ACOUSTIC DESIGN TECHNOLOGY
Noise and Vibration Consultants

ADT 3371

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THAMES YOUNG MARINERS

ENVIRONMENTAL NOISE IMPACT ASSESSMENT

ACOUSTIC CONSULTANCY REPORT ADT 3371/ENIA

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-	7 October 2022	Joe Mosley	Andrew Lockwood	first issue
A	7 October 2022	Joe Mosley	Andrew Lockwood	minor formatting issues resolved
B	12 October 2022	Joe Mosley	Andrew Lockwood	operating hours updated

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1.0 SUMMARY

Planning permission is being sought for the redevelopment of the Thames Young Mariners site. It is proposed that a new main building is erected with a rooftop plant area comprising two air source heat pumps. Also in the proposal are a number of guest residential blocks and a camping changing block.

Two new aerial ropes courses are to be constructed and the existing climbing wall is to be reprovisioned.

Acoustic Design Technology Limited have undertaken an environmental noise survey to determine the existing ambient noise levels in the vicinity of the site and to obtain representative samples of the existing activities on site.

An assessment of the potential noise breakout from the new activities has been undertaken. Predicted noise levels at the nearby houses were found to be well below the noise levels recommended in WHO for indoor areas and outdoor amenity areas. Also, when viewed in the context of the surrounding area, the noise generated was found to be low in level and not out of character, given the party boat businesses operating in the area and the close vicinity of the site to several sports pitches and a gun range.

Fixed plant installations have not been finalised at this stage, so BS 4142:2014 rating levels are proposed, on a par with the otherwise prevailing background noise levels designed to result in a 'low impact' on the closest noise sensitive properties as defined in the standard.

2.0 BASIS OF ASSESSMENT

2.1 Site Location

The site is located between Riverside Drive and the River Thames in Twickenham, London. Riverside Drive forms the eastern boundary and the River Thames forms the western boundary.

On the other side of Riverside Drive, there is a small area of two storey residential buildings. Beyond the river Thames, there are a number of two storey houses on Mallard Place and Strawberry Vale which overlook the river. Beyond this is St Mary's University London, comprising a number of teaching buildings, two sports pitches, and a student accommodation block. Approximately 7km north west of the site is Heathrow Airport.

To the immediate north and south is Ham Lands, a large nature reserve comprising open fields and woodland. Further along the river to the north, there is Twickenham Rowing Club, as well as various amateur sports pitches and a shooting range. Further down the river to the south, there are more university sports fields, as well as the Lensbury Resort, a conference centre and hotel with a sports pitch and private gardens.

The closest main road is Chertsey Road (A316), which lies approximately 2km north west of the site.

2.2 Proposed Development

Planning permission is being sought for the redevelopment of the Thames Young Mariners site. It is proposed that a new main building is erected with a rooftop plant area comprising two air source heat pumps. Also in the proposal are a number of guest residential blocks and a camping changing block.

Two new aerial ropes courses are to be constructed and the existing climbing wall is to be reprovisioned. The attached site plan 3371/SP2 shows the proposed location of these activities.

Under the current scheme, activities typically cease at 17:00, although during May, June and July, there are occasionally evening sessions which continue until 20:30, with camping in the area indicated on the site plan. This would remain the same under the new development.

2.3 Planning Policy

The National Planning Policy Framework (NPPF) sets out the general terms of reference for sustainable development, including noise. Section 180 of the February 2019 edition states that:

> *Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:*
>
> *a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
>
> *b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and*
>
> *c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.*

For this development the key principle to be applied from the NPPF is to protect existing residents from noise generated by the development.

The Noise Policy Statement for England (NPSE) published in March 2010 establishes the No Observed Effect Level (NOEL), Lowest Observed Adverse Effect Level (LOAEL) and Significant Observed Adverse Effect Level (SOAEL), although these are not linked to objective criteria, as Section 2.22 of the NPSE states:

> *It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times.*

The Ministry of Housing, Communities and Local Government guidance on planning and noise as of July 2019 includes a noise exposure hierarchy table to help determine the NOEL, NOAEL and SOAEL. This is provided in Appendix A.

2.4 Assessment Criteria

The primary guidance on the control of plant noise from new buildings of a commercial or industrial nature is to be found in BS 4142:2014+A1:2019, hereafter to be referred to in the short form BS4142. Please refer to Appendix D for an explanation of the technical terms defined in the standard.

There are no directly applicable standards for the assessment of noise from the new outdoor activities. In the absence of any specific guidance on how the noise is to be assessed, the noise generated has been estimated based on measurements of existing activities and compared with the ambient noise limits recommended in WHO for indoor areas and outdoor amenity areas.

2.5 Nearest Noise Sensitive Properties

The noise sensitive properties in the surrounding area have been grouped into 2 noise sensitive areas (NSA), as described below and as indicated on the attached site plan 3371/SP1.

NSA	Location	Direction	Approximate distance from site boundary (metres)
1	houses on Riverside Drive	east	30
2	houses on Mallard Place	west	90

The above NSA represent the closest noise sensitive properties, with others located further from the site and in some cases screened by the intervening buildings. A satisfactory noise impact at the defined NSA should therefore ensure a satisfactory noise impact at other noise sensitive areas.

2.6 Strategy for Noise Impact Assessment

Based on the information in Sections 2.1 to 2.4 above, the strategy for the noise impact assessment has been broken down into the following stages:

i. undertake an environmental noise survey to obtain background noise data and sample measurements of the activities taking place on site, as described in Section 3.0 below

ii. assess the impact of noise from the new outdoor activities and set BS4142 rating limits for fixed plant, as described in section 4.0 below

3.0 ENVIRONMENTAL NOISE SURVEY

3.1 Purpose

The purpose of the survey was to measure the currently prevailing noise levels representative of the identified noise sensitive areas and to obtain sample measurements of the noise generated by the current activities.

3.2 Scope of Survey

An unattended environmental noise survey was undertaken between 17:00 hours on Wednesday 28 September 2022 and 14:00 hours on Thursday 29 September 2022. Attended measurements were taken on site between the hours of 10:30 and 12:30 on the Thursday collection visit.

3.3 Instrumentation

The instrumentation used, and the field calibration values before and after the survey are detailed in Appendix B of this report.

3.4 Procedure

Five measurement positions were selected as described below and indicated on the attached site plan 2803/SP1:

i. on the site, next to the main entrance at the eastern boundary

ii. on the site, next to the archery range at the western boundary

iii. level with the houses on Mallard Place

iv. on the site, approximately 7 metres from the low ropes course

v. on the site, approximately 12 metres from an instructor and a group of children at the start of an orienteering session

Position 1 was chosen to obtain representative background levels for the houses on Riverside Drive (NSA1). Position 2 was chosen to obtain representative background levels for the houses on Mallard Place (NSA2). Position 3 was chosen to get a closer range reading for the houses on Mallard Place, for the purposes of assessing the character of the sound at this location.

Position 4 was chosen to obtain a sample of the noise generated by the low ropes course. This was the activity considered to be the most similar to the proposed new activities. Position 5 was chosen to obtain a sample of the typical noise generated by an instructor and a group of children at the start of an activity.

At position 1, the microphone was mounted on a pole approximately 1.5 metres above the ground. At position 2, the microphone was mounted on a pole and attached to a tent so that it was approximately 2.5 metres above the ground. At positions 3 and 4, the microphone was mounted on a tripod approximately 1.5 metres above the ground and at least 3 metres from any other acoustically reflective surface.

At positions 1 and 2, measurements were taken continuously for the duration of the survey period using a 01dB Solo sound level meter. At position 3, noise levels were measured for a 25 minute sample period using a Svantek 971 sound level meter. At positions 4 and 5, noise levels were measured for a 10 minute sample period (using a Svantek 971 sound level meter).

All meters were set to store the octave band and A-weighted 100ms short-term L_{eq} levels for subsequent post processing.

3.5 Weather Conditions

As the survey was primarily unattended, it is not possible to provide a detailed description of the weather conditions throughout the entire survey. However, during the setup and collection visits, weather conditions were fine and dry, with no more than a light breeze with similar conditions forecast for the intervening period. It is therefore considered unlikely that the weather conditions had a significant impact on the measured levels.

3.6 Description of Existing Acoustic Environment

As the survey was primarily unattended, it is not possible to provide a detailed description of the noise climate throughout the entire survey. The following description is therefore based on observations during site visits, the shape of the time history graph, and periodic audio samples.

At the eastern edge of the site (position 1), background noise levels were primarily controlled by anonymous distant traffic noise, although occasional noise from vehicles on Riverside Drive and vehicles entering and leaving the site was also audible. On the collection visit, noise from nearby children's activities was audible at this position, although this had little influence on the background levels. Reference to the attached time history graph reveals that the noise levels followed a diurnal pattern typical of an urban environment controlled by traffic noise

At the western edge of the site (position 2), noise levels were initially controlled by a mixture of anonymous distant traffic noise and occasional noise from pedestrians using nearby footpaths.

At around 20:00, the instrument cable was damaged by animals and no data was recorded at this position until 09:45 the following morning, when the recording was resumed. After this point, there was frequent noise from children using the nearby activities, particularly the archery range. Otherwise, the background levels were controlled by anonymous distant traffic noise.

At the houses on Mallard Place (position 3), the noise climate was made up of a number of different sources. Distant traffic made up the background sound level. Outdoor activities from Thames Young Mariners could occasionally be heard, although there was also noise from pedestrians on the footpath, passing planes, birdsong, nearby residents and rowing boats, which created similar levels of noise to the activities taking place on site.

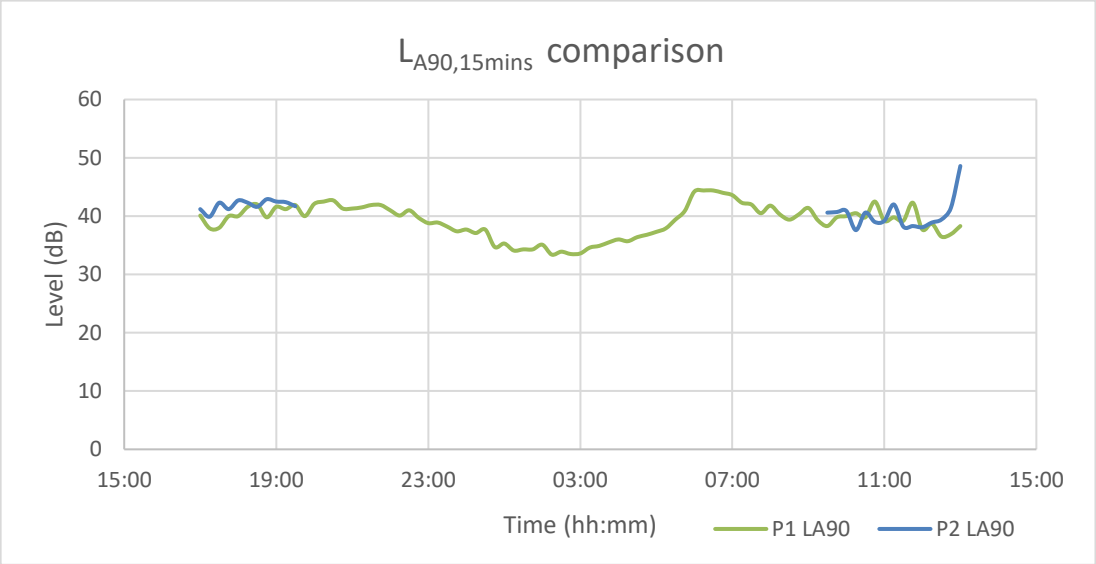
At position 4, the measured levels were controlled by children and instructors using the low ropes course. At position 5, the measured levels were controlled by the raised voices of a single instructor and 11 children at the start of an orienteering session.

3.7 Results

The logged data at positions 1 and 2 have been post processed to determine $L_{Aeq,T}$ $L_{A90,T}$ and L_{Amax} levels for each 15 minute period, and these have been displayed in the attached time history graphs 3371/TH1 and TH2.

Typical day-time and night-time background noise levels have been processed based on statistical analysis of the measured levels at position 1 according to the method described in Section 8.1.4 of BS 4142:2014.

A side by side comparison of the measured $L_{A90,15mins}$ reveals that, for the periods where measurements were taking place at position 2, there was little difference in background levels between the two positions.



Although measurements at position 2 were affected at the very end of the survey period by the close proximity of the microphone to an ongoing archery class, it would be reasonable to conclude that the typical daytime and nighttime background noise levels at each NSA would be similar. Typical background levels for each NSA are displayed in the table below:

Location	Typical L_{A90} dB	
	Day (07:00 - 23:00) $L_{A90,1hour}$	Night (23:00 - 07:00) $L_{A90,15mins}$
NSA1 Houses on Riverside Drive	40	34
NSA2 Houses on Mallard Place	40	34

The noise levels measured at positions 3 and 4 are displayed in the attached table 3371/T1. Please refer to Appendix C for explanation of the noise units and the A-weighting term used in this report.

4.0 NOISE IMPACT ASSESSMENT

4.1 Basis of Assessment

Potential environmental noise emissions from an outdoor education facility include noise breakout from internal activities, outdoor play activities and fixed plant installations.

Internal teaching activities rarely generate sufficient noise to be noticeable at more than a few metres away from the building. As the main building is around 180 metres from the nearby houses, there would be unlikely to be any significant environmental noise impact from internal activities.

Outdoor activities inevitably generate noise, and this will be audible in the surrounding area. Since the site is close to nearby residential areas, an assessment of impact has been undertaken, based on measurements taken on site.

At this stage none of the major fixed plant installations have been selected, so it is not possible to undertake a noise impact assessment of specific equipment. Environmental noise limits have therefore been proposed, which can then be used in the future selection of plant and any associated attenuation.

4.2 Outdoor Activity Noise

There is no standardised method of quantitatively assessing noise levels from outdoor activity areas. However, the WHO gives guidance on suitable ambient noise levels for indoor areas and outdoor amenity areas, as summarised below. These have been used for the assessment of the impact on the surrounding residential properties. Guest accommodation on the site has not been considered, as it will not be in use while activities are taking place.

Specific Environment	Critical Health Effect(s)	$L_{Aeq,16hr}$ (dB)
Outdoor Living Areas	Serious Annoyance daytime and evening	55
	Moderate annoyance, daytime and evening	50
Dwelling, indoors	Speech intelligibility and moderate annoyance daytime and evening	35

A computer model of the area has been constructed in Datakustik Cadna/A 2022 to estimate how the sound will radiate from the new activity areas to the nearest houses. Within the model, all buildings and barriers have been assumed to be acoustically reflective, with ground absorption taken into account as appropriate. Receiver heights have been set at 4.5 metres in line with the first floor bedroom, the most sensitive area within homes.

The existing low ropes course was considered to be the activity most similar to the proposed new activities. The noise measurements of the low ropes course (position 4) have been assumed to be representative of the noise levels generated by the two aerial ropes courses and the climbing wall. For each activity, there was also a point source representing the instructor and a group of children with raised voices (derived from measurements at position 5).

Based on this modelling, there is an estimated noise level of 30 dB $L_{Aeq,1hour}$ at the houses on Riverside Drive (NSA1) and 42 dB $L_{Aeq,1hour}$ at the houses on Mallard Place. These are both well below the WHO criterion of 50 dB $L_{Aeq,T}$ for moderate annoyance. The attached noise map 3371/NM1 shows a screenshot of the modelling and the predicted levels at Mallard Place (NSA2).

It is important to note that the outdoor activity noise will occur only during parts of the daytime and early evening, so the worst-case $L_{Aeq,1hr}$ does not represent the level that would be observed over the full 16 hour period.

Given that the prevailing $L_{Aeq,T}$ around NSA2 (measured at position 3) was approximately 43 dB during the middle of the day, it is considered unlikely that the new activities would bring the overall levels above the lower WHO level for amenity areas over the course of a full day. Assuming that a façade with partially open windows provides a reduction of 15dB to the incident $L_{Aeq,T}$, the resultant internal noise levels would also be consistent with the WHO recommendations.

When these noise levels are viewed in the context of the surrounding area, they appear even more benign. The surrounding area is predominantly urban and contains a large number of other noise sources which are likely to generate greater levels of sound. Reference to Google Maps reveals there are a number of party boat businesses operating in the area. Turks Launches for instance advertise party boats with capacity for up to 150 people, which is likely to have a far greater noise impact on riverside properties than the outdoor activities discussed above. Also, given that outdoor activities are already happening on site, and that this already forms a part of the noise climate in the surrounding area (along with the noise generated by the multiple sports pitches and the gun range discussed in Section 2.1), any additional activity noise would not be out of character. It is therefore reasonable to conclude that, although the noise may be occasionally audible, the impact of the proposal would be minimal. According to the planning guidance, this should equate to 'no observed adverse effect'.

4.3 Noise Limits

As described in Section 2.4 above, it is proposed that plant noise is assessed using the BS 4142 method, and a rating level on a par with the typically prevailing background level is defined as a 'low impact'. Proposed noise limits for fixed plant are therefore as follows:

Recommended BS 4142:2014+A1:2019 rating level limits for fixed plant		
Location	Day (07:00 - 23:00) $L_{A90,1hour}$	Night (23:00 - 07:00) $L_{A90,15mins}$
NSA1 Houses on Riverside Drive	40	34
NSA2 Houses on Mallard Place	40	34

Following selection of the new plant, cumulative noise levels can be calculated at the various noise sensitive areas and checked against the above limits. According to the planning guidance, this should equate to 'no observed effect'.

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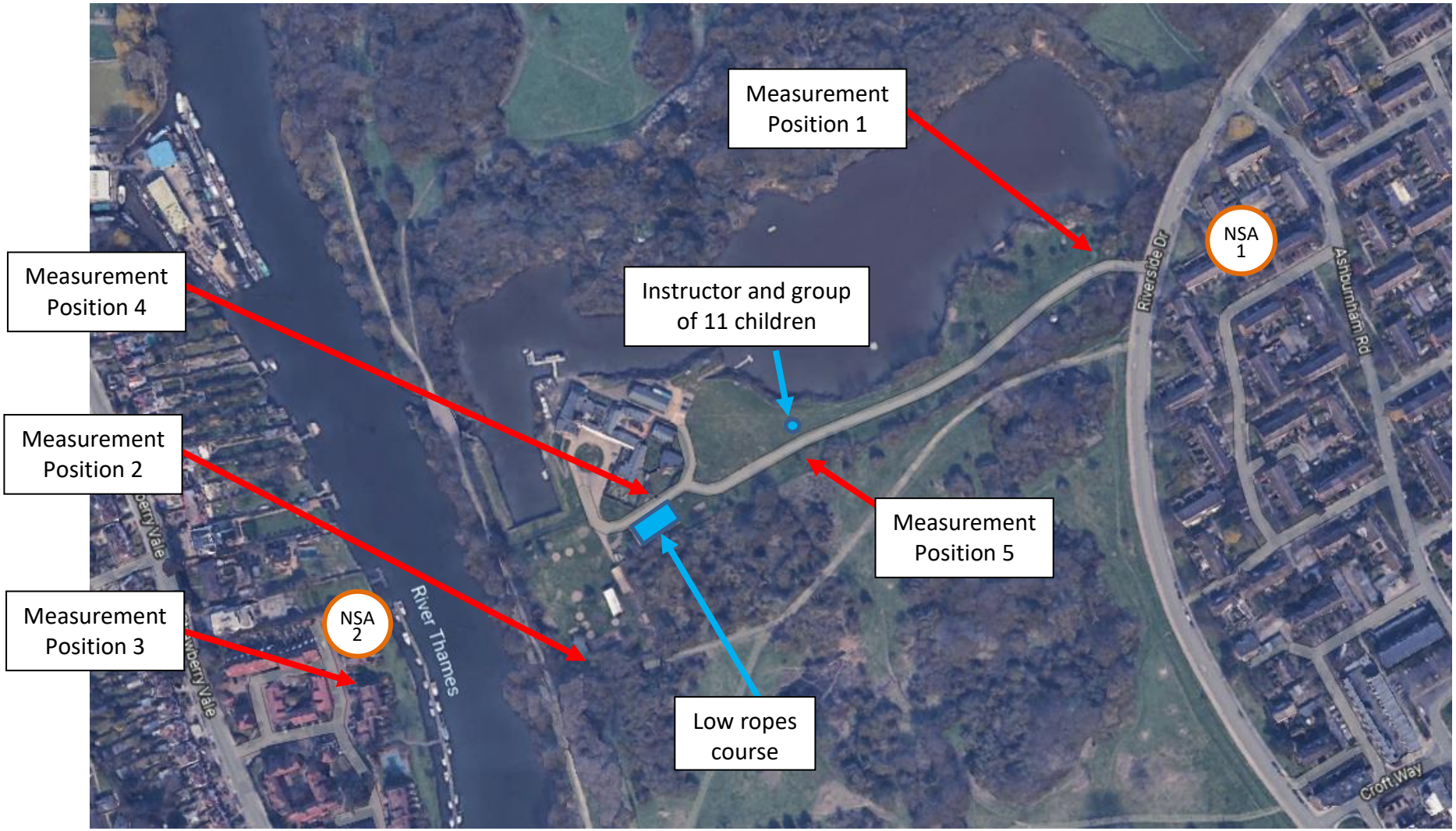

Notes	**Description** Site Plan Showing Noise Monitoring Locations, Noise Sensitive Areas and Measured Noise Sources	
	Project Thames Young Mariners	
	Survey Date 28-29th September 2022	**Drawing No.** 2803/SP1

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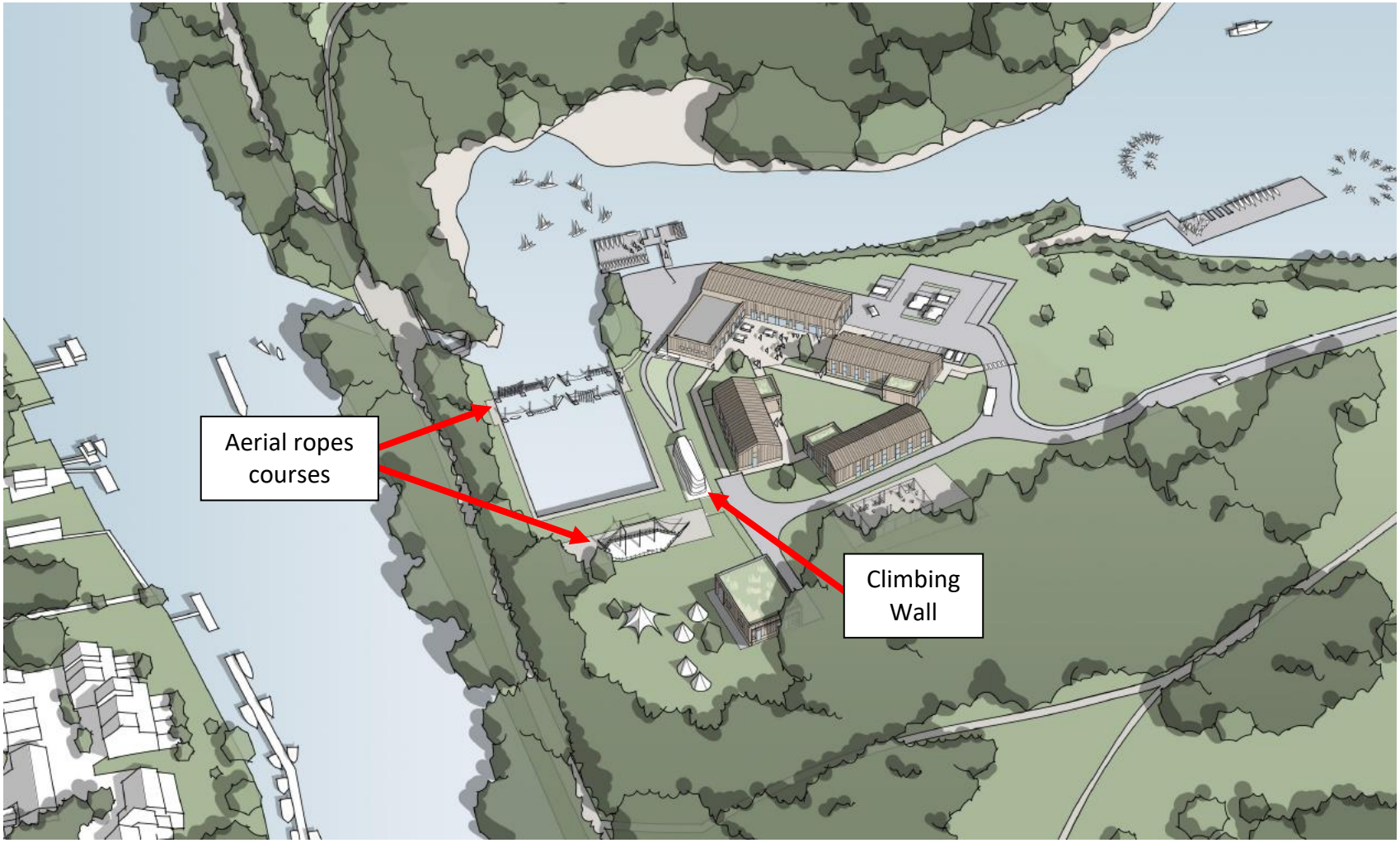

Notes	Description	
	Site plan showing proposed location of new areal ropes courses and climbing wall	
	Project	
	Thames Young Mariners	
	Survey Date	**Drawing No.**
	28-29th September 2022	2803/SP2

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Notes	**Description** Noise map showing indicative noise levels generated by the proposed activities	
	Project Thames Young Mariners	
	Survey Date 28-29th September 2022	**Drawing No.** 3371/SK1

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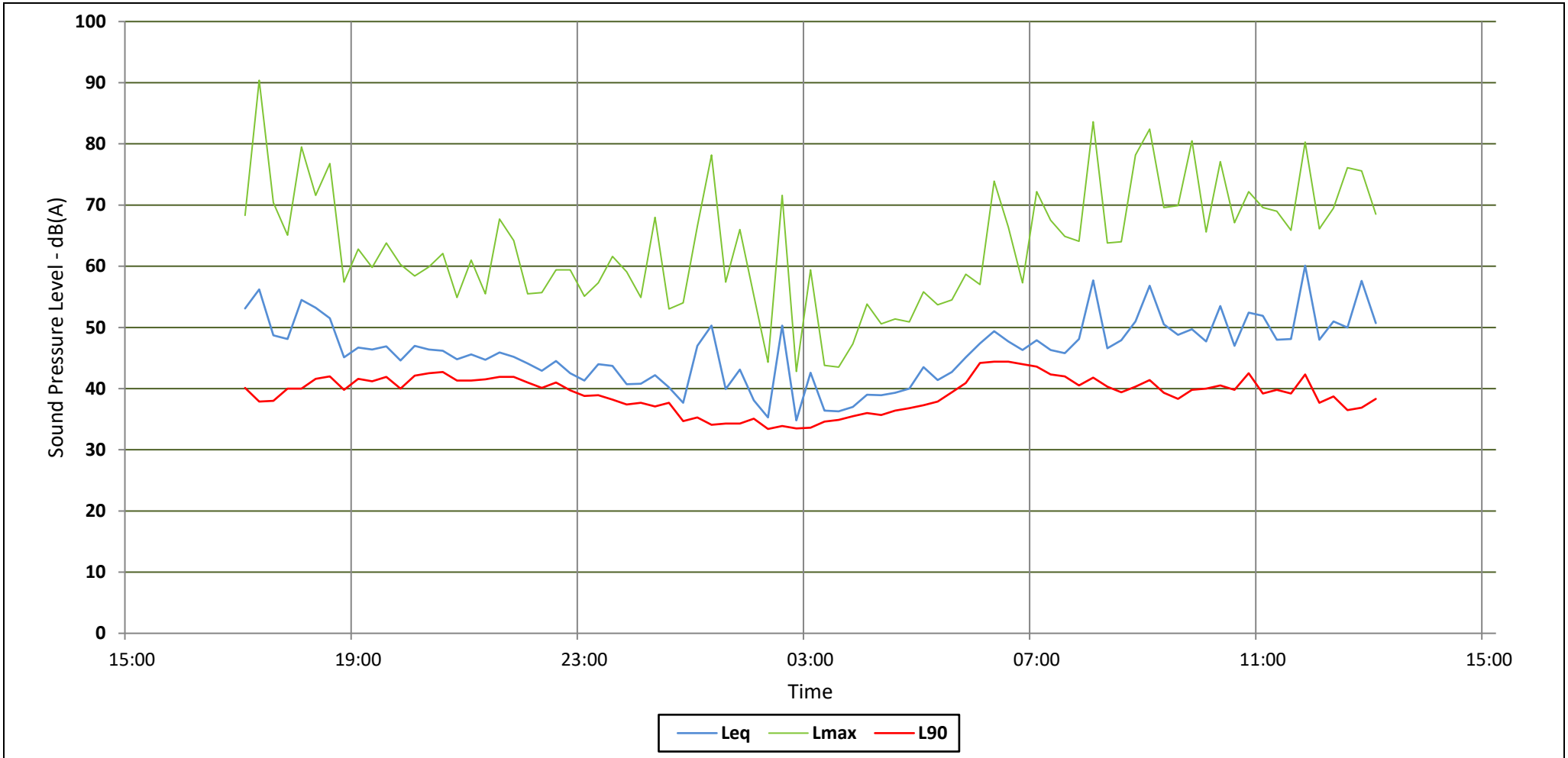

Notes	**Description** Time History Graph – Measurement Position 1	
	Project Thames Young Mariners	
	Survey Date 28th to 29th September 2022	**Drawing No.** 3371/TH1

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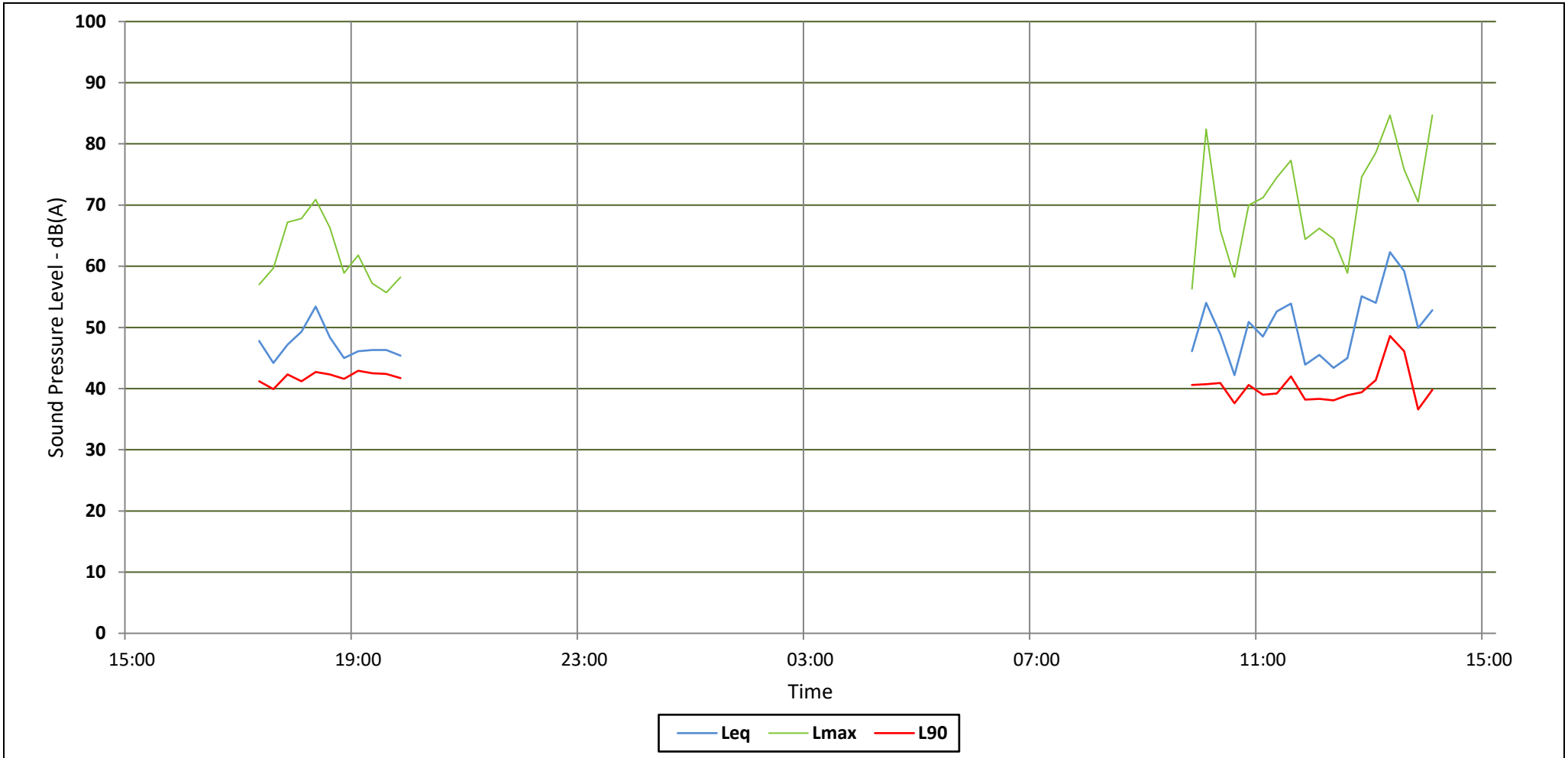

Notes	**Description** Time History Graph – Measurement Position 2	
	Project Thames Young Mariners	
	Survey Date 28th to 29th September 2022	**Drawing No.** 3371/TH2

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SURVEY RESULTS (OCTAVE BAND TIME HISTORY)

Location	Time	$L_{eq,T}$ (dB) at octave band centre frequency (Hz)								$L_{Aeq,T}$ dB	$L_{Amax,T}$ dB	$L_{A90,T}$ dB
		63	125	250	500	1k	2k	4k	8k			
Position 3	29th September 12:06 to 12:32	53	47	43	40	38	35	31	26	43	65	39
Position 4	29th September 11:02 to 11:12	49	49	46	49	51	46	39	30	54	73	39
Position 5	29th September 10:31 to 10:41	51	48	51	51	51	45	39	30	54	72	41

TABLE 2803/T1

APPENDIX A

NOISE EXPOSURE HIERARCHY TABLE

Perception	Examples of Outcomes	Increasing Effect Level	Action
No Observed Effect Level			
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, 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 perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, 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 awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

APPENDIX B – INSTRUMENTATION

Manufacturer	Type and / or Model	Serial Number	Last Laboratory Calibration	Calibrator Output (dB)	Free Field Correction (dB)	Initial reading (dB)	Final reading (dB)
01dB	(Black) Solo Class 1 Sound Level Meter	65201	November 2021				
01dB	PRE 21 S Pre-Amplifier	15619	November 2021		-0.10	113.9	114.0
01dB	MCE 212 ½ inch Microphone	101204	November 2021				
01dB	(Blue) Solo Class 1 Sound Level Meter	60320	July 2021				
01dB	PRE 21 S Pre-Amplifier	16866	July 2021		-0.1	113.9	113.9
01dB	MCE 212 ½ inch Microphone	90549	July 2021				
Svantek	Svan 971 Class 1 Sound Level Meter	34392	October 2021				
ACO	7052E ½ inch Microphone	54655	October 2021		-0.13	113.86	113.83
Svantek	SV18 Preamplifier	32179	October 2021				
Norsonic	Nor1251 Calibrator (Cal 4)	33453	February 2022	113.99			

APPENDIX C

Acoustic Terminology

The annoyance produced by noise is dependent upon many complex interrelated factors such as 'loudness', its frequency (or pitch) and any variations in its level. In order to have some objective measure of the annoyance, scales have been derived to allow for these subjective factors.

A-weighting — The human ear is more susceptible to mid-frequency noise than the high and low frequencies. To take account of this when measuring noise, the A-weighting scale is used so that the measured noise corresponds roughly to the overall level of noise that is discerned by the average person. It is also possible to calculate the A-weighted noise level by applying certain corrections to an un-weighted spectrum.

When the noise being measured has variable amplitude, such as traffic noise, it is necessary to qualify the basic dB unit. This may be done using a statistical index L_n dB, where n is any value between 0 and 100, and is the percentage of the sample time for which the stated level is exceeded. In defining the use of the index, both the value of n and the length of the sample period must be stated.

L_{10} — L_{10}, being the level exceeded for 10% of the time, has been shown to be a good indicator for traffic noise intrusion, and is used in assessing the effect of traffic noise on residential or commercial premises.

L_{90} — L_{90} is the level exceeded for 90% of the time, and is used as a measure of background noise level, as it excludes the effects of occasional transient levels, such as individual passing cars or aircraft.

In addition to the statistical noise indices defined above, the following noise units are also used to define variable amplitude noise sources:

$L_{eq,T}$ — $L_{eq,T}$ is defined as the notional steady sound pressure level which, over a stated period of time, would contain the same amount of acoustical energy as the actual fluctuating sound measured over the same period. In other words, it is a measure of the "average" noise level

L_{max} — L_{max} is the maximum time-weighted sound pressure level recorded over the stated time period

APPENDIX D

Definitions from BS 4142 : 2014

reference time interval, T_r

specified interval over which the specific sound level is determined (1 h during the day, and 15 min during the night)

specific sound level, $L_{Aeq,Tr}$

equivalent continuous A-weighted sound pressure level produced by the specific source at the assessment position produced over a given reference time interval, T_r

rating level, $L_{At,Tr}$

specific sound level plus any adjustment for the characteristic features of the sound

background noise level, $L_{A90,T}$

see Appendix C