East Woodstock

Noise Assessment Report

Report 14/0299/R01

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Vanbrugh Unit Trust

Pye Homes Ltd

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Attachments

1 Introduction

1.1 Planning permission is being sought for the development of an area of land to the south east of Woodstock in Oxfordshire. The proposed site is to comprise up to 1,500 dwellings, football stadium, primary school, local centre, care village, open space, employment and a link and ride facility. All residences and the primary school have the potential to be affected by noise from surrounding sources.

1.2 The A44 and A4095 roads have been identified as key sources of noise in the vicinity of the site. In addition, London Oxford Airport lies immediately to the south east of the site which again has the potential to generate noise at the site.

1.3 This report forms part of an Environmental Impact Assessment and details the required noise control strategy to protect the proposed noise sensitivities to be developed at the site.

1.4 The methodology and results of noise surveys undertaken at the site are provided and the subsequent detailed assessment is set out, with reference to guidance in the NPPF[1], NPSE[2], PPG[3], BS8233[4] and local planning policy.

2 Site Description

2.1 The proposed development site is located to the south east of Woodstock. The plot of land falls under the jurisdiction of two district authorities, West Oxfordshire District Council to the northwest and Cherwell District Council for the remaining section. A plan showing the location of the proposed development site is attached as figure 14/0299/SP01.

2.2 To the north west of the site lies an existing residential area and secondary school with an adjoining playing field. Along the south western boundary runs the A44 (Oxford Road), beyond which is located Blenheim Palace and associated grounds.

2.3 The residential property known as the Pest House is located on a limb of land which protrudes some 220 metres into the site from the north.

2.4 To the north of the site is an area of farmland which was planted with crops at the time of survey. The A4095 (Upper Campsfield Road) runs along the south eastern boundary of the site. There are a small number of residential properties located along this road near to the proposed development site.

[1] National Planning Policy Framework (2012)
[2] Noise Policy Statement for England (2010)
[3] Planning Practice Guidance (2014)
[4] BS 8233:2014 Guidance on sound insulation and noise reduction for buildings

2.5 To the south east beyond the A4095 lies London Oxford (Kidlington) Airport which is home to a number of aviation operations including the *Oxford Aviation Academy* – a pilot training centre. The airport has two operational runways; these are designated as 11/29 and 01/19, the latter being the most frequently used. Runway 01/19 runs broadly parallel to the south eastern boundary of the proposed development site whereas 11/29 runs perpendicular to it. There is also a Grass Runway (Designated as 03/21) on the London Oxford Airport site which is thought to be infrequently used.

2.6 The main runway (01/19) was strengthened in 2007 to allow for a greater number of larger aircraft to utilise the airport. Generally speaking, the airport caters for single and twin engine propeller aircraft, smaller jet aircraft and helicopters.

3 Planning Policy and Local Guidance

3.1 National Planning Policy Framework (NPPF)

3.1.1 The National Planning Policy Framework (NPPF), published in March 2012, is currently the relevant document for defining the national policy towards noise sensitive development. It refers to the Noise Policy Statement for England (NPSE), which is discussed in the subsequent section.

3.1.2 The current policy on sustainable development influences the emphasis of any noise assessment. The development of a quiet, rural site is by most measures less sustainable than the development of a site located near existing infrastructure and facilities. The rating of development sites based on prevailing noise levels should now reflect this.

3.1.3 Specifically on the subject of noise, paragraph 123 of NPPF states:

Planning policies and decisions should aim to:

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

3.1.4 Paragraph 123 makes reference to the Noise Policy Statement for England and no other particular standards.

3.1.5 On the general issue of amenity, paragraph 17 of the NPPF states that planning should:

Always seek to secure high quality design and a good standard of amenity for all existing and future occupants of land and buildings

3.2 Noise Policy Statement for England (NPSE)

3.2.1 This government document, published in 2010, does not set quantitative guidelines for the suitability of noise sensitive development in an area depending on the prevailing levels of noise. Absent, therefore, is reference to specific noise thresholds (e.g. the Noise Exposure Categories as defined in Planning Policy Guidance 24 (PPG 24) and referred to in section 3.4 of this report) which determine whether noise sensitive development is suitable and, if so, whether particular mitigation factors need to be considered.

3.2.2 Instead, the NPSE sets out three aims:

The first aim of the Noise Policy Statement for England

Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

The second aim of the Noise Policy Statement for England

Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

The third aim of the Noise Policy Statement for England

Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

3.2.3 Paragraph 2.24 states that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life. It also states that this does not mean that such adverse effects cannot occur.

3.2.4 In essence, therefore, each development site must be judged on its ability to deliver on each of the stated aims. Quantifying the prevailing noise levels is therefore an essential first step in assessing a given site.

3.2.5 The NPSE refers to SOAEL, the Significant Observed Adverse Effect Level. This is defined as the level above which significant adverse impacts on health and quality of life can be observed. Given the overall thrust of the NPSE, the SOAEL is therefore an important assessment standard although the document also comments that:

"It is not possible to have a single objective noise based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times."

3.2.6 Attention is drawn to the fact that the SOAEL is the level above which *significant* adverse effects can be observed. It is therefore necessary to set out a framework for developing appropriate assessment standards for different receptor locations and at different times in keeping with the advice on SOAEL. Importantly, it should be noted that the overall objective is to avoid or minimise significant adverse impacts; some degree of impact is acceptable and it is not necessary to seek to achieve no impact at all.

3.3 Planning Practice Guidance (PPG)

3.3.1 The Department for Communities and Local Government (DCLG) launched the Planning Practice Guidance (PPG)[5] in 2014.

3.3.2 The PPG on noise expands upon the NPPF and NPSE and sets out more detailed guidance on noise assessment. Like the NPPF and NPSE, the guidance does not include any specific noise levels but sets out further principles that should underpin an assessment.

3.3.3 The PPG includes a section on noise, in which paragraph 003 states:

"Local planning authorities' plan-making and decision taking should take account of the acoustic environment and in doing so consider:

- *whether or not a significant adverse effect is occurring or likely to occur;*
- *whether or not an adverse effect is occurring or likely to occur; and*
- *whether or not a good standard of amenity can be achieved."*

3.3.4 It then refers to the NPSE and states that the aim is to identify where the overall effect of the noise exposure falls in relation to Significant Observed Adverse Effect Level [6] (SOAEL), the Lowest Observed Adverse Effect Level [7] (LOAEL) and the No Observed Effect Level [8] (NOEL).

3.3.5 The guidance then presents a table, which is reproduced as table T1 overleaf. The implication of the final line of the table is that only the 'noticeable and very disruptive' outcomes are unacceptable and should be prevented. All other outcomes (i.e. all other lines in the table) can be acceptable, depending upon the specific circumstances and factors such as the practicalities of mitigation.

[5] Planning Policy Guidance (NPPG), Department for Communities & Local Government, (2013)
[6] The level of noise exposure above which significant adverse effects on health and quality of life occur.
[7] The level of noise exposure above which adverse effects on health and quality of life can be detected.
[8] The level of noise exposure below which no effect at all on health or quality of life can be detected.

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
		Lowest Observed Adverse Effect Level	
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; closing windows for some of the time because of the noise. Potential for non-awakening sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
		Significant Observed Adverse Effect Level	
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. having to keep windows closed most of the time, avoiding certain activities during periods of intrusion. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

T1 Summary of Noise Exposure Hierarchy (from NPPG)

3.3.6 Under the topic of further considerations relating to mitigating the impact of noise on residential developments, the PPG states in paragraph 009:

"The noise impact may be partially off-set if the residents of those dwellings have access to:

- *a relatively quiet facade (containing windows to habitable rooms) as part of their dwelling, and/or;*
- *a relatively quiet external amenity space for their sole use, (e.g. a garden or balcony). Although the existence of a garden or balcony is generally desirable, the intended benefits will be reduced with increasing noise exposure and could be such that significant adverse effects occur, and/or;*
- *a relatively quiet, protected, nearby external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings, and/or;*
- *a relatively quiet, protected, external publically accessible amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minutes walking distance)."*

3.3.7 This is not to say that access to the above items is mandatory, rather that it can help to offset any noise impacts.

3.4 Revoked Planning Policy Guidance 24, Planning and Noise (PPG24)

3.4.1 The Department of Environment document Planning Policy Guidance 24: Planning and Noise (1994) is no longer used at a national level to determine the suitability or otherwise of a given site for noise sensitive development, since it was revoked when the NPPF was published.

3.4.2 PPG24 permitted noise sensitive development in areas subject to low levels of environmental noise while discouraging noise sensitive development in areas subject to high levels of environmental noise. This method of assessment of the suitability of sites for residential development is now outdated following the revocation of PPG24.

3.4.3 In addition, the NPPF states that:

"the policies in the Local Plan (and the London Plan) should not be considered out of date simply because they were adopted prior to the publication of this Framework."

3.4.4 Many Local Plan policies were formulated and adopted based on the advice set out in PPG24. Where this is the case such guidance may still be appropriate when considering the development potential of a given site. In addition, reference documents cited in PPG 24 do have some relevance in developing policies for local authorities. We refer to these below.

3.4.5 In PPG 24 there were certain sound level thresholds above which it was recommended that planning permission be refused for residential use. These thresholds were derived on the basis that it is necessary to achieve acceptable internal noise levels, together with a fundamental

assumption that there existed a maximum level of sound insulation which was achievable against external noise.

3.4.6 The maximum level of sound insulation that was applied to derive the external noise thresholds set out in PPG 24 was based on the technology then available for upgrading existing properties. Even at the time of its publication, new properties that incorporated higher standards of insulation were able to be developed. In addition, since then there have been developments in sound insulating products, meaning that it is feasible to design buildings that achieve good standards of internal amenity even when external noise levels are high.

3.4.7 PPG24 stated in the introduction:

"The aim of this guidance is to provide advice on how the planning system can be used to minimise the adverse impact of noise without placing unreasonable restrictions on development…"

3.4.8 It went on to state:

"This guidance introduces the concept of Noise Exposure Categories (NECs), ranging from A-D to help local planning authorities in their consideration of applications for residential development near transport related noise sources."

3.4.9 NECs are described in detail in Annex 1 to PPG24, paragraph 1 of which stated:

"When assessing a proposal for residential development near a source of noise, local planning authorities should determine into which of the four noise exposure categories (NECs) the proposed site falls, taking account of both day and night-time noise levels. Local planning authorities should then have regard to the advice in the appropriate NEC, as below:

NEC

A *Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as a desirable level.*

B *Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection against noise.*

C *Planning permission should not normally be granted. Where it is considered that permission should be given, for example because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.*

D *Planning permission should normally be refused."*

3.4.10 The recommended ranges of daytime (07:00h to 23:00h) noise levels for different types of transportation noise source are shown in the table below.

	PPG24 Noise Exposure Category and Noise Level, dB $L_{Aeq,T}$			
Noise Source	**A**	**B**	**C**	**D**
Road Traffic	<55	55-63	63-72	>72
Rail Traffic	<55	55-66	66-74	>74
Air Traffic	<57	57-66	66-72	>72
Mixed Sources	<55	55-63	63-72	>72

T2 Noise levels corresponding to the PPG24 Noise Exposure Categories for New Dwellings

3.4.11 The values described above refer to noise levels on an open site, measured away from existing buildings and 1.2m to 1.5m above ground level. Notes to the table in PPG24 make it clear that when undertaking noise measurements at a site, all typical noises should be included in the measurements.

3.4.12 The guidance relates specifically to transportation dominant noise sources such as road and air traffic.

3.4.13 For example, under PPG24 a site affected by road traffic noise falling into NEC 'A' was regarded as unencumbered by noise issues, since the guidance states that noise need not be considered as a determining factor in granting planning permission.

3.4.14 The boundary between categories 'A' and 'B' represents the point at which the design of the proposed development would need to start to take into account the noise incident upon the site (for example through appropriate orientation of dwellings or the provision of enhanced glazing where necessary).

3.5 Local Planning Guidance

West Oxfordshire District Council (WODC)

3.5.1 The WODC Adopted Local Plan (ALP) 2011 (Adopted 2006) contains specific policy BE19 which relates to noise in a general sense. It states the following:

Planning permission will not be granted for:

a) housing and other noise sensitive development if the occupants would experience significant noise disturbance from existing or proposed development;

b) development including the use of land, if because of the noise it will create, the occupants of housing and other noise sensitive development would be exposed to significant noise disturbance, unless there is an overriding need for the proposal which cannot be met elsewhere.

3.5.2 This policy will be addressed both by the assessment contained within this document and also the accompanying Environmental Impact Assessment.

3.5.3 Janice Bamsey a planning officer with WODC has advised that this is the only piece of current local planning policy that the local authority has specifically relating to noise.

3.5.4 It should be noted that this local authority's Draft Local Plan (2011-2029) is intended to replace both the of the above policies with "Core Policy 22" which states the following with regard to noise:

"Noise

Housing and other noise sensitive development should not take place in areas where the occupants would experience significant noise disturbance from existing or proposed development. New development should not take place in areas where it would cause unacceptable nuisance to the occupants of nearby land and buildings from noise or disturbance."

3.5.5 This section of the policy broadly reflects existing policy BE19 however it should be noted that we are advised that this policy carries little weight as it has not yet been formally examined or adopted.

Cherwell District Council (CDC)

3.5.6 The Cherwell District Plan Local Plan (Adopted 1996) contains a number of specific policies which are relevant to the proposed development site. These are identified below:

ENV1 - Development which is likely to cause materially detrimental levels of noise, vibration, smell, smoke, fumes or other type of environmental pollution will not normally be permitted.

ENV6 - Developments at Oxford Airport which, either directly or indirectly, would be likely to increase noise nuisance will be resisted.

3.5.7 It is understood that these policies are to be retained in the proposed Cherwell Local Plan (2011-2031) and that no other specific development management policies are to be introduced with regard to noise.

3.6 Local Consultation

3.6.1 Contact has been made with Neil Shellard, an Environmental Health Officer at WODC and with Rob Lowther, an Environmental Health Officer at CDC.

3.6.2 Mr Shellard advised that other than usual national planning policy (and the single local policy detailed previously), WODC have no other specific guidance with regard to noise criteria. It was expressed however that any criteria used to assess the site should be consistent across both Councils.

3.6.3 Mr Lowther has also made similar comments as Mr Shellard with regard to the lack of specific local policy with the exception of those detailed above. The various criteria for acceptable internal and external noise levels, suggested in the following section, have been agreed by both Mr Lowther and Mr Shellard.

3.6.4 Discussion was also had specifically regarding aviation noise in terms of assessment, with a particular emphasis given to rotary aircraft movements (partly due to their character, such as blade slap). With regard to both fixed wing aircraft and rotary movements, both EHOs agreed that they *"…would be looking to see, where practicable, these two noise sources appraised separately and then collectively…"*.

3.7 Aviation Noise

Revoked Planning Policy Guidance (PPG24)

3.7.1 Annex 3 of PPG 24 contains detailed guidance on assessment of noise from different sources, and the following key points need to be made in relation to aircraft noise.

3.7.2 In paragraph 7:

Using forecast contours, it should be possible to determine approximately which areas are likely to fall within the different noise exposure categories. For small aerodromes local planning authorities should not rely solely on Leq where this is based on about less than 30 movements a day. Local planning authorities should also be aware that in some circumstances the public perceive general aircraft noise levels as more disturbing than similar levels around major airports.

3.7.3 In paragraph 8:

Recommended noise exposure categories for new dwellings exposed to aircraft noise are given in Annex 1, but 60 Leq dB(A) should be regarded as a desirable upper limit for major new noise sensitive development.

3.7.4 It must be noted that the NEC's contained in PPG 24 in relation to aircraft noise apply only in respect of airborne aircraft noise. In paragraph 11 it states:

"In addition to noise from aircraft landing or taking off, noise from aerodromes is likely to include activities such as engine testing as well as ground movements."

3.7.5 While it recognises that airborne aircraft noise is not the only issue to be considered in the planning context, it offers no specific guidance as to what standards should be used for the assessment of ground sources of aircraft noise.

Airborne Aircraft Noise Effects on the Community

3.7.6 The many studies which have been carried out in order to define the relationship between annoyance caused to the surrounding community and aircraft noise have found the best correlation to be with the maximum noise per flyover and the number of flyovers in any period.

3.7.7 Historically the Noise and Number Index (NNI) was used to quantify aircraft noise, although this has been replaced by the energy averaged noise level, L_{Aeq}. When presented over a 16 hour (07h00 to 23h00) daytime period and an 8 hour (23:00h to 07:00h) night time period, this is regarded as an appropriate descriptor of the noise climate.

3.7.8 For commercial airports, the standard practice is to produce noise contours for different values of L_{Aeq} around the site. For the daytime period, the annoyance categories which are used stem from the findings presented in the 1985 United Kingdom Aircraft Noise Index Study (ANIS)[9], published by the Directorate of Research of the CAA.

3.7.9 The study included an extensive survey of residents at 10 sites around major UK airports and found that there was sufficiently good correlation between the 24 hour noise index and community annoyance for it to replace NNI as the descriptor of choice. The Department of Transport, in adopting the findings of the study, in fact settled on the use of the 16 hour L_{Aeq} index as the descriptor of community annoyance. For the sites chosen for the study there is generally a close relationship between the 24 hour and 16 hour (07:00h to 23:00h) values. In terms of community reaction at 57dB L_{Aeq}, the following responses were reported:

57dB $L_{Aeq, 16h}$: 25% of the population find the noise is not acceptable

57dB $L_{Aeq, 24h}$: 25% of the population are very highly annoyed by the noise.

3.7.10 57dB L_{Aeq16h} was identified equating to the onset of significant community disturbance. From this it can be seen that even at aircraft noise levels below the "low annoyance" threshold for communities, there are likely to be some people annoyed by aircraft noise.

3.7.11 The findings of the study have been used to classify the noise levels which correlate with different degrees of overall community annoyance. They are, for commercial airports, set out in the following table:

Annoyance Category	$L_{Aeq,16h}$ **(dB)**
Low	57
Moderate	63
High	69

T3 Results of ANIS Study: Community Annoyance Categories

3.7.12 A more recent study was carried out and completed in 2007, which was designed to update the work undertaken in 1982 as part of the ANIS study. ANASE[10] concluded that there was an indication that people have become relatively more sensitive to aircraft noise since 1982 and

[9] Dora Report 9023: Aircraft Noise Index Study 1985
[10] ANASE: Attitudes to Noise from Aviation Sources in England

that the number of people expressing themselves as 'highly annoyed' at a particular noise exposure has increased.

3.7.13 The ANASE study also indicated that people were becoming more sensitive to the numbers of aircraft movements as opposed to higher noise levels emitted from single or small numbers of movements.

3.7.14 There have been, however, a number of criticisms of the ANASE survey methodology and a consensus at national government level that reliance cannot be placed on its results. As a result, its findings have not been incorporated into current national planning or aviation policy.

Aviation Policy Framework

3.7.15 The Aviation Policy Framework (APF)[11] was published in March 2013 and states (Executive Summary, paragraph 17):

Our overall objective on noise is to limit and where possible reduce the number of people in the UK significantly affected by aircraft noise.

3.7.16 The same paragraph goes on to say:

To achieve this, we want to incentivise noise reduction and mitigation, and we also want to encourage better engagement between airports and local communities and greater transparency to facilitate informed debates.

3.7.17 Section 3 of the document deals with noise and other local environmental impacts, and proposes to continue to ensure that noise exposure maps are produced at the noise-designated airports (Heathrow, Gatwick and Stansted) down to a level of 57dB $L_{Aeq,16h}$. The Government will continue to treat the 57dB $L_{Aeq,16h}$ contour as the average level of daytime aircraft noise marking the onset of significant community annoyance.

Rotary Aircraft

3.7.18 As noted in section 3.6.4 above, the local authorities have requested that rotary movements are assessed separately and then cumulatively with fixed wing aircraft. The above guidance relates to aviation noise as a whole for a commercial airport which operates a mixture of aircraft types. However there is evidence that suggests helicopter operations can be considered more intrusive and annoying to some people than fixed wing aircraft noise, due to their different noise characteristics. Previous studies of the noise impact around heliports include the London Heliport Study[12].

3.7.19 The conclusions of this report for helicopter noise are that the 16 hour average daytime noise assessment parameter ($L_{Aeq,16h}$) is logical and a particular alternative measure is not proposed.

[11] Aviation Policy Framework, Secretary of State for Transport, March 2013: Cm 8584
[12] London Heliport Study, Department for Transport, March 1995

The report notes that a simple weighting correction is not possible to distinguish helicopter noise from that of fixed wing aircraft (as is sometimes considered for small 'General Aviation' only airfields compared to larger airports which operate commercial air transport flights) but they do recommend plotting the helicopter noise contours down to 54 and 51dB L_{Aeq16h}.

3.7.20 This does not necessarily mean 54 or 51dB are critical thresholds that signify unacceptability, but they can be used as a sensitivity test to indicate where some annoyance might be experienced by some people. On the above basis, in line with the London Heliport Study, the noise contours for rotary aircraft may be plotted separately from fixed wing, illustrating the contours in 3dB increments down below 57dB to 54 and 51dB $L_{Aeq,16h}$.

3.7.21 The findings of the study have been used for a number of helicopter noise assessments and have been relied on to correlate the particular character of helicopter noise, including blade slap, with community annoyance.

3.7.22 The general operations of all aircraft operating at the Airport (fixed wing and rotary together) have been plotted in a combined contour, and assessed against the wider aviation criteria described above, with the contours plotted down to 54dB $L_{Aeq,16h}$.

3.7.23 This approach of assessment and criteria was agreed as suitable by the EHOs representing both Cherwell and West Oxon District Councils.

4 Acoustic Criteria

4.1 Internal Noise

4.1.1 Buildings can be designed to achieve specific levels of insulation against external noise. It is reasonable, therefore, to set specific internal noise standards as the test of whether a development satisfies the requirements of the NPPF and the aims of the NPSE. In essence, these require a high quality design that achieves a good standard of amenity.

4.1.2 BS 8233:2014 provides guidance for the control of noise in and around buildings. For dwellings, BS 8233 gives the following guidance on internal ambient noise levels:

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

Note 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.

T4 Table 4 of BS 8233:2014

4.1.3 The above design standards apply to the time period appropriate for the activity involved. The WHO document on which the standards are based is the Guidelines for Community Noise (World Health Organisation, 1999). The document sets out guideline values for suitable noise levels in communities and identifies that the daytime noise standard applies to a normal 16 hour day while the night time noise standard applies to an 8 hour night. In BS8233 the latter is classified as 23:00h to 07:00h.

4.1.4 A high quality design that achieves a good standard of internal amenity will ensure that night time noise levels inside bedrooms with windows closed will not exceed 30 dB $L_{Aeq,\ 8h}$. The level of sound insulation achieved by the building should therefore be determined accordingly.

4.1.5 Daytime noise levels can clearly be expected to be higher than the night time noise levels. Achieving a good standard of amenity does not require, therefore, that the same noise level should apply in living rooms or bedrooms during the daytime. However, good amenity will only be maintained providing the daytime internal noise level in living rooms, dining rooms and bedrooms does not exceed 35 dB $L_{Aeq,16h}$, 40 dB $L_{Aeq,16h}$ and 35 dB $L_{Aeq,16h}$ respectively. To avoid needless complication of building fabric requirements, it is suggested that a daytime criterion of 35 dB $L_{Aeq,16h}$ should be used for internal noise levels across all habitable rooms.

4.2 External Noise

4.2.1 Paragraph 7.7.3.2 of BS 8233:2014 indicates that in external amenity spaces it is desirable that the steady noise levels should not exceed 50 dB $L_{Aeq,T}$ and 55 dB $L_{Aeq,T}$ should be regarded as an upper guideline value. The paragraph continues to state the following:

"… it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited."

4.2.2 It can be seen that external noise levels are not proposed to be a controlling index by which suitability of a residential site is defined.

4.2.3 Therefore, when designing noise sensitive developments that incorporate gardens or other external amenity areas, the intent shall be to provide an area for each property in which the noise levels are consistent with these standards. Where these standards cannot be achieved, then reasonable measures shall be employed to provide screening or other forms of mitigation so as to minimise the noise levels in the external amenity areas.

4.2.4 An important principle here is that sustainable development sites will often be exposed to relatively high levels of environmental noise, and while means are available to insulate internal spaces, they are not always available to protect external spaces. This is why the external standards shall be viewed as targets or triggers of mitigation rather than thresholds not to be exceeded in all circumstances.

4.2.5 Strict adherence to the enforcement of such external noise criteria could preclude development in the majority of areas considered for development in semi-urban or urban environments or in areas in the vicinity of transportation noise sources.

4.2.6 This further demonstrates why the external noise standards should be viewed as aspirational targets or triggers of mitigation rather than thresholds not to be exceeded in all circumstances.

4.2.7 The Guidelines for Community Noise (World Health Organisation, 1999) include values for community noise in specific environments. It is important to note that the WHO Guidelines are aspirational, as illustrated by the National Noise Incidence Study (NNIS), published for DEFRA by the Building Research Establishment in 2000, which indicates that 55% of the population of England and Wales are exposed to external noise levels above 55 dB $L_{Aeq,\ day}$. A National Physical Laboratory (NPL) report (with reference CMAM 16, dated September 1998) reviewing the original 1980 WHO Guidelines and the 1995 draft version of the current Guidelines stated:

"*Exceedances of the WHO guideline values do not necessarily imply significant noise impact and indeed, it may be that significant impacts do not occur until much higher degrees of noise exposure are reached.*"

"*As such, it would be unwise to use the WHO guidelines as targets for any form of strategic assessment, since, given the prevalence of existing noise exposure at higher noise levels, there might be little opportunity for and little real need for any across the board major improvements. On the other hand, the most constructive use for the WHO guidelines will be to set thresholds above which greater attention should be paid to the various possibilities for noise control action when planning new developments. It is important to make clear at this point that exceedances do not necessarily imply an over-riding need for noise control, merely that the relative advantages and disadvantages of noise control action should be weighed in the balance.*"

4.2.8 To prevent moderate annoyance in outdoor living areas, such as gardens and balconies of dwellings, the WHO guideline value is 50 dB $L_{Aeq,\ 16h}$. This can be described as an upper limit for the average noise level to prevent moderate annoyance across the daytime and evening

period (07:00h to 23:00h). The corresponding guideline value to prevent serious annoyance is stated as 55 dB $L_{Aeq, 16\ hour}$. However it is again noted that these levels are aspirational in nature.

4.3 Effect Levels for Internal and External Noise

4.3.1 On the basis of all the guidance discussed above, we set out below the potential effect levels relating to the criteria adopted for the proposed residential development at this site. The aim is to avoid any Significant Observed Adverse Effects. However it is noted that even if a Significant Adverse Effect were expected, it would not necessarily indicate that a site was unsuitable for residential development.

4.3.2 Meeting the indoor noise criteria of 35 dB $L_{Aeq, 16\ hour}$ in habitable rooms during the day and 30 dB $L_{Aeq, 8\ hour}$ in bedrooms during the night will ensure that indoor noise levels will be below the Lowest Observable Adverse Effect Level and they will therefore correspond to No Observed Adverse Effect. This is on the basis that the WHO Guidelines state these noise levels as corresponding to the onset of measureable effects.

4.3.3 Where the 55 dB $L_{Aeq, 16\ hour}$ guideline figure for noise levels in gardens can be achieved, this will ensure that outdoor noise levels are well below the Significant Observed Adverse Effect Level. It is worth noting that under the previous planning guidance a site subject to noise levels of less than 55 dB $L_{Aeq, 16\ hour}$ was entirely unconstrained in terms of noise and residential development.

4.3.4 Where the 50 dB $L_{Aeq, 16\ hour}$ desirable ideal figure for noise levels in gardens can be achieved, this will ensure that outdoor noise levels are below the Lowest Observed Adverse Effect Level i.e. they will correspond to No Observed Adverse Effect.

4.4 Aircraft Noise

Airborne Aircraft

4.4.1 Table T1 above sets out a description of the range of effect levels as defined in the NPSE and PPG on noise. Taking into account all the factors discussed throughout sections 3 and 4 above, we set out in the following table proposed airborne aircraft noise levels corresponding to the NPSE effect descriptions.

Effect Level	Noise Level, dB		Typical Action
	Daytime	Night time	
NOEL	$L_{Aeq,16h} \leq 50$	$L_{Aeq,8h} \leq 45$	None required
LOAEL	$50 < L_{Aeq,16h} \leq 54$	$45 < L_{Aeq,8h} \leq 48$	Identify but do not mitigate
	$54 < L_{Aeq,16h} \leq 66$	$48 < L_{Aeq,8h} \leq 57$	Mitigate and reduce to a minimum
SOAEL	$66 < L_{Aeq,16h} < 72$	$57 < L_{Aeq,8h} < 66$	Avoid
UAEL	$L_{Aeq,16h} \geq 72$	$L_{Aeq,8h} \geq 66$	Prevent

T5 Proposed Airborne Aircraft Noise Effect Levels

4.4.2 In the above table there is a part of range above the Lowest Observed Adverse Effect Level (50 to 54dB) for which no mitigation is deemed necessary. This is based on the ANIS study referred to in Section 3.7 above, which found that 54dB $L_{Aeq,16h}$ corresponds to the onset of community annoyance around major airports, in contrast to the value of 57dB $L_{Aeq,16h}$ which corresponds to the onset of *significant* community annoyance.

4.4.3 The threshold between the Lowest and the Significant Observed Adverse Effect Levels (66dB day and 57dB night) is based on the threshold for PPG24 NEC C as it applies to noise from aircraft. If one considers the advice in BS8233:2014 that 35dB $L_{Aeq,16h}$ is the internal standard recommended for good daytime amenity within habitable rooms and pairs this with the advice in PPG24 for civil aircraft noise that 32dB sound level difference can be achieved using good quality thermal double glazing, then a threshold of 67dB $L_{Aeq,16h}$ is defined as the point beyond which special sound insulating measures are required. Taking a prudent approach, the lower of the two values, 66dB $L_{Aeq,16h}$ is indicated as the SOAEL.

4.4.4 The threshold between the Significant and Unacceptable Adverse Effect Levels (72dB day and 66dB night) is based on the threshold for PPG24 NEC D, which indicates that planning permission should normally be refused. Although PPG24 has now been revoked, it is still an important source of information and NEC's are referred to in many LPA noise policy documents.

4.4.5 On the above basis, Significant Observed Adverse Effects are defined for this site as potentially occurring when airborne aircraft noise levels exceed 66dB $L_{Aeq,16h}$ or 57dB $L_{Aeq,8h}$. The aim is therefore to avoid this situation where possible.

4.4.6 The NPSE states in paragraph 2.24 that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life. It also states that this does not mean that such adverse effects cannot occur. Therefore while the aim should be to avoid significant adverse effects (SOAEL in the table), there is no mandatory requirement to prevent them.

4.4.7 For airborne aircraft noise levels in the range 50 to 66dB $L_{Aeq,16h}$ and 45 to 57dB $L_{Aeq,8h}$ effects are expected to occur. In line with current government guidance on aircraft noise, for noise levels in the range 54 to 66dB $L_{Aeq,\ 16\ hour}$ and 48 to 57dB $L_{Aeq,8h}$ the aim shall be to incorporate

mitigation as part of the development. For noise levels in the range 50 to 54dB $L_{Aeq,16h}$ and 45 to 48dB $L_{Aeq,8h}$ the likelihood of noise effects occurring should be identified, although mitigation measures may not necessarily be warranted.

4.4.8 Where airborne aircraft noise levels are predicted to be less than 54dB $L_{Aeq,16h}$ and 48dB $L_{Aeq,8h}$ noise will not be a determining factor when considering the layout and design of the proposed development. Where airborne aircraft noise levels are predicted to be less than 50dB $L_{Aeq,16h}$ and 45dB $L_{Aeq,8h}$ the site can be assessed on the same basis as if aircraft noise were absent.

4.4.9 For the night time period, the noise levels are adjusted to account directly for the differences in NEC threshold values between the daytime and night time values.

4.4.10 So far as external noise levels in gardens and other amenity spaces are concerned, the aim would ideally be to ensure that external noise levels in proposed residential zones due to airborne aircraft do not exceed 50dB $L_{Aeq,16h}$ for the typical summer's day assessment. This aim must, however, be tempered by considering the context of the typical noise levels to which the population at large is exposed (as identified in the BRE Noise Incidence Study 2000), and the fact that sustainable development often requires construction of noise sensitive development in areas that are not inherently quiet or tranquil. Therefore, while 50dB $L_{Aeq,16h}$ can be identified as a preferred goal for external noise levels, it cannot be viewed as a threshold not to be exceeded in all circumstances.

4.4.11 In the case of airborne aircraft noise it would be appropriate to consider the effects of external daytime noise levels against the Government's adopted threshold of 57dB $L_{Aeq,16h}$ which represents the onset of significant community noise disturbance.

Noise from Aircraft on the Ground

4.4.12 Taking into account all the factors discussed throughout section 3 above we set out in the following table proposed ground level aircraft noise levels corresponding to the NPSE effect descriptions.

Effect Level	Noise Level, dB		Typical Action
	Daytime	Night time	
NOEL	$L_{Aeq,16h} \leq 50$	$L_{Aeq,8h} \leq 40$	None required
LOAEL	$50 < L_{Aeq,16h} \leq 55$	$40 < L_{Aeq,8h} \leq 45$	Identify but do not mitigate
	$55 < L_{Aeq,16h} \leq 66$	$45 < L_{Aeq,8h} \leq 57$	Mitigate and reduce to a minimum
SOAEL	$66 < L_{Aeq,16h} < 72$	$57 < L_{Aeq,8h} < 66$	Avoid
UAEL	$L_{Aeq,16h} \geq 72$	$L_{Aeq,8h} \geq 66$	Prevent

T6 Proposed Aircraft Ground Noise Effect Levels

4.4.13 In the above table the No Observed Adverse Effect Level (50dB or less) is based on WHO guidance referred to in section 4.2 above, which found that 50dB $L_{Aeq,16h}$ can be described as an upper limit for the average noise level across the daytime and evening period (07:00h to 23:00h) to prevent moderate annoyance. The 55dB LAeq,16h value is an upper limit to prevent serious annoyance and is therefore taken to be the threshold at which mitigation should be considered.

4.4.14 The threshold between the Lowest and the Significant Observed Adverse Effect Levels (66dB) is based on the threshold for PPG24 NEC C for aircraft noise. If one considers the advice in BS8233:2014 that 35dB $L_{Aeq,16h}$ is the internal standard recommended for good daytime amenity within habitable rooms and pairs this with the advice in PPG24 for civil aircraft noise that 32dB sound level difference can be achieved using good quality thermal double glazing, then a threshold of 67dB $L_{Aeq,16h}$ is defined as the point beyond which special sound insulating measures are required. Taking a prudent approach, the lower of the two values, 66dB $L_{Aeq,16h}$ is indicated as the SOAEL.

4.4.15 The threshold between the Significant and Unacceptable Adverse Effect Levels (72 dB) is based on the threshold for PPG24 NEC D for mixed sources, which indicated that planning permission should normally be refused.

4.4.16 On the above basis, Significant Observed Adverse Effects are defined for this site as potentially occurring when noise levels from aircraft on the ground exceed 66dB $L_{Aeq,16h}$. The aim is therefore to avoid this situation where possible.

4.4.17 The NPSE states in paragraph 2.24 that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life. It also states that this does not mean that such adverse effects cannot occur. Therefore while the aim should be to avoid significant adverse effects (SOAEL in the above table), there is no mandatory requirement to prevent them.

4.4.18 For ground based aircraft noise levels in the range 50 to 66dB $L_{Aeq,16h}$ effects are expected to occur. In line with the noise insulation schemes adopted at many UK airports, for noise levels in the range 55 to 66dB $L_{Aeq,16h}$ the aim will be to provide inherent mitigation as part of the development, in the form of suitable glazing and ventilation systems to ensure reasonable internal noise levels. For noise levels in the range 50 to 55dB $L_{Aeq,16h}$, the likelihood of noise effects occurring should be identified, although specific mitigation measures would not be warranted.

4.4.19 Where ground based aircraft noise levels are predicted to be less than 55dB $L_{Aeq,16h}$, noise will not be a determining factor when considering the layout and design of the proposed development.

4.4.20 Where ground based aircraft noise levels are predicted to be less than 50dB $L_{Aeq,16h}$, the site can be assessed on the same basis as if aircraft noise were entirely absent.

4.4.21 For the night time period, the noise levels are adjusted to account directly for the differences in NEC threshold values for mixed sources between the daytime and night time values.

4.4.22 Similar to airborne aircraft noise, for external noise the aim will be to ensure that levels in proposed residential zones due to airborne aircraft do not exceed 50dB $L_{Aeq,16h}$ for the typical summer's day assessment. As for airborne aircraft noise, this aim must, however, be tempered by considering the context of the typical noise levels to which the population at large is exposed (as identified in the BRE Noise Incidence Study 2000), and the fact that sustainable development often requires construction of noise sensitive development in areas that are not inherently quiet or tranquil. Therefore, while 50dB $L_{Aeq,16h}$ can be identified as a preferred goal for external noise levels, it cannot be viewed as a threshold not to be exceeded in all circumstances.

4.5 Noise from Mechanical Services (Plant)

4.5.1 The noise impact on existing dwellings as a result of any mechanical services associated with the proposed development should be controlled. The likelihood of complaints from such fixed items of plant at any neighbouring residential buildings can be assessed based on guidance contained in BS 4142:2014.

4.5.2 According to this standard, the rating level of the noise from the item of plant is determined and compared to the existing measured L_{A90} background noise level for that period. It states:

"The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact."

4.5.3 It also notes that:

"A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context."

"A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context."

"Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."

4.5.4 On this basis we therefore recommend that plant noise at existing residences should typically be designed to 5dB below the measured background noise level, so as to only marginally increase the background noise level by no more than 1dB.

4.5.5 However, in instances of low background noise, it is not considered reasonable to design plant noise levels to 5dB beneath the L_{A90} background; we would in these circumstances recommend a reasonable minimum plant noise emission limit in absolute terms of 30dB(A). In the previous version of BS 4142 (1997) it noted that *"rating levels below 35dB are considered very low"*. The current version of BS 4142 states:

"Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night."

4.5.6 Taking the typical loss through a partially open window of 10-15dB(A), the proposed minimum plant noise limit of 30dB(A) would result in levels no greater than 20dB(A) within any nearby property, which is 10dB(A) lower than the standard for bedrooms indicted in BS 8233:2014.

4.5.7 The only variation to this will be for emergency plant items such as sprinkler systems, smoke extract fans and emergency generators. These would be used during emergencies and to test that the systems work. It is proposed that testing of the systems is limited to daytime only and the plant noise limits for these items are relaxed to 10 dB above the existing background noise level during the testing period.

4.6 Summary of All Proposed Acoustic Criteria

4.6.1 Based on the above, the following noise level criteria are proposed:

- Daytime internal $L_{Aeq,16h}$ to all habitable rooms no greater than 35dB.
- Night time internal $L_{Aeq,8h}$ to all bedrooms no greater than 30dB.
- Daytime $L_{Aeq,16h}$ in outdoor amenity areas ideally no greater than the aspirational 55dB although below 50dB is desirable.

- For airborne aviation noise specifically, the internal criteria are as noted above, while for external noise an aspirational daytime $L_{Aeq,16h}$ in outdoor amenity is adjusted to 54dB.
- For ground borne aviation noise specifically, the same internal criteria apply, while for external noise an aspirational daytime $L_{Aeq,16h}$ in outdoor amenity is adjusted to 55dB.

- Plant noise limits will be set based upon the times of operation of the plant to ensure that background noise levels are not elevated by more than 1dBA; however, for periods when background noise levels are low, a limit of 30dBA will be applied.

5 Noise Survey

5.1.1 An unattended noise survey was undertaken at three locations across the site, from 11:00h on the 14th August 2014 to 07:30h on 20th August 2014.

5.1.2 Three measurement positions were located as shown in attached figure 14/0299/SP01 and described below:

- MP1: Located approximately 30 metres away from the edge of the nearside kerb of the A4095. This position was chosen to quantify noise from traffic on this road and also to determine the noise contributions from aircraft activity at and around London Oxford Airport.

- MP2: Located approximately 12 metres from the nearside kerb of the A44. This measurement position was chosen to quantify noise from road traffic.

- MP3: Located at the boundary of the existing residential area to the north west of the site. This position was chosen to quantify both noise levels at the existing residences and also the noise likely to be experienced by the proposed residences located away from the main roads.

5.1.3 The sound level meter utilised at position MP1 was able to capture audio recording of significant noise events, allowing for a more detailed analysis of the resulting data i.e. specific sources of noise could be identified.

5.1.4 The measurements were taken 1.5 metres above local ground level in free field positions.

5.1.5 Measurements were made in 15 minute periods over the duration of the survey of the L_{Amax}, L_{Aeq}, L_{A10} and L_{A90} indices.

5.1.6 Noise measurements were made using the equipment listed in table T7

Item	Manufacturer	Type
Sound Level Analyser	Norsonic	118
Acoustic Calibrator	Norsonic	1251
Weatherproof windshield	Norsonic	1212
Sound Level Analyser	Rion	NL-52 x 2
Acoustic Calibrator	Rion	NC-74 x 2
Weatherproof windshield	Rion	WS-15 x 2

T7 Equipment used during unattended noise survey.

5.1.7 The microphones were fitted with windshields and were calibrated before and after the survey; no significant drift was noted to have occurred.

5.1.8 The weather during the survey period varied with periods of rain shortly after the start, which rapidly altered to clearer weather for the remainder of the monitoring period. Generally speaking the weather was noted to have been warm, dry and clear. It should be noted that rain showers occurred throughout the afternoon of the Thursday 14th progressing through to the evening. Gusting wind was recorded on Sunday 17th August and measurement data from this day may have been influenced by these meteorological conditions. Weather records have been taken from publically available online data at *wunderground.com*.

6 Results and Observations

6.1 Plots showing the measured noise levels at each survey position can be found in the attached time histories 14/0299/TH01, TH02 and TH03.

6.2 Day and night time[13] $L_{Aeq,T}$ noise levels on each day of the survey, at each of the measurement positions, are tabulated in the following table T8.

Position	Day/Period	Measured Noise Level (dB $L_{Aeq,T}$)	
		Day (16h)	Night (8h)
MP1	Thursday 14th August	-	51
	Friday 15th August	59	49
	Saturday 16th August	58	49
	Sunday 17th August	60	52
	Monday 18th August	59	52
	Tuesday 19th August	60	52
MP2	Thursday 14th August	-	56
	Friday 15th August	63	54
	Saturday 16th August	61	55
	Sunday 17th August	62	56
	Monday 18th August	62	-
MP3	Thursday 14th August	-	35
	Friday 15th August	44	36
	Saturday 16th August	46	40
	Sunday 17th August	48	41
	Monday 18th August	48	39
	Tuesday 19th August	45	37

T8 Day and night time noise survey measurement results

6.3 Observations whilst on site indicated that road traffic was likely to be the dominant noise source and results from the unattended monitoring support this. The day and night time noise levels at MP3 are considerably lower than comparable periods at the other two positions. This would suggest that aircraft flying over the site did not have a significant impact on the measured noise levels.

6.4 It should be noted however that these measurements are only representative of the operational regime in use by the airport at the time of survey and may not be fully representative of the worst case operational patterns such as occasions when aircraft may be taking off or landing over the site when runway 11/29 is in use (although this use is understood to be very rare).

[13] Day and night time periods are defined as 07:00 to 23:00h and 23:00 to 07:00h respectively.

6.5 Whilst on site, aircraft were noted to be passing at reasonably high altitude, directly above the site from the north west to the south east towards the Airport. Due to altitude of these aircraft, resulting noise levels from aircraft in this flight pattern were not dominant. In addition, helicopters were noted to pass to the north of the site.

6.6 So far as the expected pattern of operations is concerned, general departures and arrivals on the main runway 01/19 would not be expected to overfly the site. However when this runway is in use, the helicopter circuit loop has these aircraft passing over the site. General helicopter arrivals and departures from the airport should not overfly the site as the proposed paths set out in the airport manual are intended to avoid overflying the adjacent existing residents of Woodstock; and therefore the proposed development site as well.

6.7 During the rare times runway 11/29 is in use, fixed wing aircraft and training loops would overfly the site; however helicopter circuits would then not.

6.8 Observations while on site were that occasional fixed wing aircraft movements are observable over the site and lead to audible noise. Observable helicopter operations and audible noise levels were far less common.

6.9 Paragraphs 7.2.25 and 7.2.26 below contain commentary on the measured levels of aircraft noise and how these relate to the values predicted in the noise model.

6.10 Minimum measured background noise levels at MP3 were measured as between 25dB and 34dB L_{A90} indicating that plant noise limits to existing noise sensitive receivers towards this part of the site will be based upon an absolute criterion of 30 dB(A). In areas around the perimeter of the site where background noise levels are higher (due to contributions from road traffic), plant noise limits will be higher; however these limits will be determined based on the hours of operation of any proposed plant equipment and the background noise levels specific to the locations of said plant.

7 Assessment and Mitigation

7.1 **Road Traffic Noise**

Assessment Methodology

7.1.1 To ensure a robust assessment, the worst case highest day and night time noise levels have been determined over the duration of the survey period at each measurement position. These are tabulated below for clarity (Thursday 14th and Sunday 17th August have been omitted from the analysis due to unsuitable weather conditions on these days):

Position	Day/Period	Measured Noise Level (dB $L_{Aeq,T}$)	
		Day	Night
MP1	Tuesday 19th August	60	52
MP2	Friday 15th August	63	54
MP3	Monday 18th August	48	39

T9 Worst case day and night time noise survey measurement results

7.1.2 As stated in section 5, measurement positions MP1 and MP2 were intended to quantify noise levels on the adjacent A4095 and A44 respectively. To ensure worst case assessments, noise to locations of the likely closest residences to these major road links has been assessed. The layout utilised in this assessment was *West Waddy ADP* drawing *QF 34-11 (Drawing number SK012, Job 273).*

7.1.3 A noise break-in assessment was conducted (as detailed in the following section) to determine the required glazing and ventilation specification to ensure suitable internal noise levels are provided for future residences.

7.1.4 For the majority of the site, noise levels expected in outdoor amenity areas have been based upon measurements made at MP3. Where outdoor amenity areas fall near to the perimeter of the site (in close proximity to the A44 or A4095), the effects of distance attenuation and screening from the proposed residences has been taken into account from MP1 and MP2 to derive likely noise levels in these spaces. Where garden areas are not directly screened by a building, the effects of a 1.8 metre high closed boarded garden fence has been allowed for.

Internal Acoustic Environment

7.1.5 Noise intrusion has been considered into habitable rooms within notional dwellings based upon the location of the residential plots identified on site plan 14/0299/SP01.

7.1.6 In order to control the ingress of noise to meet the proposed criteria, an appropriate construction for the external shell of the residential accommodation should be adopted.

7.1.7 Although superseded, PPG 24 contained various technical guidance, which may still be usefully considered when assessing noise impact on building design. Table 1 in Annex 6 of PPG 24 set out typical level differences that can be obtained from thermal double glazing with standard trickle vents, installed in a dwelling of traditional construction as is proposed in this case.

7.1.8 A level difference of 33dB(A) is noted for road traffic. This is based upon façade incident levels. As in this case the survey data was free field, a -3dB correction should apply, meaning a reduction of 30 dB(A) for road traffic.

7.1.9 Taking the typical noise reduction for good quality, standard thermal double glazing results in daytime noise levels below 35dB $L_{Aeq,16\ hour}$ and night time internal noise levels below 30dB $L_{Aeq,8\ hour}$ within the dwellings.

7.1.10 Therefore, with windows closed the glazing and building elements would not need to have an enhanced acoustic performance (i.e. that typical thermal glazing and non-acoustic trickle ventilators would provide adequate protection acoustically).

7.1.11 As a general note, to provide bedroom areas with the lowest possible internal noise levels (and therefore best conditions for sleep) during night time periods, building design should where possible be such that these rooms are ideally located with their outward facing façade and windows screened from significant noise sources such as nearby roads.

External Noise Environment

7.1.12 Daytime noise levels measured on site at MP3 are below the aspirational guidelines detailed in section 4.2. The measurements in this position provide a reasonable representation of the level likely to be experienced during the daytime in external amenity areas attached to the proposed residences.

7.1.13 The following general recommendations are made in relation to the masterplan. At the boundaries of the site, garden areas should be orientated so that they benefit from screening from the adjoining residence. Where this is not possible, 1.8 metre high closed boarded timber fences should be erected at the garden perimeter to provided screening from nearby roads. This should also apply to external amenity areas attached to the residences in the care village.

7.1.14 With the above in place, it should be possible to provide all residences with an external amenity area which observes daytime noise levels of below 55dB $L_{Aeq,\ 16h}$. As this target noise level is aspirational in nature the above recommendations for screening should be treated as guidelines for best practice and are not strictly mandatory.

7.2 Airborne Aircraft Noise Levels

Method of Assessment

7.2.1 The noise levels around an airport due to airborne aircraft operations are typically assessed by computer modelling, the results of which can be validated by physical measurements as necessary. This assessment makes use of Integrated Noise Modelling of operations at London Oxford Airport, based on information in the public domain on the numbers, types and modes of operation of aircraft using the facility. Where the data leaves room for interpretation, details of the assumptions made are set out.

Noise Model

7.2.2 The noise contours were produced using the US Federal Aviation Authority Integrated Noise Model (INM) Version 7.0d. This method of predicting community noise around airports is well established and has been used at many such locations throughout the UK. It requires inputs in the form of the numbers and types of aircraft operating on any given day, together with typical

split of runway use aggregated over a given period and the routing of aircraft into and out of the airport.

7.2.3 Details of the runway alignments and aircraft routings are all contained in the UKAIP, and the Aerodrome Chart for London Oxford Airport is attached for reference in Appendix A.

7.2.4 Appendix B contains information received from Oxford Airport on the numbers and types of aircraft using the airport and the use of the two runways. Our understanding of the current mode of operations is that there are not more than 300 movements per year on the cross runway (11-29), representing less than 1% of the total. As can be seen, on this runway 98% of departures and arrivals are westerly, with only 2% easterly. On the main runway (01-19) 60% of departures and arrivals are southerly, with 40% northerly.

7.2.5 Other assumptions incorporated into the model are that movements on each runway are split 50:50 between arrivals and departures, with touch and go movements each classified as an arrival and a separate departure. Helicopter operations take place from a point just to the south west of the runway intersection point, and operate 60:40 southerly vs. northerly in line with fixed wing movements on 01-19.

7.2.6 So far as helicopters overflying the application site are concerned, the helicopter flight patterns indicated in Appendix C illustrate that it is only those carrying out training flights that need to be considered. The movement data contained in Appendix B suggests that only 33 out of 2,048 movements that took place between May and September of 2014 were training flights and would have been expected to overfly the site. This represents 1.6% of total helicopter movements and aggregates out to about 1 over-flight every 5 days.

7.2.7 In order to analyse a worst case possible scenario in terms of helicopters flying over the site, we have assumed that up to 10% of helicopter movements could in fact fly over the site on the training circuit.

7.2.8 The remaining 90% of rotary aircraft movements have been modelled to utilise general arrival and departure routes to the north and south of the site, along the closest routes to the site of the various possible routes as set out in Appendix C (therefore worst case). The noise contours have been prepared on that basis.

7.2.9 In response to feedback from Cherwell and West Oxon District Councils, noise modelling has been undertaken separately for the fixed wing aircraft and the helicopters. This is in order to be able to consider the noise effects of each aircraft type separately and cumulatively.

7.2.10 In accordance with advice CAP 725[14], the INM modelling parameters were set to a tolerance of 0.1 and a refinement of 9.

[14] CAP 725 CCA guidance on the Application of the Airspace Change Process

Aircraft Types

7.2.11 Aircraft types that operate at the airport are contained in the information supplied by London Oxford Airport and are attached as Appendix B. The data was provided in the same categories as available from the historic CAA movement data which is publically available. We have combined these annual percentage figures provided by the airport in addition to the historic (2013) summer months movement data as set out in the CAA UK Airport Statistics[15] in order to derive the expected number of summer movements by the different aircrafts indicated by the airport.

7.2.12 It is not clear from the publically available historic CAA data if the number of movements published includes rotary movements or not. Therefore as a worst case step in our assessment we have for the 2013 scenario assumed that the 37,553 CAA reported movements are all by fixed wing aircraft and we have then added the rotary aircraft movements in addition to this figure, with the rotary movements making up 12% of the total movements (i.e. 42,674 total annual movements).

7.2.13 The same methodology has also been considered for the maximum permissible movement scenario, that all 160,000 allowable movements are made by fixed wing aircraft with rotary aircraft in addition (i.e. a total of 181,818 annual movements). We have incorporated these data into the INM model, using recommended aircraft substitutions (both fixed wing and rotary) as appropriate.

7.2.14 In addition, the following provisions have been made:

- The 20.05% of fixed wing aircrafts movements designated as “other” in Appendix B are not identified by aircraft type. Given the nature of the movements they represent, we have assumed they are undertaken by twin turbo prop passenger aircraft and have split the movements between the ATR 4 and the Dash 8. Given the relatively large size of these aircraft, this is considered to be a worst case assumption.

- There are three aircraft type contained in the mix which are indicated by the model as not being able to use the cross runway (11-29) due to its limited length. These are the Lear 35, Hawker Siddeley 125 SRS 700/800 (used R850 as a surrogate which is then substituted to the Lear 35) and the Piper PA42 Cheyenne. They are therefore excluded from the cross runway mix, although the total number using the cross runway has not altered. All movements associated with these three aircraft have been allocated to different aircraft types. The jet movements (Lear 35 and R850) have been added to the Cessna Citation Excel (CNA560XL) and the PA42 to the Piper PA34 Seneca.

- The 9.57% of helicopter movements designated as “other” in Appendix B are not identified by aircraft type. In the absence of other information, we have adopted the reasonable assumption that they are undertaken by a Bell B206L helicopter in the INM model.

[15] http://www.caa.co.uk/default.aspx?catid=80&pagetype=88&pageid=3&sglid=3

Modelled Noise Levels

7.2.15 The fixed wing noise contours derived from the airborne aircraft noise model with the above assumptions in place are shown for the present day (2013) level of activity in attached Figure 14/0299/INM1.

7.2.16 As a sensitivity test, further noise contours have been prepared which represent the currently assumed operations scaled up to reflect the Airport operating at its maximum annual capacity of 160,000 movements per year as per their Section 106 agreement with Cherwell District Council. These are shown in attached Figure 14/0299/INM2.

7.2.17 The helicopter noise contours with the above assumptions in place are shown for the present day (2013) level of activity in attached Figure 14/0299/INM3. Scaled up to the maximum annual capacity of 160,000 movements per year, the contours are shown in attached Figure 14/0299/INM4.

7.2.18 Finally, contours for all aircraft operations (fixed wing and rotary combined) have been produced in attached figures 14/0299/INM5 and INM6 for the 2013 and maximum annual capacity scenarios respectively.

Noise Levels at the Woodstock Site

7.2.19 Taking into account the current guidance in NPPF and NPSE, it can be seen that for the current level of activity (2013 data) none of the site is located in an area that is exposed to a Significant Observable Adverse Effect Level (66dB $L_{Aeq,16h}$) and there is no necessity to avoid noise sensitive development by virtue of airborne aircraft noise.

7.2.20 In fact, for the current level of activity it is clear that the entire site is exposed to noise levels that fall below the NOEL (No Observable Effect Level). While that does not mean that aircraft noise will be inaudible, it does effectively mean that it has no material effect on the site.

7.2.21 For the sensitivity contours prepared on the basis that the assumed current level of activity is scaled up to maximum capacity, a proportion, approximately 25% of the total area, of the development site to the north east quadrant would be expected to be exposed to noise representing the Lowest Observable Adverse Effect Level range that requires mitigation (>54dB $L_{Aeq,16h}$). In this area, consideration should be given to the mitigation issues set out in section 8.2.28 to 8.2.35 below.

7.2.22 There is a small and narrow wedge shaped section of the site towards the north east sector immediately opposite the western end of the cross runway, that lies in the Lowest Observable Adverse Effect Level above 57dB $L_{Aeq,16h}$. The following should be noted, however:

- Measured noise levels due to road traffic on the A4095 generates noise that is above these levels, and aggregate levels of aircraft ground running noise do not make them the dominant source in this area,
- All of this section of the site is currently designated for parking and employment use only.

7.2.23 Under none of the assessed operating scenarios is any part of the site exposed to noise levels that would be classified in the Significant Observable Adverse Effect Level within which development should be avoided (66 to 72dB $L_{Aeq,16h}$).

7.2.24 With regard to rotary aircraft movements, even on the sensitivity contours, with only limited numbers of helicopters undertaking circuits which overfly the site (with the vast majority of flights being general arrivals and departures, which do not over fly the site), no part of the site is exposed to noise levels from these aircraft over 51dB $L_{Aeq,16h}$, the lowest contour suggested to be plotted by the London Heliport study.

Relationship with Measured Site Levels

7.2.25 Table T12 below compares the measured $L_{Aeq,16h}$ values at three measurement locations across the site with the values estimated at the same positions by visual inspection of the London Oxford Airport noise model contours.

Position	$L_{Aeq,16\ hour}$ Daytime Noise Levels (dB)	
	Measured	***Modelled (2013 scenario)***
MP1	58-60	51-52
MP2	61-63	44
MP3	44-48	45

T10 Comparison of measured daytime noise levels to the modelled 2013 London Oxford Airport airborne aircraft noise levels.

7.2.26 In comparing the values, it should be noted that the noise measurements include the effect of all sources that may affect the site, including aircraft operations and road traffic; the noise model accounts only for the noise from airborne aircraft. With this in mind:

- MP1 is close to the A4095 and the measured levels are dominated by noise from vehicles using this road. The measured values are considerably higher than predicted due to aircraft movements alone,
- MP2 is close to the A44 Woodstock Road and the measured levels are dominated by noise from vehicles using this road. The measured values are considerably higher than predicted due to aircraft movements alone,
- MP3 is remote from both roads and likely to be less affected by road traffic noise. The measured values are expected to be more influenced by aircraft activity and indeed there is better correlation between what has been measured and what has been modelled.

7.2.27 Inspection of time history 14/0299/TH03 indicates maximum noise levels due to occasional individual events between 70dB and 83dB $L_{Amax,s}$. The number of events reaching this level ranges from 1 to 12 on any given day. Based on analysis of the noise level time trace for audible aircraft flyovers at the site, it is anticipated that these maximum levels are due to aircraft flyovers. The individual values are not unduly high, nor are they frequent, and as no

such events take place during the night time period, they are not considered to materially affect the viability of the site for noise sensitive development with regard to aircraft noise.

Mitigation

7.2.28 Considering the proposed masterplan, there is only a small narrow wedge in the eastern segment of the site that is expected to be exposed to the highest levels of airborne aircraft noise above 57dB $L_{Aeq,16h}$. All of the accommodation within this wedge is currently designated for parking and Employment Use. No residential buildings are currently located within this area (as per the masterplan layout).

7.2.29 Based on the proposals, it is anticipated that dwellings in the north east corner of the site will be exposed to daytime noise levels in excess of 54dB $L_{Aeq,16h}$, the point at which mitigation shall be considered. It must be noted that this considers the worst case position of the assumed operations representing full permitted use of the Airport.

7.2.30 We emphasise the worst case nature of this assumption in that it reflects activity at the airport being almost four times what it is currently, with the same mix of aircraft in use. With this in mind, and considering that external airborne aircraft noise cannot be mitigated, we would not expect any mitigation to be required to the external areas; however the internal noise levels within the dwellings will be limited by appropriate design of the building envelope and ventilation as commented on in the section below.

Internal Noise Levels

7.2.31 As noted in section 4.4.3 above, Table 1 of Annex 6 of PPG 24 indicates that thermal double glazing when closed is able to attenuate external noise from civil aircraft by 32dB. Since it is the windows in any traditionally built façade that limit the achievable sound insulation, it can be seen that with an external noise level of up to 57dB $L_{Aeq,16h}$, internal noise levels would be expected to be 25dB $L_{Aeq,16h}$ if good quality, well-sealed thermal double glazing is installed in any new dwelling.

7.2.32 25dB $L_{Aeq,16h}$ is well below the daytime standard of 35dB $L_{Aeq,16h}$ recommended in BS8233:2014 for living rooms and bedrooms. Therefore, it can be concluded that providing new dwellings incorporate good quality standard thermal double glazed windows, the façade will incorporate sufficient sound insulation to mitigate airborne aircraft noise down to acceptable levels.

7.2.33 For the windows to provide the necessary sound insulation, the occupant must have the facility to allow them to remain closed. For that reason, it is necessary to ensure that background ventilation into properties can be provided by means other than opening windows.

7.2.34 Such ventilation systems, either through the façade or by means of a whole house ducted arrangement, are relatively common in residential development affected by modest levels of environmental noise.

External Noise Levels

7.2.35 External noise levels in gardens of new dwellings are currently exposed to airborne aircraft noise levels ranging from around 45dB $L_{Aeq,16h}$ at the westernmost end of the site to <50dB $L_{Aeq,16h}$ in the east section closest to the airport in line with the cross runway. It is therefore expected that no gardens or outdoor amenity spaces will be exposed to noise levels above the LOAEL threshold for mitigation of 54dB $L_{Aeq,16h}$ with regards to airborne aircraft noise.

7.2.36 If a future situation arises whereby the maximum number of permitted aircraft movements actually take place, overall aircraft noise levels across the site are expected to be around 6dB higher, meaning that a number of gardens or other private amenity spaces in the north-eastern quadrant of the site would be exposed to noise levels above the LOAEL mitigation threshold of 54dB $L_{Aeq,16h}$.

7.2.37 However, with exception of a small narrow wedge of land towards the eastern part of the site which is only designated for parking and employment use, none of the site would be exposed to noise levels above the onset of significant community disturbance threshold of 57dB $L_{Aeq,16h}$ described in section 4.6.1 above, meaning that specific provision for noise mitigation need not be made.

7.3 Levels of Noise from Aircraft on the Ground

Engine Ground Running

7.3.1 Ground running of jets engines currently takes place at the western end of the cross runway (i.e. the threshold of runway 11). Such ground running is normally required after maintenance or engine checks to ensure correct operation of aircraft engines prior to flight. Testing of other engine type aircraft are suggested to be undertaken at other locations further away from the proposed development site according to the airports Noise Amelioration Scheme document; however we understand that they are also undertaken at the threshold of runway 11.

7.3.2 The airport is currently restricted to the following daytime hours, 07:00 to 19:00h, and according to recent records dating back to January 2013, amount to not more than 8 hours of running of jet aircraft during a 4 month period.

7.3.3 We have modelled this by assuming that all such running is on jet engines attached to the noisiest of the aircraft we have included in the airborne noise contour computation, the Lear 35. For comparative purposes, we have also run a contour for the more common Piper PA34 Seneca twin propeller aircraft in order to illustrate that these types of smaller aircraft are not significant compared to the jet aircraft in terms of ground running.

7.3.4 The ground running noise levels have again been computed using the US Federal Aviation Authority Integrated Noise Model (INM) Version 7.0d, which has been used to generate contours of the $L_{Aeq,16h}$ values for an aggregate day reflecting the average duration of engine ground running over an entire 4 month period. Full power ground running has been assumed to occur for 5 minutes each day which gives a total of 10 hours over a 4 month period.

7.3.5 We understand that the duration of individual ground runs or compass swing activities is longer than that modelled for a given day; however from our experience it is unlikely that the entire duration of the test will be with the engine at full power (for which we have modelled).

Site Noise Levels

7.3.6 The noise contours are shown in Figure 14/0299/INM7 ($L_{Aeq,16h}$). The contours clearly show that noise from jet aircraft is significantly higher than the more common Piper PA34 Seneca twin propeller aircraft.

7.3.7 It can be seen that the majority of the site is expected to be exposed to engine ground running noise levels below the NOEL value of 50dB $L_{Aeq,16h}$. A north eastern segment of the site is exposed to noise levels between 50 $L_{Aeq,16h}$ and 55dB $L_{Aeq,16h}$, indicating that the noise levels are above the LOAEL threshold and should be identified but not necessarily mitigated.

7.3.8 There is a very small part of the site in the north east corner that is expected to be exposed to engine ground noise levels above 55dB $L_{Aeq,16h}$, meaning that buildings in this area are expected to be exposed to engine ground noise levels that should be mitigated. The following should be noted, however:

- Measured noise levels due to road traffic on the A4095 generates noise that is above these levels, and aggregate levels of aircraft ground running noise do not make them the dominant source in this area,
- This section of the site is currently designated for parking and employment use.

7.3.9 No part of the site is exposed to noise levels that would be classified in the Significant Observable Adverse Effect Level, where development should be avoided (66 to 72dB $L_{Aeq,16h}$).

7.3.10 It should also be noted that the highest noise levels are predicted in the area designated for parking and employment use rather than dwellings. These employment buildings will also help screen some of the remaining residential areas of the site from this ground level noise, although such screening has not been considered in the model. Therefore part of the small section of residential accommodation that is currently shown within the 50-55dB L_{Aeq16h} contour behind the employment zone may be exposed to levels less than 50dB $L_{Aeq,16h}$ if the screening provided by the employment use buildings is effective.

7.4 Noise Levels at the Proposed Primary School

7.4.1 No detailed layout plans have been developed for the school. However an approximate location has been identified in the north-west part of the site (shown on attached site plan 14/0299/SP01). It should be noted that before construction, suitable design advice should be sought to control noise break in from the local noise sources to the teaching and ancillary spaces.

7.4.2 Based on measurements made at position MP3, the weekday daytime noise level in the vicinity of the school was between 44 and 48 dB $L_{Aeq, 16h}$.

7.4.3 Guidance provided within Building Bulletin 93[16] (BB93) requires primary school classrooms to achieve an internal noise level of 35 dB $L_{Aeq,\ 30\ minute}$. Based on the predicted noise levels incident on this part of the site, standard thermal double glazing and a scheme of suitable ventilation would be adequate to control internal noise levels to within this criterion.

7.4.4 BB93 provides guidance with respect to noise in outdoor teaching areas as follows:

Noise levels in unoccupied playground, playing fields and other outdoor areas should not exceed 55 dB $L_{Aeq,\ 30\ minute}$ and there should be at least on area suitable for outdoor teaching activities where noise levels are below 50dB $L_{Aeq,\ 30\ minute}$.

7.4.5 Measured noise levels on site fall below both of these thresholds and therefore noise is unlikely to be an issue in outdoor teaching areas. Despite this point, at detailed design stage consideration should still be given to the positioning of any such spaces.

[16] Building Bulletin 93 – Acoustic Design of Schools: A Design Guide (2004, revised 2012)

8 Conclusions

8.1 Planning permission is being sought for the development of an area of land to the south east of Woodstock in Oxfordshire. The proposed site is to comprise up to 1500 dwellings, football facility, local centre and care village, site for a primary school, employment area, link and ride and open space.

8.2 An assessment has been conducted on the general noise impact on the site from significant nearby noise sources, particularly the A44, A4095 and London Oxford airport.

8.3 To provide future residents, inclusive of those within the care village, with acceptable internal noise levels standard thermal double glazing and suitable ventilation will be adequate to meet the requirements.

8.4 To ensure suitable noise levels can be provided in external amenity areas, garden areas should be suitably screened from nearby roads where practicable. It should be noted however that the guidelines for noise levels in external areas are aspirational in nature.

8.5 The noise generated by aircraft activities at London Oxford Airport has been measured and modelled, and in the present circumstances found not to have any material impact on the proposed site in terms of noise levels.

8.6 Only if one were to consider significantly higher numbers of aircraft movements in line with the maximum the airport is allowed to operate would aircraft noise have a material effect on the site. Even in this scenario, only a quarter of the development site would fall within a category where mitigation, in the form of inherent measures such as suitable glazing and ventilation, should be considered and currently part of this area is designated for non-residential use.

End of Section

Glossary of Acoustic Terms

L_{Aeq}:

The notional steady sound level (in dB) which over a stated period of time, would have the same A-weighted acoustic energy as the A-weighted fluctuating noise measurement over that period. Values are sometimes written using the alternative expression dB(A) L_{eq}.

L_{Amax}:

The maximum A-weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise when occasional loud noises occur, which may have little effect on the L_{Aeq} noise level. Unless described otherwise, L_{Amax} is measured using the "fast" sound level meter response.

L_{A10} & L_{A90}:

If non-steady noise is to be described, it is necessary to know both its level and degree of fluctuation. The L_{An} indices are used for this purpose. The term refers to the A-weighted level (in dB) exceeded for n% of the time specified. L_{A10} is the level exceeded for 10% of the time and as such gives an indication of the upper limit of fluctuating noise. Similarly L_{A90} gives an indication of the lower levels of fluctuating noise. It is often used to define the background noise.

L_{A10} is commonly used to describe traffic noise. Values of dB L_{An} are sometimes written using the alternative expression dB(A) L_{n}.

L_{AX}, L_{AE} or SEL

The single event noise exposure level which, when maintained for 1 second, contains the same quantity of sound energy as the actual time varying level of one noise event. L_{AX} values for contributing noise sources can be considered as individual building blocks in the construction of a calculated value of L_{Aeq} for the total noise. The L_{AX} term can sometimes be referred to as Exposure Level (L_{AE}) or Single Event Level (SEL).

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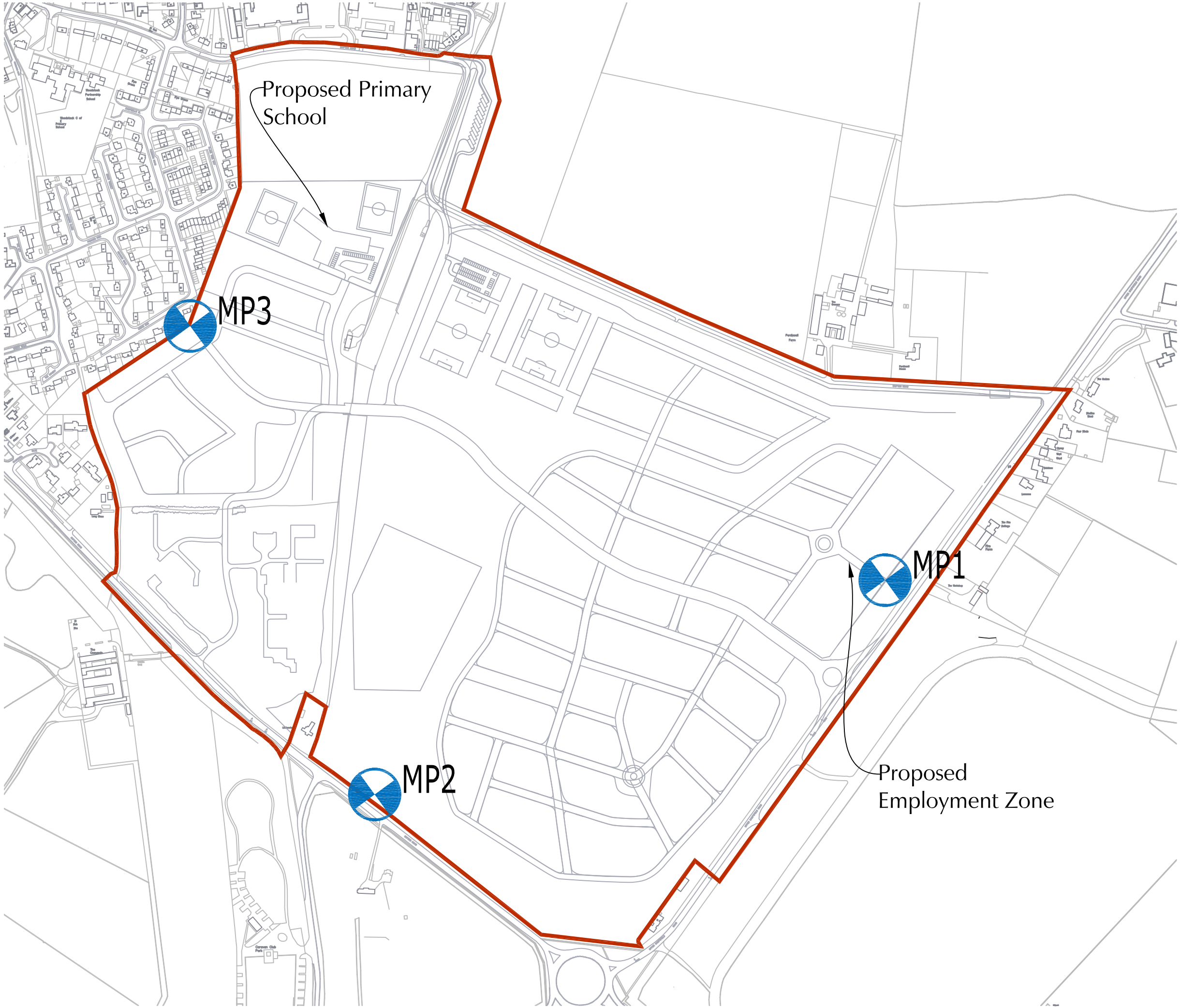

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Figure 14/0299/SP01

Title:

Site plan showing measurement position and concept stage development layout

MP Measurement Position

North

Project:

East Woodstock

Date: November 2014

Revision: -

Scale: Not to scale

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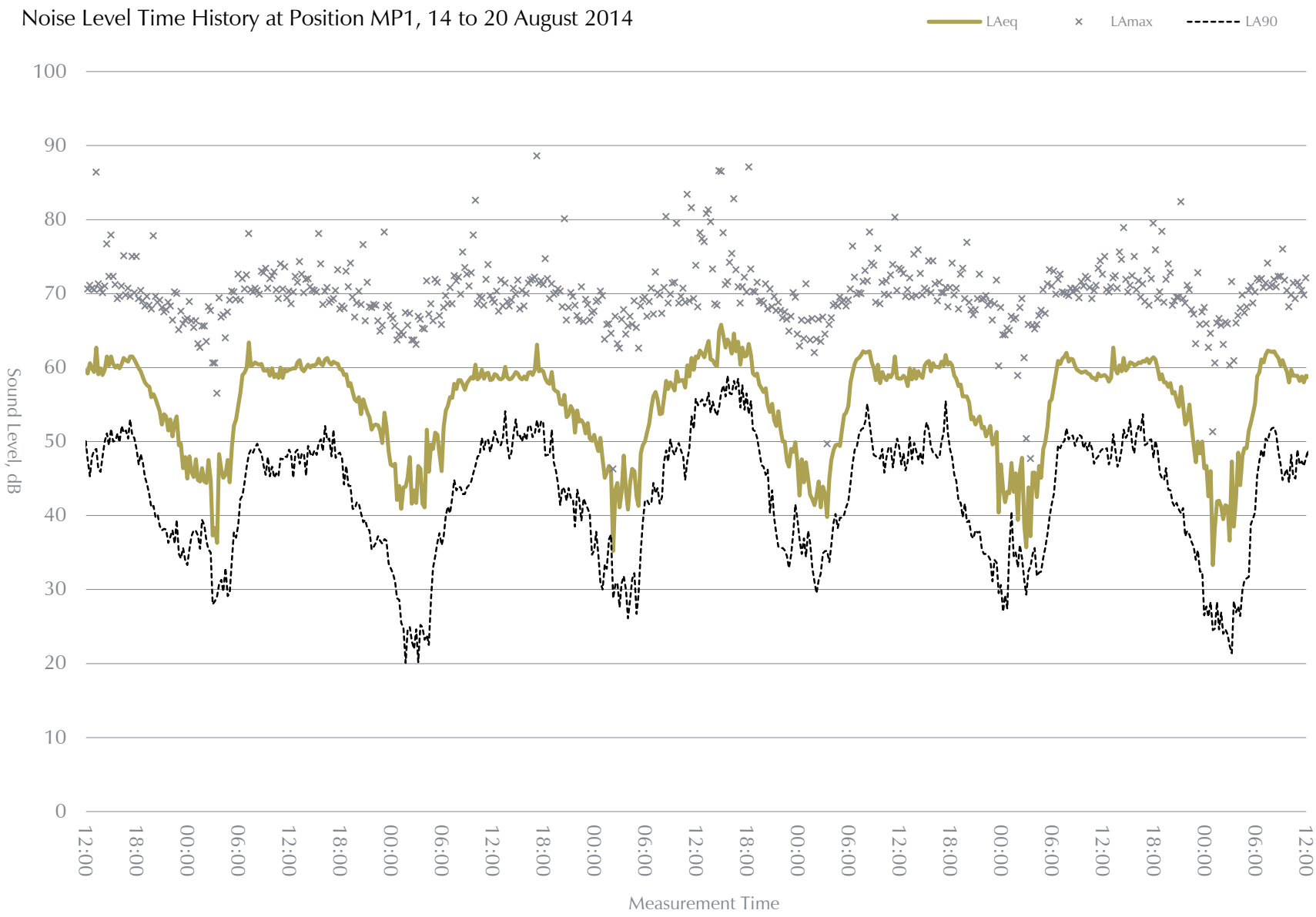


Figure 14/0299/TH01

Noise Level Time History at Position MP2, 14 to 18 August 2014

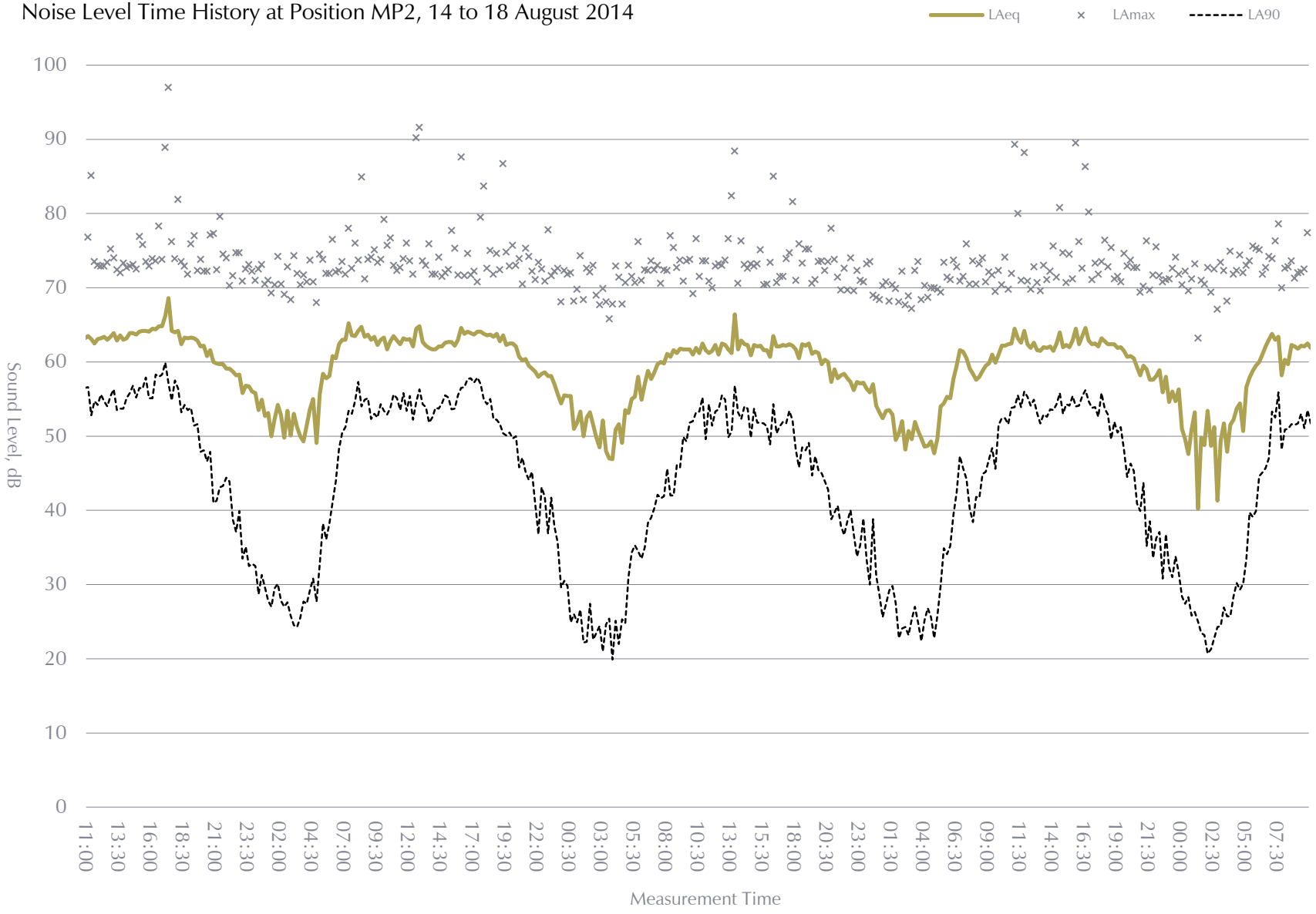


Figure 14/0299/TH02

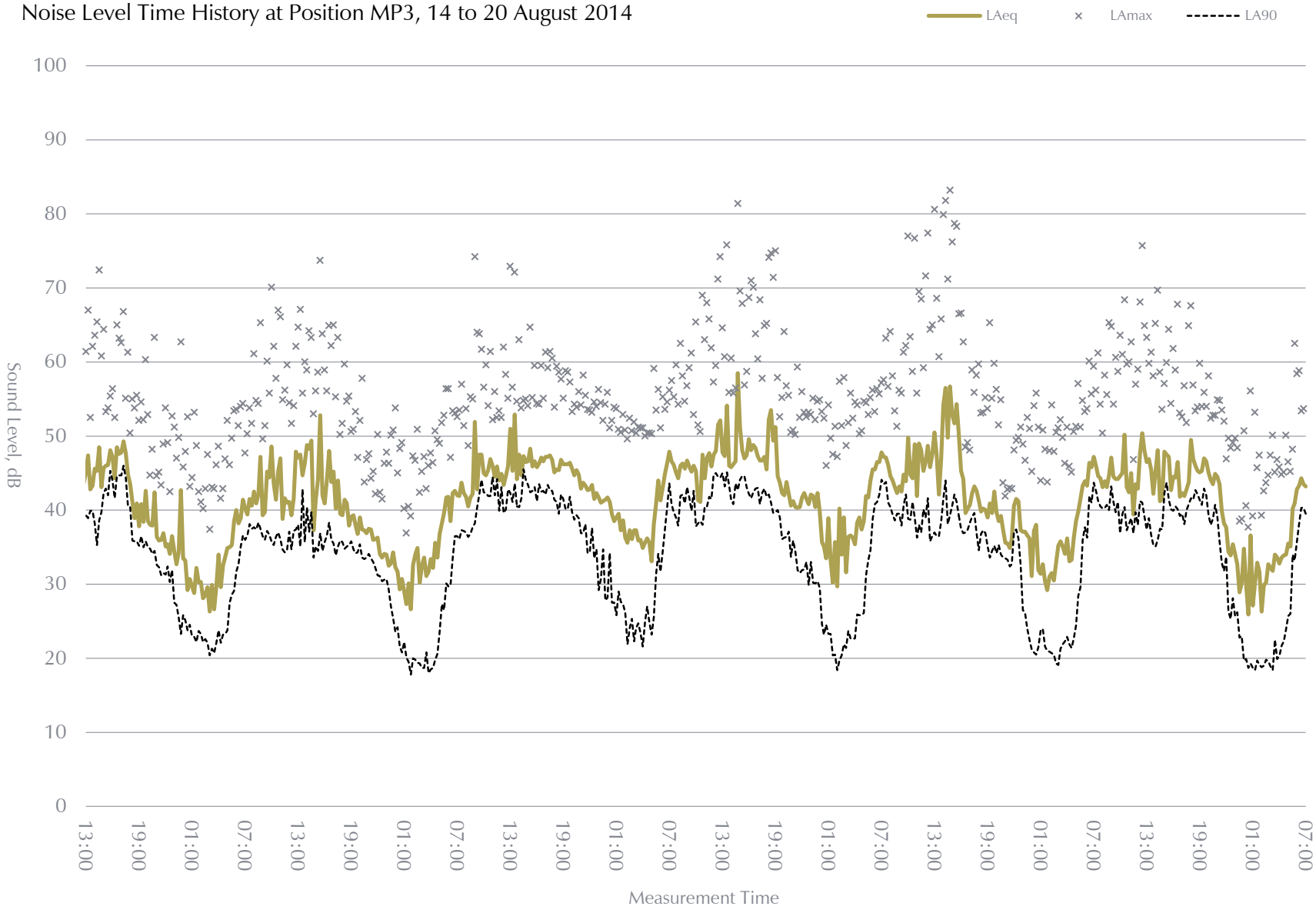
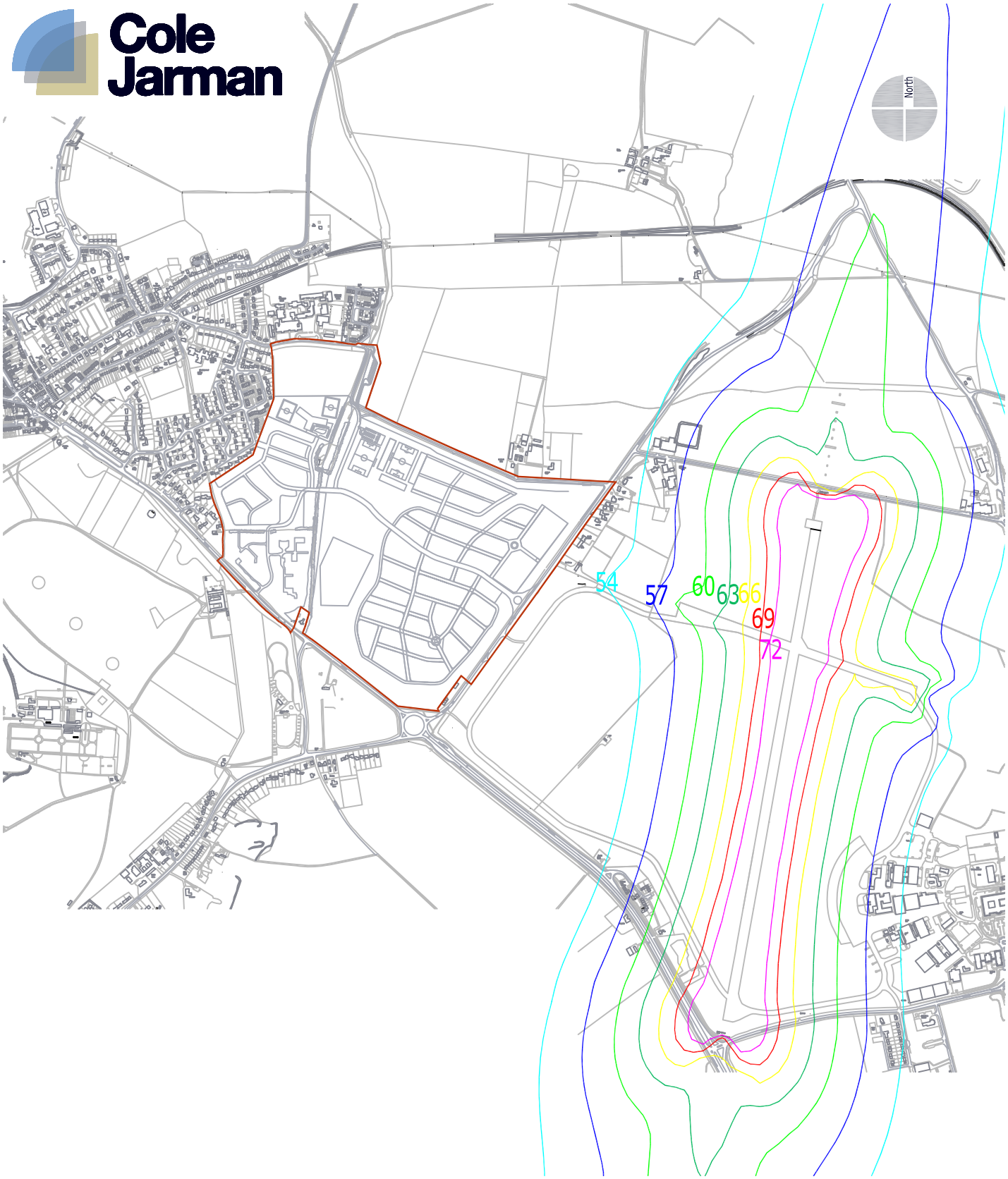


Figure 14/0299/TH03



Title: Noise Contours (LAeq,16h): Fixed Wing Only 2013 Movement Scenario

Figure 14/0299/INM1

Project: East Woodstock

Date: November 2014 Revision: -

Scale: Not to scale

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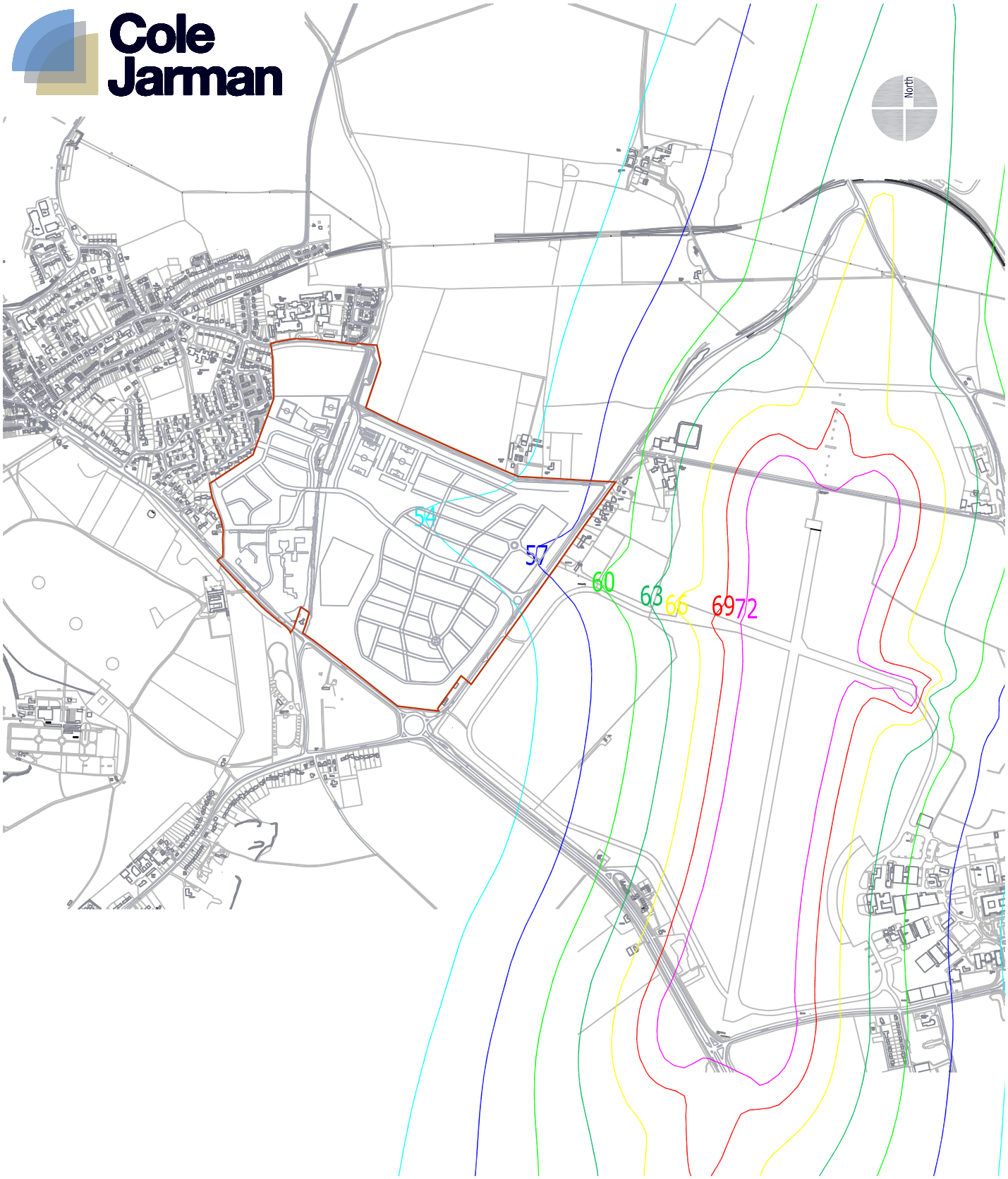

Title: Noise Contours (LAeq,16h): Fixed Wing Only Maximum Permitted Movement Scenario

Figure 14/0299/INM2

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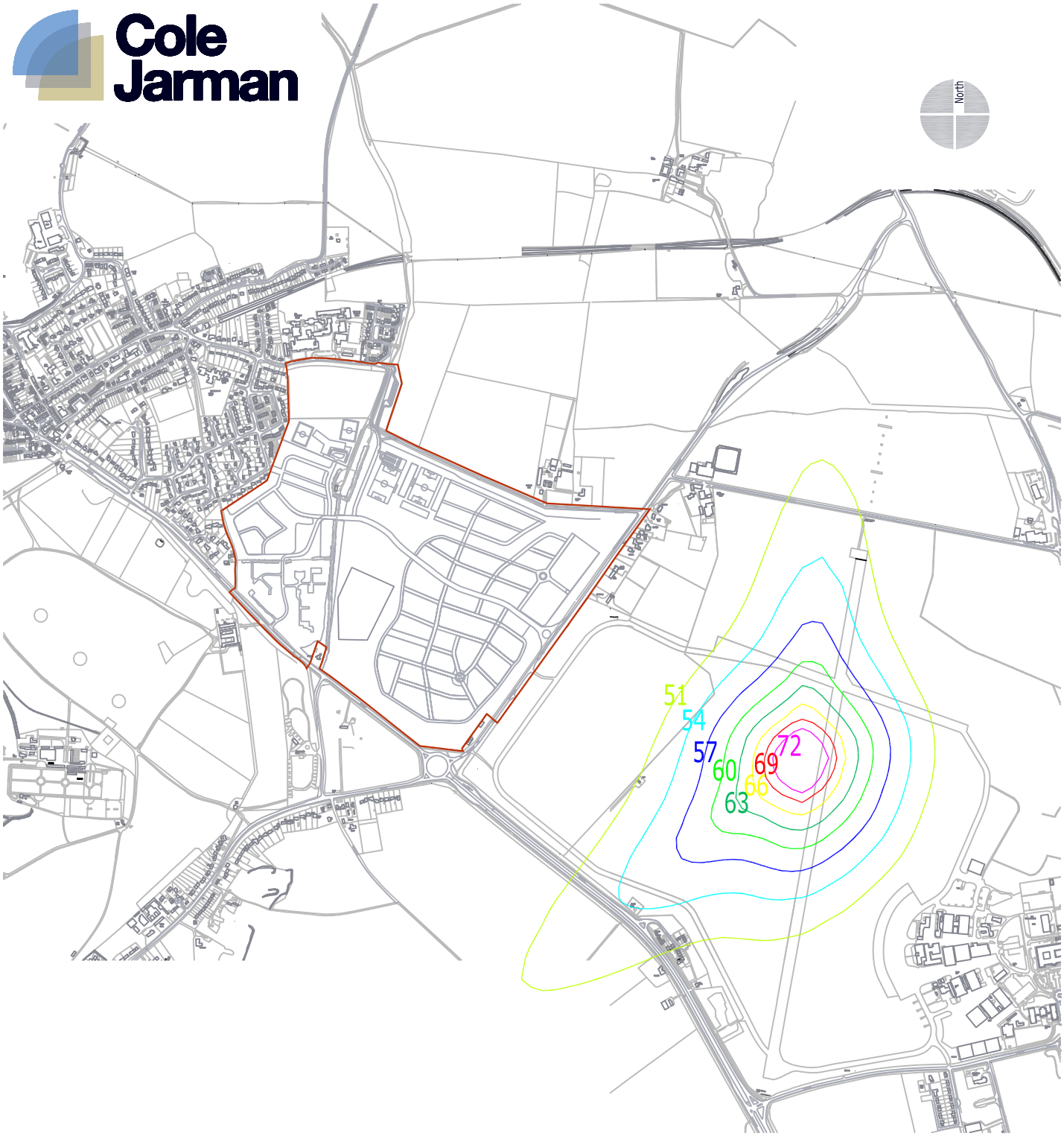

Title: Noise Contours (LAeq,16h): Rotary Aircraft Only 2013 Movement Scenario

Figure 14/0299/INM3

Project: East Woodstock

Date: November 2014

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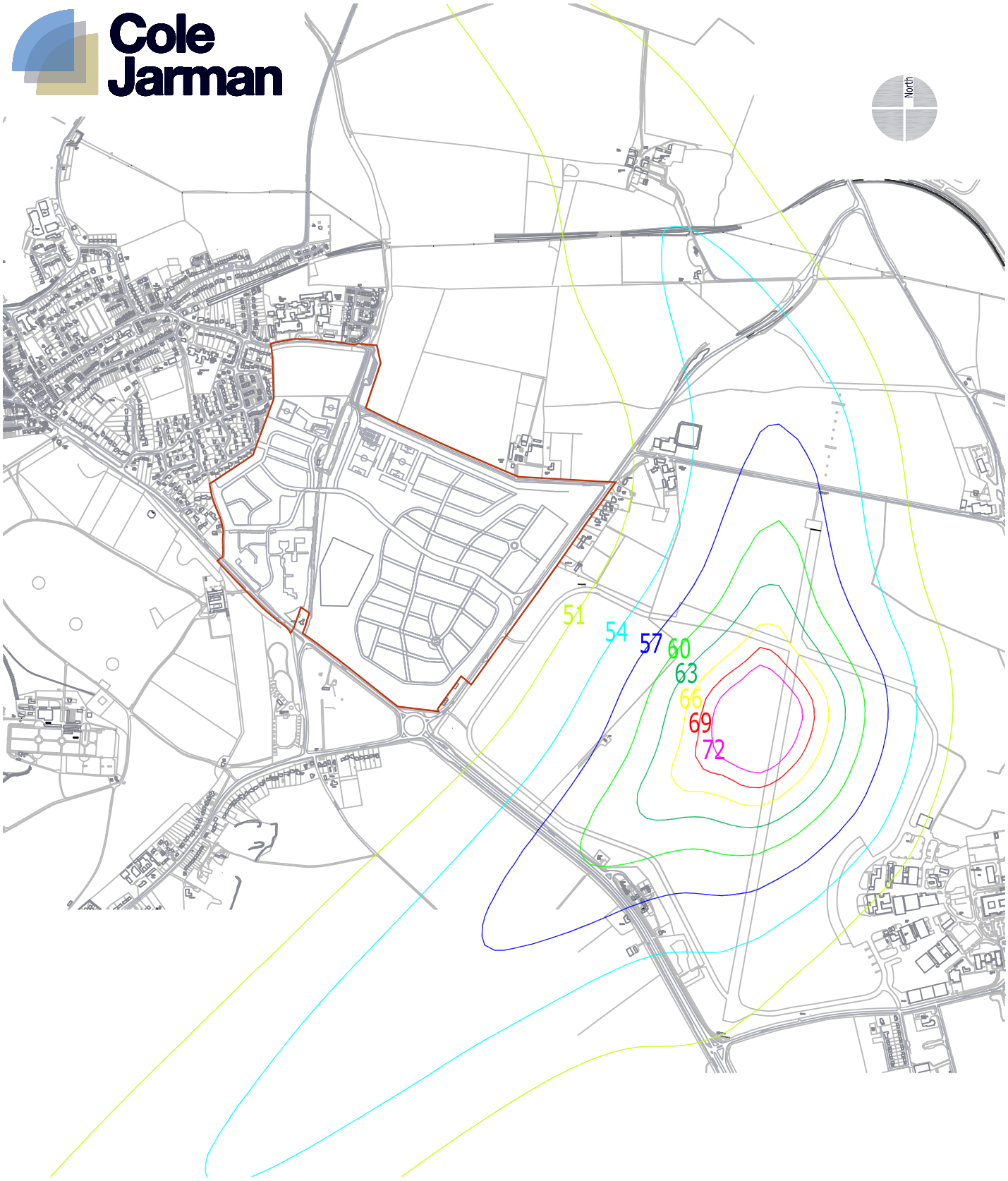

Title: Noise Contours (LAeq,16h): Rotary Aircraft Only Maximum Permitted Movement Scenario

Figure 14/0299/INM4

Project: East Woodstock

Date: November 2014 Revision: -

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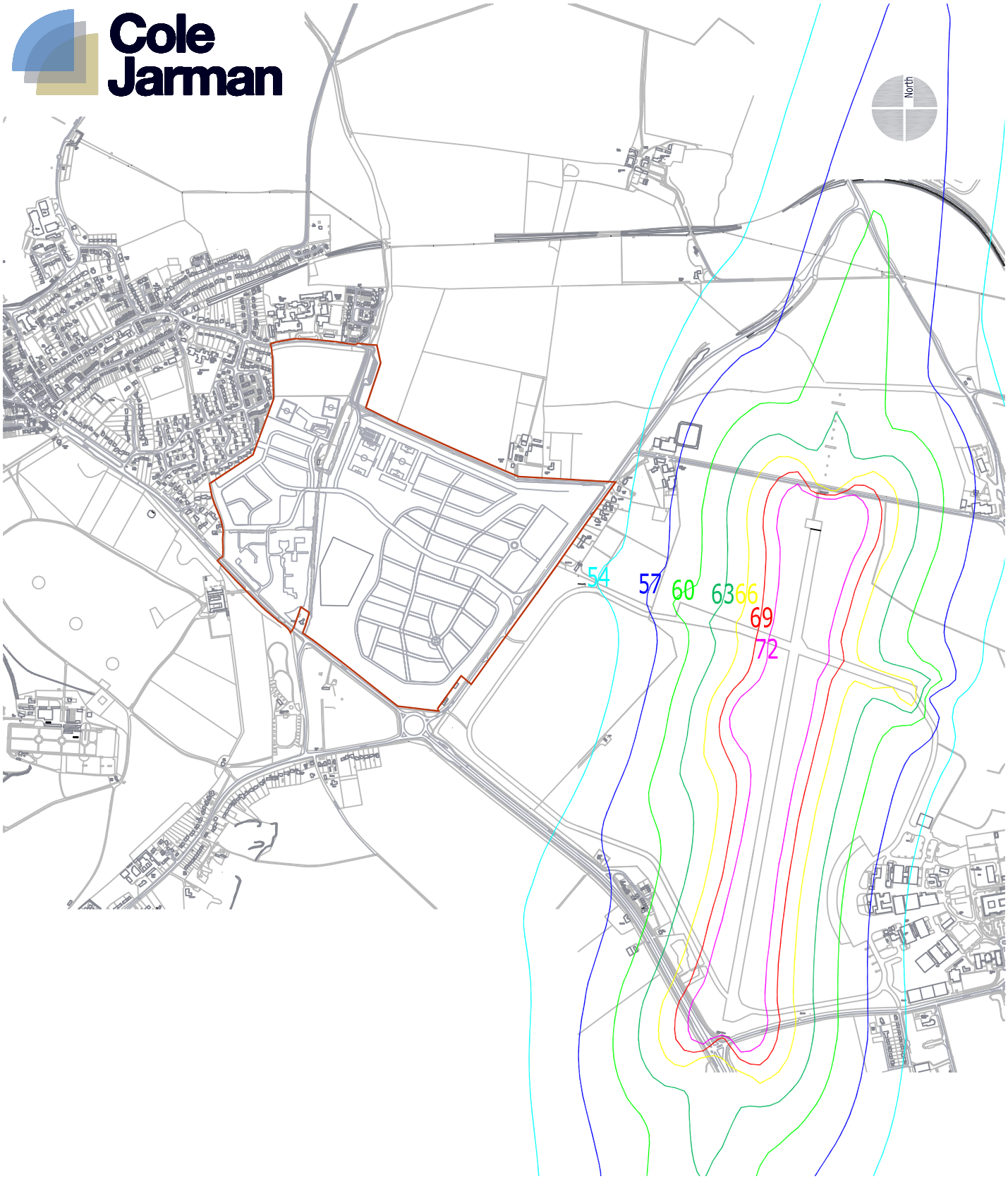

Title: Noise Contours (LAeq,16h): All Aircraft Types 2013 Movement Scenario

Figure 14/0299/INM5

Project: East Woodstock

Date: November 2014 Revision: -

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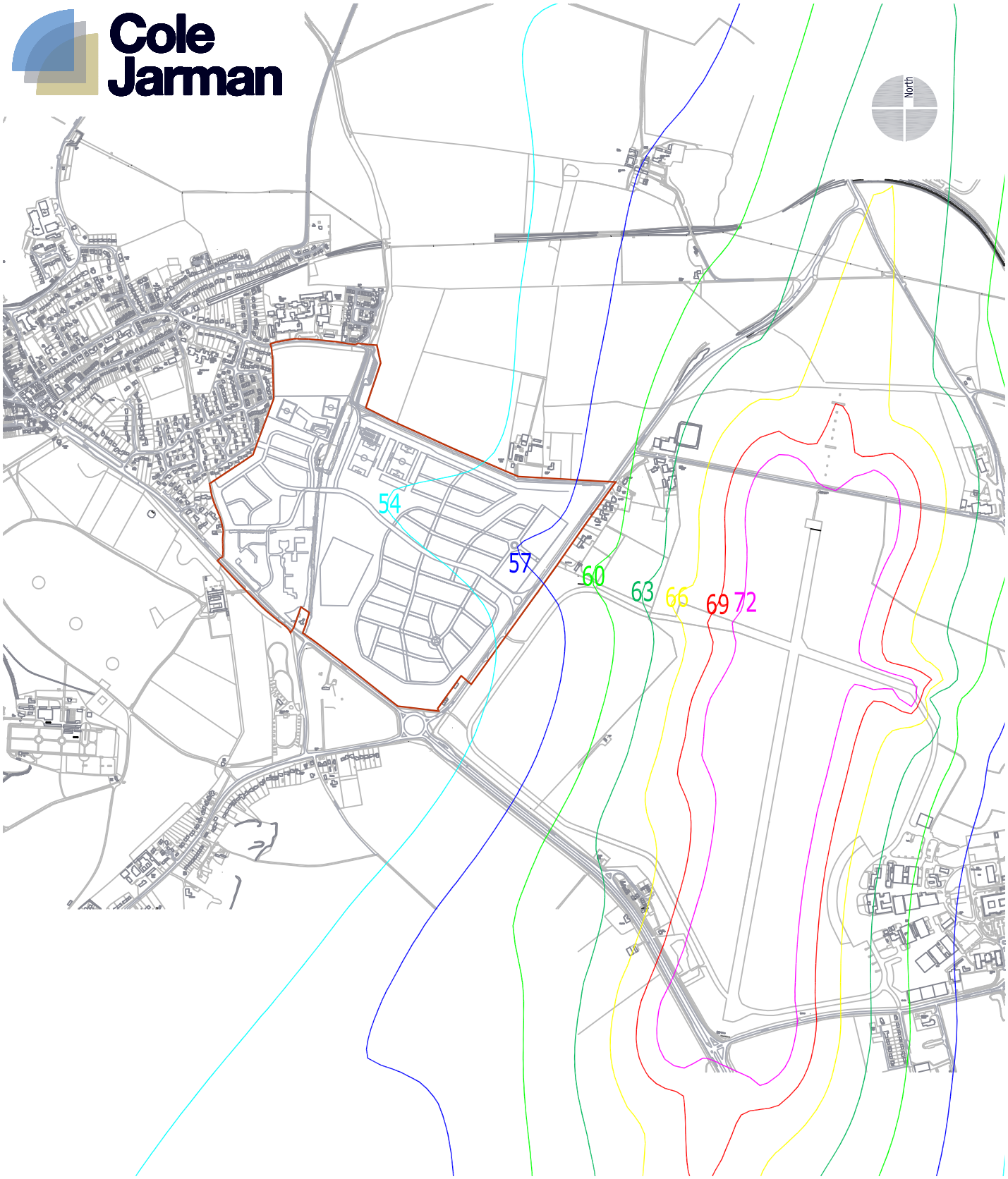

Title: Noise Contours (LAeq,16h): All Aircraft Types
Maximum Permitted Movement Scenario

Figure 14/0299/INM6

Project: East Woodstock

Date: November 2014 Revision: -

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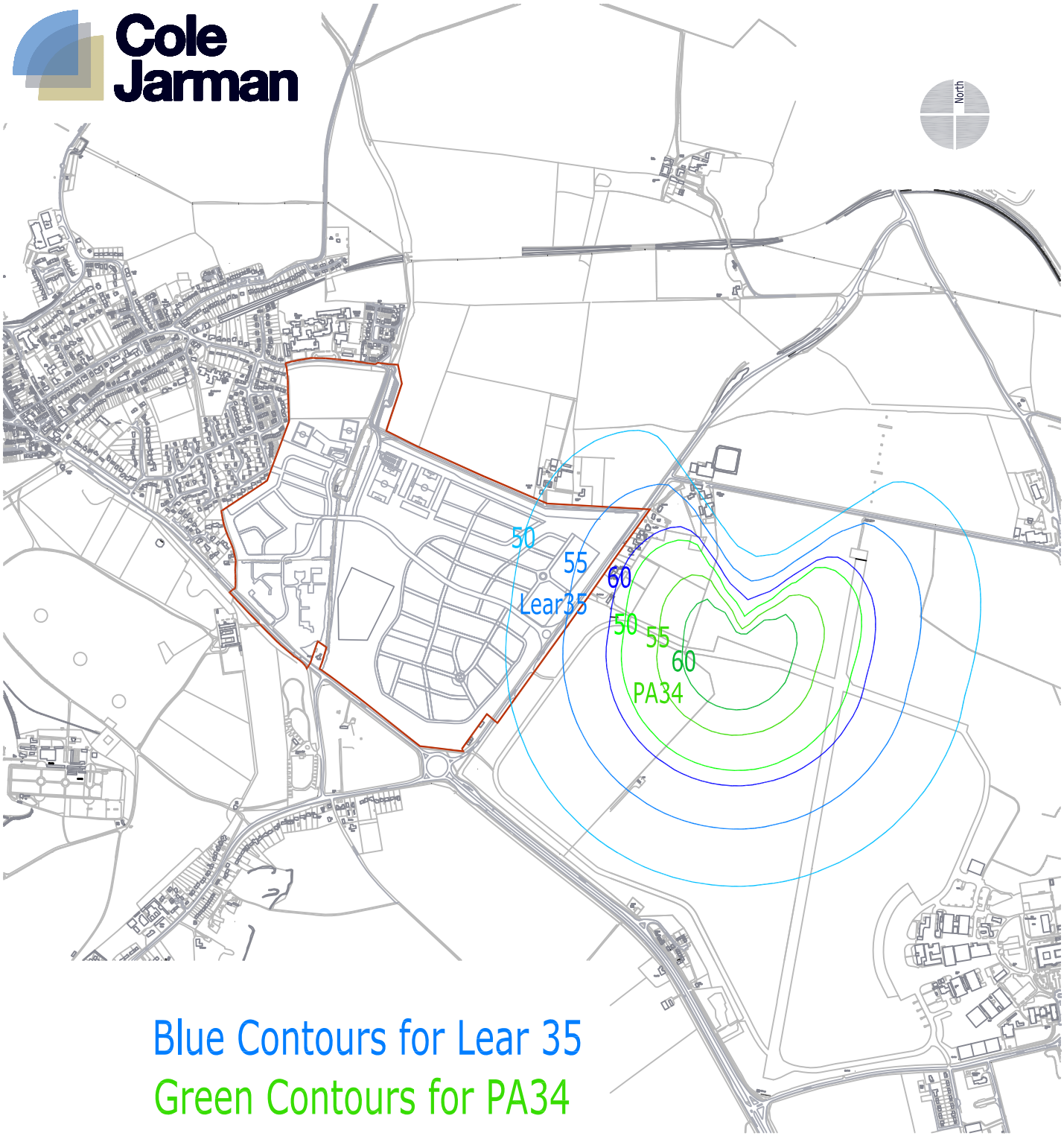

Blue Contours for Lear 35

Green Contours for PA34

Title: Noise Contours (LAeq,16h)
Ground Running

Figure 14/0299/INM7

Project: East Woodstock

Date: September 2014 Revision: -

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Appendix A

Subject: **UKAIP Aerodrome Chart**
Project: **East Woodstock**

AERODROME CHART - ICAO

ARP 515013N 0011912W

AD ELEV 270FT

OXFORD KIDLINGTON
EGTK

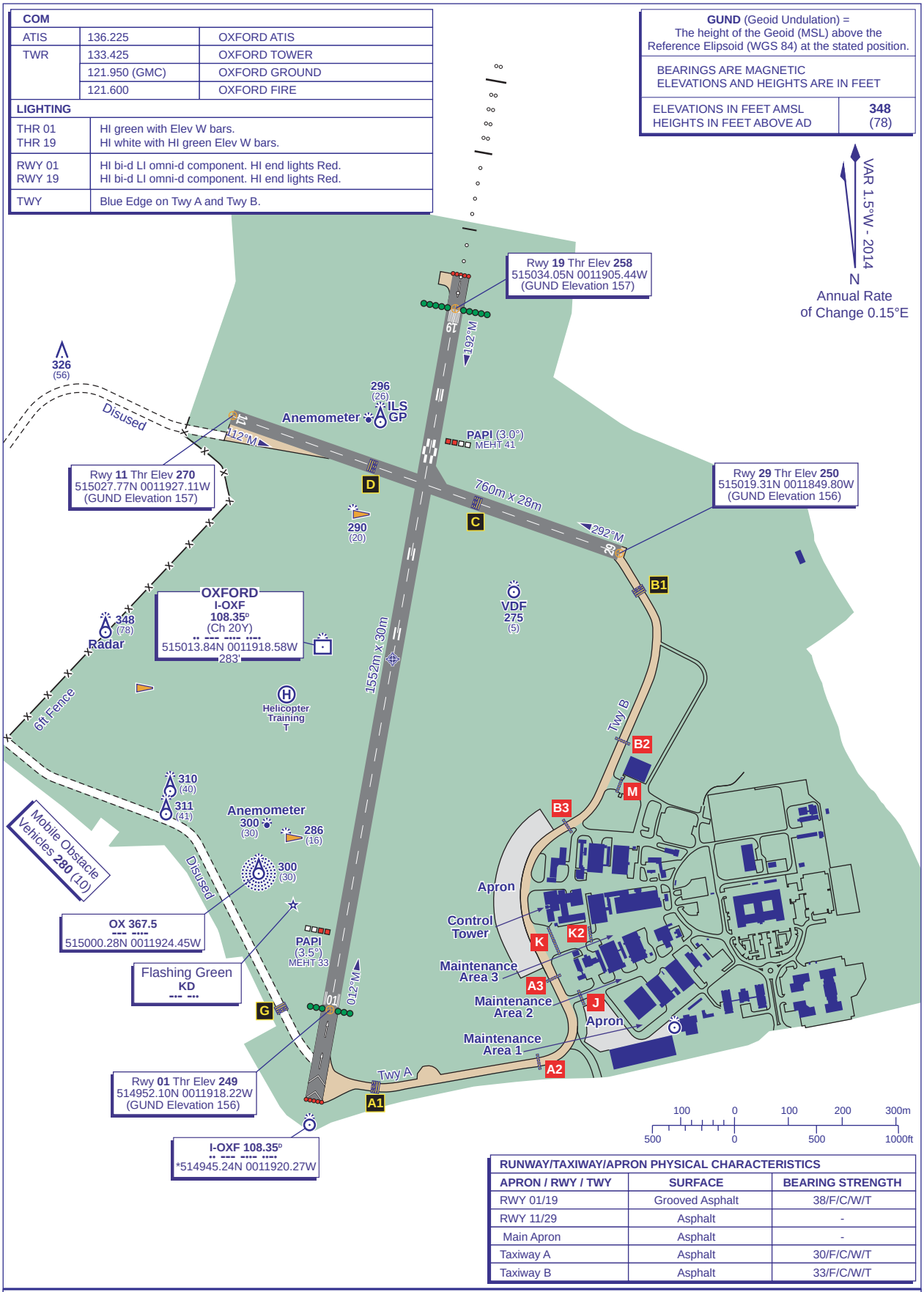
COM		
ATIS	136.225	OXFORD ATIS
TWR	133.425	OXFORD TOWER
	121.950 (GMC)	OXFORD GROUND
	121.600	OXFORD FIRE

LIGHTING	
THR 01 THR 19	HI green with Elev W bars. HI white with HI green Elev W bars.
RWY 01 RWY 19	HI bi-d LI omni-d component. HI end lights Red. HI bi-d LI omni-d component. HI end lights Red.
TWY	Blue Edge on Twy A and Twy B.

GUND (Geoid Undulation) = The height of the Geoid (MSL) above the Reference Elipsoid (WGS 84) at the stated position.

BEARINGS ARE MAGNETIC
ELEVATIONS AND HEIGHTS ARE IN FEET

ELEVATIONS IN FEET AMSL HEIGHTS IN FEET ABOVE AD	**348** (78)



RUNWAY/TAXIWAY/APRON PHYSICAL CHARACTERISTICS		
APRON / RWY / TWY	**SURFACE**	**BEARING STRENGTH**
RWY 01/19	Grooved Asphalt	38/F/C/W/T
RWY 11/29	Asphalt	-
Main Apron	Asphalt	-
Taxiway A	Asphalt	30/F/C/W/T
Taxiway B	Asphalt	33/F/C/W/T

CHANGE (7/14): OBSTACLES. ANEMOMETERS.

AERO INFO DATE 4 APR 14

Appendix B

Subject: **Oxford Airport Operations**
Project: **East Woodstock**

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Land East of Woodstock

LOA Response for information.

1. Movements

1.1.1. The movement on 01/19 can happen at any time subject to the prevailing wind, to give just summer time use would not be representative.

1.1.2 The annual usage is not something which we forecast, due to the variables i.e. weather.

1.1.3 The split direction on 11/29 currently is:

Rwy 11 - 2%

Rwy 29 - 98% due to prevailing westerly - south westerly wind flow.

1.2 Main Runway

1.1.2 01/19 split is 40/60

1.3 Helicopters

1.1.3 Helicopter movements May to Sept were 2,048.

1.3.2 Helicopter movements are included in airports submission of movements to the CAA.

1.3.3 Not all helicopter flights are training out of 2,048 movements 33 were training flights. Some of the other flights will be air tests not recorded as such on our stats.

2. Aircraft Types

2.1 Please see the next page.

3. Ground Runs

3.1 Data attached on pages 3 and 4

3.2 On the 17th August at 1300. We can confirm there was no engine running or compass swings taking place on the 29 run up / compass swing area.

LONDON OXFORD AIRPORT

Oxford Aviation Services Limited
Aircraft Movements 1st October 2013 - 30th September 2014

Count of Arrival/ Departure	Column Labels									
Row Labels	Aero Club	Air Transport	Business Aviation	Helicopters	Military	Other	Positioning Flights	Private Flights	Test & Training	Grand Total
AGUSTA AW139				4.33%						0.44%
AGUSTA 109				3.73%						0.38%
AS355 TWN SQUIREL/AS555 FENNEC				6.81%						0.69%
CESSNA 182 SKYLANE	0.37%					1.59%	0.41%	8.29%	33.30%	17.82%
CESSNA CITATION 560 EXCEL		1.86%	15.23%				5.33%			1.17%
Eurocopter 145				5.41%						0.55%
EUROCOPTER AS350 ECUREUIL				3.08%						0.31%
Eurocopter EC120 Colibri				3.20%						0.32%
EUROCOPTER EC-135				42.59%						4.33%
EUROCOPTER EC-1552				3.06%						0.31%
H.S.125 SRS 700/800		6.83%	9.42%			2.50%	5.33%			0.97%
LEARJET 35/36		3.42%	0.74%			1.36%	14.39%	0.05%	0.00%	1.16%
Other Fixed Wing	6.28%	82.61%	71.17%		100.00%	75.11%	56.21%	76.01%	2.20%	19.02%
Other Rotary				9.57%						0.97%
PIPER CHEROKEE 140-181 WAR/ARC	93.01%					9.66%	1.08%	12.09%	7.93%	18.87%
PIPER PA42 CHEYENNE III	0.16%	5.28%	3.34%			8.52%	16.55%	0.43%	0.09%	1.71%
Piper Seneca Series	0.18%		0.09%			1.25%	0.70%	3.14%	56.47%	29.12%
SA365FKMN DAUPHIN AS565 PAN				3.15%						0.32%
ROBINSON R44 HELICOPTER				4.21%						0.43%
SIKORSKY S-76 (VARIOUS)				10.86%						1.10%
Grand Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**

Aircraft Type	% of Fixed Wing Movements
PA34	32.41%
P28A	21.00%
C182	19.84%
PAY3	1.90%
C56X	1.31%
LJ35	1.29%
Z42	1.12%
H25B	1.08%
Other	20.05%
	100.00%

Aircraft Type	% of Helicopter Movements
EC35	42.59%
S76	10.86%
AS55	6.81%
EC45	5.41%
A139	4.33%
R44	4.21%
A109	3.73%
EC20	3.20%
AS65	3.15%
AS50	3.08%
EC55	3.06%
Other	9.57%
	100.00%

LONDON OXFORD AIRPORT

Engine Ground Runs Compass Swing Data

August 2014

Ground runs and compass swings Aug 2014

Date	Type	Tonnes	Ground Run/Compass swing start Time	Ground Run/Compass Swing finish Time	Position	Total ground Run/Compass Swing Time
01/08/2014	PA34	1995	08:26	08:51	11 T/H	00:25
04/08/2014	C182	1338	13:18	13:28	11 T/H	00:10
04/08/2014	PA34	1995	15:23	15:37	11 T/H	00:14
05/08/2014	PA34	1995	08:31	08:48	11 T/H	00:17
05/08/2014	PA34	1995	09:56	10:32	11 C/S	00:36
06/08/2014	C182	1338	09:33	09:48	11 T/H	00:15
07/08/2014	PA34	1995	13:31	14:18	29 T/H	00:47
07/08/2014	PA34	1995	14:07	14:27	11 T/H	00:20
08/08/2014	P28A	1055	13:21	13:31	29 T/H	00:10
11/08/2014	PA34	1995	11:10	11:19	11 T/H	00:09
12/08/2014	PA34	1995	08:41	08:48	11 T/H	00:07
13/08/2014	PA34	1995	10:12	10:50	11 T/H	00:38
14/08/2014	PA34	1995	08:25	08:47	29 T/H	00:22
14/08/2014	PA34	1995	09:59	12:12	11 T/H	02:13
15/08/2014	H25B	11567	13:40	13:52	11 T/H	00:12
15/08/2014	PA34	1995	14:55	15:20	11 T/H	00:25
22/08/2014	PA34	1995	14:53	15:08	11 T/H	00:15
26/08/2014	PA34	1995	14:00	14:10	11 T/H	00:10
27/08/2014	C182	1338	07:40	08:08	11 T/H	00:28
27/08/2014	C182	1338	10:56	11:15	11 T/H	00:19
28/08/2014	C182	1338	13:23	13:32	11 T/H	00:09
29/08/2014	PA34	1995	07:38	07:55	11 T/H	00:17
29/08/2014	C182	1338	08:48	09:05	11 T/H	00:17
29/08/2014	PA34	1995	08:26	09:20	11 T/H	00:54
29/08/2014	C182	1338	11:06	11:53	11 T/H	00:47

29/08/2014	C182	1338	13:58	14:09	11 T/H	00:11
30/08/2014	PA34	1995	09:23	09:35	11 T/H	00:12

Ground runs and compass swings Sep 14

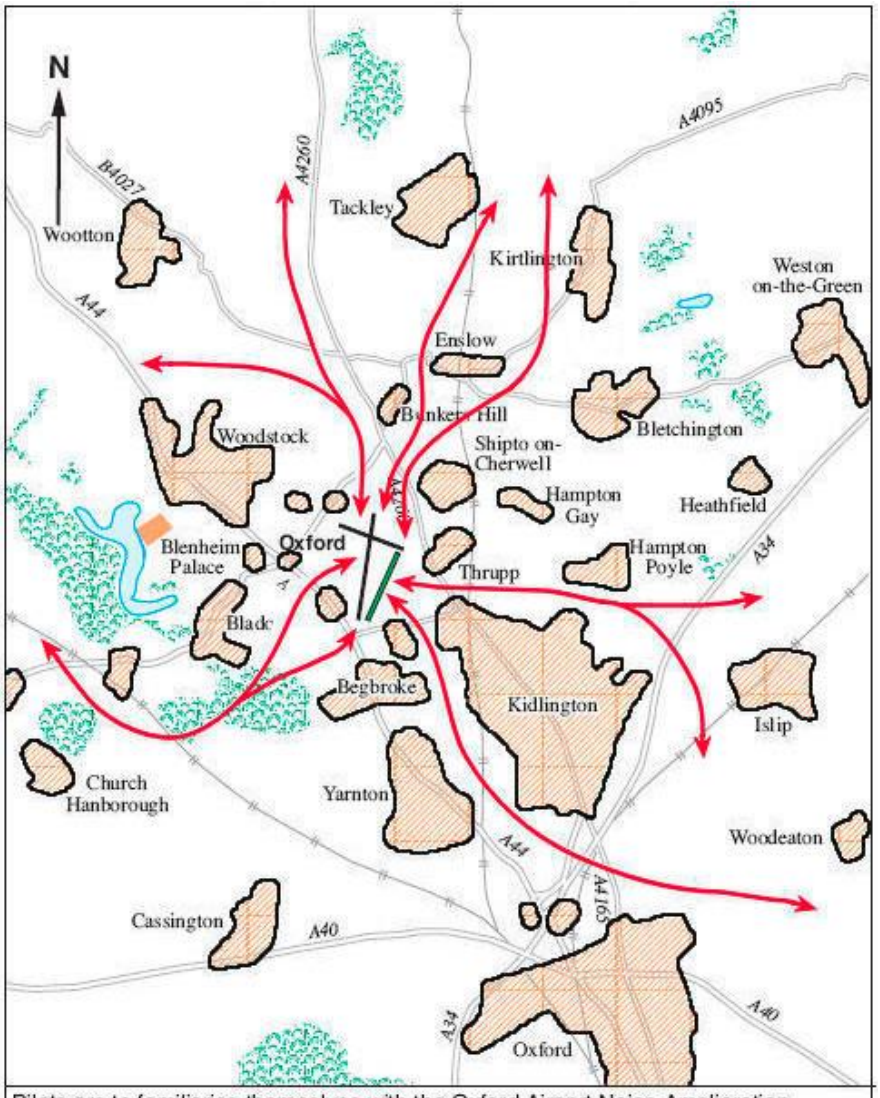
Date	Type	Tonnes	Ground Run/Compass swing start time	Ground Run/Compass Swing finish time	Position	Total ground Run/Compass Swing
01/09/2014	C182	1338	13:09	13:19	11 TH	00:10
02/09/2014	LJ35	9000	13:13	14:00	11 TH	00:47
02/09/2014	PAY3	5080	13:34	13:54	11 TH	00:20
02/09/2014	PA34	1995	14:25	14:49	11 TH	00:24
04/09/2014	PA34	1995	15:33	15:58	11 TH	00:25
05/09/2014	PA34	1995	08:26	08:47	11 TH	00:21
05/09/2014	PA34	1995	08:44	08:50	11 TH	00:06
05/09/2014	PA34	1995	10:05	10:13	11 TH	00:08
06/09/2014	PA34	1995	10:25	11:04	11 TH	00:39
08/09/2014	PA34	1995	14:58	15:25	11 TH	00:27
09/09/2014	PA34	1995	08:57	09:23	11 TH	00:26
09/09/2014	PA34	1995	09:52	10:10	11 TH	00:18
09/09/2014	PA34	1995	12:50	13:07	11 TH	00:17
09/09/2014	PA28	1055	13:18	13:26	11 TH	00:08
09/09/2014	PA34	1995	13:18	13:38	11 TH	00:20
09/09/2014	PA34	1995	14:43	15:00	11 TH	00:17
10/09/2014	Z42	975	14:16	14:41	11 TH	00:25
11/09/2014	C182	1338	07:36	07:45	11 TH	00:09
11/09/2014	C182	1338	08:12	08:24	11 TH	00:12
12/09/2014	PA34	1995	13:42	14:36	11 TH	00:54
12/09/2014	C208	3969	10:52	11:05	11 TH	00:13
15/09/2014	H25B	11567	11:14	11:22	11 TH	00:08
15/09/2014	H25B	11567	12:10	12:20	11 TH	00:10
15/09/2014	H25B	11567	12:45	12:55	11 TH	00:10

16/09/2014	H25B	11567	09:50	11:06	11 TH	01:16
16/09/2014	H25B	11567	11:27	12:46	11 TH	01:19
16/09/2014	H25B	11567	16:50	18:27	11 TH	01:37
17/09/2014	PA34	1995	07:29	07:50	29 TH	00:21
18/09/2014	PA34	1995	07:45	08:43	11 TH	00:58
18/09/2014	H25B	11567	12:33	13:58	11 TH	01:25
19/09/2014	C182	1338	11:17	11:25	11 TH	00:08
20/09/2014	PA34	1995	08:06	08:16	11 TH	00:10
22/09/2014	C182	1338	12:52	13:01	29 TH	00:09
22/09/2014	H25B	11567	14:11	15:53	11 TH	01:42
24/09/2014	PA34	1995	07:44	07:55	11 TH	00:11
24/09/2014	PA34	1995	07:47	07:56	11 TH	00:09
24/09/2014	E50P	4750	13:11	13:14	11 TH	00:03
24/09/2014	PA34	1995	13:55	15:00	11 TH	01:05
24/09/2014	PA34	1995	10:06	11:01	11 TH	00:55
25/09/2014	PA34	1995	09:45	10:45	11 TH	01:00
25/09/2014	PA34	1995	14:45	15:35	11 TH	00:50
26/09/2014	C182	1338	07:34	07:54	11 TH	00:20
26/09/2014	PA34	1995	10:00	10:55	11 TH	00:55
29/09/2014	C182	1338	10:10	10:22	11 TH	00:12
29/09/2014	H25B	11567	10:03	11:26	11 TH	01:23

Appendix C

Subject: **Oxford Airport Helicopter Flight Paths**
Project: **East Woodstock**

Arrival and Departure Routes



Pilots are to familiarise themselves with the Oxford Airport Noise Amelioration Scheme, a copy of which is held in Operations.

Appendix C

Training Circuits