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CURTINS CONSULTING LIMITED

WEST CUMBERLAND HOSPITAL PHASE 2 AND 3

NOISE ASSESSMENT REPORT

NOVEMBER 2019

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NOISE ASSESSMENT REPORT

NOVEMBER 2019

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EXECUTIVE SUMMARY

Wardell Armstrong has carried out a noise assessment for the proposed West Cumberland Hospital (WCH) Phase 1b/2, Phase 2 and Phase 3. The development consists of two new buildings (Phases 2 and 3) and the refurbishment of one existing building (Phase 1b/2).

A noise survey was undertaken to measure representative ambient and background noise levels and to identify any existing noise sources at the existing WCH which may impact on the proposed development.

Road traffic noise was identified as the most significant noise source at the facades of the proposed development. Ventilation mitigation is required for the northern most facades of Phase 2 and Phase 3 new buildings to ensure internal noise levels are met, and it is assumed that these buildings will include mechanical ventilation as part of a whole building ventilation strategy hence the internal levels would be met whilst ensuring adequate ventilation.

All other Phases of the development would meet internal noise guideline levels with windows open for ventilation. The glazing and ventilation strategy for the whole development can be confirmed as part of the detailed design stage.

An Oxidising Refrigerant Unit (ORU) was noted as the most noticeable existing plant noise which may impact the proposed receptors of the Phase 1b/2 and 3 buildings. It is calculated that the ORU would have a low impact on the proposed development and no noise mitigation measures are required.

The proposed development will include externally mounted noise emitting plant, on the roof, on the façade and at the foot of the proposed buildings. Details of proposed plant is not available however a qualitative assessment was undertaken and a design criteria proposed.

With plant noise controlled by the design criteria and when considering façade attenuation provided by the buildings and the context in which the sound resides, a low impact of the proposed plant noise is anticipated.

This assessment demonstrates that noise should not be a determining factor when considering the planning application.

1 INTRODUCTION

1.1.1 Wardell Armstrong LLP (WA) was commissioned by Curtins Consulting Limited to undertake a noise assessment for the Phase 2 and 3 of the proposed West Cumberland Hospital, Whitehaven.

1.1.2 The proposed development site is located to the south east of Whitehaven. To the northeast the site is bound by industrial premises and a car parking area. Phase 1 of the West Cumberland Hospital is located to the southeast. To the southwest, the site boarders a carpark area and residential dwellings. To the northwest the site is bound by Homewood Road, with residential dwellings beyond.

1.1.3 The development will comprise the refurbishment of an existing hospital building (Phase 1b/2), a new hospital building (Phase 2) and a new education centre and student residence (Phase 3), the site layout is shown in **Appendix A**.

1.1.4 This noise assessment has been prepared to assess the potential noise impact of existing noise sources on the proposed development as well as the potential noise impact of proposed fixed plant on existing and proposed sensitive receptors.

1.1.5 The report assesses the results of noise monitoring carried out in accordance with current guidance and includes outline recommendations for noise mitigation where appropriate.

2 ASSESSMENT METHODOLODGY

2.1 Scope of Works

2.1.1 This noise assessment is for the operational phase of the development. As part of this assessment, WA carried out a noise survey to establish the current noise levels across site.

2.1.2 The scope of works includes a consideration of the following;

- the noise impact of road traffic noise on sensitive receptors of the proposed development (staff, patients and student residences);
- the impact of noise from any existing plant on receptors of the proposed development; and,
- the impact of noise from any proposed plant at receptors inside the proposed development as well as at other nearby receptors.

2.1.3 The noise assessment takes into account current guidance including:

- National Planning Policy Framework, 2019 (NPPF).
- Planning Practice Guidance, 2014 (PPG).
- Noise Policy Statement for England, 2019 (NPSE).
- British Standard 8233:2014 Guidance on Sound Insulation & Noise Reduction for Buildings (BS8233).
- British Standard 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound (BS4142).
- Building Bulletin 93: Acoustic Design of Schools (BB93).
- Health Technical Memorandum 08-01- Acoustics 2013 (HTM).

2.1.4 Full details of these documents are included in **Appendix B**.

3 NOISE SURVEY

3.1 Monitoring Locations and Periods

3.1.1 On the 24th and 25th July 2019, WA carried out a noise survey to measure existing ambient and background noise levels at the proposed development site.

3.1.2 Attended noise measurements, supplemented with audio recordings, were taken at four locations as shown on Figure 1.

3.1.3 Table 1 shows the noise monitoring periods along with associated observations taken during installation and decommissioning of the monitoring equipment.

Table 1: Noise Monitoring Periods

Monitoring Location (ML)	Period	Start Date and Time	Finish Date and Time	Comments
ML1	Daytime	24/07/19 10:32	24/07/19 13:30	Approximately 4m from Homewood Road. Road traffic noise on Homewood Road was dominant and vehicle movements within internal hospital roads were also audible.
	Night-time	24/07/19 23:15	24/07/19 23:45	
ML2	Daytime	24/07/19 13:40	24/07/19 14:40	Measurement of background noise to the south of the site where the education centre and student residence building will be located. Road traffic noise from Homewood Road and the internal hospital road network was the most significant noise sources affecting the background levels during the day and night-time.
	Night-time	25/07/19 00:06	25/07/19 00:35	
ML3	Daytime	24/07/19 14:48	24/07/19 15:48	Measurement of background noise to the east of the site near to the proposed hospital building. Seagulls were present and contributed to the background levels daytime and night-time.
	Night-time	25/07/19 00:41	25/07/19 01:09	
ML4	Daytime	24/07/19 15:58	24/07/19 15:59	Measurement of specific plant noise, at 1m from the Oxidising Refrigerant Unit outside the existing hospital building.

3.1.4 The noise measurements were made using Class 1, integrating sound level meters. The meters were mounted on tripods 1.5m above the ground and more than 3.5 metres from any other reflecting surfaces. The sound level meters were calibrated to a reference level of 94dB at 1kHz both before, and on completion of, the noise survey. No drift in the calibration during the survey was noted.

3.1.5 A-weighted[1] L_{eqs}[2] were measured as well as the maximum and minimum sound pressure levels, A-weighted L_{90s}[3] , A-weighted L_{10s}[4]. The measured noise levels are set out in full in **Appendix C**.

3.1.6 The site weather conditions on the 24th and 25th July 2019, were as follows;

- Temperatures between 17°C and 24°C.
- Wind below 4 m/s.
- Dry weather conditions.

3.2 Existing Road Traffic Noise

3.2.1 The road traffic noise levels from Homewood Road were measured at ML1 and are summarised below in Table 3 for the relevant $L_{Aeq,16hour}$, $L_{Aeq,8hour}$ and $L_{Amax,f}$ noise indexes.

Table 2: Measured Road Traffic Noise Levels

Noise Monitoring Location	Average Daytime dB $L_{Aeq,16hour}$	Average Night-time dB $L_{Aeq,8hour}$	Highest Night-time dB $L_{Amax,f}$
ML1	64	56	76

3.3 Existing Background Noise Levels

3.3.1 In accordance with BS4142 and based on measurements at ML2 and ML3, representative daytime $L_{A90,1hour}$ and night-time $L_{A90,15minute}$ have been established, these are summarised below in Table 33. To be robust, these are based on the lowest measure L_{A90} levels from the survey periods.

Table 3: Measured Representative Background Noise levels

Noise Monitoring Location	Daytime dB(A) $L_{90,1hour}$	Night-time dB(A) $L_{90,15minute}$
ML2	42	28
ML3	42	35

3.4 Existing Industrial Noise Levels

3.4.1 Following a walk over of the site, it was noted that industrial noise from an Oxidising Refrigerant Unit (ORU) had the potential to impact upon proposed receptors within Phase 3.

[1] A' Weighting — An electronic filter in a sound level meter which mimics the human ear's response to sounds at different frequencies under defined conditions.

[2] L_{eqs} — Equivalent continuous noise level; the steady sound pressure which contains an equivalent quantity of sound energy as the time-varying sound pressure levels.

[3] L_{90} — The noise level which is exceeded for 90% of the measurement period.

[4] L_{10} — The noise level which is exceeded for 10% of the measurement period.

3.4.2 Short measurements in close proximity to the ORU were undertaken (ML4) and it was noted that the ORU operates continuously during the day and night-time periods. The sound level from the ORU was measured to be 54dB(A) at 1m.

3.4.3 No other significant existing industrial noise sources were noted during the site walk-over.

3.5 Uncertainty

3.5.1 To reduce measurement uncertainty, the following steps have been taken:

- The background noise measurement location was selected to be representative of the background noise level at ESRs.
- In accordance with guidance, the sound level meter was mounted on a tripod 1.5m above the ground. The monitoring location was also more than 3.5 metres from any other reflecting surfaces;
- The noise measurements were taken during dry and calm weather conditions for most of the monitoring period. Any periods of adverse weather conditions have been removed from the assessment data;
- The noise measurements were undertaken during proposed operational times and are representative of the daytime and night-time periods;
- The daytime and night-time background noise measurements were undertaken in accordance with the reference period required by BS4142;
- The results of each measurement period were reported to the nearest 0.1dB; and;
- Background noise measurements were made using a Class 1 integrating sound level meter.

4 NOISE ASSESSMENT

4.1 Existing road traffic noise impact on proposed sensitive receptors

4.1.1 The road traffic noise levels have been predicted across the site using SoundPLAN noise modelling software and the model was calibrated to the measured levels from Table 2 above.

4.1.2 The predicted road traffic noise levels are shown in Figure 2 for daytime $L_{Aeq,16hour}$ and Figure 3 for night-time $L_{Aeq,8hour}$ across the site and a summary of façade levels at the most sensitive facades of each proposed building is provided in Table 4 below.

Table 4: Road Traffic Noise Levels at most sensitive proposed facades

Proposed Building	Daytime dB $L_{Aeq,16hour}$	Night-time dB $L_{Aeq,8hour}$	Night-time dB $L_{Amax,f}$
Phase 2 – New Hospital Building	54	49	64
Phase 1b/2 – Hospital Refurbishment	47	42	57
Phase 3 – Education Centre	52	48	61
Phase 3 – Student Residence	48	41	56

Phase 2 – New Hospital Building

4.1.3 The lowest internal criteria from the HTM Guidance is 35dB $L_{Aeq,1hour}$ during the day and 35dB $L_{Aeq,1hour}$ or 45 $L_{Amax,f}$ (whichever is more relevant) during the nigh-time, as shown in Table 1 in section B.27 of **Appendix B**.

4.1.4 Based on the above criteria and the highest façade levels for Phase 2, as shown in Table 4, the building façade would have to provide a minimum of 19dB noise attenuation.

4.1.5 An open window provides approximately 15dB noise attenuation, therefore, an alternative means of ventilation would be required to allow windows to be closed and adequate ventilation maintained. Ventilation mitigation is required for the northern most facades of Phase 2, and it is assumed that the building will have as a minimum standard thermal double glazing

4.1.6 Given the clinical nature of Phase 2, we assume that mechanical ventilation, as part of a whole building ventilation strategy, would be included within the development design. With a mechanical ventilation system in place, windows could be closed, as required, and adequate ventilation would be maintained.

Phase 1b/2 – Hospital Refurbishment

4.1.7 The lowest internal criteria from the HTM Guidance is 35dB $L_{Aeq,1hour}$ during the day and 35dB $L_{Aeq,1hour}$ or 45 $L_{Amax,f}$ (whichever is more relevant) during the nigh-time, as shown in Table 1 in section B.27 of **Appendix B**.

4.1.8 Based on the above criteria and the highest façade levels for Phase 1b/2, as shown in Table 4, the building façade would have to provide a minimum of 12dB noise attenuation.

4.1.9 A façade attenuation of 12dB would be met with an open window; therefore, no specific noise mitigation are required for the facades of Phase 1b/2 to meet internal noise guideline levels.

Phase 3 – Education Centre

4.1.10 According to BB93, indoor ambient noise limits of between 30 and 45 dB $L_{Aeq\ 30\ minutes,}$ depending on the use of the room, should be met in all teaching rooms of the proposed Education Centre.

4.1.11 Based on the more stringent criteria of 30dB and the façade levels in Table 4, the façades of the Education Centre would have to provide a minimum of 22dB noise attenuation.

4.1.12 As an open window provides approximately 15dB noise attenuation, alternative means of ventilation would be required to allow windows to be closed and adequate ventilation maintained.

4.1.13 It is expected that mechanical ventilation, as part of a whole building ventilation strategy, would be included within the development design of the Education Centre. With a mechanical ventilation system in place, windows could be closed, as required, and adequate ventilation would be maintained.

Phase 3 – Student Residence

4.1.14 When assessing the potential noise impact from road traffic noise, residential dwelling can be considered in accordance with ProPG and BS8233. The noise levels predicted at the proposed student residence are an indication of a low noise risk to road traffic noise in accordance with ProPG.

4.1.15 Based on the façade levels shown in Table 4, for the proposed student residence to achieve internal noise levels of 35dB $L_{Aeq,16hour}$ daytime, 30dB $L_{Aeq,8hour}$ and maximum noise levels less than 45dB $L_{Amax,f}$ during the night-time, the façade would have to provide a minimum of 13dB noise attenuation.

4.1.16 A façade attenuation of 13dB would be met with an open window; therefore, no specific noise mitigation is required for the proposed student residence.

4.2 Existing plant noise impact on proposed sensitive receptors - Phase 3 (Student Residence)

4.2.1 Following a site walk over, industrial noise from an ORU was the most noticeable noise source which may impact the proposed receptors of the Phases 1b/2 and 3.

4.2.2 No noise from existing roof top plant was observed during the site walk over. However, it is accepted that any plant noise which may be emitted from the roof of the existing hospital (Phase 1), has the potential to be observed on the upper floors of the proposed development. Nevertheless, it is assumed that any existing roof top plant noise from Phase 1 does not cause noise issues at existing sensitive facades of the hospital. Therefore, any existing roof top plant associated with Phase 1 is unlikely to have any significant noise impact on the proposed development.

Specific sound level

4.2.3 The potential noise impact from the existing ORU was assessed at the proposed student residence (Phase 3), as this is the closest proposed building. Figure 4 shows the predicted noise from the ORU.

4.2.4 The industrial noise is predicted to be 38dB(A) at the façade of student residence. Therefore, in accordance with BS4142, 38dB(A) will be considered as the specific sound level.

Background sound level

4.2.5 Section 8 of BS4142 provides guidance on the selection of the background sound to be used in the assessment. BS4142 states that the background sound levels used for the assessment should be representative of the period being assessed (i.e. daytime or night-time periods), and that there is no “single” background sound level.

4.2.6 Following a review of the measured background data at ML2, we have determined that the daytime and lowest night-time background sound levels, as presented in Table 3, are representative. Therefore, for the purpose of this assessment the day and night-time L_{A90} sound levels presented in Table 3 will be used as the background sound levels.

Rating Level

4.2.7 BS4142 includes guidance on the application of an additional weighting which should be applied to the specific sound level should the industrial noise be tonal, impulsive, or intermittent, as experienced at the ESRs. Observations at sensitive receptors allows for the identification of such characteristics.

4.2.1 Based on observations made during the noise survey at ML4, the sound from the ORU was not considered to be tonal, impulsive, or intermittent. Therefore, no correction to the specific sound level is required.

Assessment of impact

4.2.2 In accordance with BS4142, the rating levels of the ORU, as received at Phase 3 of the proposed development, has been compared with the corresponding measured background noise levels during the day and night-time, as shown in Table 5.

Table 5: BS4142 Assessment of potential impact from existing ORU at the proposed Phase 3

Description	Daytime (1hour)	Night-time (15minute)
Calculated Specific Noise Level dB L_{Aeq}	38	38
Acoustic Feature Correction dB(A)	-	-
Rating Level	38	38
Average Evening Background Noise Level, dB L_{A90}	42	35
Excess of rating over background level dB(A)	-4	+3

4.2.3 The industrial noise levels form that ORU are predicted to be 4dB below background sound level during the daytime, in accordance with BS4142 this is an indication of the specific sound source having a low impact, depending on the context.

4.2.4 During The night-time, the rating level is predicted to exceedance the background sound level by 3dB, in accordance with BS4142 this is likely to be an indication of an adverse impact, depending on the context.

Context Assessment

4.2.5 BS4142:2014 States; “The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound sources exceeds the background sound level and the context in which the sound occurs”.

4.2.6 The first requirement of this statement has been determined within the noise impact assessment section above. To determine the context in which the industrial sound will

reside, three factors must be considered, these are;

- The absolute level of sound;
- The character and level of the residual sound compared to the character and level of the specific sound; and,
- The sensitivity of the receptor.

4.2.7 During the day and night-time periods, the background sound levels are between 42 and 35dB(A), and the rating level is 38dB(A). These levels are low; therefore, the absolute level is considered to be more relevant than the fact the specific sound level exceeds the background level.

4.2.8 The specific sound level from the ORU is similar in character to the residual sound, which contains low to mid frequency noise from road traffic. Therefore, it is considered that given its low sound level, noise from the ORU would not be out of character with, the other noise sources in the vicinity.

4.2.9 It should also be noted that the student accommodation building (Phase 3) would only include internal amenities areas and the facade of the building would provide at least 15dB attenuation with an open window. Taking this into consideration, the internal noise impact would be significant less that stated in Table 5 and is likely to be of a low impact.

4.2.10 A BS4142 assessment has been undertaken to assess the potential noise impact from the ORU on proposed sensitive receptors within Phase 3. The assessment indicates that the noise associated with the ORU has the potential to cause an **adverse impact** at facades of Phase 3 facing the ORU, depending on context.

4.2.11 In accordance with BS4142, the context in which the sound resides must be considered as part of the assessment. When considering context, the noise impact at Phase 3 will be less significant. Therefore, the BS4142 assessment indicates that the noise associated with the ORU will have a **low impact** on the proposed development and no mitigation measure are required for this sound source.

4.3 Proposed plant noise impact on existing and proposed sensitive receptors

4.3.1 The proposed development is likely to include externally mounted plant on each Phase. Details of proposed plant are not available, however, a qualitative assessment can be undertaken to determine the potential impact at existing and proposed sensitive receptors.

4.3.2 The buildings will be designed in accordance with the HTM to ensure levels from plant

within internal areas are kept below noise guideline levels for all existing and future sensitive receptors.

4.3.3 The background measurements undertaken and shown in Table 3 can be used to inform a design criteria for external plant noise. Typically, plant noise should not be greater than the background (L_{A90}) noise levels as measured on a typical day or night-time period, when taking into consideration the character of the noise and its context.

4.3.4 Therefore, in accordance with BS4142, the following rating levels can be used to control plant noise at closest receptors:

- Phase 1b/2 refurbishment building – Any proposed ancillary plant should not exceed the following noise levels at any sensitive façade : Daytime 45dB and Night-time 38dB
- Phase 2 new building – Any proposed ancillary plant should not exceed the following noise levels at any sensitive façade: Daytime 45dB and Night-time 38dB
- Phase 3 new building – Any proposed ancillary plant should not exceed the following noise levels at any sensitive façade : Daytime 45dB and Night-time 31dB

4.3.5 With plant noise controlled by the proposed criteria above, when considering the context and the façade attenuation provided by the buildings, the potential noise impact from any future plant is predicted to be low.

5 CONCLUSIONS

5.1.1 Wardell Armstrong has carried out a noise assessment for the proposed West Cumberland Hospital Phase 1b/2, Phase 2 and Phase 3. The development consists of two new buildings and one building refurbishment.

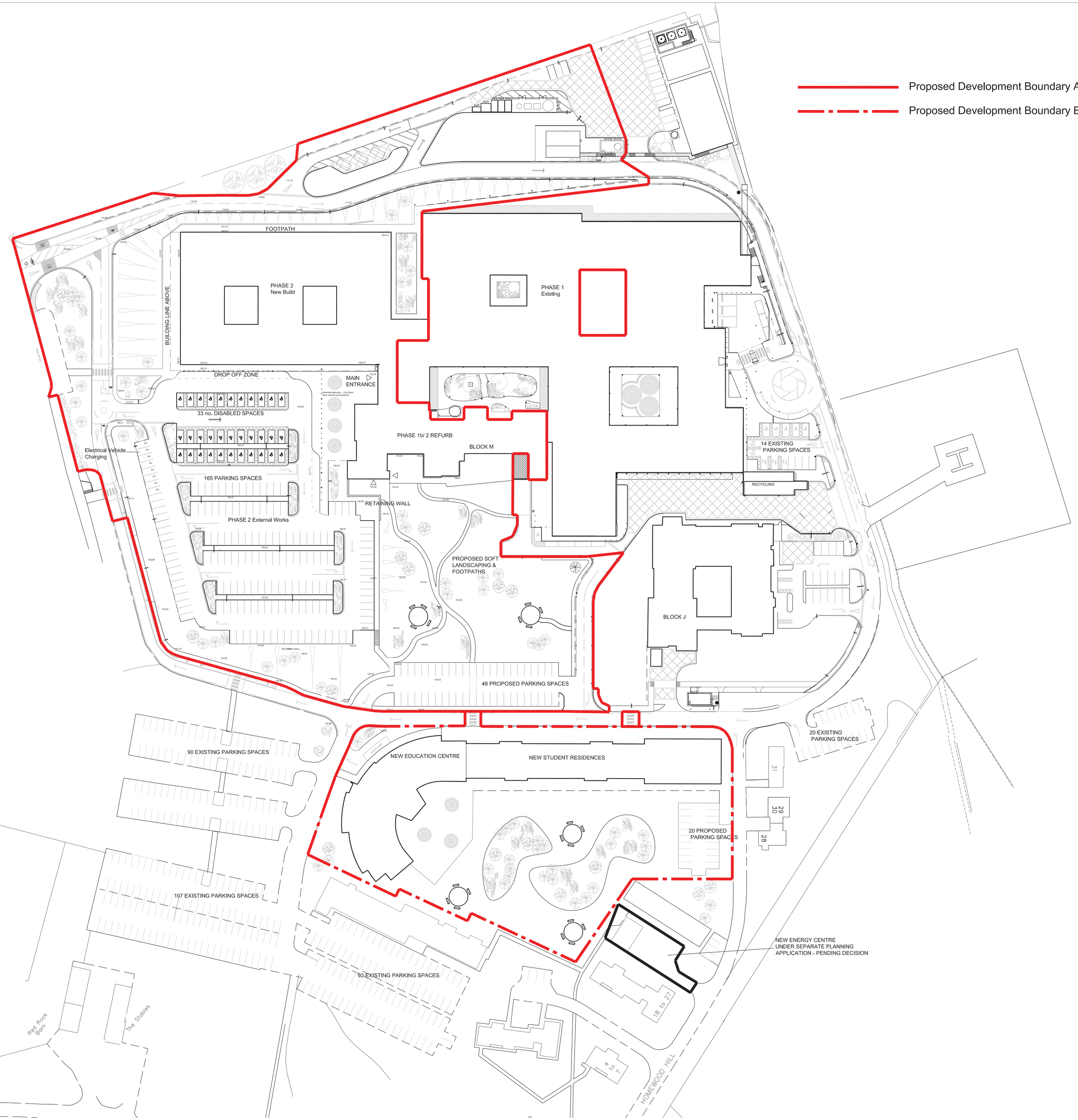
5.1.2 A noise survey was undertaken to measure representative ambient and background noise levels and to identify any existing sources which may impact the proposed development.

5.1.3 A façade attenuation of 19dB is required for the most exposed (to road traffic noise) northern façade of the proposed Phase 2 new building and 22dB for the most exposed northern façade of the proposed Phase 3 new building (education centre) . The glazing and ventilation of the buildings will provide the required façade attenuation whilst ensuring a good ventilation in each sensitive rooms.

5.1.4 Following a site walk over, industrial noise from a ORU was identified as the only significant industrial noise source at the development site. It is calculated that the ORU would have a low impact on the proposed development and no noise mitigation measures are required.

5.1.5 The proposed development will likely include externally mounted plant for all phases. Details of proposed plant is not available, however, a qualitative assessment was undertaken and a design criteria has been proposed. With plant noise controlled with the proposed criteria and also giving consideration to the context and the façade attenuation provided by the buildings, a low impact of the proposed plant noise is anticipated.

APPENDIX A Development Layout



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SCALE 1: 500 m

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Client Name:
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Site Name:
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Project Name:
West Cumberland Hospital, Whitehaven - Phase 2

Drawing Title:
Proposed Site Plan

Project No:	Sheet Size:	Scale:	
8060c	A0	1/500	
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PMG	AG	AG	P01
Suitability:			Status:
Suitable for Information			S2

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APPENDIX B Noise Legislation and Guidance

Noise Legislation and Guidance

National Planning Policy Framework

B.1 In 2019 the 'National Planning Policy Framework' (NPPF) was introduced as the current planning policy guidance within England. Paragraph 180 of the NPPF states:

'Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) Mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

b) Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity values for this reason;"

Noise Policy Statement for England

B.2 With regard to 'adverse impacts' the NPPF refers to the 'Noise Policy Statement for England' (NPSE), which defines three categories, as follows:

- NOEL – No Observed Effect Level. This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.
- LOAEL – Lowest Observed Adverse Effect Level. This is the level above which adverse effects on health and quality of life can be detected.
- SOAEL – Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur.'

B.3 The first aim of the NPSE states that significant adverse effects on health and quality of life should be avoided. The second aim refers to the situation where the impact lies somewhere between LOAEL and SOAEL, and it requires that all reasonable steps are taken to mitigate and minimise the adverse effects of noise. However, this does not mean that such adverse effects cannot occur.

Planning Practice Guidance

B.4 The Planning Practice Guidance (PPG) provides further detail about how the effect levels can be recognised. Above the NOEL noise becomes noticeable; however, it has no adverse effect as it does not cause any change in behaviour or attitude.

B.5 Once noise crosses the LOAEL threshold it begins to have an adverse effect and consideration needs to be given to mitigating and minimising those effects, taking account of the economic and social benefits being derived from the activity causing the noise.

B.6 Increasing noise exposure further might cause the SOAEL threshold to be crossed. If the exposure is above this level the planning process should be used to avoid the effect occurring by use of appropriate mitigation such as by altering the design and layout. Such decisions must be made taking account of the economic and social benefit of the activity causing the noise, but it is undesirable for such exposure to be caused.

B.7 At the highest extreme the situation should be prevented from occurring regardless of the benefits which might arise. The following Table summarises the noise exposure hierarchy.

Summary of the Noise Exposure Hierarchy			
Perception	**Examples of Outcomes**	**Increasing Effect Level**	**Action**
Not Present	No Effect	No Observed Effect	No specific measures required
		No Observed Effect Level	
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed adverse Effect	No specific measures required
		Lowest Observed Adverse Effect Level	

Summary of the Noise Exposure Hierarchy			
Perception	**Examples of Outcomes**	**Increasing Effect Level**	**Action**
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
		Significant Observed Adverse Effect Level	
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. 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
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

B.8 The PPG summarises the approach to be taken when assessing noise. It accepts that noise can override other planning concerns, but states:

"Neither the Noise Policy Statement for England nor the National Planning Policy Framework (which reflects the Noise Policy Statement) expects noise to be considered in isolation, separate from the economic, social and other environmental dimensions of proposed development."

British Standard 8233: Guidance on Sound Insulation and Noise Reduction for Buildings (BS8233).

B.9 British Standard 8233 "Guidance on sound insulation and noise reduction for buildings" 2014 provides advice and guidelines levels in regard to both internal and external noise levels. For internal noise levels, in addition to guideline levels in different type of room (ie bedrooms, living-rooms…) it states:

B.10 "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."

B.11 Furthermore, with regard to external noise, the Standard states:

"For traditional external areas that are used for amenity space such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$ with ***an*** *upper guidance value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognised 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."*

Department of Transport's memorandum, "Calculation of Road Traffic Noise" (CRTN), 1998;

B.12 The memorandum was prepared to enable entitlement under the Noise Insulation Regulations 1975 to be determined; but it is stated in the document, that the guidance is equally appropriate for the calculation of traffic noise for land use planning purposes.

B.13 The procedures outlined in CRTN assume typical traffic and noise propagation conditions that are consistent with moderately adverse wind velocities and directions during specified periods. In CRTN, all noise levels can be expressed in terms of the index L10(18 hour) dB(A).

British Standard 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound (BS4142):

B.14 BS4142 is used to rate and assess sound of an industrial and/or commercial nature including:

- sound from industrial and manufacturing processes;
- sound from fixed installations which comprise mechanical and electrical plant and equipment;
- sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and

- sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

B.15 The standard is applicable to the determination of the following levels at outdoor locations:

- rating levels for sources of sound of an industrial and/or commercial nature; and
- ambient, background and residual sound levels, for the purposes of:

  1) Investigating complaints;

  2) Assessing sound from existing, proposed, new, modified or additional source(s) of sound of an industrial and/or commercial nature; and

  3) Assessing sound at proposed new dwellings or premises used for residential purposes.

B.16 The purpose of the BS4142 assessment procedure is to assess the significance of sound of an industrial and/or commercial nature.

B.17 BS4142 refers to noise from the industrial source as the 'specific noise' and this is the term used in this report to refer to noise which is predicted to occur due to activities associated with the existing industrial premises. The 'specific noise' levels, of the existing industrial premises that have been measured are detailed in this report.

B.18 BS4142 assesses the significance of impacts by comparing the specific noise level to the background noise level (L_{A90}). This report provides details of the measured or calculated background noise levels.

B.19 Section 8 of BS4142 discusses ways to determine the background sound level, in Section 8.1 it states;

> *'Since the intention is to determine a background sound level in the absence of the specific sound that is under consideration, it is necessary to understand that the background sound level can in some circumstances legitimately include industrial and/or commercial sounds that are present as separate to the specific sound.'*

B.20 Certain acoustic features can increase the significance of impacts over that expected from a simple comparison between the specific noise level and the background noise level. In particular, BS4142 identifies that the absolute level of sound, the character, and the residual sound and the sensitivity of receptor should all be taken into consideration. BS4142 includes allowances for a rating penalty to be added if it is found

that the specific noise source contains a tone, impulse and/or other characteristic, or is expected to be present. The specific noise level along with any applicable correction is referred to as the 'rating level'.

B.21 The greater the increase between the rating level over the background noise level, the greater the magnitude of the impact. The assessment criteria given by BS4142 are as follows:

- A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.
- 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. 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.

B.22 During the daytime, BS4142 requires that noise levels are assessed over 1-hour periods. However, during the night-time, noise levels are required to be assessed over 15-minute periods.

B.23 Where the initial estimate of the impact needs to be modified due to context, BS4142 states that all pertinent factors should be taken into consideration, including:

- The absolute level of sound;
- The character and level of the residual sound compared to the character and level of the specific sound; and
- The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions.

Building Bulletin 93: Acoustic Design of Schools (BB93)

B.24 The Acoustic Performance Standards for the Priority Schools Building Programme (2012) and BB93 provide detailed guidance on recommended external and internal noise levels to be achieved at school development sites.

B.25 For new school developments, the guidance recommend that the following daytime noise levels should be achieved:

- An upper limit of 60 dB $L_{Aeq,30\ minutes}$ at the boundary of external premises used for teaching and recreation;
- 55 dB $L_{Aeq,30\ minutes}$ in unoccupied playgrounds, playing fields and other outdoor areas;
- 50 dB $L_{Aeq,30\ minutes}$ in at least one area of the unoccupied playgrounds, playing fields or other outdoor areas, to ensure suitable noise levels for outdoor teaching; and
- Indoor ambient noise limits in schools of between 30 and 45 dB $L_{Aeq,30\ minutes}$ depending on the use of the room.

Health Technical Memorandum 08-01- Acoustics

B.26 This health technical memorandum (HTM) give comprehensive advice and guidance on the design, installation and operation of specialised building and engineering technology used in the delivery of healthcare. Part 08 is for Specialist Services and 08-01 is the Acoustic section of Specialist Services.

B.27 Table 1 provides the criteria for noise intrusion from external sources which should be met inside different type of rooms. The table is reproduced below.

Table 1 - Criteria for noise intrusion from external sources in hospital rooms

Room Type	**Example**	**Criteria for noise intrusion to be met inside the spaces from external sources (dB)**
Ward – single person	Single-bed ward, single-bed recovery areas and on-call room, relatives' overnight stay	40 $L_{Aeq,\ 1hr}$ daytime 35 $L_{Aeq,\ 1hr}$ night 45 $L_{Amax,\ f}$ night
Ward – multi-bed	Multi-bed wards, recovery areas	45 $L_{Aeq,\ 1hr}$ daytime 35 $L_{Aeq,\ 1hr}$ night 45 $L_{Amax,\ f}$ night
Small office-type spaces	Private offices, small treatment rooms, interview rooms, consulting rooms	40 $L_{Aeq,\ 1hr}$
Open clinical areas	A&E	45 $L_{Aeq,\ 1hr}$
Circulation spaces	Corridors, hospital street, atria	55 $L_{Aeq,\ 1hr}$
Public areas	Dining areas, waiting areas, playrooms	50 $L_{Aeq,\ 1hr}$
Personal hygiene (en-suite)	Toilets, showers	45 $L_{Aeq,\ 1hr}$
Personal hygiene (public and staff)	Toilets, showers	55 $L_{Aeq,\ 1hr}$
Small food-preparation areas	Ward kitchens	50 $L_{Aeq,\ 1hr}$
Large food-preparation areas	Main kitchens	55 $L_{Aeq,\ 1hr}$
Large meeting rooms (>35 m2 floor area)	Lecture theatres, meeting rooms, board rooms, seminar rooms, classrooms	35 $L_{Aeq,\ 1hr}$
Small meeting rooms (≤35 m2 floor area)	Meeting rooms, seminar rooms, classrooms, board rooms	40 $L_{Aeq,\ 1hr}$
Operating theatres	Operating theatres	40 $L_{Aeq,\ 1hr}$ 50 $L_{Amax,f}$
Laboratories	Laboratories	45 $L_{Aeq,\ 1hr}$

APPENDIX C Noise Monitoring Results

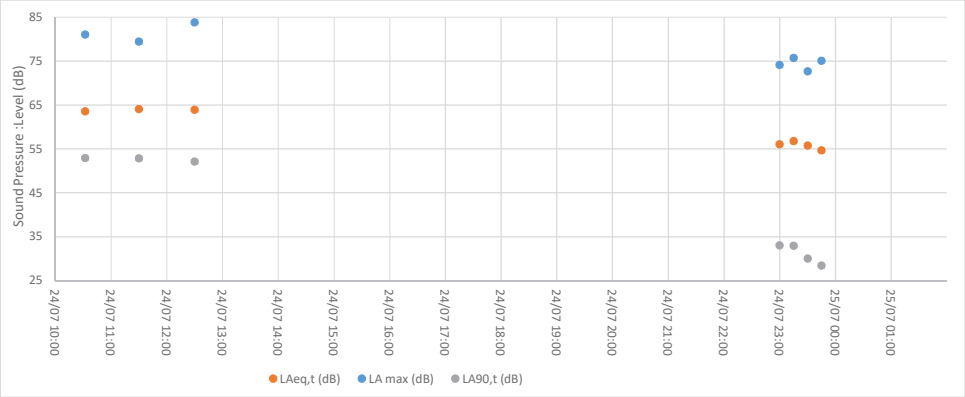
ML1

ML1 Noise Survey results - Summary

Description	Measurement of noise from Home Wood Road Road traffic noise on Home Wood Road was dominant and vehicle movements within internal hospital roads were also audible.
Daytime LAeq,t (dB)	64
Night-time LAeq,t (dB)	56
Night-time LAmax, f (dB)	76

ML1 Noise Survey results - Tabular Detailed break-down

Timestamp (dd/mm/yyyy hh:mm)	Duration (in min)	$L_{Aeq,t}$ (dB)	$L_{A\,max}$ (dB)	$L_{A90,t}$ (dB)	$L_{A10,t}$ (dB)	Time Period (Day / Night)	Comment for specific period
24/07/2019 10:32	58	63.5	81	52.9	66.8	Day	
24/07/2019 11:30	60	64	79.4	52.8	67.2	Day	
24/07/2019 12:30	60	63.9	83.8	52.1	66.9	Day	
24/07/2019 23:00	15	56	74.1	33	59.8	Night	
24/07/2019 23:15	15	56.7	75.7	32.9	59.9	Night	
24/07/2019 23:30	15	55.7	72.6	30	58.7	Night	
24/07/2019 23:45	14	54.6	75	28.4	56.3	Night	



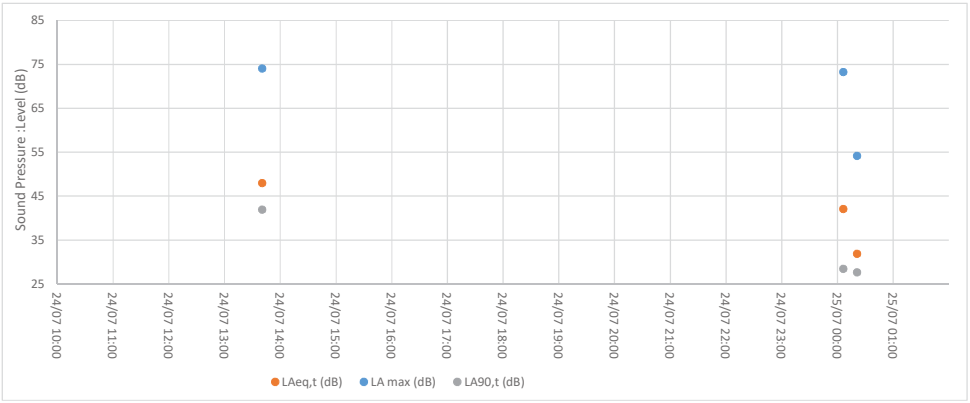
ML2

ML2 Noise Survey results - Summary

Description	Measurement of background noise to the south of the site where a new building for Phase 2 and 3 is proposed. Road traffic noise on Homewood Road and the internal road network was the most significant source affecting the background levels daytime and night-time.
Daytime LA90,t	42
Night-time LA90,t	28

ML2 Noise Survey results - Tabular Detailed break-down

Timestamp (dd/mm/yyyy hh:mm)	Duration (in min)	$L_{Aeq,t}$ (dB)	$L_{A\,max}$ (dB)	$L_{A90,t}$ (dB)	$L_{A10,t}$ (dB)	Time Period (Day / Night)	Comment for specific period
24/07/2019 13:40	59	47.9	74	41.9	50.3	Day	
25/07/2019 00:06	14	42	73.2	28.4	40.4	Night	
25/07/2019 00:21	15	31.8	54.1	27.6	33.9	Night	



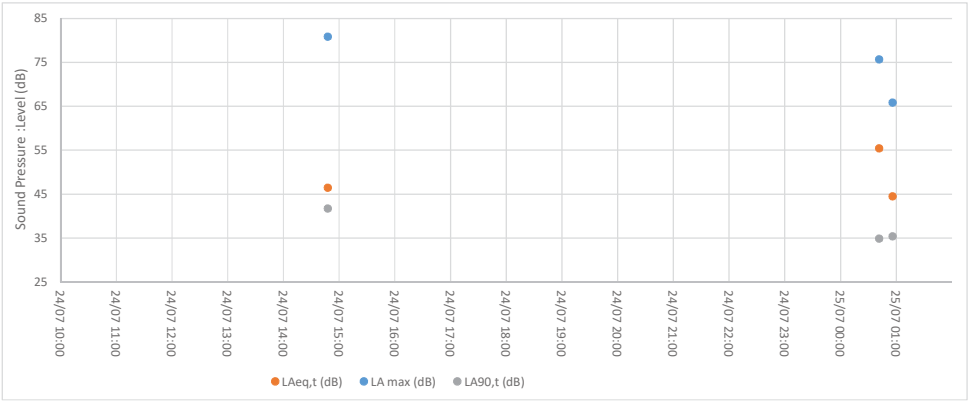
ML3

ML3 Noise Survey results - Summary

Description	Measurement of background noise to the east of the site near Phase 1 new building. Bird song was the most significant source affecting the background levels daytime and night-time.
Daytime LA90,t	42
Night-time LA90,t	35

ML3 Noise Survey results - Tabular Detailed break-down

Timestamp (dd/mm/yyyy hh:mm)	Duration (in min)	$L_{Aeq,t}$ (dB)	$L_{A\,max}$ (dB)	$L_{A90,t}$ (dB)	$L_{A10,t}$ (dB)	Time Period (Day / Night)	Comment for specific period
24/07/2019 14:48	58	46.4	80.8	41.7	47.2	Day	
25/07/2019 00:41	14	55.4	75.6	34.8	59.3	Night	
25/07/2019 00:56	15	44.4	65.8	35.3	45.7	Night	



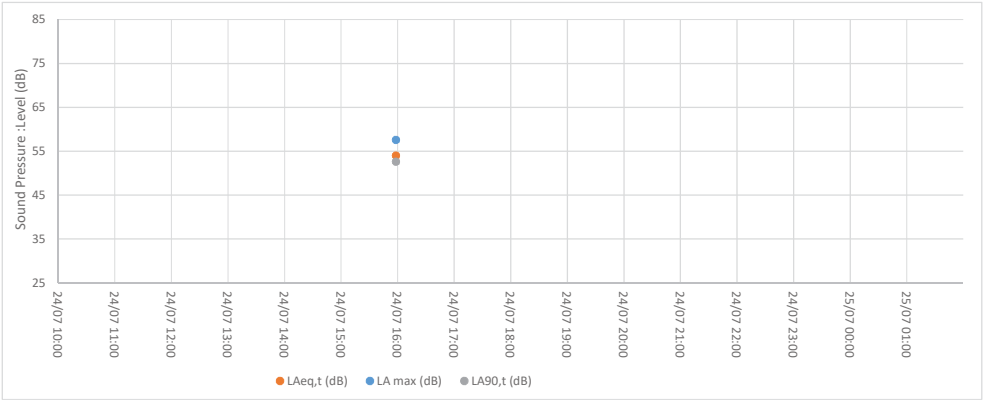
ML4

ML4 Noise Survey results - Summary

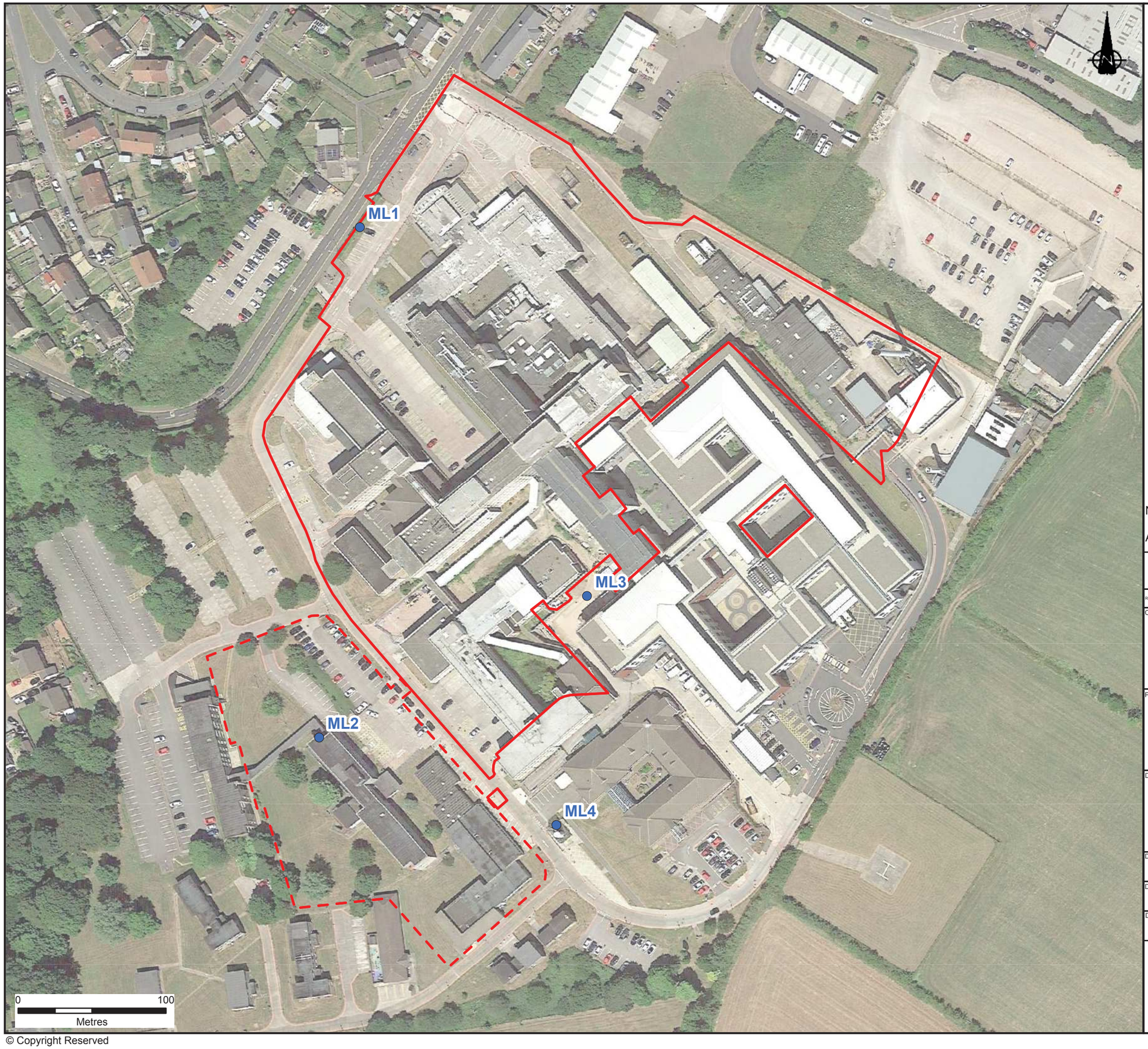
Description	Measurement of specific plant noise, at 1m from from the Oxidising Refrigerant unit at the existing Phase 1 hospital site, outside the proposed Phase 2 and 3 site boundary. Following a walk over of the site this industrial noise source was the most noticable which may impact the proposed receptors of the Phase 2 and 3 so short measurmenst in close proximity to this source were undertaklen to estimate a sound power level. The plant operates continuously during the daytime and night time period, at approximately 54dB.
Specific plant noise at 1m (LAeq,t)	54

ML4 Noise Survey results - Tabular Detailed break-down

Timestamp (dd/mm/yyyy hh:mm)	Duration (in min)	$L_{Aeq,t}$ (dB)	$L_{A\,max}$ (dB)	$L_{A90,t}$ (dB)	$L_{A10,t}$ (dB)	Time Period (Day / Night)	Comment for specific period
24/07/2019 15:58	0.5	54	57.5	52.6	55.1	Day	Specific noise at 1m from from the Oxidising Refrigerant plant



DRAWINGS



KEY

Proposed Development Boundary A

Proposed Development Boundary B

Noise Monitoring Locations

Notes:

Aerial imagery sourced from Google Earth

REVISION	DETAILS	DATE	DRAWN	CHK'D	APP'D

CLIENT

CURTINS CONSULTING LIMITED

PROJECT

WEST CUMBERLAND HOSPITAL, WHITEHAVEN - PHASE 2

DRAWING TITLE

NOISE MONITORING LOCATION PLAN

DRG No.	REV
GM10669-001	A

DRG SIZE	SCALE	DATE
A3	1:2,500	05/11/2019

DRAWN BY	CHECKED BY	APPROVED BY
EF	SU	SU

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Key

- Site Boundary Phase 2&3
- Homewood Road
- Buidling

Daytime $L_{Aeq,16h}$ dB

- < 50.0 (Negligible Risk)
- < 60.0 (Low Risk)
- < 70.0 (Medium Risk)
- >= 70.0 (High Risk)

CLIENT:	Curtins Consulting Limited
PROJECT:	West Cumberland Hospital P2 & P3
DRAWING TITLE:	Figure 2 - Daytime road traffic noise levels

DRG NO:	REV:	
GM10669/002	A	
DRG SIZE: A3	SCALE: 1:1500	DATE: 05/11/2019
DRAWN BY: MC	CHECKED BY: SU	APPROVED BY: SU

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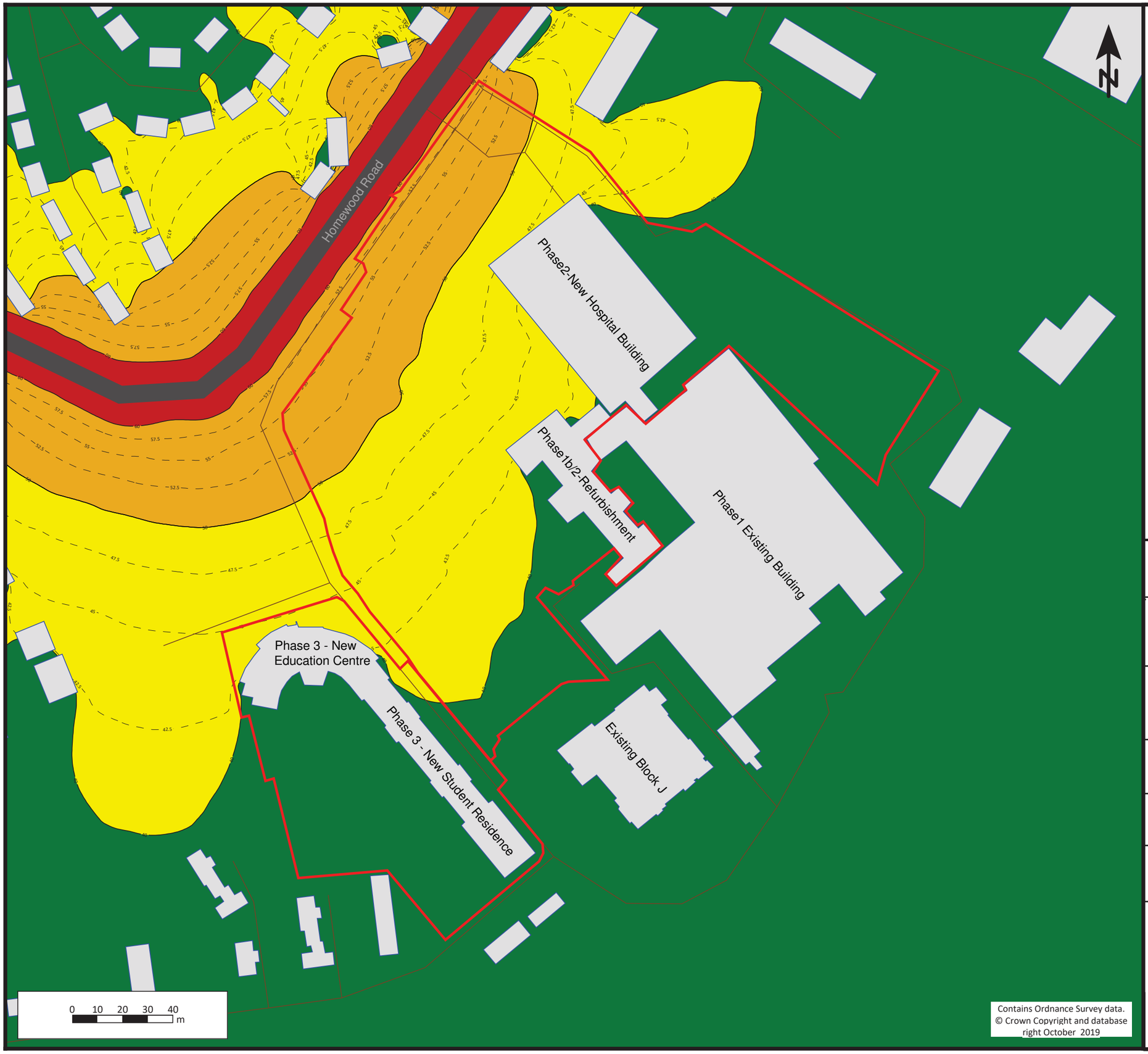

Key

- Site Boundary Phase 2&3
- Homewood Road
- Buidling

Night-time $L_{Aeq,8h}$ dB

<	40.0	(Negligible Risk)
<	50.0	(Low Risk)
<	60.0	(Medium Risk)
>=	60.0	(High Risk)

CLIENT: Curtins Consulting Limited

PROJECT: West Cumberland Hospital P2 & P3

DRAWING TITLE: Figure 3 - Night-time road traffic noise levels

DRG NO:	REV:
GM10669/003	A

DRG SIZE:	SCALE:	DATE:
A3	1:1500	05/11/2019

DRAWN BY	CHECKED BY	APPROVED BY
MC	SU	SU

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Key

- Site Boundary Phase 2&3
- Homewood Road
- Buidling
- Oxidising Refrigerant unit

$L_{Aeq,t}$ dB Industrial Noise

<	25.0
<	30.0
<	35.0
<	40.0
<	45.0
<	50.0
<	55.0
>=	55.0

CLIENT: Curtins Consulting Limited

PROJECT: West Cumberland Hospital P2 & P3

DRAWING TITLE: Figure 4 - Exsiting Industrial Noise

DRG NO:	REV:
GM10669/004	A

DRG SIZE:	SCALE:	DATE:
A3	1:1500	05/11/2019

DRAWN BY	CHECKED BY	APPROVED BY
MC	SU	SU

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