETWEEN DWELLINGS AND COMMERCIAL UNIT

6.1 Separating Elements Between Residential Parts

In order to satisfy the requirements for Approved Document E of the building regulations, the minimum sound insulation performance criteria, as shown in Table 1, should be met by all floor and wall constructions (i.e. separating elements between different residential dwellings). For this development, the upper requirements for new build developments apply.

	Design Criteria	
Element	**Airborne**	**Impact**
Floor	$D_{nT,w} + C_{tr} \geq 45$ dB for new build $D_{nT,w} + C_{tr} \geq 43$ dB for conversions	$L'_{nT,w} \leq 62$ dB for new build $L'_{nT,w} \leq 64$ dB conversions
Wall	$D_{nT,w} + C_{tr} \geq 45$ dB for new build $D_{nT,w} + C_{tr} \geq 43$ dB for conversions	-

Table 6.1 Approved Document E design criteria for party elements

All separating floor and wall construction should be designed to meet the above criteria.

6.2 Separating Elements Between Residential and Commercial Parts

Approved Document E Section 0.0.8 states that "*a higher standard of sound insulation* [than those shown in table 6.1 above] *may be required between spaces used for normal domestic purposes and communal or non-domestic* [i.e. commercial] *purposes".*

Depending on the proposed activities in the commercial space, separating elements to adjoining residential space should be designed to achieve a suitable standard of sound insulation. Guidance as to a satisfactory sound insulation criterion can be determined once more is known of proposed future uses.

7.0 CONSTRUCTION ACTIVITIES ASSESSED

It is understood that the following activities and equipment, summarised in Table 7.1, will need to be assessed with regards to noise impact to nearby sensitive premises.

Activity	Works	Duration
Site Preparation		
Site Preparation	Hand Held breaker	3 Days
Demolition		
Demolition	12T Tracked Excavator + Split Bucket Tool	2 Weeks
Demolition	JCB Tracked Excavator and Concrete Breaker Tool	1 Week
Demolition	22cm Disc Cutter	2 Weeks
Underpinning / Foundations / Bulk Excavation		
Underpinning / Foundations	Mini Tracked Excavator	12 Weeks
	Circular Saw	12 Weeks
	22mm Disc Cutter	12 Weeks
	Hand Held Breaker	12 Weeks
	Concrete Pump and Mixer	12 Weeks
Bulk Excavation	12T Tracked Excavator	1 Week
Concrete Frame / Slabs		
Concrete Frame / Slab Construction	Circular Saw	16 Weeks
	22cm Disc Cutter	16 Weeks
	Hand Held Breaker	16 Weeks
	Concrete Pump and Mixer	16 Weeks
	Concrete Poker	16 Weeks
	Compressor and Air Gun	16 Weeks
Metal Frame Dry Lining		
Metal frame Dry Lining	Circular Saw	14 Weeks
	Nail Gun	14 Weeks
	Hammer Drill	14 Weeks
Brickwork		
Brickwork	Electric Mixer	14 Weeks
	Circular saw	14 Weeks

Table 7.1 Period of Site Activities and equipment

It should be noted that it has been deemed necessary to consider only high noise phases of the works. Noise levels generated by the internal fit out and decoration works would be expected to be significantly quieter than the activities considered herein, as well as being screened from receivers to some degree by the superstructure.

8.0 HOURS OF WORK

Normal permitted hours for noisy work in the District are understood to be Monday to Friday 08:00 to 18:00, 08:00-13:00 on Saturdays. Noisy works are not expected to be permitted on Sundays or Public Holidays or outside the periods above if they will be audible at the site

boundary. Unless otherwise stated it will be assumed that these operating hours will be adhered to.

The duration of works is estimated to be 63 weeks in total.

9.0 NOISE ASSESSMENT CRITERIA

It is proposed that the limiting levels should be set as follows:

BS 5228: 2009 Code of Practice for noise and vibration on Construction and Open Sites – Part 1: Noise references the Department of Environment (DoE) Advisory Leaflet (AL) 72 (1976) 'Noise Control on Building Sites', gives advice on the maximum levels of construction site noise at residential locations during daytime hours based on levels associated with speech interference. This publication states that during daytime hours (08:00 hours to 18:00 hours) the L_{Aeq} noise level at the building façade should not exceed:

- 75 dBA in urban areas near to main roads in heavy industrial areas; or
- 70 dBA in rural, suburban and urban areas away from main road traffic and industrial noise.

Given the location of the site, in close proximity to a main road we suggest a value of 75 dB $L_{Aeq\ (10hour)}$ be adopted as an appropriate assessment criterion. It should be noted that this criterion is not proposed as an absolute limit for construction noise; rather, it should be considered as a level against which to assess the significance of noise impacts associated with demolition and construction activities.

Draft 'Guidelines for Noise Impact Assessments', published by the Institute of Acoustics and Institute of Environmental Management and Assessment (IEMA), gives guidance on describing the impact of noise based on the change in noise level as follows:

- Negligible: Assessment criterion is exceeded by 0 to 3 dBA;
- Minor adverse: Assessment criterion is exceeded by 3 to 5 dBA;
- Moderate adverse: Assessment criterion is exceeded by 5 to 10 dBA; and
- Substantial adverse: Assessment criterion is exceeded by over 10 dBA.

10.0 NOISE IMPACT ASSESSMENT

Although this development is not a major project in its footprint and expected duration, it is located in close proximity to residential receptors.

10.1 Source Noise Levels

Source noise levels for the various items of machinery involved in the demolition and construction processes have been derived from historic data and levels stated in BS 5228-Part1: 2009 *Code of practice for noise and vibration on construction and open sites: Noise*. Where possible manufacturer measured noise levels have been used.

Assumed levels and percentage on-time are indicated in attached Construction Noise Schedule 18799-CNS1.

Worst case noise levels have been predicted at the nearest noise sensitive receivers as shown on the attached site plan 18799-SP1.

Due to the numerous locations of work activities, the 'average' distance from the centre of the site has been used in our calculations. This is expected to provide representative $L_{Aeq\ (10\ hour)}$ noise levels.

10.2 Receiver Noise Levels

Predicted construction noise levels have been calculated in full accordance with BS5228:2009.

Predicted noise levels at the nearest noise sensitive receptors are indicated in Table 10.1 below.

Activity	Period	Predicted Noise Level LAeq:10hours
Receiver 1 (Rear of High Street)		
Site Preparation	3 days	77 dB(A)
Demolition	2 Weeks	77 dB(A)
Underpinning / Foundations / Bulk Excavation	12 Weeks	78 dB(A)
Concrete Frame / Slabs	16 Weeks	79 dB(A)
Metal Frame Dry Lining	14 Weeks	78 dB(A)
Brickwork	14 Weeks	68 dB(A)
Receiver 2 (Cedar Road)		
Site Preparation	3 days	73 dB(A)
Demolition	2 Weeks	73 dB(A)
Underpinning / Foundations / Bulk Excavation	12 Weeks	74 dB(A)
Concrete Frame / Slabs	16 Weeks	76 dB(A)
Metal Frame Dry Lining	14 Weeks	74 dB(A)
Brickwork	14 Weeks	64 dB(A)

Table 10.1: Worst Case Receiver Noise Levels

As shown in Table 10.1, the worst-case noise levels at Receiver 1 for some of the proposed activities (highlighted in green in Table 10.1 above) would be expected to be within the range defined has having a *minor adverse impact* as per the criteria recommended by BS 5228:2009 shown in Section 9.0 above.

The majority of worst-case noise levels at Receiver 2 (other than that highlighted in green above) would be expected to be below the appropriate maximum limit level recommended

by BS5228:2009 and therefore of *negligible impact* as per the criteria shown in Section 9.0 above.

Any impact from the proposed activities would be expected to be appropriately mitigated by the relatively short durations of works along with implementation of the noise management plan below and the adoption of best available techniques to ensure avoidable noise is minimised wherever possible.

11.0 NOISE MANAGEMENT PLAN

This section aims to highlights the appropriate mitigation measures that will be undertaken to minimise noise impacts.

This will be presented in accordance with best practice documents in order to ensure that any potential adverse noise impacts relating to demolition and construction activities are minimised.

11.1 Control of Noise at Source

Controlling noise at source is by far the most effective means of minimising any impact on nearby noise sensitive receivers.

Plant and machinery to be used on site must be selected carefully in order to minimise noise emission levels. Where there are multiple options for the same operations, the quieter unit shall be selected.

Any manufacturer recommended noise and vibration attenuation measures should also be used due to the nature of the site location relative to nearby noise sensitive receivers.

Finally, noise and vibration generating equipment should only be operational when necessary and switched off when not in use so as to minimise the accumulation of various noise sources on site.

11.2 Control of Noise Spread

British Standard 5228: 2009 provides detailed advice on methods for minimising nuisance from construction noise. This can take the form of a reduction in the source noise level and the control of noise spread and in order to comply with specified noise criteria, the contractors should comply with the recommendations in BS 5228: 2009.

Such as, fixed plant should be located away from the nearest noise sensitive receiver. Where possible, noisy processes should be carried out within the development to reduce noise spread.

11.3 Construction Traffic

The arrival of delivery vehicles must be properly co-ordinated so only one vehicle is present at a time with a maximum 30 minute stay, and there will be no holding areas permitted.

Vehicles should not be idling unnecessarily and adequate signage must be in place to remind drivers of their responsibility to minimise noise levels as far as practicable.

11.4 Site Hoarding

It is assumed that a continuous site hoarding will be installed around the perimeter of the site both for security and noise protection reasons. Although such a barrier will provide some level of noise attenuation for ground floor receivers, it is unlikely to have a major beneficial effect to receivers above first floor level due to the proximity of nearby noise sensitive receivers to the site.

11.5 Proposed Steps to Minimise Noise and Vibration

Vibration levels

Vibration levels will significantly diminish with distance and geographical attenuation. It is recommended that vibration levels are monitored during excavation/construction.

BS 5228-Part 2: 2009 *Code of practice for noise and vibration on construction and open sites: Vibration* provides criteria for cosmetic damage, as reproduced in Table 11.1 below.

Line (see Figure B.1)	Type of building	Peak component particle velocity in frequency range of predominant pulse	
		4 Hz to 15 Hz	15 Hz and above
1	Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	50 mm/s at 4 Hz and above
2	Unreinforced or light framed structures Residential or light commercial buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

NOTE 1 Values referred to are at the base of the building.

NOTE 2 For line 2, at frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.

Table 11.1: BS 5228-9: 2009 Cosmetic Damage Limits for Vibration

BS 5228-Part 2: 2009 also explains: 'The guide values [in the above table] relate predominately to transient vibration which does not give rise to resonant responses in structures, and to low-rise buildings. Where the dynamic loading caused by continuous vibration is such as to give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values [in the above table] might need to be reduced by up to 50%.

General

- Best practice, as defined in Section 72 of the Control of Pollution Act 1974, in relation to noise and vibration mitigation shall be used at all times during construction.
- Equipment is to be hired from reputable companies who can supply new well-maintained plant.
- Unnecessary revving of engines and motor driven tools is to be avoided.
- Vehicles and plant are to be switched off when not in use.
- Rubber lined chutes and dumpers will be used wherever practicable.
- Drop heights are to be minimised.
- Site vehicles are to be fitted with broadband white noise reversing alarms wherever practicable.
- All movement of plant and vehicles onto and around the site is to take place within permitted working hours.
- Erect solid screens or barriers around the site boundary and use acoustic fencing panels wherever noisy work is taking place.

Plant machinery and equipment.

- The quietest available equipment and methods will be used in conjunction with noise barriers and all practicable mitigation measures.
- The use of percussive breaking equipment will be avoided wherever practicable.
- Noise generating fixed plant shall be located as far from sensitive premises as possible.
- Mechanical generators shall be avoided wherever practicable.
- Electricity driven plant and equipment will be used in favour of diesel or petrol driven plant and equipment wherever practicable.
- Care is to be taken to always select the quietest available equipment, wherever practicable, and to keep that equipment well maintained in accordance with manufacturer's instructions.

- All equipment covered by European Directive 2000/14/EC on the noise emission in the environment by equipment for outdoors is to bear the CE marking and the indication of the guaranteed sound power level (and to be accompanied by an EC declaration of conformity).
- Any equipment not covered by the EU Directive should comply with the generic plant noise emissions in Annex C of BS 5228 and should be properly silenced and maintained in accordance with manufacturers' instructions.
- Plant and equipment in frequent use should be replaced every three years to ensure that noise levels are minimised by using the most efficient and well maintained machinery.

Key construction processes and equipment

- Wherever practicable non-percussive techniques are to be used. Equipment that demolishes structures by crushing, bending, shearing, cutting or hydraulic splitting are to be used wherever practicable. Wherever practicable building elements are to be detached from a structure and lowered to the ground.
- Wherever practicable floor slabs will be broken up using non-percussive techniques and wherever practicable slabs are to be levered from their position and removed from site for breaking up/crushing elsewhere. Where this is not possible slabs are to be cut and separated around their perimeter to isolate the slab from the rest of the structure before breaking up.
- Where percussive breakers are to be used, multiple breakers are to be employed where practicable to minimise the time taken to break up concrete and floor slabs.
- The contractor is to communicate with neighbours to ensure that they are well informed about timing and to minimise disturbance as far as practicable.
- Wherever practicable non-percussive pile reduction techniques are to be utilised.
- Excavation plant will be switched off when not in use and will be subject to regular maintenance and checks and servicing.
- Spoil conveyors will be electrically powered with drive motors located as far from neighbouring properties as practicable and sound insulated. All conveyors must have a service contract to ensure regular maintenance and replacement of worn parts.
- Concrete pours are to take place only within permitted hours. Careful planning will be necessary by the contractor and design team to ensure that the volume of pours make this possible and that sufficient contingency is allowed for potential delays on any given day.

- Steelwork fabrication and cutting is to take place off site wherever practicable. Where this is not practicable cutting and fabricating is to take place within a mobile acoustic enclosure.
- Hydraulic or pneumatic shears are to be used to crop rebar if necessary in preference to angle grinders.
- Electrical generators and air compressors are not to be used during construction unless unavoidable. Where unavoidable these are to be located within the site itself and acoustically screened from neighbouring properties.
- A temporary builder's power supply is to be used from the outset to avoid the need for generators.
- Where generators or compressors must be used the contractor will demonstrate that they are the quietest available super or ultra-silent units incorporating sound attenuating acoustic enclosures or other sound reduction techniques.
- Generators and compressors must be switched off when there is no demand on site.
- Where appropriate generators and compressors must be isolated from adjacent structures to avoid transfer of noise and vibration to adjoining properties.

11.6 Proposed Steps to Minimise Dust Emissions

Risk Assessment

- A detailed dust risk assessment should be undertaken by competent person(s) according to the requirements of the London Plan Supplementary Guidance on The Control of Dust and Emissions During Construction and Demolition.

Site Management

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner and record the measures taken. Make the complaints log available to the local authority when asked.
- Record any exceptional incidents that cause dust and/or air emissions, either on or off site and the action taken to resolve the situation in the log book.
- Hold regular liaison meetings with other high-risk construction sites within 500m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised.

Preparing and maintaining the site

- Plan site layout so that machinery and dust causing activities are located away from receptors as far as is possible. Use intelligent screening where possible
- Erect solid screens or barriers around the site boundary.
- Avoid site runoff of water or mud.
- Keep site fencing, barriers clean.
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. lf they are being re-used on site then re-cover, spraying down with water if possible.
- Depending on the duration that stockpiles will be present and their size, cover, fence or water to prevent wind whipping.

Operating vehicle/machinery and sustainable travel

- Ensure all vehicles switch off engines when stationary.
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
- Implement a Travel Plan that supports and encourages sustainable staff travel {public transport, cycling, walking and car-sharing).

Operations

- Use only cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. Suitable local exhaust ventilation systems.
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible.
- Use enclosed chutes, conveyors and covered skips where practicable.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
- Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Waste management

- Use only registered waste carriers to take waste off site.
- No bonfires or burning of waste materials.

Measures specific to construction

- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
- For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.

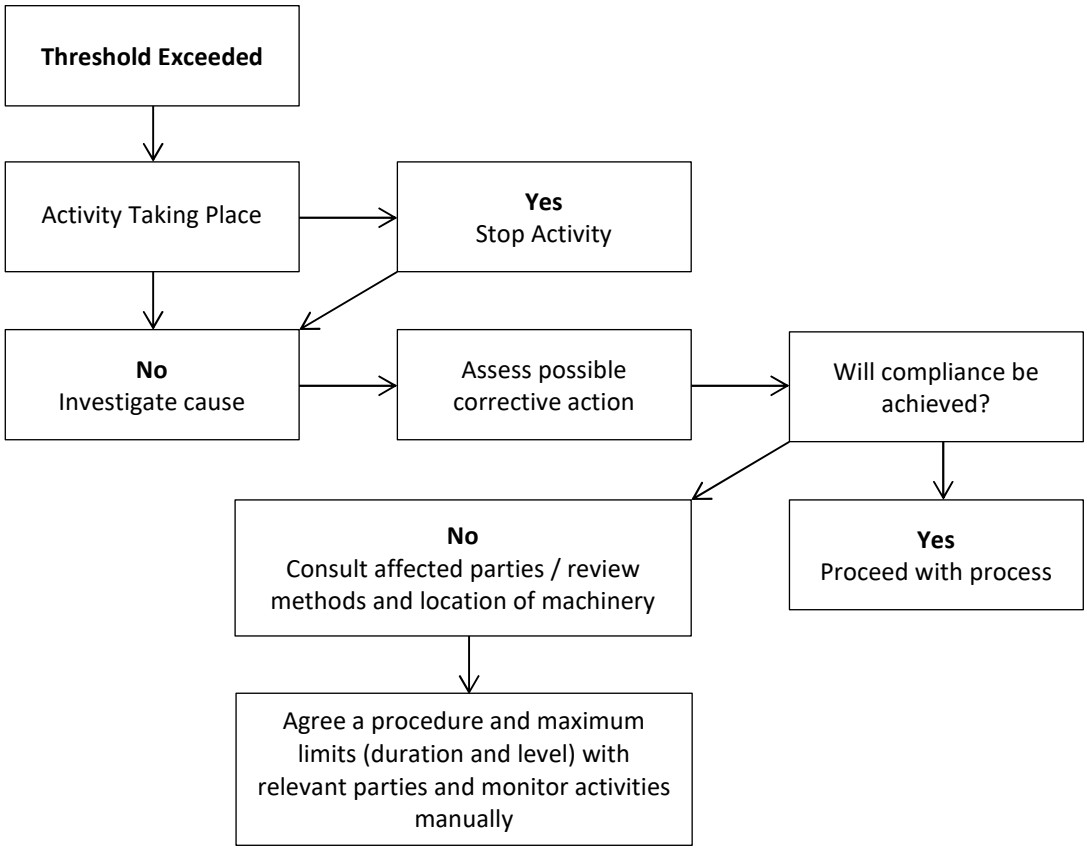
11.7 Publicity and Communication

Good public relations and extensive consultations with local authorities are of paramount importance to minimise the impact of construction work. In particular, local residents will need to be advised that any higher levels of noise will only be for a short period of time and that publicised works schedules will be adhered to.

Careful consideration should be given to occupiers of adjoining properties.

11.8 Incident Procedure

Should the noise criteria agreed with the Local Authority be exceeded during the demolition and construction programme, the following procedure should be followed:



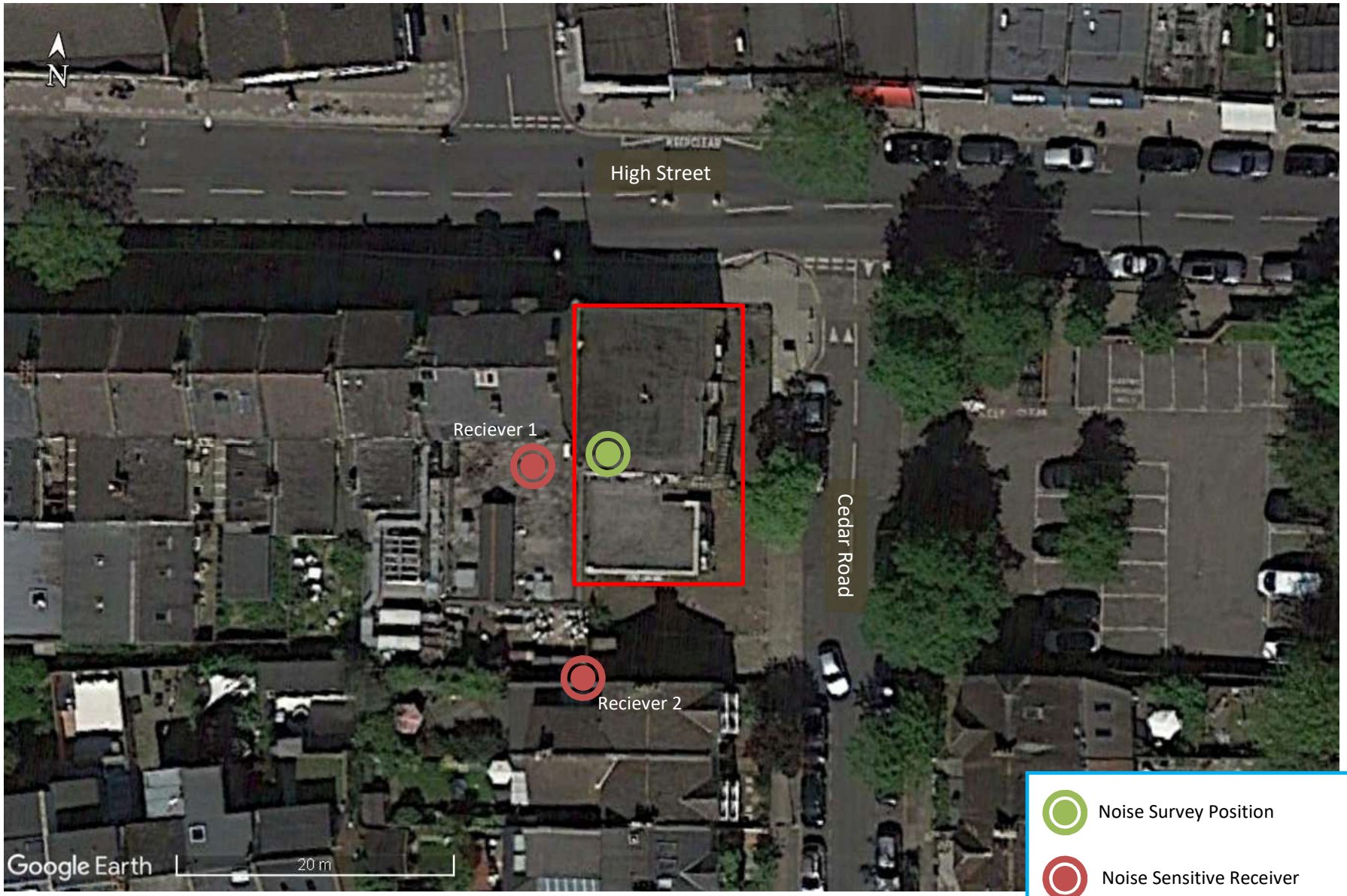
Any exceedances caused and the subsequent action taken should be recorded in a table as follows:

Date	Time	Findings of Investigation and Action Taken

11.9 Complaints Procedure

All complaints to be investigated immediately by site manager for investigation and follow up. Any complaints should be logged as follows:

Date of receipt	Time of receipt	Contact details of complainant	Description of complaint	Date of investigation	Findings of investigation and actions taken

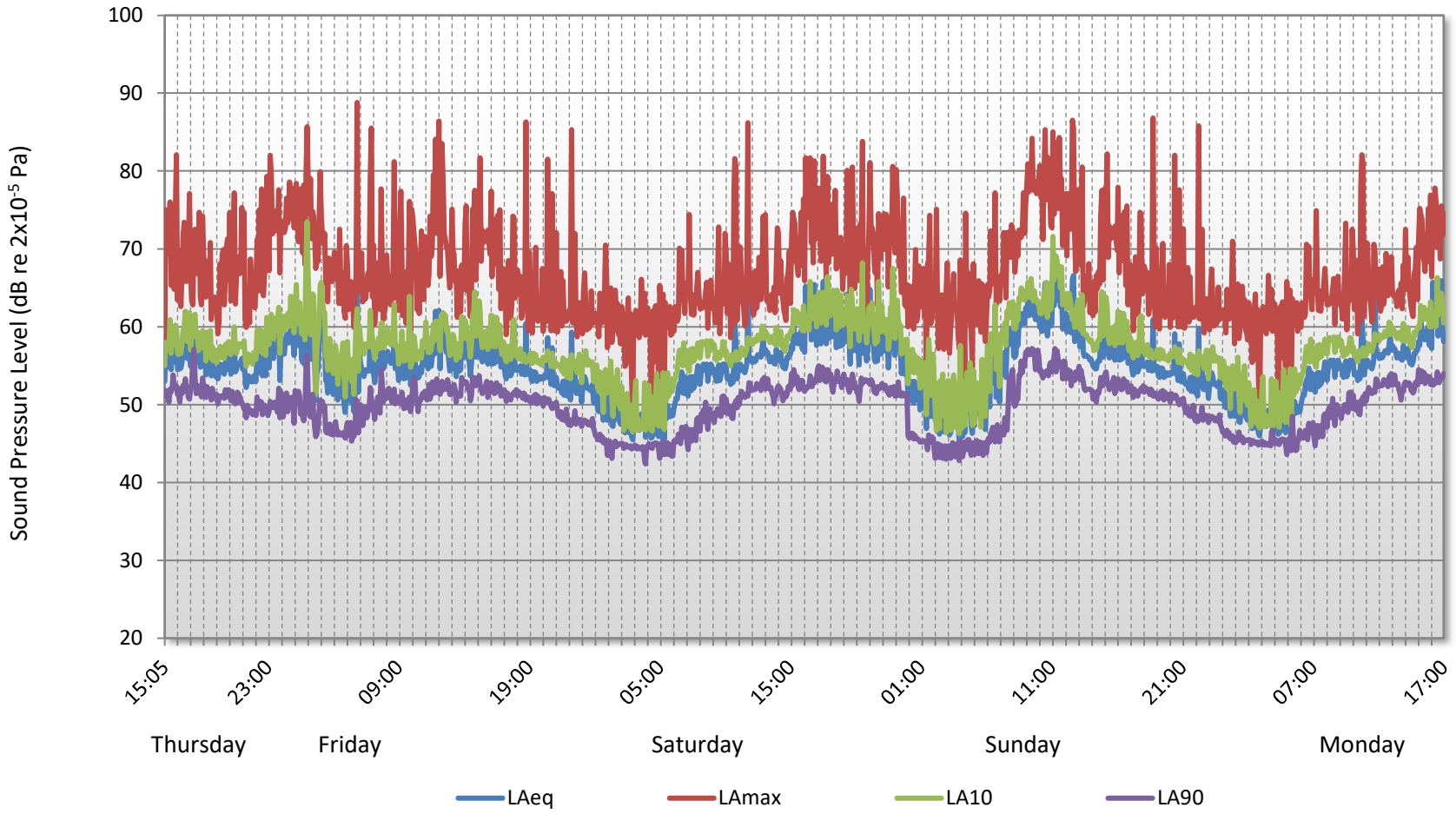


18799-SP1 Indicative site plan indicating noise monitoring position and nearest noise sensitive receivers **Date:** 30 January 2024

42 High Street, Teddington

Environmental Noise Time History

20/9/18 to 24/9/18



18799-TH1

Construction Noise Schedue

18799

42 High Street, Teddington

Activity	Plant/Equipment	No.	% on time	Duration	Screening
Hand Held Breaker	Hand Held Pneumatic Breaker	1	20	3 Days	No
12T Tracked Excavator + Split Bucket Tool	Tracked excavator	1	80	2 Weeks	No
JCB Tracked Excavator and Concrete Breaker Tool	Pulverizer mounted on excavator 29T	1	20	1 Week	No
22cm Disc Cutter	Angle Grinder (grinding steel)	1	20	2 Weeks	No
Mini Tracked Excavator	Mini tracked excavator	1	20	12 Weeks	No
Circular Saw	Hand-held circular saw (petrol-cutting concrete blocks)	2	5	12 Weeks	No
22mm Disc Cutter	Angle Grinder (grinding steel)	1	5	12 Weeks	No
Hand Held Breaker	Hand Held Pneumatic Breaker	1	5	12 Weeks	No
Concrete Pump and Mixer	Concrete mixer truck (discharging) & concrete pump (pumping)	1	10	12 Weeks	No
12T Tracked Excavator	Tracked excavator	1	70	1 Week	No
Circular Saw	Hand-held circular saw (petrol-cutting concrete blocks)	2	20	16 Weeks	No
22cm Disc Cutter	Angle Grinder (grinding steel)	1	20	16 Weeks	No
Hand Held Breaker	Hand Held Pneumatic Breaker	1	5	16 Weeks	No
Concrete Pump and Mixer	Concrete mixer truck (discharging) & concrete pump (pumping)	1	20	16 Weeks	No
Concrete Poker	Poker vibrator	2	20	16 Weeks	No
Compressor and Air Gun	Compressor for hand-held pneumatic breaker	1	1	16 Weeks	No
Circular Saw	Hand-held circular saw (petrol-cutting concrete blocks)	2	30	14 Weeks	Yes
Nail Gun	Nail Gun	4	50	14 Weeks	Yes
Hammer Drill	Drill	2	20	14 Weeks	Yes
Electric Mixer	Small Cement Mixer	2	10	14 Weeks	Yes
Circular saw	Hand-held circular saw (petrol-cutting concrete blocks)	2	10	14 Weeks	Yes

APPENDIX A

GLOSSARY OF ACOUSTIC TERMINOLOGY

dB(A)

The human ear is less sensitive to low (below 125Hz) and high (above 16kHz) frequency sounds. A sound level meter duplicates the ear's variable sensitivity to sound of different frequencies. This is achieved by building a filter into the instrument with a similar frequency response to that of the ear. This is called an A-weighting filter. Measurements of sound made with this filter are called A-weighted sound level measurements and the unit is dB(A).

L_{eq}

The sound from noise sources often fluctuates widely during a given period of time. An average value can be measured, the equivalent sound pressure level L_{eq}. The L_{eq} is the equivalent sound level which would deliver the same sound energy as the actual fluctuating sound measured in the same time period.

L_{10}

This is the level exceeded for not more than 10% of the time. This parameter is often used as a "not to exceed" criterion for noise

L_{90}

This is the level exceeded for not more than 90% of the time. This parameter is often used as a descriptor of "background noise" for environmental impact studies.

L_{max}

This is the maximum sound pressure level that has been measured over a period.

Octave Bands

In order to completely determine the composition of a sound it is necessary to determine the sound level at each frequency individually. Usually, values are stated in octave bands. The audible frequency region is divided into 10 such octave bands whose centre frequencies are defined in accordance with international standards.

Addition of noise from several sources

Noise from different sound sources combines to produce a sound level higher than that from any individual source. Two equally intense sound sources operating together produce a sound level which is 3dB higher than one alone and 10 sources produce a 10 dB higher sound level.

Attenuation by distance

Sound which propagates from a point source in free air attenuates by 6dB for each doubling of distance from the noise source. Sound energy from line sources (e.g. stream of cars) drops off by 3 dB for each doubling of distance.

APPENDIX A

Subjective impression of noise

Sound intensity is not perceived directly at the ear; rather it is transferred by the complex hearing mechanism to the brain where acoustic sensations can be interpreted as loudness. This makes hearing perception highly individualised. Sensitivity to noise also depends on frequency content, time of occurrence, duration of sound and psychological factors such as emotion and expectations. The following table is a reasonable guide to help explain increases or decreases in sound levels for many acoustic scenarios.

Change in sound level (dB)	Change in perceived loudness
1	Imperceptible
3	Just barely perceptible
6	Clearly noticeable
10	About twice as loud
20	About 4 times as loud

Barriers

Outdoor barriers can be used to reduce environmental noises, such as traffic noise. The effectiveness of barriers is dependent on factors such as its distance from the noise source and the receiver, its height and its construction.

Reverberation control

When sound falls on the surfaces of a room, part of its energy is absorbed and part is reflected back into the room. The amount of reflected sound defines the reverberation of a room, a characteristic that is critical for spaces of different uses as it can affect the quality of audio signals such as speech or music. Excess reverberation in a room can be controlled by the effective use of sound-absorbing treatment on the surfaces, such as fibrous ceiling boards, curtains and carpets.