

**New Proposed Attraction,
Alton Towers Resort,
Noise Assessment Report**
Merlin Entertainments Limited, Alton Towers Resort

April 2016

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Executive Summary

CDC has been engaged by Alton Towers Resort to undertake a noise assessment relating to the design, construction and operations of a proposed new ride within the Resort.

This report outlines the assessment and findings relating to the noise assessment for the proposed new roller coaster at Alton Towers Resort.

As part of this assessment, noise surveys have been undertaken to establish representative ambient noise levels at noise sensitive receivers (NSRs) around the perimeter of Alton Towers Resort. These measurements form the basis of the assessments undertaken.

An assessment has been undertaken in relation to potential construction impacts. This relates to both construction traffic and construction activities, throughout the construction duration. Construction traffic is not expected to increase existing noise levels at defined noise sensitive receivers (NSRs).

An assessment of construction activities has also been undertaken, in accordance with BS5228, based upon the assumed construction programme activities. The assessment predicts that adverse impacts may occur during the construction of the roller coaster, at Wootton Lane properties. These impacts are expected to occur only during the construction of the higher elevations of the coaster. Best practicable means to reduce and control noise levels during this period will be employed to ensure that noise impacts are managed appropriately. No significant impacts are predicted during other construction phases, to any receivers.

An operational noise assessment has been undertaken for operational sound from the roller coaster and additional transportation relating to the development. Operational transportation directly related to the development, will not increase existing noise levels and so the impact is considered 'neutral'.

Noise from the roller coaster itself has been assessed. When assessed in accordance with the adopted criterion, all NSRs comply with the requirements for sound levels to receivers. This is based upon noise attenuating mitigation being incorporated into the coaster design and construction, which has been confirmed by Alton Towers Resort.

Section 1 of this report provides an overview of the proposed development. Section 2 outlines relevant policy and planning guidance. Section 3 outlines relevant calculation methodology. Section 4 outlines consultation that has been undertaken with the Local Authority. Section 5 describes the proposed criteria for the project. Section 6 outlines the details of baseline data for the surrounding area. Section 7 describes the reference data that has been used for the study. Section 8 outlines the assessment for construction activities, while section 9 outlines the operational assessment. Section 10 discusses any residual effects, while Section 11 outlines any potential cumulative impacts. Section 12 outlines the report conclusions.

1. Introduction & Overview

- 1.1. CDC has been commissioned by Merlin Entertainments, Alton Towers Resort, to assess the impact from noise relating to the proposed new attraction, to the nearest Noise Sensitive Receptors (NSRs), located external to Alton Towers Resort.
- 1.2. The proposed attraction will be a timber roller coaster that will be located towards the north of the Alton Towers Resort site. Specifically, the proposed ride will be located to the south east of the Sea Life Centre and to the south west of Katanga Canyon. The proposed attraction will be located upon the current site of the Log Flume attraction, with the Log Flume attraction being removed.
- 1.3. Reference sound measurement data has been provided by the ride manufacturer, which was taken from similar rollercoaster constructions located in the USA. These are the Kentucky Rumbler at Beech Bend Park in Kentucky, the Wildcat located at Hershey's Park, Pennsylvania and the Ozark Wildcat, located at Celebration City. Other related reference data has also been used.
- 1.4. The roller coaster structure will be formed from timber elements, predominately made up of Southern Yellow Pine. The rails will be formed from a combination of timber and steel. The build-up will comprise six timber strips fixed on top of one another, with a solid steel rail guider fixed on the top of the strips. The coaster will have steel wheels that will be guided by the steel and timber construction.
- 1.5. The coaster will have a 'silent' magnetic lift system that will guide the coaster to the first and highest drop. This will ensure that lift mechanism noise as the carriage travels to its highest elevation point will not be a concern.
- 1.6. Low noise magnetic brake systems will also be utilised to minimise the effects of noise from the coaster.
- 1.7. It is understood that construction programme will commence in September 2016 with completion anticipated for December 2017.
- 1.8. This assessment considers the potential noise impacts from the proposed development to off Resort receivers, from both construction and operational activities.
- 1.9. The following figure outlines the proposed location within the park for the roller coaster.

Figure 1 Location of the proposed roller coaster

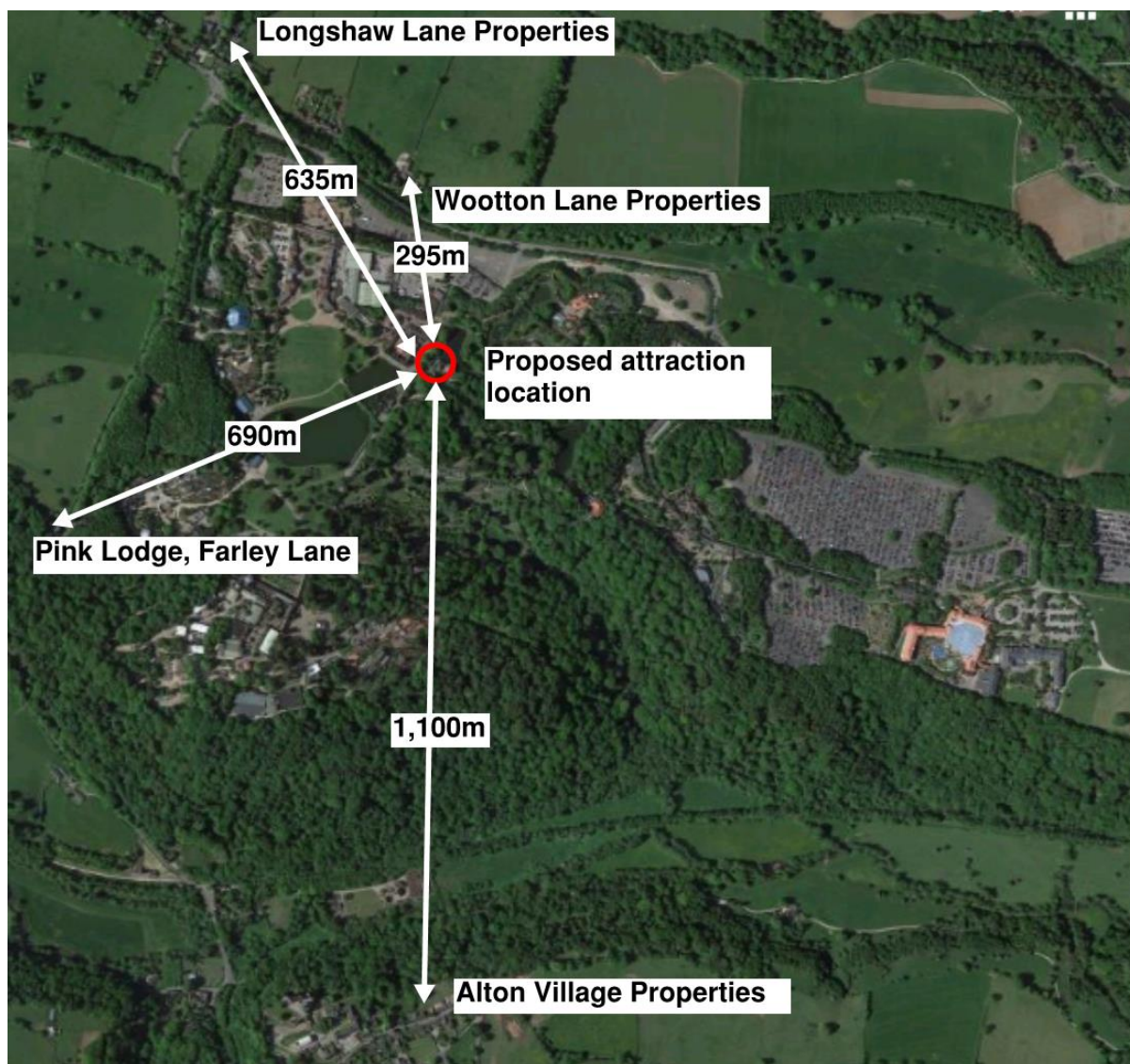


1.10. The nearest noise sensitive residential receivers (NSRs) from the proposed attraction have been defined as follows:

- North of the proposed attraction – Residential properties on Wootton Lane. These properties are approximately 295m from the closest element of the proposed attraction.
- North West of the proposed attraction – Residential properties on Longshaw Lane. These properties are approximately 635m from the closest element of the proposed attraction.
- South West of the proposed attraction – Pink Lodge, located on Farley Lane. This property is approximately 690m from the closest element of the proposed attraction.
- South of the proposed attraction – Residential properties in Alton Village. These properties are approximately 1,100m from the closest element of the proposed attraction.

1.11. These NSRs are illustrated in the following figure.

Figure 2 NSR distances relative to the proposed attraction



1.12. Criteria and calculation methodology has been developed based upon accepted code of practice for the assessment of environmental noise.

1.13. Further information is provided in Section 3 of this report.

2. Policy & Guidance Documents

2.1. National & Local Policy and Guidance

Noise Policy Statement for England

2.2. The Noise Policy Statement for England (NPSE) applies to all forms of noise including environmental noise, neighbour noise and neighbourhood noise but does not apply to noise in the workplace. The Government recognises that the effective management of noise requires a co-ordinated and long term approach that encompasses many aspects of modern society.

2.3. The long term vision of Government noise policy is set out to promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.

2.4. 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.

National Planning Policy Framework, 2012 (NPPF)

2.5. The National Planning Policy Framework (NPPF) includes the following statements relating to noise and the requirement to take it into account in the planning process:

2.6. Section 109 indicates that “The planning system should contribute to and enhance the natural and local environment by:

- preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability”.

2.7. Section 123 indicates that “Planning policies and decisions should aim to:

- avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;
- mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;
- recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established¹; and
- identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.”

¹ The NPPF contains the caveat “Subject to the provisions of the Environmental Protection Act 1990 and other relevant law”.

2.8. The NPPF does not therefore provide absolute limits on noise that are acceptable or unacceptable in a given situation. It does, however, set out the need to use planning decisions, including through the use of conditions, to avoid or mitigate adverse impacts on health and quality of life resulting from noise.

The Control of Pollution Act 1974

2.9. The Control of Pollution Act 1974 Section 61 sets out the procedures whereby contractors may obtain 'Prior Consent' for construction works within agreed noise limits. Applications for such consents would be made to the local authority and would contain a construction method statement and the steps to be taken to minimise noise. The local authority has the power to attach conditions to any consent given.

The Environmental Protection Act 1990

2.10. Under Part III of the Environmental Protection Act 1990 as amended by the Noise and Statutory Nuisance Act 1993, local authorities have a duty to investigate noise complaints relating to a variety of sources, excluding road traffic noise. If the local authority is satisfied that the noise amounts to a statutory nuisance it will serve an Abatement Notice which may require that the noise be stopped altogether or limited to certain times.

3. Assessment Methodology

3.1. The following British Standards, Codes of Practice and references have been referred to and used as part of the assessment:

- Construction noise activities have been considered in accordance with methodology and data contained within BS5228-2009+A1:2014 'Code of Practice for noise and vibration from construction and open sites-Part 1';
- Traffic noise impacts have been considered in accordance with guidance within DMRB (Design Manual for Roads and Bridges) and CRTN (Calculation of Road Traffic Noise);
- Operational noise from has been assessed in accordance with BS4142:1997 "Method for rating industrial noise affecting mixed residential and industrial areas", in line with Phase 1 assessments.

BS5228-2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise

3.2. There are no statutory limits regarding construction noise. BS5228-1:2009+A1:2014 '*Code of practice for noise and vibration control on construction and open site – Part 1: Noise*', provides guidance on assessing the potential significance of noise effects from construction activities in Annex E. Within the guidance there are two approaches described for threshold limits and noise level changes.

3.3. The following table has been reproduced from table E.1 in BS5228-1:2009+A1:2014, and shows the 'ABC criteria' thresholds for potential significant effect.

3.4. The ambient noise level is determined through baseline noise survey at, or within the vicinity of, the nearest residential properties and then rounded to the nearest 5dB to determine the appropriate category (A, B or C) and subsequent threshold value. This is compared with the noise level predicted from construction activity. A potential significant effect is indicated if the construction noise level exceeds the appropriate category threshold value. If the existing ambient level exceeds the threshold category threshold values, then a potential significant impact is indicated if the total noise level, including both the ambient noise and the various contributions of construction noise, is greater than the ambient noise level by more than 3dB.

Table 1 Construction Activity Noise Levels: Example Threshold of Potential Significant Effect at Dwellings (BS5228-1:2009+A1:2014)

Assessment Category and Threshold Value Period	Threshold Value in decibels (dB) ($L_{Aeq,T}$)		
	Category A ^{A)}	Category B ^{B)}	Category C ^{C)}
Night-Time (23:00 – 07:00)	45	50	55
Evenings and Weekends ^{D)}	55	60	65
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75
NOTE 1: A potential significant effect is indicated if the total $L_{Aeq,T}$ noise level arising from the site exceeds the threshold level for the Category appropriate to the ambient noise level.			
NOTE 2: If the ambient noise level exceeds the threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq,T}$ noise level for the period increases by more than 3dB due to site noise.			
NOTE 3: Applied to residential receptors only.			
A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.			
B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.			
C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values.			
D) 19:00 – 23:00 Weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.			

Department for Transport Memorandum, Calculation of Road Traffic Noise, 1988

3.5. The Department for Transport Memorandum, Calculation of Road Traffic Noise provides methods for measuring and calculating noise levels from road traffic, which is assessed over an 18 hour period from 06:00 to 24:00, using annual average weekday traffic (AAWT) flows. The basic noise level for a road segment can be calculated using the traffic flow, traffic speed and percentage heavy vehicles for a road segment. The traffic data will be based on the construction methods that are to be employed and information from the traffic assessment (TA).

Design Manual for Roads and Bridges part 11:3:7

3.6. The advice note entitled 'Design Manual for Roads and Bridges, Volume 11, Section 3, Part 7 HD 213/11 Noise and Vibration' dated 2011 provides guidance on the assessment of the impacts that road projects may have on levels of noise and vibration. Where appropriate, this advice may be applied to existing roads.

3.7. It provides guidance on the significance of changes in road traffic noise, identifying that changes in noise smaller than 1 dBA are not perceptible in the short term. Assuming no changes to percentage composition of heavy goods vehicles or traffic speeds, an increase in traffic volume of 25% is required to alter the noise levels by 1 dBA.

3.8. The advice note gives an example classification of magnitude of impacts for opening year road traffic noise impacts, as shown in Table 2:

Table 2 DMRB Noise Changes and Magnitude of Opening Year Impacts

Noise change, $L_{A10,18h}$	Magnitude of Impact
0	No change
0.1 – 0.9	Negligible
1 – 2.9	Minor
3 – 4.9	Moderate
5+	Major

3.9. Although advice is given on the magnitude of impacts, no specific guidance is provided on the significance of the effect of these changes.

BS 4142: 2014 Methods for and assessing industrial and commercial sound

3.10. BS 4142:1997 describes methods for determining and assessing noise levels from noise sources with a view to determining the likelihood of adverse impact.

3.11. The document has been developed for the purposes of:

- investigating complaints,
- Assessing sound from proposed new, modified or additional sources of sound of an industrial and / or commercial nature; and
- Assessing sound at proposed new dwellings or premises used for residential purposes.

3.12. The document is now suitable for the determination of noise nuisance. Furthermore, that standard is not intended to apply to the following sources of noise:

- recreational activities, including all forms of motorsport;
- music or other entertainment;
- shooting grounds;
- construction and demolition;
- domestic animals;
- people;
- public address systems for speech;

- other sources falling within the scopes of other standards or guidance.

3.13. The methodology requires the determination of the specific sound level, corrected for characteristic feature in order to produce a rating level. The rating level is then compared against the background noise level (expressed as $L_{A90,T}$), thereby producing an 'excess of Rating over background sound level' figure. This figure is then used for assessment of likelihood of adverse impact.

3.14. The standard places great emphasis on the context of the sound environment that is being assessed and the development overall. This is an essential part of the assessment process, particularly when predicting likelihood of adverse impact. However, for guidance the following is included in the standard:

- Typically, the greater the difference, the greater the magnitude of the impact;
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context;
- The lower the rating is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. When the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

4. Consultation

4.1. Consultation have been undertaken with the Local Authority regarding appropriate criteria and methodology to be referenced for the assessment of operational noise from the proposed attraction.

4.2. The following criteria has been agreed in consultation with the Local Authority.

- Ambient noise levels, expressed as $L_{Aeq, 15mins}$ dB, measured at the nearest receivers of the proposed attraction, should not exceed background noise levels, expressed as $L_{A90, 15mins}$ dB, as measured before the proposed attraction becomes operational.

4.3. For the purposes of this assessment the nearest residential receivers to the proposed attraction have been defined as follows:

- North of the proposed attraction – Properties on Wootton Lane. These properties are approximately 295m from the closest element of the proposed attraction.
- North West of the proposed attraction – Properties on Longshaw Lane. These properties are approximately 635m from the closest element of the proposed attraction.
- South West of the proposed attraction – Pink Lodge, located on Farley Lane. This property is approximately 690m from the closest element of the proposed attraction.
- South of the proposed attraction – Properties in Alton Village. The nearest properties located within Alton Village are approximately 1,100m from the closest element of the proposed attraction.

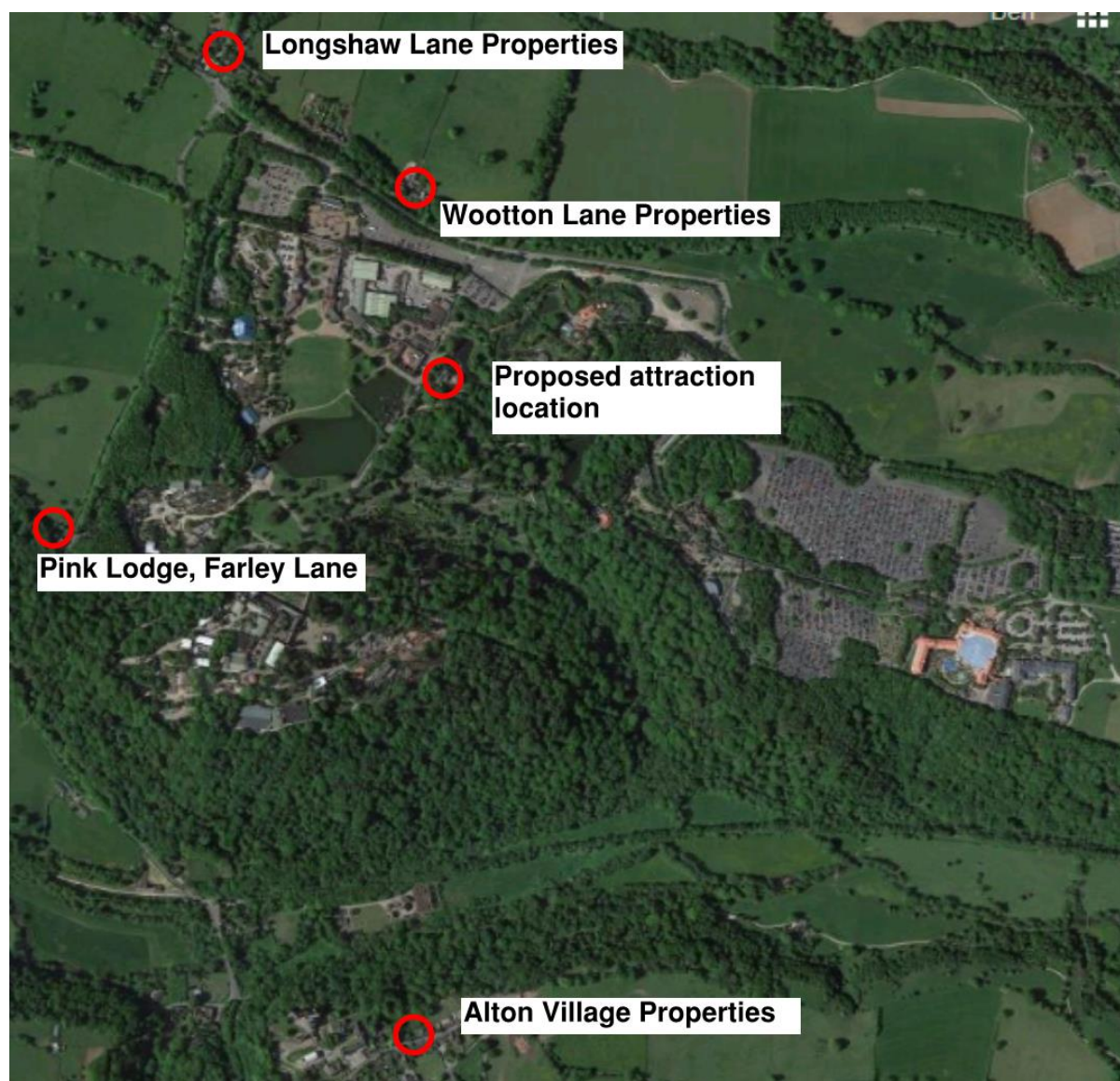
5. Proposed Criteria

- 5.1. For the purposes of this assessment, the following criteria has been used as a guideline.
- 5.2. Impacts relating to transportation have been considered in accordance with guidance outlined within DMRB, based upon changes in ambient noise levels. This relates to both construction and operational transportation.
- 5.3. Noise from construction activities have been assessed in accordance with guidance outlined within BS5228. In this instance, based upon ambient noise levels at receivers, the Threshold value is 65 dB L_{Aeq} . Predicted construction noise impacts above this Threshold would be deemed a 'significant' impact. Where levels are predicted to be below the Threshold, impacts are deemed not to be 'significant'.
- 5.4. Operational impacts have been considered in accordance with criterion agreed in consultation with the Local Authority.

6. Baseline Data Collection

- 6.1. A number of baseline surveys of the sound environment in the proximity of Alton Towers Resort have been undertaken over a representative day time hours. These included weekend and weekday time periods.
- 6.2. Measurements were undertaken on Sunday 18th and Monday 19th January 2015 and Sunday 15th March 2015. For comparative purposes, additional measurements were undertaken on Friday 8th April 2016.
- 6.3. Alton Towers Resort was closed during measurements undertaken in January 2015. Alton Towers Resort was operational during the March 2015 and April 2016 measurement periods.
- 6.4. Measurements were taken at a number of receiver locations around the perimeter of the Alton Towers Resort. However, for the purposes of this assessment, only measurements taken at, or near, the defined receivers for this assessment have been presented.
- 6.5. The measurement equipment was calibrated before and after measurements were taken and no drift was observed.
- 6.6. Meteorological conditions during the measurement period were in line with recommendations for environmental noise surveys, with minimal wind (<5m/s) during all surveys. An air temperature of 10-15°C was noted during all surveys. The cloud cover was minimal during the 2015 measurement days. The cloud cover was 80% during the 2016 measurement period. Meteorological conditions did not affect the measurement results.
- 6.7. Several measurements were taken at each defined location. Measurements were undertaken over 15 minute time periods. The measurement locations are shown in the following Figure.

Figure 3 Measurement locations



6.8. The measurement locations illustrated in the above Figure are further detailed below:

Wootton Lane Properties: Measurements undertaken at boundary with Alton Towers Resort on Wootton Lane, directly adjacent to Wootton Lane residential properties. Road traffic noise dominates the soundscape at this location.

Longshaw Lane: Measurements undertaken directly adjacent to residential properties on Longshaw Lane. Localised road traffic noise on Longshaw Lane and pass by traffic on Farley Lane, dominates the soundscape at this location.

Pink Lodge, Farley Lane: Measurements undertaken directly opposite Pink Lodge. Road traffic on Farley Lane, dominates the noise soundscape in this area, in addition to occasional activity noise from Alton Towers Resort.

Alton Village: Measurements undertaken in the Churchyard located in the Village. Local road traffic dominates the noise soundscape in this area, in addition to occasional activity noise from Alton Towers Resort and wildlife sounds.

6.9. The following table outlines the averaged results of the measurements. The L_{Aeq} values are the logarithmic averages while the L_{A90} values are the most commonly occurring, in accordance with BS4142:2014. Where this has not been possible an arithmetic average has been used.

Table 3: Averaged measured noise levels

Location	April 2016		March 2015		January 2015		Distance relative to attraction
	L_{Aeq} dB	L_{A90} dB	L_{Aeq} dB	L_{A90} dB	L_{Aeq} dB	L_{A90} dB	
Wootton Lane Properties	64	49	63	46	63	37	295m
Longshaw Lane	58	41	N/A	N/A	N/A	N/A	635m
Pink Lodge, Farley Lane	61	50	N/A	N/A	61	38	690m
Alton Village	N/A	N/A	48	40	47	36	1,100

6.10. Based upon the above measurement results, the following levels have been used for the purposes of the assessment for the proposed attraction.

6.11. The following levels are taken for the most up to date measurements (April 2016) for Wootton Lane, Longshaw Lane and Pink Lodge and the March 2015 measurements for Alton Village (taken when Alton Towers Resort was operational).

Table 4: Measurements used for assessment of proposed attraction

Location	$L_{Aeq, 15mins}$ dB	$L_{A90, 15mins}$ dB
Wootton Lane Properties	64	49
Longshaw Lane	58	41
Pink Lodge, Farley Lane	61	50
Alton Village	48	40

6.12. The above levels form the basis of the assessment undertaken for this project.

7. Reference Data

7.1. As part of this assessment, reference noise data has been provided to Alton Towers Resort by the proposed attraction supplier. This data has been used to establish source noise levels from the attraction, for the purposes of assessment.

7.2. All data provided is representative of similar timber rollercoasters based in the US.

7.3. L_{Aeq} dB levels within the data suggest a maximum level of up to 74 dB L_{Aeq} at approximately 10m from the track centre line, when the ride is operational. A lower level of 68 dB L_{Aeq} at 10m was also measured for sections of the coaster where the car velocity is reduced and rider intensity was less. For the purposes of this assessment, the 74 dB L_{Aeq} value has been used. L_{Amax} levels were measured at approximately 10-15 dB above L_{Aeq} levels.

7.4. Measurements were provided for the Ozark Wildcat timber roller coaster. These measurements included data for the rollercoaster being both loaded with people while the Theme Park was open and without people, while the Theme Park was closed. The measurement data was undertaken over a measurement period representative of one complete ride cycle that lasted 135 seconds.

7.5. The difference between the levels with Park open and closed, is negligible for L_{Aeq} values. This suggests that the screaming / shouting element of the timber roller coaster ride, does not add to the L_{Aeq} values. However, it is accepted that the octave band content between screams / shouts and roller coaster movements would be different.

7.6. The L_{Amax} values are up to 15 dB more than the L_{Aeq} values for the loaded coaster, compared to 10 dB difference for unloaded coaster measurements. It is assumed that the higher L_{Amax} values are as a result of the effect of screaming / shouting, as the roller coaster passes the measurement position.

7.7. An octave band spectrum has been derived for the purposes of assessment, based upon measurements from other roller coasters. Octave band data was not included within the reports provided to ATR by the roller coaster manufacturer.

8. Construction Noise Assessment

Construction Overview

8.1. It is understood that the construction programme will last for approximately 15 months, from September 2016 to December 2017. The construction duration will incorporate two periods of the winter shut down period for Alton Towers Resort.

8.2. At this time, it is anticipated that the works will be phased and not carried out simultaneously. Construction will be phased as follows:

- Ground works including clearance, excavation, levelling and foundations
- Roller coaster construction works
- Testing and commissioning.
- Landscaping and theming.

8.3. The above constructions phases are assumed to overlap to some degree.

Construction Traffic

8.4. Construction activities are expected to be undertaken between September 2016 and December 2017. This period includes two periods of ATR winter shut down. It is currently anticipated that construction equipment and materials will be stored on site, thereby reducing the number of trips from construction vehicles to and from the site.

8.5. At this time there is no formal schedule for the number of construction vehicles that will arrive at the Resort, however, the daily numbers are expected to be low in comparison to the overall traffic in the area, even during Alton Towers Resort winter shut down period.

8.6. It is anticipated that any construction traffic would use the main Farley Road entrance to enter and leave the site. All construction traffic will arrive during Alton Towers Resort normal opening hours, or just before Resort opening. No night time deliveries will be made. No construction transportation is anticipated to arrive or leave the site during weekends.

8.7. Construction workers will arrive by personal or shared transportation, but again, the number of vehicles will be small in comparison to the overall visitor vehicles arriving at the site on any given day.

8.8. In terms of noise impacts from transportation, anything less than a 25% increase in flows equates to a change of less than 1 dB and so is not considered an impact. In this case the predicted flows from construction traffic will be significantly less than 25% and so the impact is considered as 'No Change'.

8.9. Therefore, the impact from construction traffic is expected to be 'No Change'.

Construction Activities

8.10. All construction activities will be undertaken during daytime hours, as defined in BS5228, between 07:00 – 18:00 Monday to Friday and Saturdays between 07:00 – 13:00.

8.11. Based upon measured ambient levels at the defined NSRs, the Threshold value for 'significance' has been defined as 65 dB L_{Aeq} , in accordance with BS5228. Predicted construction noise impacts above this Threshold would be deemed a 'significant' impact. For levels predicted to be below the Threshold, impacts are deemed not to be 'significant'.

8.12. This Threshold level would also be applicable for winter shut down periods.

8.13. The following table presents a worst case construction equipment list, assuming all the equipment in the list operates simultaneously. The equipment included for the construction of the roller coaster has been supplied by the ride supplier.

Table 5 Assumed construction equipment and associated noise levels (ref. BS5228)

Assumed Construction Equipment	L _{Aeq} (dB) at 10m
Site Clearing	
Wheeled Loaders x 2	76 dB
Tracked Excavator x 1	80 dB
Dozer x 1	88 dB
Site Clearing Total	89 dB
Foundation Works	
Concrete mixer truck (discharging) & concrete pump (pumping)	79
Dozer 20 tonne	75
Foundation Works Total	80 dB
Roller Coaster Construction	
Hand held drills x 10	85
Hand Held Circular Saws x 10	91
Compressors for hand tools x 2	73
Club hammer x 10	92
Tower Crane at 40m	84
Roller Coaster Construction Total	95 dB

8.14. The following table outlines the predicted impact from construction activities for each of the above defined construction phases.

Table 6 Construction noise assessment – Site Clearing Phase

Location	Relative distance from proposed attraction to receiver	Distance correction based upon point source attenuation, dB	Defined Threshold value, BS5228, L _{Aeq} dB	Predicted noise level (construction + ambient)	Significant Impact Predicted?
Wootton Lane Properties	295	29 dB	65 dB	65 dB	No Significant Impact Predicted
Longshaw Lane	635	36 dB	65 dB	59 dB	No Significant Impact Predicted
Pink Lodge, Farley Lane	690	37 dB	65 dB	62 dB	No Significant Impact Predicted
Alton Village	1,100	41 dB	65 dB	51 dB	No Significant Impact Predicted

Table 7 Construction noise assessment - Foundation Works

Location	Relative distance from proposed attraction to receiver	Distance correction based upon point source attenuation, dB	Defined Threshold value, BS5228, L _{Aeq} dB	Predicted noise level (construction + ambient)	Significant Impact Predicted?
Wootton Lane Properties	295	29 dB	65 dB	64 dB	No Significant Impact Predicted
Longshaw Lane	635	36 dB	65 dB	58 dB	No Significant Impact Predicted
Pink Lodge, Farley Lane	690	37 dB	65 dB	61 dB	No Significant Impact Predicted
Alton Village	1,100	41 dB	65 dB	49 dB	No Significant Impact Predicted

Table 8 Construction noise assessment - Roller Coaster Construction

Location	Relative distance from proposed attraction to receiver	Distance correction based upon point source attenuation, dB	Defined Threshold value, BS5228, L _{Aeq} dB	Predicted noise level (construction + ambient)	Significant Impact Predicted?
Wootton Lane Properties	295	29 dB	65 dB	68 dB	Significant Impact Predicted
Longshaw Lane	635	36 dB	65 dB	62 dB	No Significant Impact Predicted
Pink Lodge, Farley Lane	690	37 dB	65 dB	63 dB	No Significant Impact Predicted
Alton Village	1,100	41 dB	65 dB	55 dB	No Significant Impact Predicted

8.15. It can be seen from the above assessment that the predicted construction levels do not exceed the outlined Threshold value as outlined in BS5228, except in one case.

8.16. The roller coaster construction phase is predicted to cause a significant impact at Wootton Lane properties. The level is predicted to exceed the 65 dB L_{Aeq} Threshold value by 3 dB.

8.17. The calculations do not take into account corrections relating to shielding from the Resort. This will reduce levels to less than Threshold. However, for the construction of track elevations above 4m, noise levels may still exceed Threshold levels.

8.18. In this case it is advised that ‘best practical means’ are employed to ensure that potential noise impacts are minimised. CDC will work with Alton Towers during the construction phase to ensure that the Contractor is aware of potential noise issues and that impacts are minimised in terms of level and duration.

9. Operational Noise Assessment

Transportation

9.1. A traffic assessment has been undertaken for the proposed attraction. The assessment concludes that the proposed attraction will generate a maximum 5% increase in traffic numbers to and from the Resort. This is considered a nominal overall increase in relation to the total trips to Alton Towers Resort on a daily basis.

9.2. In terms of noise impacts from transportation, anything less than a 25% increase in flows equates to a change of less than 1 dB and so is not considered an impact. In this case the predicted flows from construction traffic will be significantly less than 25% and so the impact is considered as ‘No Change’.

9.3. Therefore, the predicted impact of sound relating directly to operational transportation for these events, would be ‘no change’.

Operational Noise from the Attraction

9.4. A noise assessment has been undertaken to understand the potential noise impacts from the ride itself to defined NSRs. This assessment has taken into account various scenarios, including:

- Noise emissions from various heights across the ride, based on varying track elevations. The two main assessment scenarios for heights have been defined as above and below 4m, relative to ground level. This height has been chosen as the site itself offers considerable acoustic shielding for heights below 4m (buildings, others rides). The effects of woodland have also been considered. These effects are reduced above a certain height. In this instance this height has been taken as 4m, although in reality the effects of woodland would be produced higher than 4m.
- Several mitigation options have been considered. These include sound insulating elements to the underside of track, sound insulation elements to side of track (barriers) and complete tunnel enclosures. The tunnel and track side barriers are proposed to be constructed with absorbing lining to the inner surface.

9.5. The noise levels that have been used as a reference for this assessment are the highest L_{Aeq} levels, taken from data received from ride suppliers. This level is 74 dB $L_{Aeq,135secs}$. All levels have been extrapolated to 10m from track for consistency before calculating to NSR distances.

9.6. An $L_{Aeq,15minute}$ value has been extrapolated from the manufacturer data. This assumes that a typical ride cycle will take 2 minutes with 90 second load unload cycle. This results in four ride cycles within 15 minutes. The resulting $L_{Aeq,15mins}$ at 10m from the coaster is approximately 71 dB. This figure has been used for the assessment.

9.7. The design of the proposed attraction has evolved over time to allow for site and environmental constraints to be incorporated into the layout. As part of this evolution, acoustic mitigation has been incorporated and the following elements of design will be included into the overall construction of the roller coaster.

- Tunnel constructions at the highest elevation point with absorbing inner lining. The proposed tunnel will start from the top of the first drop and extend to the lowest point after the drop. The tunnel will have absorbing material fixed to the inner wall. The tunnel will also be themed;
- Side barriers to track elevations which are located at high elevations closest to NSRs. The proposed barriers will extend to the height of the safety barrier (0.8m) and be installed with a sound absorbing liner to the inner wall. The minimum density of the board should be 10kg/m², excluding any theming that may be applied.
- All turns extending more than 45° from the horizontal axis to be installed with a track insulation board to the underside of the track. This will minimise the effect of sound travelling to the receivers unmitigated, when off the carriage is off axis to the horizontal.

9.8. Corrections to the source noise levels have been applied. These are summarised as follows:

- Mitigation to the track includes a minimum 5 dB correction for barriers to side and underside of track and a conservative 10 dB correction for tunnelled sections.
- A 10 dB correction for shielding provided by the wider Alton Towers Resort for track elevations below 4m, relative to ground level.
- Correction for air absorption has been allowed for in line with guidance outlined with ISO 9613.
- Correction for woodland has been calculated in line with guidance outlined with ISO 9613. Given the density of trees in this area, the correction would also apply to all seasons.

9.9. Based upon the above noise mitigation elements, noise levels are expected to comply with the defined criteria for ambient noise levels (expressed as dB L_{Aeq,15mins}) not to exceed existing background noise levels (expressed as dB L_{A90}).

9.10. The following tables outline the results of the study for track elevations both above and below 4m, in addition to the combination of the two at the nearest receivers.

Table 9 Predicted level at receivers, <4m track elevations

Receiver	Location relative to site	Minimum distance to receiver	Measured L _{A90,15mins} dB	Corrections applied	Predicted L _{Aeq,15mins} dB, after corrections applied	Predicted L _{Aeq,15mins} relative to L _{A90} dB
Wootton Lane Properties	North	295	49	Shielding by wider Resort, air absorption, distance correction	44	-5
Longshaw Lane	North West	635	41	Air absorption, shielding by wider Resort, distance correction	39	-2
Pink Lodge, Farley Lane	South West	690	50	Woodland, air absorption, shielding by wider Resort, distance correction	33	-17
Alton Village	South	1,100	40	Woodland, air absorption, shielding by wider Resort, distance correction	30	-10

Table 10 Predicted level at receivers, >4m track elevations

Receiver	Location relative to site	Minimum distance to receiver	Measured $L_{A90,15mins}$ dB	Corrections applied	Predicted $L_{Aeq,15mins}$ dB, after corrections applied	Predicted $L_{Aeq,15mins}$ relative to L_{A90} dB
Wootton Lane Properties	North	295	49	Mitigation to track, air absorption, distance correction	44	-5
Longshaw Lane	North West	635	41	Mitigation to track, air absorption, distance correction	39	-2
Pink Lodge, Farley's Lane	South West	690	50	Mitigation to track, air absorption, distance correction	39	-11
Alton Village	South	1,100	40	Mitigation to track, air absorption, distance correction	35	-5

Table 11 Predicted combined $L_{Aeq,15mins}$ at receivers

Receiver	Location relative to site	Combined <4m height and >4m height	Measured $L_{A90,15mins}$ dB	Comments
Wootton Lane Properties	North	47	49	Comply
Longshaw Lane	North West	42	41	Comply (1 dB excess considered negligible)
Pink Lodge, Farley's Lane	South West	40	50	Comply
Alton Village	South	36	40	Comply

9.11. The combined levels illustrated in the above table demonstrate that all receivers will comply with the requirement for $L_{Aeq,15min}$ dB at the receivers, not to exceed existing $L_{A90,15min}$ dB values. Longshaw Lane is predicted to be 1 dB above the required levels. This is considered negligible, particularly when the assessment has used the highest measured source data, which is considered a worst case.

9.12. CDC has been engaged by ATR to offer support to the development of the attraction for planning, detailed design and construction stages. Therefore, it will be ensured that recommendations for acoustic mitigation are developed through all phases and effectively implemented into the construction of the roller coaster.

10. Residual Effects

10.1. Residual noise effects to Wootton Lane properties, during the construction of the roller coaster may occur. It is recommended that the Contractor employs 'best practical means' to control and reduce noise levels as much as is practical.

10.2. CDC will work with Alton Towers during the construction phase to ensure that the Contractor is aware of noise impacts and that these impacts are successfully managed, with respect to level and duration, through this period of the construction programme.

10.3. At this stage, no residual effects are predicted from the operations of the roller coaster. However, CDC has been engaged throughout the design and construction process to ensure this remains the case as the design develops.

11. Cumulative Effects

11.1. At the time of writing, there are no major developments proposed within the local vicinity of ATR, which may overlap with the roller coaster construction schedule.

11.2. During the general winter shut down periods for the theme park, the construction of the proposed roller coaster may overlap with general maintenance activities across the Resort. In accordance with Section 61 of the Control of Pollution Act 1974, best practicable means will be employed throughout the construction duration to ensure that adverse impacts are mitigated.

11.3. ATR actively manages the effects of noise from new and existing rides and attractions within the Resort. New proposed rides and attractions undergo noise assessments to ensure that levels do not exceed existing background noise levels at receivers.

11.4. Therefore, cumulative effects during construction of operations are not expected to increase noise levels over and above those outlined within this report.

12. Conclusions

12.1. This report outlines the assessment and findings relating to a noise assessment for the proposed new roller coaster attraction at Alton Towers Resort.

12.2. Noise surveys have been undertaken to establish representative ambient noise levels at noise sensitive receivers (NSRs) around the perimeter of Alton Towers Resort. These measurements form the basis of the assessments undertaken.

12.3. An assessment has been undertaken in relation to potential construction impacts. This relates to both construction traffic and construction activities, throughout the construction duration. Construction traffic is not expected to increase existing noise levels at defined noise sensitive receivers (NSRs).

An assessment of construction activities has also been undertaken, in accordance with BS5228, based upon the assumed construction programme activities. The assessment predicts that significant impacts may occur during the construction of the roller coaster, at Wootton Lane properties. These impacts are expected during the construction of the higher elevations of the coaster. 'Best practicable means' to reduce and control noise levels during this period will be employed to ensure that noise impacts are managed appropriately. No significant impacts are predicted during other construction phases, to any receivers.

12.4. An operational noise assessment has been undertaken for operational sound from the roller coaster and transportation relating to the development. Operational transportation directly related to the development, will not increase existing noise levels and so the impacts are predicted.

12.5. Noise from the roller coaster itself has been assessed. When assessed in accordance with the adopted criterion, all NSRs comply with the requirements for sound levels to receivers. This is based upon noise attenuating mitigation being incorporated into the coaster design and construction.

12.6. Based upon the above it can be seen that the proposed development will comply with the adopted criteria.

12.7. Furthermore, Alton Towers Resort will engage the services of an acoustic consultant during the detailed design and construction stages to ensure that the above elements are considered as the design progresses and to ensure that all elements comply with the adopted criteria set out in this report.