Appendix H Noise Impact Assessment

REF: L1114.1 V1

RED TWIN LIMITED
Consultants in Acoustics

Mr Richard Loveridge
Patchway Town Council
Callicroft House
150 Rodway Road
Patchway
BRISTOL
BS34 5DQ

The Red Suite, 1st Floor
Aztec Centre
Aztec West
Almondsbury
BRISTOL BS32 4TD

T: 01454 203777
www.redtwin.co.uk

25th March 2019

RE: SCOTTS PARK (PATCHWAY SPORTS & SOCIAL) – PROPOSED ALL WEATHER PITCH ASSESSMENT OF NOISE IMPACT

Dear Mr Loveridge,

Following our recent correspondence, we are writing to you with respect to the above, to document our assessment of noise impact.

The proposal includes the removal of an existing dilapidated hard-court play area, and replacement with a slightly larger new all-weather synthetic grass playing surface.

The subject of this assessment is the noise impact of the proposed facility on neighbouring noise sensitive properties.

We understand the new facility will only be permitted to operate during normal daytime hours.

The existing hard court area has permission to operate in a very similar manner to the proposed new facility and this has been taken into context in our assessment.

Our assessment of noise impact from the new noise facility is based on available guidance and relevant British Standards.

1.0 AVAILABLE GUIDANCE FOR ASSESSMENT OF NOISE IMPACT…

1.1 Noise Policy Statement For England (2010)

The NPSE seeks to clarify the underlying principles and aims in existing policy documents, legislation and guidance that relate to noise. The statement applies to all forms of noise, including environmental noise, neighbour noise and neighbourhood noise.

The statement sets out the long-term vision of the government's noise policy, which is to

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

This long term vision is supported by three aims:

"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."

The long-term policy vision and aims are designed to enable decisions to be made regarding what is an acceptable noise burden to place on society.

The Explanatory Note within the NPSE provides further guidance on defining 'significant adverse effects' and 'adverse effects' using the following concepts:

No Observed Effect Level (NOEL) – the level below which no effect can be detected. Below this level no detectable effect on health and quality of life due to noise can be established;

Lowest Observable Adverse Effect Level (LOAEL) – the level above which adverse effects on health and quality of life can be detected; and

Significant Observed Adverse Effect Level (SOAEL) – the level above which significant adverse effects on health and quality of life occur.

The three aims can therefore be interpreted as follows:

- The first aim is to avoid noise levels above the SOAEL;
- The second aim considers situations where noise levels are between the LOAEL and SOAEL. In such circumstances, all reasonable steps should be taken to mitigate and minimise the effects. However, this does not mean that such adverse effects cannot occur; and
- The third aim considers situations where noise levels are between the LOAEL and NOEL. In these circumstances, where possible, reductions in noise levels should be sought through the pro-active management of noise.

The NPSE recognises that it is not possible to have single objective noise-based measures that define the SOAEL, LOAEL and NOEL that are applicable to all sources of noise in all situations. The levels are likely to be different for different noise sources, receptors and at different times of the day.

1.2 Planning Practice Guidance (2014)

The national Planning Practice Guidance (PPG) *"advises on how planning can manage potential noise impacts in new development"* and provides guidelines that are in line with the NPPF.

The PPG states that local planning authorities should take account of the acoustic environment and in doing so consider:

"Whether or not a significant adverse effect is occurring or likely to occur;
Whether or not an adverse effect is occurring or likely to occur; and
Whether or not a good standard of amenity can be achieved."

This guidance introduced the concepts of NOAEL (No Observed Adverse Effect Level), and UAEL (Unacceptable Adverse Effect Level). Further details are provided in Table 1.

Perception	Examples of Outcomes	Increasing Effect Level	Action
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 through use of appropriate mitigation whilst taking into account the social and economic benefit
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 through use of appropriate mitigation

TABLE 1: SUMMARY OF PLANNING PRACTICE GUIDANCE ASSESSMENT CRITERIA

Factors to be considered in determining whether noise is a concern are identified including the absolute noise level of the source, the existing ambient noise climate, time of day, frequency of occurrence, duration, character of the noise and cumulative effects.

With particular regard to mitigating noise effects on residential developments, the PPG highlights that effects may be partially off-set if residents have access to a relatively quiet façade as part of their dwelling or a relatively quiet amenity space (private, shared or public).

1.3 Local Authority Guidance

We have reviewed the South Gloucestershire Council's guidance on noise in the context of planning.

The council policy on noise and planning is set out in Specific Guidance Note 1 *Planning and Noise.*

Of particular relevance is section 7.3 Sports and Recreational which states the following:

> *Proposals for sports and recreational facilities must consider any guidance or best practice advice available for the type of sport proposed to take place at the facility.*

There is no specific guidance relating to sporting facilities in the local guidance document. In the absence of specific guidance, we have followed what is, in our opinion, the most relevant guidance for the situation.

1.4 World Health Organisation 'Guidelines For Community Noise'

The World Health Organisation 'Guidelines for Community Noise' published in 1999 gives the following description of community noise,

> *Community noise (also called environmental noise, residential noise or domestic noise) is defined as noise emitted from all sources except noise at the industrial workplace. Main sources of community noise include road, rail and air traffic, industries, construction and public work, and the neighbourhood. The main indoor sources of noise are ventilation systems, office machines, home appliances and neighbours. Typical neighbourhood noise comes from premises and installations related to the catering trade (restaurant, cafeterias, discotheques, etc.); from live or recorded music; sport events including motor sports; playgrounds; car parks; and domestic animals such as barking dogs.*

This definition is considered to include noise related to sports, such as the use of the proposed new facility.

For brevity we have not discussed the standards in this document since they are repeated within the Sport England guidance summarised in section 1.5, and British Standard 8233 summarised in section 1.7.

1.5 Sport England Guidance

Sport England have produced a *Design Guidance Note* giving advice and recommendations in the planning of new AGPs (Artificial Grass Pitches).

The document *Artificial Grass Pitch (AGP) Acoustics – Planning Implications* is intended to offer a consistent approach for local authority noise assessments, and to provide limits that might be set for proposals adjacent to sensitive residential areas.

Within section 3 of the guidance, there is reference to World Health Organisation '*Guidelines for Community Noise*', and confirms

> *Based on a 15 decibel sound reduction of a partially open window, the noise level outside a residential property during the daytime about 1 metre from façades of living spaces should not exceed 50 dB* L_{Aeq}.

The WHO document also provides guidance for outdoor living areas. It states that to avoid 'moderate annoyance' during the daytime and evening the noise level should not exceed 50 dB $L_{Aeq(T)}$.

World Health Organisation guidelines for residential development are typically calculated over a 16 hour daytime period. For an artificial grass pitch, a 16 hour assessment period may not truly reflect the noise impact as it takes into account times of use and non-use.

It is suggested an appropriate assessment time period is for one hour, $L_{Aeq(1\ hour)}$ as this is typically the time period for a community sports session on an AGP.

This WHO criteria was reviewed in a report by the National Physical Laboratory (reference CMAM16) which states:

> *Exceedance of the WHO guideline values does not necessarily imply significant noise impact and indeed, it may be that significant impacts do not occur until much higher levels of noise exposure are reached*

Therefore it is not necessarily the case that where these levels are exceeded, the noise will adversely affect nearby residential properties.

1.6 British Standard 4142:2014

This standard is intended for use in a specific set of circumstances. The scope of the document states the following,

> ***"1.1** This British Standard describes methods for rating and assessing sound of an industrial and/or commercial nature…*

There are several specific exclusions to the scope of this standard which are stated to be as follows,

> ***"1.3** …The standard is not intended to be applied to the rating and assessment of sound from:*
>
> *a) recreational activities, including all forms of motorsport;*
>
> *…*

In our opinion the proposed use of the sports facility is outside of the scope of this assessment methodology and BS4142 has not been used.

1.7 British Standard 8233:2014

This standard is intended for use in a specific set of circumstances. The scope of the document states the following,

> *"This British Standard provides guidance for the control of noise in and around buildings. It is applicable to the design of new buildings, or refurbished buildings undergoing a change of use, but does not provide guidance on assessing the effects of changes in the external noise levels to occupants of an existing building.*
>
> *This British Standard does not cover:*
>
> *a) specialist applications, such as auditoria and cinemas (for cinemas, see BS ISO 9568);*
> *b) vibration control, except where it is evident in the form of radiated sound; or*
> *c) noise that breaks out from the building that might affect external receptors."*

At face value, it would seem that the standard is not appropriate for this assessment. However, this document defines a set of indoor noise levels for residential property which are used for all manner of assessments of residential properties and hence are considered to be of relevance.

The standard provides criteria for an appropriate indoor noise within a residential property, and desirable noise levels in external amenity space which are taken from the WHO Community Noise Guidelines 1999.

In general, for steady external noise sources, it is desirable that the internal ambient noise level does not exceed the guideline values in Table 2.

Activity	Location	Day Time Hours 07:00 to 23:00	Night Time Hours 23:00 to 07:00
Resting	Living Room Indoors	35 dB $L_{Aeq,16hour}$	--
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	--
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

TABLE 2: BS8233:2014 RECOMMENDED RESIDENTIAL INDOOR NOISE LEVELS FOR STEADY NOISE

There are numerous footnotes to this table. Of relevance to this assessment are the following which state,

> *NOTE 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved."*

The levels set out in Table 2 are considered to be the LOAEL, below which there is expected to be no adverse effect due to noise.

As stated in the footnote, increases to these levels of up to 5 dB(A) would be considered acceptable and so an increase to these values of 5 dB would form the SOAEL.

Furthermore, we would expect neighbouring dwellings to achieve reasonable internal noise levels with ventilation being provided at a normal rate, typically this would be with windows open.

It is normal to expect a 10-15 dB(A) reduction through an open window and hence by taking the lesser attenuation figure, we would not expect noise from new sources to exceed 45 dB(A) L_{Aeq} measured 1 m from the external building façade where there is an opening window. This is more onerous than the external noise level derived by Sport England.

The standard also provides the following guidance for consideration of noise in external amenity spaces, stating the following,

> *"7.7.3.2 Design criteria for external noise*
> *For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB LAeq,T, with an upper guideline value of 55 dB LAeq,T which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development*

should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited."

The time period T used in consideration of external amenity space is not stated in BS8233, however we understand the values have been taken from the World Health Organisation Community Noise Guidelines 1999 which use a 16-hour daytime period between 07:00 to 23:00.

The design standards cited above are commensurate with a "good" standard of amenity. They do not suggest a noise source will be inaudible, but they provide a quantitative basis to assess the quality of outdoor space. Clearly it would be impractical to apply the above limits to a situation which already experienced noise exposure above the guideline levels.

In relation to external amenity noise levels the LOAEL threshold is considered to be external noise levels of 50 dB(A) $L_{Aeq,16hr}$, below which no adverse effects are expected; and the threshold for the SOAEL is considered to be external noise levels of 55 dB(A) $L_{Aeq,16hr}$.

1.8 Noise Level Change Guidance

The findings of the IOA/CIEH working party are currently in draft form although we understand the principles have been accepted at enquiry and are of assistance to this assessment.

The draft guidelines state that for any assessment, the noise level threshold and significance should be determined by the assessor, based upon the specific evidence and likely subjective response to noise, the impact scale adopted in this assessment is shown in Table 3.

Change in Noise Level dB(A)	Subjective Response	Significance
0	No change	No impact
0.1 – 2.9	Barely perceptible	Minor impact
3.0 – 4.9	Noticeable	Moderate impact
5.0 – 9.9	Up to a doubling or halving of loudness	Substantial impact

TABLE 3: GUIDELINES FOR CONSIDERATION OF NOISE IMPACT DUE TO CHANGES IN LEVEL

2.0 SIGNIFICANCE OF NOISE IMPACTS...

Sensitive receptors are understood to include residential property around the perimeter of the proposed site. Residential property is classed as having a high sensitivity to noise.

The following terminology has been used to define noise effects:

Adverse – detrimental or negative effects to an environmental resource or receptor;
Negligible – imperceptible effects to an environmental resource or receptor; or
Beneficial – advantageous or positive effects to an environmental resource or receptor.

Where adverse or beneficial noise effects have been identified, these are described using the following scale:

Minor – slight, very short or highly localised effect;
Moderate – limited effect (by extent, duration or magnitude), which may be important at a local scale; or

Major – considerable effect (by extent, duration or magnitude) of more than local significance or in breach of recognised acceptability, legislation, policy or standards.

As the proposed use of the site is permanent, the duration of noise effects is defined as **Long-term** which is a period lasting for longer than 2 years.

Table 4 provides a matrix showing the significance of effects depending on the sensitivity of receptors and magnitude of impact.

Sensitivity of Receptor	Significance of Effect Depending on Magnitude of Impact			
	High	**Medium**	**Low**	**Very Low**
High (Residential)	Major	Moderate	Minor	Negligible

TABLE 4: SIGNIFICANT OF EFFECTS MATRIX

Generally, effects classed from negligible to minor are considered to be insignificant, whereas effects classed from moderate to major are considered to be significant. However, final determination of whether effects are likely to be significant is made following the classification of effects and using professional judgement. These include consideration of the duration, frequency and likelihood of noise effects and whether they are temporary or permanent and the area and number of receptors affected.

It is noted that the extent of effects due to the proposed MUGA will have an effect localised on the nearest neighbouring properties. On this basis the default scale of the impact would be **minor** which is not expected to be significant.

3.0 MEASURED SOUND LEVELS...

3.1 Measurement Methodology

All outdoor noise measurement has been conducted in full accordance with ISO 1996 and BS EN ISO 7445 Parts 1 and 2, as well as the ANC Green Book Guidelines, BS8233 and BS4142.

3.2 Pre-Development Background & Ambient Sound Levels

We understand the intention is to operate the new facilities during the normal daytime hours which are defined in BS8233 to be between 07:00 to 23:00.

There are no restrictions on the minimum duration of measurement of the *Background Sound Level* in BS4142, albeit to say they should represent the "*Typical*" level when the new noise source will be in operation.

The definition of "typical" has been inferred in BS4142 to be the most common value of the $L_{A90,1hr}$ experienced during the day time (07:00 to 23:00).

The *Ambient* and *Background Sound Level* at the nearest neighbouring properties includes contributions from distant road traffic on the main local roads and A38, but also the M5, bird song, existing users of the sports facilities and normal domestic sounds of people. These dominant sources of sound set the context for the assessment of noise impact.

It is noted that the currently permitted use of the sports fields includes the use of the dilapidated hard courts which are to be replaced. During our survey we noted children playing basketball on the courts, and we understand that on weekends the grounds host local football matches.

The sound of the existing uses is not well represented in the measurements of *Background Sound Level* because these uses were not occurring at the time of the survey. The measured sounds are therefore not fully reflective of the currently permitted uses and hence are artificially low which represents a more onerous assessment of noise impact.

We have undertaken measurements of the *Ambient* and *Background Sound Level* in a representative location of the nearest noise sensitive neighbours over an extended period. The locations of the measurement equipment are indicated in Appendix A and can be summarised as follows,

Location 1 The measurement position was within the garden of No 64 Windermere Road, Patchway BRISTOL, BS34 5PR at 1 m from the façade, and tripod mounted at 1.5 m above local ground level. The location is representative of the rear elevation of housing along Windermere Road.

A summary of the processed data is shown in Table 5.

Survey Location	Period	Ambient Sound Level dB(A) $L_{Aeq,16hr}$	Most common Background Sound Level dB(A) $L_{A90,1hr}$
Location 1	Day 07:00-23:00	53	46

TABLE 5: SUMMARY OF BASELINE SOUND LEVELS

We have assessed the uncertainty associated with the measurement of the *Background Sound Level* based on the measurement tolerance of a Class 1 sound level meter which conforms with IEC61672-1:2002. The largest calculated uncertainty based on the frequency spectrum of the measured *Background Sound Level* is ±1 dB(A). We have included the measurement uncertainty in our assessment.

4.0 MODELLING OF SPORTS FACILITIES...

4.1 Sport England Guidance

We have followed the guidance provided by Sport England to assess the noise emission from the proposed sports facility.

The representative noise level for an artificial grass pitch is stated to be 58 dB(A) $L_{Aeq,1hr}$ at a distance of 10 m from the side-line halfway marking. The measurements were taken at 1.5 m above local ground level. The accompanying explanation states,

> *"Noise levels were measured during nine sports sessions on three separate AGPs. The sessions included football, hockey and rugby and participation by men, women and children. The purpose was to determine a 'typical' noise level generated from a 'typical' AGP sports session."*

It should be noted that the "typical" noise levels provided suggest that elevated and reduced noise emission levels are possible depending on the activity. Due to the difficulty in assessing the noise

generated by people we are of the opinion that this is the correct approach but stress that using the principle of a "typical" use does not guarantee the noise levels will be acceptable at all times.

The noise level for an AGP was determined from measurements at existing facilities which were of greater area than the proposed MUGA, typically accommodating a full size football pitch.

To obtain a representative level for the smaller MUGA proposed we have modelled a full size football pitch in free-field conditions (i.e. with no reflecting surfaces such as building or fences near by) in accordance with the Sport England guidance, and used this to ascertain the level of noise generated per square meter of sports field.

Although it is not stated in the guidance, we are aware of the preparatory work undertaken by Sport England and understand that research was undertaken into how best to model the sound of people moving about a sports pitch. It was determined that the most appropriate method for modelling noise emission is to use an "area source" which covers the whole playing surface. Our modelling uses an area source with a spacing between sources of 2 m.

An image of our model for a full size AGP, based on the Sport England guidance is provided in the appendix Figure 6.

It should be noted that in the worst case (e.g. a very one-sided match) where all players are concentrated into one part of the facility, the noise emission would also be concentrated and have a detrimental effect on receptors in closer proximity to that end of the pitch.

The worst cases highlighted, (e.g. noisier uses, uneven distribution of players) would be expected to average out in the long-term, and in our opinion, it is the long-term impact which should be considered when planning the feasibility of proposals such as this.

The hours of community use of the MUGA are likely to be 17:00 to 22:00 weekdays and 09:00 to 17:00 on weekends.

4.2 Existing Facility

The existing hard play area has the potential to be used for sports, as do the grassed areas surrounding it.

These existing facilities are therefore capable of generating noise, which in our opinion should be included in the soundscape to form a judgement on the impact.

In order to assess the noise impact, we have generated a model of the existing facilities, which is based on the emissions levels (per square meter) stated in the Sport England guidance.

Our modelling is based on detailed CAD information made available to us.

Full details of the modelling and results are provided in the appendix.

4.3 Proposed Facility

Following the same method used to model the existing facility, we have also modelled the proposed new MUGA.

The modelling has not included any barriers or screens to the perimeter of the MUGA.

Full details of the modelling and results are provided in the appendix.

5.0 ASSESSMENT PARTICULARS...

5.1 Assessment Location

We have identified the worst-case residential neighbours within the locality using an exploratory run of our site noise model which is described in more detail in the appendix.

The assessment of noise impact has been undertaken at the most affected sensitive receptors as follows,

> Receiver No 1 – No 58 Windermere Road, Patchway BRISTOL BS34 5PR. The property is a two-storey dwelling with opening windows facing the park. The assessment location is 1 m from the façade of the building at 4 m above ground level to represent the first-floor window.

5.2 Sound Propagation Modelling

Full details of the modelling methodology are provided in the appendix. Briefly the modelling settings include,

- Hard ground (worst case)
- Downwind propagation in all directions (worst case)
- Calculation height of 4 m (worst case for two storey properties)
- Area source height of 1.5 m
- Area source spacing of 2 m

The calculated noise levels are indicated at 4 m above local ground level to represent the first floor of a traditional house. The highest floor of a building is expected to benefit least from screening effects and secondary propagation effects, whilst being negligibly further from the source.

5.3 Calculated Specific Sound Levels

The modelling of sound propagation from the existing hard courts and proposed MUGA has provided an estimate of the resulting outdoor sound levels at the neighbouring properties.

The following summarises the estimated levels of sound reaching the facades of the nearest properties during a 1 hour period of use.

Case	Receiver	Specific Sound Level (dB(A) $L_{Aeq,hr}$)	Comment
Existing (Hard Courts)	1	47	
Proposed (MUGA)	1	46	MUGA area slightly larger and further away from receiver than existing case

TABLE 6: CALCULATED SPECIFIC SOUND LEVELS

The outcome of the modelling indicates the sound levels experienced at the most affected property to be 46 dB(A) L_{Aeq} over a typical 1 hour period due to use of the proposed MUGA. The calculated level is 1 dB less than if the existing hard courts were redeveloped for the same use and is largely the result of the new facility being moved further from the boundary.

6.0 ASSESSMENT OF NOISE IMPACT...

6.1 External Amenity Space

The sound levels measured at location 1 are 53 dB(A) $L_{Aeq,16hr}$, and we can conclude the current exposure does not achieve the "good" standard of external amenity being above the LOAEL.

Based upon the most likely hours of use of the proposed MUGA (as described in section 4.3), we have combined the existing ambient sound level with the specific sound from the proposed MUGA. The combined total day time sound level in the gardens of the neighbouring houses is expected to be 53 dB(A) $L_{Aeq,16hr}$ and unchanged from the current value, even with maximum occupancy of the MUGA on the weekend.

Location	Period	Criterion	Target	*Residual Sound Level* With Calculated *Specific Sound Level* dB(A)	Comment
Receiver No 1	Daytime 07:00 to 23:00	External Amenity (Good)	≤ 50 dB(A)	53 (53+46)	Existing conditions do not achieve "good" standard however "reasonable" standards are achieved.
		External Amenity (Reasonable)	≤ 55 dB(A)		

TABLE 7: SUMMARY OF NOISE IMPACT AT RECEIVER LOCATION

The currently experienced *Residual Sound Levels* measured at the worst affected receivers confirm that a reasonable standard for external amenity is achieved generally.

The introduction of additional sound from the proposed MUGA is expected to lead to a negligible increase in the ambient sound level at the nearest receivers.

The locality currently includes sports pitches which we understand are generally used on weekends and which would be expected to include similar sounds to the proposed use of the MUGA (e.g. whistles, shouting etc).

It is noted that the soundscape observed during our survey during the weekday evenings did not include the sound of sports taking place, and the 16 hour average value was affected by a couple of hours in the evening where we understand a local youth club occupied the park.

During periods of respite in the ambient sound, such as in the evening, the ambient sound reduced to c. 44-48 dB(A) $L_{Aeq,15min}$. In our opinion the use of the MUGA may become audible and noticeable within the existing soundscape at certain times of day, and with intensification of the use of a new facility. Although the number of properties affected would remain small and the sounds would not be unusual as they are currently already experienced at other times of day/week.

We therefore conclude the impact on external amenity to be **minor** and of a **low** significance.

6.2 Assessment at the Property Facade

Our modelling predicts the sound level at the façade of the nearest and most affected property (Receiver No 1) to be 46 dB(A) $L_{Aeq,1hr}$ as a result of the MUGA being in use.

The calculated level achieves the Sport England basis of assessment (max 50 dB(A) $L_{Aeq,1hr}$) at the façade of the neighbouring property, and can therefore be considered acceptable.

The calculated level does not achieve the British Standard basis of assessment (max 45 dB(A) $L_{Aeq,1hr}$) at the façade of the neighbouring property, although it is noted that the existing soundscape does not achieve this value. Consequently, we would expect the resulting internal sound within the properties to currently exceed the British Standard guidance level of 35 dB(A) $L_{Aeq,16hr}$.

The estimated sound levels at the property façade due to the proposed MUGA are expected to remain much the same as could be experienced from the permitted use of the existing hard play areas.

Due to their being no change in level we conclude that the increase in noise would be **negligible** and of a **very low** significance.

6.3 Noise Level Change

We estimate there to be a negligible increase in ambient sound level at the most affected receiver during the day.

To investigate the wider effects more rigorously we have used our noise modelling package to ascertain the change in noise levels all around the park between by comparing the existing hard play being used, with the new MUGA being used.

The output from our modelling software is included as Figure 12 in the appendix.

The use of the new MUGA is anticipated to result in a marginal reduction in level at the nearest residential properties which back onto Scotts Park along Windemere Road.

In all other receptor locations, a slight increase in level is anticipated, of the order of 1-2 dB(A) $L_{Aeq,1hr}$. The greatest increase in level is expected to be contained within the sports fields where it would be of little consequence.

Following the IOA/CIEH guidance for noise impact, we conclude that the proposed MUGA would lead to a barely perceptible change in level and lead to the conclusion that it has a **minor** impact, and hence is of **low** significance.

7.0 EFFECTS OF UNCERTAINTY...

We have included the uncertainty in the measured values of *Background Sound Level.*

There are other sources of uncertainty in our assessment, such as, the variation in *Background Sound Level* on a different day, and the calculation tolerances for the propagation model.

The survey of the *Background Sound Level* has been undertaken in full accordance with BS7445 and ANC Green Book Guidance using laboratory calibrated measurement equipment over an extended surveying period. These precautions will minimise sources of uncertainty in the survey data. The existing site conditions exhibit a low variability in the ambient and background sound levels and our data is considered to be a good representation of the site.

The ISO propagation model used is stated to give results that are "on average correct" although tolerances are given for individual octave bands. We therefore expect uncertainty to have only a small influence on the outcome of the estimated levels.

We do not expect the effects of uncertainty to have a significant effect on the outcome of our assessment.

8.0 BEST PRACTICE NOISE MITIGATION...

The Sport England guidance document for AGPs provides some useful guidance for the mitigation of noise. It is noted in the guidance that the sound of ball impact, particularly hockey balls can generate short term increases in level considerably in excess of the noise from the users.

The guidance suggests the following to help mitigate ,

- The fencing, (typically weldmesh fencing) used to the perimeter should be clamped with resilient fixings to avoid vibrations.
- The use of padding to strike boards, goal boards and fencing can significantly reduce the sound of ball impact (notably hockey).
- Sheet metal advertising signs should be avoided in proximity to plain surfaces or replaced by soft vinyl signs.
- People tend to congregate around the entrance to the courts, and it is advisable to locate the access away from nearby housing where possible.
- Some users may act in an unreasonable manner. Should this occur a management/monitoring plan could be developed to respond to specific incidents, such as restrictions to certain groups using the facility.

9.0 ASSESSMENT CONCLUSION...

We have undertaken a quantitative assessment of the potential noise impact a new multi-use games area at Scotts Park (Patchway Sports and Social Club) in Patchway, Bristol.

We have measured the pre-development sound levels at the nearest neighbouring properties over an extended period.

We have undertaken a numerical modelling exercise of the existing hard courts and proposed MUGA based on noise level information made available in Sport England guidance, which we have used to estimate the noise emission to the surroundings.

Our assessment concludes that the proposed MUGA would lead to a low impact due to noise, and it would not be expected to result lead to an adverse impact.

We note that the likelihood for the use to intensify when a desirable new facility is completed may be noticeable to the nearest neighbours compared with the low utilisation of the current dilapidated facilities.

RED TWIN LIMITED
Consultants in Acoustics

We do not anticipate uncertainty in our assessment to alter the conclusions reached.

I trust this covers all required points. Please advise if you require anything further.

Yours sincerely,
For Red Twin Limited

Ian Matthews CEng MEng MIOA AMIMechE
Director
Chartered Engineer

APPENDIX A – SITE PLAN…

FIGURE 1: CONTEXTUAL SITE PLAN AERIAL VIEW – NOT TO SCALE

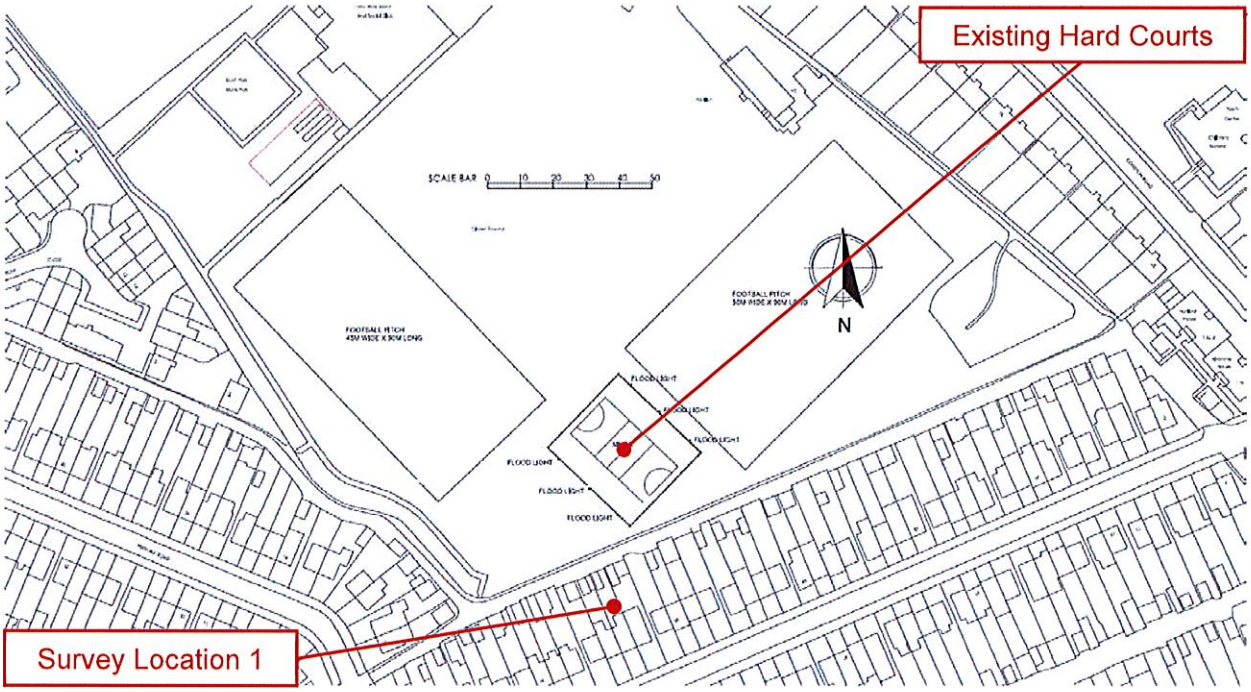

FIGURE 2: EXISTING BLOCK PLAN

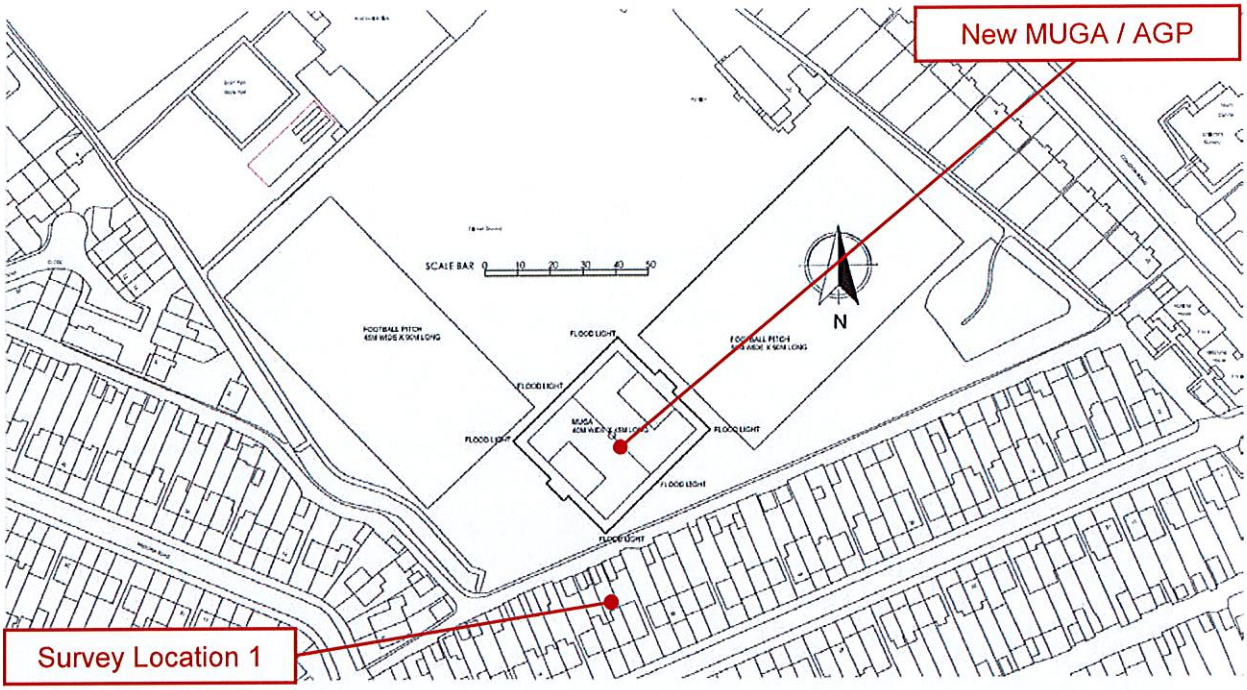

FIGURE 3: PROPOSED BLOCK PLAN

APPENDIX B – PRE-DEVELOPMENT NOISE SURVEY DETAILS...

Address: 64 Windermere Road, Patchway BRISTOL BS32 5PR

Date: Wednesday 20th March to Thursday 21st March 2019

Measurement Locations

1. The measurement position was 1 m from the rear façade of the property at No 64 Windermere Road Patchway BRISTOL BS34 5PR. The microphone was tripod mounted at 1.5 m above local ground level and was close to a reflecting place. See Figure 4. The equipment was set up and left unattended for the duration of the survey. The equipment was set to log data every 2 seconds and has been post-processed into 1 hour daytime periods.

Personnel

The survey set up and managed by Ian Matthews of Red Twin Limited.

Equipment

Location No 1 - Brüel & Kjær hand held analyser Type 2250 serial No 2685348 with Type 4189 microphone, serial No 2676519 and preamplifier Type ZC0032 I.D No 11592. The analyser was fitted with a UA-1404 microphone protection kit and secured within a weatherproof case. The sensitivity of the hand held analyser and microphone was checked before and after the measurements using an acoustic calibrator. A Brüel & Kjær Type 4231 acoustic calibrator serial 2656621 was used and a drift in sensitivity of -0.01 dB was observed during the survey which is within acceptable tolerances.

The hand held analyser was calibrated in the laboratory on 30.05.2018 and the calibrator was laboratory calibrated on 14.09.2018. Calibration certificates are available on request.

Weather

The weather during the survey was good and appropriate for noise measurement. We have obtained logged weather data from the met office weather station located nearby in Horfield. The data shows that there was no rainfall during the survey, and wind speeds remained below 2 m s^{-1}. The whole duration of the survey experience weather conditions suitable for noise measurement and were in accordance with BS7445 and ANC Green Book Guidelines.

Survey Comments

During the survey we observed the main sources of environmental sound affecting the site to be due to road traffic noise. The road traffic was not visible and it is believed the sound was emanating from the A38 to the SE and/or M5 to the NW.

We also observed a significant contribution from bird song, with many birds sheltering within the mature trees on the site.

There is an increase in the ambient sound between approximately 18:00 and 19:30 which we understand to be from Patchway Youth Club which operates between 7-9pm on a Monday and Wednesday evening and often use the park.

FIGURE 4: PHOTOGRAPH OF MEASUREMENT LOCATION NO 1

Results

Due to the large amount of data gathered the survey measurements are summarised graphically. Full tabulated data is available on request.

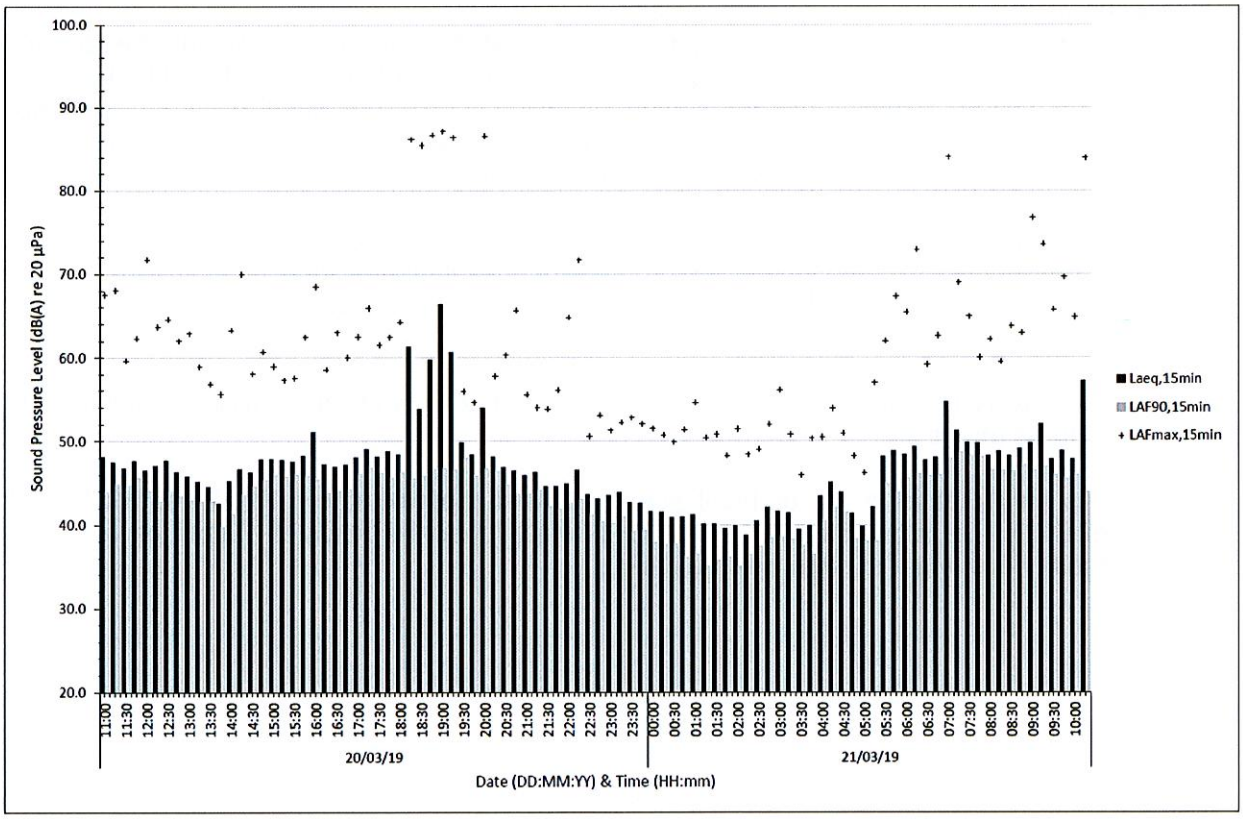

FIGURE 5: TIME HISTORY MEASURED AT LOCATION NO 1

APPENDIX C – NOISE MODELLING…

Modelling Methodology

We have undertaken prediction of environmental sound from the proposed aircraft movements using calculations based on the method described in ISO 9613-2 *Acoustics – Attenuation of Sound During Propagation Outdoors – Part 2: General Method of Calculation.*

The ISO propagation model calculates the sound pressure level from a source sound power level in each 1/1 octave band and subtracts various attenuation factors as follows,

$$L_{ft}(DW) = L_w + D_c - \left(A_{div} + A_{atm} + A_{gr} + A_{bar} + A_{misc}\right)$$

Where

$L_{ft}(DW)$ is the equivalent continuous downwind octave-band sound pressure level (dB)
L_w is the octave band sound power level (dB)
D_c is a directivity correction that describes the extent by which the $L_{ft}(DW)$ deviates in a specified direction from the level of an omni-directional sound source (dB)
A_{div} is the attenuation due to geometrical divergence (dB)
A_{atm} is the attenuation due to atmospheric absorption (dB)
A_{gr} is the attenuation due to the ground effects (dB)
A_{bar} is the attenuation due to a barrier (dB)
A_{misc} is the attenuation due to miscellaneous other effects such as foliage, industrial sites and housing (dB).

The A-weighted total level is obtained by combining the octave band levels with the appropriate weighting, and summing the contributions from each source.

Our calculations are performed using a proprietary software package, Predictor V2019.02 available through EMS in the UK, and it should be noted that the model is an approximation of the real situation. The calculated values are based on geometry information included in the model, some of which is approximate.

The model has assumed a 'hard' ground generally. Including the ground as acoustically "hard" implies no sound energy is lost to the ground which represents a worst case for design.

The model has included the effects of air absorption at 273 K at 101 kPa and 60% humidity.

All propagation is modelled as downwind.

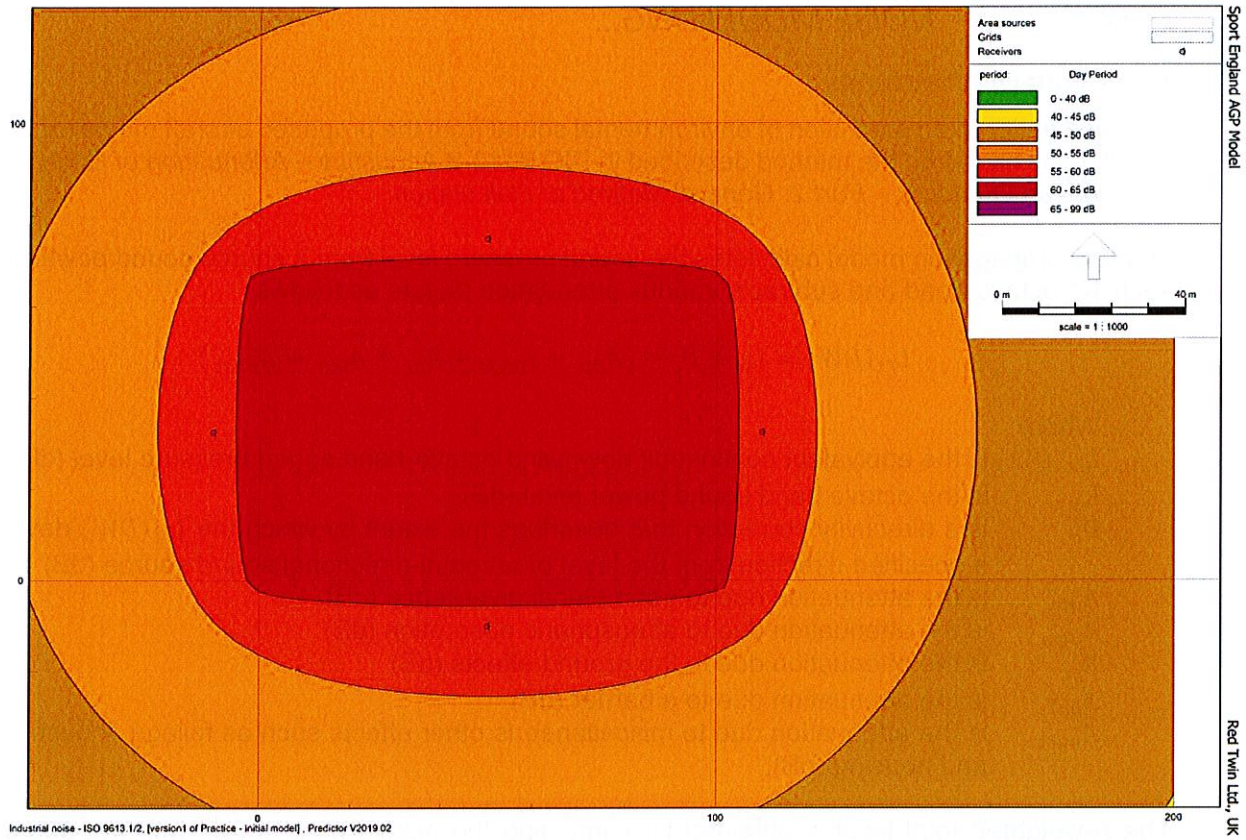

FIGURE 6: ACOUSTIC MODEL OF SPORT ENGLAND AGP IN FREE-FIELD CONDITIONS AT HEIGHT OF 1.5 M

FIGURE 7: VIEW OF EXISTING SITE ACOUSTIC MODEL (DO NOT SCALE)

FIGURE 8: VIEW OF PROPOSED SITE ACOUSTIC MODEL (DO NOT SCALE)

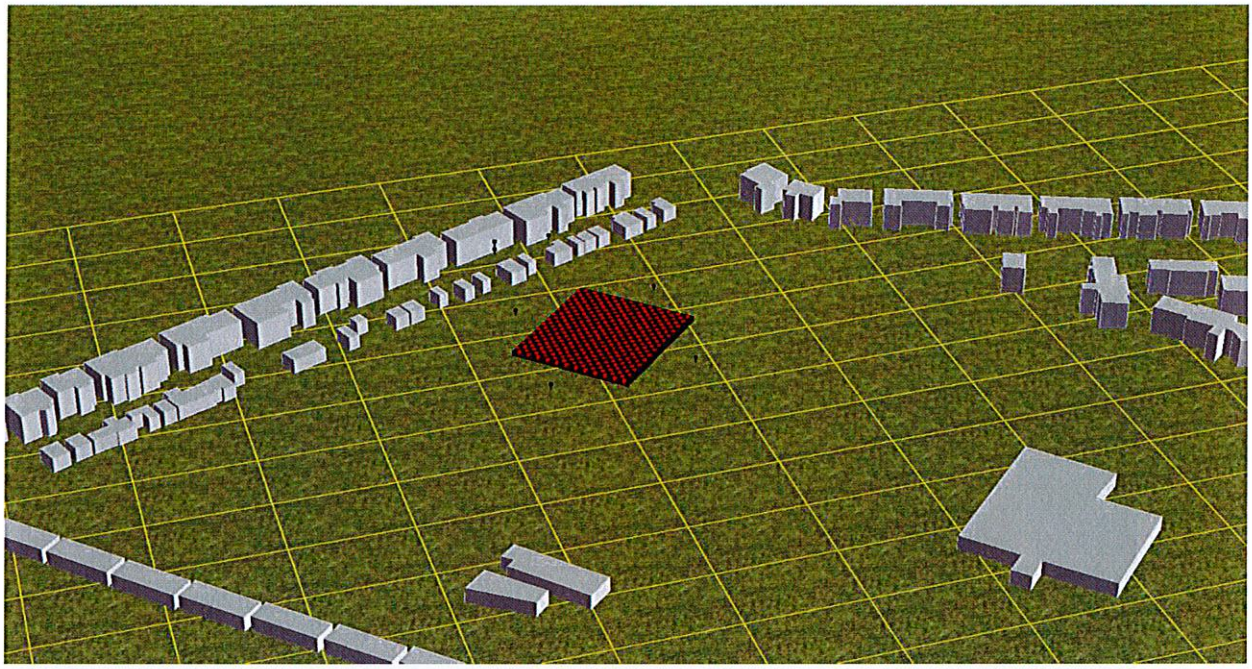

FIGURE 9: 3D VIEW OF PROPOSED ACOUSTIC MODEL (DO NOT SCALE)

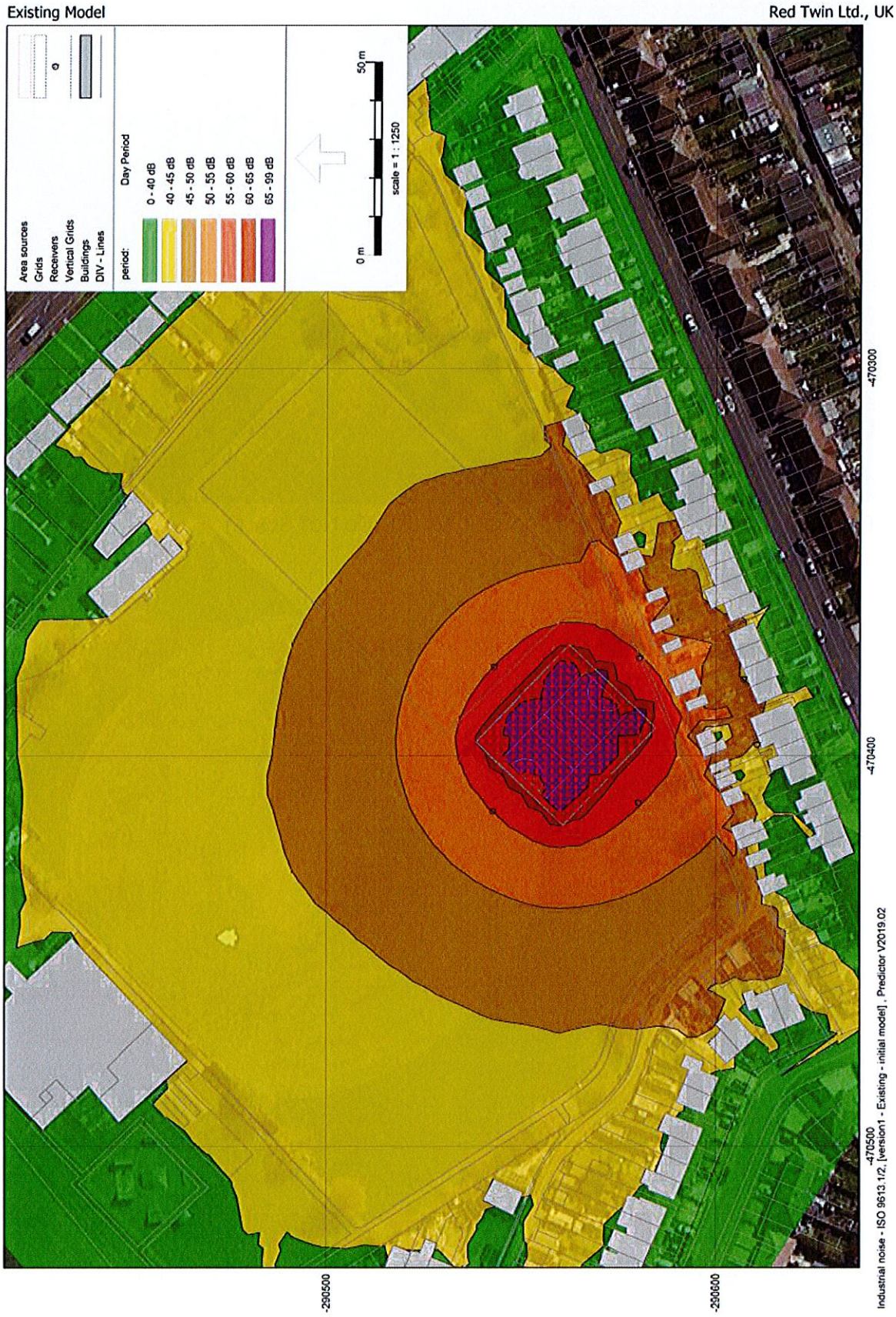

FIGURE 10: CALCULATED NOISE CONTOURS – EXISTING SITE (DO NOT SCALE)

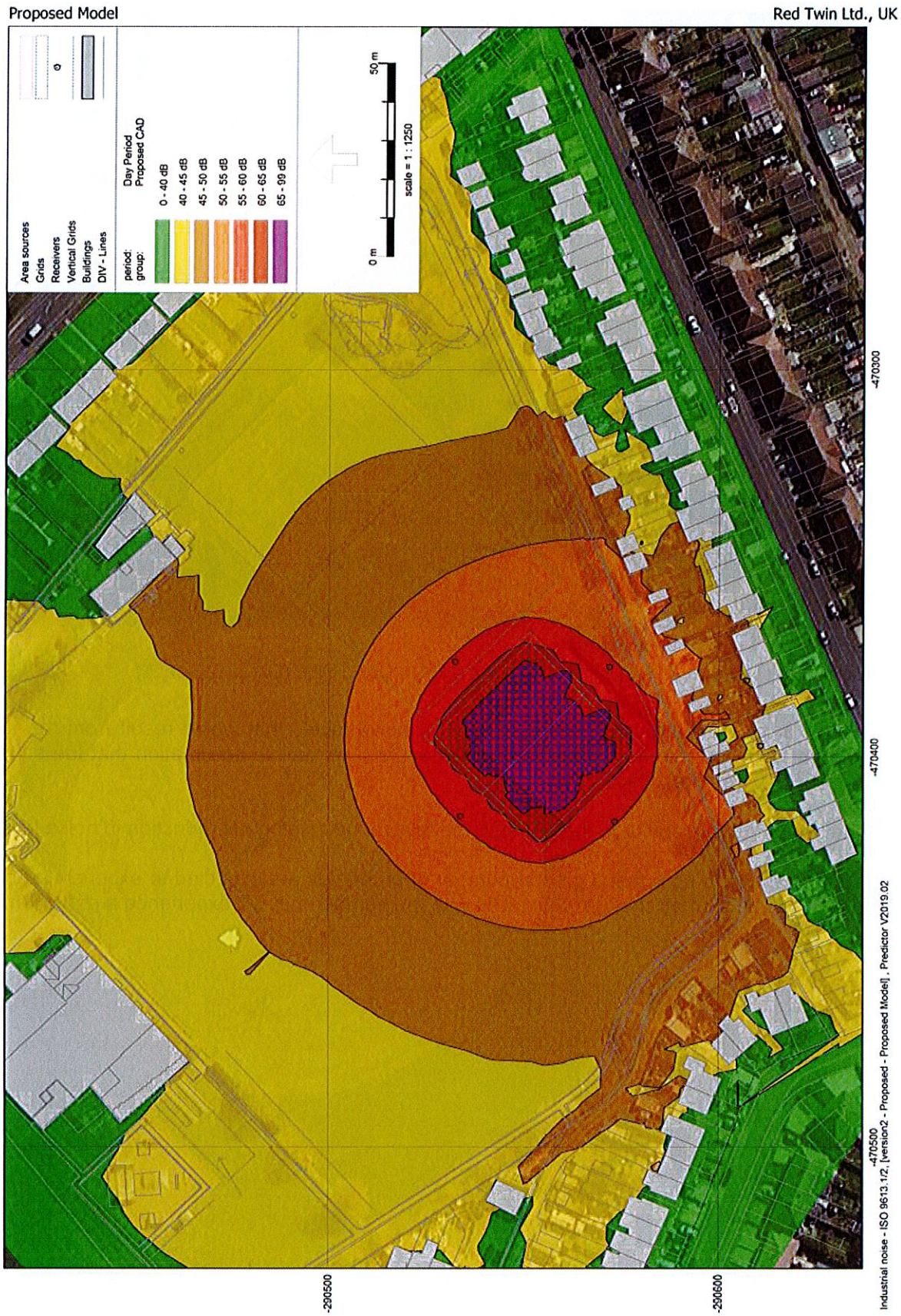

FIGURE 11: CALCULATED NOISE CONTOURS – PROPOSED SITE (DO NOT SCALE)

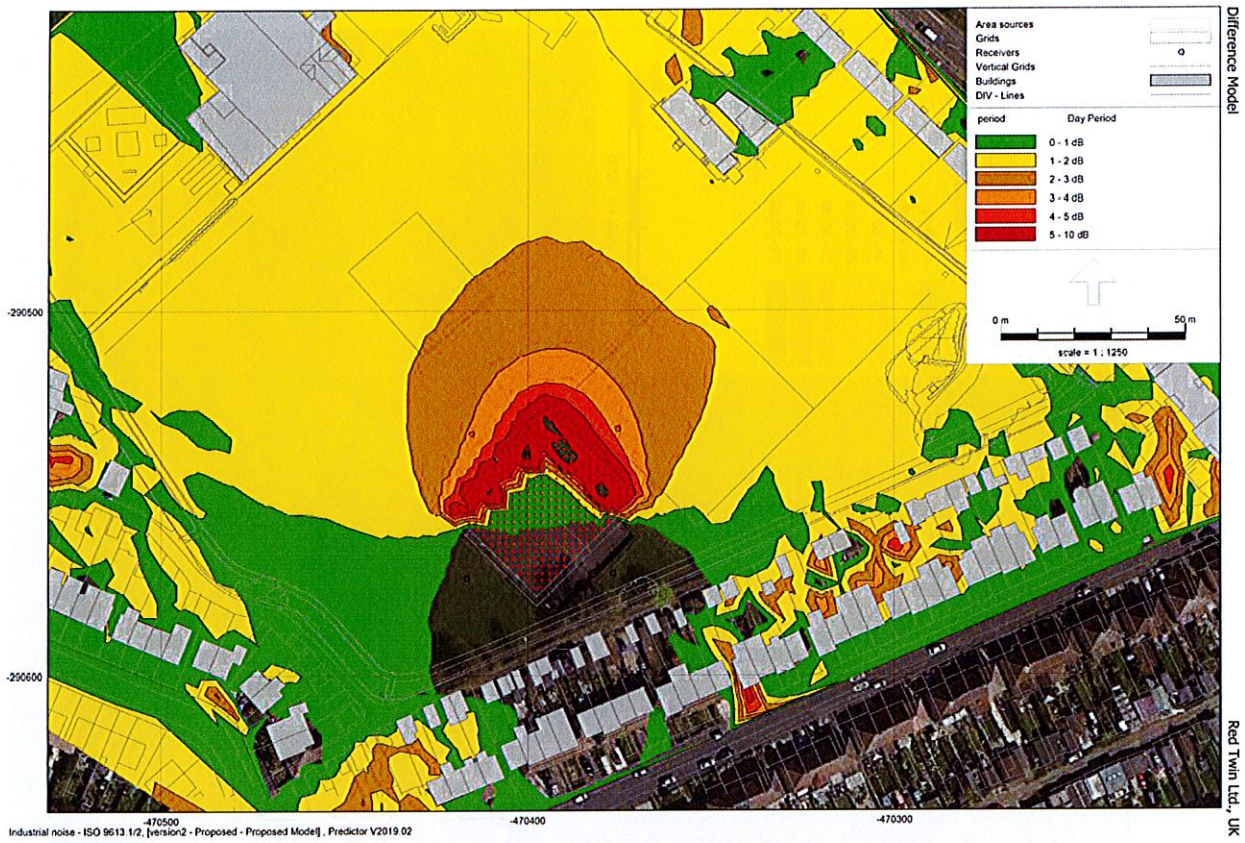

FIGURE 12: CALCULATED NOISE CONTOURS – PROPOSED SITE (DO NOT SCALE)

The coloured contours indicate the change in noise levels that would result from the use of the existing hard court area, and the proposed new MUGA, on the assumption that the same type of "typical" activity takes place.

The area without a colour to the South of the MUGA indicates a net reduction in noise level.

It is interesting to note that a greater number of properties are expected to experience an increase in level, albeit a small change, compared with the number that will experience a reduction.