

# Public Document Pack

SUPPLEMENTARY INFORMATION – 2

LICENSING SUB COMMITTEE – 15<sup>TH</sup> AUGUST 2023

AGENDA ITEM 7 – Application for the grant of a premises licence for RSPB St Aidan's Nature Park, St Aidan's Nature Reserve, Astley Lane, Swillington, Leeds, LS26 8AL.

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# Leeds 2023 – The Nest

## Noise Management Plan

**Leeds Culture Trust Limited**

Revision 0

09 August 2023

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Revision	Date	Reason
0	09/08/2023	Issue.

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# 1 Introduction

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## 1.1 Appointment

1.1.1 F1 Acoustics Company Limited (F1AC) has been appointed by Leeds Culture Trust Limited (LCTL) to provide sound control management for Leeds 2023 – The Nest at RSPB St Aidan's Nature Park, Astley Lane, Leeds, LS26 8AL, taking place from Monday 4<sup>th</sup> September 2023 to Saturday 9<sup>th</sup> September 2023.

1.1.2 This Noise Management Plan (NMP) contains details of the noise management strategies that will be executed by F1AC on behalf of LCTL, and to ensure that the objectives of the Licencing Act 2003 relating to public nuisance and conditions of the Premises Licence relating to music noise are addressed and implemented at all times during the event.

1.1.3 This NMP is a “live document” and will be updated alongside the overall event management plan as it is developed in the lead up to the event.

## 1.2 About F1 Acoustics Company Limited

1.2.1 F1AC are specialists in event and festival sound control and have provided services for festivals including Glastonbury, Boomtown, Southwest Four, Leeds Festival, Latitude Festival and GALA Festival plus numerous other single stage and multi-stage events across the UK. We have a combined experience of over 30 years providing high quality sound control services and all of our Consultants are Members of the Institute of Acoustics. As well as entertainment sound control the company deals with the whole range of acoustics and noise issues, our staff have presented expert testimony at planning and licencing hearings as well as being accustomed to liaising with Local Authority Officers regarding noise.

1.2.2 F1AC will use integrating sound level meters capable of measuring in third-octave bands and conforming to the Class 1 specification contained in BS EN 61672-1:2013 for all off-site measurements, with all sound level meters used for on-site monitoring, if required by conditions within the Premises Licence, conforming to the Class 2 specification or better. These sound level meters will be within a two year period of calibration traceable to national standards. All sound level meters will be checked for calibration with an equivalent or more accurate Class of acoustic calibrator, which is within a two year

period of calibration traceable to national standards, before and after each monitoring session.

- 1.2.3 F1AC has used National Guidelines, The Code of Practice on Environmental Noise Control at Concerts (The Noise Council, 1995) and our expert experience in this sector to tailor this Noise Management Plan for the type of event, number of customers, number of stages, location and context to ensure an achievable protocol is established.

## 2 Guidance and Music Noise Level Limits

### 2.1 Code of Practice on Environmental Noise Control at Concerts

2.1.1 The Code of Practice on Environmental Noise Control at Concerts contains the following relevant guidance regarding the off-site noise limits at the nearest noise sensitive receptors (NSR):

*“3.1 The music noise levels (MNL) when assessed at the prediction stage or measured during sound checks or concerts should not exceed the guidelines shown in Table 1 at 1 metre from the façade of any noise sensitive premises for events held between the hours of 09.00 and 23.00.*

**Table 1**

<b>Concert days per calendar year, per venue</b>	<b>Venue category</b>	<b>Guideline</b>
1 to 3	Urban Stadia or Arenas	The MNL should not exceed 75 dB(A) over a 15 minute period
1 to 3	Other Urban and Rural Venues	The MNL should not exceed 65 dB(A) over a 15 minute period
4 to 12	All Venues	The MNL should not exceed the background noise level by more than 15 dB(A) over a 15 minute period

**Notes to Table 1**

- 1. The value used should be the arithmetic average of the hourly LA90 measured over the last four hours of the proposed music event or over the entire period of the proposed music event if scheduled to last for less than four hours.*
- 2. There are many other issues which affect the acceptability of proposed concerts. This code is designed to address the environmental noise issue alone.*
- 3. In locations where individuals may be affected by more than one venue, the impact of all the events should be considered.*

4. For those venues where more than three events per calendar year are expected, the frequency and scheduling of the events will affect the level of disturbance. In particular, additional discharges can arise if events occur on more than three consecutive days without a reduction in the permitted MNL.

5. For indoor venues used for up to about 30 events per calendar year an MNL not exceeding the background noise by more than 5 dB(A) over a fifteen minute period is recommended for events finishing no later than 23.00 hours.

6. Account should be taken of the noise impact of other events at a venue. It may be appropriate to reduce the permitted noise from a concert if the other events are noisy.

7. For venues where just one event has been held on one day in any one year, it has been found possible to adopt a higher limit value without causing an unacceptable level of disturbance.

3.2 For events continuing or held between the hours 23.00 and 09.00 the music noise should not be audible within noise-sensitive premises with windows open in a typical manner for ventilation.

#### Notes on Guidelines 3.2

1. The use of inaudibility as a guideline is not universally accepted as an appropriate method of control. References 6 & 7 (Appendix 1) set out the various issues. This guideline is proposed as there is insufficient evidence available to give more precise guidance.

2. Control can be exercised in this situation by limiting the music noise so that it is just audible outside the noise sensitive premises. When that is achieved it can be assumed that the music noise is not audible inside the noise sensitive premises.

3.3 The nature of music events means that these guidelines are best used in the setting of limits prior to the event (see 4.0).

3.4 Assessment of noise in terms of dB(A) is very convenient but it can underestimate the intrusiveness of low frequency noise. Furthermore, low frequency noise can be very noticeable indoors. Thus, even if the dB(A) guideline is being met, unreasonable disturbance may be occurring because of the low frequency noise. With certain types of events, therefore, it may be necessary to



*set an additional criterion in terms of low frequency noise, or apply additional control conditions.*

*Notes to Guideline 3.4*

*1. It has been found that it is the frequency imbalance which causes disturbance. Consequently there is less of a problem from the low frequency content of the music noise near to an open air venue than further away.*

*2. Although no precise guidance is available the following may be found helpful (Ref.8): A level up to 70 dB in either of the 63 Hz or 125 Hz octave frequency band is satisfactory; a level of 80 dB or more in either of those octave frequency bands causes significant disturbance.*

*3.5 Complaints may occur simply because people some distance from the event can hear it and that, consequently, they feel the music must be loud even though the guidelines are being met. In fact topographical and climatic conditions can be such that the MNL is lower at locations nearer to the venue.”*

## 2.2 Proposed Music Noise Level Limits

- 2.2.1 The national guidance document “Code of Practice on Environmental Noise Control at Concerts”, although withdrawn by the Chartered Institute of Environmental Health (CIEH) in 2019 is still the most up to date guidance document available and is still often used in establishing the off-site music noise levels (MNL) for events.
- 2.2.2 The local context, duration and timings of an event can also be a significant factor in deciding appropriate MNL criteria.
- 2.2.3 The Nest is part of the LEEDS 2023’s Year of Culture celebrating Leeds’ cultural past, present and future. Each performance will last for only 90 minutes with each stage operating independently for approximately 20 minutes during each performance and each performance is scheduled to finish by 21:30.
- 2.2.4 Considering the guidance, the local context and the format of the event it is proposed to adopt an off-site target MNL limit of  $L_{Aeq,15min}$  65 dB for the events at the nearest noise sensitive premises.

## **3 Site, Environs and Details of the Event**

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### **3.1 Site Location**

- 3.1.1 The event is being held at RSPB St Aidan's Nature Park, Astley Lane, Leeds, LS26 8AL.
- 3.1.2 St Aidan's is a 355 hectare nature park located between Leeds and Castleford in West Yorkshire. The land was formerly an opencast coal mining area that was flooded in 1988, after the riverbank collapsed. The character of the area is rural.
- 3.1.3 The nearest noise sensitive premises are residential properties located to the northeast on Princess Street, Victoria Court, Albert Court and Jubilee Gardens. Approximately 1 km to the south are residential properties on Pit Lane and Parsonage Road.
- 3.1.4 A plan showing the event site location and surrounding area is included as Figure 1.

### **3.2 The Nest**

- 3.2.1 The Nest is a theatre production that explores how we can combat the climate crisis and create a better world for future generations. The performance follows the cast on a quest through the RSPB St Aidan's Nature Park, exploring it across several beautiful locations as it is spectacularly animated with music, movement and projection like never before. The performance route is around Bowers Lake, stopping at four locations, starting and ending at the visitor centre.
- 3.2.2 There will be a separate sound system at each of the four locations, operating one at a time for approximately 20 minutes per location.
- 3.2.3 The event is being held nightly from Tuesday 5<sup>th</sup> September to Saturday 9<sup>th</sup> September 2023, with a public dress rehearsal on Monday 4<sup>th</sup> September 2023 and technical rehearsals on Sunday 3<sup>rd</sup> September 2023. The performances are programmed to start at 19:45 and will last for approximately 90 minutes.
- 3.2.4 A plan showing the site layout including the location of the stages is included as Figure 2.

### 3.3 Sound System

3.3.1 Details of the proposed sound system have been provided by appointed sound system provider and are provided below:

#### **Oddball Stage**

- Main Hangs: 4x d&b XSL8 and 2x d&b XSL12 a side – L&R flown arrays
- Surround - d&b 1 x V10P & 1x V-SUB a side – L&R
- Fills: 3x d&b V10P
- Sub Array: 2x d&b SL Subs
- Flat Roof - 1 x d&b V7P & 1 x d&b V-SUB

#### **Petrified Forest Stage**

13x d&b E8, 4 x d&b B6-SUB

#### **Flooded Lands Stage**

- 8x d&b Y10P, 4 x d&b V-SUB

#### **Seeders Return Stage**

- 2x HK Linear 5 MKii 115 with 2x HK Linear 5 MKii 118 Subs

3.3.2 The sound system will have appropriate controls for adjusting and fine-tuning individual third octave-bands. A multi-band compressor/limiter or dynamic equaliser will also be used where required to provide greater control of the sound level output. The only people with access to change the settings on the compressors/limiters will be members of the sound engineering team.

3.3.3 Music noise level sound propagation predictions for the four stages have been carried out using SoundPLAN 9.0 sound modelling software and are reported in Appendix B.

## 4 Sound Control Procedure

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### 4.1 Personnel

- 4.1.1 To ensure the proposed off-site MNL limits presented in this NMP are not exceeded, all the steps of the sound control procedure outlined below will be adopted. Such procedures have been developed over a number of years and successfully implemented at numerous concerts, festivals and events. Staff carrying out the sound control program will be available to work closely with the LCC Officers, if they are in attendance.
- 4.1.2 A team consisting of one Sound Control consultants will be in attendance during the rehearsals on Sunday 3<sup>rd</sup> September, the public dress rehearsal on Monday 4<sup>th</sup> September and the first live event on Tuesday 5<sup>th</sup> September 2023.
- 4.1.3 The project manager responsible for the event Sound Control will be Rupert Burton BSc (Hons) MIOA(E) or Robert Miller BSc (Hons) MIOA(E). Rupert and Robert both have over 15 years of experience running sound control for events large and small at both indoor and outdoor venues. Contact details for the Lead Consultant on-site will be provided to the local authority prior to the event. The Lead consultant attending the event or the project manager will be contactable at any time during the event period on the site communication radio and/or by mobile phone.
- 4.1.4 The sound control team will liaise with the team of audio engineers. The audio engineers will work under the instruction of the sound control team and put in to place any required alterations to the sound systems overall or frequency-based output to achieve compliance with the proposed music noise level limits and this noise management plan.
- 4.1.5 MNL limits for each stage will be set and verified over the rehearsal, dress rehearsal and the first live show. To maintain compliance with the proposed off-site MNL limits the stages will be operated within the verified limits for the remaining shows. The event management will be responsible for ensuring the stage levels maintain the agreed limits.

### 4.2 Sound Control Program

#### Pre-event Information

- 4.2.1 Prior to the event LCTL will contact local residents of noise sensitive premises in writing detailing the community hotline telephone number, nature, timings of the programmed entertainment, rehearsals, sound checks and propagation tests for the event.

### **Event Build and Breakdown**

- 4.2.2 The build and breakdown will occur in the days before and after the event. Timings for carrying out any build or breakdown activities that might cause noise to be audible to residents outside the site will be agreed with the Local Authority.

### **Sound Propagation Tests**

- 4.2.3 Sound propagation tests will be carried on Sunday 3<sup>rd</sup> September. Times and durations of the sound propagation tests will be available to the Local Authority upon request.
- 4.2.4 The sound propagation tests consist of playing music, similar to the programmed event content, through the sound systems and measuring the MNL at fixed monitoring points to be used throughout the event in the front of house (FOH) area, ideally at the mixing position where located FOH. Concurrent off-site measurements at the nearest noise sensitive premises will also be taken. These tests take account of all physical factors (e.g. distance, ground absorption, air absorption and meteorological conditions) such that the on-site operating sound levels can be adjusted and set to achieve compliance with the off-site target MNL before the start of the event.

### **Sound Monitoring and Control**

- 4.2.5 LCTL are to inform all relevant parties that F1AC are undertaking the sound control role as part of the premises license requirement and that this role has been appointed and approved by LCTL. F1AC will have ultimate operational control over all the sound levels throughout the event. Therefore, all other parties, including artists, production managers, stage managers, sound engineers and event managers will be instructed not to increase any sound levels unless specifically agreed by the Consultant responsible for sound control.
- 4.2.6 Off-site noise levels will be measured using Class 1 specification integrating sound level meters capable of measuring third-octave bands. Octave band MNL measurements will be regularly taken at the proposed monitoring positions as shown in Figure 1. The monitoring positions identified with the highest MNL will be monitored more frequently

than those with a lower MNL. Additional monitoring positions may be added during the event if identified as required or if requested by the Local Authority.

- 4.2.7 If any MNL are measured to be above the proposed MNL limits, provided in Table 4.1, the sound engineer at the stage identified will be instructed to reduce the sound level, until a measurement showing compliance with the target MNL limits can be taken. In addition to the control of the overall sound level, frequency adjustments can also be made to reduce the sound at certain low frequencies, often characterised outside the event as a ‘bass beat’.

**Table 4.1: Proposed Music Noise Level Limits**

Location	Time Period	Broadband Music Noise Level, $L_{Aeq,15min}$ , dB
Noise monitoring location representative of a noise sensitive premises (measured in free-field).	15 minutes	65

- 4.2.8 Throughout the event, F1AC will be available to liaise closely with LCC Officers responsible for noise. If F1AC is made aware of MNL approaching the limits, sound levels will be reduced at the stage where it is considered necessary. Results of the off-site noise monitoring and any related actions will be collated and kept available by F1AC for inspection by the Local Authority at any time during the event.

### **Low Frequency Sound Control**

- 4.2.9 Paragraph 3.4 from the Noise Council guidance provided in Section 1 states low frequency noise should also be considered separately to minimise the disturbance at noise sensitive premises. Notes on Paragraph 3.4 indicate that the onset of significant disturbance is between 70 dB and 80 dB (unweighted). Note 1 of Paragraph 3.4 states that it is the frequency imbalance that causes the disturbance and consequently there is less of a problem from the low frequency content of the music noise near to an open-air venue than further away.
- 4.2.10 The frequency imbalance occurs because the distance attenuation of sound is frequency dependent, with lower (bass) frequencies attenuating at a slower rate than higher frequencies. The distance at which this frequency imbalance becomes noticeable is generally between 1 – 2 km.

- 4.2.11 At noise sensitive premises closer to the site than the onset of the frequency imbalance the  $L_{Aeq,15min}$  MNL limit proposed will take in to account the low frequency component of the music noise. At these noise sensitive premises, the music noise will contain the full frequency range without significant imbalance, subsequently controlling the A-weighted limit will also control the low frequency component of the MNL.
- 4.2.12 As a guide, it would be expected in the near-field area surrounding the event site, where the music noise is dominant, that the difference between the broadband A-weighted and C-weighted sound levels ( $L_{Ceq,15min}$  minus  $L_{Aeq,15min}$ ) would be approximately 15 to 20 dB, depending on the genre of music.
- 4.2.13 The assessment of the MNL at the noise sensitive premises will include a subjective assessment for any frequency components or featured elements that may cause significant disturbance (including low frequency music noise). In the event that a significant disturbance is identified, appropriate adjustments will be actioned at the relevant stage.
- 4.2.14 Table 4.2 shows the target low frequency MNL limit that, based on our expert experience of similar events, will be applied at NSR where the low frequency component of the music noise is dominant, likely to be at a distance greater than 1 – 2 km from the event.

**Table 4.2: Target Low Frequency Music Noise Level Criteria**

Location	Time Period	63 Hz and 125 Hz Octave Band Music Noise Level, $L_{Zeq,15min}$ , dB
Noise monitoring location representative of a noise sensitive premises where the low frequency component of the music noise is dominant (measured in free-field).	15 minutes	70

#### **Community Hotline and Response to Complaints**

- 4.2.15 A dedicated community hotline, the telephone number of which will be published as aforementioned in Paragraph 4.2.1, will be staffed throughout the duration of the event and rehearsal days. All complaints will be logged and those relating to noise will immediately be relayed to the sound control team with details, where provided, of the

complainant's name, address and postcode, telephone number and a description of the disturbance.

- 4.2.16 Should any complaints of noise be received, at any time during the rehearsals, events or sound propagation tests, a consultant from the sound control team will visit the complainant address (or representative location) and take a measurement. If the MNL is measured to be above the limit immediate action will be taken on-site to reduce the MNL from the event. This will be achieved by two-way radio or mobile communication with all persons involved with the sound control procedures, thus a quick response to the problem can be actioned. However, from experience, it has been found that this proactive sound control procedure will prevent the limits from being exceeded in the first place. Results of complaint investigation monitoring and any related actions will be collated and kept available by F1AC for inspection by the Local Authority at any time during the event.

**Post-event Report**

- 4.2.17 A noise compliance report will be available within an agreed timeframe after the event. The report will include a summary of the on-site and off-site noise levels measured throughout the rehearsals, public dress rehearsal and the first live event; actions taken as a result of the measurements; complaints received; complaint investigation measurements; and any actions taken as a result of complaint investigation.





Key

MP1 – rear of 8 to 20 Princess Street  
 MP2 – rear of 24 to 46 Princess Street  
 MP3 – 20 Pit Lane

**Legend**

- Monitoring Points
- ★ Stages



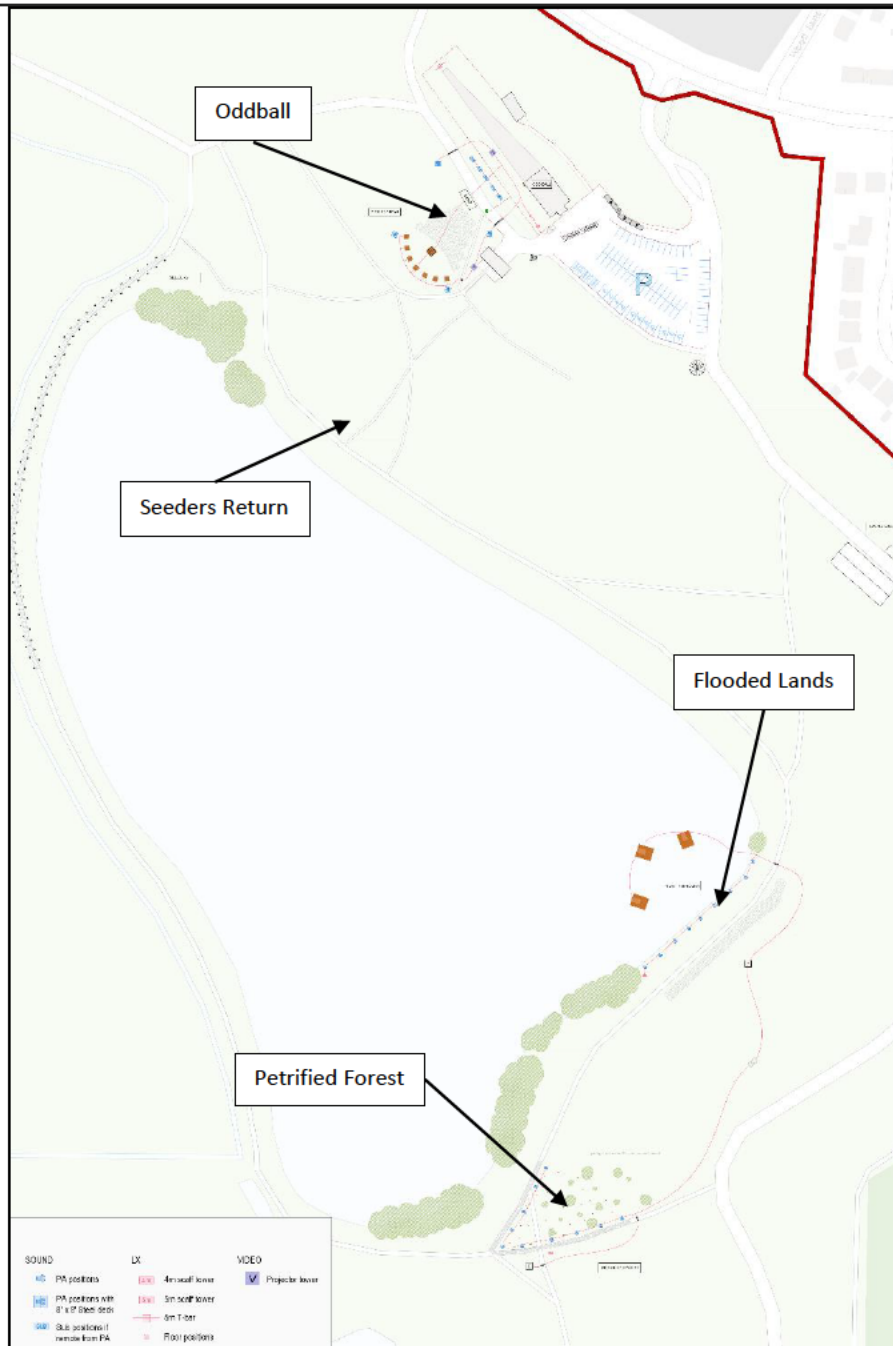
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REV	DATE	D	R	DESCRIPTION
0	09/08/2023	RB	RM	Issue

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PROJECT:	Leeds 2023 - The Nest– Noise Management Plan
CLIENT:	Leeds Culture Trust Limited
TITLE:	Site Location, Noise Sensitive Receptors and Proposed Monitoring Positions
DATE:	09/08/2023
REVISION:	0
SCALE:	Scale as shown.
DRAWING NO:	1867/Leeds2023TheNest-NMP/1/0
FIGURE NO:	1
DRAWN BY:	Rupert Burton
REVIEWED BY:	Robert Miller



REV	DATE	D	R	DESCRIPTION
0	09/08/2023	RB	RM	Issue

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PROJECT:	Leeds 2023 - The Nest- Noise Management Plan
CLIENT:	Leeds Culture Trust Limited
TITLE:	Site Plan
DATE:	09/08/2023
REVISION:	0
SCALE:	Not to scale.
DRAWING NO:	1867/Leeds2023TheNest-NMP/2/0
FIGURE NO:	2
DRAWN BY:	Rupert Burton
REVIEWED BY:	Robert Miller

**Appendices**

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### Glossary of Acoustic Terms

Noise is defined as unwanted sound. The range of audible sound is from 0 dB to 140 dB. The frequency response of the ear is usually taken to be about 18 Hz (number of oscillations per second) to 18,000 Hz. The ear does not respond equally to different frequencies at the same level. It is more sensitive in the mid-frequency range than at the lower and higher frequencies, and because of this, the low and high frequency component of a sound are reduced in importance by applying a weighting (filtering) circuit to the noise measuring instrument. The weighting which is most used and which correlates best with the human subjective response to noise is the A-weighting. This is an internationally accepted standard for noise measurements.

The ear can just distinguish a difference in loudness between two noise sources when there is a 3 dB difference between them. Also when two sound sources of the same noise level are combined the resultant level is 3 dB higher than the single source. When two sounds differ by 10 dB one is said to be twice as loud as the other.

The subjective response to a noise is dependent not only upon the sound pressure level and its frequency, but also its intermittency. Various indices have been developed to try and correlate annoyances with the noise level and its fluctuations. The indices and parameters used in this report are defined below:

- **Background Noise Level** – The prevailing sound level at a location, measured in terms of the  $L_{A90,T}$ , on an equivalent day and at an equivalent time when no concert or sound checks are taking place.
- **dB(A)** – The A-weighted sound pressure level whereby various frequency components of sound are weighted (equalized) to reflect the way the human ear responds to different frequencies.
- **$L_{Aeq}$**  – The equivalent continuous sound pressure level which at a given location over a given period of time contains the same A-weighted sound pressure level of a steady sound that has the same energy as the fluctuating sound under investigation.
- **$L_{AN,T}$**  – The A-weighted sound level exceeded for N% of the measurement period (T).
- **Music Noise Level (MNL)** – The  $L_{Aeq}$  of the music noise measured at a particular location.
- **Noise Consultant** – A person given responsibility by the organiser of the event for monitoring noise levels in accordance with the prevailing conditions, and who has the ability and authority to make decisions and implement changes in noise level during the event.

## **Appendix B**

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### Music Noise Level Sound Propagation Predictions

## MUSIC NOISE LEVEL SOUND PROPAGATION PREDICTIONS

Project	Leeds 2023 – The Nest
To	Leeds Culture Trust
Author	Rupert Burton, Director, F1 Acoustics Company Limited
Reviewer	Robert Miller, Director, F1 Acoustics Company Limited
Reference	1867/MusicNoiseTechnicalMemo/Rev0

### 1 INTRODUCTION

F1 Acoustics Company Limited (F1AC) has been appointed by Leeds Culture Trust to provide music noise level (MNL) computer modelling of the proposed Leeds 2023 – The Nest event at RSPB St Aidan's Nature Park, Astley Lane, Leeds, LS26 8AL. The modelling and this technical memo seek to demonstrate that the event can operate with an appropriate on-site MNL for the audience whilst complying with the proposed off-site MNL limits at noise sensitive premises.

### 2 MUSIC NOISE LEVEL CRITERIA

The proposed MNL limit for The Nest at the nearest noise sensitive premises is  $L_{Aeq,15min}$  65 dB.

### 3 MUSIC NOISE LEVEL SOUND PROPAGATION PREDICTION METHODOLOGY

Sound propagation predictions have been undertaken using ISO 9613 'Acoustics – Attenuation of sound during propagation outdoors' as implemented by SoundPLAN 9.0 sound modelling software. The ISO 9613 predictions of the event site have taken into account the attenuation from geometrical divergence, atmospheric absorption and ground effect between the selected stages and the noise prediction positions surrounding the event site representative of the nearest noise sensitive premises.

Mapping of the event site has been supplied by the client with additional surrounding mapping acquired from the Ordnance Survey Open Data website. Topographical DTM data has been obtained from the Environment Agency Open Government online.

Typical variable atmospheric conditions have been considered to be a temperature of 15°C and 70 % relative humidity for the assessment. The attenuation from ground effect has been calculated based on porous ground at the source, middle and receiver areas, water has been considered as hard ground.

Downwind propagation has been assumed in all directions for the purposes of the noise predictions.

Sound systems have been input using d&b audiotechnik ArrayCalc software to model representative speaker systems and set-ups appropriate for each stage. This includes proposed trim heights; the stage width; subwoofer layout; and any specific subwoofer configuration. The detailed 3D sound system directivity patterns are directly imported to the SoundPLAN model which uses this data to predict sound levels from individual speakers.

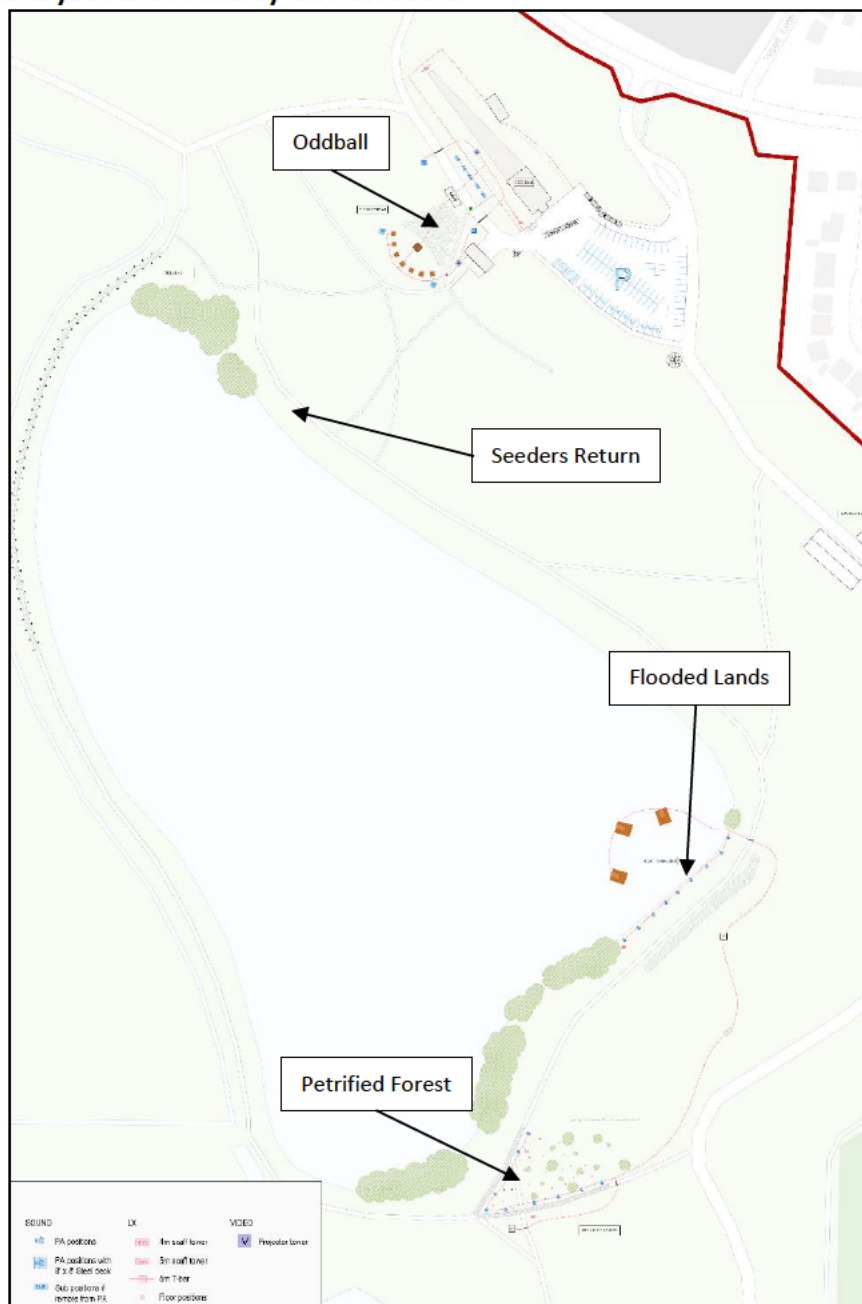
## 4 EVENT AND SOUND SYSTEM INFORMATION

### Event Description

The Nest is a theatre production, taking place at RSPB St Aidan's Nature Park, that explores how we can combat the climate crisis and create a better world for future generations. The performance follows the cast on a quest through the site, exploring it across several beautiful locations as it is spectacularly animated with music, movement and projection like never before. The performance route is around Bowers Lake, stopping at four locations, starting and ending at the visitor centre.

There will be a separate sound system at each of the four locations, operating one at a time for approximately 20 minutes per location. The site layout and stage locations are shown in Figure 4.1.

**Figure 4.1: Site Layout and Sound System Locations**





## Sound Systems

Details of the proposed sound system have been provided by appointed sound system provider and are provided below:

### Oddball:

- Main Hangs: 4x d&b XSL8 and 2x d&b XSL12 a side – L&R flown arrays
- Surround - d&b 1 x V10P & 1x V-SUB a side – L&R
- Fills: 3x d&b V10P
- Sub Array: 2x d&b SL Subs
- Flat Roof - 1 x d&b V7P & 1 x d&b V-SUB

### Petrified Forest:

- 13x d&b E8, 4 x d&b B6-SUB

### Flooded Lands:

- 8x d&b Y10P, 4 x d&b V-SUB

### Seeders Return:

- 2x HK Linear 5 MKii 115 with 2x HK Linear 5 MKii 118 Subs

A 3D render of the modelled sound system are provided in Figures 4.2, 4.3, 4.4 and 4.5.

**Figure 4.2: 3D Render of Modelled Oddball Sound System**

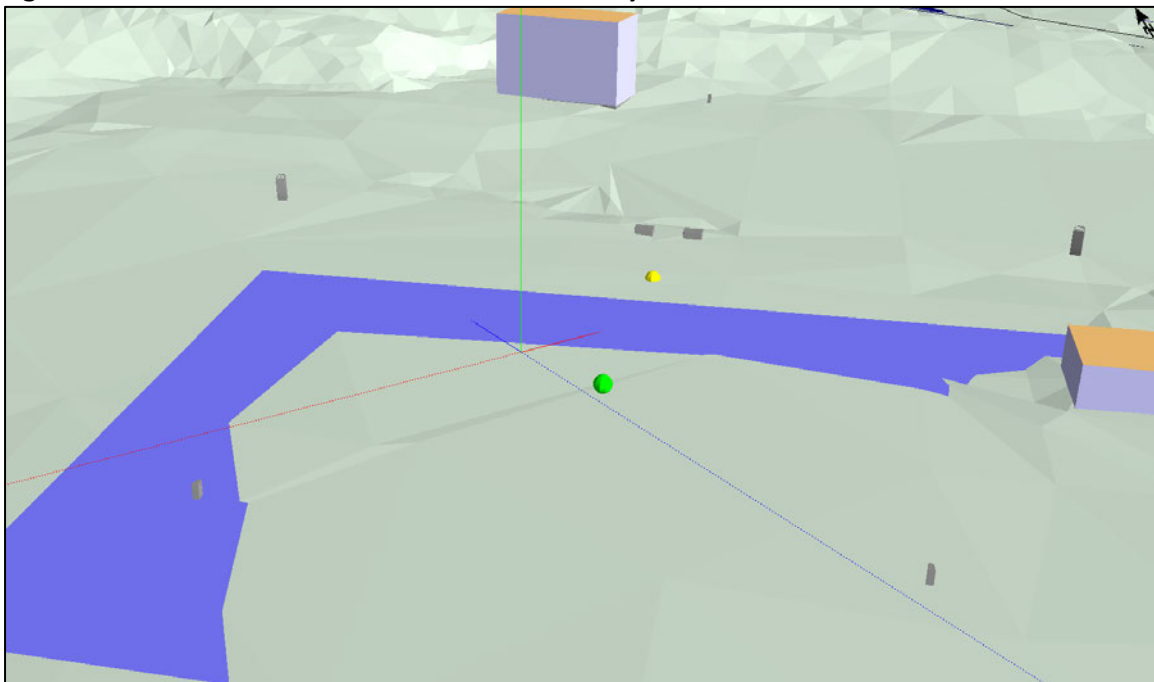


Figure 4.3: 3D Render of Modelled Petrified Forest Sound System

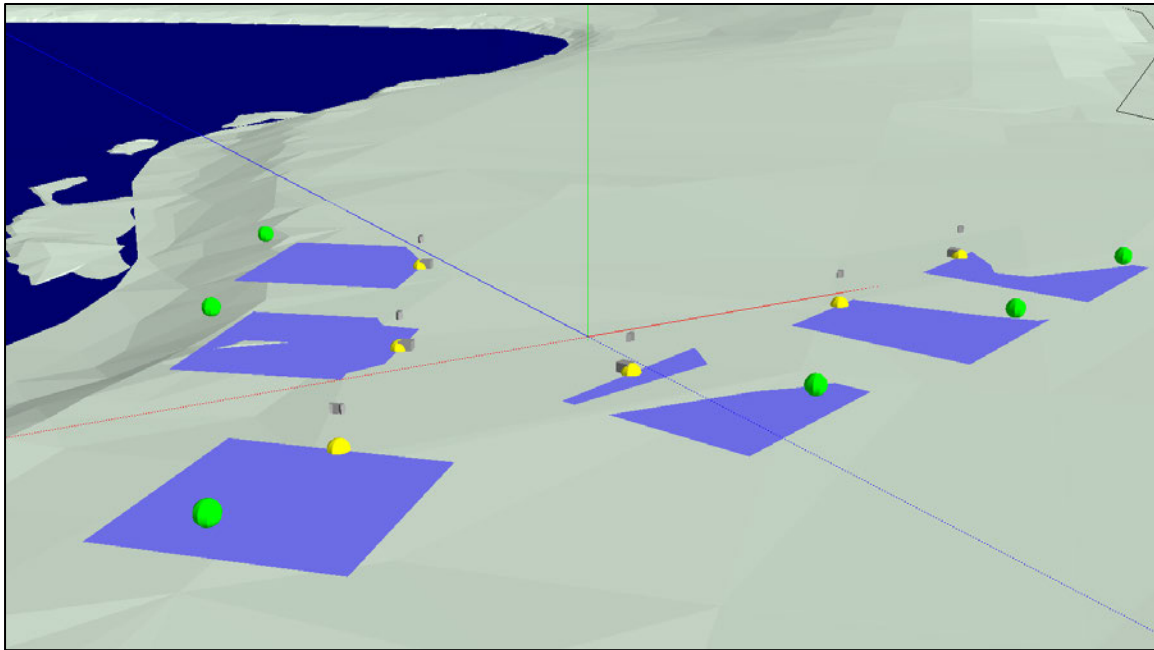
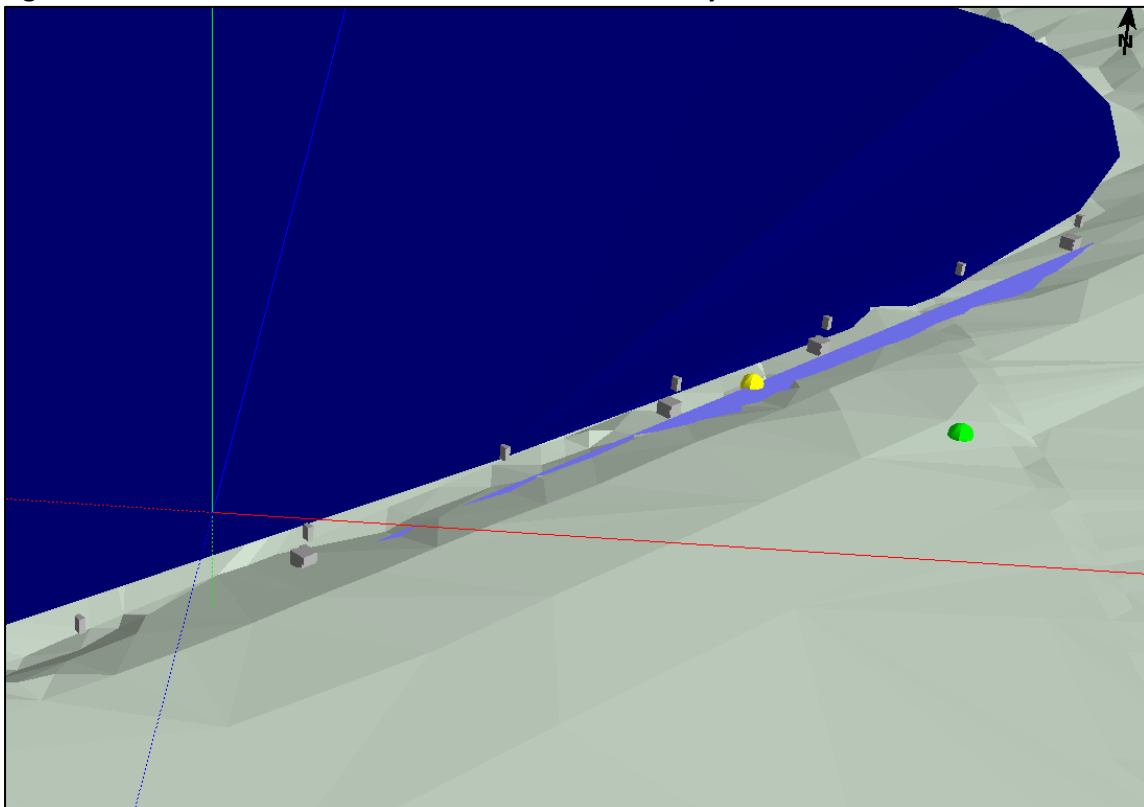
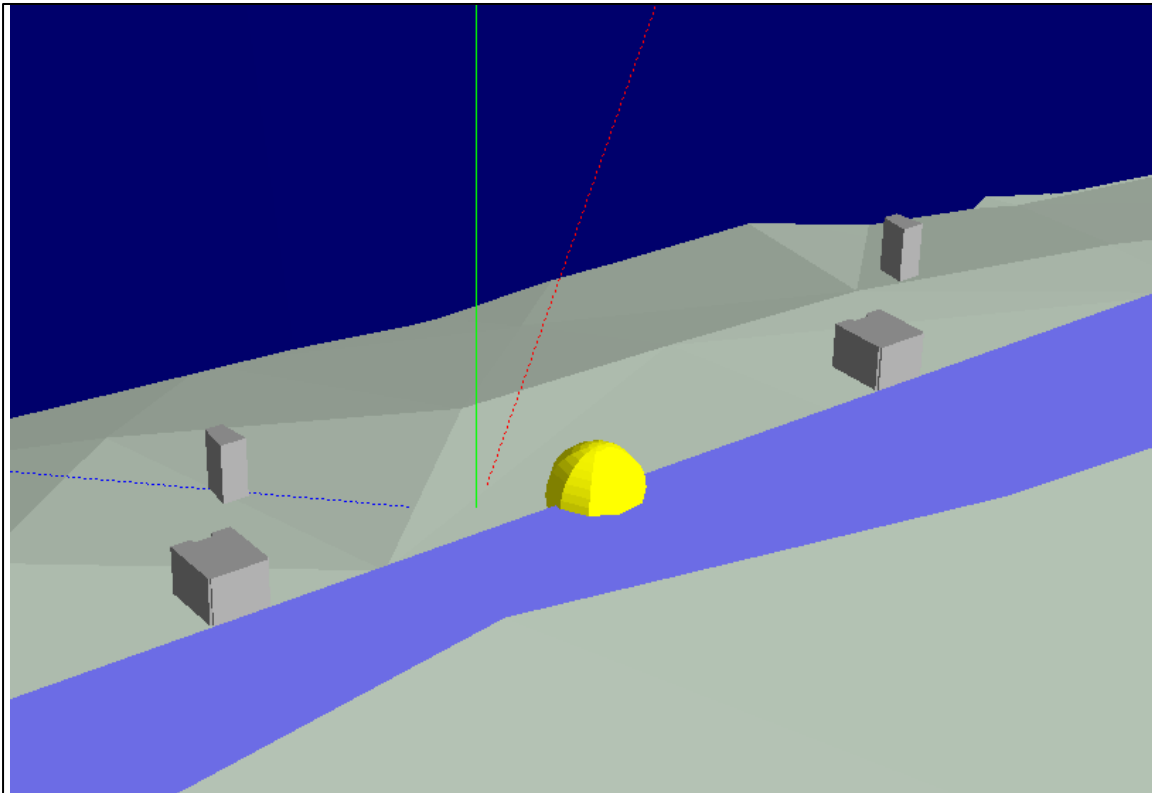


Figure 4.4: 3D Render of Modelled Flooded Lands Sound System

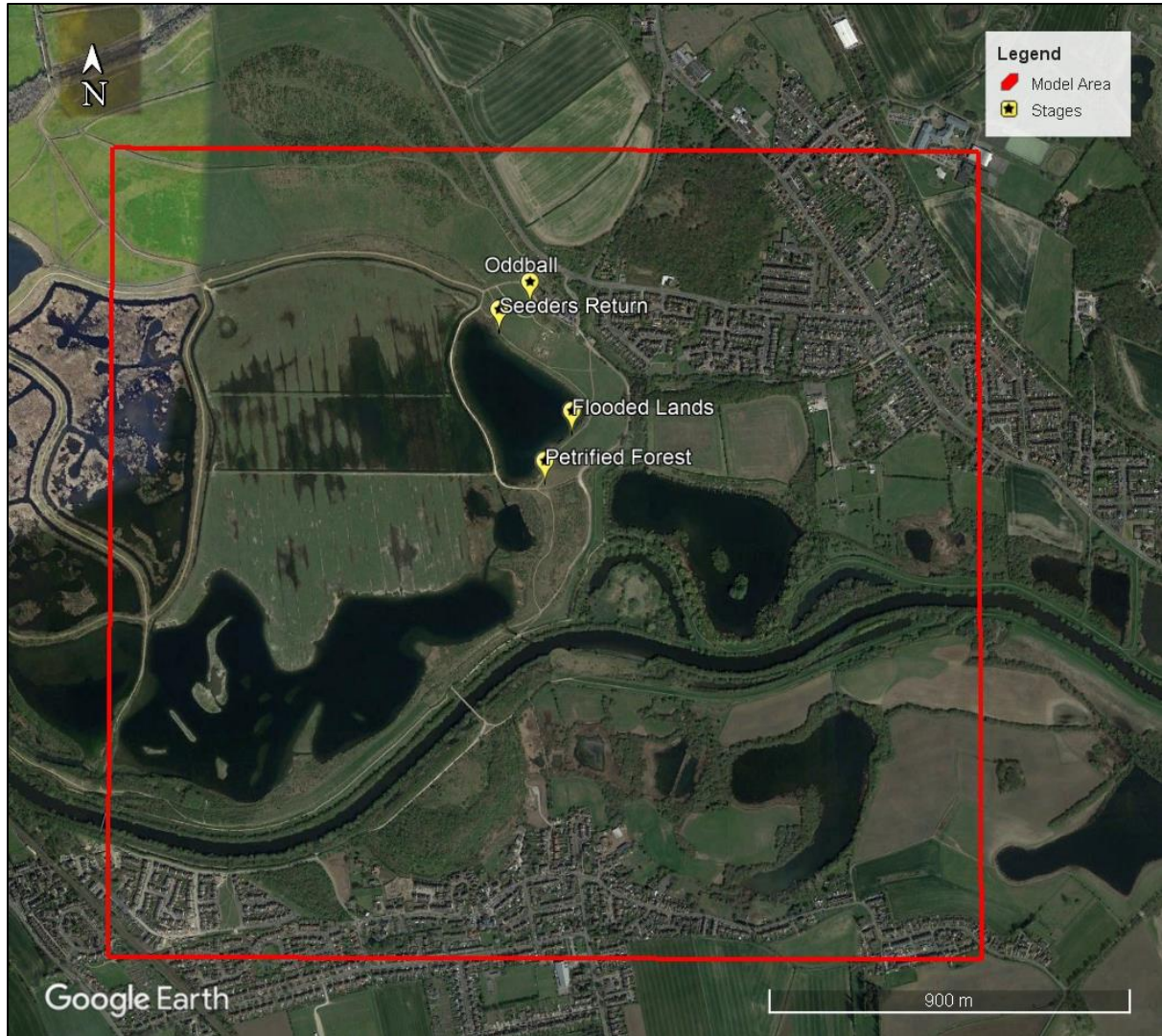


**Figure 4.5: 3D Render of Modelled Seeders Return Sound System**

#### Noise Model Prediction Area

MNL have been predicted at the surrounding area as shown in Figure 4.5 at a height of 1.5 m above local ground.

Figure 4.5: Noise Model Area



### Source Input Music Noise Levels

A music frequency spectrum sourced from the SoundPLAN library (Rock/Pop) has been used as the input for the sound system. The input spectrum is shown in Table 4.1.

**Table 4.1: Source Input Music Noise Level Frequency Spectrum**

	Octave Band $L_{Aeq,T}$ , dB							
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Rock/Pop	99	95	93	93	91	88	82	75

The frequency spectrum given in Table 4.1 has been normalised so the front of house sound levels modelled at 1.5 m above local ground level are as follows:

- Oddball -  $L_{Aeq,15min}$  85 dB at 20 m
- Petrified Forest –  $L_{Aeq,15min}$  85 dB at 10 m
- Flooded Lands -  $L_{Aeq,15min}$  85 dB at 10 m
- Seeders Return -  $L_{Aeq,15min}$  85 dB at 10 m

**5 MUSIC NOISE LEVEL PREDICTION RESULTS**

The results of the MNL propagation predictions for each stage are presented as broadband A-weighted MNL grid maps, presented in Figures 5.1 to 5.4.

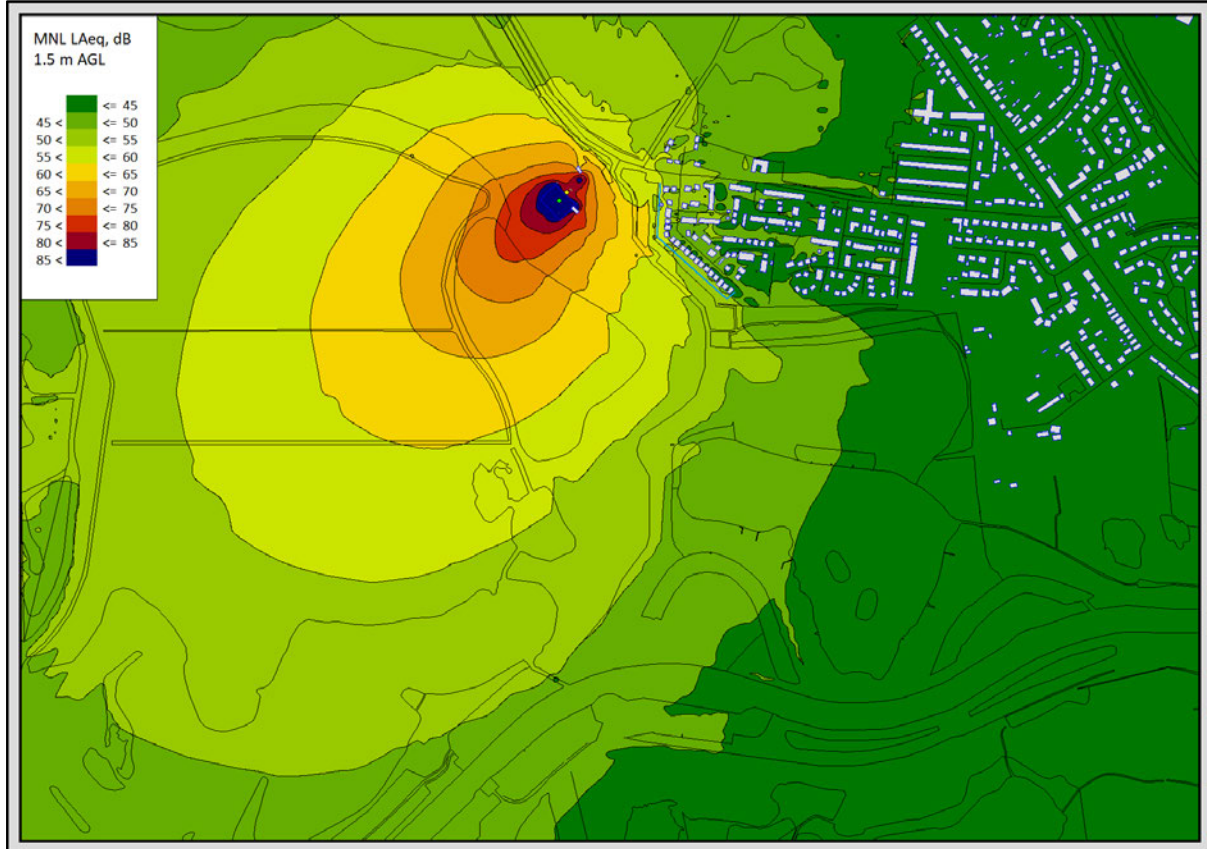
**Figure 5.1: Music Noise Level Grid Map – Oddball Stage**

Figure 5.2: Music Noise Level Grid Map – Petrified Forest Stage

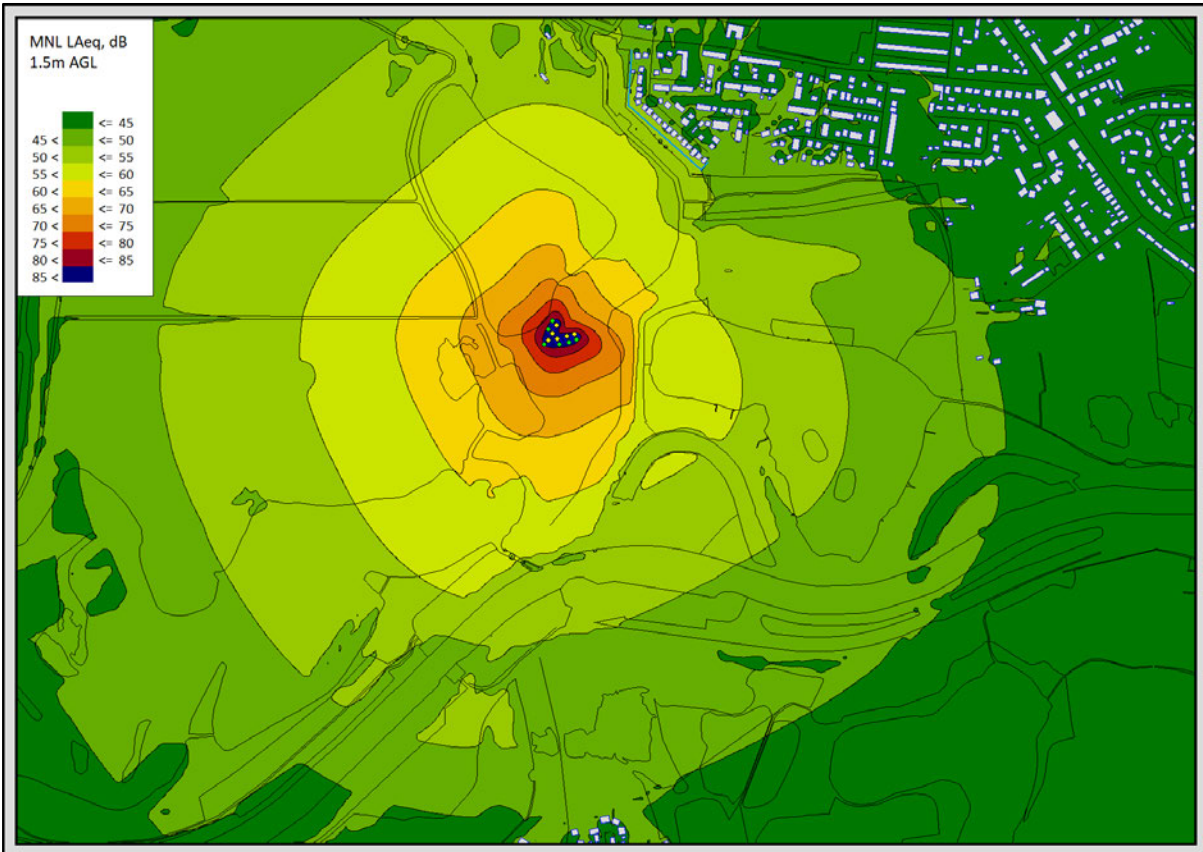
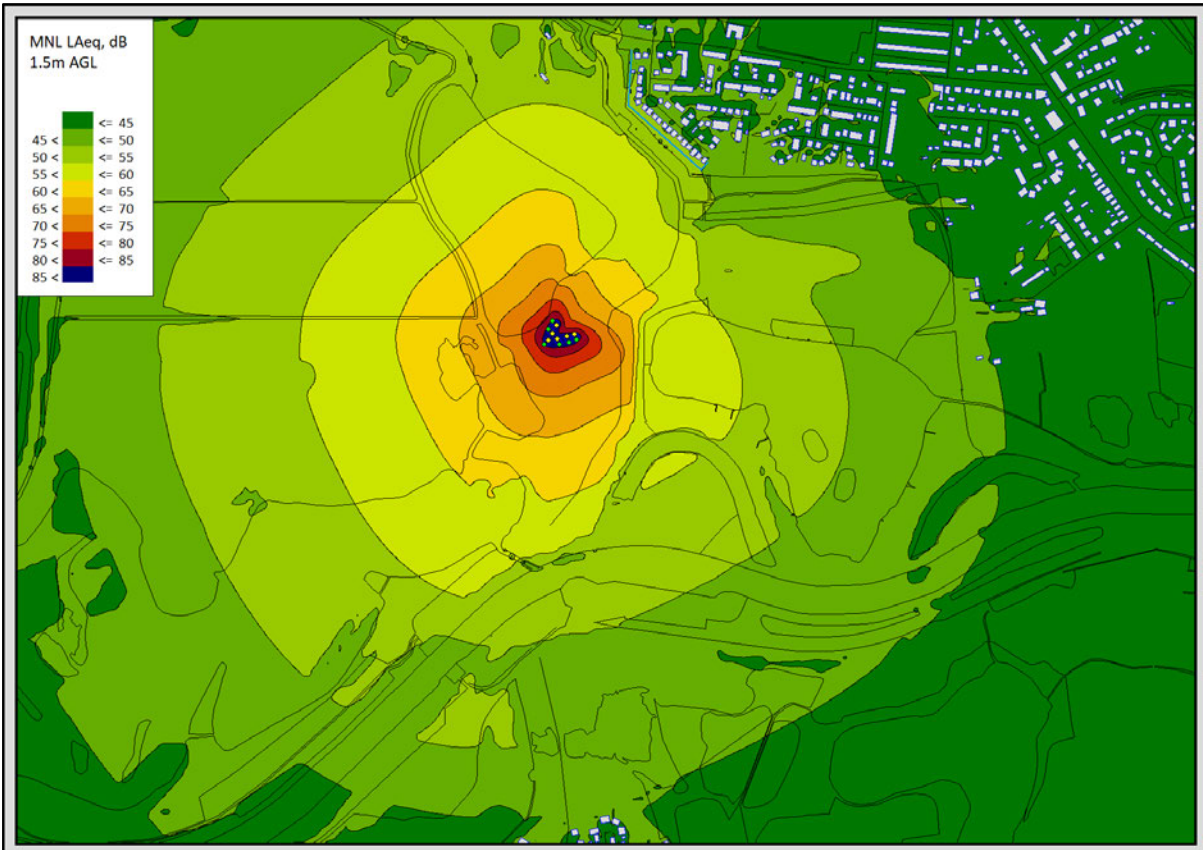
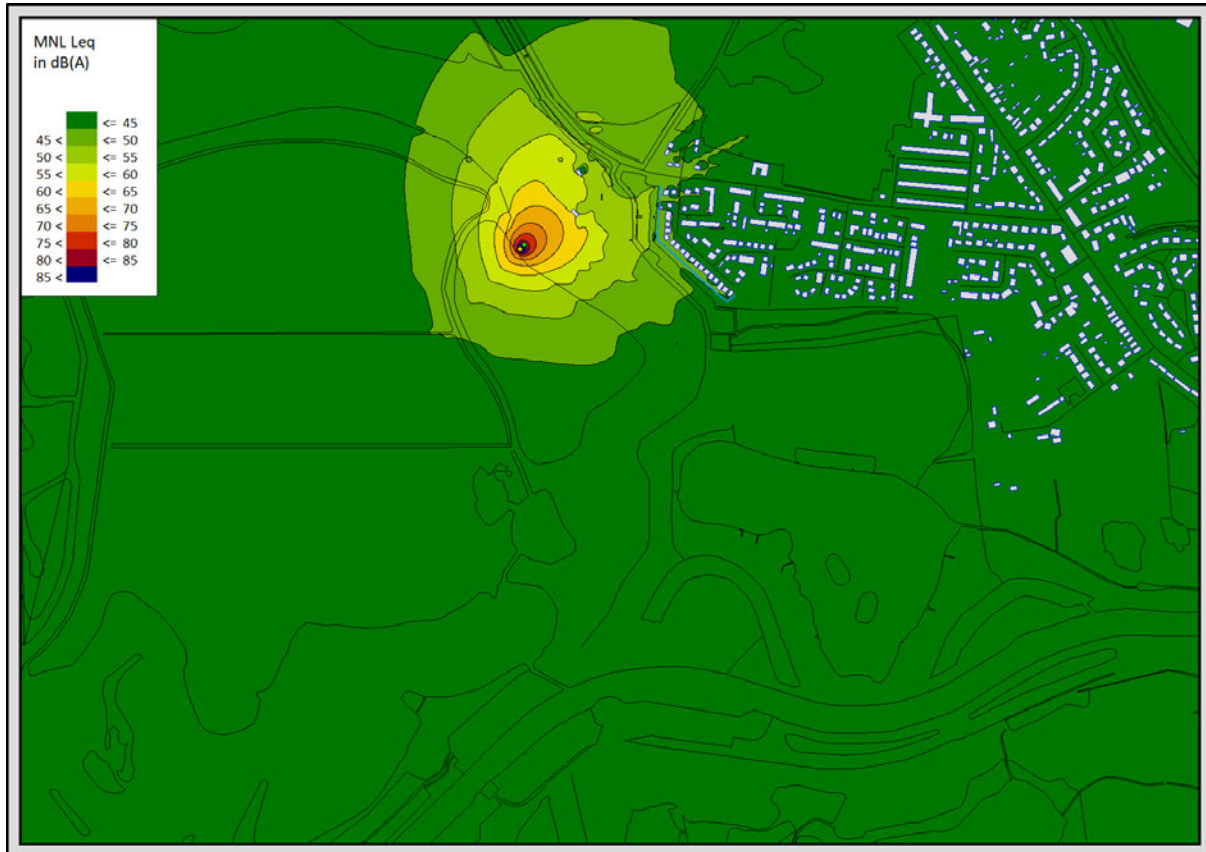


Figure 5.3: Music Noise Level Grid Map – Flooded Lands Stage



**Figure 5.4: Music Noise Level Grid Map – Seeders Return Stage**



The prediction methodology used predicts downwind propagation in all directions for all sources at the same time, this may result in the off-site music noise levels being over predicted compared to the real-world, as each receptor is at a different angle to the stage it would not be possible for all receptors to be directly downwind of the stage at the same time. The results should therefore be considered a worst-case scenario.

The sound prediction results demonstrate that it is feasible to operate The Nest at RSPB St Aidan's Nature Park with a reasonable on-site MNL in the audience areas considering the context and type of event, while maintaining compliance with the proposed off-site MNL limit at the nearest noise sensitive premises.

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