London Luton Airport

wood.

London Luton Airport Operations Limited

Luton Airport Expansion - 19 mppa

Environmental Impact Assessment

Volume 3: Figures and Appendices

JULY 2022

IEMA
Transforming the world to sustainability
- EIA -

Wood Group UK Limited – July 2022

Report for

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Document revisions

No.	Details	Date
1	ES Addendum Volume 3	July 2022

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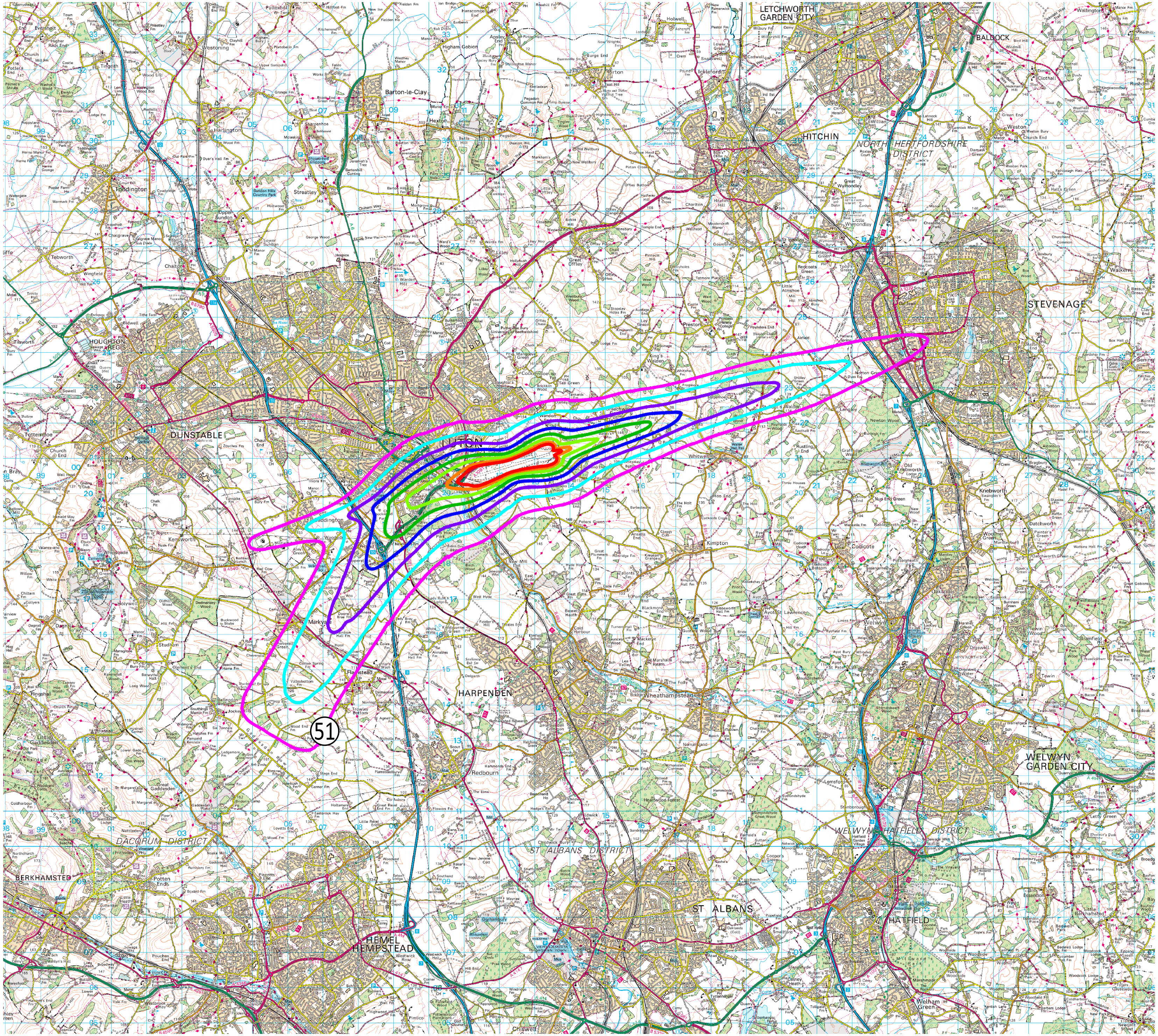
Figures



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LEGEND:

$L_{Aeq,16h}$ Daytime Noise Contours,

- 51 dB LOAEL
- 54 dB
- 57 dB
- 60 dB
- 63 dB SOAEL
- 66 dB
- 69 dB
- 71 dB UAEL

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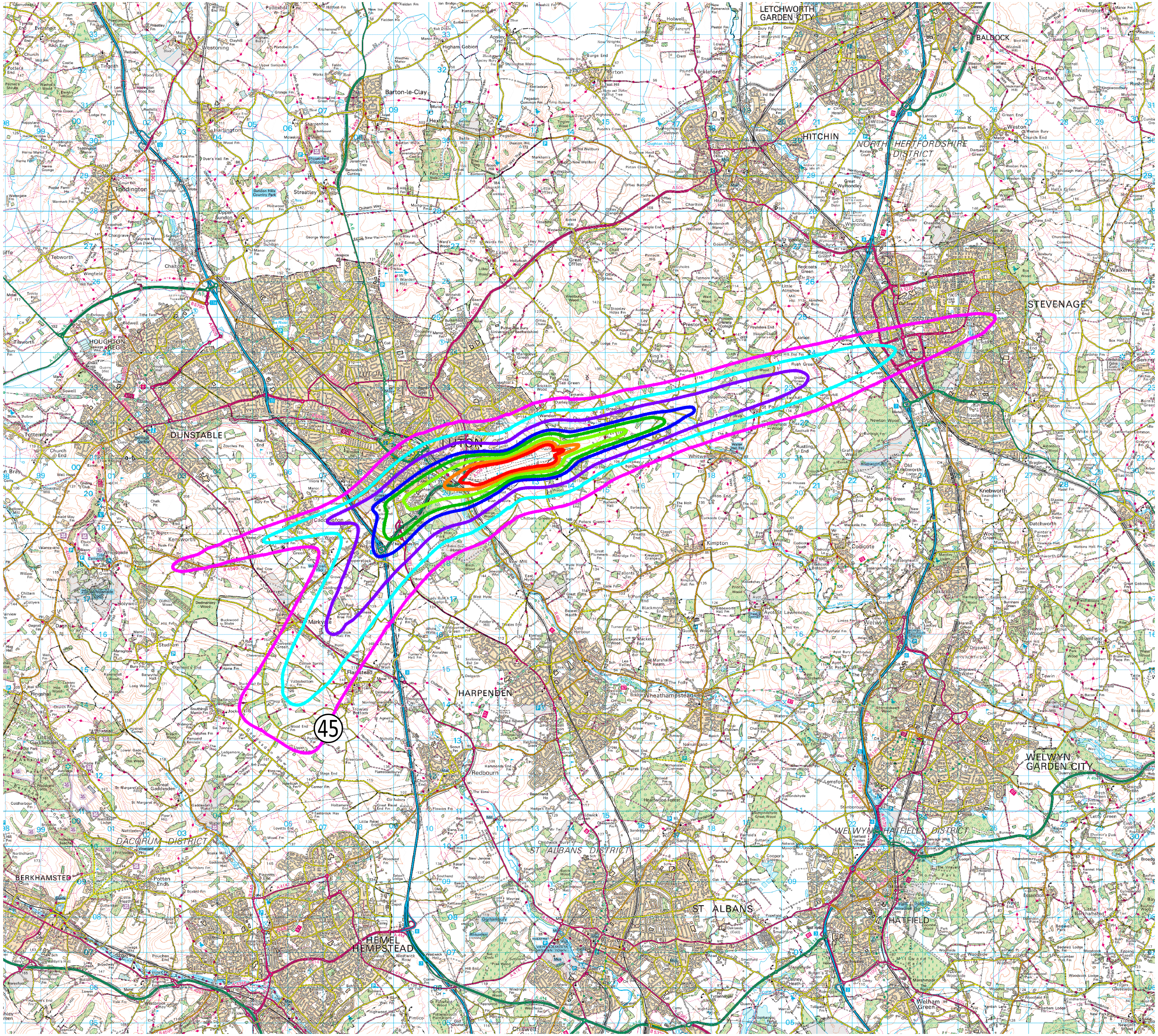
Existing Condition 10 2023
$L_{Aeq,16h}$ Daytime Noise Contours

FIGURE 6.1

DRAWN: MP	CHECKED: DR
DATE: June 2022	SCALE: 1:150,000@A4

FIGURE No:

A11060-S73-61-1.0



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LEGEND:

$L_{Aeq,8h}$ Night-time Noise Contours,

- 45 dB LOAEL
- 48 dB
- 51 dB
- 55 dB SOAEL
- 57 dB
- 60 dB
- 63 dB
- 66 dB UAEL

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Existing Condition 10 2023
$L_{Aeq,8h}$ Night-time Noise Contours

FIGURE 6.2

DRAWN: MP	CHECKED: DR
DATE: June 2022	SCALE: 1:150,000@A4

FIGURE No:

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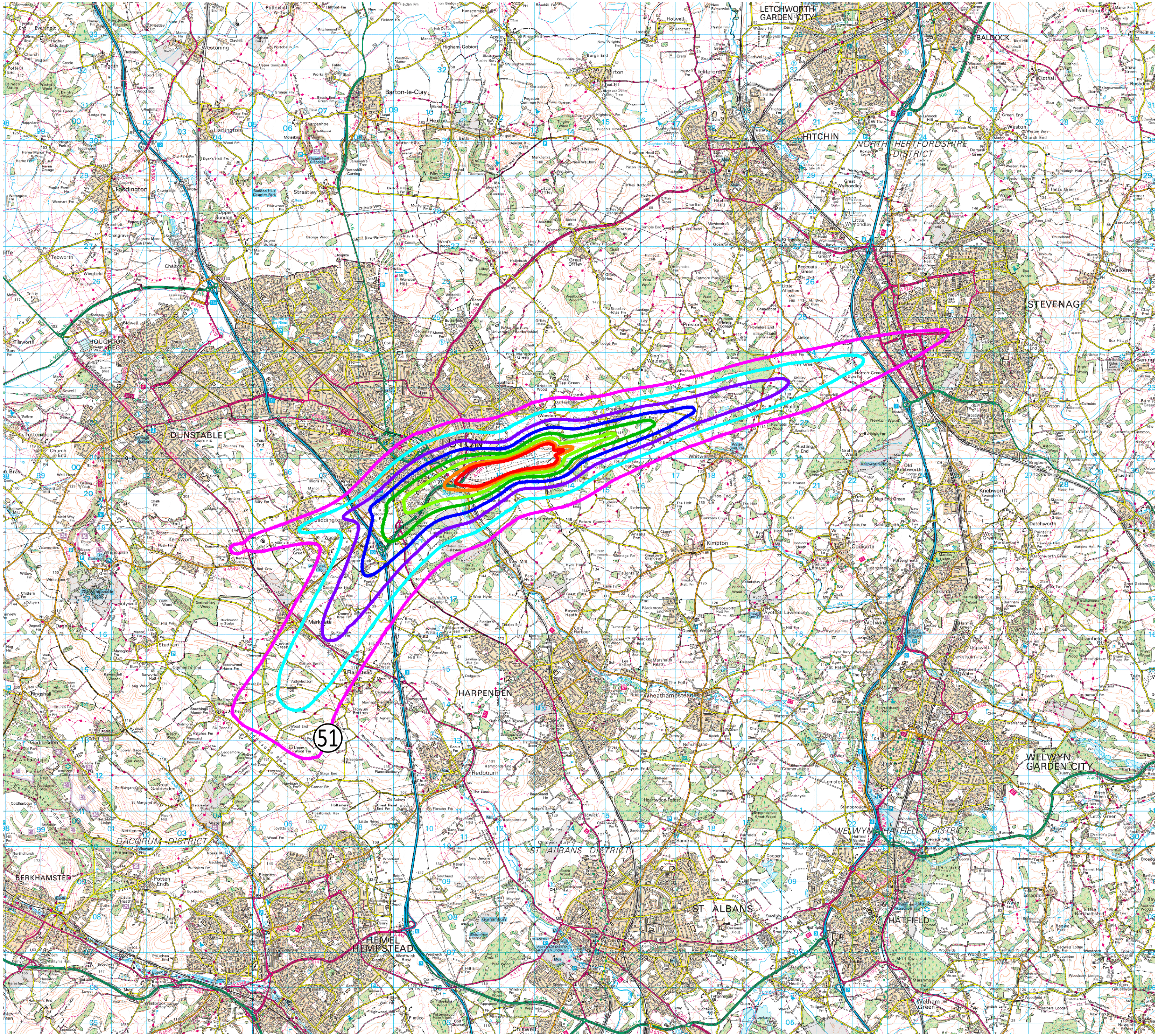

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LEGEND:

$L_{Aeq,16h}$ Daytime Noise Contours,

- 51 dB LOAEL
- 54 dB
- 57 dB
- 60 dB
- 63 dB SOAEL
- 66 dB
- 69 dB
- 71 dB UAEL

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2023 18 mppa

$L_{Aeq,16h}$ Daytime Noise Contours

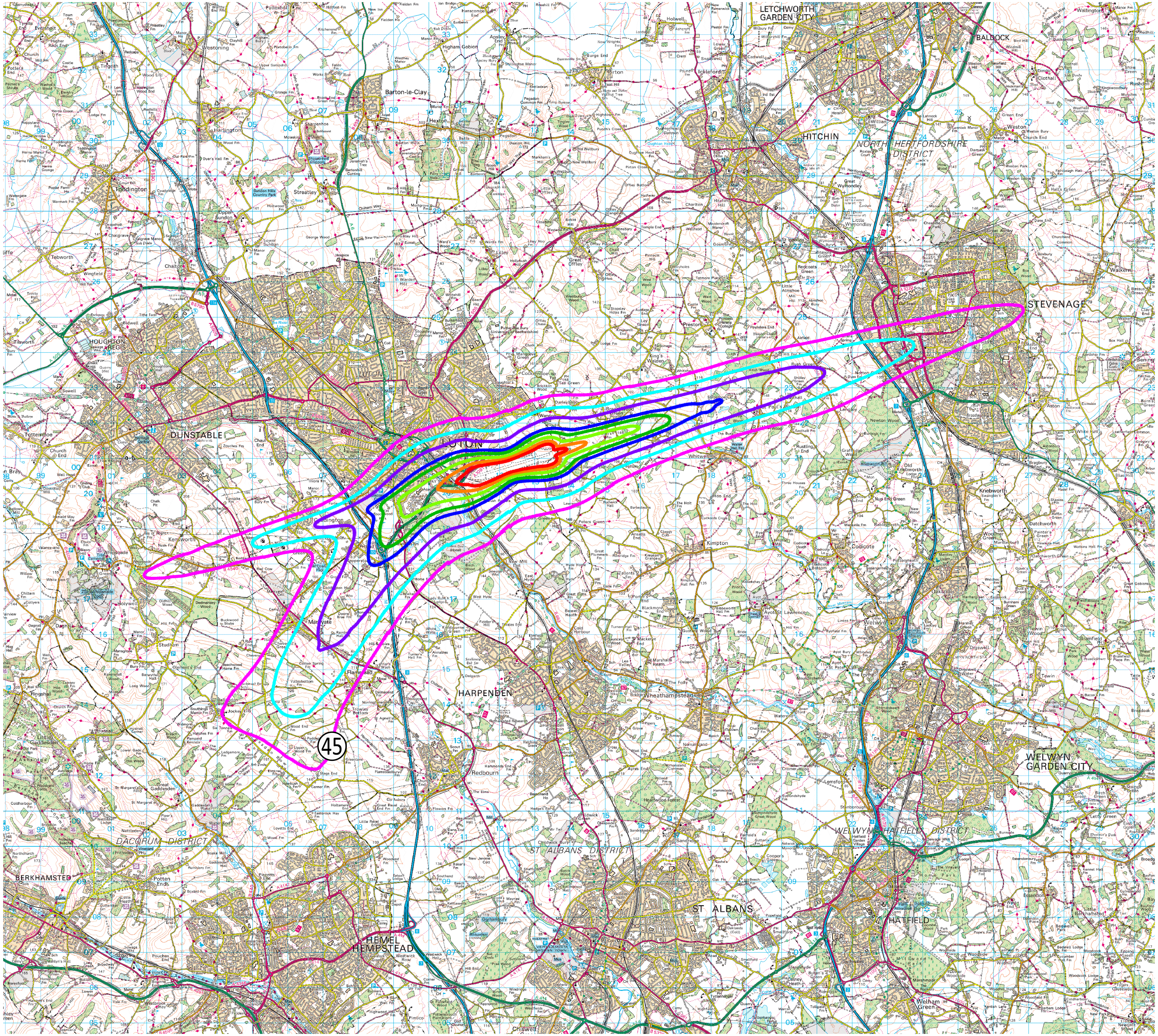
FIGURE 6.3

DRAWN: MP | CHECKED: DR

DATE: June 2022 | SCALE: 1:150,000@A4

FIGURE No:

A11060-S73-63-1.0



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LEGEND:

$L_{Aeq,8h}$ Night-time Noise Contours,

- 45 dB LOAEL
- 48 dB
- 51 dB
- 55 dB SOAEL
- 57 dB
- 60 dB
- 63 dB
- 66 dB UAEL

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2023 18 mppa

$L_{Aeq,8h}$ Night-time Noise Contours

FIGURE 6.4

DRAWN: MP | CHECKED: DR

DATE: June 2022 | SCALE: 1:150,000@A4

FIGURE No:

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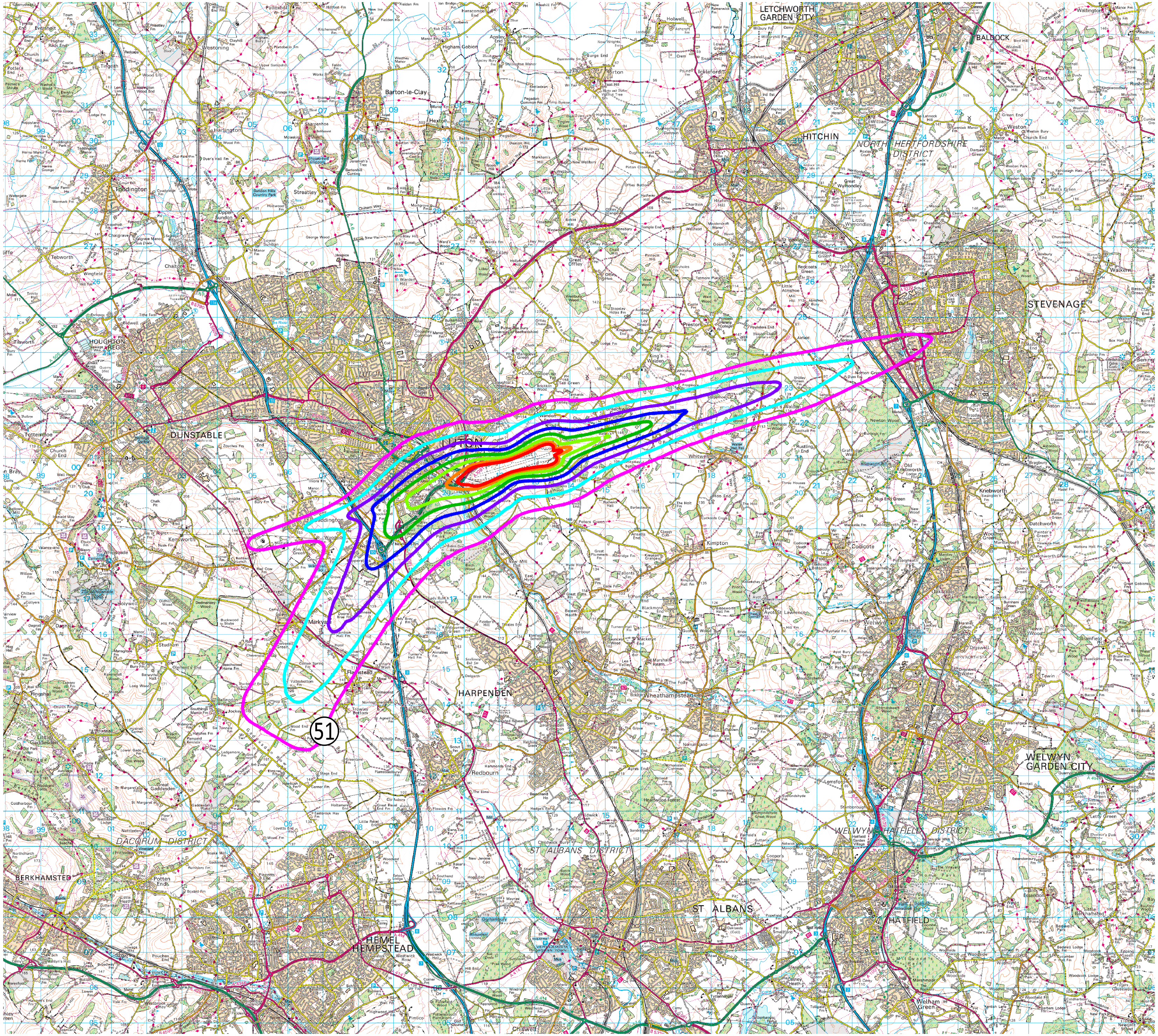

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LEGEND:

$L_{Aeq,16h}$ Daytime Noise Contours,

- 51 dB LOAEL
- 54 dB
- 57 dB
- 60 dB
- 63 dB SOAEL
- 66 dB
- 69 dB
- 71 dB UAEL

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Existing Condition 10 2024
$L_{Aeq,16h}$ Daytime Noise Contours

FIGURE 6.5

DRAWN: MP	CHECKED: DR
DATE: June 2022	SCALE: 1:150,000@A4

FIGURE No:

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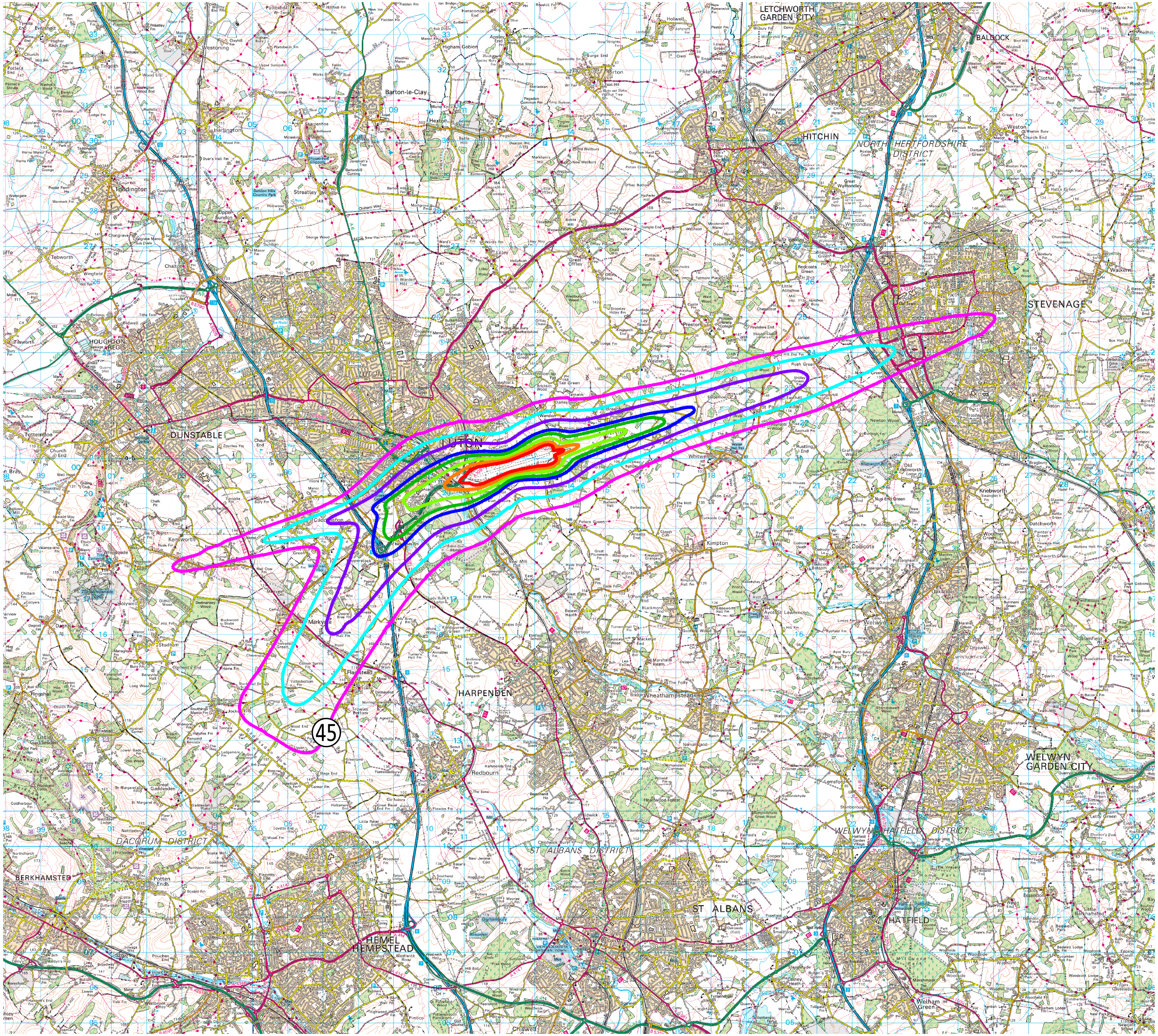

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LEGEND:

$L_{Aeq,8h}$ Night-time Noise Contours,

- 45 dB LOAEL
- 48 dB
- 51 dB
- 55 dB SOAEL
- 57 dB
- 60 dB
- 63 dB
- 66 dB UAEL

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Existing Condition 10 2024
$L_{Aeq,8h}$ Night-time Noise Contours

FIGURE 6.6

DRAWN: MP CHECKED: DR

DATE: June 2022 SCALE: 1:150,000@A4

FIGURE No:

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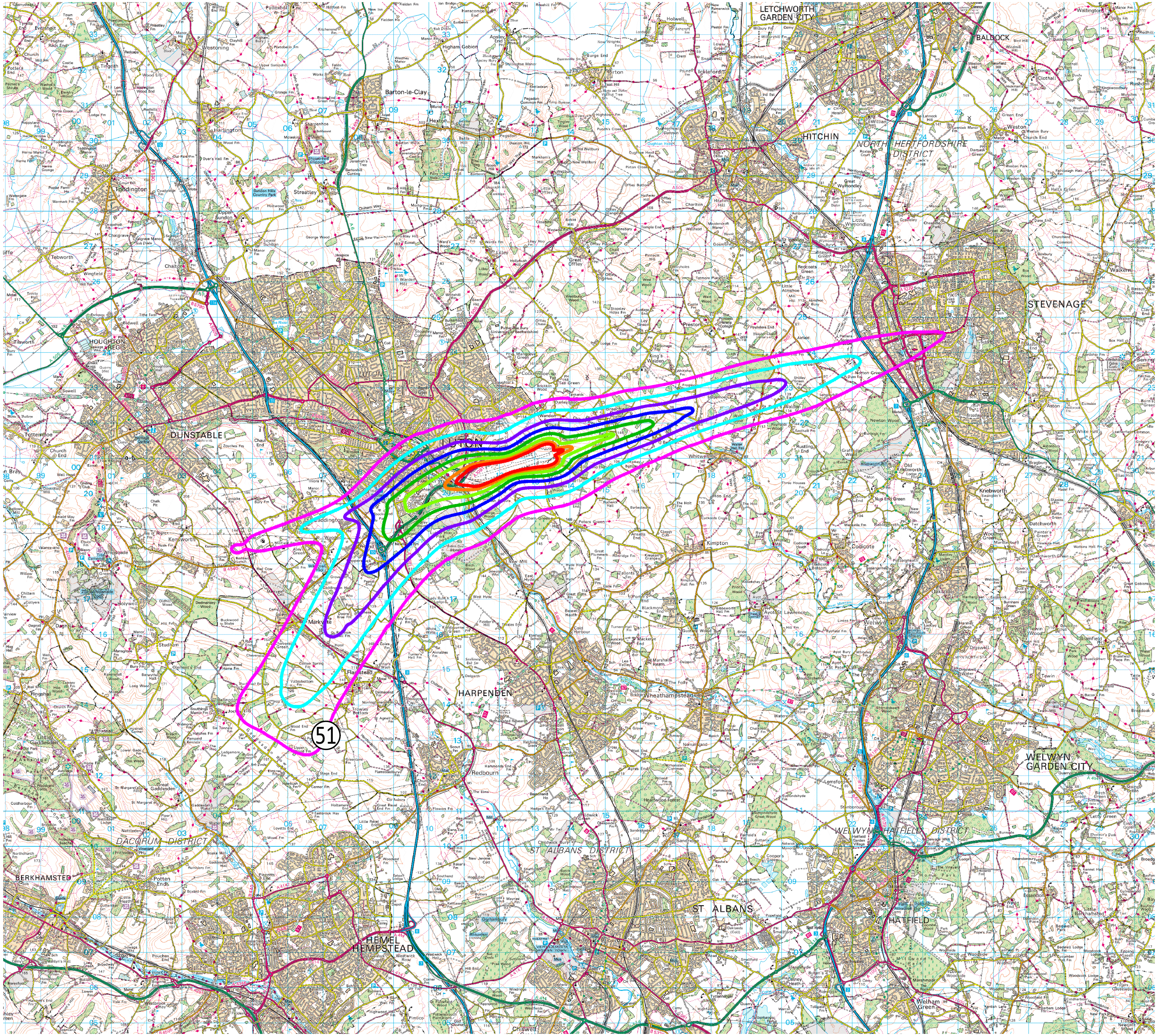

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LEGEND:

$L_{Aeq,16h}$ Daytime Noise Contours,

- 51 dB LOAEL
- 54 dB
- 57 dB
- 60 dB
- 63 dB SOAEL
- 66 dB
- 69 dB
- 71 dB UAEL

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2024 18 mppa

$L_{Aeq,16h}$ Daytime Noise Contours

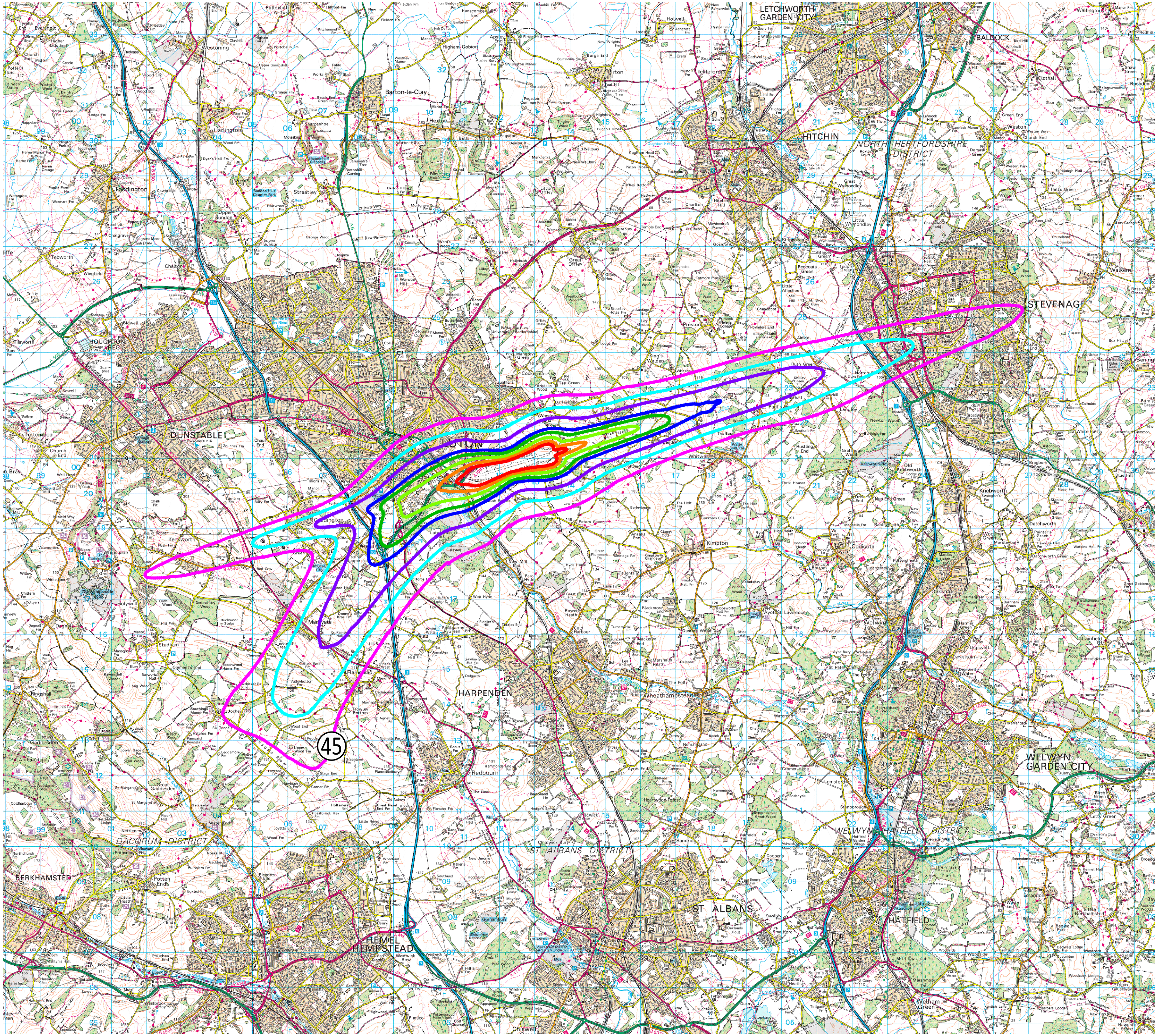
FIGURE 6.7

DRAWN: MP | CHECKED: DR

DATE: June 2022 | SCALE: 1:150,000@A4

FIGURE No:

A11060-S73-67-1.0



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LEGEND:

$L_{Aeq,8h}$ Night-time Noise Contours,

- 45 dB LOAEL
- 48 dB
- 51 dB
- 55 dB SOAEL
- 57 dB
- 60 dB
- 63 dB
- 66 dB UAEL

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$L_{Aeq,8h}$ Night-time Noise Contours

FIGURE 6.8

DRAWN: MP CHECKED: DR

DATE: June 2022 SCALE: 1:150,000@A4

FIGURE No:

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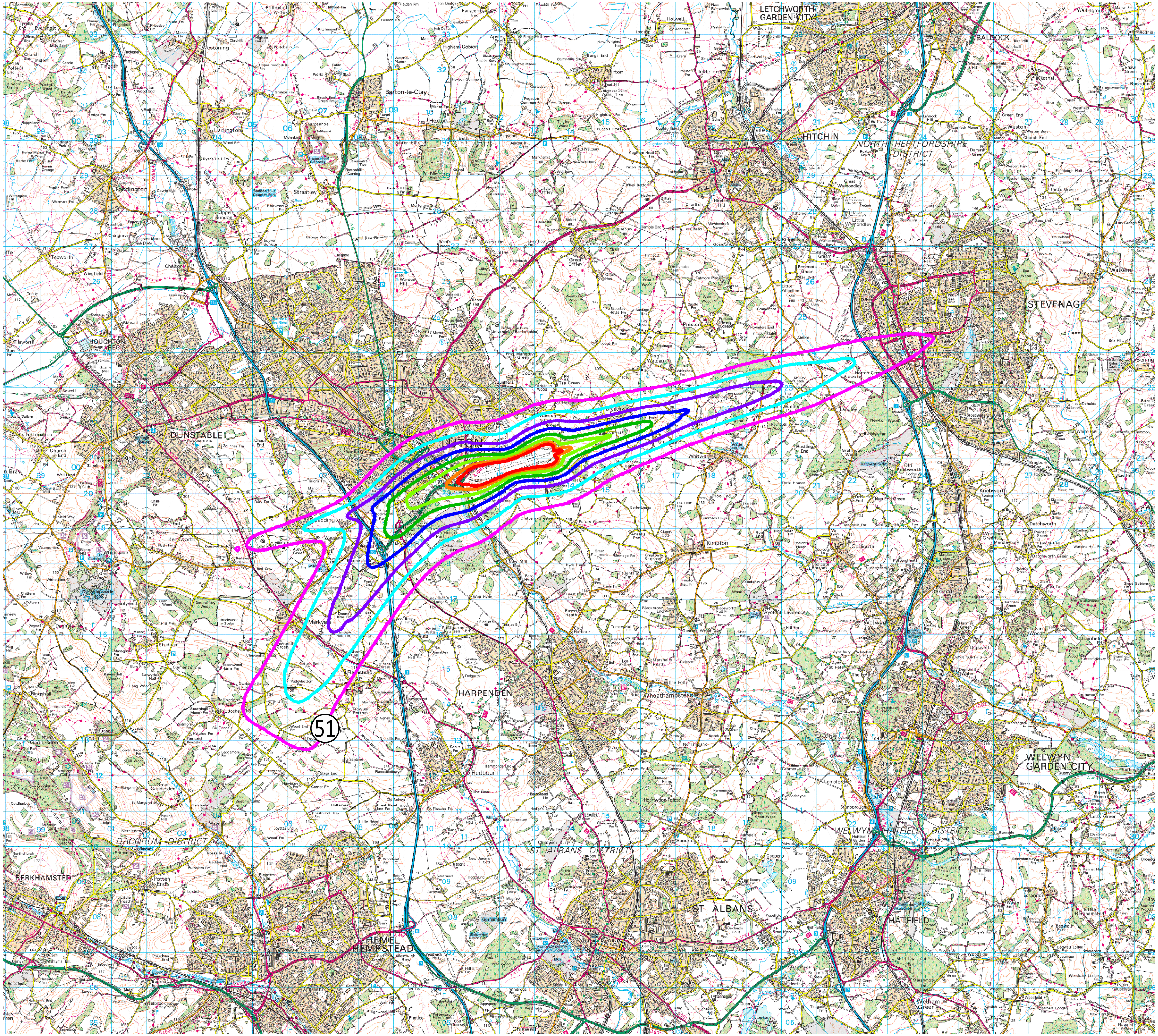

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LEGEND:

$L_{Aeq,16h}$ Daytime Noise Contours,

- 51 dB LOAEL
- 54 dB
- 57 dB
- 60 dB
- 63 dB SOAEL
- 66 dB
- 69 dB
- 71 dB UAEL

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Existing Condition 2025
$L_{Aeq,16h}$ Daytime Noise Contours

FIGURE 6.9

DRAWN: MP	CHECKED: DR
DATE: June 2022	SCALE: 1:150,000@A4

FIGURE No:

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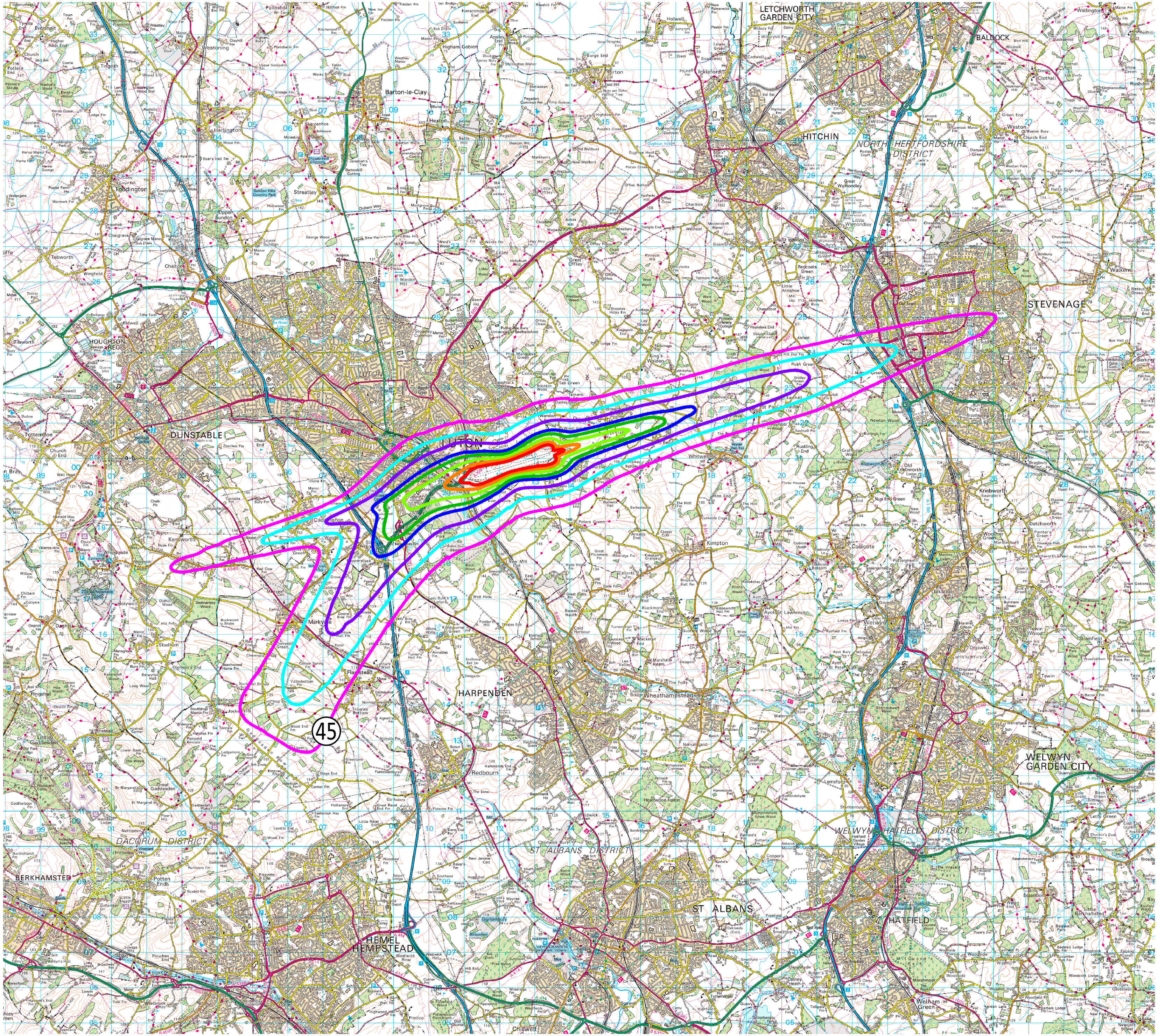

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LEGEND:

$L_{Aeq,8h}$ Night-time Noise Contours,

- 45 dB LOAEL
- 48 dB
- 51 dB
- 55 dB SOAEL
- 57 dB
- 60 dB
- 63 dB
- 66 dB UAEL

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Existing Condition 10 2025
$L_{Aeq,8h}$ Night-time Noise Contours

FIGURE 6.10

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DATE: June 2022 | SCALE: 1:150,000@A4

FIGURE No:

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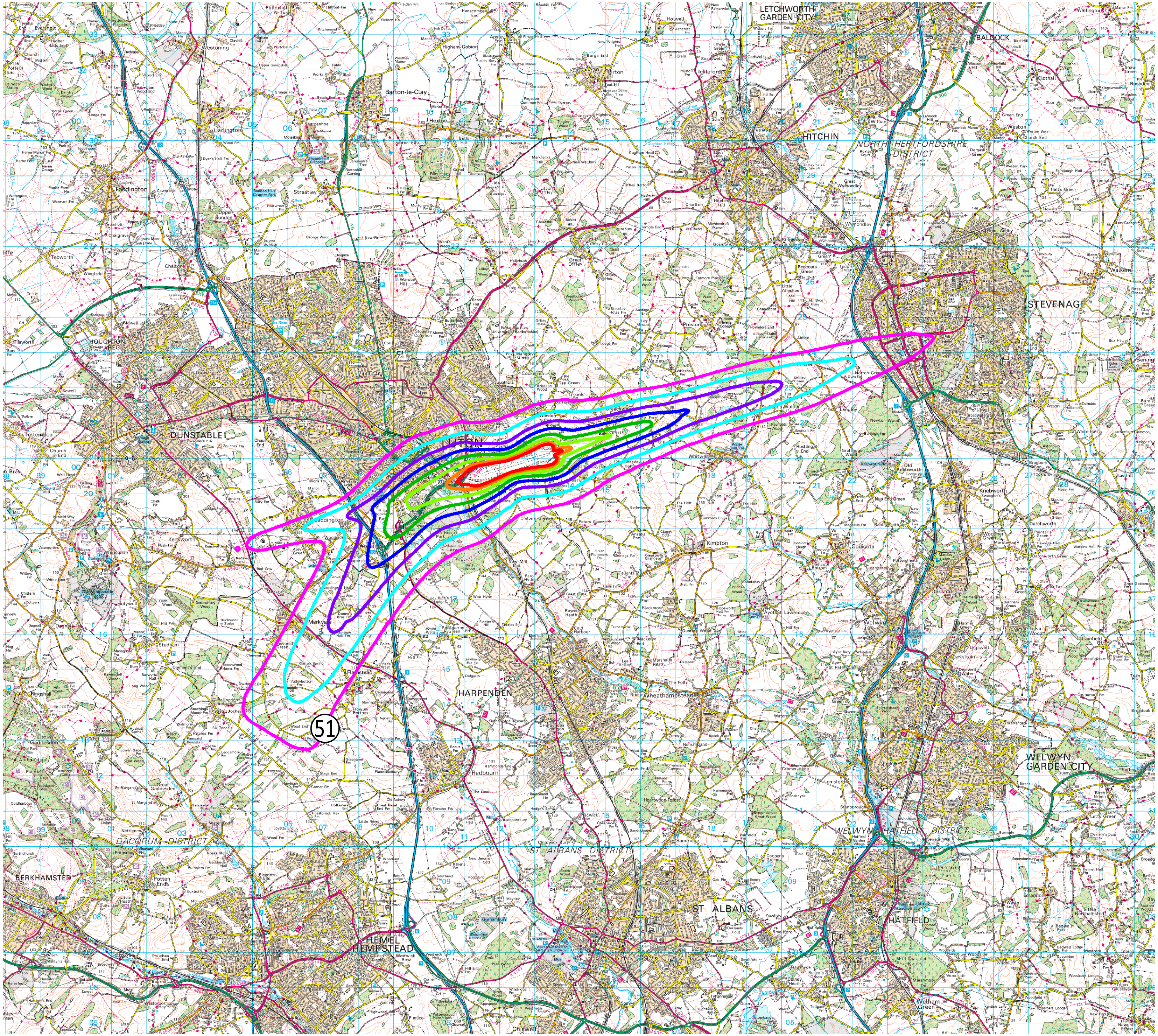

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LEGEND:

$L_{Aeq,16h}$ Daytime Noise Contours,

- 51 dB LOAEL
- 54 dB
- 57 dB
- 60 dB
- 63 dB SOAEL
- 66 dB
- 69 dB
- 71 dB UAEL

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2025 19 mppa

$L_{Aeq,16h}$ Daytime Noise Contours

FIGURE 6.11

DRAWN: MP	CHECKED: DR
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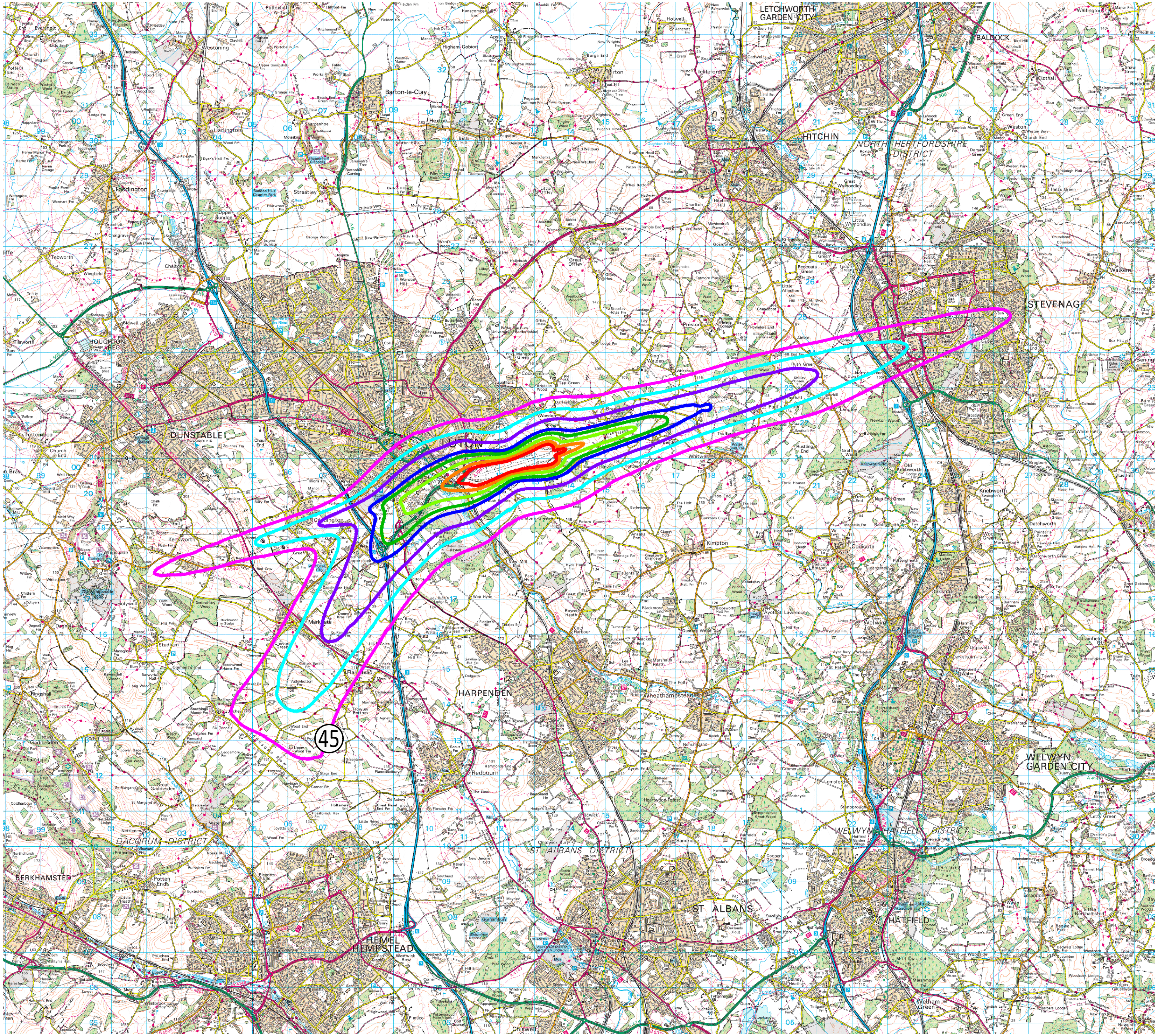
FIGURE No:	A11060-S73-71-1.0



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LEGEND:

$L_{Aeq,8h}$ Night-time Noise Contours,

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- 48 dB
- 51 dB
- 55 dB SOAEL
- 57 dB
- 60 dB
- 63 dB
- 66 dB UAEL

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2025 19 mppa
$L_{Aeq,8h}$ Night-time Noise Contours

FIGURE 6.12

DRAWN: MP	CHECKED: DR
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FIGURE No:

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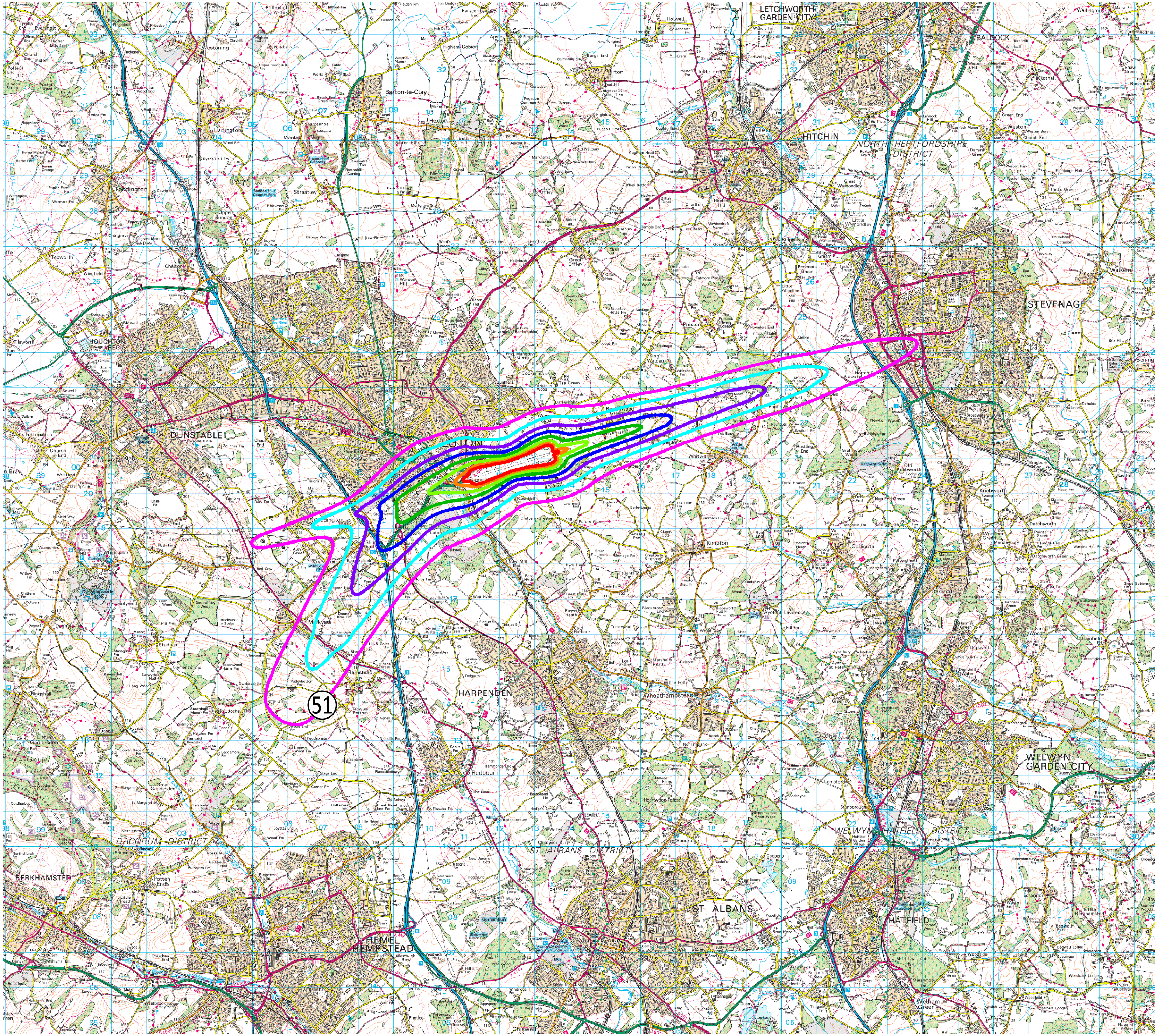

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LEGEND:

$L_{Aeq,16h}$ Daytime Noise Contours,

- 51 dB LOAEL
- 54 dB
- 57 dB
- 60 dB
- 63 dB SOAEL
- 66 dB
- 69 dB
- 71 dB UAEL

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Existing Condition 10 2028+
$L_{Aeq,16h}$ Daytime Noise Contours

FIGURE 6.13

DRAWN: MP	CHECKED: DR
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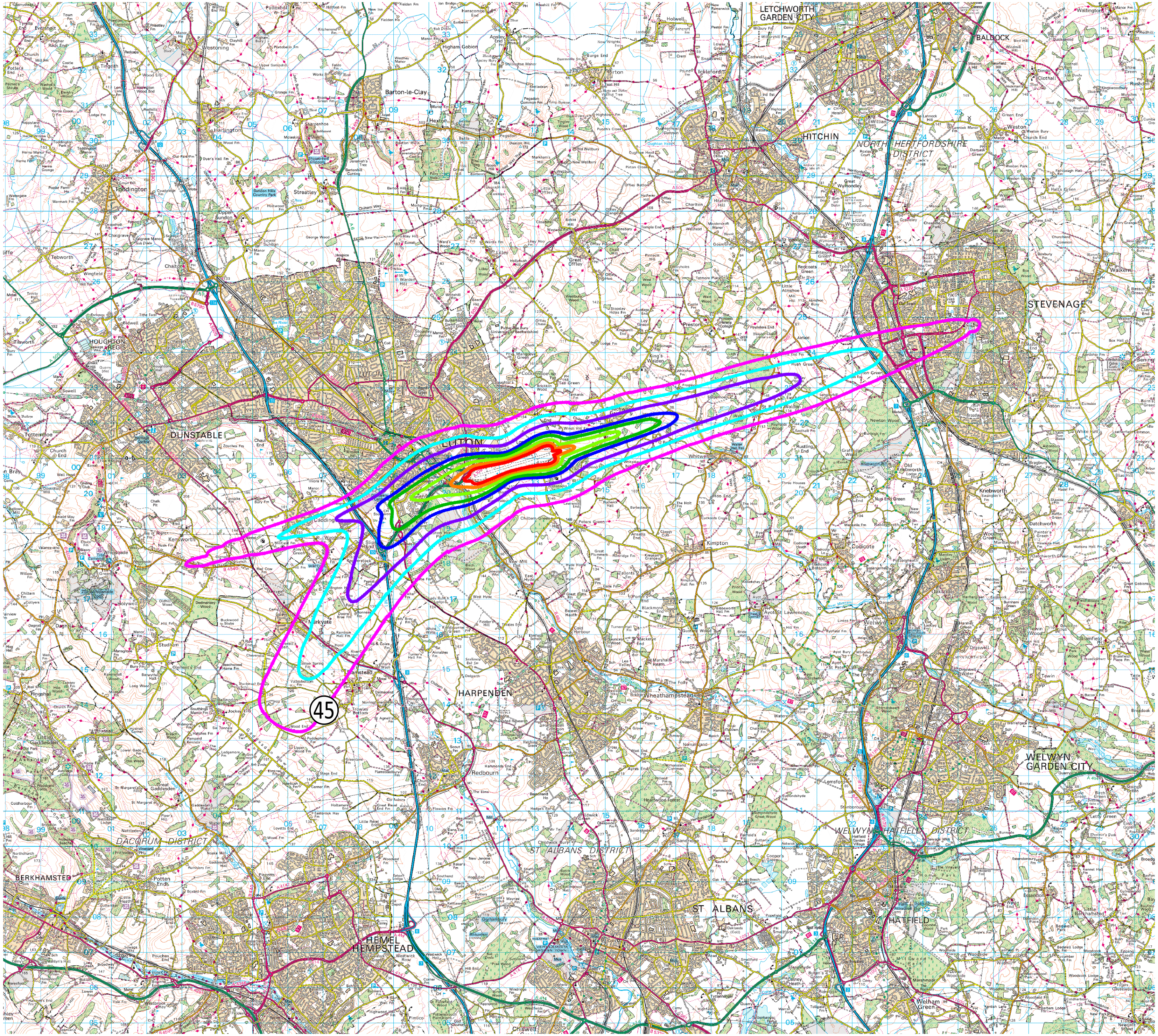

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LEGEND:

$L_{Aeq,8h}$ Night-time Noise Contours,

- 45 dB LOAEL
- 48 dB
- 51 dB
- 55 dB SOAEL
- 57 dB
- 60 dB
- 63 dB
- 66 dB UAEL

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Existing Condition 10 2028+
$L_{Aeq,8h}$ Night-time Noise Contours

FIGURE 6.14

DRAWN: MP | CHECKED: DR

DATE: June 2022 | SCALE: 1:150,000@A4

FIGURE No:

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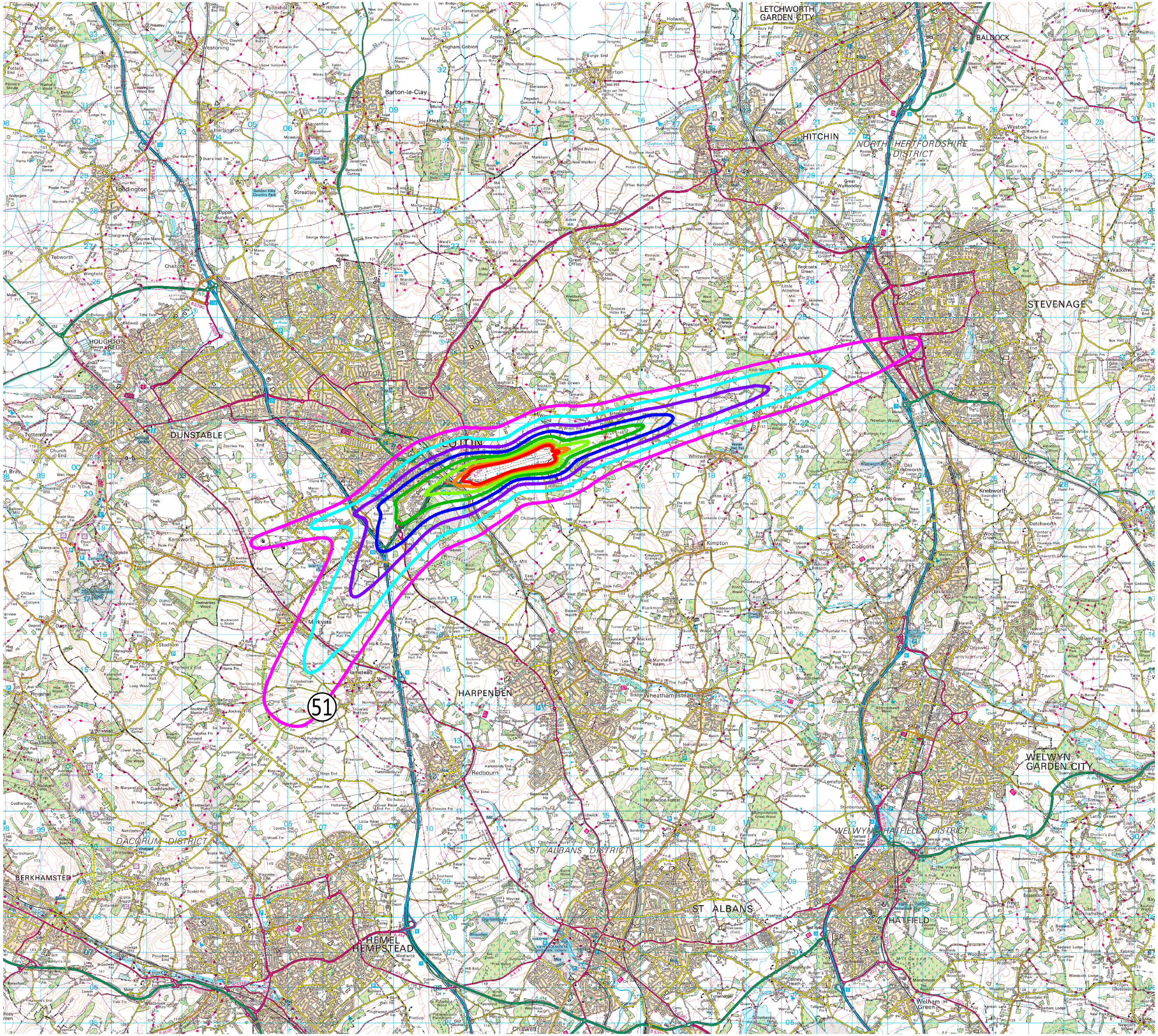

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LEGEND:

$L_{Aeq,16h}$ Daytime Noise Contours,

- 51 dB LOAEL
- 54 dB
- 57 dB
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2028 19 mppa

$L_{Aeq,16h}$ Daytime Noise Contours

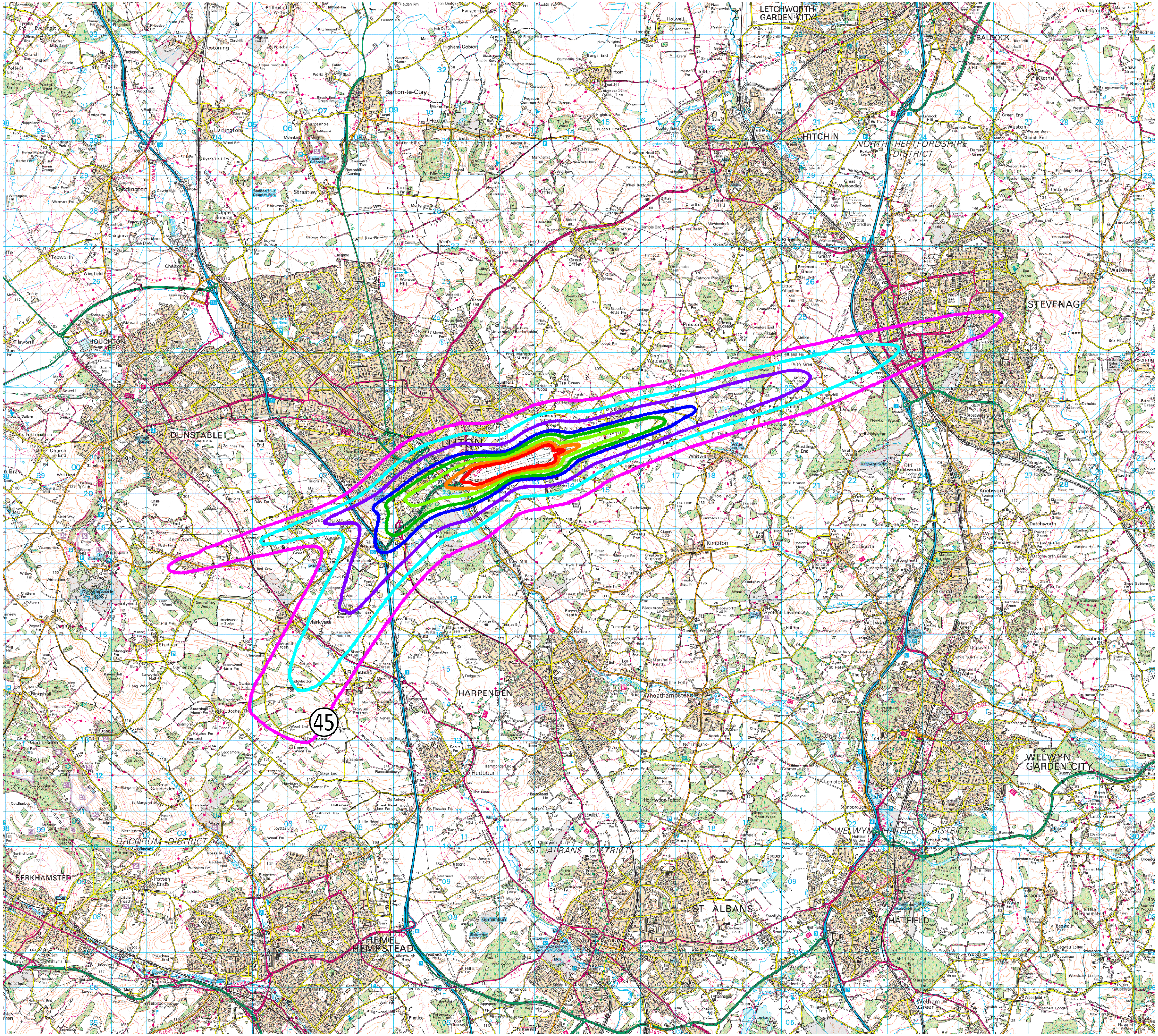
FIGURE 6.15

DRAWN: MP | CHECKED: DR

DATE: June 2022 | SCALE: 1:150,000@A4

FIGURE No:

A11060-S73-75-1.0



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LEGEND:

$L_{Aeq,8h}$ Night-time Noise Contours,

- 45 dB LOAEL
- 48 dB
- 51 dB
- 55 dB SOAEL
- 57 dB
- 60 dB
- 63 dB
- 66 dB UAEL

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2028 19 mppa
$L_{Aeq,8h}$ Night-time Noise Contours

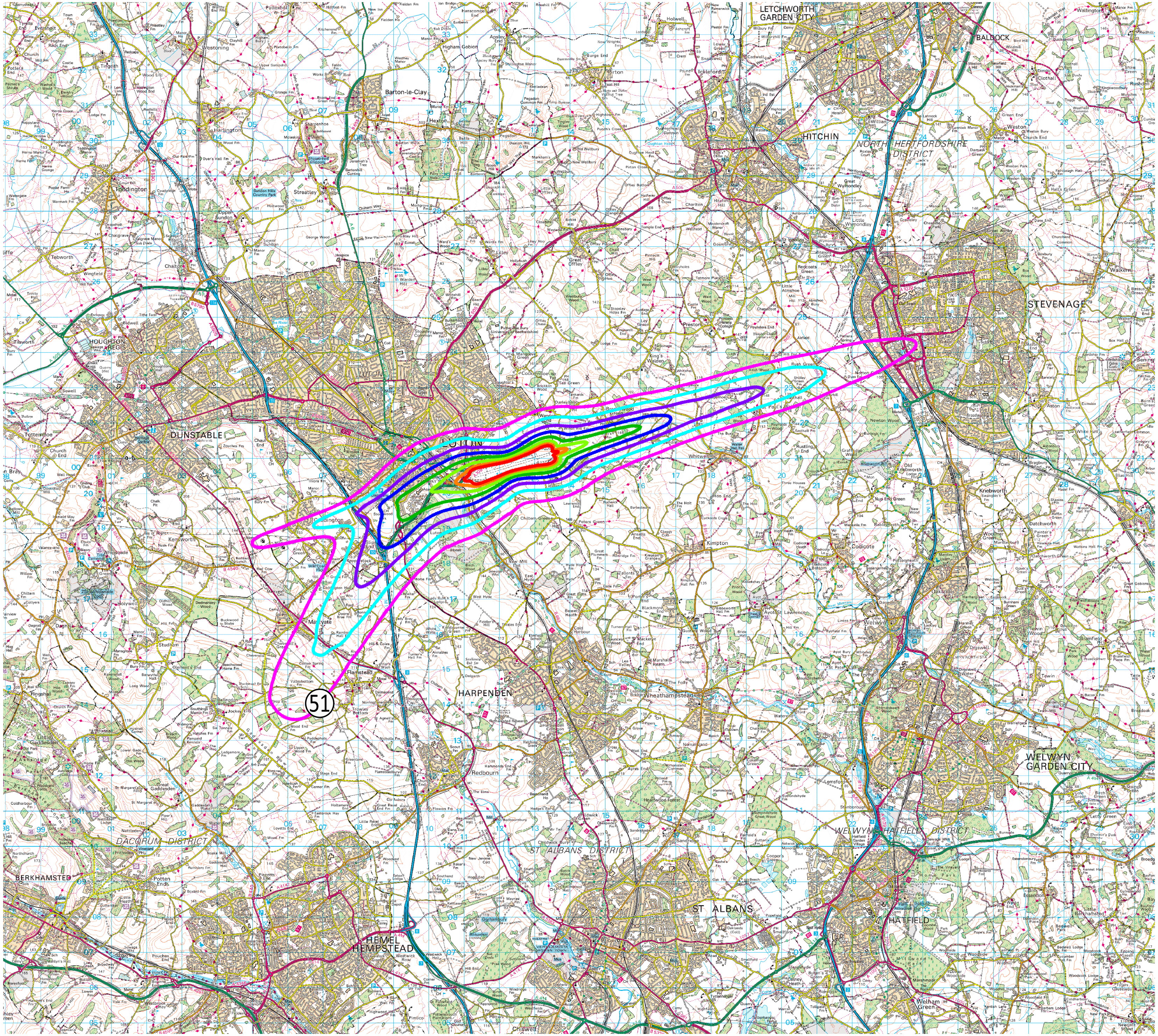
FIGURE 6.16

DRAWN: MP | CHECKED: DR

DATE: June 2022 | SCALE: 1:150,000@A4

FIGURE No:

A11060-S73-76-1.0



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LEGEND:

$L_{Aeq,16h}$ Daytime Noise Contours,

- 51 dB LOAEL
- 54 dB
- 57 dB
- 60 dB
- 63 dB SOAEL
- 66 dB
- 69 dB
- 71 dB UAEL

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2031 19 mppa

$L_{Aeq,16h}$ Daytime Noise Contours

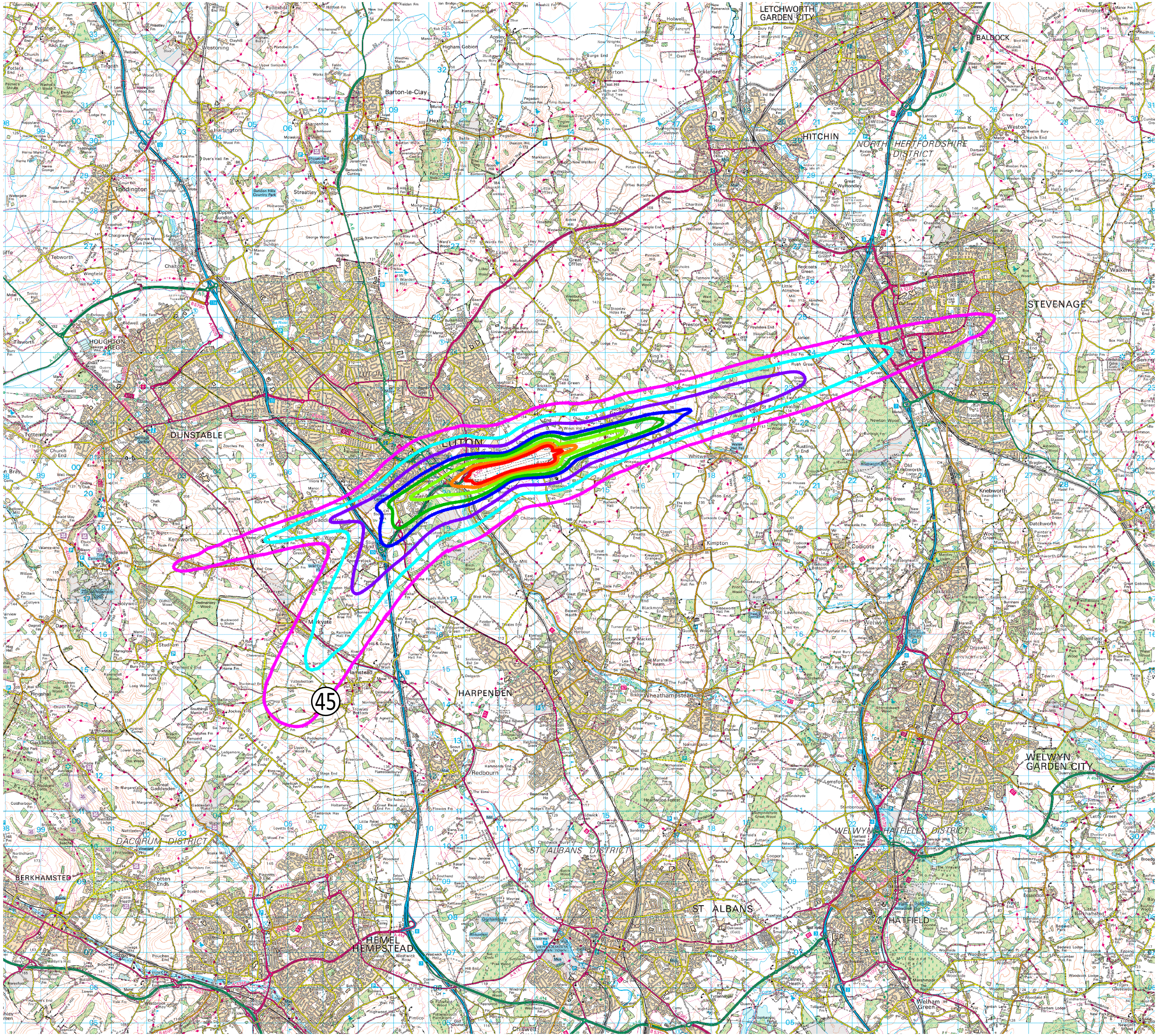
FIGURE 6.17

DRAWN: MP | CHECKED: DR

DATE: June 2022 | SCALE: 1:150,000@A4

FIGURE No:

A11060-S73-77-1.0



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LEGEND:

$L_{Aeq,8h}$ Night-time Noise Contours,

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- 48 dB
- 51 dB
- 55 dB SOAEL
- 57 dB
- 60 dB
- 63 dB
- 66 dB UAEL

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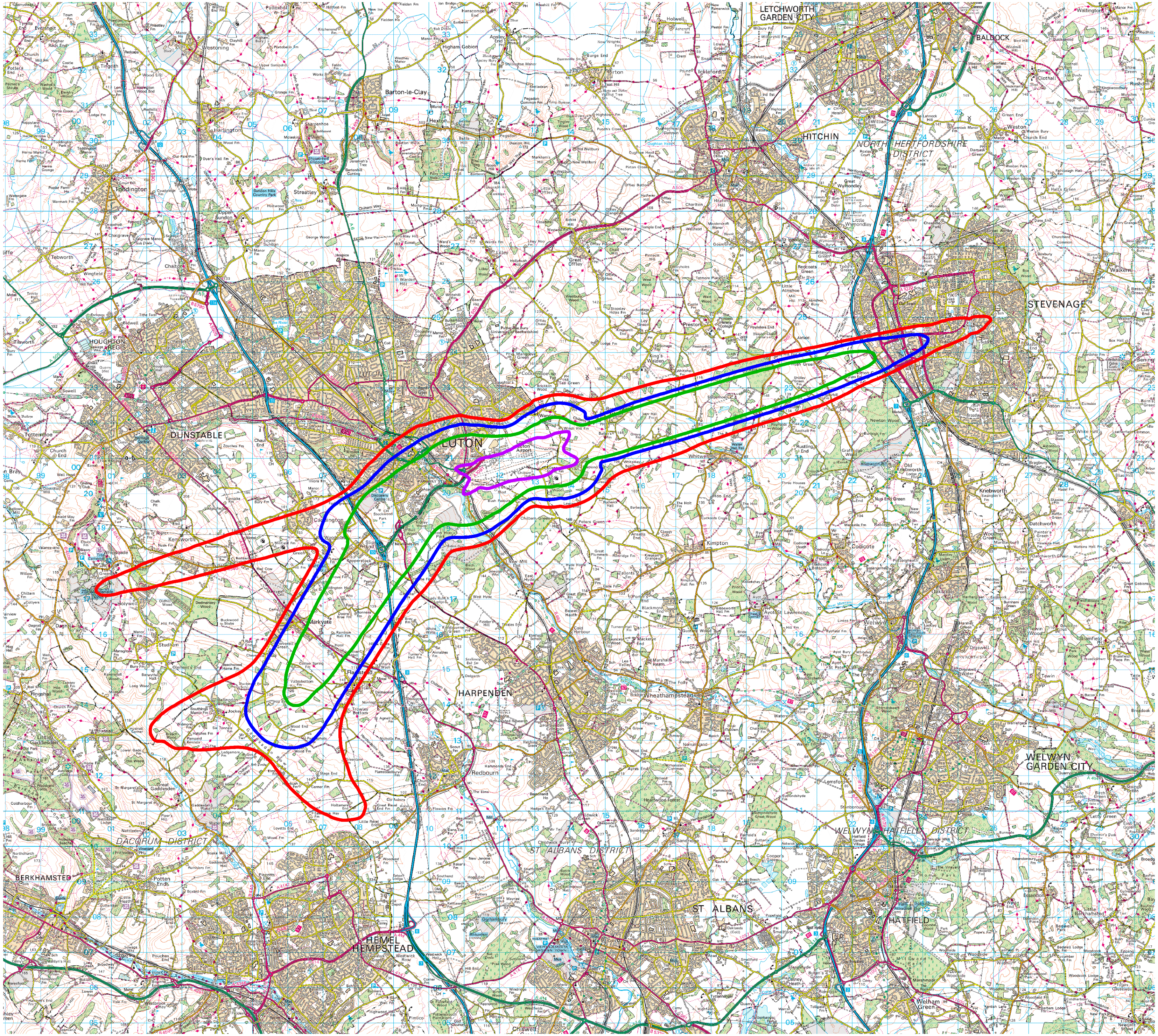
$L_{Aeq,8h}$ Night-time Noise Contours

FIGURE 6.18

DRAWN: MP	CHECKED: DR
DATE: June 2022	SCALE: 1:150,000@A4

FIGURE No:

A11060-S73-78-1.0



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LEGEND:

- N65, 25 (red)
- N65, 50 (blue)
- N65, 100 (green)
- N65, 200 (purple)

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Summer Daytime N65 Noise Contours
Existing Condition 10 2023

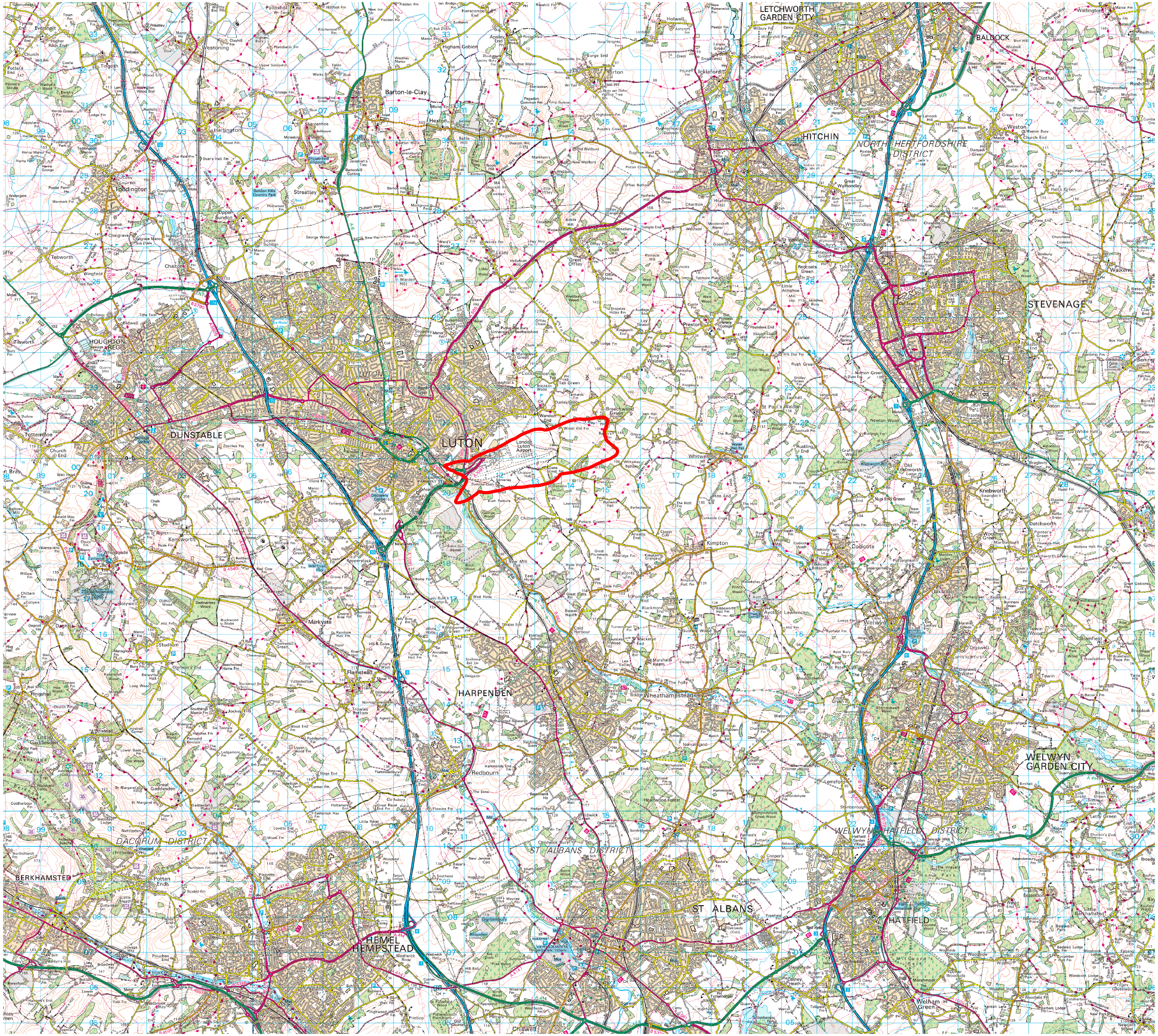
FIGURE 6.19

DRAWN: MP — CHECKED: DR

DATE: June 2022 — SCALE: 1:150,000@A4

FIGURE No:

A11060-S73-79-1.0



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LEGEND:

N60, 25

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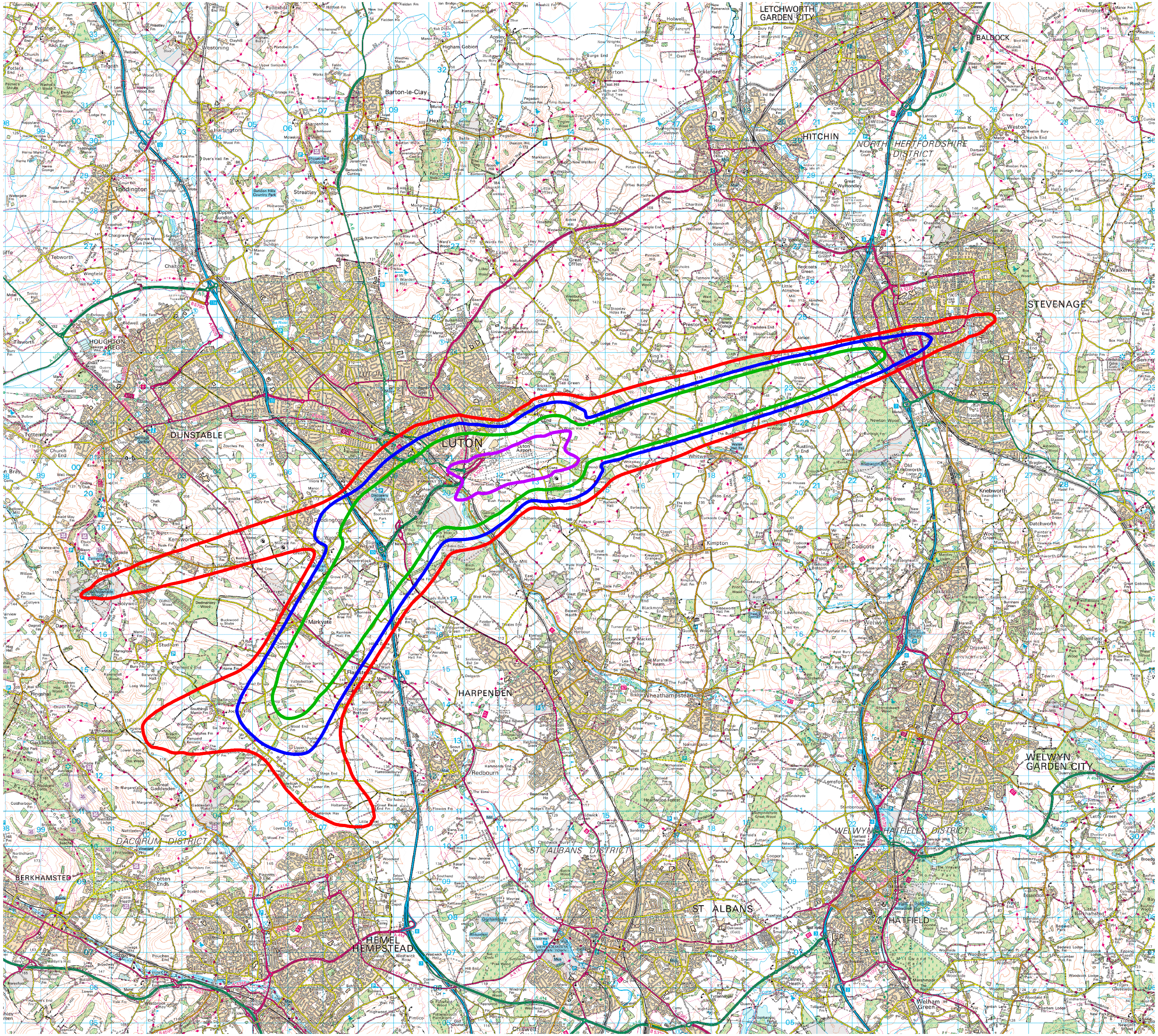
Summer Night Time N60 Noise Contours
Existing Condition 10 2023

FIGURE 6.20

DRAWN: MP	CHECKED: DR
DATE: June 2022	SCALE: 1:150,000@A4

FIGURE No:

A11060-S73-80-1.0



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LEGEND:

- N65, 25
- N65, 50
- N65, 100
- N65, 200

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London Luton Airport

Summer Daytime N65 Noise Contours 2023 18 mppa

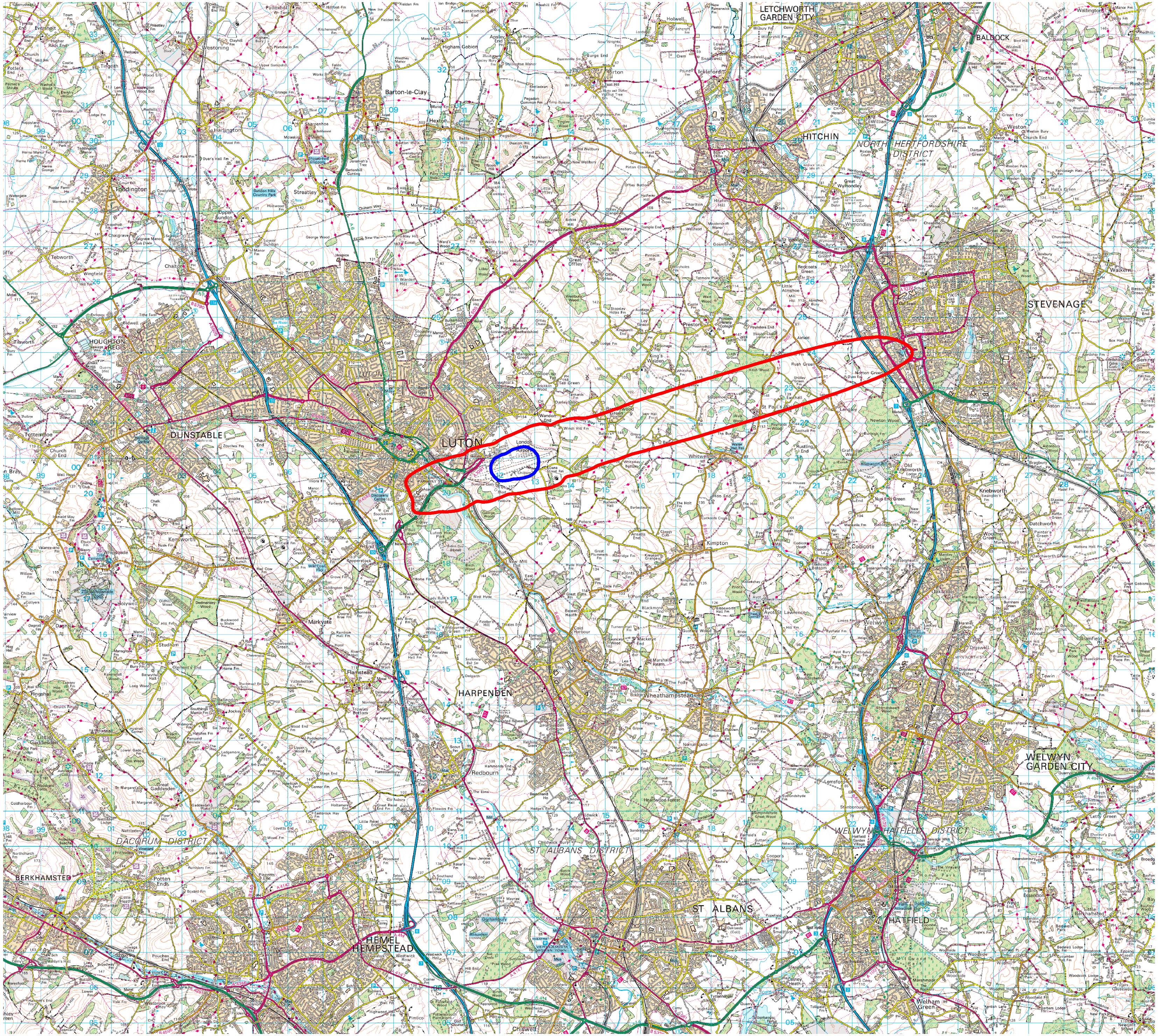
FIGURE 6.21

DRAWN: MP | CHECKED: DR

DATE: June 2022 | SCALE: 1:150,000@A4

FIGURE No:

A11060-S73-81-1.0



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LEGEND:

- N60, 25
- N60, 50

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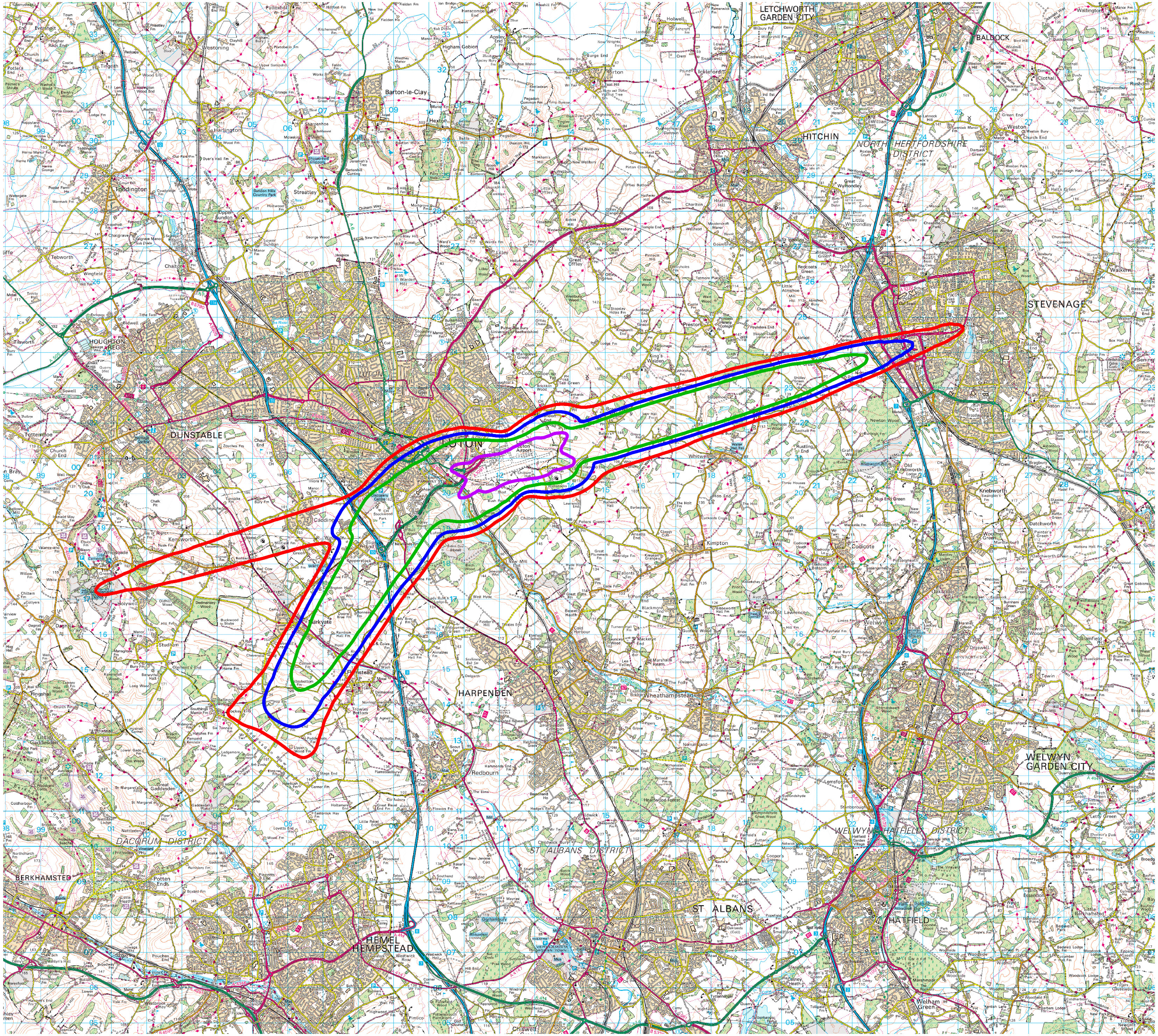
FIGURE 6.22

DRAWN: MP	CHECKED: DR
DATE: June 2022	SCALE: 1:150,000@A4
FIGURE No:	A11060-S73-82-1.0



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LEGEND:

- N65, 25
- N65, 50
- N65, 100
- N65, 200

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Summer Daytime N65 Noise Contours
Existing Condition 10 2028+

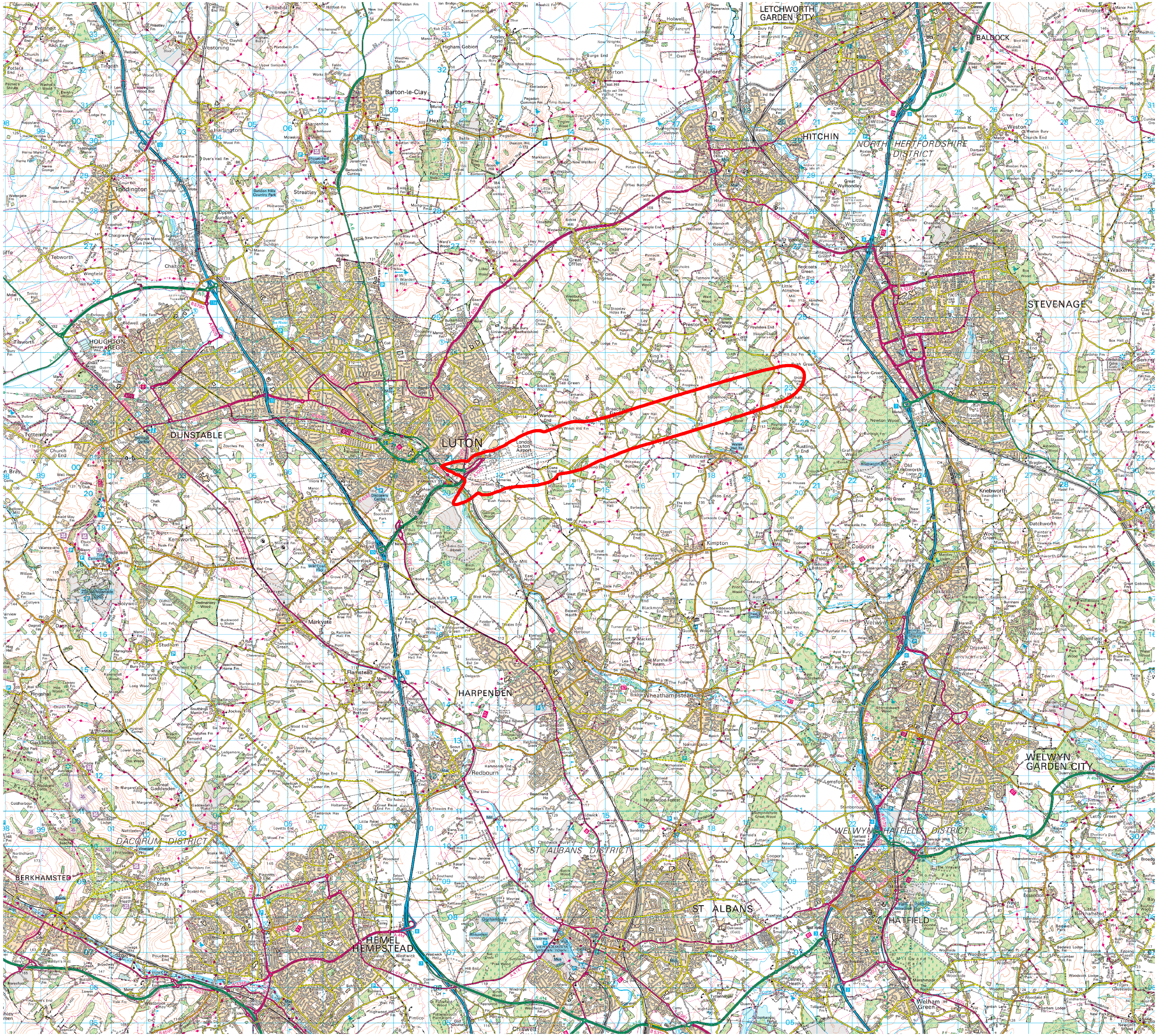
FIGURE 6.23

DRAWN: MP
CHECKED: DR

DATE: June 2022
SCALE: 1:150,000@A4

FIGURE No:

A11060-S73-83-1.0



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LEGEND:

N60, 25

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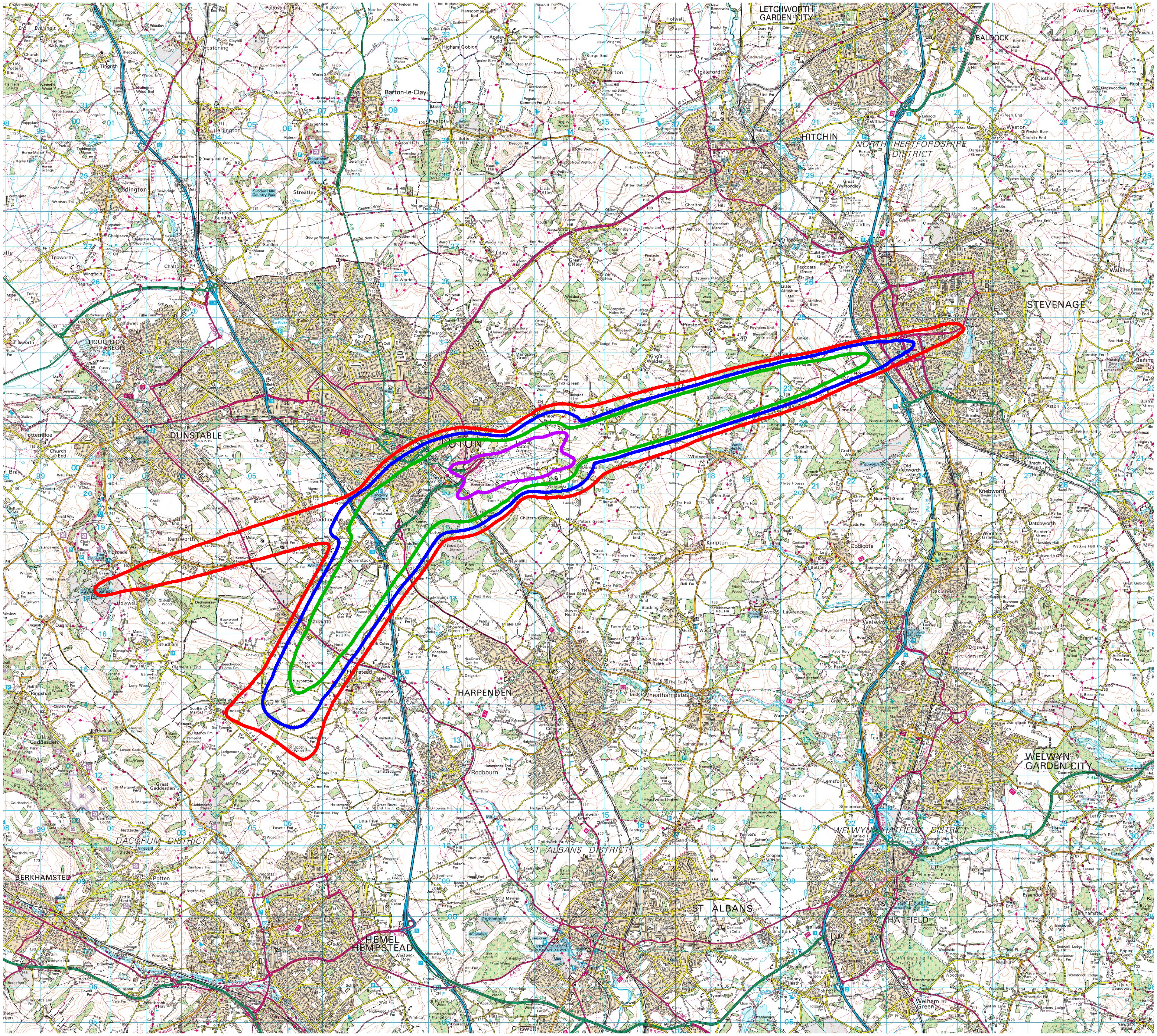
Summer Night Time N60 Noise Contours Existing Condition 10 2028+

FIGURE 6.24

DRAWN: MP	CHECKED: DR
DATE: June 2022	SCALE: 1:150,000@A4

FIGURE No:

A11060-S73-84-1.0



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LEGEND:

- N65, 25 (red)
- N65, 50 (blue)
- N65, 100 (green)
- N65, 200 (purple)

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London Luton Airport

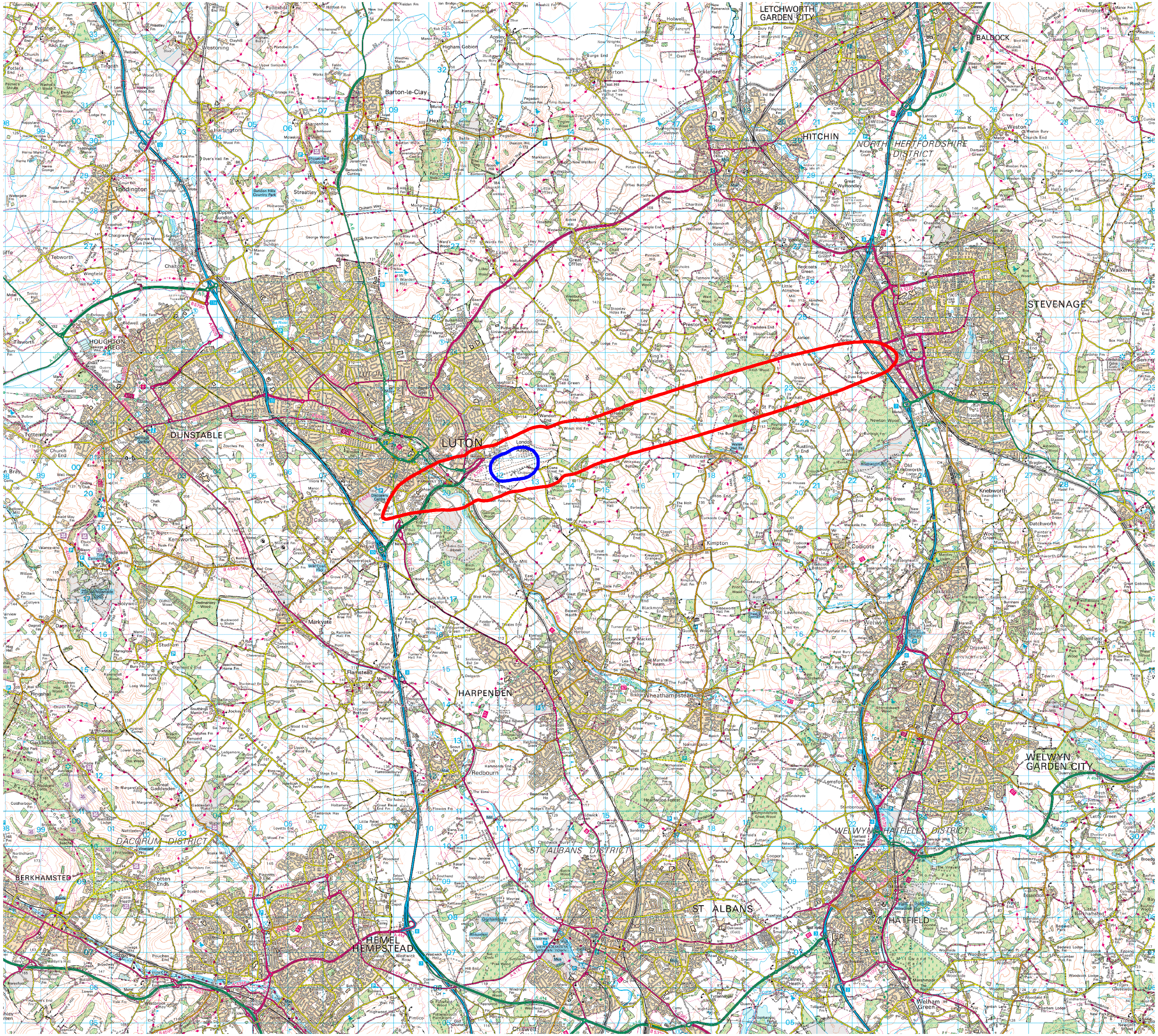
Summer Daytime N65 Noise Contours
2028 19 mppa

FIGURE 6.25

DRAWN: MP	CHECKED: DR
DATE: June 2022	SCALE: 1:150,000@A4

FIGURE No:

A11060-S73-85-1.0



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LEGEND:

N60, 25

N60, 50

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Summer Night Time N60 Noise Contours 2028 19 mppa

FIGURE 6.26

DRAWN: MP	CHECKED: DR
DATE: June 2022	SCALE: 1:150,000@A4

FIGURE No:

A11060-S73-86-1.0

Appendix 1A
Glossary

Term	Definition
Ambient noise	Usually expressed using the $L_{Aeq,T}$ unit, commonly understood to include all sound sources present at any particular site, regardless of whether they are actually defined as noise.
Apron	The airport apron is the area of an airport where aircraft are parked, unloaded or loaded, refuelled, or boarded.
A-weighting	The sensitivity of the ear is frequency dependent. Sound level meters are fitted with a weighting network which approximates to this response and allows sound levels to be expressed as an overall single figure value, in dB(A).
Background noise	This is the steady noise attributable to less prominent and mostly distant sound sources above which identifiable specific noise sources intrude. It is usually expressed using the LA90 unit.
Baseline	A study of existing environmental conditions
Biodiversity	The concept of a variety in all species of plants and animals through which nature finds its balance.
Carbon Budget	The UK Carbon Budget is the total quantity of greenhouse gas emissions permitted in the United Kingdom over a specified period.
Carbon dioxide equivalent	A measure used to compare the emissions from various greenhouse gases based on their global warming potential relative to that of carbon dioxide.
Carbon emission	The release of carbon into the atmosphere.
Climate change mitigation	Action to reduce the causes of climate change (e.g. emissions of greenhouse gases), as well as reducing future risks associated with climate change.
Committee on Climate Change	An independent advisory body, established under section 32 of the Climate Change Act 2008, tasked with helping the UK Government set and meet carbon budgets and adapt to climate change.
Cumulative Effect	The combined effects of foreseeable human induced changes within a specific geographical area over a certain period of time. Effects can be both direct and indirect.
dB / Decibel	The unit used to describe the magnitude of sound is the decibel (dB) and the quantity measured is the sound pressure level. The decibel scale is logarithmic and it ascribes equal values to proportional changes in sound pressure, which is a characteristic of the ear. Use of a logarithmic scale has the added advantage that it compresses the very wide range of sound pressures to which the ear may typically be exposed to a more manageable range of numbers. The threshold of hearing occurs at approximately 0 dB (which corresponds to a reference sound pressure of 2 x 10-5 Pascals) and the threshold of pain is around 120 dB. The sound energy radiated by a source can also be expressed in decibels. The sound power is a measure of the total sound energy radiated by a source per second, in watts. The sound power level, Lw is expressed in decibels, referenced to 10-12 watts.
Effect	A temporary or permanent consequence of a singular or collective impact associated with the proposal.

Term	Definition
EIA regulations	Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (SI No 571)
Emissions scenario	Scenarios of how greenhouse gas emissions may vary in future. These are used by scientists to generate climate change projections.
Environment	Our physical surroundings including air, water and land.
Environmental impact assessment	An assessment undertaken to determine the potential impacts of a proposed development on various elements of the environment, such as on air quality and ecology and social issues such as socio-economics and transport.
Environmental statement	The report of the Environmental Impact Assessment of a proposed development.
Extreme weather event	Unusual, severe or unseasonal weather; or weather at the extremes of the range of weather seen in the past.
Frequency (Hz)	Frequency is analogous to musical pitch. It depends upon the rate of vibration of the air molecules that transmit the sound and is measured as the number of cycles per second or Hertz (Hz). The human ear is sensitive to sound in the range 20 Hz to 20,000 Hz (20 kHz). For acoustic engineering purposes, the frequency range is normally divided up into discrete bands. The most commonly used bands are octave bands, in which the upper limiting frequency for any band is twice the lower limiting frequency, and one-third octave bands, in which each octave band is divided into three. The bands are described by their centre frequency value and the ranges which are typically used for building acoustics purposes are 63 Hz to 4 kHz (octave bands) and 100 Hz to 3150 Hz (one-third octave bands).
Future baseline	The situation that would occur if the proposed development that is the subject of the Environmental Impact Assessment does not proceed. The predicted impacts of the development are compared against this theoretical scenario.
Greenhouse Gas	A gas such as carbon dioxide, methane, chlorofluorocarbons, nitrous oxide, ozone, and water vapour that contributes to the greenhouse effect by absorbing infrared radiation.
Groundwater	Water held underground in the soil or in pores and crevices in rock.
Health	A state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity.
Health impact assessment	A means of assessing the health impacts of policies, plans and projects in diverse economic sectors using quantitative, qualitative and participatory techniques.
Hypertension	Abnormally high blood pressure.
Impact	Something which temporarily or permanently causes a change to the environmental baseline, whether adverse or beneficial, as a result of the proposals.
Indices of multiple deprivation	A UK government qualitative study of deprived areas in English local counties. Commonly known as the IMD, is the official measure of relative deprivation for small areas in England.
Indirect impacts	Impacts on the environment, which are not a direct result of the development but are often produced away from it or as a result of a complex pathway.
Inter-project effects assessment	An assessment of how the environmental effects resulting from the Proposed Development could combine with the same topic-related effects generated by other proposed or committed developments to affect a common receptor. For example, noise generated by the construction of the Proposed Development and that generated from another construction site nearby could affect the same residential property receptor.

Term	Definition
L_{A90}	Level exceeded 90% of the time (background noise).
$L_{Aeq,T}$	Equivalent continuous A-weighted sound pressure level.
$L_{Amax,T}$	The maximum A-weighted sound pressure level, normally associated with a time weighting, F (fast), or S (slow), such as $L_{AF,max}$ or $L_{AS,max.}$
Lowest observable adverse effect level	This is one of three observed effect level definitions to the assessment of noise in England, in order to identify and rate noise impact on the community from any development. It is the level above which adverse effects on health and quality of life can be detected.
Lower super output area	Geographic hierarchy designed to improve the reporting of small area statistics in England and Wales.
Land use	The primary use of the land, including both rural and urban activities.
MAGIC	A website that provides geographic information about the natural environment from across government.
Methodology	The specific approach and techniques used for a given study.
Mitigation	Any process, activity or entity designed to avoid, reduce, or remedy adverse environmental effects likely to be caused by a development project.
N60 & N70	Nx contours define ground receptors exposed to a number of events with a maximum noise level of x dB L_{ASmax} or greater.
No observed effect level	This is one of three observed effect level definitions to the assessment of noise in England, in order to identify and rate noise impact on the community from any development. It is the level below which no effect can be detected and below which there is no detectable effect on health and quality of life due to noise.
Non-technical summary	The 'executive summary' of an Environmental Statement prepared in non-technical language so that it can be read by the layperson.
Nx	Nx or Number Above is the total number of aircraft operations that exceed a specified sound level threshold. For example, N65 is the count of departure and arrival events in express of 65dB L_{AMAX}.
Operational phase	Standard operation after commissioning.
Parent permission	The planning permission granted in 2014 for expansion of the airport with a cap of 18 million passengers per annum, which provides the overall baseline and context for subsequent planning consents, and this current application.
Paris Agreement	An agreement within the United Nationals Framework Convention on Climate Change (UNFCCC) that sets out a global action plan to mitigate greenhouse gas emissions and limiting global warming to well below 2°C, as well as strengthening the ability of countries to deal with the impacts of climate change.
Particulate matter	Particulate matter (PM), also known as particle pollution, is a complex mixture of extremely small particles and liquid droplets that get into the air. Once inhaled, these particles can affect the heart and lungs and cause serious health effects.
Peak Day Air Transport Movements	The busiest day in terms of the number of Air Traffic Movements
Potential receptors	Locations used by people at which there is an environmental or social change that could affect a health outcome.

Term	Definition
Proposed scheme	The proposed expansion of Luton Airport beyond the permitted passenger cap of 18 million passengers per annum to 19 million passengers per annum through a planning application to Luton Borough Council.
Ramsar site	A designation of wetland sites of international importance under the Ramsar Convention.
Rating level, $L_{Ar,Tr}$	The specific sound level plus any adjustment for the characteristic features of the sound.
Receptors	A component of the natural or man-made environment such as water or a building that is affected by an impact.
Residual impacts	Effects remaining after mitigation measures have been implemented.
Scheduled Monument	In the United Kingdom, a scheduled monument is a nationally important archaeological site or historic building, given protection against unauthorised change.
Scoping	An early stage within the Environmental Impact Assessment Process where the significance of environmental issue and scope of the environmental studies are determined.
Significant effect	Significant effects are those identified as 'Major' within the significance evaluation matrix (contained within Chapter 4: Approach to preparing the Environmental Statement).
Significant observed adverse effect level	This is one of three observed effect level definitions to the assessment of noise in England, in order to identify and rate noise impact on the community from any development. It is the level above which significant adverse effects on health and quality of life occur.
Sound	This is a physical vibration in the air, propagating away from a source, whether heard or not.
Sound power levels (L_w)	Sound power levels (L_w) are used to describe the sound output of a sound source.
Spatial scope	The area over which changes to the environment are predicted to occur as a consequence of a Proposed Scheme.
Surface water	Water found on the surface of the Earth (not underground or in the atmosphere), for example in rivers, seas, lakes and reservoirs.
Taxiing	Taxiing is the slow movement of an aircraft on the ground, under its own power, before take-off or after landing.
Temporal scope	The time period over which changes to the environment and the resultant effects are predicted to occur.
Topic	The environment that could be affected by the proposed development.
Traffic flows	The interactions between travellers and infrastructure.
Transboundary effects	Effects that would affect the environment in another state within the European Economic Area (EEA)
Unacceptable Adverse Effect Level	The level above which extensive and regular changes in behaviour and/or an inability to mitigate the effect of noise leading to psychological stress or physical effects occurs.
Vibration	Vibration is an oscillatory motion. The magnitude of vibration can be defined in terms of displacement, i.e. how far from the equilibrium something moves, velocity (how fast something moves), or acceleration (the rate of change of the velocity).

Term	Definition
Visual Effect	The change in the appearance of the townscape as a result of the development. This can be positive or negative.
Wellbeing	A state in which every individual realises his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully and is able to make a contribution to her or his community.
92-Day Peak Period Air Transport Movements	The 92-day period within which the highest number of Air Transport Movements occurs.

Appendix 1B
Abbreviations

Abbreviation	Term
ACA	Airport Carbon Accreditation
ACI	Airports Council International
ACOG	Airspace Change Organising Group
ADMS	Atmospheric Dispersion Modelling System
AEDT	Aviation Environmental Design Tool
AEM	Advanced Emissions Model
AIP	Aeronautical Information Package
ANCON	Aircraft Noise Contour Model
ANG	Air Navigation Guidance
ANPS	Airports National Policy Statement
AONB	Area of Outstanding Natural Beauty
APF	Aviation Policy Framework
APIS	Air Pollution Information System
APU	Auxiliary Power Unit
AQAL	Air Quality Assessment Level
AQMA	Air Quality Management Area
AQO	Air Quality Objective
AQS	Air Quality Standard
ASAS	Airport Surface Access Strategy
ATC	Air Traffic Control
ATM	Air Traffic Movement
ATWP	Air Transport White Paper
BEIS	Business, Energy and Industrial Strategy
BSI	British Standards Institute
CAA	Civil Aviation Authority
CCC	Committee on Climate Change
CCD	Climb, Cruise and Descent

Abbreviation	Term
CCO	Continuous Climb Operations
CCS	Carbon Capture and Storage
CDA	Continuous Descent Approaches
CEA	Cumulative Effects Assessment
CEMP	Construction Environmental Management Plan
CL	Critical Load
CLE	Critical Level
CMD	Common Mental Health Disorders
CO	Carbon monoxide
COMEAP	Committee on the Medical Effects of Air Pollutants
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
CPMP	Car Parking Management Plan
CRP	Carbon Reduction Plan
CTA	Central Terminal Area
CTF	Community Trust Fund
C_6H_6	Benzene
DART	Direct Air-Rail Transit
dB	Decibels
DCLG	Department for Communities and Local Government
DCO	Development Consent Order
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
EAL	Environmental Assessment Level
EC	European Commission
EEA	European Economic Area/European Environment Agency
EEP	Energy and Emissions Projections
EFT	Emission Factors Toolkit
EIA	Environmental Impact Assessment

Abbreviation	Term
EMEP	European Monitoring and Evaluation Programme
END	Environmental Noise Directive
EPUK	Environmental Protection UK
ES	Environmental Statement
ETS	Emissions Trading Scheme
EU	European Union
FAA	Federal Aviation Administration
FASI	Future Airspace Strategy Implementation
FES	Future Energy Scenarios
GCD	Great Circle Distance
GDG	Guideline Development Group
GHG	Greenhouse Gas
GSE	Ground Support Equipment
HA	High Annoyance
HIA	Health Impact Assessment
IAQM	Institute of Air Quality Management
IAS	International Aviation and Shipping
ICAO	International Civil Aviation Organisation
IEMA	Institute of Environmental Management and Assessment
INM	Integrated Noise Model
IPA	Impact Pathway Approach
IPCC	Intergovernmental Panel on Climate Change
km	kilometre
km^2	Square kilometres
LAQM	Local Air Quality Management
LBC	Luton Borough Council
LCC	Low-Cost Carrier
LLA	London Luton Airport
LLACC	London Luton Airport Consultative Committee
LLAOL	London Luton Airport Operations Limited

Abbreviation	Term
LOAEL	Lowest Observed Adverse Effect Level
LRTAP	Long-Range Transboundary Air Pollution
LSOA	Lower Layer Super Output Areas
LTO	Landing and Take-Off
LTP	Local Transport Plan
m	meter
MAGIC	Multi Agency Geographic Information for the Countryside
MHCLG	Ministry of Housing, Communities and Local Government
mppa	Million Passengers Per Annum
NAEI	National Atmospheric Emissions Inventory
NNG	Night Noise Guideline
NO	Nitric oxide
NOEL	No Observed Effect Level
NO_x	Oxides of nitrogen
NO_2	Nitrogen Dioxide
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
NPRs	Noise Preferential Routes
NPS	National Policy Statement
NPSE	Noise Policy Statement for England
NSIP	Nationally Significant Infrastructure Project
NTS	Non-Technical Summary
NVL	Noise Violation Limits
ORR	Office of Road and Rail
OS	Ordnance Survey
PAS	Publicly Available Standard
Pb	Lead
PC	Process Contribution
PCM	Pollution Climate Mapping
PEC	Predicted Environmental Contribution

Abbreviation	Term
PM	Particulate Matter
QC	Quota Count
RAF	Royal Air Force
ROC	Renewables Obligation Certificate
SAC	Special Area of Conservation
SAF	Sustainable Aviation Fuel
SEL	Single Event Level
SET	Small Emitters Tool
SIDs	Standard Instrument Departures
SIGS	Sound Insulation Grant Scheme
SOAEL	Significant Observed Adverse Effect Level
SofS	Secretary of State
SoNA	Survey of Noise Attitudes
SoR	Start of Take-off Roll
SoS	Secretary of State
SOV	Single Occupancy Vehicle
SO_2	Sulphur dioxide
SPA	Special Protection Area
SRT	Systematic Review Team
SSSI	Site of Special Scientific Interest
STARs	Standard Arrival Routes
STS	Staff Travel Survey
SWMP	Site Waste Management Plan
TA	Transport Assessment
TDP	Transport Decarbonisation Plan
TNIP	Transport Noise Information Package
TP	Travel Plan
T&D	Transmission and Distribution
UAEL	Unacceptable Adverse Effect Level
UK	United Kingdom

Abbreviation	Term
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
WebTAG	Web-based Transport Analysis Guidance
WHO	World Health Organisation
ZoI	Zone of Influence
µg	Micro-gram

Appendix 5A
Climate Assessment Supporting Data

Introduction

This appendix should be read in conjunction with the **Chapter 5: Climate** of Volume 2: Environmental Statement Addendum (ES).

This appendix sets out any modifications to assessment methodology and amendments to supporting data used to calculate greenhouse gas (GHG) emissions as part of the climate assessment

Assessment methodology

Emission Factors

Data on improvement factors under upper, central, and lower emission scenarios have been collated from current government policy, CCC advice and industry reports. An overview of the trend for each improvement factor out to 2050 are shown in **Table 5A.1**.

Amended emission factors for each time period used in the assessment are presented in **Table 5A.2** to **Table 5A.6**.

Table 5A.1 Improvement factors (relative to the 2019 baseline data) used in the climate assessment for the upper, central, and lower future emission scenarios.

Improvement factor	Upper emission scenario	Central emission scenario	Low emission scenario
Private vehicle splits by fuel type ƚ	37% petrol, 19% diesel, 44% electric (assumed to be plug-in hybrids) by 2050[1]	2% petrol, 1% diesel, 97% battery electric vehicles by 2050[2]	0% petrol, 0% diesel, 100% battery electric vehicles by 2050[3]
Vehicle efficiency improvements ƚ	Efficiency factor of 0.65 petrol, 0.68 diesel, 0.73 electric by 2050[1]		
Vehicle efficiency improvements (Public Service Vehicles including buses and coaches)	No improvement (efficiency factor 1 diesel, 1 electric) by 2050. Note the fleet mix is assumed to be all diesel[1]		
Rail efficiency improvements (diesel)	No improvement (efficiency factor of 1) by 2050[1]	Efficiency factor of 0.58 by 2050 (median value)	3.82% annual improvement, equating to an efficiency factor of 0.29 by 2050[4]
Electricity generation efficiency improvements	Efficiency factor of 0.54 by 2050[2]	Efficiency factor of 0.43 by 2050[5] (assumed to flat line from 2040)	Efficiency factor of -0.02 by 2050[3]
Aircraft and engine efficiency	0.92 in 2050[6]	0.9 in 2050	0.88 in 2050[6]
Air traffic management and operations	No improvement in 2050[6]	0.96 in 2050	0.93 in 2050[6]

[1] Department for Transport (2020), TAG Data Book. Available at https://www.gov.uk/government/publications/tag-data-book
[2] *Steady Progression Scenario*, taken from: National Grid (2020), Future Energy Scenarios, FES 2020. Available at https://www.nationalgrideso.com/future-energy/futureenergyscenarios/fes-2020-documents
[3] *Leading the Way Scenario,* taken from National Grid (2020), Future Energy Scenarios, FES 2020. Available at https://www.nationalgrideso.com/future-energy/futureenergyscenarios/fes-2020-documents
[4] ORR (2020), Table 6100 - Estimates of normalised passenger and freight carbon dioxide equivalent (CO2e) emissions. Available at https://dataportal.orr.gov.uk/statistics/infrastructure-and-emissions/rail-emissions/
[5] BEIS (2019), Updated energy and emissions projections: 2019 [online]. Available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/931215/Web_figures__EEP2019_.ods
[6] Sustainable Aviation (2020). Sustainable Aviation Carbon Road-Map: A path to Net Zero. Available online at: https://www.sustainableaviation.co.uk/wp-content/uploads/2020/02/SustainableAviation_CarbonReport_20200203.pdf

Improvement factor	Upper emission scenario	Central emission scenario	Low emission scenario
Sustainable aviation fuel##	2050 5% implementation[7] 10% life-cycle emission reduction[10]	2050 30% implementation[8] 60% life-cycle emission reduction[11]	2050 75% implementation[9] 100% life-cycle emission reduction[12]

Table 5A.2 Improvement factors (relative to 2019 data) used in the climate assessment for the pessimistic, central, and optimistic scenario for the 2025 time period.

Improvement factor	Pessimistic	Central	Optimistic
Private vehicle splits by fuel type	Petrol 53% / Diesel 41% / Electric 5%	Petrol 51% / Diesel 47% / Electric 2%	Petrol 49% / Diesel 45% / Electric 6%
Vehicle efficiency improvements	Petrol 0.89 / Diesel 0.93 / Electric 0.97		
Vehicle efficiency improvements (Public Service Vehicles including buses and coaches)	Bus / Coach (diesel) 1		
Rail efficiency improvements	1	0.86	0.82
Electricity generation efficiency improvements	0.89	0.69	0.78
Air traffic management and operations	1	0.99	0.99

Table 5A.3 Improvement factors (relative to 2019 data) used in the climate assessment for the pessimistic, central, and optimistic scenario for the 2028 time period.

Improvement factor	Pessimistic	Central	Optimistic
Private vehicle splits by fuel type	Petrol 53% / Diesel 36% / Electric 11%	Petrol 52% / Diesel 42% / Electric 7%	Petrol 43% / Diesel 35% / Electric 22%
Vehicle efficiency improvements	Petrol 0.85 / Diesel 0.89 / Electric 0.84		
Vehicle efficiency improvements (Public Service Vehicles including buses and coaches)	Bus / Coach (diesel) 1		
Rail efficiency improvements	1	0.79	0.7
Electricity generation efficiency improvements	0.84	0.58	0.7
Air traffic management and operations	1	0.99	0.98
Sustainable aviation fuel	1	0.98	0.96

7 DfT Jet Zero Consultation: BAU scenario
8 SAF mandate consultation; see Table p37
9 DfT Jet Zero Consultation: High Ambition scenario
10 SAF mandate consultation, para 3.34
11 SAF mandate consultation; see Table p41, Scenario E
12 Assumes 100% power to liquid, nuclear electricity

Table 5A.4 Improvement factors (relative to 2019 data) used in the climate assessment for the pessimistic, central, and optimistic scenario for the 2032 time period.

Improvement factor	Pessimistic	Central	Optimistic
Private vehicle splits by fuel type	Petrol 51% / Diesel 29% / Electric 20%	Petrol 48% / Diesel 35% / Electric 17%	Petrol 263% / Diesel 19% / Electric 55%
Vehicle efficiency improvements	Petrol 0.79 / Diesel 0.82 / Electric 0.79		
Vehicle efficiency improvements (Public Service Vehicles including buses and coaches)	Bus / Coach (diesel) 1		
Rail efficiency improvements	1	0.74	0.6
Electricity generation efficiency improvements	0.8	0.54	0.54
Air traffic management and operations	1	0.99	0.97
Sustainable aviation fuel	1	0.96	0.92

Table 5A.5 Improvement factors (relative to 2019 data) used in the climate assessment for the pessimistic, central, and optimistic scenario for the 2040 time period.

Improvement factor	Pessimistic	Central	Optimistic
Private vehicle splits by fuel type	Petrol 44% / Diesel 23% / Electric 33%	Petrol 23% / Diesel 15% / Electric 62%	Petrol 1% / Diesel 1% / Electric 99%
Vehicle efficiency improvements	Petrol 0.69 / Diesel 0.72 / Electric 0.77		
Vehicle efficiency improvements (Public Service Vehicles including buses and coaches)	Bus / Coach (diesel) 1		
Rail efficiency improvements	0.87	0.66	0.44
Electricity generation efficiency improvements	0.68	0.43	0.26
Air traffic management and operations	1	0.98	0.95
Sustainable aviation fuel	1	0.92	0.81

Table 5A.6 Improvement factors (relative to 2019 data) used in the climate assessment for the pessimistic, central, and optimistic scenario for the 2050 time period.

Improvement factor	Pessimistic	Central	Optimistic
Private vehicle splits by fuel type	Petrol 37% / Diesel 19% / Electric 44%	Petrol 2% / Diesel 1% / Electric 97%	Petrol 0% / Diesel 0% / Electric 100%
Vehicle efficiency improvements	Petrol 0.65 / Diesel 0.68 / Electric 0.73		
Vehicle efficiency improvements (Public Service Vehicles including buses and coaches)	Bus / Coach (diesel) 1		
Rail efficiency improvements	1	0.59	0.3
Electricity generation efficiency improvements	0.54	0.43	-0.02
Air traffic management and operations	1	0.96	0.93
Aircraft and engine efficiency	0.92	0.90	0.88
Sustainable Aviation Fuel	0.995	0.82	0.25

Methodology for quantifying surface access GHG emissions

As in the 2021 ES Addendum, surface access emissions have been calculated using employee and passenger numbers and by estimating the number of total kilometres travelled for each mode of transport.

Employee commuting distance has been sourced from the DfT National Travel Survey 2020[13] average commuting length of 14.12 km.

Data on passenger and employee journeys have been multiplied by the most recent emissions factors from the 2021 conversion factors published by BEIS[14].

The 2019 emissions factors used for the surface access assessment are:

- Passenger vehicle (average sized car petrol): 0.17431 $kgCO_2e/km$;
- Passenger vehicle (average sized car diesel): 0.16843 $kgCO_2e/km$
- Passenger vehicle (average sized car plug in hybrid electric vehicle, including UK Electricity for EV usage): 0.02383 $kgCO_2e/km$
- Passenger vehicle (average sized car battery electric vehicle, including UK Electivity for EV
- usage): 0.05031 $kgCO_2e/km$
- Motorbike (average sized): 0.11355 $kgCO_2e/km$;
- Taxis (black cab): 0.30624 $kgCO_2e/km$;
- Taxis (regular taxi): 0.20826 $kgCO_2e/km$;
- Local Bus (average): 0.10227 $kgCO_2e$ /passenger/km;
- Coach (average): 0.02684 $kgCO_2e$ /passenger/km;
- National rail: 0.03549 $kgCO_2e$ /passenger/km; and
- Light rail and tram: 0.02861 $kgCO_2e$ /passenger/km.

Methodology for quantifying airport buildings and operations GHG emissions

Raw data on airport building and ground operations at LLA, as provided for the 2021 ES Addendum, have been multiplied by the latest emissions factors from the 2021 conversion factors published by BEIS.[14]

The 2019 emission factors used are:

- Electricity generation UK grid mix: 0.21233 $kgCO_2e$ /kWh;
- Transmission and distribution (T&D) of UK grid electricity: 0.01879 $kgCO_2e$ /kWh
- Natural gas: 0.18316 $kgCO_2e$ /kWh;
- Diesel (heating and power): 2.75857 $kgCO_2e$ /litre;
- Diesel (vehicles): 2.51233 $kgCO_2e$ /litre;
- Refrigerants (R410A): 2088 $kgCO_2e$ /kg
- Refrigerants (HFC-134a): 1430 $kgCO_2e$ /kg

[13] Department for Transport, (2021), "National Travel Survey: 2020",Available at: https://www.gov.uk/government/statistics/national-travel-survey-2020

[14] BEIS (2021), Greenhouse gas reporting: conversion factors 2021 Available at: https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2021

- Refrigerants (R407C): 1774 kgCO_2e /kg

Quantification of GHGs

This section sets out quantifications of GHG emissions which have been recalculated since the 2021 ES Addendum.

Aviation Emissions

Table 5A.7 Aviation GHG emissions (ktCO2/yr) for domestic and international sources in the 2019 baseline, 'without development' and 'with development' cases in the upper, central, and lower emission scenarios.

		2025		2028		2032		2040		2050	
	2019 baseline	Without development	With development	Without development	With development	Without development	With development	Without development	With development	Without development	With development
Upper emissions scenario											
Domestic	40.0	40.0	40.0	39.9	39.2	38.9	38.8	38.8	38.8	35.8	35.7
EEA	828.4	828.4	836.8	802.9	810.6	796.0	807.7	795.2	806.9	732.3	743.1
RoW	184.4	184.4	193.3	173.1	191.5	172.2	190.9	172.1	190.7	158.5	175.6
Total	1052.8	1052.8	1070.2	1015.9	1041.3	1007.1	1037.4	1006.1	1036.4	926.6	954.5
Central emissions scenario											
Domestic	40.0	39.8	39.8	38.8	38.2	37.0	36.9	35.1	35.0	27.9	27.8
EEA	828.4	823.6	832.0	781.2	788.6	757.4	768.6	717.8	728.4	570.2	578.6
International	184.4	183.4	192.2	168.4	186.3	163.9	181.6	155.3	172.1	123.4	136.7
Total	1052.8	1046.8	1064.0	988.4	1013.1	958.3	987.2	908.2	935.5	721.4	743.1
Lower emissions scenario											
Domestic	40.0	39.6	39.6	37.5	36.8	34.6	34.6	30.2	30.2	8.0	8.0
EEA	828.4	818.9	827.2	754.2	761.4	709.0	719.5	618.6	627.7	164.2	166.6
International	184.4	182.3	191.1	162.6	179.9	153.4	170.0	133.9	148.3	35.5	39.4
Total	1052.8	1040.8	1057.9	954.3	978.1	897.1	924.1	782.6	806.2	207.8	214.0

Surface access emissions

Amended projected surface access GHG emissions for the 2019 baseline, 'without development' and 'with development' the assessment years 2025, 2028, 2032, 2040 and 2050 in three future improvement scenarios (upper emission, central emission, and lower emission scenarios) are shown in **Table 5A.8**.

Table 5A.8 Surface access GHG emissions ($ktCO_2e/yr$) associated with LLA

	2019 baseline	2025 Without development	2025 With development	2028 Without development	2028 With development	2032 Without development	2032 With development	2040 Without development	2040 With development	2050 Without development	2050 With development
Upper emission Scenario											
Passengers	396.1	275.9	340.8	254.0	317.9	230.2	287.2	198.6	246.5	180.6	223.2
Employees	9.7	8.4	9.0	7.9	8.5	7.2	7.7	6.2	6.7	5.7	6.1
Total	405.7	284.4	349.8	261.9	326.4	237.4	295.0	204.8	253.2	186.3	229.4
Central emission scenario											
Passengers	396.1	276.9	342.1	253.8	317.9	215.8	269.6	125.0	152.4	69.2	80.5
Employees	9.7	8.4	9.0	7.9	8.5	6.8	7.3	4.1	4.4	2.4	2.7
Total	405.7	285.4	351.1	261.7	326.4	222.7	276.9	129.1	156.8	71.6	83.2
Lower emission scenario											
Passengers	396.1	267.1	330.2	222.1	277.8	144.8	179.1	51.4	58.8	30.4	32.4
Employees	9.7	8.2	8.8	7.0	7.5	4.8	5.2	2.0	2.2	1.4	1.6
Total	405.7	275.4	339.0	229.2	285.3	149.6	184.3	53.4	61.0	31.8	34.0

Airport buildings and ground operations

Amended emissions for airport buildings and ground operations are presented in **Table 5A.9**

Table 5A.9 Airport building and ground operation emissions ($ktCO_2e/yr$)

	2019 baseline*	2025 Without development	2025 With development	2028 Without development	2028 With development	2032 Without development	2032 With development	2040 Without development	2040 With development	2050 Without development	2050 With development
Upper emission scenario											
Electricity (location-based)	10.1	7.4	7.9	5.2	5.5	5.0	5.3	4.3	4.5	3.4	3.5
Electricity (market-based)	10.1	0.5	0.5	0.3	0.4	0.3	0.4	0.3	0.4	0.3	0.4
Gas	1.5	1.5	1.6	1.5	1.6	1.5	1.6	1.5	1.6	1.5	1.6
Diesel – Heating	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Diesel – Power	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Diesel – Vehicles LLAOL	1.1	1.1	1.1	1.0	1.1	1.0	1.1	1.0	1.1	1.0	1.1
Diesel – Vehicles 3rd Part	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Refrigerants (total)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
TOTAL (location-based)	13.8	11.1	11.7	8.9	9.4	8.7	9.1	8.0	8.4	7.0	7.4
TOTAL (market-based)	13.8	4.1	4.4	4.0	4.2	4.0	4.2	4.0	4.2	4.0	4.2
Central emission scenario											
Electricity (location-based)	10.1	5.8	6.1	3.7	3.9	3.3	3.5	2.7	2.8	2.7	2.8
Electricity (market-based)	10.1	0.5	0.5	0.3	0.4	0.3	0.4	0.3	0.4	0.3	0.4
Gas	1.5	1.5	1.6	1.5	1.6	1.5	1.6	1.5	1.6	1.5	1.6

	2019 baseline*	2025		2028		2032		2040		2050	
		Without development	With development	Without development	With development	Without development	With development	Without development	With development	Without development	With development
Diesel – Heating	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Diesel – Power	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Diesel – Vehicles LLAOL	1.1	1.0	1.1	1.0	1.1	1.0	1.1	1.0	1.1	1.0	1.1
Diesel – Vehicles 3rd Part	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Refrigerants (total)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
TOTAL (location-based)	13.8	9.5	10.0	7.3	7.7	7.0	7.4	6.4	6.7	6.4	6.7
TOTAL (market-based)	13.8	4.1	4.4	4.0	4.2	4.0	4.2	4.0	4.2	4.0	4.2
Upper emission scenario											
Electricity (location-based)	10.1	6.5	6.9	4.4	4.6	3.4	3.6	1.6	1.7	-0.1	-0.1
Electricity (market-based)	10.1	0.5	0.5	0.3	0.4	0.3	0.4	0.3	0.4	0.3	0.4
Gas	1.5	1.5	1.6	1.5	1.6	1.5	1.6	1.5	1.6	1.5	1.6
Diesel – Heating	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Diesel – Power	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Diesel – Vehicles LLAOL	1.1	1.0	1.1	1.0	1.1	1.0	1.1	1.0	1.1	1.0	1.1
Diesel – Vehicles 3rd Part	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Refrigerants (total)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
TOTAL (location-based)	13.8	10.2	10.7	8.0	8.5	7.0	7.4	5.3	5.6	3.6	3.8
TOTAL (market-based)	13.8	4.1	4.4	4.0	4.2	4.0	4.2	4.0	4.2	4.0	4.2

Assessment of effects: the global climate

International aviation

Amended international aviation GHG emissions for the 'Proposed Scheme' and the 'with development case as a percentage of the 37.5 $MtCO_2$/yr planning assumption are shown in **Table 5A.10** and **Table 5A.11**.

Table 5A.10 International aviation GHG emissions from the expansion of LLA (i.e. the Proposed Scheme) as a proportion of 37.5 MtCO2/yr

	2025		2028		2032		2040		2050	
	$MtCO_2$/yr	%	$MtCO_2$/yr	%	$MtCO_2$/yr	%	$MtCO_2$/yr	%	$MtCO_2$/yr	%
Upper emission scenario	0.017	0.05%	0.026	0.07%	0.030	0.08%	0.030	0.08%	0.028	0.07%
Central emission scenario	0.017	0.05%	0.025	0.07%	0.029	0.08%	0.027	0.07%	0.022	0.06%
Lower emission scenario	0.017	0.05%	0.024	0.07%	0.027	0.07%	0.024	0.06%	0.006	0.02%

Table 5A.11 International aviation GHG emissions from the 'with development' case as a proportion of of 37.5 MtCO2/yr

	2025		2028		2032		2040		2050	
	$MtCO_2$/yr	%	$MtCO_2$/yr	%	$MtCO_2$/yr	%	$MtCO_2$/yr	%	$MtCO_2$/yr	%
Upper emission scenario	1.03	2.75%	1.00	2.67%	1.00	2.66%	1.00	2.66%	0.92	2.45%
Central emission scenario	1.02	2.73%	0.97	2.60%	0.95	2.53%	0.90	2.40%	0.72	1.91%
Lower emission scenario	1.02	2.72%	0.94	2.51%	0.89	2.37%	0.78	2.07%	0.21	0.55%

Emissions intensity

Fuel burn and CO_2 emissions per passenger and per km travelled from departing commercial flights scenario under the 'without development' and 'with development' case in each year in the central, upper and lower emission scenarios are shown in **Table 5A.12**, **Table 5A.13** and **Table 5A.14**.

Table 5A.12 Fuel burn and CO_2 emissions per passenger and per passenger km from departing flights in the central emission scenario

	Domestic				EEA				Rest of the World			
	Fuel burn per passenger (kg)	**Fuel burn per passenger km (kg)**	**CO_2 per passenger (kg)**	**Co₂ per passenger per km (kg)**	**Fuel burn per passenger (kg)**	**Fuel burn per passenger km (kg)**	**CO_2 per passenger (kg)**	**CO_2 per passenger per km (kg)**	**Fuel burn per passenger (kg)**	**Fuel burn per passenger km (kg)**	**CO_2 per passenger (kg)**	**CO_2 per passenger per km (kg)**
2019	17	0.000008	54	0.000024	33	0.0000005	104	0.0000015	66	0.0000047	209	0.000015
2025 WOD	16	0.000007	51	0.000023	32	0.0000005	100	0.0000014	67	0.0000047	211	0.000015
2025 WD	16	0.000007	49	0.000022	31	0.0000004	96	0.0000014	64	0.0000045	200	0.000014
2028 WOD	15	0.000007	47	0.000021	31	0.0000005	96	0.0000014	64	0.0000048	199	0.000015
2028 WD	14	0.000006	44	0.000020	30	0.0000004	92	0.0000013	62	0.0000044	190	0.000013
2032 WOD	15	0.000007	44	0.000020	31	0.0000005	93	0.0000014	64	0.0000048	196	0.000014
2032 WD	14	0.000006	42	0.000019	29	0.0000004	89	0.0000013	61	0.0000043	185	0.000013
2040 WOD	15	0.000007	42	0.000019	30	0.0000004	88	0.0000013	64	0.0000047	185	0.000014
2040 WD	14	0.000006	40	0.000018	29	0.0000004	85	0.0000012	61	0.0000043	176	0.000012
2050 WOD	13	0.000006	33	0.000015	27	0.0000004	70	0.0000010	57	0.0000042	147	0.000011
2050 WD	12	0.000006	32	0.000014	26	0.0000004	67	0.0000010	54	0.0000038	140	0.000010

Table 5A.13 Fuel burn and CO_2 emissions per passenger and per passenger km from departing flights in the upper emission scenario

	Domestic				EEA				Rest of the World			
	Fuel burn per passenger (kg)	**Fuel burn per passenger km (kg)**	**CO_2 per passenger (kg)**	**CO_2 per passenger per km (kg)**	**Fuel burn per passenger (kg)**	**Fuel burn per passenger km (kg)**	**CO_2 per passenger (kg)**	**CO_2 per passenger per km (kg)**	**Fuel burn per passenger (kg)**	**Fuel burn per passenger km (kg)**	**CO_2 per passenger (kg)**	**CO_2 per passenger per km (kg)**
2019	17	0.000008	54	0.000024	33	0.0000005	104	0.0000015	66	0.0000047	209	0.000015
2025 WOD	16	0.000007	51	0.000023	32	0.0000005	101	0.0000015	67	0.0000048	212	0.000015
2025 WD	16	0.000007	49	0.000022	31	0.0000004	97	0.0000014	64	0.0000045	202	0.000014
2028 WOD	15	0.000007	48	0.000022	31	0.0000005	99	0.0000015	65	0.0000048	204	0.000015

	Domestic				EEA				Rest of the World			
	Fuel burn per passenger (kg)	Fuel burn per passenger km (kg)	CO_2 per passenger (kg)	CO_2 per passenger per km (kg)	Fuel burn per passenger (kg)	Fuel burn per passenger km (kg)	CO_2 per passenger (kg)	CO_2 per passenger per km (kg)	Fuel burn per passenger (kg)	Fuel burn per passenger km (kg)	CO_2 per passenger (kg)	CO_2 per passenger per km (kg)
2028 WD	14	0.000006	45	0.000020	30	0.0000004	94	0.0000014	62	0.0000044	196	0.000014
2032 WOD	15	0.000007	47	0.000021	31	0.0000005	98	0.0000014	65	0.0000048	205	0.000015
2032 WD	14	0.000006	44	0.000020	30	0.0000004	94	0.0000014	62	0.0000044	195	0.000014
2040 WOD	15	0.000007	47	0.000021	31	0.0000005	97	0.0000014	65	0.0000048	205	0.000015
2040 WD	14	0.000006	44	0.000020	30	0.0000004	94	0.0000014	62	0.0000044	195	0.000014
2050 WOD	15	0.000007	47	0.000021	31	0.0000005	97	0.0000014	65	0.0000048	205	0.000015
2050 WD	14	0.000006	44	0.000020	30	0.0000004	94	0.0000014	62	0.0000044	194	0.000014

Table 5A.14 Fuel burn and CO_2 emissions per passenger and per passenger km from departing flights in the lower emission scenario

	Domestic				EEA				Rest of the World			
	Fuel burn per passenger (kg)	Fuel burn per passenger km (kg)	CO_2 per passenger (kg)	CO_2 per passenger per km (kg)	Fuel burn per passenger (kg)	Fuel burn per passenger km (kg)	CO_2 per passenger (kg)	CO_2 per passenger per km (kg)	Fuel burn per passenger (kg)	Fuel burn per passenger km (kg)	CO_2 per passenger (kg)	CO_2 per passenger per km (kg)
2019	17	0.000008	54	0.000024	33	0.0000005	104	0.0000015	66	0.0000047	209	0.000015
2025 WOD	16	0.000007	51	0.000023	32	0.0000005	100	0.0000014	67	0.0000047	210	0.000015
2025 WD	15	0.000007	49	0.000022	30	0.0000004	96	0.0000014	63	0.0000045	199	0.000014
2028 WOD	15	0.000007	45	0.000020	31	0.0000005	93	0.0000014	64	0.0000047	192	0.000014
2028 WD	14	0.000006	42	0.000019	29	0.0000004	89	0.0000013	61	0.0000043	184	0.000013
2032 WOD	14	0.000006	42	0.000019	30	0.0000004	87	0.0000013	63	0.0000047	183	0.000014
2032 WD	14	0.000006	40	0.000018	29	0.0000004	84	0.0000012	60	0.0000043	174	0.000012
2040 WOD	14	0.000006	36	0.000016	30	0.0000004	76	0.0000011	62	0.0000046	160	0.000012
2040 WD	13	0.000006	35	0.000016	28	0.0000004	73	0.0000011	59	0.0000042	151	0.000011
2050 WOD	12	0.000006	10	0.000004	26	0.0000004	20	0.0000003	54	0.0000040	42	0.000003
2050 WD	12	0.000005	9	0.000004	25	0.0000004	19	0.0000003	51	0.0000036	40	0.000003

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Appendix 8A

Not used – See July 2021 Update to Volume 2 Noise Chapter (41431RR20V3NA)

Appendix 8B
Noise - Air Traffic Movements

Table 8B.1 Forecast flows for 92 summer day period

	2023 18mppa		2023 Current Limit		2024 18mppa		2024 Current Limit		2025 19mppa		2025 Current Limit		2028 19mppa		2031 19mppa	
	Daytime	**Night-time**	**Daytime**	**Night-time**	**Daytime**	**Night-time**	**Daytime**	**Night-time**	**Daytime**	**Night-time**	**Daytime**	**Night-time**	**Daytime**	**Night-time**	**Daytime**	**Night-time**
A300	225	146	203	123	225	146	212	123	226	146	n/a	133	226	146	218	146
A318ceo	0	0	0	0	0	0	0	0	0	0	n/a	0	0	0	0	0
A318 neo	0	0	0	0	0	0	0	0	0	0	n/a	0	0	0	0	0
A319ceo	2560	360	2304	304	1760	289	1654	245	2010	347	n/a	316	49	n/a	0	0
A319 neo	0	0	0	0	0	0	0	0	0	0	n/a	0	0	0	0	0
A320ceo	7440	1296	6696	1092	6807	1290	6398	1093	6542	1292	n/a	1178	1888	438	0	0
A320 neo	4473	742	4025	626	5914	819	5559	694	6203	829	n/a	756	14088	2040	16100	2354
A321ceo	4415	499	3974	421	4019	451	3778	382	3661	303	n/a	276	0	0	0	0
A321 neo	3225	793	2903	669	3616	842	3399	713	3733	926	n/a	845	5638	1210	5699	1150
A330	11	0	10	0	11	0	11	0	11	0	n/a	0	11	0	11	0
B737-Max	1033	254	930	214	1787	277	1680	234	3804	675	n/a	615	4108	758	4954	805
B737-300 / 73C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0	0
B737-400	12	103	11	87	12	103	12	87	13	103	n/a	94	13	103	0	103
B737-500	20	0	18	0	20	0	19	0	21	0	n/a	0	21	0	0	0
B737-600	0	0	0	0	0	0	0	0	0	0	n/a	0	0	0	0	0

	2023 18mppa		2023 Current Limit		2024 18mppa		2024 Current Limit		2025 19mppa		2025 Current Limit		2028 19mppa		2031 19mppa	
	Daytime	**Night-time**	**Daytime**	**Night-time**	**Daytime**	**Night-time**	**Daytime**	**Night-time**	**Daytime**	**Night-time**	**Daytime**	**Night-time**	**Daytime**	**Night-time**	**Daytime**	**Night-time**
B737-700	36	0	32	0	37	0	35	0	39	0	n/a	0	39	0	0	0
B737-800 / 73H	3588	551	3229	465	2835	529	2665	448	824	132	n/a	121	541	49	0	0
B737-900	189	40	170	34	189	40	178	34	190	40	n/a	36	190	40	0	0
B757	n/a	128	n/a	108	n/a	128	n/a	109	n/a	129	n/a	117	n/a	129	0	129
B767-200	0	0	0	0	0	0	0	0	0	0	n/a	0	0	0	0	0
B767-300	0	0	0	0	0	0	0	0	0	0	n/a	0	0	0	0	0
B787-800 / 900	17	0	15	0	17	0	16	0	17	0	n/a	0	29	0	29	0
Dash 8	0	0	0	0	0	0	0	0	0	0	n/a	0	0	0	0	0
DO328	0	0	0	0	0	0	0	0	0	0	n/a	0	0	0	0	0
E135/145	340	0	306	0	353	0	332	0	366	0	n/a	0	366	0	366	0
E175/195	n/a	n/a	n/a	n/a	10	n/a	10	n/a	11	n/a	n/a	n/a	11	n/a	11	0
F10062	0	0	0	0	0	0	0	0	0	0	n/a	0	0	0	0	0
OTHER	7120	81	6408	68	7389	84	6945	71	7660	87	n/a	79	7631	90	7600	78
Total	34706	4994	31235	4210	35003	4997	32903	4232	35331	5007	n/a	4566	34849	5002	34987	4765

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Appendix 8C
Noise modelling report

LONDON LUTON AIRPORT

A11060-N67-DR

07 July 2022

ES ADDENDUM – NOISE CONTOURING METHODOLOGY

1.0 INTRODUCTION

London Luton Airport Operations Limited (LLAOL) made a Section 73 application for an increase in their annual passenger limit to 19 million passengers per annum (mppa), and for an increase in the limits on the area of the 57 dB daytime and 48 dB night time noise contours. For both contours there is a short term limit that applies until the end of 2027 and a lower long term limit that applies from 2028 onwards.

Bickerdike Allen Partners LLP (BAP) have produced noise contours for an number of scenarios, which are included in an addendum to the Environmental Statement (ES) prepared to accompany the application. This appendix details the methodology for the production of these noise contours. It follows the same format as the corresponding appendix in the 2012 ES, specifically *Appendix H Appendix N03 Detailed Noise Input Data, Methodology and Airport Noise Contours*.

The latest contours and those in the 2012 ES, have been prepared by Bickerdike Allen Partners LLP (BAP) based on actual and forecast future movements provided by London Luton Airport Operations Limited (LLAOL). These include the actual and expected number of movements by the individual aircraft types.

The ES addendum contains contours for the following scenarios:

- Existing Condition 10 2023
- 2023 18mppa (Proposed Short Term Contour Area Limit)
- Existing Condition 10 2024
- 2024 18mppa (Worst Intermediate Year)
- Existing Condition 10 2025
- 2025 19mppa
- Existing Condition 10 2028
- 2028 19mppa (Proposed Long Term Contour Area Limit)
- 2031 19mppa

Details of the noise contour methodology for these scenarios are given below.

2.0 SOFTWARE

The overall $L_{Aeq,T}$ contours were produced using the version 7.0d of the Federal Aviation Administration (FAA) Integrated Noise Model (INM). This is relatively minor update of version 7.0c which was used to produce the contours presented in the 2012 ES.

To produce the number above contours (N65 and N60) the INM software was used in conjunction with the Transport Noise Information Package (TNIP Expert v2.3b) from the Australian Government Department of Transport and Regional Services.

3.0 GEOGRAPHICAL INFORMATION

Geographical information about the location and height of the runway have been taken from the UK Aeronautical Information Package (AIP) for London Luton Airport. This is unchanged from the information used in the 2012 ES.

As before the INM study includes the effect of local topography. The data is based on the Ordnance Survey Landform Panorama product and then processed for input into the INM model.

4.0 AIRCRAFT OPERATIONS

The basis for the summer noise contours are the aircraft movements during a 92 day summer period. Specifically, the movements from the 16th June to the 15th September inclusive were used. This is the standard summer period used when producing noise contours in the U.K. This period represents a worst case as it includes the peak period at the airport due to holidays. For annual contours, the movements across the whole year are considered.

4.1 Traffic Distribution by Aircraft Type

The forecast of future aircraft operations used within this assessment are presented in Appendix 8B of the ES addendum.

4.2 Flight Tracks and Dispersion

Arrivals at London Luton Airport (LLA) use Standard Arrival Routes (STARs), which involve straight final approaches with the aircraft typically joining the extended centreline of the runway around 8 nautical miles from the thresholds. Arrivals are therefore modelled as straight approaches, along the runway centreline.

Departures use the published Standard Instrument Departures (SIDs) given in the UK Aeronautical Information Publication (AIP). The use of the departure flight tracks is monitored by the Airport’s track keeping system. The tracks flown are also available to view via the Airport’s web site using the TraVis system.

A number of the SIDs are initially similar close to the airport. Therefore, a set of six modelled representative departure tracks, three from each runway end, for use in the INM model were generated based on actual tracks flown. The traffic has then been dispersed from these representative tracks as described below.

The dispersion model has the assumption that there are three "dispersed" tracks associated with each departure route; these comprise the representative track of each route and one sub-track either side. The allocation of departure movements to each track is as follows:

• 68.26 % along the representative track;

• 15.87 % along each of the two sub-tracks either side of the representative track.

This dispersion model is that assumed by the INM software when it generates the sub-tracks from the actual tracks. These assumptions are identical to those used for the previous contours.

The same set of modelled flight tracks were used to produce all the noise contours. The departure tracks to the east and the arrival tracks are the same as those used for the 2012 ES, but those to the west have been revised to reflect an airspace change and also the adjustments to an on route bearing to counter the natural drift in magnetic north.

4.3 Flight Profiles

For the departure movements the INM model offers a number of standard flight profiles for most aircraft types, particularly for the larger aircraft types. These relate to different departure weights which are greatly affected by the length of the flight, and consequently the fuel load.

In the INM the weight is referred to as the stage length. Stage lengths occur in increments of 500 up to 1500 nmi and then in increments of 1000 nmi. As the stage length increases the aircraft has to depart with greater fuel and so its flight profile is slightly lower than when a shorter stage length is flown.

Following long term measurement of aircraft departures in southern Luton and discussion with airlines the standard flight profiles were supplemented with custom profiles for the Airbus A319 and A320 and the Boeing 737-800. These better reflected the operational procedures flown and also improved the correlation between measured and predicted noise levels, when considering both the results from southern Luton and the fixed monitors of the airport’s noise and track keeping system. This change occurred after the 2012 ES, so the earlier contours used standard flight profiles.

For the departure movements the appropriate stage lengths were determined from the destinations, which were provided in the forecasts. For the 2012 ES contours the stage length was similarly set for each departing aircraft based on its destination. In some cases, particularly for smaller aircraft, profiles do not exist in the INM model for the stage lengths flown. In these cases, the closest available stage length was used.

4.4 Traffic Distribution by Route

For all scenarios, the modelled route usage is the average of the summer activity in the five years (2015-2019). This five-year average split of departures by route is summarised in Table 1.

Runway	Modelled Departure Route	Percentage of Runway Departures
08	E1	11%
	E2	52%
	E3	38%
26	CPT_260	38%
	DVR_9Y	51%
	OLY_260	11%

Table 1: Modelled departure route usage (2015-2019 average)

4.5 Traffic Distribution by Runway

For all the scenarios, the modelled runway usage is the average of the summer activity in the five years (2015 to 2019). This five-year average split by runway is given in Table 2.

Runway	Percentage of Movements
08	22%
26	78%

Table 2: Modelled runway usage (2015-2019 average)

4.6 Future Aircraft Types

For all the scenarios, the modelled performance of the modernised aircraft types has been based on current aircraft types available in the INM, but with an allowance for their expected lower noise levels.

The modelled change in noise for the A320neo compared with the A320ceo has been derived from measured noise levels from Luton Airport in 2018. The modelled change in noise levels for the A321neo are based on measured results in 2018 and the first half of 2019, due to it only beginning regular operations late in 2018.

The modelled change in noise for the Boeing 737 MAX compared with the 737-800 are based on a comparison of certification noise levels. The modelled changes in noise levels for the modernised aircraft are detailed in Table 3.

Modernised Aircraft Type	Current Aircraft Type	Change in Modernised Aircraft Noise	
		Arrivals	Departures
Airbus A320neo	Airbus A320ceo	-1.0 dB	-3.8 dB
Airbus A321neo	Airbus A321ceo	0.0 dB	-1.9 dB
Boeing 737 MAX	Boeing 737-800	-2.2 dB	-3.0 dB

Table 3: Latest modelled change in noise produced by modernised aircraft types

At the time of the 2012 ES none of the modernised aircraft types had flown, let alone been certificated or entered service. Consequently, assumptions were made on their expected performance, and these are detailed in Table 4.

Modernised Aircraft Type	Current Aircraft Type	Change in Modernised Aircraft Noise	
		Arrivals	Departures
Airbus A319neo	Airbus A319	-3.0 dB	-3.0 dB
Airbus A320neo	Airbus A320	-3.0dB	-3.0 dB
Airbus A321neo	Airbus A321	-3.0 dB	-3.0 dB
Boeing 737 MAX	Boeing 737-800	-3.0 dB	-3.0 dB

Table 4: 2012 ES modelled change in noise produced by modernised aircraft types

Comparing Tables A3 and A4 shows a similar overall modelled improvement from departures, but a decrease in the modelled improvement from arrivals. The Airbus A319neo has only sold in very limited numbers and does not feature in the latest forecast so is not included in Table 3.

5.0 VALIDATION OF INM MODEL

To provide a check of the methodology used for producing the regular noise contours for London Luton Airport (LLA) a validation exercise has been conducted annually for several years. This involves the comparison of predicted noise levels for individual operations by key aircraft types with the measured noise levels obtained from the Noise and Track Keeping (NTK) system.

For all the scenarios the results of the validation exercise used to produce the actual contours for 2019 at the airport were used and are summarised below.

The validation exercise for the 2019 actual contours was based on the then most recent set of annual measured results from the airport's NTK system, the data for 2018. The exercise considered the most common and loudest aircraft types. The measured sound exposure levels (SELs) obtained for the three main aircraft types operating at Luton Airport, the Airbus A319ceo, Airbus A320ceo, and the Boeing 737-800, from the fixed Noise Monitoring Terminals (NMTs) in 2018 are shown in Table 5. These are the averages of thousands of results in 2018 for each operation. Table 5 also includes the noise levels from the Validated INM Prediction. These are generally very similar to the measured noise levels, being less than 1 dB different.

Aircraft Type	Operation	Movement-Weighted NMT Noise Level, SEL dB(A)	
		2018 Average[1]	Validated INM Prediction
Airbus A319ceo	Arrival	84.7	84.5
	Departure	83.6	84.2
Airbus A320ceo	Arrival	84.4	84.2
	Departure	83.9	84.5
Boeing 737-800	Arrival	85.7	86.5
	Departure	86.2	86.0

Table 5: Comparison of Measured Sound Exposure Levels – Fixed NMTs

[1] Average based on results from specific NMTs exposed by each operation.

Measured noise levels for each aircraft type vary to some degree year on year. BAP have reviewed the average measured arrival and departure noise levels for the A320ceo, the most common type, over the period 2014-2018. The highest arrival noise levels occurred in 2018, the highest departure noise levels occurred in 2014.

To allow for this variation in noise level, for all the future scenarios the modelled noise level for the A320ceo on departure has been increased to the 2014 level, which is 0.7 dB higher than that in 2018. The arrival noise levels have not been altered.

Appendix 8D
Not used – See July 2021 Update to Volume 2 Noise Chapter (41431RR20V3NA)

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Appendix 8E
Noise - L_{Aeq} Assessment results

Table 8E.1.1 Comparisons of operational noise levels ($L_{Aeq,T}$ dB) for existing 18 mppa condition 10 2021 – 2027 and for Proposed Development years 2023 to 2025 contour areas sq.km

Contour Level, $L_{Aeq,T}$	2023 Condition 10 Noise Limit	2024 Condition 10 Noise Limit	2025 Condition 10 Noise Limit	Proposed Scheme 2023 18 mppa	Proposed Scheme 2024 18 mppa	Proposed Scheme 2025 19 mppa
Daytime dB $L_{Aeq,16hr}$						
51	53.6	53.7	53.5	57.6	56.1	53.5
52	46.1	46.2	46.1	49.4	48.1	46.1
53	39.3	39.4	39.4	42.3	41.2	39.4
54	33.3	33.4	33.3	36.0	35.0	33.3
55	28.0	28.0	28.0	30.2	29.4	28.0
56	23.3	23.3	23.3	25.4	24.5	23.3
57	19.4	19.4	19.4	21.1	20.4	19.4
58	16.0	16.0	16.0	17.4	16.8	16.0
59	13.1	13.2	13.2	14.3	13.9	13.2
60	11.0	11.0	11.0	11.9	11.6	11.0
61	9.3	9.3	9.3	10.0	9.7	9.3
62	7.9	7.9	7.9	8.5	8.3	7.9
63	6.6	6.6	6.6	7.1	6.9	6.6
64	5.4	5.4	5.4	5.9	5.7	5.4

Contour Level, $L_{Aeq, T}$	2023 Condition 10 Noise Limit	2024 Condition 10 Noise Limit	2025 Condition 10 Noise Limit	Proposed Scheme 2023 18 mppa	Proposed Scheme 2024 18 mppa	Proposed Scheme 2025 19 mppa
65	4.4	4.4	4.4	4.8	4.7	4.4
66	3.4	3.5	3.5	3.9	3.7	3.5
67	2.7	2.7	2.7	3.0	2.9	2.7
68	2.1	2.2	2.2	2.4	2.3	2.2
69	1.8	1.8	1.8	1.9	1.9	1.8
Night time dB $L_{Aeq, 8hr}$						
45	60.6	60.5	60.4	68.5	68.2	64.5
46	51.3	51.3	51.2	58.1	57.9	54.8
47	43.8	43.8	43.7	49.3	49.1	46.6
48	37.2	37.2	37.2	42.1	41.9	39.8
49	31.2	31.2	31.2	35.6	35.4	33.5
50	25.8	25.8	25.8	29.8	29.7	28.0
51	21.5	21.5	21.5	24.6	24.5	23.1
52	17.8	17.8	17.8	20.5	20.4	19.2
53	14.8	14.8	14.8	17.0	16.9	16.0
54	12.1	12.1	12.2	14.1	14.0	13.2
55	10.1	10.1	10.1	11.5	11.5	10.8
56	8.5	8.5	8.5	9.6	9.6	9.1
57	7.1	7.1	7.1	8.1	8.1	7.7
58	5.9	5.9	5.9	6.8	6.8	6.4

Contour Level, $L_{Aeq,\,T}$	2023 Condition 10 Noise Limit	2024 Condition 10 Noise Limit	2025 Condition 10 Noise Limit	Proposed Scheme 2023 18 mppa	Proposed Scheme 2024 18 mppa	Proposed Scheme 2025 19 mppa
59	4.8	4.8	4.8	5.6	5.6	5.2
60	3.8	3.8	3.9	4.5	4.5	4.2
61	3.0	3.0	3.0	3.6	3.6	3.4
62	2.3	2.3	2.3	2.8	2.8	2.6

Table 8E.1.2 Comparisons of operational noise levels ($L_{Aeq,\,T}$ dB) for existing 18 mppa condition 10 2021 – 2027 and for Proposed Development years 2023 to 2025 number of dwellings

Contour Level, $L_{Aeq,\,T}$	2023 Condition 10 Noise Limit	2024 Condition 10 Noise Limit	2025 Condition 10 Noise Limit	Proposed Scheme 2023 18 mppa	Proposed Scheme 2024 18 mppa	Proposed Scheme 2025 19 mppa
Daytime dB $L_{Aeq,16hr}$						
51	14227	14551	14530	16282	15427	14530
52	10697	10756	10742	12176	11533	10742
53	8478	8446	8466	9332	9083	8466
54	7168	7172	7184	7736	7532	7184
55	6353	6323	6323	6779	6620	6323
56	5094	5094	5094	5491	5265	5094
57	4572	4572	4544	4714	4667	4544
58	3722	3729	3729	4050	3920	3729
59	2926	2935	2890	3315	3250	2890
60	2018	2059	2047	2455	2279	2047
61	1479	1591	1591	1737	1665	1591

Contour Level, $L_{Aeq, T}$	2023 Condition 10 Noise Limit	2024 Condition 10 Noise Limit	2025 Condition 10 Noise Limit	Proposed Scheme 2023 18 mppa	Proposed Scheme 2024 18 mppa	Proposed Scheme 2025 19 mppa
62	888	888	888	1172	1090	888
63	639	639	639	744	688	639
64	423	449	449	566	483	449
65	267	267	267	347	339	267
66	7	7	7	9	9	7
67	7	7	7	7	7	7
68	3	3	3	7	7	3
69	0	0	0	0	0	0
Night time dB $L_{Aeq, 8hr}$						
45	19589	19617	19608	24602	24518	22190
46	14027	13988	14002	18493	18379	16320
47	9760	9808	9752	12741	12724	11048
48	7725	7725	7712	9131	9078	8332
49	6731	6724	6709	7494	7483	7126
50	5281	5281	5281	6364	6182	5728
51	4659	4689	4659	5222	5222	4918
52	3854	3854	3854	4460	4460	4078
53	3203	3203	3202	3728	3728	3411
54	2104	2104	2104	2915	2866	2600
55	1671	1671	1671	1993	1993	1840

Contour Level, $L_{Aeq, T}$	2023 Condition 10 Noise Limit	2024 Condition 10 Noise Limit	2025 Condition 10 Noise Limit	Proposed Scheme 2023 18 mppa	Proposed Scheme 2024 18 mppa	Proposed Scheme 2025 19 mppa
56	1052	1052	1052	1457	1457	1313
57	720	720	720	892	892	750
58	456	456	456	635	635	633
59	352	352	359	455	455	406
60	42	42	45	282	270	124
61	8	8	8	8	8	8
62	5	5	5	7	7	7

Table 8E.1.3 Comparisons of operational noise levels ($L_{Aeq, T}$ dB) for existing 18 mppa condition 10 2021 – 2027 and for Proposed Development years 2023 to 2025 population

Contour Level, $L_{Aeq, T}$	2023 Condition 10 Noise Limit	2024 Condition 10 Noise Limit	2025 Condition 10 Noise Limit	Proposed Scheme 2023 18 mppa	Proposed Scheme 2024 18 mppa	Proposed Scheme 2025 19 mppa
Daytime dB $L_{Aeq,16hr}$						
51	32959	33531	33449	37565	35560	33449
52	24970	25133	25075	28294	26832	25075
53	19389	19330	19370	21410	20866	19370
54	16442	16427	16469	17717	17283	16469
55	14530	14456	14456	15483	15153	14456
56	11885	11885	11885	12756	12259	11885
57	10606	10606	10525	10908	10804	10525
58	8602	8614	8614	9320	8988	8614

Contour Level, $L_{Aeq, T}$	2023 Condition 10 Noise Limit	2024 Condition 10 Noise Limit	2025 Condition 10 Noise Limit	Proposed Scheme 2023 18 mppa	Proposed Scheme 2024 18 mppa	Proposed Scheme 2025 19 mppa
59	6983	7006	6889	7734	7610	6889
60	5122	5244	5218	6006	5643	5218
61	3809	4078	4078	4449	4259	4078
62	2327	2327	2327	3055	2863	2327
63	1735	1735	1735	2000	1863	1735
64	1129	1209	1209	1538	1296	1209
65	715	715	715	943	922	715
66	16	16	16	21	21	16
67	16	16	16	16	16	16
68	6	6	6	16	16	6
69	0	0	0	0	0	0
Night timedB $L_{Aeq, 8hr}$						
45	45064	45132	45125	57121	56956	51138
46	32080	31982	32004	42560	42288	37437
47	22262	22383	22255	29302	29258	24966
48	17805	17805	17776	20874	20779	19259
49	15418	15398	15366	17211	17178	16328
50	12211	12211	12211	14538	14158	13217
51	10775	10820	10775	12073	12073	11257
52	8897	8897	8897	10291	10291	9380

Contour Level, $L_{Aeq, T}$	2023 Condition 10 Noise Limit	2024 Condition 10 Noise Limit	2025 Condition 10 Noise Limit	Proposed Scheme 2023 18 mppa	Proposed Scheme 2024 18 mppa	Proposed Scheme 2025 19 mppa
53	7495	7495	7494	8633	8633	7970
54	5350	5350	5350	6942	6827	6335
55	4281	4281	4281	5062	5062	4709
56	2753	2753	2753	3750	3750	3389
57	1954	1954	1954	2337	2337	2019
58	1226	1226	1226	1733	1733	1724
59	950	950	977	1224	1224	1080
60	122	122	130	757	723	360
61	20	20	20	20	20	20
62	12	12	12	16	16	16

*Current Condition 10 daytime limit is 19.4 sq.km
**Current Condition 10 night-time limit is 37.2 sq.km

Table 8E.2.1 Comparisons of operational noise levels ($L_{Aeq, T}$ dB) for 2028 Scenarios contour areas sq.km

Contour Level, $L_{Aeq, T}$	2028 Condition 10 Noise Limit	Proposed Scheme 2028 19 mppa	Proposed Scheme 2031 19 mppa	Baseline 2028 12.4 mppa
Daytime dB $L_{Aeq,16hr}$				
51	44.5	45.3	43.1	45.6
52	37.9	38.7	36.7	39.0
53	31.9	32.6	30.8	32.8
54	26.5	27.1	25.4	27.4
55	22.1	22.6	21.3	22.8

Contour Level, $L_{Aeq, T}$	2028 Condition 10 Noise Limit	Proposed Scheme 2028 19 mppa	Proposed Scheme 2031 19 mppa	Baseline 2028 12.4 mppa
56	18.3	18.7	17.6	18.9
57	15.2	15.5	14.7	15.5
58	12.5	12.8	12.1	12.7
59	10.4	10.6	10.0	10.4
60	8.7	8.9	8.4	8.5
61	7.3	7.5	7.1	7.1
62	6.1	6.2	5.9	5.9
63	5.0	5.1	4.8	4.8
64	4.0	4.1	3.9	3.8
65	3.2	3.2	3.0	3.0
66	2.4	2.5	2.3	2.4
67	2.0	2.0	1.9	2.0
68	1.7	1.7	1.6	1.7
69	1.4	1.4	1.4	1.4
Night time dB $L_{Aeq,8hr}$				
45	52.5	58.4	52.9	57.0
46	44.4	49.5	44.6	48.8
47	37.7	42.0	37.6	41.9
48	31.6	35.5	31.5	35.6
49	26.1	29.6	26.2	29.9

Contour Level, $L_{Aeq, T}$	2028 Condition 10 Noise Limit	Proposed Scheme 2028 19 mppa	Proposed Scheme 2031 19 mppa	Baseline 2028 12.4 mppa
50	21.6	24.5	21.5	24.9
51	18.1	20.3	18.0	20.8
52	15.0	17.0	15.1	17.2
53	12.4	14.1	12.5	14.3
54	10.2	11.6	10.3	11.8
55	8.6	9.6	8.6	9.9
56	7.2	8.1	7.2	8.2
57	6.0	6.8	6.0	6.9
58	4.9	5.6	4.9	5.7
59	3.9	4.5	3.9	4.6
60	3.1	3.6	3.1	3.7
61	2.4	2.8	2.4	2.9
62	1.9	2.2	1.9	2.2

Table 8E.2.2 Comparisons of operational noise levels ($L_{Aeq, T}$ dB) for 2028 Scenarios number of dwellings

Contour Level, $L_{Aeq, T}$	2028 Condition 10 Noise Limit	Proposed Scheme 2028 19 mppa	Proposed Scheme 2031 19 mppa	Baseline 2028 12.4 mppa
Daytime dB $L_{Aeq,16hr}$				
51	9876	10226	9558	9788
52	7898	8106	7645	7771
53	6801	6990	6640	6741

Contour Level, $L_{Aeq,T}$	2028 Condition 10 Noise Limit	Proposed Scheme 2028 19 mppa	Proposed Scheme 2031 19 mppa	Baseline 2028 12.4 mppa
54	5452	5632	5325	5456
55	4704	4849	4664	4650
56	4098	4116	3877	3867
57	3291	3360	3222	3078
58	2401	2576	2136	2133
59	1737	1815	1695	1473
60	1133	1238	1047	892
61	746	746	720	641
62	562	633	489	447
63	359	399	359	282
64	121	121	8	9
65	8	8	8	8
66	7	7	5	5
67	0	0	0	0
68	0	0	0	0
69	0	0	0	0
Night time dB $L_{Aeq,8hr}$				
45	15488	19438	16591	16626
46	10550	13742	11467	11730
47	7914	9545	8310	8986

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Contour Level, $L_{Aeq, T}$	2028 Condition 10 Noise Limit	Proposed Scheme 2028 19 mppa	Proposed Scheme 2031 19 mppa	Baseline 2028 12.4 mppa
48	6765	7457	6784	7510
49	5291	6111	5323	6408
50	4677	5146	4711	5314
51	3792	4415	3769	4560
52	3115	3546	2845	3844
53	2142	2838	2129	3056
54	1702	1977	1716	2183
55	1057	1428	968	1483
56	724	892	724	892
57	456	635	458	641
58	352	440	392	455
59	123	233	123	270
60	8	11	8	8
61	5	8	5	7
62	0	3	0	3

Table 8E.2.3 Comparisons of operational noise levels ($L_{Aeq, T}$ dB) for 2028 Scenarios population

Contour Level, $L_{Aeq, T}$	2028 Condition 10 Noise Limit	Proposed Scheme 2028 19 mppa	Proposed Scheme 2031 19 mppa	Baseline 2028 12.4 mppa
Daytime dB $L_{Aeq,16hr}$				
51	22556	23377	21878	22346

Contour Level, $L_{Aeq,T}$	2028 Condition 10 Noise Limit	Proposed Scheme 2028 19 mppa	Proposed Scheme 2031 19 mppa	Baseline 2028 12.4 mppa
52	18155	18657	17581	17927
53	15595	16016	15185	15497
54	12608	13027	12279	12625
55	10892	11175	10809	10754
56	9448	9483	8958	8984
57	7699	7853	7558	7314
58	5868	6274	5417	5322
59	4449	4643	4336	3788
60	2951	3209	2743	2337
61	2009	2009	1954	1744
62	1518	1724	1308	1194
63	977	1059	977	757
64	352	352	20	21
65	20	20	20	20
66	16	16	12	10
67	0	0	0	0
68	0	0	0	0
69	0	0	0	0
Night time dB $L_{Aeq,8hr}$				
45	35433	44729	38066	38151

Contour Level, $L_{Aeq,T}$	2028 Condition 10 Noise Limit	Proposed Scheme 2028 19 mppa	Proposed Scheme 2031 19 mppa	Baseline 2028 12.4 mppa
46	23793	31303	25895	27116
47	18189	21728	18939	20673
48	15494	17175	15541	17264
49	12222	14068	12326	14629
50	10780	11861	10807	12304
51	8751	10171	8717	10563
52	7277	8294	6769	8908
53	5462	6750	5436	7266
54	4352	5027	4389	5466
55	2764	3692	2558	3815
56	1964	2337	1964	2337
57	1226	1733	1235	1744
58	950	1178	1032	1224
59	359	613	359	723
60	20	28	20	20
61	12	20	12	16
62	0	6	0	6

Appendix 8F
Noise - L_{Amax} Assessment data

Table 8F.1 Old aircraft, dB L_{Amax} (non-residential)

Location	A320 ceo Arr 26	A320ceo Arr 08	A320ceo Dep SL2 26	A320ceo Dep SL2 08	737-800 Arr 26	737-800 Dep SL2 26	737-800 Dep SL3 26	A321ceo Dep SL3 26
Old Knebworth Lodge Farm	37	14	31	64	41	37	37	33
Caddington	24	75	56	40	32	61	61	63
Park Town, Luton	38	63	73	56	44	77	77	82
Whitwell	53	25	41	63	57	48	48	46
Breachwood Green	65	25	40	74	68	47	47	45
St Pauls Walden	64	22	36	70	67	44	44	42
Farley Hill School Luton	28	60	59	44	35	64	64	67
Slip End	28	54	77	44	35	78	79	82
Harpenden Children's Home	28	28	45	40	35	50	49	47
Walkern	61	6	21	38	60	29	29	25
Stevenage (Eastern Perimeter)	63	8	22	45	66	31	31	27
Stevenage Station	65	13	26	62	69	36	36	32
Luton (Wandon End)	52	44	63	68	57	68	68	68
Kensworth	16	70	43	30	25	47	48	45
Hudnall Corner	11	36	43	24	20	48	47	44
Flamstead	21	30	64	36	29	67	67	66
Markyate	20	42	68	35	28	70	71	69

Table 8F.2 New aircraft, dB L_{Amax} (non-residential)

Location	A320 neo Arr 26	A320neo Arr 08	A320neo Dep SL2 26	A320neo Dep SL2 08	737 MAX 8 Arr 26	737 MAX 8 Dep SL2 26	737 MAX 8 Dep SL3 26	A321neo Dep SL3 26
Old Knebworth Lodge Farm	36	13	26	59	39	34	34	31
Caddington	23	74	52	35	30	58	58	61
Park Town, Luton	37	62	69	52	42	74	74	80
Whitwell	52	24	36	58	54	45	45	44
Breachwood Green	64	24	35	69	66	44	44	43
St Pauls Walden	63	21	32	65	65	41	41	40
Farley Hill School Luton	27	59	55	40	33	61	61	65
Slip End	27	53	73	40	33	75	76	80
Harpenden Children's Home	27	27	41	36	33	47	46	45
Walkern	60	5	16	34	58	26	26	23
Stevenage (Eastern Perimeter)	62	7	18	41	64	28	28	25
Stevenage Station	64	12	22	57	67	33	33	30
Luton (Wandon End)	51	43	59	64	55	65	65	66
Kensworth	15	69	39	25	22	44	45	43
Hudnall Corner	10	35	39	19	18	45	44	42
Flamstead	20	29	59	32	27	64	64	64
Markyate	19	41	63	31	26	67	68	67

Table 8F.3 Residential, dwellings, old aircraft

dB L_{Amax}	A320 ceo Arr 26	A320ceo Arr 08	A320ceo Dep SL2 26	A320ceo Dep SL2 08	737-800 Arr 26	737-800 Dep SL2 26	737-800 Dep SL3 26	A321ceo Dep SL3 26
80	4	170	176	24	18	683	796	2573
81	1	165	5	5	16	359	481	1937
82	1	105	5	4	16	209	338	1517
83	1	34	2	4	4	8	8	1046
84	0	0	0	3	4	5	4	770
85	0	0	0	0	1	2	2	607
86	0	0	0	0	1	2	2	394
87	0	0	0	0	0	0	2	346
88	0	0	0	0	0	0	0	60
89	0	0	0	0	0	0	0	2
90	0	0	0	0	0	0	0	0
91	0	0	0	0	0	0	0	0
92	0	0	0	0	0	0	0	0
93	0	0	0	0	0	0	0	0
94	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0
96	0	0	0	0	0	0	0	0
97	0	0	0	0	0	0	0	0
98	0	0	0	0	0	0	0	0
99	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0
Total	7	474	188	40	60	1268	1633	9252

Table 8F.4 Residential, dwellings, new aircraft

dB L_{Amax}	A320 neo Arr 26	A320neo Arr 08	A320neo Dep SL2 26	A320neo Dep SL2 08	737 MAX 8 Arr 26	737 MAX 8 Dep SL2 26	737 MAX 8 Dep SL3 26	A321neo Dep SL3 26
80	1	165	0	3	16	8	8	1517
81	1	105	0	0	4	5	4	1099
82	1	34	0	0	1	2	2	779
83	0	0	0	0	1	2	2	607
84	0	0	0	0	1	0	2	467
85	0	0	0	0	0	0	0	346
86	0	0	0	0	0	0	0	138
87	0	0	0	0	0	0	0	2
88	0	0	0	0	0	0	0	0
89	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0
91	0	0	0	0	0	0	0	0
92	0	0	0	0	0	0	0	0
93	0	0	0	0	0	0	0	0
94	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0
96	0	0	0	0	0	0	0	0
97	0	0	0	0	0	0	0	0
98	0	0	0	0	0	0	0	0
99	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0
Total	3	304	0	3	23	17	18	4955

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Appendix 8G
Noise - N-Contours report

LONDON LUTON AIRPORT

A11060-N68-DR

24 June 2022

N65 & N60 Contours

1.0 INTRODUCTION

London Luton Airport Operations Limited (LLAOL) made a Section 73 application for an increase in their annual passenger limit to 19 million passengers per annum (mppa), and for an increase in the limits on the area of the 57 dB daytime and 48 dB night time noise contours. For both contours there is a short term limit that applies until the end of 2027 and a lower long term limit that applies from 2028 onwards.

Bickerdike Allen Partners LLP (BAP) have produced N65 and N60 number above contours for an addendum to the Environmental Statement (ES) prepared to accompany the application.

Number above contours outline the extent of the area exposed to at least a certain L_{Amax} noise level at least a certain number of times. An N65, 200 contour outlines the area exposed to at least 65 dB L_{Amax} at least 200 times in the period it is for, typically the day (07:00 – 22:59). Due to the nature of these contours they can be very sensitive to small changes in the movements used to produce them. For instance, if an airport had 190 movements per day it would have no N65, 200 contour, however this doesn't mean that the 190 movements are not significant. Equally if the airport had ten extra movements there would be an N65 200 contour, although any impact of the 10 extra movements is likely to be small.

Number above contours are often formed by the common area exposed by the combination of L_{Amax} footprints for various operations. If there were 15 arrivals and 10 departures neither operation on its own would be sufficient to generate an N65 25 contour. However, in combination they do reach the threshold of 25 movements and therefore the N65 25 contour would be the outline of the area where the 65 dB L_{Amax} footprints of the arrivals and departures overlap.

There are a number of examples of small changes in the number of aircraft movements having a relatively large impact of the size of the number above contours prepared for the ES addendum. This note reports the areas and the number of people and dwellings within the contours and provides context for understanding the differences between those representing the current and proposed limits.

2.0 NUMBER ABOVE CONTOURS

Number Above Contours have been prepared for four scenarios, these are:

- Existing Condition 10 2023. These are based on the 2023 18mppa scenario below, but with the forecast movements factored down in order to achieve 57 dB $L_{Aeq,16h}$ daytime and 48 dB $L_{Aeq,8h}$ night-time contour areas equal to the Existing Condition 10 contour area limits that apply up to the end of 2027.
- 2023 18mppa. The 57 dB $L_{Aeq,16h}$ daytime and 48 dB $L_{Aeq,8h}$ night-time contour areas for this scenario are the proposed contour area limits up to the end of 2027.
- Existing Condition 10 2028. These are based on the 2028 19mppa scenario below, but with the forecast movements factored down in order to achieve 57 dB $L_{Aeq,16h}$ daytime and 48 dB $L_{Aeq,8h}$ night-time contour areas equal to the Existing Condition 10 contour area limits that apply from 2028 onwards.
- 2028 19mppa. The 57 dB $L_{Aeq,16h}$ daytime and 48 dB $L_{Aeq,8h}$ night-time contour areas for this scenario are the proposed contour area limits from 2028 onwards

2.1 Daytime N65 Contours

2.1.1 2023 Scenarios

N65 contours have been produced at values of 25, 50, 100 and 200 for the daytime period (07:00-22:59) based on average summer day movements for the Existing Condition 10 2023 and 2023 18mppa scenarios. These are shown in the attached Figures A11060-S73-79 and A11060-S73-81 respectively. The areas of these contours and the number of people and dwellings within them are shown in Table 1 below. Table 2 shows a summary of the average summer day movements in terms of arrivals and departures by runway direction for the 2023 scenarios.

Contour Value (N65)	Contour Area (km^2)		Dwellings		Population	
	Existing Condition 10 2023	2023 18mppa	Existing Condition 10 2023	2023 18mppa	Existing Condition 10 2023	2023 18mppa
25	72.8	77.1	20,983	22,219	48,555	51,555
50	46.2	48.6	10,701	11,858	24,551	27,364
100	29.3	32.5	5,602	6,405	13,156	14,824
200	2.9	3.6	7	13	16	27

Table 1: Summer daytime N65 contour areas, and dwelling and population counts

Operation (Runway)	Average Summer Day Representative Movements	
	Existing Condition 10 2023	2023 18mppa
Westerly Arrivals (Rwy 26)	130	144
Easterly Arrivals (Rwy 08)	37	41
Westerly Departures (Rwy 26)	135	150
Easterly Departures (Rwy 08)	38	43

Table 2: Average summer day movements[1]

2.1.2 2023 N65 25 Contours

In both cases the N65 25 contour is based on the combination of footprints for each of the four basis operations as they all have over 25 movements a day. The contour based on the proposed limits scenario is larger. This is due to the increased movements resulting in the footprints of some noisier types contributing.

2.1.3 2023 N65 50 Contours

The N65 50 contours for both scenarios are based on the combination of footprints for westerly operations. The N65 contour for the 2023 18mppa scenario is larger. This is due to the increased movements resulting in the footprints of some noisier types contributing.

2.1.4 2023 N65 100 Contours

The N65 100 contours for both scenarios are based on the combination of footprints for westerly operations as they have over 100 movements a day each. The contour based on the 2023 18mppa scenario is larger. This is due to the increased movements resulting in the footprints of some noisier types contributing.

2.1.5 2023 N65 200 Contours

The N65 200 contours for both scenarios are similar in shape. The contour based on the 2023 18mppa scenario is larger.

In both cases to the east of the airport the contours are based on the overlap of the footprints for the westerly arrivals and those for the westerly departures to reach the threshold of 200 movements. As the contour is based on the start of roll noise from westerly departures it does not extend far beyond the east end of the runway.

[1] Movements are rounded to the nearest whole number

To the west of the airport the contours are formed by the overlap of footprints for the westerly departures, easterly arrivals and the easterly departures. As the contour is based on start of roll noise from easterly departures it doesn't extend far beyond the west end of the runway.

2.1.6 2028 Scenarios

N65 contours were produced at values of 25, 50, 100 and 200 for the daytime period (07:00-22:59) based on average summer day movements for the Existing Condition 10 2028 and 2028 19mppa scenarios. These are shown in the attached Figures A11060-S73-83 and A11060-S73-85 respectively. The areas of these contours and the number of people and dwellings within them are shown in Table 3 below. Table 4 shows a summary of the average summer day movements in terms of arrivals and departures by runway direction for the 2028 scenarios.

Contour Value (N65)	Contour Area (km^2)		Dwellings		Population	
	Existing Condition 10 2028	2028 19mppa	Existing Condition 10 2028	2028 19mppa	Existing Condition 10 2028	2028 19mppa
25	54.0	54.6	13,737	13,842	31,454	31,715
50	37.0	37.5	7,995	8,075	18,246	18,430
100	25.8	26.3	4,875	4,934	11,340	11,506
200	3.1	3.2	7	13	16	27

Table 3: Summer daytime N65 contour areas, and dwelling and population counts

Operation (Runway)	Average Summer Day Representative Movements	
	Existing Condition 10 2028	2028 19mppa
Westerly Arrivals (Rwy 26)	141	145
Easterly Arrivals (Rwy 08)	40	41
Westerly Departures (Rwy 26)	147	150
Easterly Departures (Rwy 08)	42	43

Table 4: Average summer day movements[2]

2.1.7 2028 N65 25 Contours

In both cases the N65 25 contour is based on the combination of footprints for each of the operations as they all have over 25 movements a day. The contour based on the 2028 19mppa scenario is slightly larger than that based on the Existing Condition 10 scenario.

[2] Movements are rounded to the nearest whole number

2.1.8 2028 N65 50 Contours

The N65 50 contours for both scenarios are based on the combination of footprints for westerly operations. The contour based on the 2028 19mppa scenario is larger. This is due to the increased movements resulting in the footprints of some noisier types contributing.

2.1.9 2028 N65 100 Contours

The N65 100 contours for both scenarios are based on the combination of footprints for westerly operations as they all have over 100 movements a day. The contour based on the 2028 19mppa scenario is larger. This is due to the increased movements resulting in the footprints of some noisier types contributing.

2.1.10 2028 N65 200 Contours

The N65 200 contours for both scenarios are similar in shape. The contour based on the 2028 19mppa scenario is larger. This is due to the increased movements resulting in the footprints of some noisier types contributing.

In both cases to the east of the airport the contours are based on the overlap of the footprints for the westerly arrivals and those for the westerly departures to reach the threshold of 200 movements. As the contour is based on the start of roll noise from westerly departures it does not extend far beyond the east end of the runway.

To the west of the airport the contours are formed by the overlap of footprints for the westerly departures, easterly arrivals and the easterly departures. As the contour is based on start of roll noise from easterly departures it doesn't extend far beyond the west end of the runway.

2.2 Night Time N60 Contours

2.2.1 2023 Scenarios

N60 contours have been produced at values of 25 and 50[3] for the night time period (23:00-06:59) based on average summer night movements for the Existing Condition 10 2023 and 2023 18mppa scenarios. These are shown in the attached Figures A11060-S73-80 and A11060-S73-82 respectively. The areas of these contours and the number of people and dwellings within them are shown in Table 5 below. Table 6 shows a summary of the average summer night movements in terms of arrivals and departures by runway direction for the 2023 scenarios.

[3] There are insufficient night time movements to generate an N60 100 or 200 contour under either of the 2023 scenarios, or to generate an N60 50 contour under the Existing Condition 10 scenario.

Contour Value (N60)	Contour Area (km^2)		Dwellings		Population	
	Existing Condition 10 2023	2023 18mppa	Existing Condition 10 2023	2023 18mppa	Existing Condition 10 2023	2023 18mppa
25	5.8	21.0	67	1,702	180	4,223
50	-	1.0	-	0	-	0
100	-	-	-	-	-	-
200	-	-	-	-	-	-

Table 5: Summer night time N60 contour areas, and dwelling and population counts

Operation (Runway)	Average Summer Night Representative Movements	
	Existing Condition 10 2023	2023 18mppa
Westerly Arrivals (Rwy 26)	20	24
Easterly Arrivals (Rwy 08)	6	7
Westerly Departures (Rwy 26)	15	18
Easterly Departures (Rwy 08)	4	5

Table 6: Average summer night movements[1]

2.2.2 2023 N60 25 Contours

The 2023 18mppa night time N60 25 contour is larger in area and contains more dwellings and population than the Existing Condition 10 2023 scenario. This is due to the 2023 18mppa contour extending further east, over Stevenage, and further west, over a portion of south Luton.

The Existing Condition 10 2023 contour to the east of the airport is based on the overlap of the footprints for the 20 westerly arrivals and the 15 westerly departures. As the contour is based on the start of roll noise from westerly departures it does not extend far beyond the east end of the runway. The 2023 18mppa scenario has more movements, and so contour to the east is based on the overlap of the footprints for the 24 westerly arrivals and the 5 easterly departures. This ends around Stevenage where some of the departures turn off the extended runway centreline.

To the west of the airport the 2023 18mppa contour is formed by the overlap of the footprints for the 18 westerly departures and 7 easterly arrivals. It ends where the arrival and departure routes diverge. The combination of westerly departures and easterly arrivals is only 21 movements under the Existing Condition 10 2023 scenario. The contour to the west of the airport is therefore based on the combination of these movements and the 4 easterly departures. As the contour is based on the start of roll noise from easterly departures it does not extend far beyond the west end of the runway.

2.2.3 2023 N60 50 Contours

There are insufficient movements in the Existing Condition 10 2023 scenario to generate an N60 50 contour. The 2023 18mppa N60 50 contour is formed by the overlap of the footprints for the 18 westerly departures, the 24 westerly arrivals, the 5 easterly departures and the 7 easterly arrivals, which between them are sufficient to reach the contour threshold. The contour is largely contained within the airport site and contains no people or dwellings.

2.2.4 2028 Scenarios

N60 contours were produced at values of 25 and 50[4] for the night time period (23:00-06:59) based on average summer night movements for the Existing Condition 10 2028 and 2028 19mppa scenarios. These are shown in the attached Figures A11060-S73-84 and A11060-S73-86 respectively. The areas of these contours and the number of people and dwellings within them are shown in Table 7 below. Table 8 shows a summary of the average summer night movements in terms of arrivals and departures and runway direction for the 2028 scenarios.

Contour Value (N60)	Contour Area (km^2)		Dwellings		Population	
	Existing Condition 10 2028	2028 19mppa	Existing Condition 10 2028	2028 19mppa	Existing Condition 10 2028	2028 19mppa
25	11.6	20.0	247	2,005	627	5,124
50	-	1.0	-	0	-	0
100	-	-	-	-	-	-
200	-	-	-	-	-	-

Table 7: Summer night time N60 contour areas, and dwelling and population counts

Operation (Runway)	Average Summer Night Representative Movements	
	Existing Condition 10 2028	2028 19mppa
Westerly Arrivals (Rwy 26)	21	24
Easterly Arrivals (Rwy 08)	6	7
Westerly Departures (Rwy 26)	16	18
Easterly Departures (Rwy 08)	4	5

Table 8: Average summer night movements[1]

[4] There are insufficient night time movements to generate an N60 100 or 200 contour under either of the 2028 scenarios, or to generate an N60 50 contour under the Existing Condition 10 scenario.

2.2.5 2028 N60 25 Contours

The night time N60 25 contour shows increases in both area and the number of dwellings and population from the Existing Condition 10 to the 19mppa scenario. This is due to the 19mppa contour extending further east, over Stevenage, and further west, over portion of south Luton.

The Existing Condition 10 contour to the east of the airport is based on the overlap of the footprints for the 21 westerly arrivals and 4 easterly departures, to just reach the threshold of 25 movements. This ends before Stevenage where some of the departures turn off the extended runway centreline. The 19mppa scenario has more movements, and the 3 additional westerly arrivals combined with the approximately 50% of easterly departures that turn off the extended runway centreline around 2.5km later are sufficient to exceed the threshold of 25. This causes an extension of the contour towards Stevenage, as the contour only ends when all of the departures have turned off the extended runway centreline.

To the west of the airport the 19mppa contour is formed by the overlap of the footprints for the 18 westerly departures and 7 easterly arrivals. It ends where the arrival and departure routes begin to diverge. The combination of westerly departures and easterly arrivals is only 21 movements under the Existing Condition 10 scenario and therefore is insufficient to generate a 25 contour to the west of the airport.

2.2.6 2028 N60 50 Contours

There are insufficient movements in the Existing Condition 10 scenario to generate an N60 50 contour. The 19mppa N60 50 contour is formed by the overlap of the footprints for the 18 westerly departures, the 24 westerly arrivals, the 5 easterly departures and the 7 easterly arrivals, which between them are sufficient to reach the contour threshold. The contour is largely contained within the airport site and contains no people or dwellings.

3.0 SUMMARY

BAP have produced number above contours for an environmental statement addendum prepared to accompany an application to vary Luton airport's planning conditions. The contours have been produced for four scenarios representing the airport's existing short term and long term limits, and the proposed short term and long term limits being applied for. The areas and the number of dwellings and population within the contours have been presented.

Some of the contours are noticeably larger than others, particularly at night, despite relatively small increases in the numbers of movements used to produce them. The individual contributions of easterly and westerly arrivals and departures to the contours have been discussed to provide context regarding these increases in contour size.

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for Bickerdike Allen Partners

David Charles
Partner

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Appendix 8H
Not used – See July 2021 Update to Volume 2 Noise Chapter (41431RR20V3NA)