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Bicester Motion Experience Quarter

Environmental Noise Impact Assessment

Prepared by Chris Beale BSc.

Friday, 26 March 2021

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1. Abstract

1.1. Outline planning permission is sought for a new motorsport venue, Bicester Motion Experience Quarter that celebrates the past, present and future of motoring in the United Kingdom. The venue location, history and description are well documented in the application pack but will include a mixture of experience tracks and driving modules, including private testing, vehicle manufacturer research and development, and planned road-based activities involving small numbers of vehicles with, in the most part, road silenced engines. The facility is not proposed for major racing activities.

1.2. SPLtrack Limited specialises in automotive noise assessment and real-time management and have been instructed to carry out an assessment of the impact of noise from the proposed track activities. Incorporated in 2013, the company provides consultancy and monitoring services to most of the major motor sport venues in the United Kingdom. The company also provides acoustic modelling software and design assistance to a number of international automotive projects. The company is the innovator of the noise management platform that monitors 'drive-by' noise levels from the trackside and provides remote monitoring at receptors in real time. The system is explained in more detail in this document.

1.3. An understanding of the nature of motor vehicle noise and methods of environmental management is important. For this reason, an explanatory section (section 3) has been included.

1.4. The executive summary has been placed at the front of this document for the convenience of the reader. Detailed analysis can be found in the following pages.

1.5. Comments should be directed to the author at the contact points shown in the header to this document.

2. Executive summary

2.1. Calculations shown in this document represent the best available means of assessment using comparative data and noise propagation computation for motorsport activity. This is formed on many years of experience in automotive noise management by SPLtrack Limited.

2.2. The assessment has been informed by data from the baseline survey[1], attended measurements and calculations based upon anticipated levels due to traffic flows. The Covid pandemic has resulted in reduced traffic and virtually no aircraft overflights, therefore ambient noise levels during attended measurements in 2021 were lower than would normally be expected. The 2019 baseline survey results are typical of normal conditions.

2.3. Model calculations consider one minute sample periods, representing continuous circuit noise and therefore worst case noise conditions. Assessments over longer periods would be lower because they would include periods of respite between track sessions.

2.4. Having assessed test track activity against ambient noise by means of live testing[2] it is clear that the necessary tools are available to enable the applicant to manage typical operational noise levels to within 5dB of the LOAEL and so achieve **low impact** within the definition provided by the NPPF.[3] It is also apparent that normal circuit activities will not have a significant adverse impact upon residents under the objectives of the Noise Policy Statement for England (NPSE).

2.5. Certain operations, such as public events or non-standard track activities, could trigger higher noise levels, however mitigation by regulation of the number of higher noise activity days per year, control of track session duration and elimination of non-compliant vehicles would ensure that impact could be kept to a minimum.

2.6. These measures will be defined in the **Bicester Motion Noise Management Plan** that will form the regulatory management system under which circuit facilities will be controlled.

2.7. The applicant anticipates that a comprehensive noise management plan, to be agreed by Cherwell District Council, will be a condition of any planning consent.

2.8. The applicant has explored the merits and agreed the suitability of a noise management plan with Cherwell District Council during the pre-application stage of the planning process and will continue to work with the Council going forward.

[1] Section 6

[2] Section 8

[3] Table 2

3. Noise from motor vehicle leisure activities

3.1. The relationship between automotive activity facilities in the United Kingdom and environmental noise in the adjacent community has not always been positive, however relatively recent developments in noise management technology and a sea change in the understanding of operators and participants has achieved much. Many motor venues now have very positive relationships with their neighbours.

3.2. Most important has been the understanding that motor vehicle noise can only be measured dynamically. For this reason all circuits now use a 'drive-by' noise trapping system that is able to measure each vehicle accurately at its point of maximum noise output. The system in use at most UK circuits. It was designed and developed by SPLtrack and has become a standard for accuracy. The number of vehicles on circuit simultaneously does affect overall noise from the venue, however the change in noise level associated with numbers of vehicles is not intuitive. For example, doubling the number of vehicles increases receptor levels by only 3dB which represents a 'just perceptible' increase in noise. Clearly, lower noise output from all participating vehicles results in lower environmental impact, however a single non-compliant vehicle has a disproportionate environmental impact both in the sound level at receptors and disturbance due to the audible prominence of that vehicle. Drive-by noise regulation ensures that such vehicles can be removed from the circuit immediately and provides the basis for confidence in calculation and planning.

3.3. Daily management of circuit time, including the length of circuit sessions and the periods of intermission between them is important. For this reason, an appropriate sample period should be used to evaluate noise in the environment. This ensures that there will be sufficient detailed reporting to prevent short periods of high noise being lost in longer measurement periods.

3.4. Most venues operate a calendar that provides for a tiered operational calendar which identifies the number of days in the year on which certain classes of vehicle may operate. This strategy ensures that a balance between public amenity and the moderate noise impact from, for example, historic vehicle activities can be managed.

3.5. A significant cause of misunderstanding between residents and motoring venues is lack of communication. Bicester Motion will engage with the community and will ensure that timely information regarding venue activities is communicated to residents.

4. Planning Policy and Noise guidance

4.1. The National Planning Policy Framework (NPPF), February 2019, sets out the Government's planning policies for England. These policies "articulate the Government's vision of sustainable development." In respect of noise, Paragraph 180 of the NPPF states the following:

4.1.1.mitigate and reduce to a minimum potential adverse impact resulting from noise from new development and avoid noise giving rise to significant adverse impacts on health and quality of life;

4.1.2.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

4.1.3.limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation"

4.2.Guidance on the interpretation of the policy aims within the NPPF is contained within the National Planning Policy Guidance (NPPG). The NPPG introduces the concept of noise exposure hierarchy based on likely average response. The guidance in the NPPG is summarised in the table below:

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

Perception	Examples of Outcomes	Increasing Effect Level	Action
		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

Table 1: Noise Exposure Hierarchy

4.2 The NPPF and NPPG reinforce the March 2010 DEFRA publication 'Noise Policy Statement for England' (NPSE), which states three policy aims.

"Through the effective management and control of environmental, neighbor and neighbourhood noise within the context of Government policy on sustainable development:

- 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*"

4.3 Together, the first two aims require that no significant adverse impact should occur and that, where a noise level falls between a level that represents the lowest observable adverse effect (LOAEL) and a level which represents a significant observed adverse effect (SOAEL), then according to the explanatory notes in the statement

"…all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life, whilst also taking into consideration and guiding principles of sustainable development. This does not mean that such events cannot occur."

4.4 It is clear from the above that when determining the impact of noise, the significance must be taken into account. The fact that a noise can be heard and may even affect the acoustic character of the area is not sufficient to refuse planning permission.

Noise Guidance

4.5 There is no British Standard that can be applied directly to the assessment of motor leisure venue noise, however it is possible to apply objective standards to the assessment of noise and the effect produced by the introduction of a certain noise source. Methods include reference to the WHO Guidelines Values, the change in noise level resulting from the development and comparisons of the specific noise against the existing background noise level, a BS 4142 type assessment.

4.6 BS 4142 is limited to the assessment of industrial noise and is not intended to applied to the assessment of recreational activities, including all forms of motorsport. Therefore, in relation to track activity the standard is not applicable. Whilst the WHO Guidelines provide useful guidance, they are based on 16-hour time period which may 'average' out the impact of noise. In addition, as shown in section 7.0 of this report, existing noise levels are already in excess of the limits. Therefore, in this case the most appropriate method is the change in noise level that may result of the development.

Change in noise level L_{AeqT} dB	Response	Impact
<3	Imperceptible	None
3 – 5	Perceptible	Low
6 – 9	Up to a doubling	Moderate
10 – 12	More than a doubling	Significant
>12	-	Unacceptable

Table 2 - Change in noise level

4.7 Changes in noise levels of less than 3 dBA are not perceptible under normal circumstances and changes of 10 dBA are equivalent to a doubling of loudness. The following criteria has been developed based on the Noise Exposure Hierarchy as advised in the planning practice guidance (Table 2).In terms of guidance contained within the NPPG based on Table 2 above it is recommended that an Observed Adverse Effect would not occur until noise levels from activity at the site exceed the LOAEL by more than 5 dB. Where the suggested criteria is exceeded by more than 10 dB, this is an indication of a significant adverse impact and should be avoided. Where noise levels are between 5 – 10 dB noise should be mitigated and reduced to a minimum. This can be achieved by several methods including restrictions on the following:

1. The days in the year on which activities are permitted.
2. The time of day during which activity is permitted.
3. Maximum permitted noise levels at defined receptors.
4. Permitted noise levels may be varied on a selected number of days in order to accommodate specific events.
5. It is usually a combination of these factors that form the basis of a regulatory method.

5. Noise modelling software

5.1. ADA modelling uses calculation methodologies verified by SPL's experience of environmental monitoring of motor sport events. The software factors sound directivity and drive-by data for a wide range of motor vehicles accumulated over seven years of development. It incorporates calculations for buildings, embankments, woodland and other surface features and has an analysis module barrier structures and for woodland that can be found in a variety of current technical papers.

5.2. ADA provides a desktop assessment that enables the noise impact of proposed activity at the venue to be assessed against ambient noise that would be experienced at a receptor in the absence of that activity. The noise modelling software has been used to predict noise levels from similar motorsport activity and has been validated by measurement at existing premises.

5.3. The software is also able to factor meteorological conditions and their impact upon noise propagation.

6. Baseline survey

6.1. A baseline survey was undertaken in spring 2019. Measurement locations were agreed with officers of Cherwell District Council and were chosen to represent locations likely to have the widest range between specific and ambient noise thresholds. The baseline survey report is reproduced in this document[4].

6.2. The survey was conducted over a period from March 22nd to 1st April 2019 in weather conditions that were within limits for traceable measurement.

[4] Appendix 1

6.3. The methods used, including instrumentation, procedures and weather conditions followed relevant guidance.

6.4. When compared with calculated ambient levels that appear in figure 1, the virtual baseline model, we see that the measured levels compare closely. The figures below refer to the time interval 06:00 to 18:00:

Receptor	Survey	Model
Fulmar Court	46.6 - 49.6	45.0
Blencowe Close	47.0 - 49.3	46.0

6.5. Noise levels at other receptors have been determined used computer modelling. These levels have been validated by short-term measurements carried out by Sharps Redmore Acoustic Consultants. Short-term attended measurements were carried out at locations comparable to some of the receptor locations identified in the virtual baseline model. The locations were chosen to represent the closest noise sensitive properties to the site and publicly accessible.

6.6. Attended measurements were carried out over a two hour period during the middle of the day on the 15th February 2021. Measurements were carried out using a Norsonic sound level meter which was calibrated before and after the survey with no drift in accuracy found. Weather conditions were cold, dry with light wind and were suitable for taking noise measurements.

6.7. Existing noise levels are dominated by road traffic, both sides of the site being bordered by busy A-roads. Skimmingdish Lane and Buckingham Road pass between of the receptor positions and the site. At the time of the survey Covid-19 restrictions were in place, therefore traffic flows on the surrounding roads was lower than normal. Using statistics recorded by the Department of Transport during the Covid restrictions typical traffic levels (all motor vehicles) on 15th February 2021 were 68% less than typical conditions. The impact would on noise levels would be to reduce noise levels by between 1-2 dB.

6.9. The noise survey carried out by Sharps Redmore (SR) is consistent with the baseline survey conducted by SPLtrack and the levels predicted by the models after correction for traffic flows.

7. Noise models

7.1. It is important to establish an accurate method of predictive calculation and provide enforcement tools that will enable *any* form of activity to be defined and strictly controlled.

7.2. In order to demonstrate that such control is possible, models have been created to examine conditions that can be verified by physical tests.

8. Live tests

8.1. A live test was conducted on the 24th March 2021 using a selection of vehicles. A test circuit was configured using part of the old taxiway hardstanding. This area is not in a similar position to the proposed circuits, but is closer to the west boundary of the site. It does however demonstrate the accuracy of the predictive models and correlation with drive-by measurements.

8.2. A drive-by noise monitor and two boundary noise monitors were installed.

8.3. Wind conditions were SW 5m/s, the effect of which has been included in the models.

8.4. Each model assesses a single vehicle on the test circuit shown in ten positions, each position representing 10% of the energy generated by the car during each lap. The positions have been chosen to represent the points at which the highest noise output can be expected.

8.5. The drive-by monitor was positioned 20m from the centre line of the track (this being the normalised distance for drive-by monitoring systems generally) at a location where maximum acceleration occurs.

8.6. Two meters were installed at the west boundary of the site (labelled R1 and R2 in the models). All meters were calibrated prior to tests and were Class 1 devices. Microphones were enclosed in weatherproof shrouds with 150mm windshields (calibration corrected) and were mounted at a height of 1.5m above ground level.

8.7. Each car lapped at speed for a period of five minutes, equivalent to approximately ten laps of the circuit. Measurements were recorded for each session and the highest 1m value for each car was used in the analysis. The metrics used were:

8.7.1.Drive-by: dBLAFmax

8.7.2.Boundary meters: dBLAeq(1min)

8.8. Although five cars were tested there were two distinct drive-by levels, the louder being a Jaguar D Type that passed the drive-by monitor at 99dBLAFmax and the remaining cars that all passed the monitor at approximately 85dBLAFmax.

8.9. Two models have been created to demonstrate the impact of the two observed drive-by noise levels at the boundary receptors. In each model the calculated level at each receptor is shown and below it the actual level measured by the associated meter.

8.10. A summary table is provided within each model illustrating the relationship between circuit noise and that from ambient sources, primarily the A4421. In the table, 'Ambient' refers to the calculated noise level in the absence of the circuit, 'Specific' refers to circuit noise alone and 'Level' refers to the cumulative level comprising ambient noise and circuit noise.

8.11. Whilst the tests do not involve the actual circuit layouts that appear in the application, they demonstrate that:

8.11.1. ADA modelling is able to provide accurate predictions of circuit noise from vehicles with a range of noise output characteristics and;

8.11.2. Drive-by noise management is an appropriate tool for controlling circuit noise at source.

8.12. Using a combination of modelling and drive-by management, the applicant is therefore able to accurately predict and manage the environmental impact of any type of circuit activity.

8.13. The table on the following page summarises the test results with respect to NPPF impact thresholds for the test configuration under short-term continuous use. Were the assessment to be performed over a longer sample period (e.g. 30 minutes), the NPPF assessment would be none/low for all receptors in each case.

Drive-by level 85dBLAFmax	Ambient dBLAeq(1min)	Specific dBLAeq(1min)	Increase in noise level dB	NPPF impact
R1	66	58	-8	None
R2	63	55	-8	None

Drive-by level 99dBLAFmax	Ambient dBLAeq(1min)	Specific dBLAeq(1min)	Increase in noise level dB	NPPF impact
R1	66	72	6	Low/Moderate
R2	63	69	6	Low/Moderate

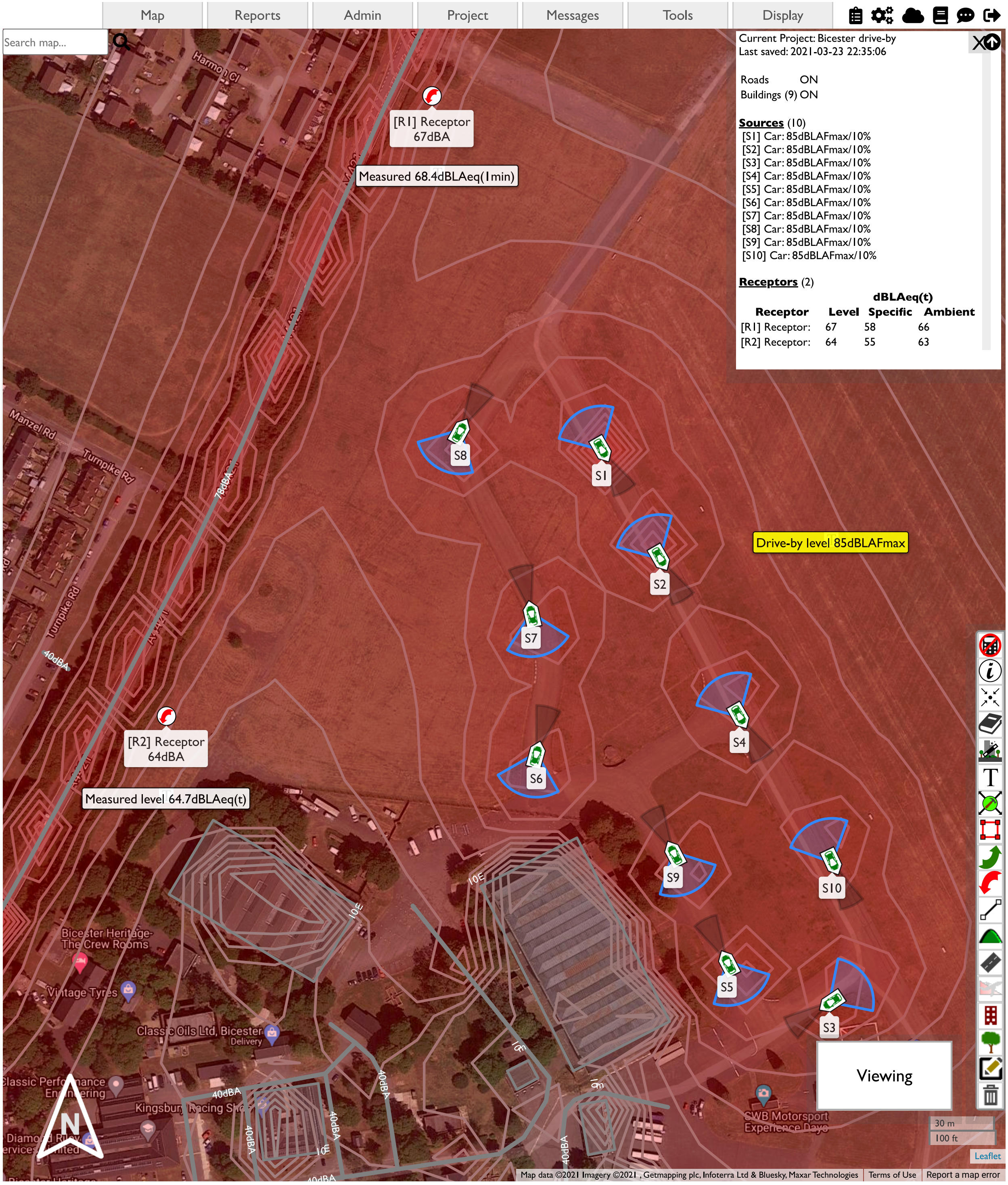
Table 3 - Summary of live test results

8.14. Notes to table 3:

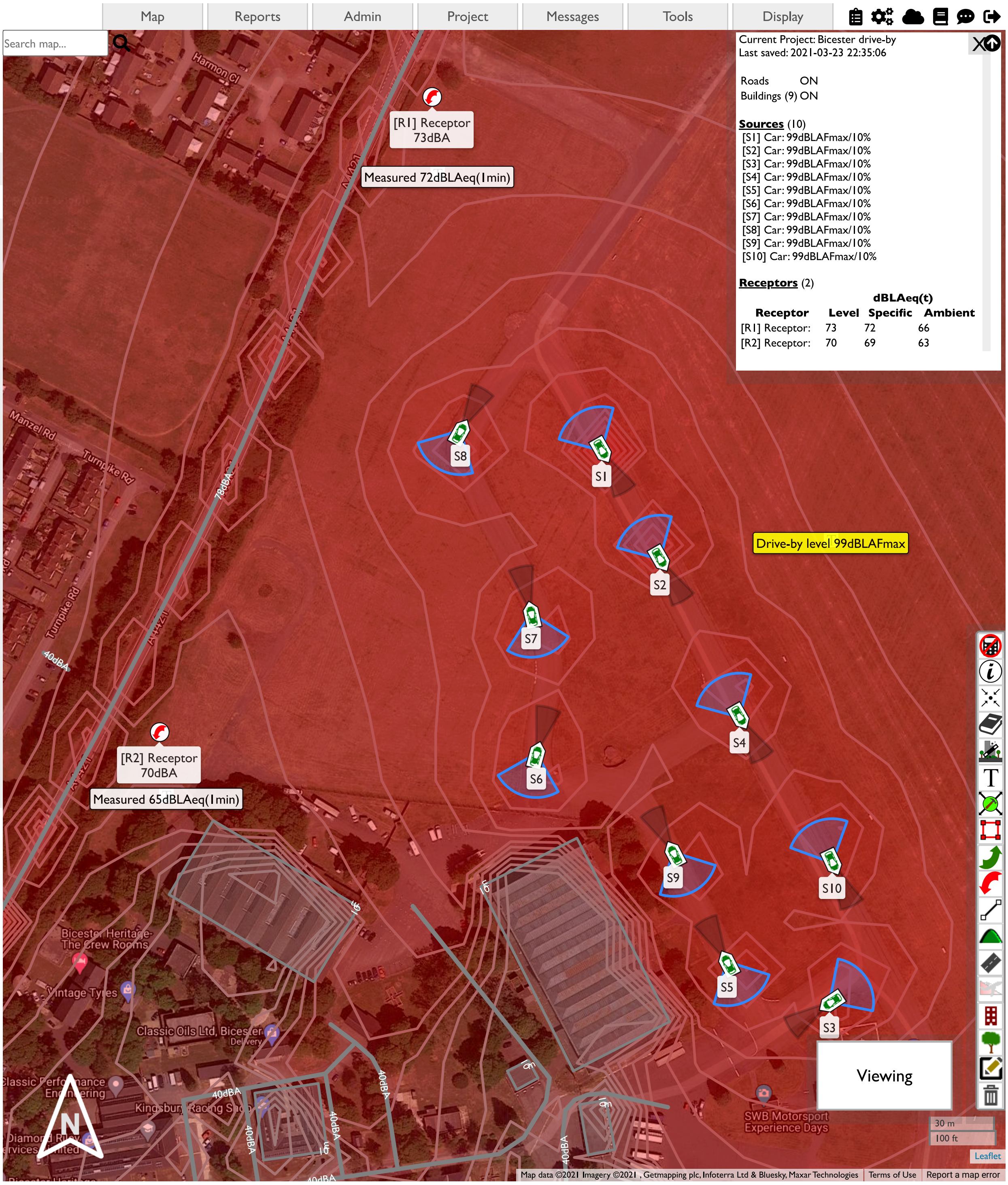
8.14.1. Levels at properties on the opposite side of Buckingham road would be slightly lower than those shown in the table, however the purpose of this exercise was to demonstrate the accuracy of modelling predictions against actual measurements. Had receptors at the properties been used it would have been more difficult to isolate circuit noise from ambient noise and the outcome may have been less clear.

8.14.2.The circuit layouts defined in the application are located further from the west boundary and would have significantly lower impact than the test conditions summarised here. They would however be subject to similar analysis and would be equipped with appropriate drive-by monitoring stations.

8.14.3. Boundary monitoring would be used in addition to drive-by controls to verify compliance with the noise management plan.



Model 1 - 85dBLAFmax drive-by level



Model 2 - 99dBLAFmax drive-by level

9. Noise mitigation

9.1. In the case of events that may involve higher noise levels, such as those that involve public attendance, mitigation of noise impact can be achieved by:

9.1.1. restricting the number of days in the year on which high impact and moderate impact activity was permitted or;

9.1.2. restricting the amount of time in each hour or day during which noisy activity was permitted (e.g. by restricting the number of laps per hour that a noisy vehicle could operate) or;

9.1.3. a combination of strategies.

9.2. Various permutations of these noise mitigation methods are employed at most UK motorsport venues. The proposed noise metering equipment installation at the Experience Quarter includes a 'look forward' calculation that is able to show at what time noise limits will be reached based upon accumulated data, making enforcement a manageable and accurate process. Full data and enforcement reporting would be available to demonstrate compliance.

9.3. A complete description of agreed mitigation and logging procedures will be set out in the Noise Management Plan.

9.4. Agreement to the content of the active Noise Management Plan by Cherwell District Council would be a condition of planning consent. Conditions within the Plan could then be varied quickly without recourse to planning procedure, providing for immediate mitigation of noise conditions.

9.5. The Noise Management Plan will be a live document subject to regular review.

Appendix 1 - Baseline survey

1. This survey has been conducted to evaluate ambient and background noise levels in populated area close to the Bicester Heritage site.

2. Monitoring

    2.1. Monitoring receptor locations were discussed and agreed with Neil Whitton, Environmental Protection Officer of Cherwell District and South Northamptonshire Council prior to installation. The actual monitoring receptor positions used were very close to agreed locations but were necessarily adjusted to ensure the security of monitoring equipment and were subject to the agreement of residents.

    2.2. Meters used were NTi XL2 type approved and UKAS laboratory calibrated to BS-EN61672-3 Class 1. Certificates for both meters are appended to this report.

    2.3. Meters were field calibrated prior to and immediately after the measurement sessions. In both cases the variation was less than 0.1dB.

    2.4. The measurements were conducted continuously from the 22nd March 2019 to the 1st April 2019

    2.5. The receptor locations were as follows:

        2.5.1. Blencowe Close to the west of the site

        2.5.2. Fulmar Court to the south of the site

    2.6. The photographs below illustrate the equipment in position at Fulmar Court.

3. Modelling

    3.1. Prior to the survey a noise model was created in the SPLtrack SPæL system. The model factored noise from roads surrounding the site and the survey receptors.

3.2.The result of the modelling exercise is shown in the appendix.

4. Monitoring results

4.1.The following table illustrates the data from each of the monitoring receptor locations:

Fulmar Court									
Session		00-06			06-18			18-24	
Date	LA eq	L90	LAF max	LA eq	L90	LAF max	LA eq	L90	LAF max
Fri, 22 Mar 2019	47.2	39.4	67.2	49.8	44.3	80.8	46.3	41.1	70.1
Sat, 23 Mar 2019	44.6	34.2	72.4	48.8	41.5	73.3	45.4	38.8	65.8
Sun, 24 Mar 2019	45.8	33.5	67.0	46.6	39.4	71	44.4	37.9	75.1
Mon, 25 Mar 2019	47.0	33.7	68.8	49.7	43.6	78.6	45.9	39.3	71.7
Tue, 26 Mar 2019	46.9	36.8	68.4	47.9	42.4	72.2	44.4	37.2	68.4
Wed, 27 Mar 2019	45.4	34.9	63.6	48.5	41.8	80.2	46.5	41.1	68.0
Thu, 28 Mar 2019	46.3	35.6	64.1	47.6	39.9	86.2	48.2	44.0	70.9
Fri, 29 Mar 2019	48.1	42.5	70.6	48.2	43.0	76.5	48.7	42.3	70.0
Sat, 30 Mar 2019	46.8	40.5	67.6	46.7	39.8	70.1	44.1	38.1	64.9
Sun, 31 Mar 2019	41.2	29.3	64.0	49.6	43.2	78.6	45.2	37.3	69.7
Mon, 1 Apr 2019	43.0	29.4	63.4	48.9	43.4	80.7			
Equivalent	46.0	35.4	68.0	48.5	42.0	79.6	45.8	36.1	70.0
Blencowe Close									
Session		00-06			06-18			18-24	
Date	LA eq	L90	LAF max	LA eq	L90	LAF max	LA eq	L90	LAF max
Wed, 27 Mar 2019	46.1	35.1	69.6	47.2	40.2	47.2	45.4	38.5	69.1
Thu, 28 Mar 2019	48.8	34.3	75.5	48.1	38.8	76.3	46.3	42.2	66.9
Fri, 29 Mar 2019	47.8	42.8	69.6	49.3	45.6	75.4	49.7	42.3	69.6
Sat, 30 Mar 2019	46.5	38.2	68.7	47.0	40.2	70.1	43.8	36.9	69.7

Fulmar Court									
Session		00-06			06-18			18-24	
Date	LA eq	L90	LAF max	LA eq	L90	LAF max	LA eq	L90	LAF max
Sun, 31 Mar 2019	37.3	29.1	61.9	47.9	42.4	77.4	45.9	38.7	76.9
Mon, 1 Apr 2019	35.4	29.1	57.5	47.9	41.7	75.4			
Equivalent	46.5	34.8	70.6	48.7	41.5	76.5	46.6	33.1	71.8

4.2. Each day has been separated into sessions as follows:

4.2.1. 00:00 Midnight to 06:00

4.2.2. 06:00 to 18:00

4.2.3. 18:00 to Midnight

4.3. The following metrics have been recorded:

4.3.1. $dBLA_{eq}$

4.3.2. $dBLAF_{max}$

4.3.3. $dBLA_{90}$

4.4. The equivalent level for each session on each day has been calculated. For LA_{eq} and LAF_{max} results the equivalent summation is logarithmic whilst for the L_{90} the summary is statistical.

4.5. A graphical analysis of the monitoring results is shown in the appendix.

4.6. Weather conditions throughout the monitoring sessions have been summarised in the graphic analysis.

5. Executive Summary

5.1. Recorded noise levels were consistent from day to day and session to session indicating that the results can be considered typical of those that would prevail during proposed circuit operations.

5.2.Weather conditions were suitable throughout the survey. Wind conditions remained within traceable limits (max 7m/s) whilst daily temperatures varied between 8.7°C and 16.5°C.

5.3.Ambient noise levels during the 06:00 - 18:00 sessions at both locations were very similar recording an equivalent value of 48.1 and 48.7dBL$A_{eq(session)}$ respectively. Background noise levels were also very similar recording 42.0 and 41.5 dBL$A_{90(session)}$ respectively. $LAF_{max(session)}$ levels were 79.6 and 76.5dB respectively.

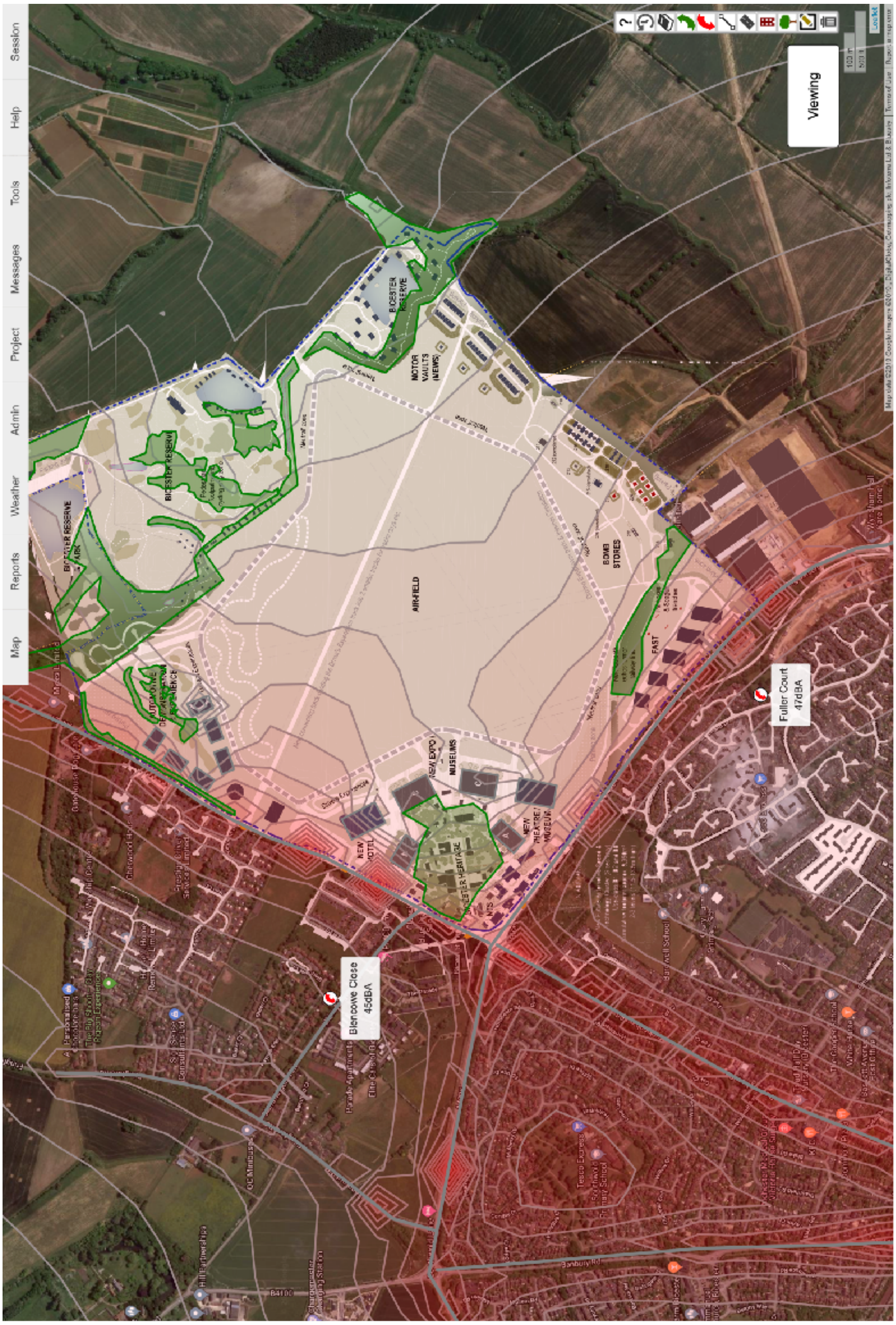
5.4.With slight adjustments the model can be used to extrapolate the levels at other locations around the site with expectations of reasonable accuracy.

5.5.SPLtrack has well established data and directive models for sports and racing cars gained over several years monitoring at all of the major UK motor sport circuits. These can be applied to the overall model to create views for various track configurations, noise mitigation options and drive-by noise control levels.

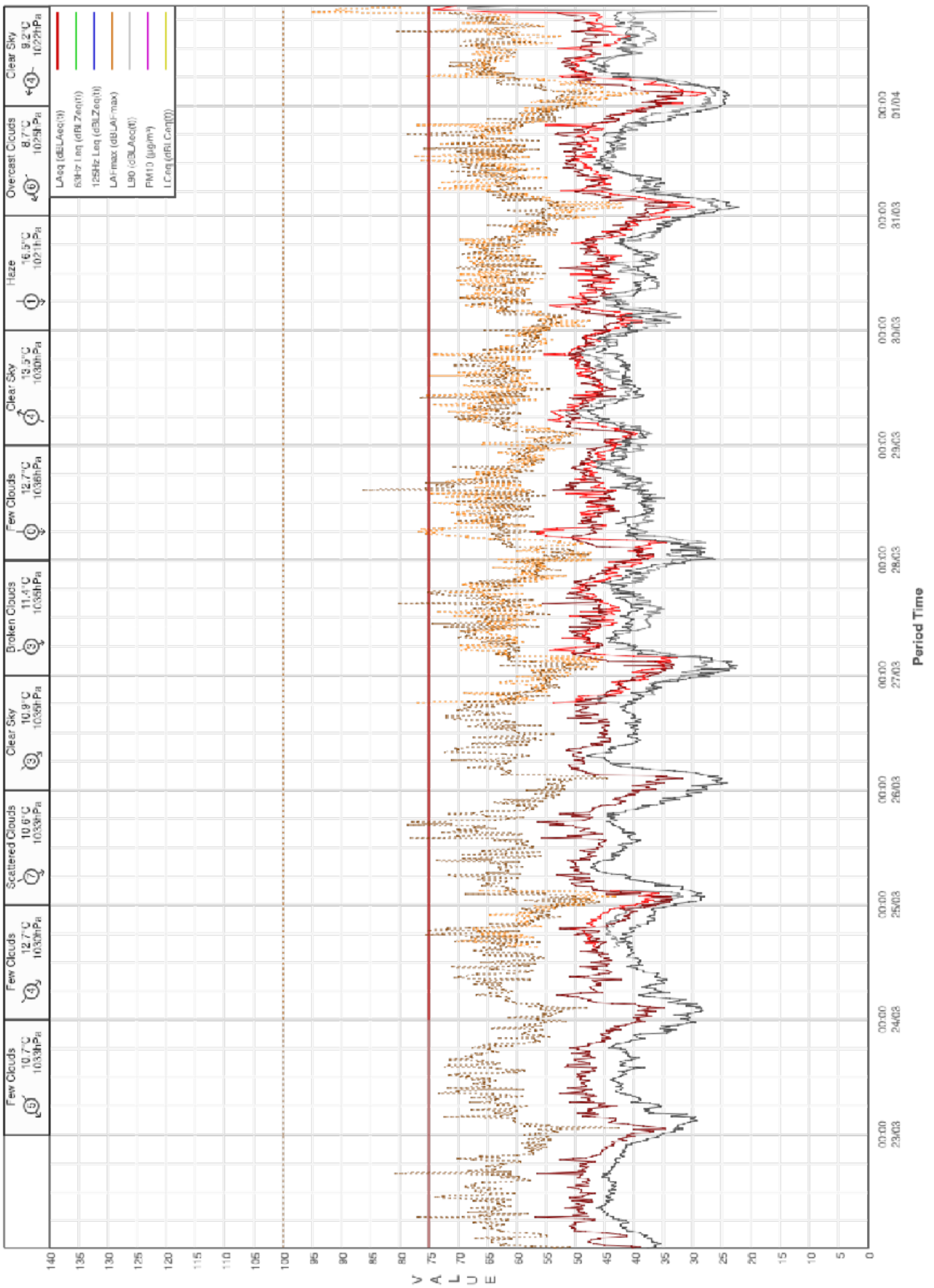
Chris Beale BSc

Tuesday, 16 April 2019

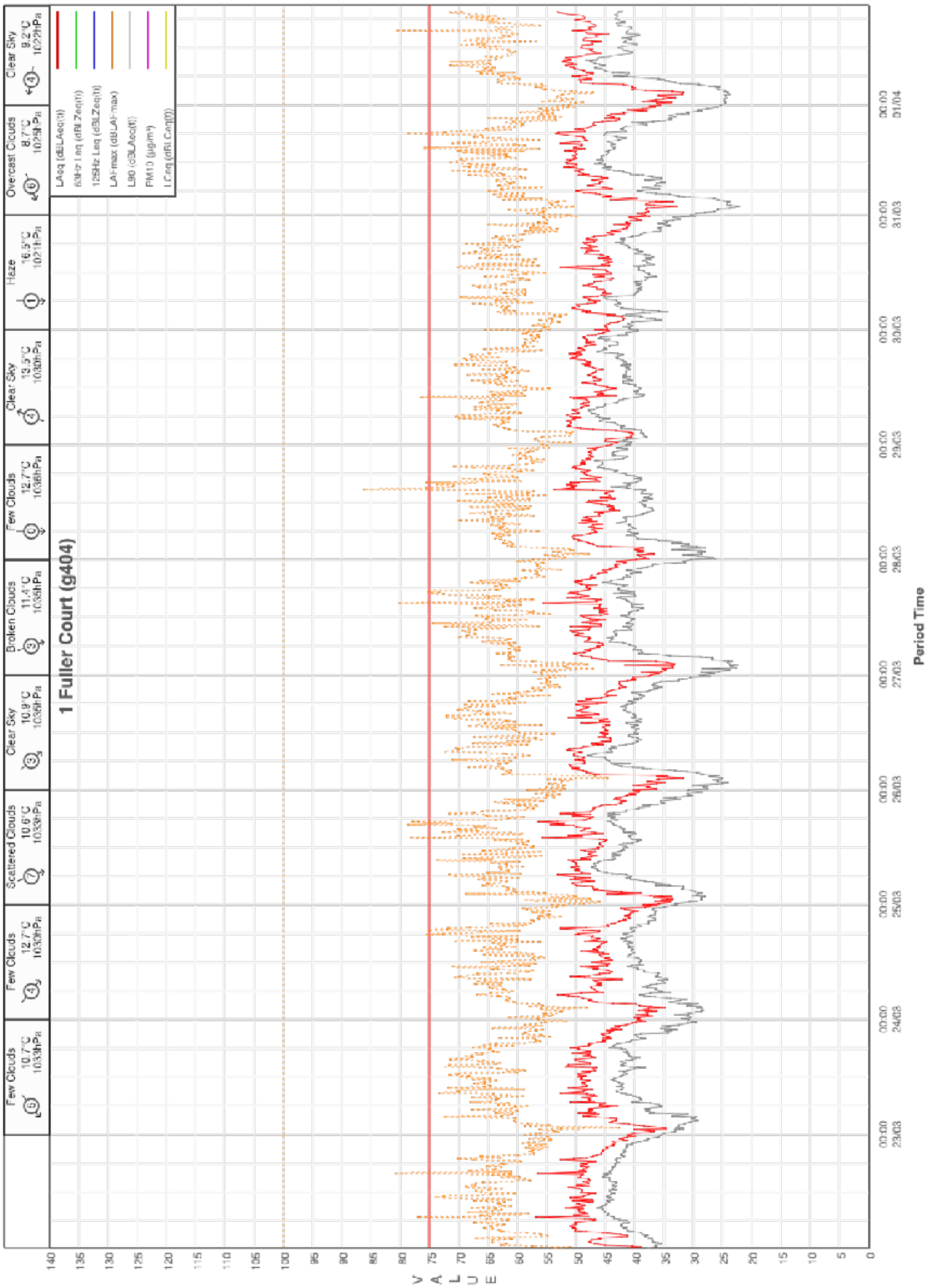
Baseline survey locations



Baseline data graphs



Blencowe Close



Fulmar Court

Calibration certificates

MTS Calibration

MTS Calibration Ltd,
The Grange Business Centre,
Belasis Avenue,
Billingham TS23 1LG,
England
Telephone: 01624 876 410

ilac-MRA

UKAS CALIBRATION 0607

CERTIFICATE OF CALIBRATION

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Approved Signatory:

Tony Sherris

Issued by: MTS Calibration Ltd

Date of Issue: 04 March 2019 Certificate Number: 32836U

Sound Level Meter

Sound Level Meter Periodic Tests to EN 61672-3: 2013 Class 1

Client: SPLtrack Ltd
The Coach House
Mallory Park Circuit
Leicestershire LE9 7QE

Instrument Make: NTI Audio
Instrument Model: XL2 TA
Serial Number: A2A-13691-EO

Associated Equipment	Make	Model	Serial number
Preamplifier	NTI Audio	MA220	6896
Microphone	NTI Audio	MC230	1015
Calibrator	Larson Davis	CAL200	9175
Calibrator supplied by	MTS for this calibration		

Test results summary, detailed results are shown on subsequent pages.

Periodic tests were performed in accordance with procedures from IEC 61672-3:2013 Class 1

Tests performed	Section	Results of test	Page	Comments
Calibration Certificate	22		1	
Additional information			2	
Indication with Calibrator Supplied	10	No Limit	3	
Self-Generated Noise	11	No Limit	3	
Frequency and Time-weightings at 1kHz	14	Complies	3	
Long term stability	15	Complies	3	
High stability	21	Complies	3	
Acoustic Tests	12	Complies	4	
Frequency Weighting A	13	Complies	5	
Frequency Weighting C	13	Complies	6	
Frequency Weighting Z	13	Complies	7	
Level Linearity	16	Complies	8	
Level Linearity Range Control	17	Complies	9	
Tone-burst Response	18	Complies	10	
Peak C sound level	19	Complies	11	
Overload indication	20	Complies	12	

The instrument was within the above specification as received - no modifications were made

The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3: 2013 for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2: 2013, to demonstrate that the model of sound level meter fully conformed to the Class 1 specifications in IEC 61672-1: 2013, the sound level meter submitted for testing conforms to the Class 1 specifications of IEC 61672-1: 2013

Additional tests performed	Reference	
Microphone full frequency response	32838U	See additional UKAS certificate
A Wtg with Outdoor Microphone	32836M	See additional certificate

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

MTS Calibration

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ilac-MRA UKAS CALIBRATION 0607

CERTIFICATE OF CALIBRATION

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Approved Signatory:

Tony Sherris

Issued by: MTS Calibration Ltd

Date of Issue: 04 March 2019 Certificate Number: 32833U

Sound Level Meter

Sound Level Meter Periodic Tests to EN 61672-3: 2013 Class 1

Client: SPLtrack Ltd
The Coach House
Mallory Park Circuit
Leicestershire LE9 7QE

Instrument Make: NTI Audio
Instrument Model: XL2 TA
Serial Number: A2A-12690-EO

Associated Equipment	Make	Model	Serial number
Preamplifier	NTI Audio	MA220	7280
Microphone	NTI Audio	MC230	A14951
Calibrator	Larson Davis	CAL200	9175
Calibrator supplied by	MTS for this calibration		

Test results summary, detailed results are shown on subsequent pages.

Periodic tests were performed in accordance with procedures from IEC 61672-3:2013 Class 1

Tests performed	Section	Results of test	Page	Comments
Calibration Certificate	22		1	
Additional information			2	
Indication with Calibrator Supplied	10	No Limit	3	
Self-Generated Noise	11	No Limit	3	
Frequency and Time-weightings at 1kHz	14	Complies	3	
Long term stability	15	Complies	3	
High stability	21	Complies	3	
Acoustic Tests	12	Complies	4	
Frequency Weighting A	13	Complies	5	
Frequency Weighting C	13	Complies	6	
Frequency Weighting Z	13	Complies	7	
Level Linearity	16	Complies	8	
Level Linearity Range Control	17	Complies	9	
Tone-burst Response	18	Complies	10	
Peak C sound level	19	Complies	11	
Overload Indication	20	Complies	12	

The instrument was within the above specification as received - no modifications were made

The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3: 2013 for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2: 2013, to demonstrate that the model of sound level meter fully conformed to the Class 1 specifications in IEC 61672-1: 2013, the sound level meter submitted for testing conforms to the Class 1 specifications of IEC 61672-1: 2013

Additional tests performed	Reference	
Microphone full frequency response	32835U	See additional UKAS certificate
A Wtg with Outdoor Microphone	32833M	See additional certificate

Appendix 2 - Glossary of terms

Ambient Noise	The total encompassing sound in a given situation at a given time, usually composed of sound from many sources far and near
A-weighted sound pressure, p_A	Value of overall sound pressure, measured in pascals (Pa), after the electrical signal derived from a microphone has been passed through an A-
A-weighted sound pressure level, L_{pA}	Quantity of A-weighted sound pressure, given by the following formula in
Background Noise Level, $L_{A90,T}$	The A weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90% of a given time interval, T, measured using time weighting, F, and quoted to the nearest whole number of decibels
Daytime Decibel (dB)	The period 06:00-18:00 hours
dB $L_{EP,w}$	Weekly noise exposure level
dB $L_{EP,d}$	Daily noise exposure level
Decibel (dB)	A unit of level derived from the logarithm of the ratio between the value of a quantity and a reference value. It is used to describe the level of many different quantities. For sound pressure levels the reference quantity is 20 uPa. The threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions
dB(A), L_{As}	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A)
Free-field level	Sound pressure level measured outside, far away from reflecting surfaces. Measurements are made 1.5 m above the ground and at least 3.5 m away from other reflecting surfaces are usually regarded as being free-field measurements. To minimize the effect of reflections the measuring position should be at least 3.5 m to the side of the reflecting surface (i.e. not 3.5 m from the reflecting surface in the direction of the source). Estimates of noise from aircraft overhead usually include a correction of 2 dB to allow for reflections from the ground.
Façade level	Sound pressure level measured 1 m in front of the façade of a property.
$L_{A10,T}$	The A weighted noise level exceeded for 10% of the measurement period, T.
$L_{A90,T}$	The A weighted noise level exceeded for 90% of the measurement period, T. This is defined in BS 4142 as the background noise level.
L_{AE}	The sound exposure level – the level of a sound with a period of 1 second that has the same sound energy as the event considered.
$L_{Aeq,T}$	The equivalent continuous A-weighted sound pressure level is the value of the A-weighted sound pressure level in decibels (dB) of a continuous, steady sound, that within a specified time interval, T, has the same mean squared sound pressure as the sound under consideration that varies with time.

LAmax	The highest A weighted noise level recorded during a noise event. The time weighting (slow or fast) should be stated.
Night time	The period 23:00-09:00 hours.
Octave band	Band of frequencies in which the upper limit of the band is twice the frequency of the lower limit.
Third octave band	Band of frequencies in which the upper limit of the band is 2 times the frequency of the lower limit.
Residual noise	The ambient noise remaining at a given position in a given situation when the specific noise source is suppressed to a degree such that it does not contribute to the ambient noise.
Sound Power Level, L_W	An absolute parameter widely used for rating and comparing sound sources. Sound power is a physical property of the source alone, independent of any external or environmental factors.
Sound Pressure, p	Root-mean-square value of the variation in air pressure measured in pascals (Pa), above and below atmospheric pressure, caused by the sound.
Sound Pressure Level, L_p	Quantity of sound pressure, in decibels (dB).
Specific Noise Level, $L_{Aeq,Tr}$	The equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval.
Specific Noise Source	The noise source under investigation.