WWHAR – Noise Masterplan Review

DATE:	21 April 2023	**CONFIDENTIALITY:**	Public
SUBJECT:	West Winch Housing Access Road - Noise Masterplan Review		
PROJECT:	WWHAR	**AUTHOR:**	M Ashcroft
CHECKED:	S Whydle	**APPROVED:**	S Whydle

INTRODUCTION

WSP have been commissioned by Borough of King's Lynn and West Norfolk Council to undertake detailed noise modelling of Development Blocks within the West Winch Strategic Growth Area Supplementary Planning Document (SPD) masterplan.

Five Development Block Areas have been identified across the masterplan adjacent to the proposed new West Winch Housing Access Road (WWHAR). The purpose of this assessment is to demonstrate that the Development Blocks are suitable for residential development, and the target internal and external noise criteria would be achievable with indicative housing layouts. The plots that have been considered are those closest to the proposed WWHAR, which once operational, will be the dominant noise source affecting the future homes. As the WWHAR has not yet been constructed, this is a predictive exercise, with future noise levels calculated based on a 3D noise model and road traffic data.

The Development Block Areas that have been modelled are shown on the masterplan presented in Appendix A.

WSP have undertaken previous studies to consider the potential noise impacts on the future homes within the masterplan. In early 2021 an initial study was undertaken to predict noise levels from the WWHAR and the surrounding road network across the masterplan area to understand any constraints to development and give an idea of the likely mitigation measures that would be required. A further study was undertaken later in 2021 to consider two speed options for the WWHAR, 40mph and 60mph. This assessment found that the 40mph road speed would be preferable for noise, although the differences between the options were small, and it was noted that other design considerations should be considered. It is understood that the proposed speed limit for the WWHAR will be 40mph, and the traffic data used for this assessment reflect this.

Previous noise modelling of the WWHAR has been based on the whole masterplan area without individual buildings modelled. This modelling showed that the proposed plots adjacent to the WWHAR would be exposed to fairly high noise levels, and good acoustic design measures would be required to ensure that suitable noise levels could be achieved for the residential properties, particularly those in the areas closest to the WWHAR. The purpose of this assessment is therefore to build on the previous studies and identify whether, adopting the principles of good acoustic design, suitable internal and external noise levels for residential development could be achieved.

It should be noted that the modelling undertaken at this stage is indicative as final traffic data and highways designs are not yet available for the WWHAR.

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ACOUSTIC CRITERIA

Acoustic Criteria

Both BS 8233:2014 *Guidance on sound insulation and noise reduction for buildings*[1] and ProPG*: Planning and Noise*[2] set out target internal and external noise levels for residential developments (see Table 1). In order to support a future planning application, a noise assessment will need to be undertaken which should demonstrate that these target levels will be achieved. At this masterplanning stage it is therefore important to demonstrate that the target levels could be achieved, in principle.

Table 1 – Target noise levels for residential development

Target Level	Daytime	Night-time	
	dB $L_{Aeq,16h}$	dB $L_{Aeq,8hr}$	Typical dB $L_{AF,max}$
Internal noise levels in habitable rooms	35	30	45
External noise levels in gardens	55	-	

As the WWHAR has not yet been constructed, the noise assessment at this stage is predictive in nature. The prediction methodologies for road traffic noise do not allow for prediction of maximum event noise levels, and therefore, at this stage only the average (L_{Aeq}) noise criteria can be considered.

ProPG also introduces the concept of 'good acoustic design' as follows:

"Good acoustic design is about more than the numbers. It is a holistic design process that creates places that are both comfortable and attractive to live in, where acoustics is considered integral to the living environment.

Good acoustic design can involve, for example, careful site layouts and better orientation of rooms within dwellings. Good acoustic design does not mean "gold plating" or significantly increasing costs. This guidance seeks to encourage and promote design outcomes that are proportionate and reasonable in the particular circumstances of each development site."

This principle has been adopted in the development of the indicative building layouts and should continue to be adopted as the development progresses.

[1] British Standards institution, BS 8233:2014 Guidance on sound insulation and noise reduction for buildings (2014)
[2] Association of Noise Consultants, Institute of Acoustics & Chartered Institute of Environmental Health, ProPG: Planning & Noise, New Residential Development (2017)

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NOISE MODEL

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

- Topography for the surrounding area – Environment Agency LIDAR[3].
- Scheme alignment and topography – 2D and 3D CAD drawings of the scheme (from February 2021). The 3D drawing did not include 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 materially influence the conclusions of this masterplanning assessment.
- Traffic data – this has been provided for the key sections of the WWHAR and A47 adjacent to the Development Block Areas considered in this assessment.
- 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 entire masterplan, so underpins a robust and worst-case assessment.
- The noise model has utilised the prediction methodologies set out in the Calculation of Road Traffic Noise (CRTN)[4], 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 Transport Research Laboratory research (non-motorway equations)[5].

Building heights have been modelled as follows:

- Detached and semi-detached houses – 9m
- Terraced houses (Area 3 only) – 11m
- Garages – 3m

It should be noted that the noise modelling undertaken is only preliminary. It is anticipated that the WWHAR highway design will be revised as part of the ongoing design for the planning application. In addition, other information used for this assessment may be updated. Therefore, there is the potential for the predicted noise levels to change, and it is considered appropriate to consider a degree of uncertainty with regard to the predicted noise levels and subsequent assessment and conclusions.

ASSESSMENT

Noise contour plots have been produced at heights of 1.5m for the daytime (representing the ground floor) and 4.0m for the night-time (representing the first floor).

[3] https://data.gov.uk/dataset/3fc40781-7980-42fc-83d9-0498785c600c/lidar-composite-dtm-2019-1m Accessed January 2021.
[4] Calculation of Road Traffic Noise. 1988. Department of Transport Welsh Office. London: HMSO
[5] Abbott and Nelson. 2002. Converting the UK traffic noise index $L_{A10,18h}$ to EU noise indices for noise mapping. TRL Limited

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The purpose of the daytime plot is to consider the external noise levels affecting the future façades of the buildings at ground floor level where living rooms would typically be located, and the external noise levels within gardens. The purpose of the night-time plot is to consider the external noise levels affecting the future façades of the buildings at 1st floor level, where bedrooms would typically be located.

Internal noise break-in can be mitigated through screening of the source, or at the receiver through a combined glazing and ventilation strategy. However, external noise levels in gardens can only be mitigated by screening. The orientation of buildings and fencing is important in ensuring suitable external noise levels in gardens can be achieved. Typically, the residential building itself is used to provide screening from the road to the rear garden, and this is usually an effective good acoustic design measure.

A typical garden fence is generally not of sufficient mass to provide notable acoustic attenuation. However, in key locations, standard garden fences can be upgraded to an acoustic fence to provide better attenuation. In order to reduce the predicted noise levels in gardens, acoustic fencing (at a height of 2m) has been assumed for key locations.

MODELLING ITERATIONS

The indicative building layouts for five Development Block Areas, as provided by the masterplanning team, have been included in the noise model. It was clear from the first modelling iteration that the indicative building layouts within Areas 1 and 2 would be unlikely to provide sufficient screening such that the target noise level within gardens could be achieved. A second iteration was therefore prepared for Areas 1 and 2 which required the above minor changes to the Development Block Area sizes. For Areas 3, 4 and 5, the majority of the proposed gardens met the criterion with only a few exceeding. It was therefore decided that the building layouts for Areas 3, 4 and 5 did not require further consideration, but Areas 1 and 2, needed additional modelling. A subsequent iteration (Iteration 2) for Areas 1 and 2 was produced which showed improved noise levels within gardens.

A summary of the building layout iterations and alterations that were required to the masterplan Development Block Areas is included in Appendix B.

The noise contour plots for each Area (Iteration 2 for Areas 1 and 2 and Iteration 1 for Areas 3, 4 and 5) are presented in Appendix C for both the daytime (07:00 -23:00) and night-time (23:00 – 07:00) periods. The figures show the indicative building layouts as well as the proposed acoustic fencing.

For clarity the building layouts for each Development Block Area as provided by the masterplanning team have been presented in Appendix D.

DISCUSSION

The modelling shows that for the daytime plots, the majority of gardens are anticipated to meet or be below the 55 dB $L_{Aeq,T}$ criteria. There are a few garden areas which may exceed this level in part, but it is anticipated that these areas could be refined at future design stages.

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In terms of the predicted noise levels affecting the façades of the future buildings, it was previously identified that the buildings fronting the WWHAR would require the greatest consideration. The majority of the proposed buildings for all Areas lie within the 55 – 60 dB $L_{Aeq,16h}$ contour band during the daytime and 50 – 55 dB $L_{Aeq,8h}$ during the night-time.

In order to ensure that suitable internal noise levels can be achieved, standard or acoustic laminate glazing is likely to be required. Mechanical background ventilation such as mechanical ventilation heat recovery (MVHR) may be required, or passive through-wall acoustic ventilation. For these receptors fronting the WWHAR, internal noise levels will need to be balanced with the anticipated overheating conditions such that residents do not have to choose between their house being too hot or too loud. These measures are not uncommon for new residential buildings in noisy environments and whilst they will require further consideration at future stages, this does not need to be a constraint to development.

The modelling clearly shows that the principles of good acoustic design have been met, by setting back properties from the road where possible, and using the proposed buildings to screen the gardens. Furthermore, the modelling shows that the five Development Block Areas modelled are suitable for residential development. It is clear that appropriate internal and external noise levels can be achieved for future homes based on the indicative layouts that have been considered.

As noted in the introduction, the WWHAR design is still in progress and the traffic data will be updated prior to the planning submission for the road. This means that the noise level predictions are likely to change. However, as the WWHAR and residential masterplans are being designed in tandem, there are potential opportunities for embedding mitigation such as screening using earthworks (e.g. bunds or the road in cutting) which could be incorporated into the road design, to help reduce noise levels for the future residential properties.

CONCLUSIONS

The purpose of this assessment has been to understand whether suitable internal and external noise levels for residential development could be achieved with indicative building layouts within selected Development Block Area.

Based on the indicative building layouts that have been modelled for Areas 1 to 5, it is clear that the target internal and external noise levels can be achieved (subject to appropriate façade mitigation measures) and as such, the Development Blocks are suitable for residential development.

As the design of the WWHAR evolves, noise will need to continue to be considered and further assessments should be undertaken at the appropriate stages.

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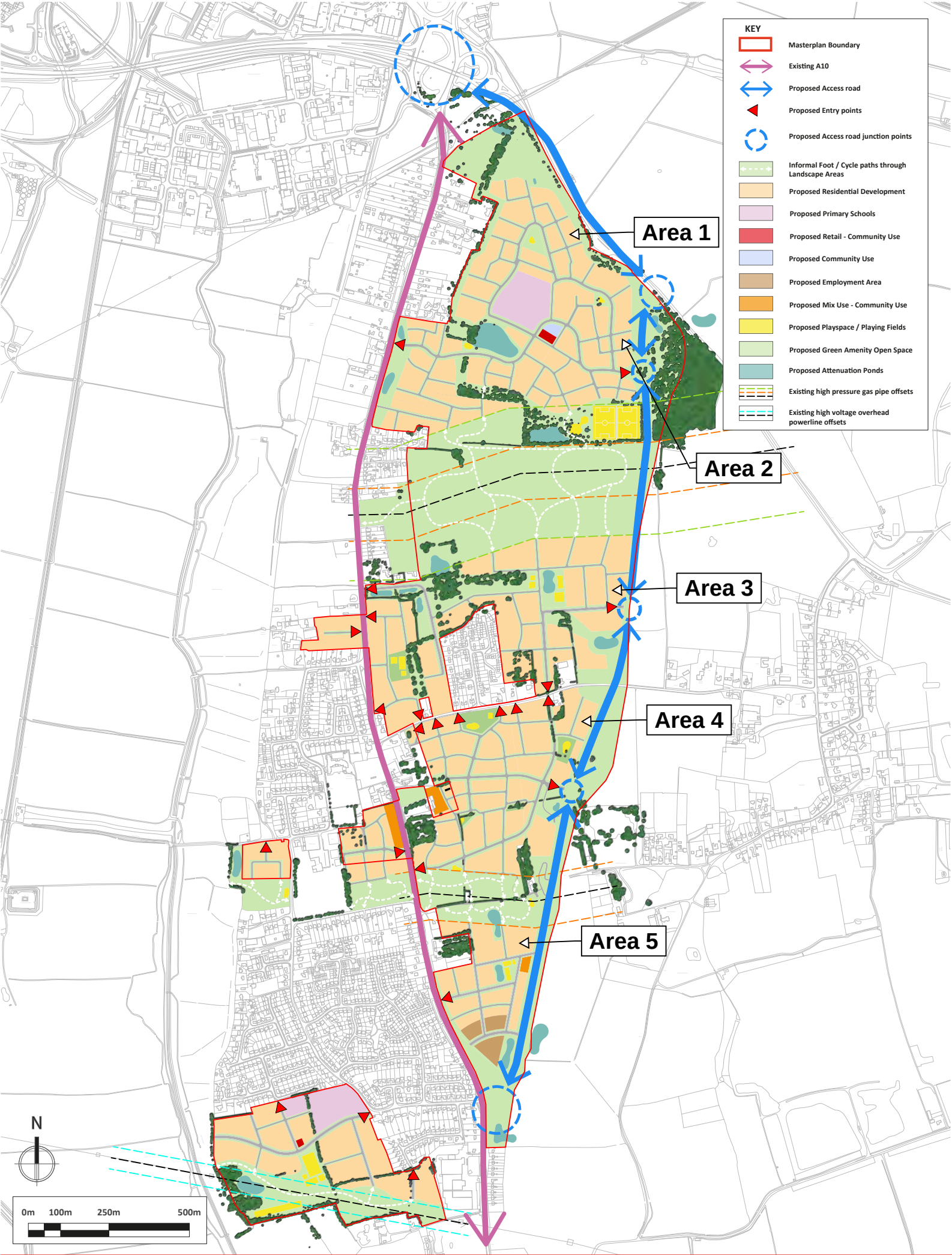
APPENDIX A – MASTERPLAN AREAS



SOUTH EAST KING'S LYNN GROWTH AREA MASTERPLAN SPD

Overall Framework Masterplan

Scale: 1:5000 @ A1
23rd November 2022

Borough Council of King's Lynn & West Norfolk

wsp

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APPENDIX B – DEVELOPMENT BLOCK AREA MODELLING ITERATIONS

The below Table presents a summary of the modelling iterations for each Development Block Area, including alterations that were made such that indicative building layouts could be produced.

Table 2 – Modelling Iterations Summary

Area	Iteration	Comments
1	Iteration 1	Initial noise modelling showed the first iteration of building layouts was unlikely to provide sufficient screening such that the target noise level within gardens could be achieved.
	Iteration 2	The Development Block Area to the west has been increased by 10-13m in order to provide efficient depth of block and back-to-back housing setback, as well as providing a service road to the continuous housing fronting the new WWHAR.
2	Iteration 1	Initial noise modelling showed the first iteration of building layouts was unlikely to provide sufficient screening such that the target noise level within gardens could be achieved.
	Iteration 2	The Development Block Area to the west has been increased by 2-3m in order to provide efficient depth of block and back-to-back housing setback, as well as providing a service road to the continuous housing fronting the new WWHAR.
3	Iteration 1	The Development Block Area to the west has been increased by 6m in order to provide efficient depth of block and back-to-back housing setback, as well as providing a service road to the continuous housing fronting the new WWHAR.
4	Iteration 1	The Development Block Area to the west has been increased by 8m in order to provide efficient depth of block and back-to-back housing setback, as well as providing a service road to the continuous housing fronting the new WWHAR.
5	Iteration 1	No changes were made to the Development Block Area

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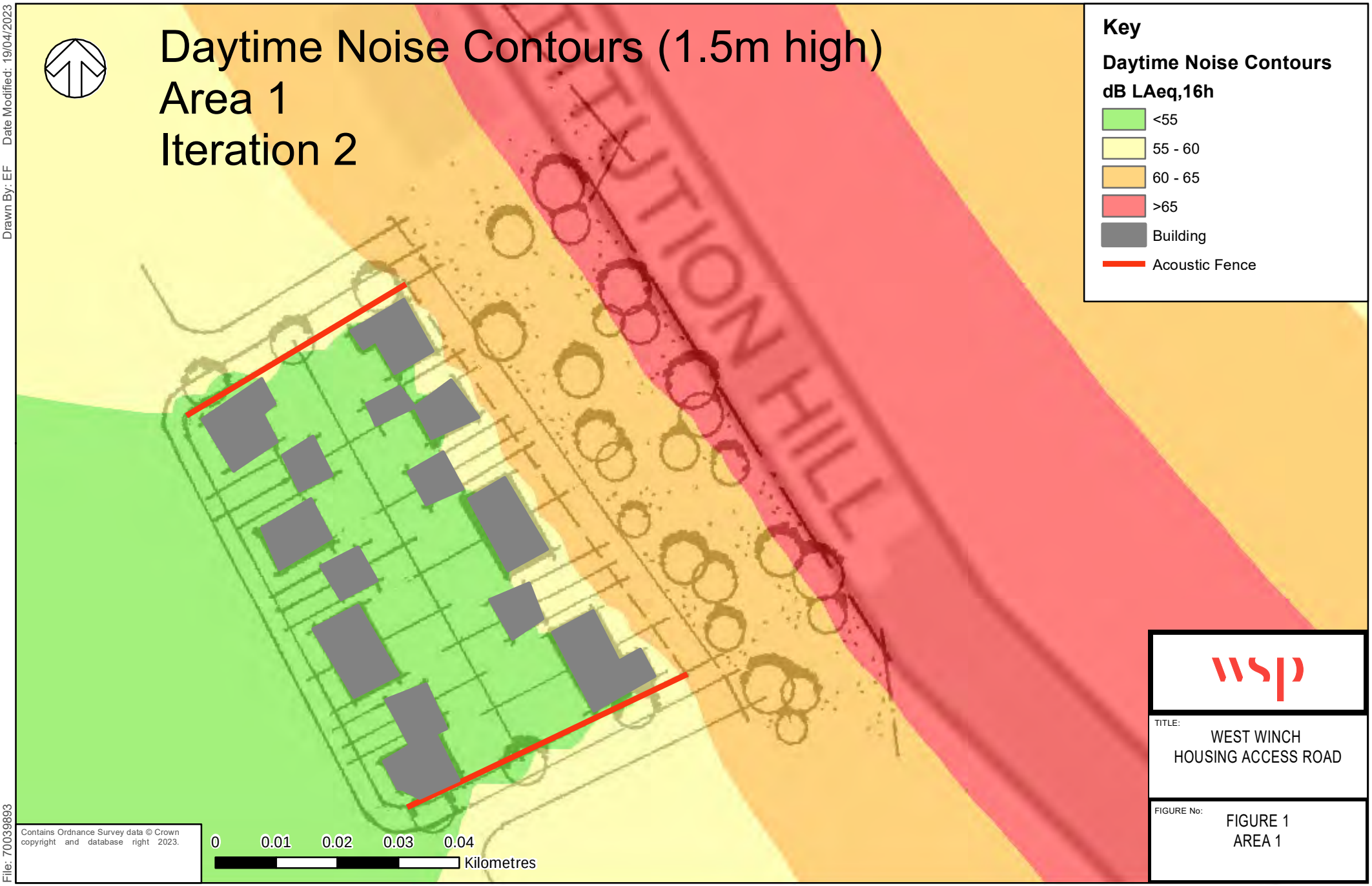
APPENDIX C - NOISE CONTOUR PLOTS

Noise Contour plots have been produced as follows:

- Figure 1 – Area 1 Daytime Noise Contour Plot
- Figure 2 – Area 2 Daytime Noise Contour Plot
- Figure 3 – Area 3 Daytime Noise Contour Plot
- Figure 4 – Area 4 Daytime Noise Contour Plot
- Figure 5 – Area 5 Daytime Noise Contour Plot
- Figure 6 – Area 1 Night-time Noise Contour Plot
- Figure 7 – Area 2 Night-time Noise Contour Plot
- Figure 8 – Area 3 Night-time Noise Contour Plot
- Figure 9 – Area 4 Night-time Noise Contour Plot
- Figure 10 – Area 5 Night-time Noise Contour Plot


Daytime Noise Contours (1.5m high)
Area 1
Iteration 2
Key
Daytime Noise Contours
dB LAeq,16h
<55
55 - 60
60 - 65
>65
Building
Acoustic Fence
Drawn By: EF
Date Modified: 19/04/2023
File: 70039893
Contains Ordnance Survey data © Crown copyright and database right 2023.
0
0.01
0.02
0.03
0.04
Kilometres
wsp
TITLE:
WEST WINCH
HOUSING ACCESS ROAD
FIGURE No:
FIGURE 1
AREA 1

Daytime Noise Contours (1.5m high)
Area 2
Iteration 2

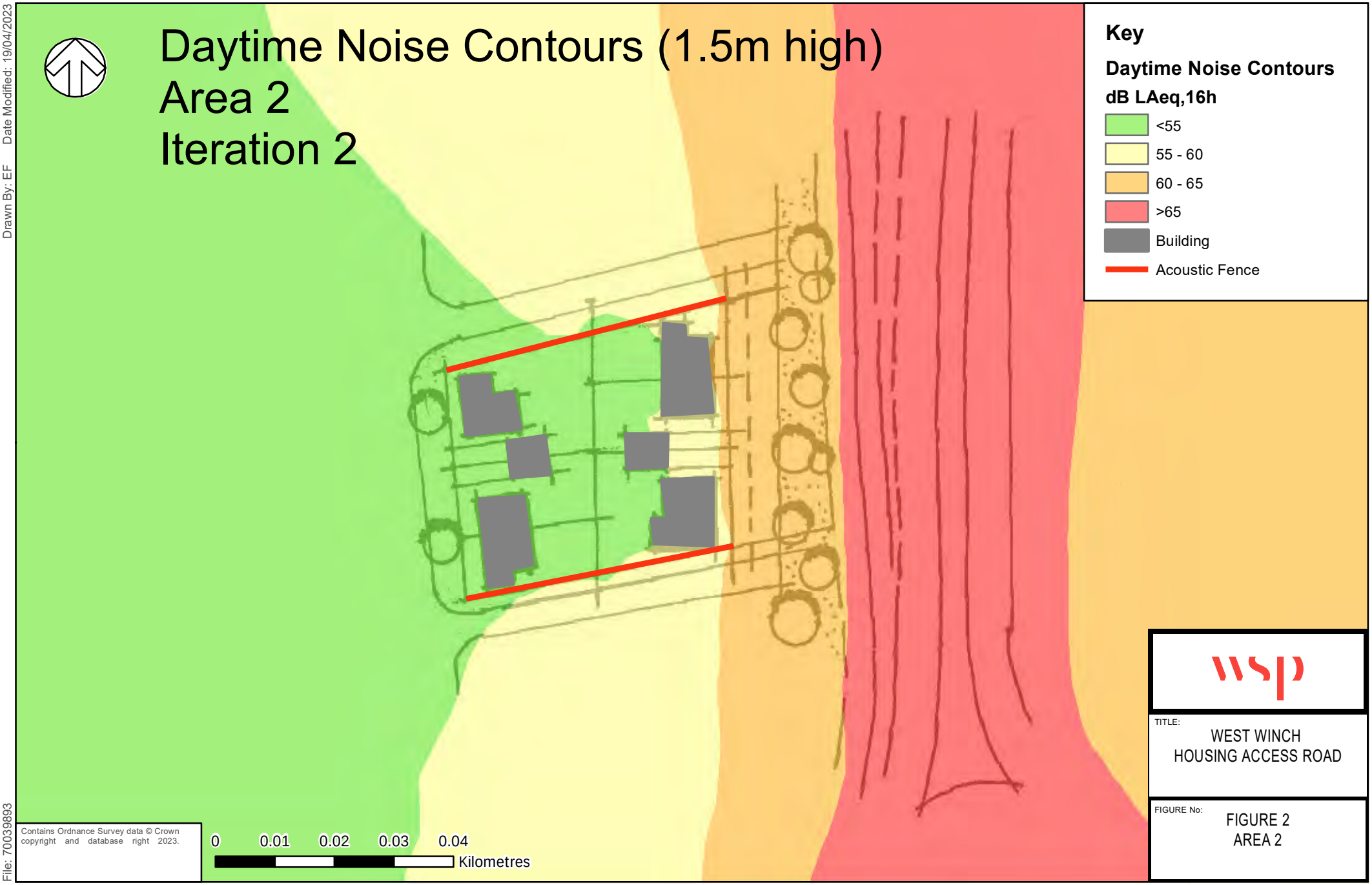


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FIGURE No:
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AREA 2

Daytime Noise Contours (1.5m high)
Area 3
Iteration 1

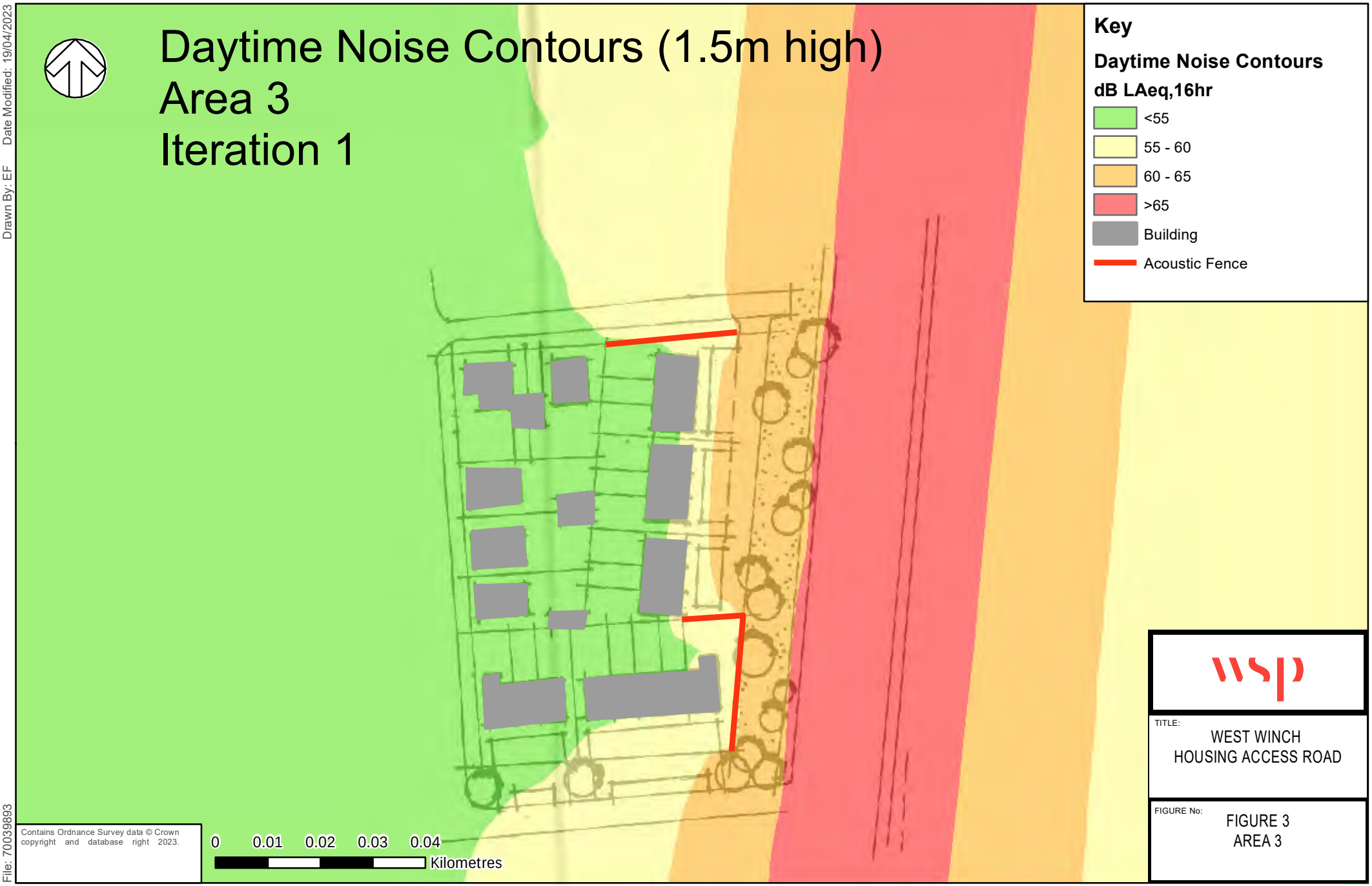

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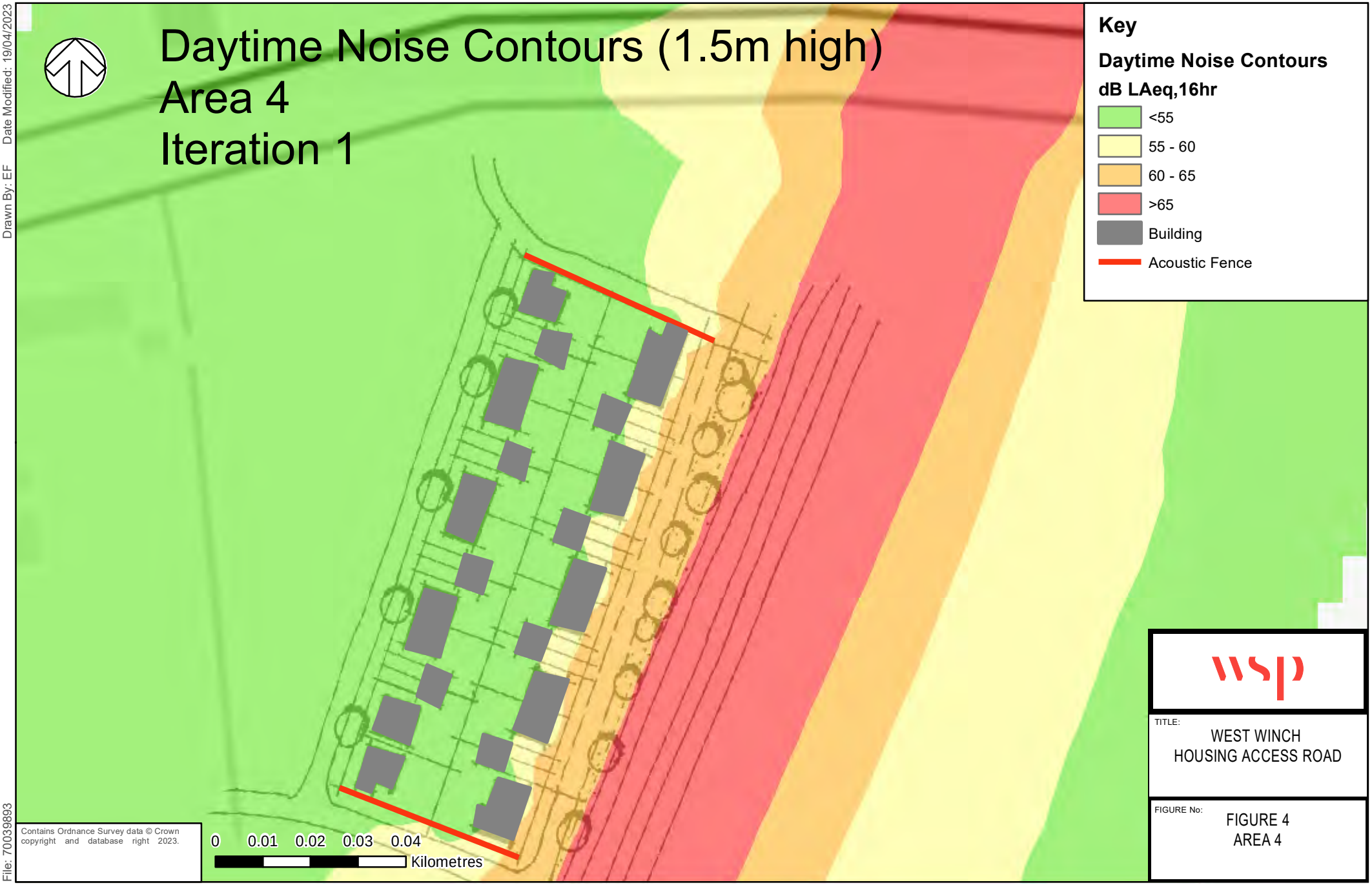
FIGURE No:
FIGURE 3
AREA 3


Daytime Noise Contours (1.5m high)
Area 4
Iteration 1
Key
Daytime Noise Contours
dB LAeq,16hr
<55
55 - 60
60 - 65
>65
Building
Acoustic Fence
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Date Modified: 19/04/2023
File: 70039893
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FIGURE No:
FIGURE 4
AREA 4

Daytime Noise Contours (1.5m high)
Area 5
Iteration 1

Key

Daytime Noise Contours
dB LAeq,16hr

- <55
- 55 - 60
- 60 - 65
- >65
- Building
- Acoustic Fence

0 0.01 0.02 0.03 0.04 Kilometres

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FIGURE No:
FIGURE 5
AREA 5

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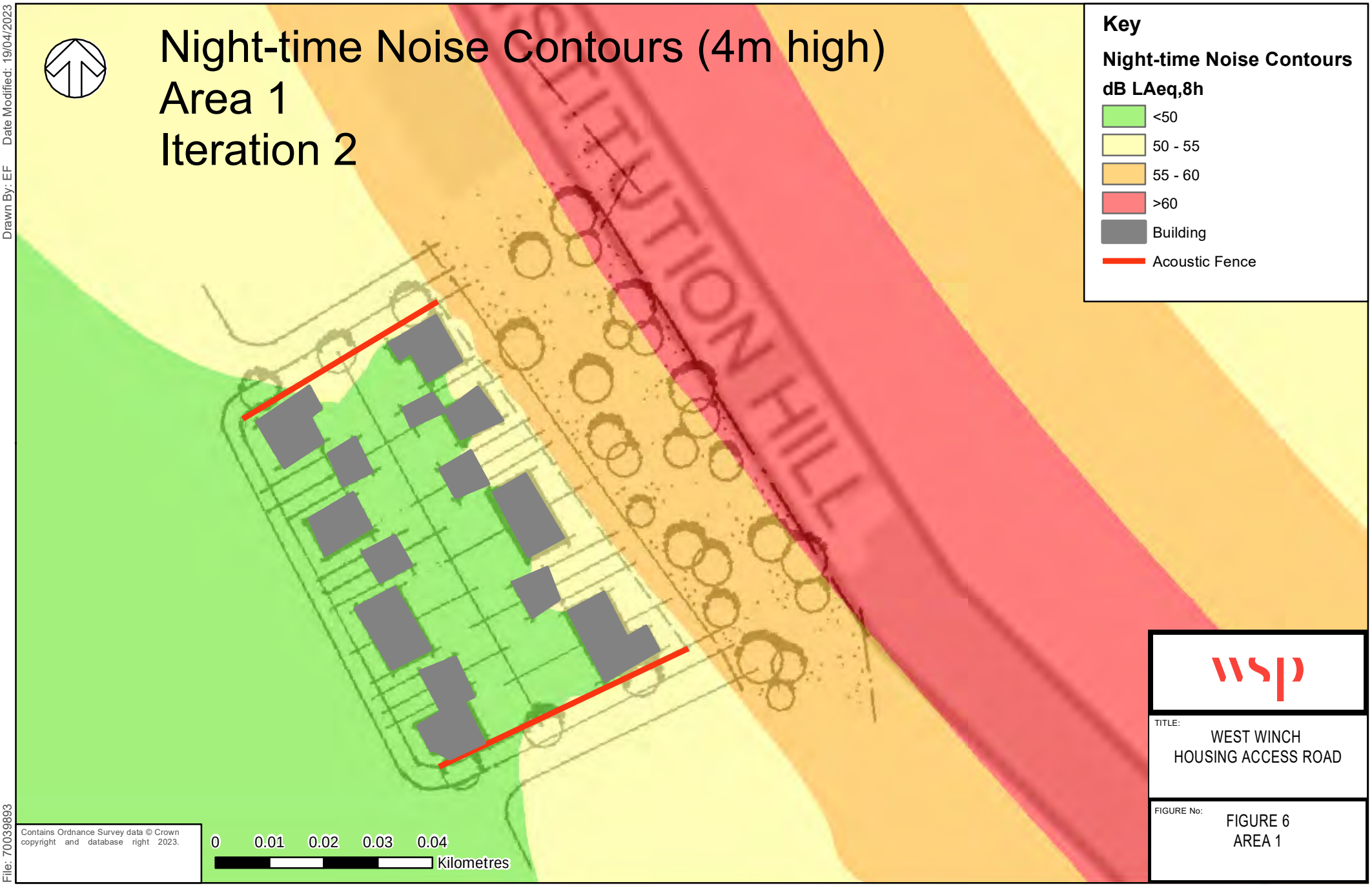
Night-time Noise Contours (4m high)
Area 1
Iteration 2
Key
Night-time Noise Contours
dB LAeq,8h
<50
50 - 55
55 - 60
>60
Building
Acoustic Fence
SUBSTITUTION HILL
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HOUSING ACCESS ROAD
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FIGURE 6
AREA 1
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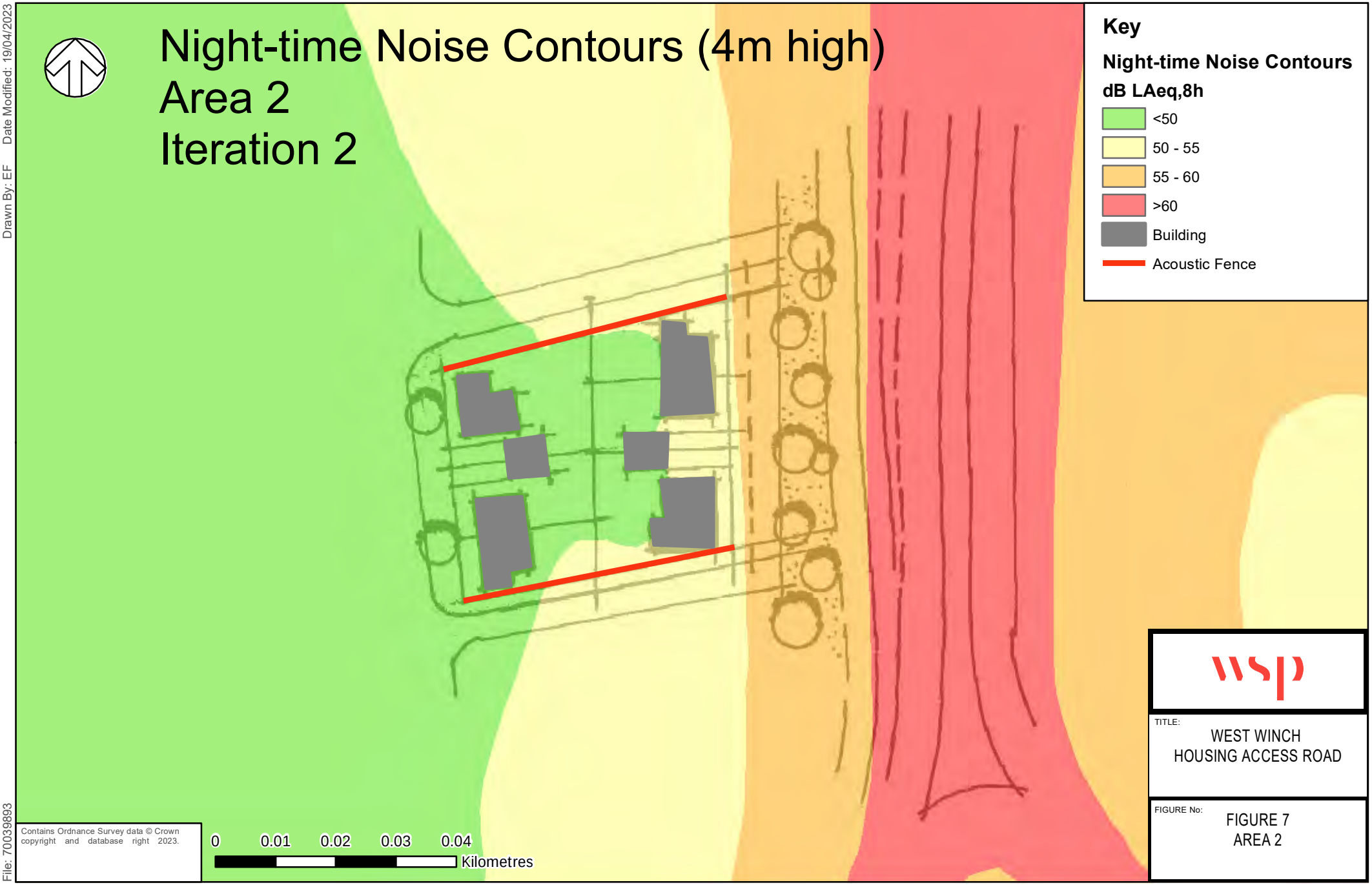
Night-time Noise Contours (4m high)
Area 2
Iteration 2



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WEST WINCH
HOUSING ACCESS ROAD

FIGURE No:
FIGURE 7
AREA 2

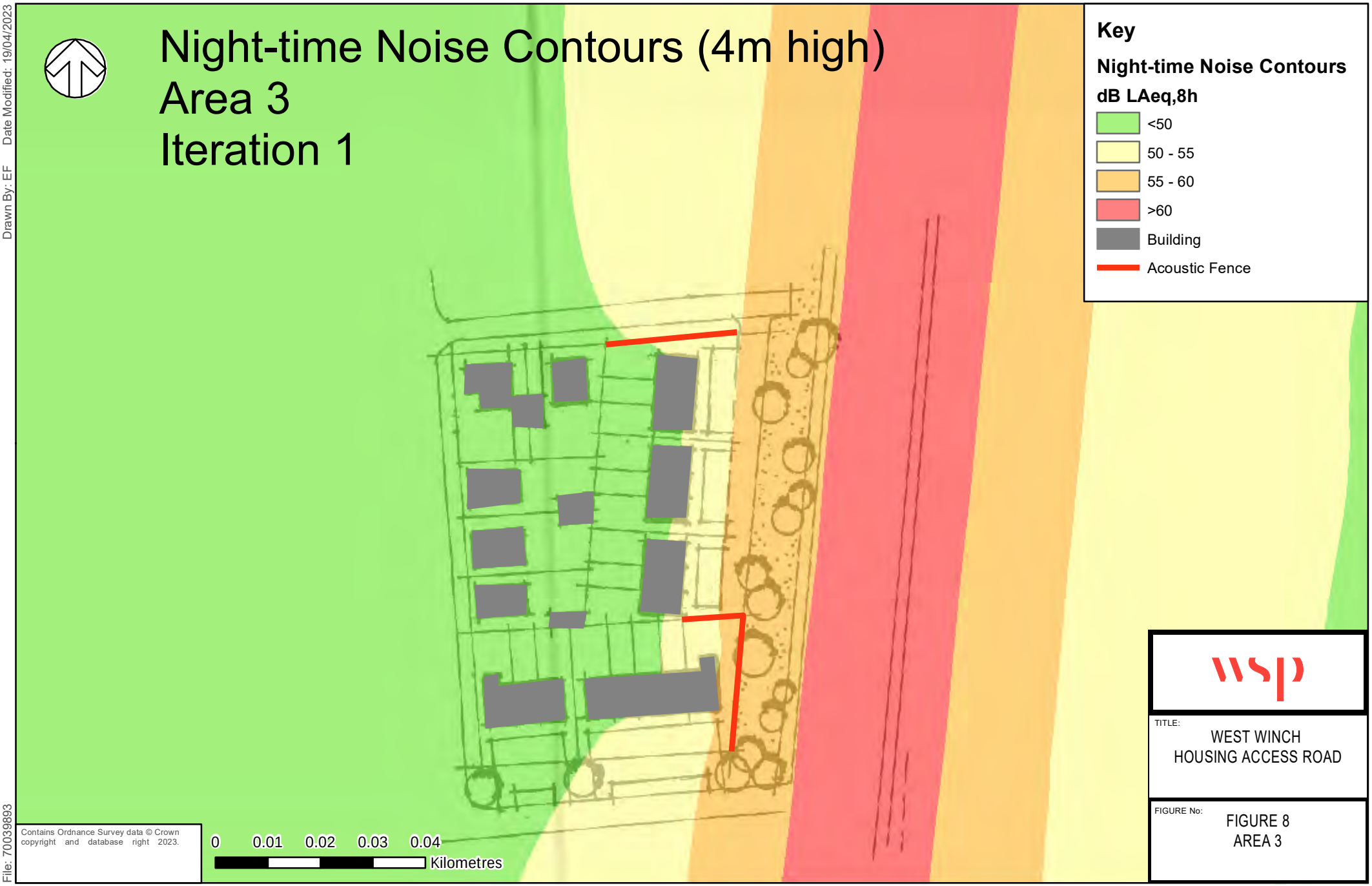
Night-time Noise Contours (4m high)
Area 3
Iteration 1
Key
Night-time Noise Contours
dB LAeq,8h
<50
50 - 55
55 - 60
>60
Building
Acoustic Fence
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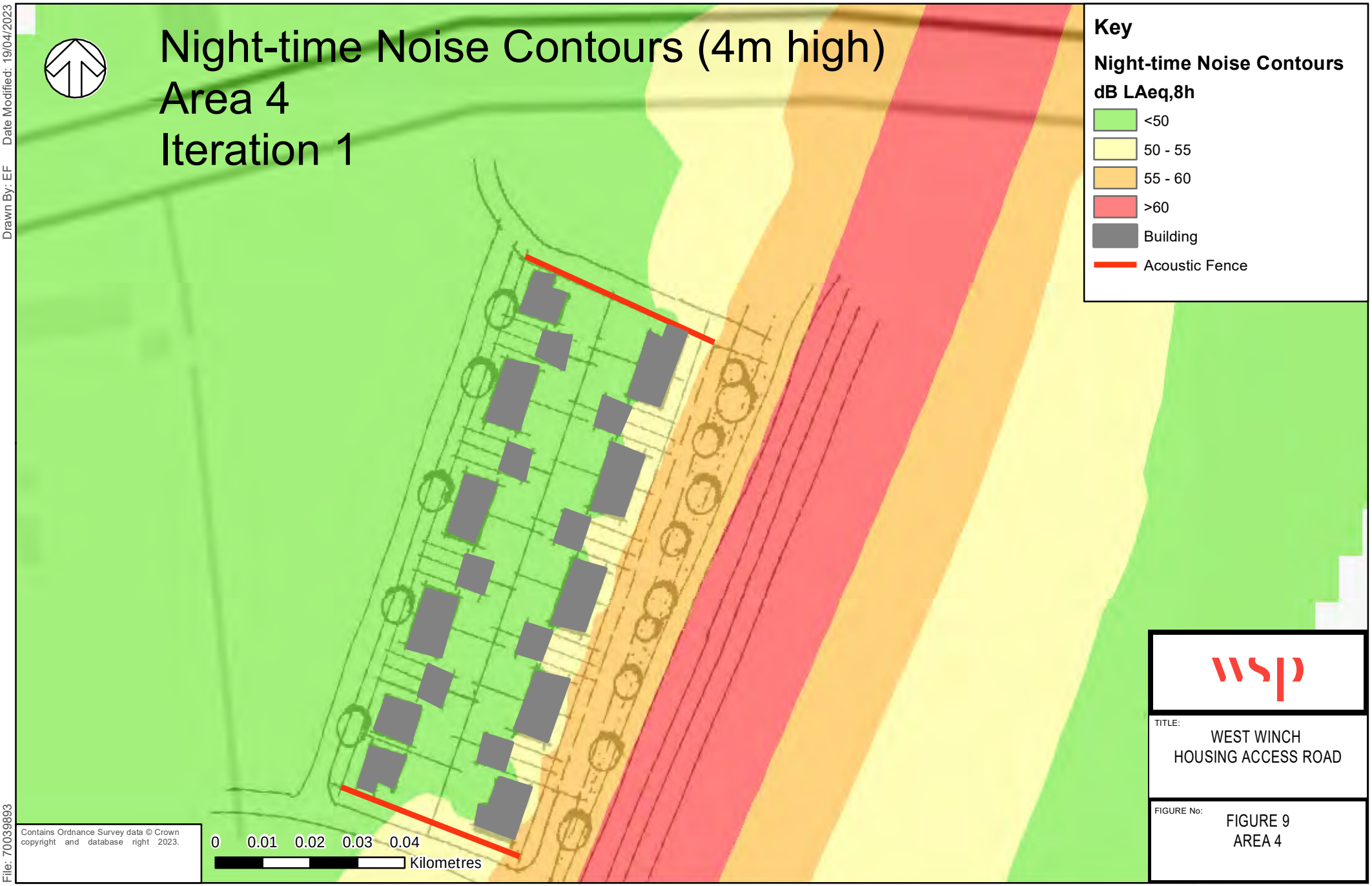
FIGURE No:
FIGURE 8
AREA 3


Night-time Noise Contours (4m high)
Area 4
Iteration 1
Key
Night-time Noise Contours
dB LAeq,8h
<50
50 - 55
55 - 60
>60
Building
Acoustic Fence
Drawn By: EF
Date Modified: 19/04/2023
File: 70039893
Contains Ordnance Survey data © Crown copyright and database right 2023.
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Kilometres
wsp
TITLE:
WEST WINCH
HOUSING ACCESS ROAD
FIGURE No:
FIGURE 9
AREA 4

Night-time Noise Contours (4m high)
Area 5
Iteration 1

Key

Night-time Noise Contours

dB LAeq,8h

- <50
- 50 - 55
- 55 - 60
- >60
- Building
- Acoustic Fence

0 0.01 0.02 0.03 0.04 Kilometres

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TITLE:
WEST WINCH
HOUSING ACCESS ROAD

FIGURE No:
FIGURE 10
AREA 5

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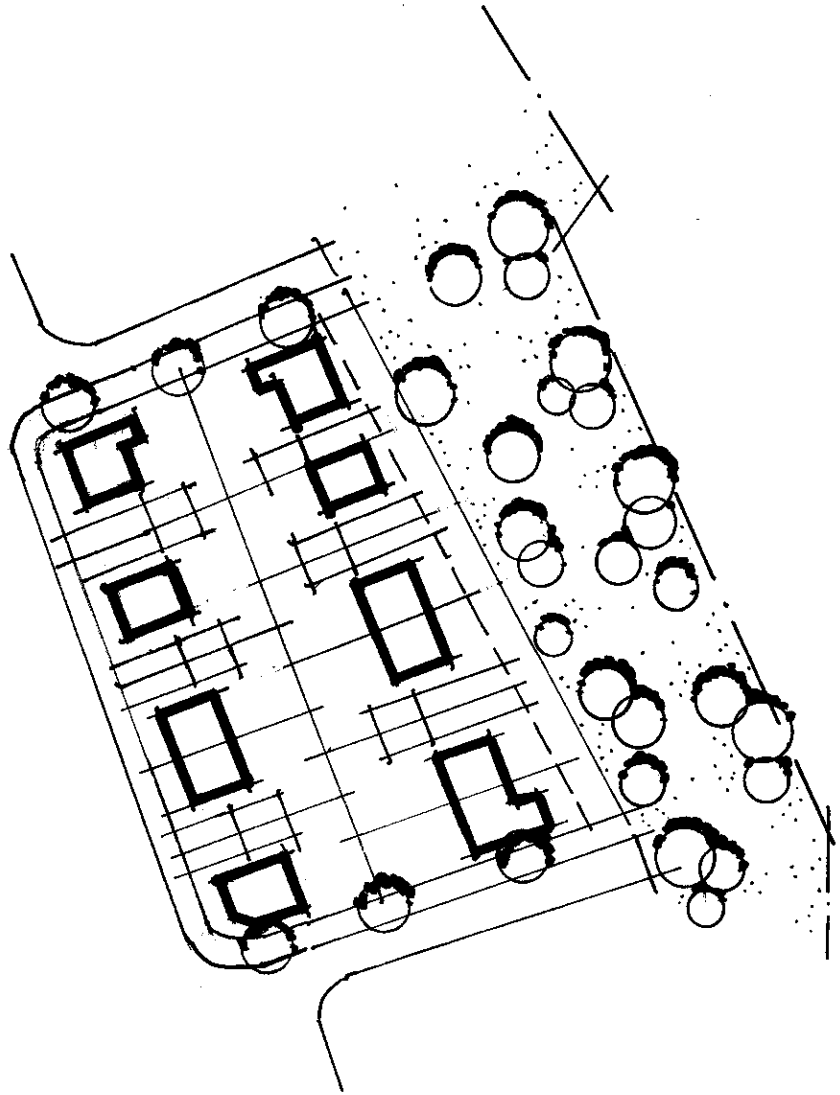
APPENDIX D – DEVELOPMENT BLOCK AREA MASTERPLANS



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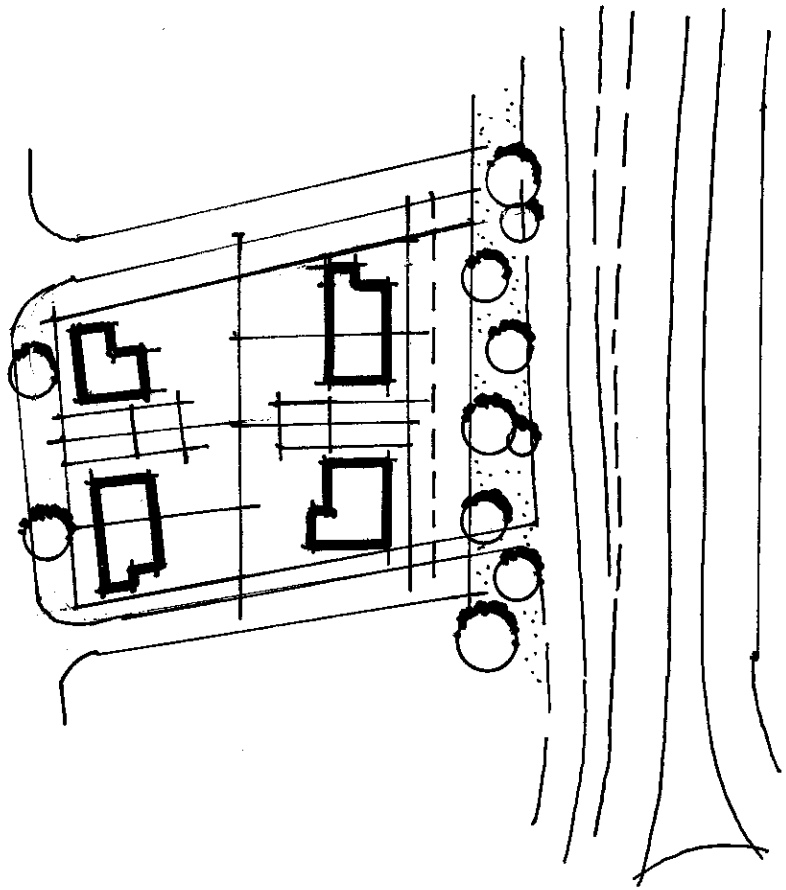

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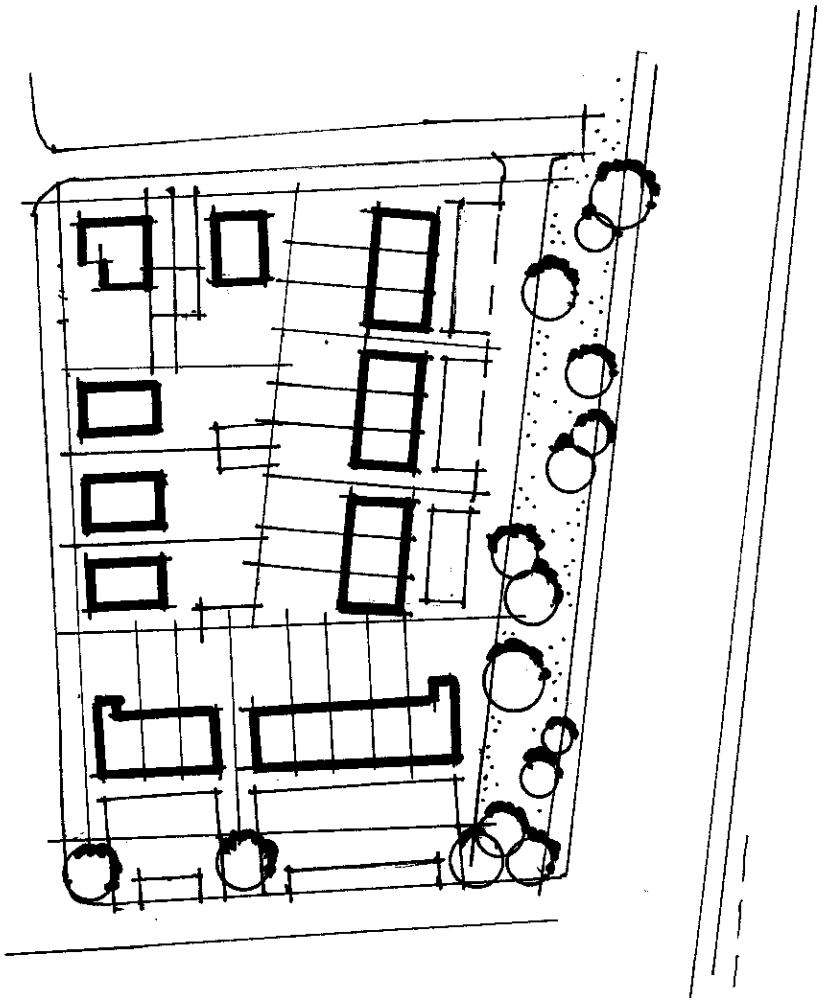

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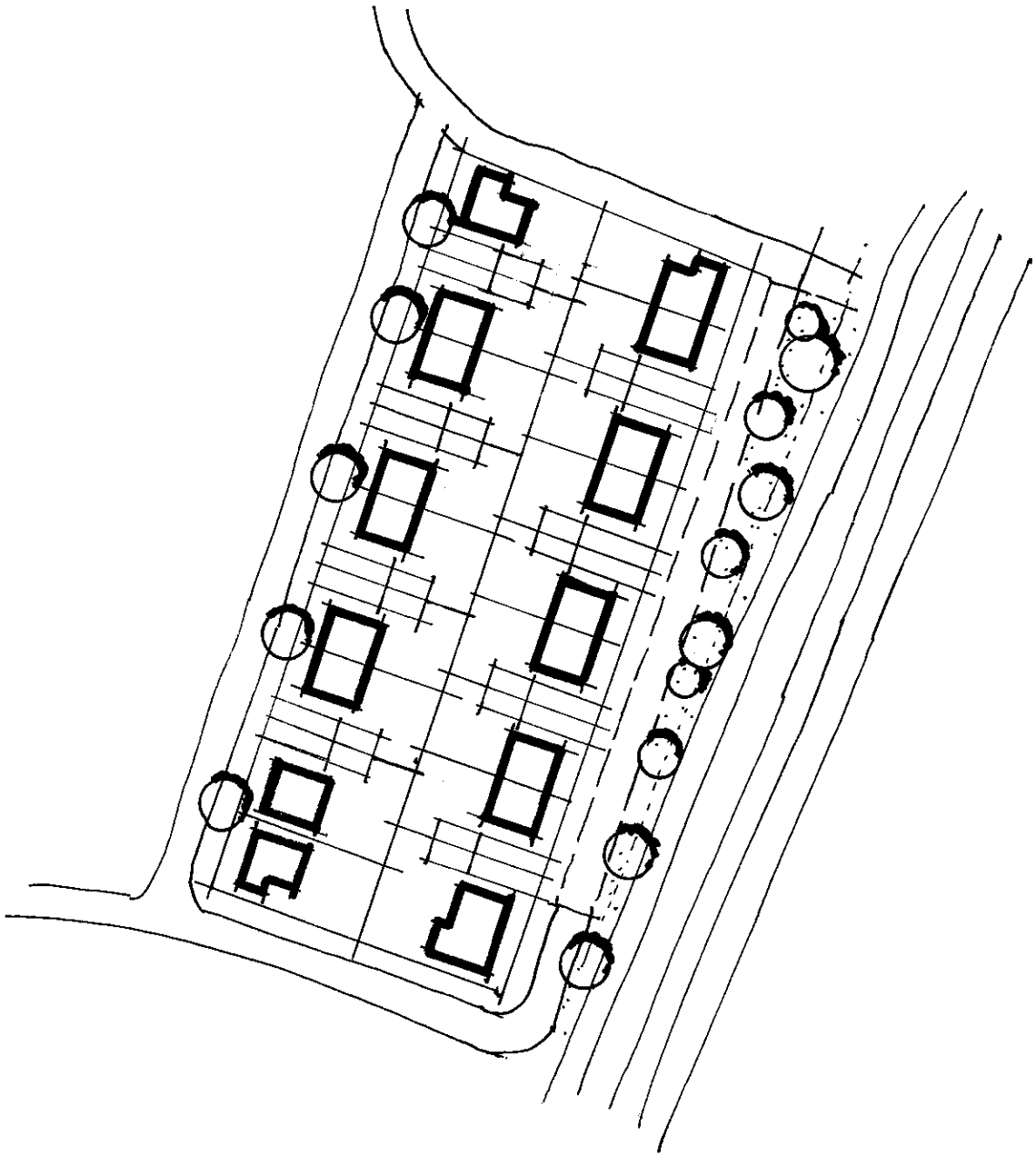

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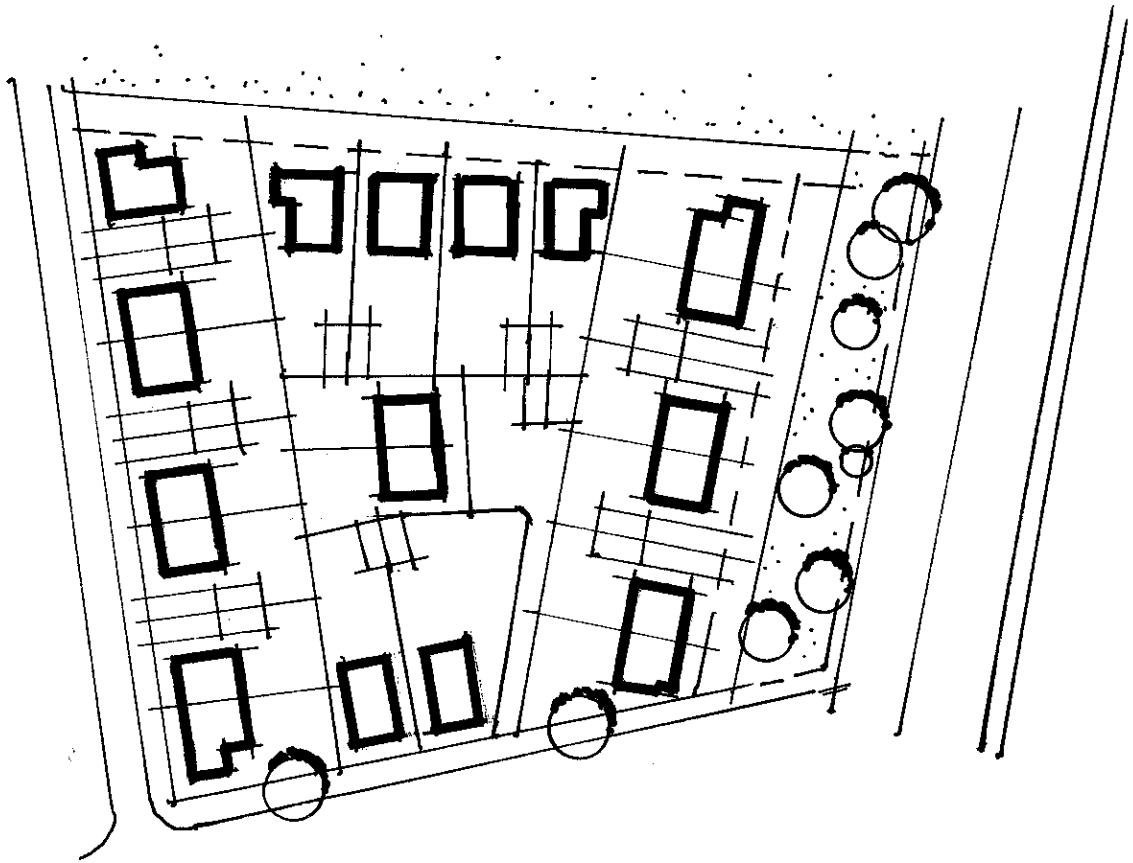

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