Appendix 15.3 Operational Noise Modelling Assessments

OPERATIONAL NOISE

Introduction

The modelling reported in this section is intended to predict how the 'switching on' of the Proposed Development operation affects the existing noise climate of the area. The model includes:

- Noise from roads (using measured noise levels to calibrate existing traffic data and predicted data for new access road traffic flows);
- Noise from trains (using the measured noise levels to calibrate Thameslink and Southwestern train services and the train timetables and SEL data for HS1 services).
- Noise from the rides including the shouts and screams of visitors

At this point in the drafting of the PEIR (6th July 2020) the modelling does not currently include noise due to the operation of the Developments building services or any construction noise that is concurrent with the operation of the Proposed Development.

Assessment criteria

The significance of traffic noise changes can be determined from the following assessment criteria:

A short-term increase in road traffic noise of 1 decibel (dB) is considered to be just perceptible by most people. A description of classifying the magnitude of impacts for short-term traffic noise is presented in the following table

Table 15.3.1 Criteria for determining magnitude of impact of noise changes in the short term after completion of the proposed development (Source: DMRB).

Magnitude	Criteria $L_{A10,18hr}$ noise change from existing traffic levels
Major	5 dB or more
Moderate	3 – 4.9 dB
Low	1 – 2.9 dB
Negligible	0.1 – 0.9 dB
No change	0 dB

According to the Design Manual for Roads and Bridges (DMRB), a 3 dB LA10, 18h change in the long term (typically 15 years after project opening) is considered perceptible. A description of classifying the magnitude of impacts for short-term traffic noise is presented in the following table

Table 15.3.2 Criteria for determining magnitude of impact of noise changes in the long term after completion of the proposed development (Source: DMRB).

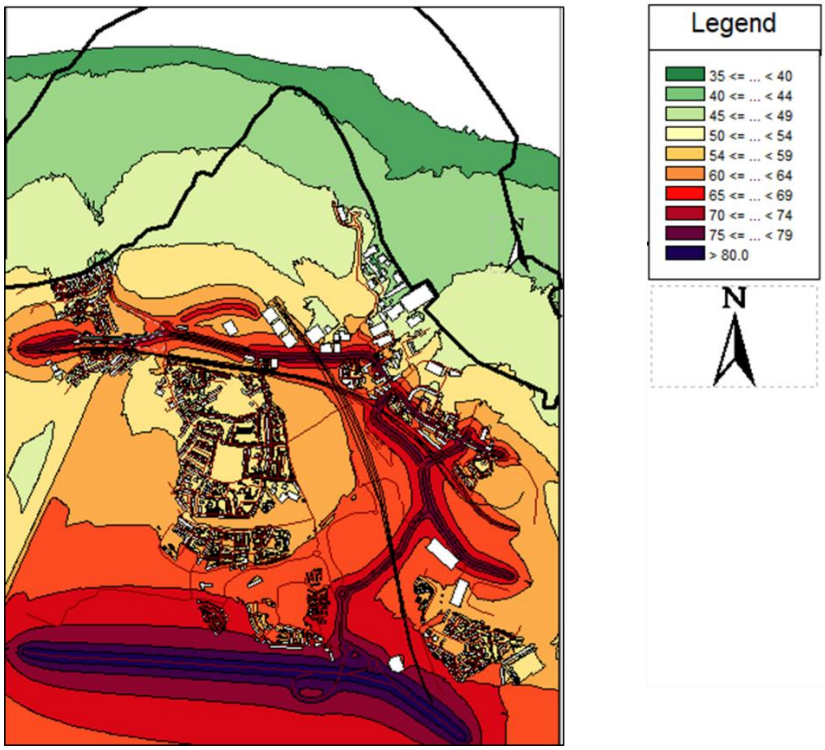
Magnitude	**Criteria** **$L_{A10,18hr}$ noise change from existing traffic levels**
Major	10 dB or more
Moderate	5 – 9.9 dB
Low	3 – 4.9 dB
Negligible	0.1 – 2.9 dB
No change	0 dB

Baseline noise climate

Kent Project Site assessment

The following figure demonstrates the baseline noise climate around the Kent Project Site, captured by calibrating a CadnaA model to noise survey and traffic count data (provided in Appendix 15.1).

Figure 15.3.1 Calculated daytime levels LAeq,18hr dB(A) for the area surrounding the Kent Project Site, calibrated to baseline noise survey and traffic movement data.

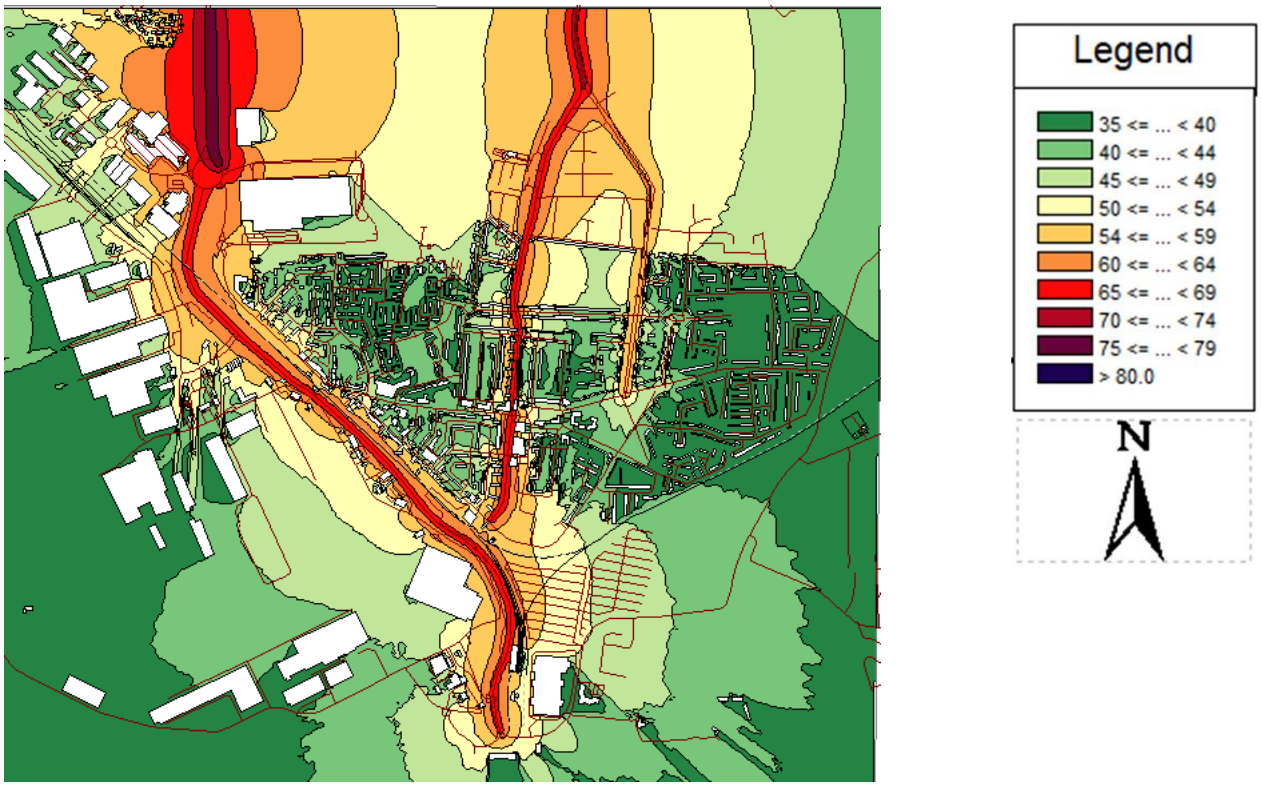


Essex Project Site assessment

A noise survey was planned to assess the baseline conditions around this location; however, it was postponed due to the COVID-19 pandemic in the UK. Noise measurements undertaken during lockdown conditions are not considered to be representative of the typical environment, as such, surveys are postponed until there is representative activity occurring in the area.

Figure 15.3.2 therefore demonstrates the baseline noise climate around the Essex Project Site utilising government traffic noise data from 2017 (shown in Appendix 15.1).

Figure 15.3.2 Calculated daytime levels LAeq,18hr dB(A) for the Essex Project Site, calibrated to Department for Environment, Food and Rural Affairs traffic movement noise data.



Summary of Noise Sources

The baseline noise environment in and around the Kent Project Site includes contributions from the following noise sources identified during the on-site noise surveys:

- Road traffic noise using the existing principal east-west routes past the Kent Project Site: the A226 London Road to the north and the A2 to the south.
- Road traffic using the principal north-south route past the Kent Project Site: the B259 Stanhope Road and the B2175 Dover Road.
- Rail traffic on the east west network rail lines serving Greenhithe, Swanscombe and Northfleet stations.

- Rail traffic on the high speed (HS1) rail lines serving (and passing through) Ebbsfleet International Station.
- Sources of industrial noise to the west of Swanscombe Marshes off Lower Road / Manor Road.
- Sources of industrial noise south of Swanscombe Marshes and north of London Road off Manor Way.
- Road traffic noise from local roads.
- Marine traffic on the Thames.
- Existing wharves on the Thames.
- Occasional aircraft overflight.

From noise level data provided by the Department for Environment, Food and Rural Affairs the baseline noise environment in and around the Essex Project Site is expected to include contributions from the following noise sources:

- Road traffic noise from the A1089.
- Industrial noise from Tilbury Docks.
- Motor vehicle noise from Car distribution centres.
- Rail noise from Tilbury Town trainlines.
- Marine traffic on the Thames.
- Road traffic from local Tilbury Town roads.

Operational 2038 traffic noise assessment

The noise model in this section is informed by LDP 2038 design day visitor predictions. The traffic flows input onto the access roads is based on a prediction of 77,000 day visitors in the year 2038.

Predictions are founded on the following assumptions for the Proposed Development:

- 75% of visitors will arrive directly via the Kent Project Site access roads;
- To evaluate the worst-case scenario, the remaining 25% of visitors have been assumed to arrive via the Essex Project Site access road to utilise the ferry terminal at Tilbury Town;
- 40% of visitors will arrive by car with an average of 3 people in each car;

- Equating to 15,000 Kent Project Site car movements and 5,000 Essex Project Site car movements;
- 12% of visitors will arrive by coach with an average of 50 people per coach;
- Equating to 300 Kent Project Site coach movements and 5,000 Essex Project Site car movements through Tilbury Town; and
- Approximate service vehicle movements of 20 to the Kent Project Site and 30 to the Essex Project Site.

Modelling Inputs

Figure 15.3.3 shows the proposed access routes that are to be used to support the flow of traffic related to the operation of The Proposed Development.

Figure 15.3.3: Image showing planned Kent and Essex Project Site Access Route.

Table 15.3.3. shows the changes to traffic flows on these access roads as a result of the visitor predictions discussed above

Table 15.3.3. Existing and predicted traffic movements with respect to the proposed developments access routes.

Road ID	Road Description	Number of Traffic Movements in 18hr Period (06:00-23:00)
AR1	Tiltman Avenue - to be used as a Development service vehicle route. 20 service vehicle movements are predicted for each 18hr day. These were added to the existing traffic level from the noise model calibration.	820 (22% heavy vehicle)
AR2	Staff bus service and express taxi route – to be developed specifically for The Development. Average electric vehicle bus pickups every 30minutes in each direction (72 movements predicted for each 18hr day). If 3% of guests arrive by taxis along this route with an average of 3 people per taxi equates to 500 cars / 1000 vehicle movements every 18hr day. The predicted traffic flow was also added to the existing London road traffic numbers to the East of the access road entrance.	1,072 (4% heavy vehicle)
AR3	New access road running from near Ebbsfleet International station to The Proposed Development for an electric transport vehicle, as well as coach / taxi short-stay drop-offs. The transport vehicle is understood to be electric and therefore very quiet in comparison to other traffic sources. Average electric vehicle bus pickups every 30 minutes in each direction have been predicted (72 movements every 18hr day). If 3% of guests arrive by taxis along this route with an average of 3 people per taxi, this equates to an approximation of 500 cars and 1000 vehicle movements each 18hr day. It is understood that there are plans for are 27 short stay coach spaces. A worst-case prediction of 100 coaches and 200 vehicle movements has been implemented for coach movements along this road.	1,344 (16% heavy vehicle)
AR4	New access road running from near Ebbsfleet International station to The Proposed Development. This road is expected to be used for coach, and personal vehicle day parking as well another service vehicle route (20 movements predicted each 18hr day) It is understood there are parking space plans for 200 long stay coaches, 7,500 public cars (with 300 overflow spaces) and 250 staff cars. The prediction numbers consider full capacity in this high-volume scenario.	15,920 (5% heavy vehicle)

Road ID	Road Description	Number of Traffic Movements in 18hr Period (06:00-23:00)
AR5	Northfleet Industrial Estate road to be used as a Development service delivery access road. 20 heavy vehicle movements are predicted for each 18hr day.	20 (100% heavy vehicle)
AR6	New access road running between the ferry terminal and the Development entrance (subsequently connecting into AR3). This road will be used primarily for Taxi drop- offs to the hotels as well as the electric transport vehicle. 500 taxi movements have been predicted alongside an average electric vehicle bus pickup every 30 minutes in each direction (72 movements every 18hr day).	572 (17% heavy vehicle)
AR7	Access road for vehicles travelling to The Proposed Development via the A2 From department of Transport 2018 data, an average of 14,850 vehicle movements occur daily. For the noise model, a summation of the existing vehicle movements and AR5 predicted data was assumed (worst-case scenario)	32,114
AR8	The increase in vehicle movements on the A2 road due to 2038 visitor predictions was modelled. From department of Transport 2018 data, an average of 159,560 vehicle movements occur daily. The AR5 predicted visitor data was assumed to all originate from the A2 (worst-case scenario), therefore model predictions incorporated a summation of these values.	176,824
AR9	The Department for Environment, Food and Rural Affairs, $L_{Aeq,16hrs}$ Road Noise data provide baseline noise levels (2017) for this location. In modelling a worst-case scenario, it was assumed that the entirety of visitors arriving from locations north of the river travel to the ferry terminal via this access road	8,640 (42% heavy vehicle)

Modelling Results

The following figures show a comparison between the baseline ambient noise climate and the predicted noise climate due to 2038 traffic movements over an 18hr period (06:00-24:00).

Noise contours are used to show the difference in levels caused by the Proposed Development. Because both sets of data are computed in terms of A-weighted (dBA) quantities, their difference is expressed in terms of dB – although expressing the difference in terms of dBA would yield the same result.
The colours within the noise contours represent the following calculated changes to the noise levels of the area:

- The purple area shows the distance at which the noise from The Proposed Development traffic flows will likely cause the existing noise climate to increase by a level equal to or greater than 10 dB.

- The red area shows the limiting distance at which the noise from The Proposed Development traffic flows will likely cause the existing noise climate to increase by a level between 5 and 10 dB.

- The orange area shows the limiting distance at which the noise from The Proposed Development traffic flows will likely cause the existing noise climate to increase by a level between 3 and 5 dB.

- The yellow area shows the limiting distance at which the noise from The Proposed Development traffic flows will likely cause the existing noise climate to increase by a level between 1 and 3 dB.

- The green areas show the locations where the noise from The Proposed Development traffic flows will likely have a minimal to no effect on the baseline ambient noise level of the region (level changes between 0 and 1 dB).

Figure 15.3.4: Calculated daytime levels LAeq,18hr dB(A) for the area surrounding Kent Project Site, calibrated to noise survey and traffic movement data predicted for 2038.

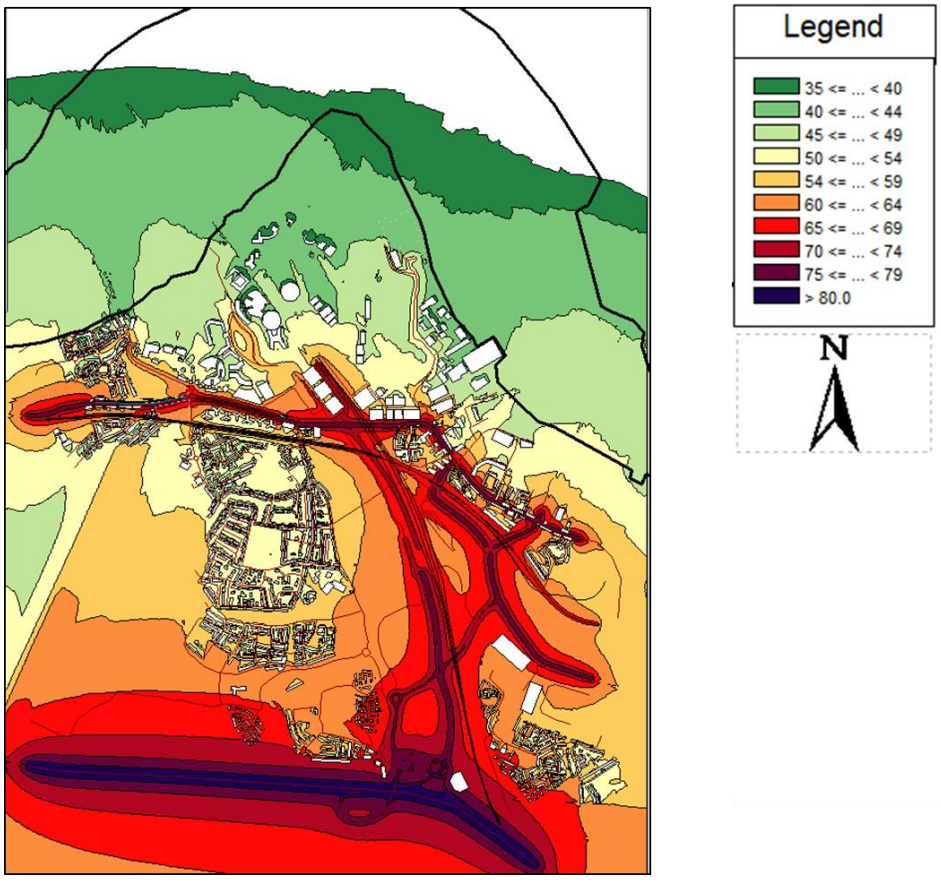


Figure 15.3.5: Difference between the noise caused by the operation of the Kent Project Site in 2038 and the baseline ambient noise levels. Levels shown are differences in daytime LAeq, 18 hour (dB).

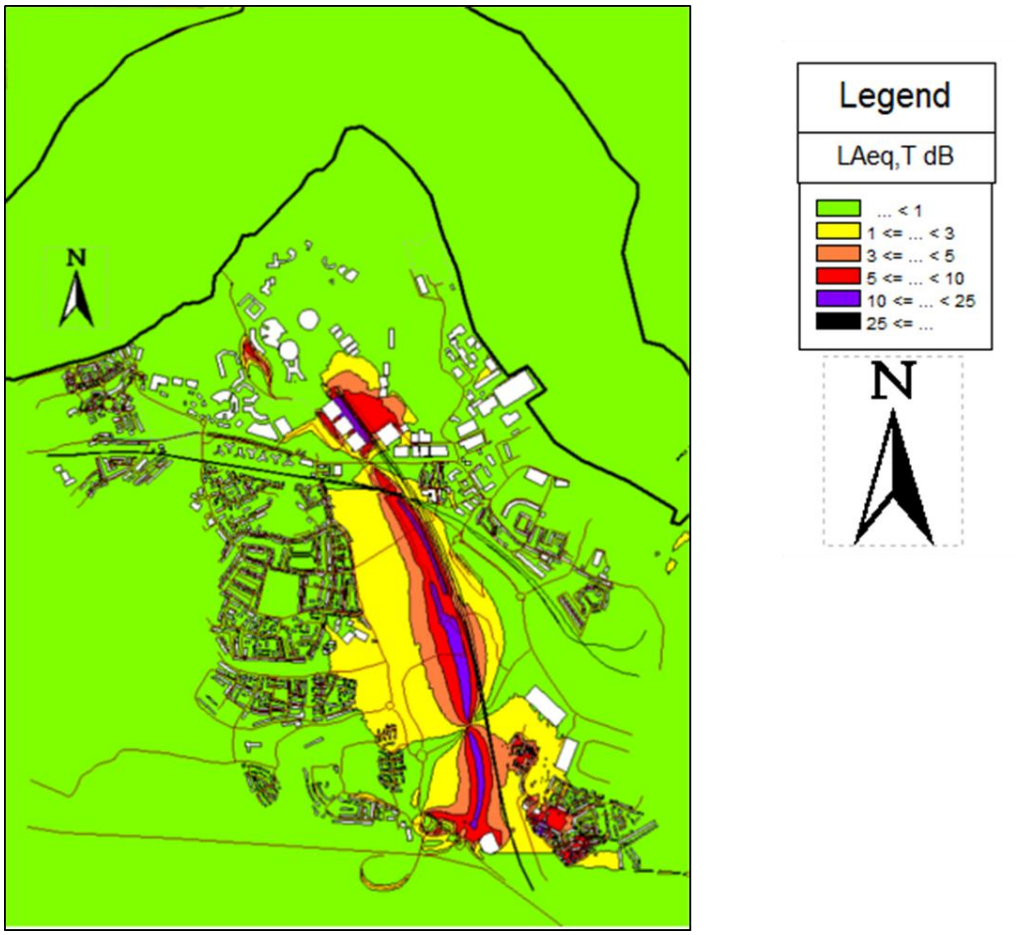
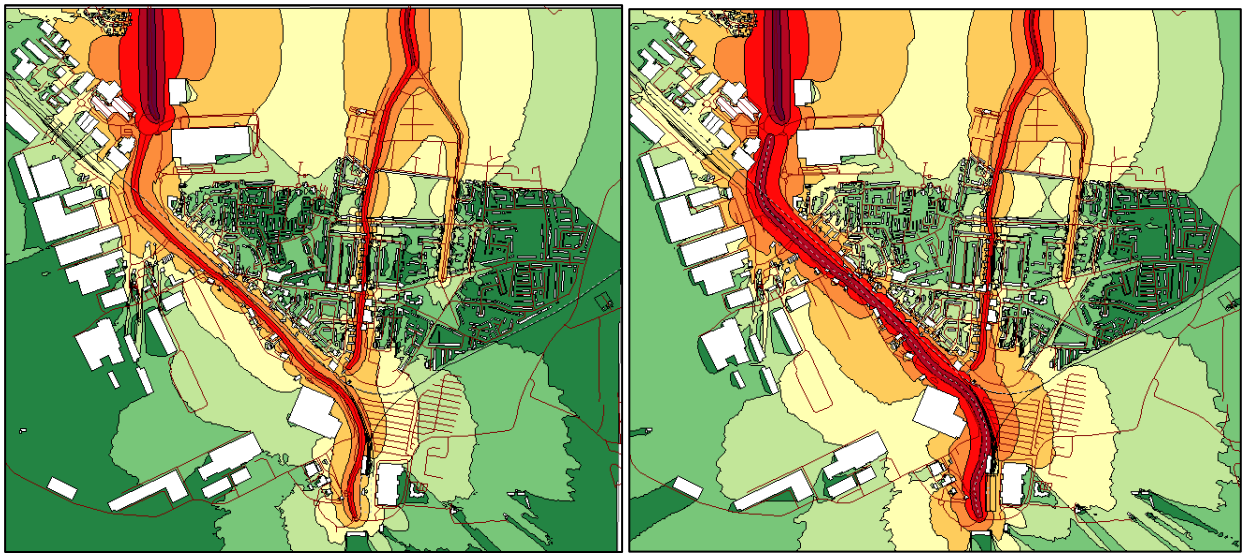


Figure 15.3.6: Calculated daytime levels LAeq,18hr dB(A) for the Essex Project Site, calibrated to 2017 DEFRA traffic data (left image) and 2038 predicted traffic movement noise data (right image).



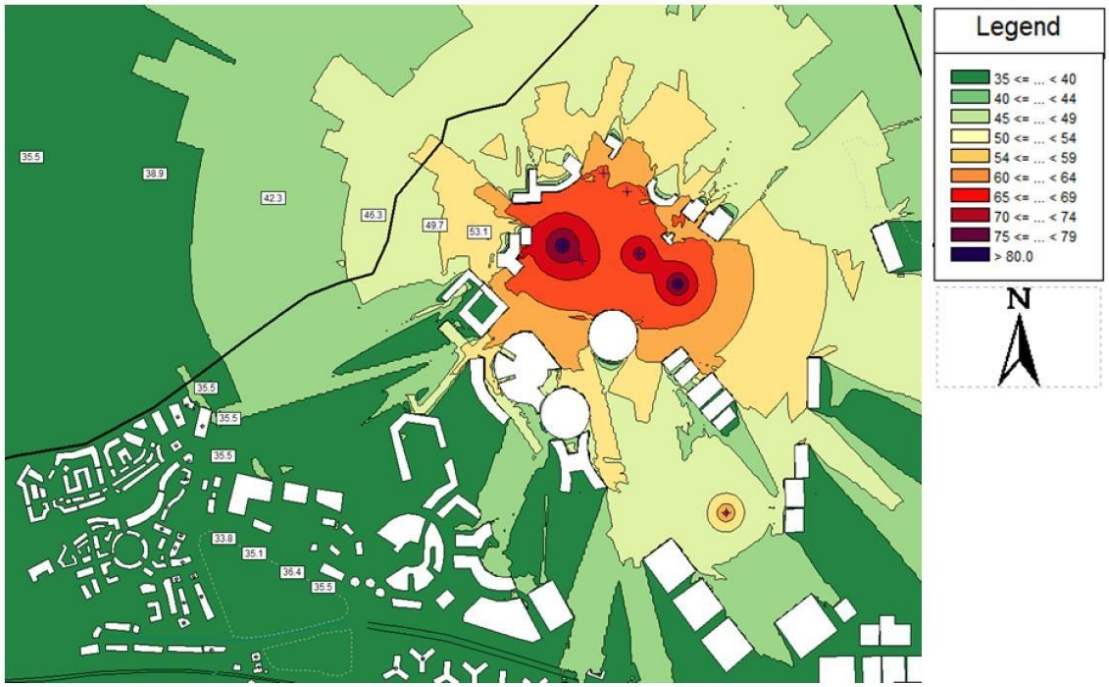
Operational 2038 ride noise assessment

Figure 15.3.7 and Figure 15.3.8 provide a comparison between the baseline ambient noise climate and the predicted noise climate due the operation of attractions and rides using $L_{A,max,f}$ as the noise index.
In the modelling of the noise from the attractions and rides shown in Figure 15.3.7 six outdoor rides have been modelled in Gate 1. In Figure 15.3.8 a further three outdoor rides have been modelled in Gate 2 along with a series of 'boxed' (indoor) rides.

The following assessments are therefore based on the likelihood of rides and attractions being clearly audible outside residential premises when all other peak noise sources are absent. This represents the quiet time between road traffic events when the noise from a ride or attraction (including shouts and screams) might be audible.

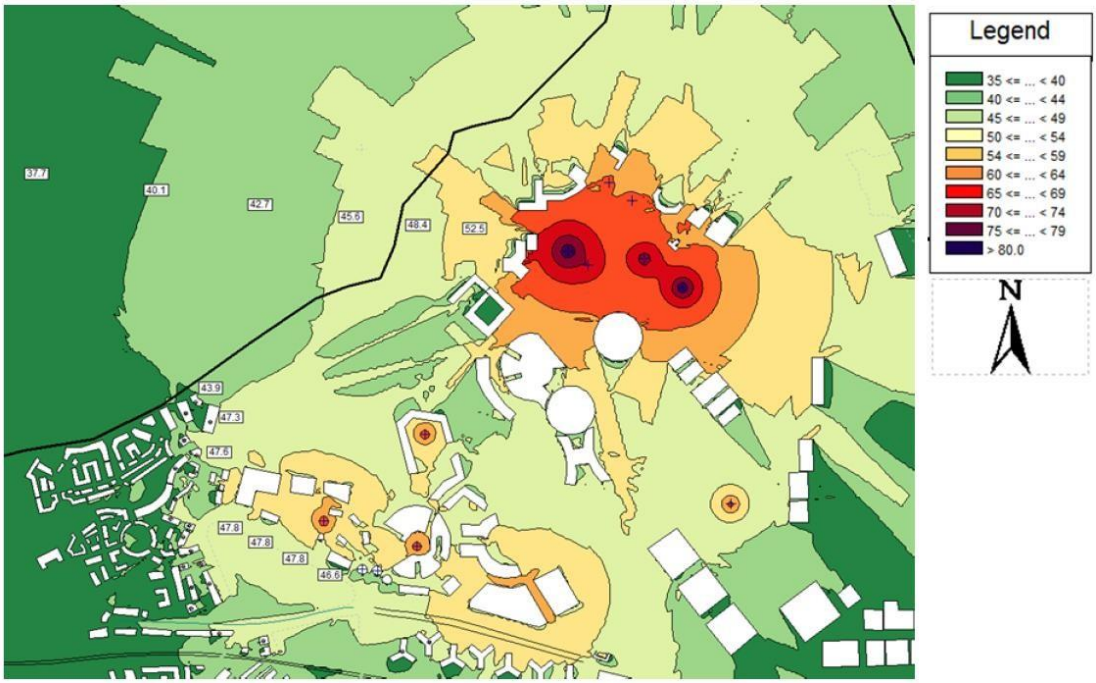
Gate 1 rides

Figure 15.3.7 Calculated daytime levels $L_{A,max,f}$ dB(A) for the area surrounding The Kent Project Site, with only the Gate 1 rides and attractions in operation (no road traffic or any other sources of noise modelled).



Gate 2 rides

Figure 15.3.8 Calculated daytime levels $L_{A,max,f}$ dB(A) for the area surrounding The Kent Project Site, with the Gate 1 and Gate 2 rides and attractions in operation (no road traffic or any other sources of noise modelled).



An assessment was conducted using $L_{A,max,f}$ noise survey data in conjunction with 3D acoustic modelling. This exercise however showed that the current noise climate to the south and east of Gate 2 is strongly influenced by the peaks in noise caused by the movements of HGV vehicles along Manor Way. As these movements will cease due to the construction of the Proposed Development, comparing the future $L_{A,max,f}$ from rides and attractions to the current peak noise levels (that are highly influenced by HGV movements) is not a reliable predictor. Figure 15.3.9. illustrates this modelling issue when noise from existing roads is considered in a ride noise impact assessment. This has been provided for reference.

Figure 15.3.9 Calculated daytime levels $L_{A,max,f}$ dB(A) for the area surrounding The Kent Project Site, with the Gate 1 and Gate 2 rides and attractions in operation (and baseline road traffic noise considered).

Assessment summary

Road traffic noise (Kent Project Site)

Inspecting Figure 15.3.5 which considers the effect of road traffic noise only, in terms of LAeq,18hrs, the results show the new access road from the A2 to cause the most significant changes when the Proposed Development is 'switched on'.

The following breakdown of affected areas is limited to developments in a direct line of sight to the new access roads.

In the area of residential properties to the south of the resort and to the west of the access road traffic movement calculations Figure 15.3.5 show ambient noise level increases by 1 dB (Low impact magnitude) for properties in:

- High Street (eastern side)
- Stanhope Road (eastern side / western side when there are no eastern side houses)
- Stanhope Street (eastern end)
- Merriall Close (northern end)
- Park View (eastern end)

- Weldon Road (eastern end)
- Candy Dene (eastern end)
- Ackers Drive (north side)

In the area of residential properties to the south of the resort and to the east of the access road traffic movement calculations in Figure 15.3.5 show ambient noise level increases by at least 1 dB (Low magnitude and greater) for properties in:

- Conrad Mews
- Marlow Close
- Thackeray Drive
- Wellesley Corner
- Caxton Park
- Colby Mews
- Springhead Parkway
- Paris Drive
- Stratford Way
- Amsterdam Way

In the area of residential properties to the east of the resort traffic movement calculations in Figure 15.3.5 show ambient noise level increases by at least 1 dB for properties in:

- Snowdon Hill
- Robinson Way (including Phoenix Court, Black Eagle Drive)

The only other predicted change to the noise climate due to new roads are due to the electric land vehicle moving along access roads where there was previously no significant noise activity and around the resorts parking areas. However, the calculations show that the noise from these areas is unlikely to propagate to any residential areas.

Noise from rides and attractions

Inspecting Figure 15.3.7 which considers the effect of the operation of the Gate 1 rides and attractions only, the results show that using $L_{A,max,f}$ as the noise index, rides are not predicted to produce $L_{A,max,f}$ levels in excess of the 43 dBA threshold. The lowest background noise levels measured during onsite noise surveys was found to be 48 dB(A) (at monitoring location 1, shown in Appendix 15.3). Therefore, the $L_{A,max,f}$ of 43 dBA was taken to be a threshold level for audibility of ride noise. Figure 15.3.8 includes noise from rides and attractions at both Gate 1 and Gates 2. In this case, noise levels are predicted above the threshold at the nearest residential premises.

The following breakdown of affected areas is limited to developments in a direct line of sight to the rides.

On the basis of a comparison between peak and background noise levels, with outdoor rides operating in both Gate 1 and Gate 2, the residential properties in:

- Wainwright Avenue
- Stonely Crescent
- Tiltman Avenue
- Vaughan Avenue
- Duncannon Place
- Reed Court
- *Knockhall Road*
- *Ingress Gardens*
- *Craylands Lane*
- *Craylands Square*
- *Caspian Way*
- *Pentstemon Drive*
- *Orchard Road*
- *Alma Road*

- In addition, any new housing in land between Tiltman Avenue and London Road with a direct line of sight to the new rides and attractions.

The locations picked out in italics are south of London Road. It is less likely for noise from rides and attractions (including shouts and screams) to be audible at these locations as this would depend on their being a sufficiently lengthy gap in road traffic noise on London Road. Nevertheless, they are included here for completeness.