

6 NOISE AND VIBRATION

Introduction

- 6.1 This chapter considers the effects on the surrounding environment of noise and vibration associated with the demolition for and construction and operation of the proposed JFH which includes the Main Hospital Building and Westaway. It specifically describes the methodology used to assess the effects; the baseline conditions currently existing at the site and surrounding area; the mitigation measures required to prevent, reduce or offset any significant negative effects; and the likely residual effects after these measures have been adopted.
- 6.2 Assessments have been carried out in accordance with relevant national standards and guidelines and following consultation with SoJ.
- 6.3 The assessment of temporary effects considers:
- noise and vibration from demolition and construction activities on site
 - noise from off-site construction traffic on neighbouring roads.
- 6.4 Assessment of the effects of operational noise considers:
- building services plant noise
 - changes in road traffic noise due to operation of the development
- 6.5 The following appendices support this chapter:
- Appendix C-1: Acoustic Terminology
 - Appendix C-2A: Baseline Noise Survey – Main Hospital Site
 - Appendix C-2B: Baseline Noise Survey – Westaway Court
 - Appendix C-3A: Construction and Demolition Vibration Study – Main Hospital Site
 - Appendix C-3B: Construction and Demolition Vibration Study – Westaway Court
 - Appendix C-4: Traffic Noise Assessment
 - Appendix C-5: Construction Noise Assessment.

Review of proposed development

- 6.6 The surrounding noise climate of the proposed JFH will be comparable to that of the current hospital, which is an active urban environment with traffic and plant noise dominating. Any potential change to the current noise climate due to operational or construction activities has been assessed.
- 6.7 The proposed JFH has been designed to minimise the potential impact of noise on receptors surrounding the site and also on users of the hospital.

Legislation, policy context and guidance

- 6.8 This assessment considers the impacts and effects of noise and vibration in relation to the relevant legislation and planning policy, a summary of which is provided.

Legislation

- 6.9 Relevant legislation includes the Statutory Nuisances (Jersey) Law 1999, which covers a wide range of public nuisances and provides guidance on how noise may be controlled.
- 6.10 Large scale developments are often required to be accompanied by a Construction Environment Management Plan (CEMP), detailing specifically how environmental impacts such as noise and vibration will be monitored and controlled during the construction phase.

Policy context and guidance

- 6.11 Whilst the UK policy such as National Planning Policy Framework (NPPF) and Noise Policy Statement for England (NPSE) has no formal relevance in Jersey, these are useful as an acceptable standard for this assessment and the intent supports the Island Plan (2011).
- 6.12 The National Planning Policy Framework (NPPF)¹ defines the Government's planning policies for England. Key to this assessment are paragraphs 109 and 123 of NPPF as described below.
- 6.13 Paragraph 109 requires the planning system to “contribute to and enhance the natural and local environment by ... preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of ... noise pollution”.

¹ Department for Communities and Local Government (2012); *National Planning Policy Framework*; <http://www.communities.gov.uk/publications/planningandbuilding/nppf>

6.14 Paragraph 123 of NPPF states that “*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 businesses 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.”*

6.15 The NPPF planning objectives reflect and are linked to the policies and objectives set out in the NPSE².

6.16 The NPSE uses the key phrases ‘significant adverse’ and ‘adverse’. In clarifying what these mean the NPSE notes that:

“There are two established concepts from toxicology that are currently being applied to noise effects, for example, by the World Health Organization. These are:

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.”

6.17 The Policy extends these concepts to include:

“SOAEL – Significant Observed Adverse Effect Level - This is the level above which significant adverse health effects on health and quality of life occur.”

² Department for Environment Food and Rural Affairs (2010), *Noise Policy Statement for England*

6.18 These terms are adopted in the Government’s Planning Practice Guidance on noise (PPG-N)³, which presents example outcomes to help characterise these effects (see Table 6.1).

Table 6.1: Noise exposure hierarchy based on likely average response (based on PPG-N)

	Perception	Examples of outcomes	Increasing effect level	Action
	Not noticeable	No effect	No observed effect	No specific measures required
	No Observed Effect Level (NOEL)			
	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 (LOAEL)			
← Increasing noise 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; 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 perceived change in the quality of life.	Observed adverse effect	Mitigate and reduce to a minimum
	Significant Observed Adverse Effect Level (SOAEL)			
	Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, 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
	Unacceptable Adverse Effect Level (UAEL)			
	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

³ Department for Communities And Local Government (2012) *National Planning Practice Guidance – Noise*, <http://planningguidance.planningportal.gov.uk/blog/guidance/noise/noise-guidance/> (Revision date: 06 03 2014)

- 6.19 The NPSE notes 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. It is for a project to identify relevant SOAELs taking account of the different sources of exposure and different receptors.
- 6.20 Any receptor forecast to experience an overall exposure from the proposed development that exceeds the relevant SOAELs is identified as being subject to significant adverse impact on health and quality of life (under Government noise policy) and hence identified as a likely significant adverse effect.
- 6.21 Where the noise level from the proposed development is between LOAEL and SOAEL, the NPSE states:
- “all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur.”*
- 6.22 Other factors, such as the number of dwellings affected and the magnitude of noise change, can result in impacts between LOAEL and SOAEL being reported as likely significant effects in EIA terms. The EIA process requires that likely significant effects are identified along with the envisaged mitigation to avoid or reduce these significant effects.

Standards and guidelines

- 6.23 Reference is also made to the following:
- British Standard BS4142: 2014. Methods for Rating and Assessing Industrial and Commercial Sound.
 - British Standard BS5228:2009+A1:2014. Code of Practice for Noise and Vibration Control on Construction and Open Sites. Part 1 Noise and Part 2 Vibration.
 - Noise Control on Construction and Demolition Sites, States of Jersey Environmental Health Best Practice Guide 2015
 - Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 7, HD213/11 Revision 1, Noise and Vibration, Highways Agency and Welsh Office, 2011.

- Calculation of Road Traffic Noise (CRTN), Department of Transport, Welsh Office, 1988.
- Department of Health, *Specialist Services Health Technical Memorandum (HTM) 08-01: Acoustics*, 2013
- American Society of Heating (2015), *Refrigeration and Air-Conditioning Engineers (ASHRAE)*, Handbook.

Consultation

Consultation

6.24 Discussion and email correspondence with the SoJ Environmental Health Officer (EHO) was conducted to agree scope for the baseline noise measurement survey and assessment methodology. Table 6.2 outlines what was discussed and when the consultation was received.

Table 6.2: EHO consultation responses

Comment	Date and type of correspondence
The approach proposed for the baseline noise survey is considered acceptable	Email and phone call 14/02/2017
Construction noise guidance provided; this included the SoJ best practice guide	Email 08/03/2017
The assessment methodology proposed is considered acceptable	Email and phone call 16/03/2017 and 15/05/2017
Construction noise should be assessed against 72dBL _{Aeq,1hr} , not 75dBL _{Aeq,12hr} used for the 2017 EIS	Email 13/03/2017

Methodology

Overview

- 6.25 The assessment approach takes account of the key policies, guidance and legislation described in paragraph 6.23.
- 6.26 The assessment considers impacts and effects of noise and vibration at dwellings, hotels, commercial and retail premises around the site due to demolition, construction and operation of the proposed development. For this case, they have all been assessed as dwellings, since all are in the near vicinity of existing residential buildings, providing a more stringent assessment criterion. The need to protect dwellings will therefore ensure that the impacts at other premises are identified and reported.

- 6.27 The assessment also considers any impact and effects of noise and vibration on the hospital buildings within the site boundary that will remain operational during demolition, construction and operation of the proposed development.
- 6.28 The significance of effects due to vibration from demolition and construction activities has been assessed in absolute terms relative to building damage and thresholds associated with disturbance.
- 6.29 Operationally, building services plant will be controlled by appropriate planning conditions to meet the appropriate noise level criteria relative to background noise at surrounding receptors. This will avoid potentially significant effects by ensuring, by condition, adequate mitigation controls.

Methodology for establishing baseline conditions

- 6.30 The proposed JFH site is located in a busy urban environment with the daytime baseline noise climate dominated by plant and traffic noise from minor roads, which are adjacent to the site, and distant traffic on Esplanade. Road traffic is less busy at night but remains a significant noise source.
- 6.31 Existing noise sensitive receptors around the proposed development at the main hospital site include residential buildings in Gloucester Street, Kensington Place, Newgate Street and Patriotic Place, and also The Haven Guest House and Kensington Guest House situated on Kensington Place. Existing noise sensitive receptors around the proposed development at Westaway Court include residential buildings on Rouge Bouillon and Saville Street, as well as Helvetia School on Rouge Bouillon and the SoJ offices at Maison le Pape.
- 6.32 The quantitative assessment for establishing baseline conditions focussed on receptors closest to the site, where any potential impact would be greatest. Baseline noise survey data has been gathered at appropriate locations around the proposed development to represent the range of noise climates associated with the various receptors. The number of locations and the timing of the surveys have been informed by consultation with SoJ and analysis of map information. Full details of the surveys and results are provided in Appendices C-2A and C-2B.
- 6.33 Measurement locations and noise sensitive receptors are shown in Figure 6.1 and 6.2, as they stood at the time of the respective surveys.

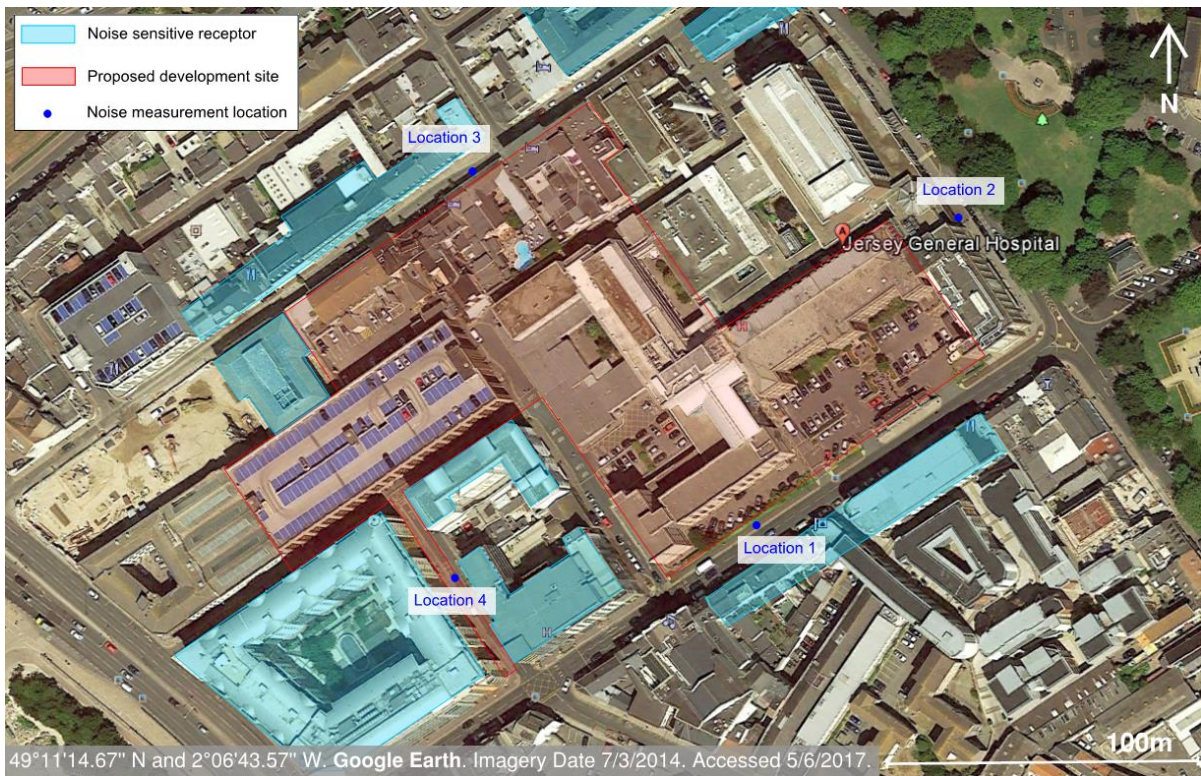


Figure 6.1: Baseline noise survey – main hospital site

6.34 An environmental noise survey was conducted at four measurement locations from Tuesday 21st to Thursday 23rd February 2017. The following measurement locations were chosen to be suitable both for the EIA and to inform the acoustic design of the proposed new building envelope.

- Location 1 – Gloucester Street
- Location 2 – The Parade
- Location 3 – Kensington Place
- Location 4 – Patriotic Place.

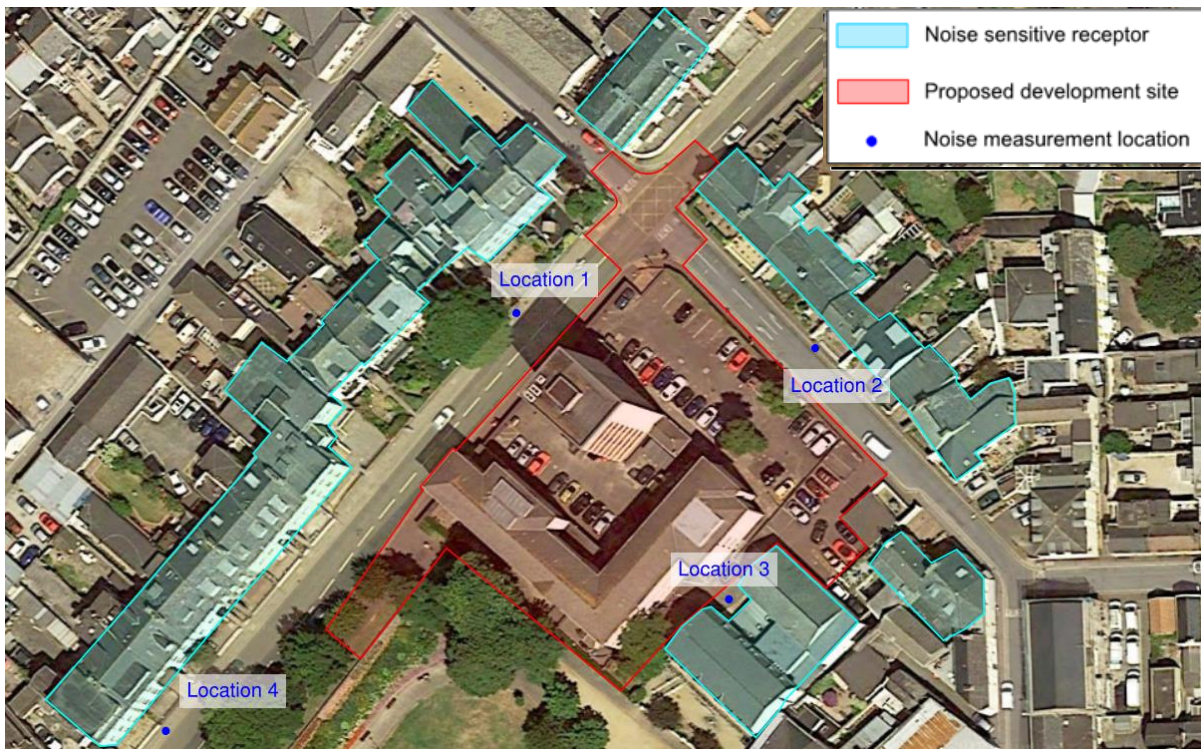


Figure 6.2: Baseline noise survey – Westaway Court

6.35 An environmental noise survey was conducted at four measurement locations from Tuesday 13th to Thursday 15th March 2018. The following measurement locations were chosen to be suitable both for the EIA and to inform the acoustic design on the proposed new building envelope.

- Location 1 – Elizabeth Place
- Location 2 – Saville Street
- Location 3 – Outside of Maison le Pape
- Location 4 – Elizabeth Place.

6.36 Daytime, evening and night-time noise measurements of $L_{A90,T}$, $L_{Aeq,T}$, $L_{A10,T}$ and $L_{Amax,F}$ were taken.

Assessment methodology

6.37 The assessment considers the impact of operational noise and demolition / construction noise and vibration on sensitive receptors.

Demolition and construction traffic noise

- 6.38 The extent of the study area for off-site demolition and construction road traffic routes has been defined where any of the following criteria would apply (referenced from DMRB and CRTN):
- the flow changes are estimated to be greater than +25% or -20%
 - HGV composition would change by 5% or more; and
 - Mean traffic speeds would change by 10km/h or more.
- 6.39 These criteria relate to the potential for road traffic related to construction to cause traffic noise level changes of at least 1dB. Changes below these thresholds are considered to be negligible. This methodology has been used to assess the change in noise level over the daytime period (08:00 until 18:00) potentially associated with construction traffic, as no night-time traffic is expected under normal conditions.
- 6.40 To estimate an absolute traffic noise level on Lewis Street, the highest daytime noise level measured on Kensington Place has been applied since this traffic will be diverted to Lewis Street.

Demolition and construction noise

- 6.41 Noise from construction activities has been calculated based on the approach presented in BS5228-1. This uses the construction plant and processes that are likely to be required for the proposed development, considering the number and type of equipment, operational time, the distance to the receptors and any intervening screening. While it is not yet known what plant will be on site, an assumption has been made based on similar developments.
- 6.42 The quantitative assessment has focused on selected, representative receptors closest to the site, which are likely to experience the largest changes in noise levels during construction and therefore represents the 'worst case'. The assessment has included qualitative consideration of how the different relative positions (distances and screening) would affect the construction noise exposure to these properties.
- 6.43 The assessment is also based on the assumption that works will be managed by means of a Construction and Environmental Management Plan.

Demolition and construction vibration

- 6.44 The assessment of construction vibration on receptors surrounding the site has been based on BS5228-2. Significance of effects due to vibration from demolition and construction activities has been assessed in absolute terms relative to building damage and thresholds associated with disturbance for the closest receptors immediately surrounding the development. Other sources of data have been referred to and referenced where required.
- 6.45 The vibration assessment also considers the impact of vibration on laboratory instruments within the hospital buildings that will remain operational during demolition and construction for JFH, particularly Pathology, Radiology and operating theatres. Equipment functional performance vibration criteria define the maximum acceptable levels of vibration. Human comfort in wards is also considered. The criteria are defined in terms of generic vibration limits for instrument performance or in terms of human comfort published in the ASHRAE handbook. Where available, manufacturers' criteria have been compared against the required criteria.

Operational noise – building services plant

- 6.46 The design of the proposed JFH is not yet progressed to the level where detailed information regarding the design of the buildings services plant is available. In order to mitigate any potential noise from this source, noise from building services plant will be controlled through the specification of noise limits and acoustic design requirements.
- 6.47 BS4142 has been used to define a maximum plant noise limit based on typical background levels at the nearest unscreened noise sensitive receptors to the site. It is assumed that more distant receptors would not be adversely affected if noise is adequately controlled at the closer, more impacted receptors.

Operational noise – traffic noise

- 6.48 The methodology within CRTN has been used to calculate any difference in traffic noise due to changes in traffic flow due to the proposed JFH. As defined in DMRB, a study area of either 600m around the new or altered highways and sections of existing roads, or within 1km of the new works that are predicted to be subject to a change in noise level of more than 1dB(A) as a result of the scheme on opening is used.
- 6.49 Traffic flows for the do minimum (without the proposed development) and do something (with the proposed development) have been used for the assessment.

Significance Criteria

6.50 Significance criteria applied in the assessment vary according to what aspect of noise and vibration is being assessed. These are described in the next sections.

Demolition and construction traffic noise

6.51 CRTN presents a procedure for the prediction of road traffic noise. Where traffic flows are sufficient for CRTN to be valid, the relevant parts of this procedure have been used to predict, for a given road at a reference distance, the change in noise level resulting from the change in road traffic between the baseline and the assessment case with construction traffic.

6.52 Where traffic flows are lower than those covered by CRTN, the L_{eq} for individual vehicles was calculated and the period L_{eq} was calculated from the flows.

6.53 A potential significant effect of construction road traffic noise is identified where the development causes a 3dB increase where the baseline traffic noise level is between LOAEL and the upper applied limit. Where the baseline is above the upper limit, an increase greater than 1dB is assessed as a potentially significant effect.

6.54 In terms of UK government policy, the effect levels in Table 6.3 have been applied for residential buildings. The upper criterion has been reduced from SOAEL for construction normally taken as $75dB_{Leq}$ to $72dB_{Leq}$, at the request of the EHO (see Table 6.2). These represent higher noise levels than the effect levels for operational road traffic since they relate to the temporary situation and will only occur for part of the construction programme. This implies that sensitivity to noise which occurs temporarily is lower than that for permanent changes in noise levels.

Table 6.3: Assessment criteria for daytime construction traffic noise for dwellings

Effect level	Noise level (facade)
LOAEL	$65dB_{Leq,12hr}$
Upper limit reduced from SOAEL	$72dB_{Leq,1hr}$

Demolition and construction noise

6.55 Maximum desirable noise levels for demolition and construction site works are provided in the SoJ guide on the control of noise on construction and demolition sites⁴ and have been used in this assessment. It states “noise levels, between say 08:00 and 18:00

⁴ States of Jersey Health and Social Services Policy Guidance No 1 *Guidelines on noise control for construction sites*, February 2004.

hours, outside the nearest window of the noise sensitive property closest to the site boundary should not exceed:

- 70 dB(A) in rural, suburban and urban areas away from main road traffic and industrial noise sources
- 72 dB(A) in urban areas near main roads”

6.56 The 72dB(A) threshold has been used as the site is located in a busy urban environment, where traffic and plant noise dominate.

6.57 A potentially significant effect is indicated when the level exceeds this threshold level.

6.58 The effect levels in Table 6.4 have been applied for residential buildings.

Table 6.4: Adverse effect levels for demolition and construction noise at dwellings (as set by UK and SoJ government policy)

Effect level	Period	Noise level
LOAEL	Day	65dB _{LAeq,daytime}
	Evening	55dB _{LAeq,1hr}
	Night	45dB _{LAeq,1hr}
SOAEL	Day (limit reduced below SOAEL at request of SoJ EHO)	72dB _{LAeq,1hr}
	Evening	65dB _{LAeq,1hr}
	Night	55dB _{LAeq,1hr}

Demolition and construction vibration

6.59 Few types of construction activities give rise to vibration of a level sufficient to cause building damage. However, disturbance can potentially be experienced over large distances.

6.60 The risk of vibration causing damage to buildings is assessed in terms of the peak particle velocity (PPV) at the base of the building⁵. The building damage risk criteria given in Table 6.5 have been applied to all buildings, below which there is no risk of building damage.

⁵ British Standards Institution (1993); BS7385 1993 –Part 2 *Evaluation and Measurement for vibration in buildings – Guide to damage levels for groundborne vibration*

Table 6.5: Assessment criteria for risk of buildings damage from vibration

Category of buildings	Peak particle velocity (PPV) at buildings foundations	
	Transient vibration ⁶	Continuous vibration ⁷
Potentially vulnerable buildings ⁸	≥6 mm/s	≥3 mm/s
Structurally sound buildings	≥12 mm/s	≥6 mm/s

- 6.61 BS 5228: Part 2 provides guidance on human perception in terms of PPV and states that at 0.3mm/s and above, vibration may be “*just perceptible in residential environments*”.
- 6.62 Equipment and process criteria are based on guidance given in the ASHRAE handbook⁹. For human perception in sensitive areas, the maximum tolerable vibration should be limited to RF1 in accordance with HTM08-01. The assessment therefore assumes a criterion between VC-A and RF1 is appropriate.
- 6.63 For Operating Theatres, ASHRAE and HTM08-01 guidance suggests that vibration be limited to RF1. It has been found that under some circumstances, surgical microscopy where cantilevered microscope stands are used, the vibration may need to be limited to 0.02mm/s (between VC-C and VC-B) due to amplification of the vibration by the cantilever arms¹⁰.
- 6.64 Table 6.6 provides details of the VC and RF criteria.

⁶ Transient vibration relative to building response such as impulsive vibration from percussive piling.

⁷ Continuous vibration relative to building response such as vibrating rollers.

⁸ BS7385-2 highlights that the criteria for aged buildings may need to be lower if the buildings are structurally unsound. The standard also notes that criteria should not be set lower simply because a building is important or historic (listed). Where information about these structures is not currently known, the significance criteria for these receptors has been set at a lower level on a precautionary basis.

⁹ American Society of Heating (2015), *Refrigeration and Air-Conditioning Engineers (ASHRAE)*, Handbook.

¹⁰ David Hiller, *The prediction and mitigation of vibration impacts of tunnelling*, Paper Number 5, Proceedings of Acoustics 2011

Table 6.6: Generic vibration limits for instrument performance (VC) and human comfort (RF)

Limit	RMS Velocity (mm/s)	Instrument Requirements / Human Comfort
RF < 1	0.1	Threshold of perceptible vibration. Suitable in most instances for bench microscopes up to 100x magnification, laboratory robots, hospital operating rooms and critical work areas.
VC-A	0.05	Bench microscopes up to 400x magnification; optical and other precision balances; micro balances; coordinate measuring machines; metrology laboratories; optical comparators; microelectronics manufacturing equipment; proximity and projection aligners, etc.
VC-B	0.025	Microsurgery, eye surgery, neurosurgery; bench microscopes at magnification greater than 400x; optical equipment on isolation tables; microelectronic manufacturing equipment, such as inspection and lithography equipment (including steppers) to 3 µm line widths
VC-C	0.013	Optical microscopes to 1000x; electron microscopes up to 30,000x magnification; microtomes; magnetic resonance imagers; microelectronics manufacturing equipment, such as lithography and inspection equipment to 1 µm detail size

Operational noise – building services plant

6.65 Operational noise effects have been assessed using the principles of BS4142, which provides a methodology for assessing the likely effects of noise of an industrial and/or commercial nature. The full assessment procedure, takes into account:

- the level of the operational noise relative to the background noise level;
- the absolute level of operational noise;
- the character of the operational noise; and
- the sensitivity of the receptor.

6.66 BS4142 also requires the context to be considered which, in the case of the proposed JFH, is the measured background noise level. The LOAELs and SOAELs used for road traffic noise in Table 6.7 will be used to consider this aspect of the context of the impact from building services noise. It is not considered necessary to adjust the BS4142 ratings when measured background is between the LOAEL and SOAEL values.

6.67 It is not possible to determine noise emission levels at this stage. Building services plant noise would be controlled by planning conditions, such that noise from plant would be regarded as not significant. A noise limit is defined as 5dB below typical background levels for no potential significant effect at nearby residential or other sensitive receptors.

Operational noise – traffic noise

- 6.68 DMRB provides a basis for evaluating the magnitude of impact and the significance of an effect in order to arrive at an overall level of significance. Considering the magnitude of noise impacts in the long term (typically 15 years) for the do minimum and do something cases, a potentially significant effect for road traffic noise is identified where the proposed development would cause a 3dB or greater increase in road traffic noise level where the do minimum noise level is below SOAEL. Where the do minimum traffic noise level is above SOAEL, any increase in level greater than 1dB is assessed as a potentially significant effect. LOAEL and SOAEL for road traffic noise for this assessment are given in Table 6.7.

Table 6.7: Adverse effect levels for road traffic noise

Effect level	Period	Noise level
LOAEL	Day	50dB _{L_{Aeq,16hr}}
	Night	40dB _{L_{Aeq,8hr}}
SOAEL	Day	63dB _{L_{Aeq,16hr}}
	Night	55dB _{L_{Aeq,8hr}}

Limitations and assumptions

Limitations

- 6.69 For some of the sources of noise that will arise from construction and operation of the proposed development it is not possible, at this stage of the project design, to quantify levels of noise that will arise. Where possible, calculations have been carried out based on the assumptions set out below.

Assumptions

- 6.70 Assumptions have been made regarding the number and types of plant to be used during the demolition and construction phases, based upon professional judgement and experience of other similar projects. It is assumed that phases within each of the demolition and construction stages occur sequentially; whilst some overlap may occur, this has not been modelled.
- 6.71 Construction noise assumptions have been made in accordance with BS5228 and effects are considered in relation to a fixed level criteria as stated in the SoJ construction guidelines. The values are determined assuming that all activity is located towards the centre of the site and that all equipment and plant is operating simultaneously.

6.72 It is assumed that the Construction Environmental Management Plan (CEMP) will ensure that best practicable means are employed and, despite the limitations, the approach taken for this assessment is considered to be robust.

6.73 It is assumed that equipment that inherently creates a high level of vibration will be avoided due to the sensitivity of the hospital.

Baseline Environment

6.74 Baseline day, evening and night-time levels measured at the monitoring locations around the main hospital site (Figure 6.1) over the period Tuesday 21st February 2017 to Thursday 23rd February 2017 are summarised in Table 6.8, Table 6.9 and Table 6.10 respectively. Averages of the measured ambient and background noise levels are presented.

Baseline day, evening and night-time levels measured at the monitoring locations around Westaway Court (Figure 6.1) over the period Tuesday 21st February 2018 to Thursday 23rd February 2018 are summarised in Table 6.11, Table 6.12 and Table 6.13 respectively. Averages of the measured ambient and background noise levels are presented.

Table 6.8: Summary of baseline daytime noise levels at main hospital site – free-field

Location	Ambient noise level dBL _{Aeq}	Background noise level dBL _{A90}
1 - Gloucester Street	71	62
2 – The Parade	65	59
3 – Kensington Place	60	50
4 – Patriotic Place	62	55

Table 6.9: Summary of baseline evening noise levels at main hospital site – free-field

Location	Ambient noise level dBL _{Aeq}	Background noise level dBL _{A90}
1 - Gloucester Street	68	51
2 – The Parade	63	51
3 – Kensington Place	57	44
4 – Patriotic Place	59	50

Table 6.10: Summary of baseline night-time noise levels at main hospital site – free-field

Location	Ambient noise level dBL _{Aeq}	Background noise level dBL _{A90}
1 - Gloucester Street	55	41
2 – The Parade	51	41
3 – Kensington Place	44	39
4 – Patriotic Place	44	40

Table 6.11: Summary of baseline daytime noise levels at Westaway Court – free-field

Location	Ambient noise level dBL _{Aeq}	Background noise level dBL _{A90}
1 – Elizabeth Place	71	60
2 – Saville Street	63	53
3 – Maison le Pape	52	48
4 – Elizabeth Place	70	59

Table 6.12: Summary of baseline evening noise levels at Westaway Court – free-field

Location	Ambient noise level dBL _{Aeq}	Background noise level dBL _{A90}
1 – Elizabeth Place	70	58
2 – Saville Street	61	49
3 – Maison le Pape	50	44
4 – Elizabeth Place	68	55

Table 6.13: Summary of baseline night-time noise levels at Westaway Court – free-field

Location	Ambient noise level dBL _{Aeq}	Background noise level dBL _{A90}
1 – Elizabeth Place	50	38
2 – Saville Street	44	37
3 – Maison le Pape	42	37
4 – Elizabeth Place	50	42

Design Mitigation

6.75 It has been assumed that standard construction management measures (best practicable means – BPM) would be implemented as part of the demolition work and construction of the proposed JFH to manage and mitigate noise and vibration. The contractor would also be required to operate in accordance with the guidance provided

in the SoJ Guidelines on Noise Control for Construction Sites (2004). This guide includes measures which would be adopted to minimise the likelihood of significant disturbance to neighbouring properties. These measures would be adopted and the demolition and construction noise assessment has been based on this assumption.

- 6.76 Particular consideration would be given to the careful selection of plant, construction methods and programming to minimise the noise impact at closest sensitive receptors (and therefore all receptors). Equipment would be sited as far from sensitive receptors or as close to any acoustic screen located between the activity and the receptor as reasonably practicable.
- 6.77 Site specific measures would also be employed where reasonably practicable, as outlined in the framework CEMP (Appendix O-1).
- 6.78 In relation to vibration, best practicable means (BPM) would include review of ground work processes and the time of day of operation depending on the sensitivity of the neighbouring buildings. This would be coordinated as part of the liaison exercise.

Assessment of effects

Assessment of effects from construction

- 6.79 This section considers any potential effects due to noise and vibration prior to the incorporation of any mitigation, which is discussed in 6.121.

Demolition and construction road traffic noise

- 6.80 The main types of traffic movements associated with demolition and construction are:
- Workforce movements to/from the site;
 - Deliveries made to the site;
 - Removal of material from the site; and
 - Trips made by associated trades.
- 6.81 An estimate of the construction vehicles for each of the four stages of construction are provided in tables 6.14 to 6.17, obtained from the Arup Construction Vehicle Movements (version two) report, as provided in Appendix H of the Transport Assessment. Of the total vehicles provided in these tables, 20% are estimated to be HGVs.
- 6.82 The substructure and superstructure concrete phases have the highest number of vehicles per day, where it is expected that all the 84 vehicles will be HGVs.

Table 6.14: Summary of construction vehicle movements – Phase 1A

Phase	Duration (months)	Vehicles	Average Vehicles/Month	Vehicles Peak Day
Demolition	6	1,283	214	11
Substructure Construction	3	923	308	15
Substructure Concrete	3	5,040	1,680	84
Superstructure Construction	6	1,615	269	13
superstructure Concrete	6	10,080	1,680	84
Fit Out	10	1,776	178	9
Total	34	20,717	-	-

Table 6.15: Summary of construction vehicle movements – Phase 1B

Phase	Duration (months)	Vehicles	Average Vehicles/Month	Vehicles Peak Day
Demolition	6	1,956	326	16
Substructure Construction	4	1,359	340	17
Substructure Concrete	4	6,720	1,680	84
Superstructure Construction	7	3,850	550	27
superstructure Concrete	7	11,760	1,680	84
Fit Out	14	3,647	260	13
Total	42	29,292	-	-

Table 6.16: Summary of construction vehicle movements – Phase 2

Phase	Duration (months)	Vehicles	Average Vehicles/Month	Vehicles Peak Day
Demolition	4	1,160	290	15
Substructure Construction	2	396	198	10
Substructure Concrete	2	3,360	1,680	84
Superstructure Construction	4	396	99	5
superstructure Concrete	4	6,720	1,680	84
Fit Out	6	369	62	3
Total	22	12,401	-	-

Table 6.17: Summary of construction vehicle movements – Westaway Court

Phase	Duration (months)	Vehicles	Average Vehicles/Month	Vehicles Peak Day
Demolition	4	445	111	6
Substructure Construction	2	268	134	7
Substructure Concrete	2	3,360	1680	84
Superstructure Construction	4	687	172	9
superstructure Concrete	4	6,720	1680	84
Fit Out	6	668	111	6
Total	22	12,148	-	-

6.83 During construction, road closures are proposed along Newgate Street, along part of Kensington Place (between the junction with Kensington Street and the exit to Patriotic Street MSCP) and along part of Patriotic Street (between the junction with Newgate Street and the exit to Patriotic Street MSCP). Without a contractor on board at this stage these closures are not confirmed but it is likely that these road links will need to be closed.

6.84 During phase 1A, to mitigate the temporary closure of Kensington Place adjacent to the site boundary, it is proposed to reverse the one-way direction of traffic on Lewis Street between the junctions with Kensington Place and Kensington Street. This is anticipated

to result in a significant increase in traffic flow being redirected on to Lewis Street, a one-way road providing access to a mix of commercial and residential properties.

- 6.85 During phase 1B, to mitigate the closure of Newgate Street and the associated exit from Patriotic Street MSCP, it is proposed to make Patriotic Place two-way with the introduction of traffic signals at the junction with Gloucester Street, resulting in some queuing on Patriotic Place. Further assessment of these proposals can be found in the TA.
- 6.86 Whilst Kensington Place is closed, its traffic will consist entirely of construction vehicles. Noise levels at the receivers along the road link have been predicted and are likely to exceed the upper criterion level (72dB_{L_{Aeq}}). This could be a significant exceedance, but will not be for long durations as it is heavily dependent on the type and number of vehicles passing through, and their speed, all of which will vary greatly throughout the project. Due to the potential for large exceedances of the criterion, this is considered a significant effect.
- 6.87 Whilst Newgate Street is closed, its traffic will comprise entirely of construction vehicles. Due to the potential for large exceedances of the criterion, this is considered a significant effect.
- 6.88 Whilst Patriotic Street is partly closed, its traffic will comprise entirely of construction vehicles along the closed section. Noise levels at the receivers along the road link have been predicted, and are likely to exceed the upper criterion level. This could be a significant exceedance, but will not necessarily be for long durations as it is heavily dependent on the type and number of vehicles passing through, and their speed, all of which will vary greatly throughout the project. The concrete phases require the highest numbers of HGVs, and is thus likely to present the highest risk of dangerous noise levels. Due to the potential for large exceedances of the criterion, this is considered a significant effect.
- 6.89 Where road diversions are proposed, the proportional change associated with construction traffic along Lewis Street is likely to be greater than 25% of the overall flow and hence greater than a 1dB change in traffic noise. A doubling of traffic corresponds with an increase of 3dB, which would cause a significant effect.
- 6.90 Due firstly to road closures impacting traffic flows on the surrounding road network and the duration for which they would occur, and secondly to potential periods of very high noise levels being predicted, noise effects from demolition and construction traffic are therefore assessed as significant.

Demolition and construction noise

6.91 The works, totalling 96 months (not including any overlap), have been divided into the following stages, which each representing distinct activities in terms of noise impact.

Phase 1A (34 months):

- Stage 1: Demolition (approx. 6 months)
- Stage 2: Construction of substructure (approx. 6 months)
- Stage 3: Construction of superstructure (approx. 12 months)
- Stage 4: Fit out (approx. 10 months)

Phase 1B (38 months):

- Stage 1: Demolition (approx. 6 months)
- Stage 2: Construction of substructure (approx. 8 months)
- Stage 3: Construction of superstructure (approx. 12 months)
- Stage 4: Fit out (approx. 12 months)

Phase 2 (24 months):

- Stage 1: Demolition (approx. 4 months)
- Stage 2: Construction of substructure (approx. 4 months)
- Stage 3: Construction of superstructure (approx. 8 months)
- Stage 4: Fit out (approx. 6 months)

Westaway Court (24 months), included in Phase 1A:

- Stage 1: Demolition (approx. 4 months)
- Stage 2: Construction of substructure (approx. 4 months)
- Stage 3: Construction of superstructure (approx. 8 months)
- Stage 4: Fit out (approx. 6 months)

6.92 Buildings for demolition within the site boundary, as shown in Figures 6.3 and 6.4, include:

- Peter Crill House, Block D (including the Day Care extension)
- The Gwyneth Huelin Block, Block E
- Stafford Hotel
- Hotel Revere
- 36-40 Kensington Place (inc. Sutherland Court)
- 44 Kensington Place (inc. Aromas Building)
- Link Block
- Engineering Block (Block G)
- 1980s Block (Block A)
- 1960s Wing (Block B)
- Westaway Court.

6.93 Buildings for construction and redevelopment are contained within the site boundary.

6.94 Assessment of noise has been carried out at the locations shown in Figures 6.5 and 6.6, labelled A-L. These are considered to be representative of worse-case affected receptors. Appendix C-5 contains details and assumptions of the calculation. Tables 6.18, 6.19 and 6.20 provide the estimated noise levels for each stage of the demolition and construction process. As operations have been assumed to occur sequentially, only the highest noise levels within each of the stages have been provided, representing the worst case.

6.95 Details of the assessment location usages are as follows:

A) Ground: Commercial/Hotel/Residential

1st – 3rd floor: Hotel/Residential

B) Ground: Retail/Residential

1st – 3rd floor: Residential (height varying along street)

- C) Ground, 1st and 2nd floor: Commercial
 - D) Ground – 5th floor: Residential/Commercial, HSBC
 - E) Ground – 5th floor: Commercial, Royal Bank of Canada
 - F) Ground floor: Commercial/Retail, Jersey General Hospital Dental Department
1st – 5th floor: Residential
 - G) Ground floor: Commercial/Retail
1st – 3rd floor: Residential (height varying along street)
 - H) Ground, 1st and 2nd floor: Operational hospital building (Granite Block)
 - I) Ground – 2nd floor: Residential (height varying along street)
 - J) Ground – 2nd floor: Residential (height varying along street)
 - K) Ground – 2nd floor: Residential/SoJ offices, Maison le Pape
 - L) Ground – 2nd floor: Residential/Commercial/School (height varying along street)
- 6.96 Construction noise levels are likely to meet, or exceed by up to 9dB, the 72dB(A) criterion at noise sensitive receptors A-D during the first three stages of phase 1A. Since this exceedance will only be for short periods during the daytime, the impact is assessed as moderate.
- 6.97 Construction noise levels are likely to meet, or exceed by up to 6dB, the 72dB(A) criterion at noise sensitive receptor H during the first three stages of phase 1B. Since this exceedance will only be for short periods during the daytime, the impact is assessed as moderate.
- 6.98 Construction noise levels are likely to meet, or exceed by up to 11dB, the 72dB(A) criterion at noise sensitive receptor H during stages 1-3 of phase 2. Despite this exceedance only being for short periods during the daytime, due to the location of NSR H within the demolition/construction site itself, the impact is assessed as severe. It is recommended therefore that patients be relocated for the first three stages of phase 2.
- 6.99 Noise from demolition and construction noise is, therefore, assessed as a **significant** effect.

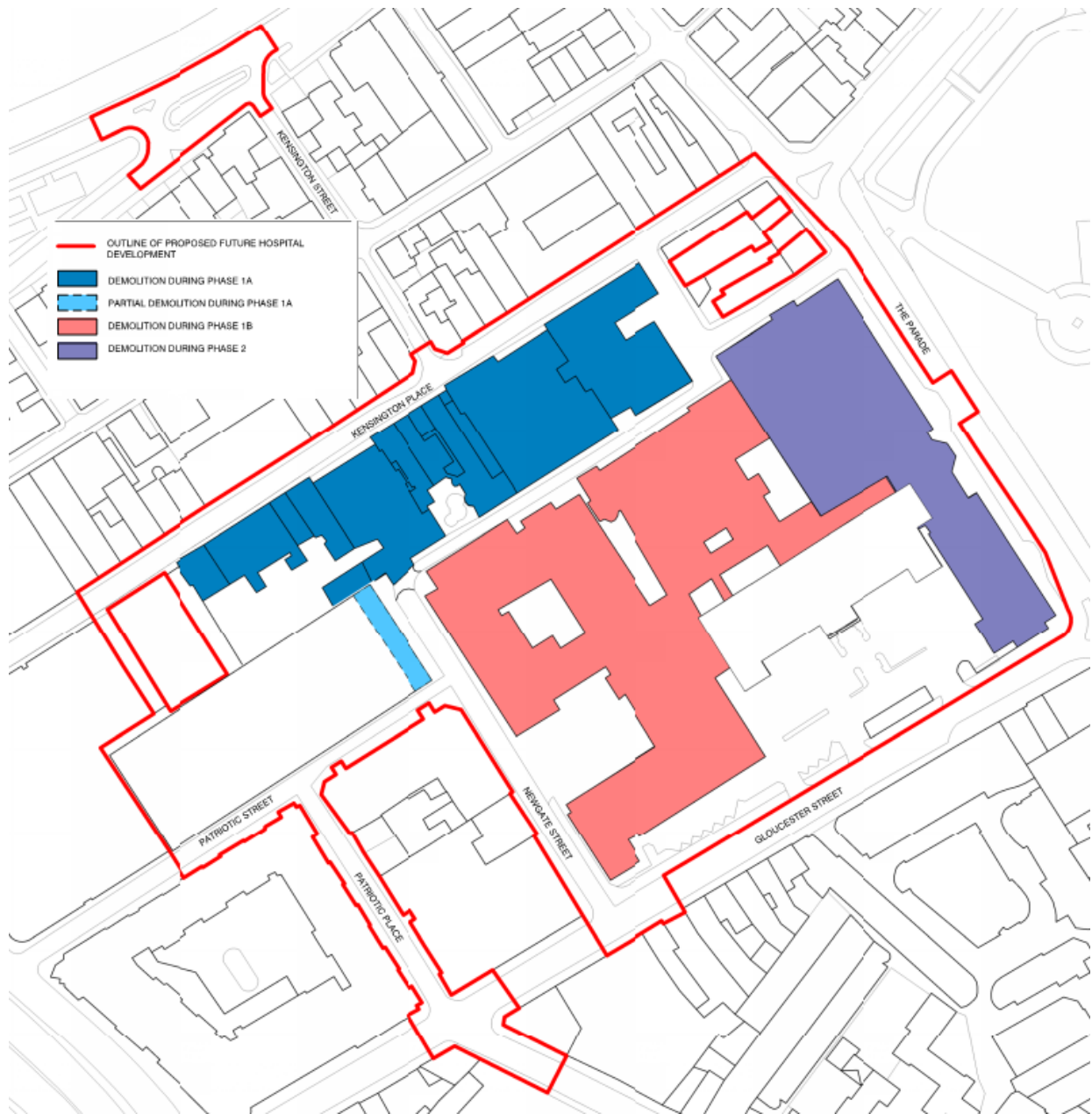


Figure 6.3: Buildings for Demolition – Main Hospital Site

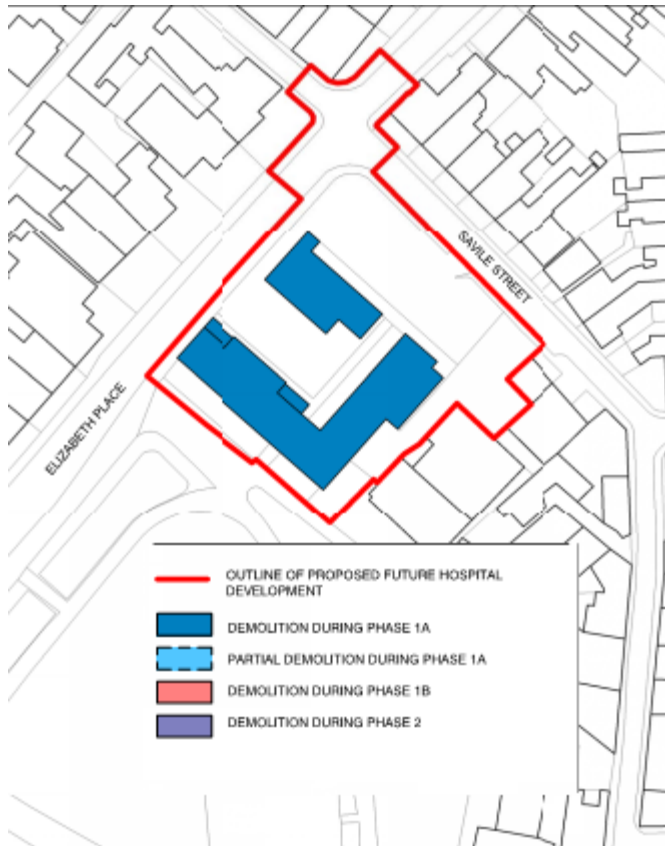


Figure 6.4: Buildings for Demolition – Westaway Court

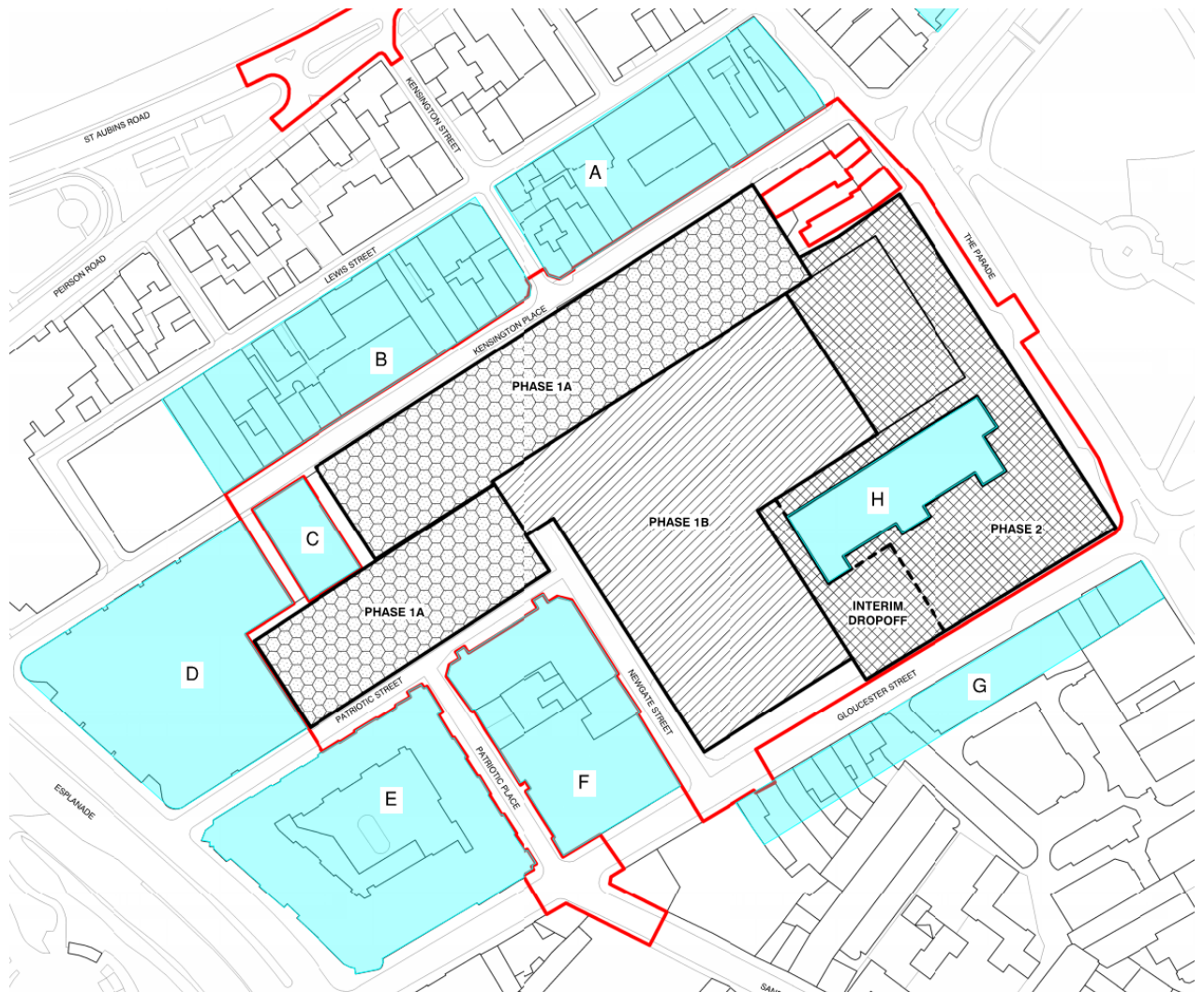


Figure 6.5: Noise Sensitive Receptors – Main Hospital Site

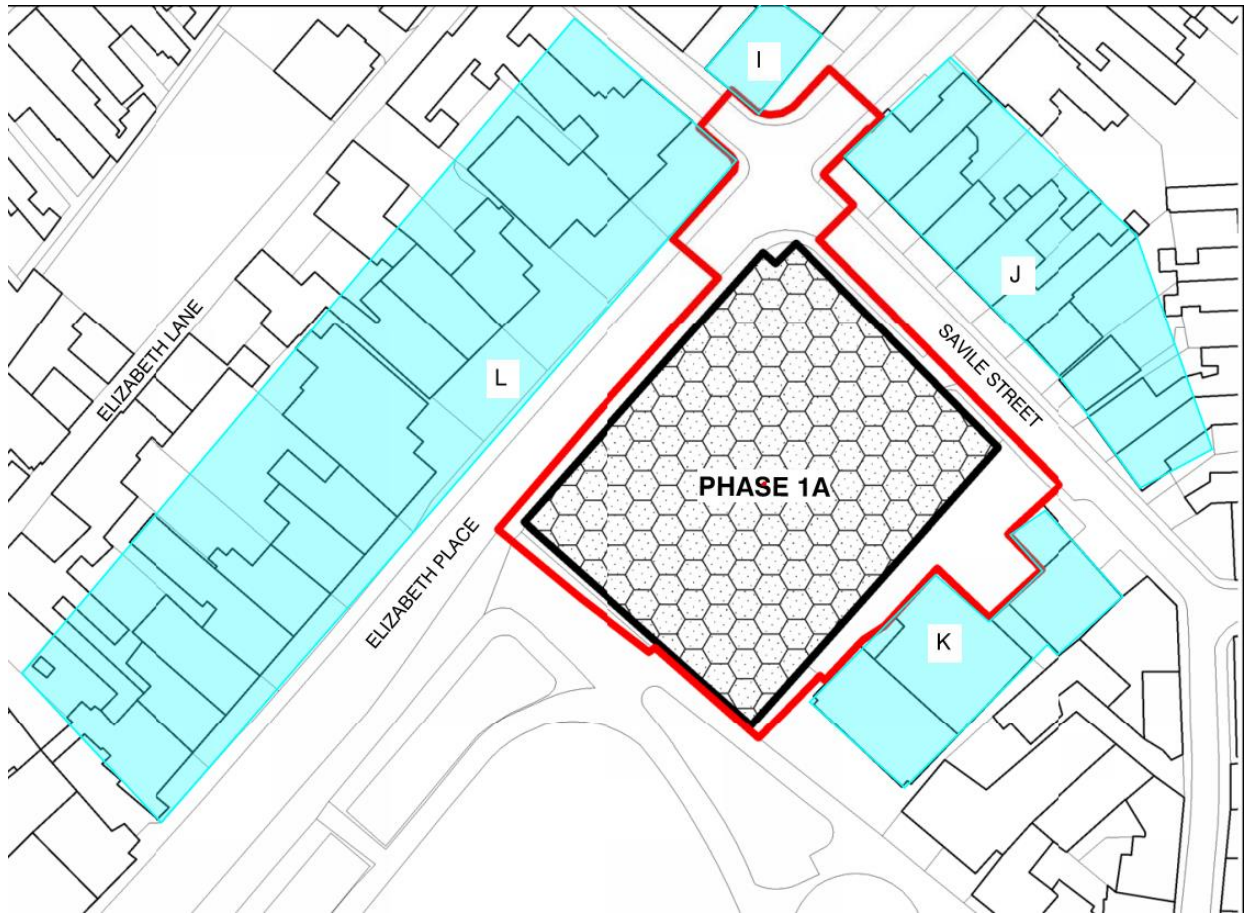


Figure 6.6: Noise Sensitive Receptors – Westaway Court

Table 6.18: Predicted construction noise levels (0800-1800 hours) – Phase 1A

NSR (see Figure 6.5)	Approx. distance to site centre (m)	Assumed stage* activity noise level (dBL _{Aeq,T})			
		1	2	3	4
A	33	73	75	75	63
B	18	79	81	81	69
C	22	77	79	79	68
D	25	76	78	78	67

*Construction stages defined in paragraph 6.92

Table 6.19: Predicted construction noise levels (0800-1800 hours) – Phase 1B

NSR (see Figure 6.5)	Approx. distance to site centre (m)	Assumed stage* activity noise level (dBL _{Aeq,T})			
		1	2	3	4
F	52	68	70	70	58
G	83	63	65	65	53
H	24	77	78	78	67

*Construction stages defined in paragraph 6.92

Table 6.20: Predicted construction noise levels (0800-1800 hours) – Phase 2

NSR (see Figure 6.5)	Approx. distance to site centre (m)	Assumed stage* activity noise level (dBL _{Aeq,T})			
		1	2	3	4
G	32.5	73	75	75	64
H	13.6	81	83	83	72

*Construction stages defined in paragraph 6.92

Demolition and construction vibration

Vibration effects within the Hospital Site

6.100 For the purposes of establishing likely significant effects from construction vibration on equipment, factors relating to site activity, frequency content, ground conditions, distances and elevation are required. However, at this stage of project design, they have not yet been established. This makes it difficult to accurately predict construction and demolition vibration levels. However, estimates have been made of the expected levels of vibration from individual activities on site to inform a qualitative assessment. Appendix

C-3a and C-3b provides full details of the vibration assessment for the new main building and Westaway Court respectively.

- 6.101 Assessment of vibration has been carried out for demolition taking place at various distances from areas of the hospital that would be operational during the works. Vibration levels for a range of construction activities have been estimated and compared to assumed relevant vibration criteria. For the reasons set out in Appendix C-5, the assessment has been based on the processes that are likely to cause the highest vibration, excluding processes that would clearly be unsuitable for use in such a sensitive environment. It is likely that vibration experienced by many departments will exceed the criteria and be adversely affected. However, vibration criteria will need to be confirmed when equipment specifications are known. Without mitigation, the effect on the operational hospital is therefore likely to be **significant**.

Vibration effects beyond the Hospital Site

- 6.102 During construction, worst case activity has been assumed to be equivalent to continuous flight auger (CFA) piling as described in the paper, “A comparison of noise and vibration from percussive and bored piling” by D M Hiller (Proceedings of Underground Construction – 2003). This results in a PPV of less than 1mm/s at a horizontal distance of 10m and less than 10mm/s at 1m.
- 6.103 The calculated level of vibration during piling may be perceptible to people within their houses when the PPV is greater than 0.3mm/s. At levels of 1.0mm/s and above, BS 5228-2 notes that “*It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.*”
- 6.104 The majority of adjacent buildings are at least 10m away from the site boundary; therefore the potential worst case vibration levels will be below the threshold of 6mm/s for potential cosmetic damage shown in Table 7. Assessment locations F and G, shown in Figure 6.5, are closer to the site boundary, therefore there is the potential for vibration during piling to be occasionally perceptible when piling is close to the site boundary. Any perceptible vibration would be intermittent and of short duration and is therefore the effect is assessed to be **not significant**.
- 6.105 It has been assumed that vibratory compaction will not be required due to the relatively small site and the likely construction activities for a development of this type. Other compaction methods may be adopted.
- 6.106 Vibration effects from demolition and construction activities on receptors surrounding the site are therefore assessed as **not significant**.

Assessment of effects from operation

Building services plant noise

6.107 In order to meet the criteria, target noise limits have been set at the assessment locations that are 5dB(A) below the typical lowest measured background noise levels. The target rating noise levels (as defined in BS 4124) are set out in Table 6.18 below, which apply at the most exposed façade of each NSR. The characteristics of the sound (e.g. tonality, intermittent nature) affect the rating level by application of appropriate corrections. At the detailed design stage it will be possible to manage building services noise so that noise levels would not exceed these target rating noise levels and hence noise impacts at surrounding residential properties would be **not significant**.

Table 6.21: Target criteria for buildings services plant noise levels

Location (see Figure 6.5)	Target rating noise levels, day (07:00-23:00) (dBL _{Ar,Tr} (1 hr))	Target rating noise levels, night (23:00-07:00) (dBL _{Ar,Tr} (1 hr))
A	45	37
B	48	38
C	48	38
D	48	38
E	42	35
F	42	35
G	42	35
H	45	37
WC1	55	33
WC2	48	32
WC3	43	32
WC4	54	37

Road traffic noise

6.108 Appendix C-4 presents the road traffic flows around the proposed development for the 'do minimum 2025' and 'do something 2025' scenarios.

6.109 At this stage there are no confirmed changes to speed limits and no changes to the percentage of HGVs have been predicted due to operation of JFH.

6.110 The predicted traffic flows reflect the addition of two half decks being added to the MSCP.

6.111 Apart from the most southerly entrance to the MSCP from Patriotic Street, which would have a decrease in traffic flow of 49%, the proportionate change associated with

operational traffic would be negligible, i.e. less than 25% of the overall flow and hence less than a 1dB change in traffic noise. Due to small increases in the overall traffic on Patriotic Street, it is unlikely that the decrease in flow from the southerly entrance of the MSCP would cause any noticeable noise impact.

6.112 The existing access for ambulances onto and off site is from Gloucester Street, just south of the junction with The Parade. It is proposed to move the ambulance bay so accessible from either Kensington Place, Patriotic Street or Gloucester Street, with an exit to either Newgate Street/Gloucester Street or Kensington Place/ Kensington Street. Whilst this will change the route taken by ambulances (who may have sirens on) onto more minor roads in a semi-residential area, the various entrances will help to minimise any potential impact of siren noise as they will not all go down the same road. Ambulance sirens are also short, intermittent events, which are generally only used in an emergency and are often not used once they are within the hospital grounds nor during the night-time. Therefore, in summary the change to the ambulance route will not represent a significant impact.

6.113 Noise effects from operational traffic is assessed as **not significant**.

Mitigation

6.114 This section describes the options available for reducing the impacts from noise and vibration for sources for which a significant adverse effect has been identified.

Mitigation of effects from construction

Demolition and construction traffic noise

6.115 Demolition and construction works will take place between the hours of 0800 and 1800 Monday to Friday and 0800 and 1300 Saturday, with vehicles mainly accessing the site during these hours. For logistical reasons it may be necessary to have occasional deliveries outside these hours, such as if any abnormal loads are required to transport large items.

6.116 Disturbance from construction vehicles to residents will be mitigated and minimised through implementation of the CEMP which is likely to include such measures as not leaving engines idling, minimising the need to wait on the public highway and also managing vehicle movements to avoid unnecessary queueing.

Demolition and construction noise

6.117 Conventional solid site hoarding would not provide sufficient attenuation for NSR F and H and for all receptors around Westaway Court, as shown in Figure 6.5 and Figure 6.6, as there are residential properties above ground floor level (so would have a direct line of sight over the hoarding to most plant and activities). Planning the demolition process

so that demolition occurs from the centre of the site outwards would provide screening from the remaining structure, thus keeping the duration of the identified significant effect to a minimum. Barriers may be beneficial for reducing noise in the hospital buildings (at NSR C and D).

- 6.118 No evening and night-time demolition or construction work is proposed. Noise limits may need to be agreed at a later date if required, or if noise proves to be disruptive for nearby NSRs. Equipment such as generators or pumps which may be required to run continuously may be screened or enclosed to reduce the noise impact and where possible, could be positioned away from sensitive locations.
- 6.119 Additional mitigation which also applies to construction vibration is described below in 6.121.
- 6.120 To mitigate and minimise impacts on the elements of the hospital that will be operational during the works, agreements will be required between JFH and the contractor about working hours (site and hospital facilities), construction methods, temporary screening, etc.

Demolition and construction vibration

- 6.121 With appropriate liaison with residents prior to piling works, any temporary disturbance at dwellings adjacent to the sites is likely to be tolerated. Details of communications and a point of contact with the contractor for residents will be set out in the CEMP which would be prepared by the contractor (See appendix O-1 for an outline CEMP).
- 6.122 Temporary disruption is expected to normal operation of many of the operational departments due to demolition and construction vibration. This is inevitable as some works are necessary close to the buildings that house vibration sensitive equipment. Possible mitigation measures are provided below, which are also beneficial for demolition and construction noise.
- 6.123 Mitigation at Source:
- **Work Scheduling:** Schedule construction/demolition work with Pathology activity to minimise operational time overlap, in particular high disturbance activities. Scheduling may be used to agree on specific time periods for high disturbance demolition activities e.g. large bulldozers and piling. Communication and coordination between contractors and Jersey Hospital will be essential to minimise adverse effects.
 - **Site Planning:** Position equipment, where possible, away from the Lab Block to minimise vibration. Apply speed limits for all heavy machinery entering or leaving

the site and ensure trafficking routes are maintained to be smooth and even. Details will be provided in the CEMP.

- **Demolition:** Concrete munchers, saw cutting, and hydro demolition are preferred over the use of concrete breakers and jack- (pneumatic) hammers. Impact forces can be mitigated through controlling drop weight and height and providing an impact mat, or can be avoided by removing materials by lifting from the top-down. A balance between duration of the works and low vibration demolition methods is required.
- **Piling:** The use of bored or screw piling is essential rather than percussive or vibratory methods.
- **Excavation and Compaction:** Where excavation is required in rock, the use of lower vibration excavation techniques such as rock saws and ripping rather than percussive breakers may be required. Fill materials require compaction without the use of vibratory methods.
- **Machinery:** Light rather than heavy machinery will be used to excavate and transport soil, debris and other construction materials to and from the site. Machinery with rubber tyres, instead of tracks, will be used. Care will be taken to avoid collision with walls, columns, and other in-place objects. Heavy items will be lifted and gently placed and not dropped, to avoid impact noise and vibration.

6.124 Mitigation at Receiver:

- **Work Scheduling:** Schedule hospital work in affected departments with construction/demolition activities to minimise operational time overlap for which excessive vibration would occur. Communication and coordination between Jersey Hospital and contractors will be important in avoiding significant effects.
- **Isolation of sensitive equipment:** Install vibration isolation such as damper pads, active vibration tables, optical tables, etc., if not already installed and where practical. It is essential that any such mitigation is properly specified and designed to avoid resonances that could otherwise increase the vibration rather than reduce it.

Mitigation of effects from operation

Building services plant noise

6.125 Design of building services plant, including positioning, enclosures or screening, will reduce plant noise to the defined noise limits as provided in Table 6.21.

Road traffic noise

6.126 No significant effect of road traffic noise is predicted and therefore no mitigation is required.

Residual effects

Residual effects from construction

Demolition and construction traffic noise

6.127 The temporary effect of noise level change from all traffic due to road diversions is likely to be **significant** due to their timescale, impacting properties along Lewis Street. In absolute terms, the level would be below the daytime LOAEL so there will be no health impacts due to traffic noise.

6.128 During certain periods of the construction phases (particularly the concrete phases), large exceedances of the upper assessment criterion are likely to occur along the roads closed for construction traffic. This will not necessarily be for long durations, but due to the potential for significant exceedances of the criterion, the effect is considered to be **significant**.

Demolition and construction noise

6.129 The significance criteria are likely to be exceeded at various locations during the temporary construction works. Careful management of construction and demolition processes would reduce noise levels, and the peak values will only be experienced for short periods, but the effect nonetheless remains **significant**.

Demolition and construction vibration

6.130 With the implementation of the mitigation described above, the residual effect of offsite vibration from demolition and construction is assessed as **not significant** and would be below a level at which impacts to health may occur.

6.131 Within the hospital, the use of vibration sensitive equipment (within Pathology, Radiology and operating theatres, for example) is likely to be impacted if it is required to be used during the demolition and substructure construction works.

6.132 Mitigation options have been outlined in Appendix C3 and are intended to reduce the vibration transmitted to sensitive occupancies as far as is reasonably possible. The mitigation options include activities to manage the disruption through scheduling and through user feedback both informed by the information from vibration monitoring. However, the reduction in vibration cannot be predicted with confidence at this stage and hence some risk of disruption remains.

6.133 While not a direct form of vibration mitigation, it has been recommended that vibration monitoring be implemented during the demolition and construction works.

Residual effects from operation

Building services plant noise

6.134 Noise effects from building services plant is assessed as **not significant**, as noise criteria will be sufficiently below the current background noise levels, therefore there will be no health impacts due to operational plant noise.

Road traffic noise

6.135 Noise effects from operational traffic is assessed as **not significant**, owing to the fact that any variation in road traffic noise has been predicted as negligible, resulting in no impacts to health.

Table 6.22 Assessment summary matrix

Potential Effect	Sensitivity of Receptors	Magnitude (prior to mitigation)	Significance (prior to mitigation)	Mitigation	Magnitude (following mitigation)	Significance (following mitigation)	Comments
Demolition and construction traffic noise	Moderate	Moderate	Significant	Construction vehicles mainly accessing the site between the hours of 0800-1800 Monday to Friday and 0800-1300 Saturday. Disturbance from construction vehicles to residents will be mitigated and minimised through implementation of the CEMP	Moderate	Significant	Properties located on Lewis Street are likely to be impacted during demolition and construction due to diversions, however there are likely to be no health impacts.
Demolition and construction noise	Moderate	Moderate	Significant	Planning of demolition in order to provide screening from remaining structures. Noise barriers to reduce levels at the hospital buildings. Positioning of/screening/enclosures for generators or pumps. Agreements between JFH and the contractor about working hours, construction and mitigation methods. CEMP to outline best practice.	Moderate	Not significant	Significance criteria likely to be exceeded at NSRs A-F for short periods during phase 1A. Mitigation to reduce noise levels as to not cause likely health impacts.
Demolition and construction noise	Moderate	Moderate	Significant	Planning of demolition in order to provide screening from remaining structures. Noise barriers to reduce levels at the hospital buildings. Positioning of/screening/enclosures for generators or pumps. Agreements between JFH and the contractor about working hours, construction	Moderate	Not significant	Significance criteria likely to be exceeded at NSR H for short periods during phase 1B. Mitigation to reduce noise levels as to not cause likely health impacts.

Potential Effect	Sensitivity of Receptors	Magnitude (prior to mitigation)	Significance (prior to mitigation)	Mitigation	Magnitude (following mitigation)	Significance (following mitigation)	Comments
				and mitigation methods. CEMP to outline best practice.			
Demolition and construction noise	Moderate	Severe	Significant	Planning of demolition in order to provide screening from remaining structures. Noise barriers to reduce levels at the hospital buildings. Positioning of/screening/enclosures for generators or pumps. Agreements between JFH and the contractor about working hours, construction and mitigation methods. CEMP to outline best practice.	Severe	Not significant	Significance criteria likely to be greatly exceeded at NSR H for short periods. Recommended to decant building for at least the first three stages of phase 2, or if this is not possible, carefully coordinate site and ongoing hospital activities.
Demolition and construction vibration (neighbourhood)	Moderate	Minor	Not significant	CEMP to outline best practice. Liaison with nearby residents to reduce the impact of perceptible vibration.	Minor	Not significant	NSRs A (Kensington Place) and B (Kensington Place) have the potential for vibration to be perceptible for short periods.
Demolition and construction vibration (operational hospital site)	High	Significant	Significant	As discussed in Appendix C-3: The mitigation options include activities to manage the disruption through scheduling and through user feedback both informed by the information from vibration monitoring.	Moderate to severe	Significant	Mitigation options have been outlined in Appendix C-3 and are intended to reduce the vibration transmitted to sensitive occupancies as far as is reasonably possible. However, the reduction in vibration cannot be predicted with confidence at this stage and hence some risk of disruption remains.

Potential Effect	Sensitivity of Receptors	Magnitude (prior to mitigation)	Significance (prior to mitigation)	Mitigation	Magnitude (following mitigation)	Significance (following mitigation)	Comments
Operational building services plant noise	Moderate	Minor	Not significant	Design of enclosures or screening for plant.	Minor	Not significant	No NSRs affected
Operational road traffic noise	Moderate	Minor	Not significant	None required	Minor	Not significant	No NSRs affected