TECHNICAL NOTE

DATE:	05 March 2021	**CONFIDENTIALITY:**	Internal
SUBJECT:	West Winch HAR and South East King's Lynn Growth Area Masterplan - acoustics technical note		
PROJECT:	70071439-N01	**AUTHOR:**	Tom Farmer
CHECKED:	Toby Lewis	**APPROVED:**	Toby Lewis

INTRODUCTION

The acoustics team at WSP is currently working with Norfolk County Council (NCC) on the noise and vibration aspects of the Environmental Impact Assessment for the West Winch Housing Access Road (WWHAR). The WWHAR facilitates adjacent residential led development known as the South East King's Lynn Growth Area (SEKLGA).

WSP has been commissioned by NCC to assist with the quantification of the future noise climate to inform the masterplanning of the SEKLGA. This technical note predicts the road traffic noise levels across the development parcels which make up the SEKLGA. The results are presented in the form of an initial site noise risk assessment, as noise contours which align with the Red Amber Green (RAG) guidance in the ProPG[1]. The note goes on to outline the good acoustic design measures that should be considered as part of the ongoing preparation of the masterplan, to demonstrate that development parcels will be suitable for residential led development.

METHODOLOGY AND GUIDANCE

NOISE MODEL

A 3D noise model has been constructed using CadnaA® modelling software. The model has been built using data from the following sources:

- Topography for the surrounding area – Environment Agency LIDAR.[2]
- Scheme alignment and topography – 2D and 3D CAD drawings of the scheme. These were based on the most up to date designs available at the time of the assessment (February 2021). The 3D drawing did not include the detailed design for the two side road junctions on the WWHAR, the Hopkins Roundabout and the proposed A47 Roundabout, because these had not been finalised. However, the absence of these details is not expected to influence materially the conclusions of this outline masterplanning assessment.
- Traffic data – this was provided for all roads which have the potential to materially affect the noise levels across the SEKLGA, including:
  - A10 between the Hardwick Interchange and WWHAR;
  - WWHAR between the A10 and A47;
  - A47 between Hardwick Interchange and WWHAR roundabout; and
  - The Hardwick Interchange.

[1] ProPG: Planning & Noise for New Residential Development. May 2017. ANC, IOA & CIEH.
[2] https://data.gov.uk/dataset/3fc40781-7980-42fc-83d9-0498785c600c/lidar-composite-dtm-2019-1m Accessed January 2021.

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- The above traffic data are based on the traffic model scenario of the future forecast year in 2039 with the WWHAR and the full development of approximately 4000 homes which make up the SEKLGA, so underpins a robust and worst-case assessment.
- The noise model has utilised the prediction methodologies set out in CRTN[3], which predicts a noise level in terms of a $L_{A10,18h}$. The daytime ($L_{Aeq,16h}$) and night-time ($L_{Aeq,8h}$) noise levels have been derived using Method 3 of the TRL research[4].

NOISE PLANNING POLICY AND LINKING TO THE ProPG GUIDANCE

The NPSE[5] contains the following aims (which are also reflected in the NPPF[6]):

- "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."

'Significant adverse' and 'adverse' impacts can be aligned with the SOAEL and LOAEL respectively. These are described in the NPSE as follows:

- *"**LOAEL** - Lowest Observable Adverse Effect Level - This is the level above which adverse effects on health and quality of life can be detected.*
- ***SOAEL** - Significant Observed Adverse Effect Level - This is the level above which significant adverse effects on health and quality of life occur."*

LOAELs and SOAELs are not quantified numerically in national planning policy. However, some guidance documents produced since the NPSE was published have aligned numerical values with these definitions for particular noise sources. These include LA 111[7] which aligns values of LOAEL and SOAEL for daytime and night-time road traffic noise[8] as shown in Table 1.

Table 1 – Values of LOAEL and SOAEL used for this assessment – following guidance in LA 111.

Time Period	LOAEL	SOAEL
Day	55dB $L_{A10,18hr}$ facade[1]	68dB $L_{A10,18hr}$ facade[2]

[3] Calculation of Road Traffic Noise. 1988. Department of Transport Welsh Office. London: HMSO
[4] Abbott and Nelson. 2002. Converting the UK traffic noise index $L_{A10,18h}$ to EU noise indices for noise mapping. TRL Limited
[5] Noise Policy Statement for England, 2010
[6] National Planning Policy Framework, 2019
[7] LA 111 Design Manual for Roads and Bridges – noise and vibration. Rev 2. May 2020.
[8] LA 111 was published by Highways England, and as such, was predominantly intended for motorways and truck roads. However, in the absence of other numerical criteria, these are considered appropriate for this assessment.

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Night	40dB $L_{night,\ outside}$[3] (free-field)	55dB $L_{night,\ outside}$[3] (free-field)

1 – equivalent to 50dB $L_{Aeq,16h}$ which is the conservative target usually applied to external amenity spaces for new dwellings, as set-out in BS 8233:2014.
2 – equivalent to 63dB $L_{Aeq,16h}$ which represents the threshold for potential eligibility under the Noise Insulation Regulations 1975.
3 – $L_{night,\ outside}$ is the same as $L_{Aeq,8h}$

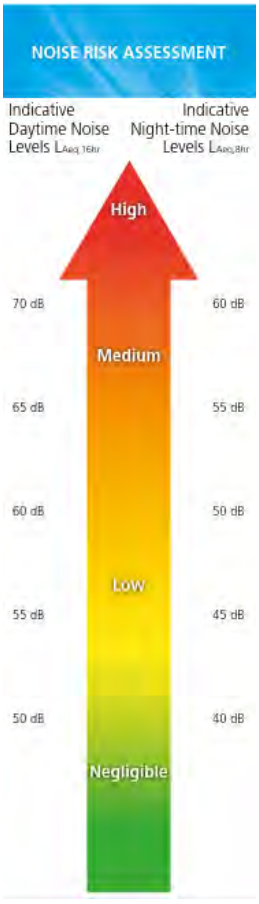
It is these values for LOAEL and SOAEL that have been adopted for this assessment, and have been aligned to the RAG scale from the ProPG, as shown in Plate 1.This plate illustrates that an increasing noise level is associated with an increasing risk of adverse effects from noise.

For the figures presented in this technical note, the RAG colour scheme aligns with the policy definitions and advice shown in Table 2.

Table 2 – Initial site noise risk assessment – aligned with noise planning policy and application advice

Colour	Noise level in policy terms	Summary of ProPG pre-planning application advice
Red	Above SOAEL	There is an increased risk that development may be refused on noise grounds.
Orange	Between LOAEL and SOAEL	The site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and it is demonstrated how the adverse impacts of noise will be mitigated and minimised, and that a significant adverse noise impact (levels above SOAEL) will be avoided in the finished development.
Yellow	Between LOAEL and SOAEL	The site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in suitable report which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.
Green	Below LOAEL	These noise levels indicate that the development site is likely to be acceptable from a noise perspective, and the application need not normally be delayed on noise grounds.

Plate 1 - Initial site noise risk assessment from ProPG



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INITIAL SITE NOISE RISK ASSESSMENT

The initial site noise risk assessment plots for the SEKLGA are presented in figures 1 to 4 below. Figures 1 and 2 show the predicted daytime noise levels, and figures 3 and 4 show the predicted night-time noise levels. The noise contours have been plotted in the absence of any noise mitigation measures.

The following conclusions can be drawn from these figures:

- Much of the central area of the development site is coloured green, suggesting noise levels are below the LOAEL. These areas should be suitable for residential development without the requirement for specific noise mitigation measures.
- The majority of the remainder of the site is coloured yellow and orange, suggesting noise levels are between the LOAEL and SOAEL. These areas should be suitable for residential development providing that suitable mitigation measures are adopted which demonstrate good acoustic design. It should be noted that these noise contours were plotted based on 'open site conditions' (i.e. in the absence of any buildings on-site). Appropriately located and orientated buildings positioned at the exposed edges of the site should screen other more centrally located development, meaning that a greater proportion of the site is likely to be within the green (below LOAEL) category than suggested in figures 1-4.
- The outer areas of the site, particularly those located closest to the WWHAR and the A47 are within the red area, suggesting that noise levels are above the SOAEL. These areas are unlikely to be suitable for residential development in the absence of mitigation measures designed to reduce noise levels. The indicative masterplan (November 2020), which can be seen beneath the noise contours in figures 1-4, shows that some of the proposed residential parcels in the north and south of the site are situated within this red area. It will therefore be necessary for mitigation measures to be explored for some development parcels.

GOOD ACOUSTIC DESIGN RECOMMENDATIONS

As the masterplan design evolves, it will be important for good acoustic design measures to be carefully considered, particularly for those areas located closest to the roads. A hierarchy of potential noise mitigation measures for the SEKLGA is listed below, in descending order of preference in terms of good acoustic design. A combination of the following measures is likely to be required to ensure that acceptable residential amenity is achieved throughout the development.

1 **Maximising the spatial separation between the roads and sensitive receptors**

- The distance between the road, particularly the WWHAR and A47 should be maximised as much as possible, whilst acknowledging the need to maximise the housing allocation on-site. The greater the separation distance, the lower the noise levels at the nearest sensitive receptors.
- For the reasons explained above, sensitive development on the areas shown in red (and preferably orange) in figures 1 to 4 should be avoided.

- It is acknowledged that this may not be achievable in all instances, particularly where development space is at a premium. Therefore, please see item 3 below for how the areas of the site which fall within the red and orange areas could be minimised through noise screening, and item 4 below regarding optimal layout and orientation at the exposed edges of the development parcels.

2 Exploring options for minimising noise generation from the roads

- Whilst this is unlikely to be feasible for the existing roads, this could be explored for the new or altered roads (e.g. the WWHAR or the section of A47 to be dualled). Potential measures that could be explored could include low noise surfacing or reducing/regulating vehicle speed.
- LA 111 indicates that low noise surfacing only provides a worthwhile benefit on roads with a traffic speed of greater than c. 75km/h (c. 46mph). Therefore, this option would only be applicable to roads where the traffic speeds are expected to be greater than this.
- Reducing speed limits could potentially reduce noise generation. Whilst historically the potential benefit may have been relatively limited due to the increasing influence of engine noise (rather that tyre noise) at lower speeds, the anticipated uptake of non-combustion powered vehicles (e.g. electric vehicles), could improve the relative benefits of speed reductions.

3 Noise screening (barriers, bunds etc)

- Figures 5 to 8 presented below illustrate the potential benefits of screening between the roads and development parcels. The alignment and extent of the screening, which has been modelled with a height of 3m, is shown by the blue line in figures 5 to 8.
- The screening could be achieved by acoustic noise barriers / fences (which may need to be of made of an absorptive material on the road side to prevent reflection of noise to properties on the opposite side of the road), through landscaping / earth mounds / other structures (e.g. gabions), which may be more preferable from a landscape perspective than acoustic fences, or a combination of multiple options. Any options would need to be considered holistically, particularly considering landscape, engineering, maintenance and other environmental impacts.
- It is acknowledged that screening may not be feasible for some development areas of the SEKLGA, in particular those development parcels adjacent to the A10 in West Winch. These were included in the noise model to demonstrate that there is likely to be a workable solution to provide acceptable residential amenity for all areas, even if this is achieved through a different combination of good acoustic design measures.
- As illustrated in figures 5 to 8, the provision of the noise screening included in these figures would remove the areas of red (i.e. above SOAEL) from the development parcels, meaning that all areas within the development site would be suitable for residential development from a noise perspective, subject to additional good acoustic design measures for the areas closest to the roads.

4 Layout and orientation of the buildings

- It may be possible to utilise the layout of the development parcels to provide an 'acoustic shadow' for other areas of the development site. This could be achieved through the use of 'barrier blocks'; typically, large and relatively tall buildings closer to the noise source which provide screening to other buildings and/or external amenity space behind.
- It is important that any barrier blocks are suitably designed in terms of their use, internal layout, sound insulation and ventilation requirements. For example, barrier blocks would ideally not be for residential use, but if they were, noise sensitive rooms would ideally face away from the source and enhanced sound insulation and ventilation requirements may be required for rooms on the 'noisy' side of the block.
- The provision of external amenity space (e.g. gardens) with an uninterrupted view to the roads should be avoided. The orientation of the blocks should be carefully considered to ensure that gardens are positioned on the 'quiet' side of exposed dwellings.

5 Building façade, ventilation and overheating strategy

- All buildings on-site will need to be designed with a suitable façade sound insulation, ventilation and overheating strategy. Particular consideration will be required for those development parcels which are located closer to the roads, where it may not have been possible to employ alternative more preferable good acoustic design measures. Particular focus will be required for the glazing, ventilation and possible cooling designs.

Conclusions

It is anticipated that the development parcels which comprise the SEKLGA will be suitable for residential led development subject to good acoustic design measures which should be embedded into the masterplan.

Assuming that acoustic screening, equivalent to that shown in figures 5 to 8, was provided on-site, sensitive development could be built closer to the roads than would be possible without such noise screening. However, it would still be recommended that the distance between the road and nearest sensitive development were maximised so as to avoid development within the orange area (upper bracket of between LOAEL and SOAEL).

The orange area could be used as an offset distance or as a suitable corridor for earth bunding/ landscaping if conventional acoustic barriers were less preferable. Any development within the orange area would require very careful consideration in terms of the type of development (ideally avoiding noise sensitive uses). If residential uses were proposed, dwellings would need to be orientated so that external amenity areas were not located on the 'noisy' side of the plot. Furthermore, a greater degree of façade, ventilation and overheating mitigation measures may be necessary if residential development were to be proposed in these areas.

Key

Free-field ground floor daytime noise level from roads - no noise mitigation

dB, LAeq,16h

- Less than 50
- 50 - 55
- 55 - 63
- Greater than 63

Wisbech Road
Saddlebow Road
Nar Ouse Way
Hardwick Road
Oldmedow Road
Greenyard Way
South Lynn
Hardwick
Pierpoint Drain
River Nar
Hill Cottages
White House Farm
Lodge or The Pheasants
Fair G
middle zone - 205m
inner zone - 82m
gas pipeline
inner zone - 82m
middle zone - 205m
Gas pipeline location based on 'Underground Utilities Search - West Winch Sheet 3 OF

0 50 100 200 300 400 Meters

wsp

TITLE:
South East King's Lynn
Growth Area Masterplan
Noise contour plan
Acoustic constraints
from roads

FIGURE No:
Figure 1
Daytime noise level
No noise mitigation
Northern Area
Nov 2020 masterplan underlain

Date Modified: 02/03/2021
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Key

Free-field ground floor daytime noise level from roads - no noise mitigation

dB, LAeq,16h

- Less than 50
- 50 - 55
- 55 - 63
- Greater than 63

zone - 205m

nner middle zone - 82m

gas pipeline

nner middle zone - 82m

West Winch

North Runcton

Gas pipeline location based on 'Underground Utilities Search-West Winch Sheet 5 OF 6'

Punyon Drain

High Orchard

Hay's Wood

North Runcton Common

Sunnyside Farm

KEY

- Masterplan Boundary
- WWHAR Road Zone
- Hopkins Homes Schem
- Metacre Scheme (Dec
- Other Landowners
- Zurich Assurance Zone

0 37.575 150 225 300 Meters

wsp

TITLE:
South East King's Lynn
Growth Area Masterplan
Noise contour plan
Acoustic constraints
from roads

FIGURE No:
Figure 2
Daytime noise level
No noise mitigation
Southern Area
Nov 2020 masterplan underlain

Date Modified: 02/03/2021

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Key

Free-field ground floor night-time noise level from roads - no noise mitigation

dB, LAeq,8h

- Less than 40
- 40 - 50
- 50 - 55
- Greater than 55

Wisbech Road
Saddlebow Road
Nar-ouse Way
Hardwick Road
Oldmedow Road
Greenyard Way
South Lynn
Pump Drain
River Nar
Hardwick
Pierpoint Drain
Hill Cottages
White House Farm
middle zone - 205m
inner zone - 82m
gas pipeline
inner zone - 82m
middle zone - 205m
Gas pipeline location based on 'Underground Utilities Search - West Winch Sheet 3 OF
Lodge or The Pheasants
Fair Gr

0 50 100 200 300 400 Meters

wsp

TITLE:
South East King's Lynn
Growth Area Masterplan
Noise contour plan
Acoustic constraints
from roads

FIGURE No:
Figure 3
Night-time noise level
No noise mitigation
Northern Area
Nov 2020 masterplan underlain

Key

Free-field ground floor night-time noise level from roads - no noise mitigation

dB, LAeq,8h

- Less than 40
- 40 - 50
- 50 - 55
- Greater than 55

zone - 205m

nner middle zone - 82m

gas pipeline

nner middle zone - 82m

West Winch

North Runcton

Gas pipeline location based on 'Underground Utilities Search-West Winch Sheet 5 OF 6'

Punyton Drain

Hay's Wood

North Runcton Common

Sunnyside Farm

KEY

- Masterplan Boundary
- WWHAR Road Zone
- 1 Hopkins Homes Schem
- 2 Metacre Scheme (Dec
- Other Landowners
- Zurich Assurance Zone

0 40 80 160 240 320 Meters

wsp

TITLE:
South East King's Lynn
Growth Area Masterplan
Noise contour plan
Acoustic constraints
from roads

FIGURE No:
Figure 4
Night-time noise level
No noise mitigation
Southern Area
Nov 2020 masterplan underlain

Key

Acoustic screening (3m high)

Free-field ground floor daytime noise level from roads - with noise mitigation

dB, LAeq,16h

- Less than 50
- 50 - 55
- 55 - 63
- Greater than 63

Wisbech Road
Saddlebow Road
Nar-ouse Way
Hardwick Road
Oldmedow Road
Greenyard Way
A1
South Lynn
Hardwick
Pierpoint Drain
River Nar
Hill Cottages
White House Farm
middle zone - 205m
inner zone - 82m
gas pipeline
inner zone - 82m
middle zone - 205m
Lodge or The Pheasants
Fair Gr

Gas pipeline location based on 'Underground Utilities Search - West Winch Sheet 3 OF

0 50 100 200 300 400 Meters

wsp

TITLE:
South East King's Lynn
Growth Area Masterplan
Noise contour plan
Acoustic constraints
from roads

FIGURE No:
Figure 5
Daytime noise level
With noise mitigation
Northern Area
Nov 2020 masterplan underlain

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Key

Acoustic screening (3m high)

Free-field ground floor daytime noise level from roads - with noise mitigation

dB, LAeq,16h

- Less than 50
- 50 - 55
- 55 - 63
- Greater than 63

zone - 205m

nner middle zone - 82m

gas pipeline

nner middle zone - 82m

West Winch

North Runcton

Gas pipeline location based on 'Underground Utilities Search-West Winch Sheet 5 OF 6'

Hall Orchard

Hay's Wood

North Runcton Common

Sunnyside Farm

Puny Drain

Education Facility

KEY

Masterplan Boundary

WWHAR Road Zone

Hopkins Homes Schen

Metacre Scheme (Dec

Other Landowners

Zurich Assurance Zone

0 40 80 160 240 320

Meters

wsp

TITLE:

South East King's Lynn
Growth Area Masterplan
Noise contour plan
Acoustic constraints
from roads

FIGURE No:

Figure 6
Daytime noise level
With noise mitigation
Southern Area
Nov 2020 masterplan underlain

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Key

Acoustic screening (3m high)

Free-field ground floor night-time noise level from roads - with noise mitigation

dB, LAeq,8h

- Less than 40
- 40 - 50
- 50 - 55
- Greater than 55

Wisbech Road

Saddlebow Road

Nar-ouse Way

Hardwick Road

Oldmedow Road

Greenyard Way

South Lynn

Hardwick

River Nar

Hill Cottages

White House Farm

middle zone - 205m

inner zone - 82m

gas pipeline

inner zone - 82m

middle zone - 205m

Gas pipeline location based on 'Underground Utilities Search - West Winch Sheet 3 OF

Lodge or The Pheasants

Fair Gr

0 50 100 200 300 400 Meters

wsp

TITLE:

South East King's Lynn
Growth Area Masterplan
Noise contour plan
Acoustic constraints
from roads

FIGURE No:

Figure 7
Night-time noise level
With noise mitigation
Northern Area
Nov 2020 masterplan underlain

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Key

Acoustic screening (3m high)

Free-field ground floor night-time noise level from roads - with noise mitigation

dB, LAeq,8h

- Less than 40
- 40 - 50
- 50 - 55
- Greater than 55

zone - 205m

nner middle zone - 82m

gas pipeline

nner middle zone - 82m

West Winch

North Runcton

Gas pipeline location based on 'Underground Utilities Search-West Winch Sheet 5 OF 6'

Puny Drain

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- Masterplan Boundary
- WWHAR Road Zone
- 1 Hopkins Homes Schen
- 2 Metacre Scheme (Dec
- Other Landowners
- Zurich Assurance Zone

0 37.575 150 225 300 Meters

wsp

TITLE:
South East King's Lynn
Growth Area Masterplan
Noise contour plan
Acoustic constraints
from roads

FIGURE No:
Figure 8
Night-time noise level
With noise mitigation
Southern Area
Nov 2020 masterplan underlain