Jonathan McClue – Principal Planning Officer
London Borough of Camden
5 Pancras Square
London
N1C 4AG

Dear Jonathan,

Application Ref: 2020/5593/P
UCL Ear Institute: Proposed redevelopment of former Royal National Throat, Nose and Ear Hospital 330 Gray's Inn Road
Introduction

The UCL Ear Institute ("the Ear Institute") has been engaging with London Borough of Camden ("the Council") and Groveworld ("the Applicant") over the last 12 months to find a mutual resolution to several significant concerns in relation to the impact of the proposed development on the Ear Institute's operations.

We wrote to formally object to the Applicant's application in our letter of 30 November 2020 and set out the justification behind our significant concerns. Since then, a great deal of work and time has been invested by the Ear Institute and its advisors to find appropriate measures to mitigate the impacts and disturbance that will arise from the development. The aim has been to enable the Applicant's proposals to progress, whilst protecting the Ear Institute's world-leading research operation. Whilst we believe that appropriate solutions can be achieved, both UCL, the Ear Institute and its partners need to be assured that appropriate mitigation measures are secured and enforced.

The Ear Institute has appointed a team of experts to assess the level of construction and post-construction impact and develop measures to mitigate the impact. The results of these studies have been shared with the Council's planning team and Applicant and the key findings are set out below. It is important to appreciate that the Ear Institute will be severely impacted during construction of the development and be unable to maintain operations on-site. Consequently, the Ear Institute will have to decant to an alternative site at significant cost and disruption to ongoing projects funded by both the UK government and non-governmental research charities. It is also critical that the effects of the post-constructional operational noise from the development be appropriately assessed and considered.

Background

A research institute has been sited at Gray's Inn Road since 1947. The present expanded Ear Institute is an integral part of UCL's Faculty of Brain Sciences, opening at its current location in 2005 as a result of a Joint Infrastructure award from The Wellcome Trust, Office of Science and Technology and the Department of Trade and Industry. The Ear Institute's mission is to uncover new knowledge on the biological basis of hearing to apply this to diagnose and treat hearing loss, an under-represented sensory disorder that affects over 11 million adults in the UK (one 6th of the population). Hearing loss (including tinnitus) affects our ability to communicate, compromising the physical, emotional and social health of those whose suffer from it. The increasing age of our population, combined with environmental noise exposure means that the number of people suffering from hearing loss and tinnitus continue to grow. ***The Ear Institute is leading the national effort*** to understand this debilitating condition and to develop and deliver therapies. To do this it brings together some of the most influential academics and clinicians in the world from scientific and clinical research in fields as diverse as human genetics, biophysics, computational neuroscience, cell biology and human cognition.

The Institute employs 60 full time staff and 33 PhD students and educates over 130 students across Masters and Bachelors courses, as well as training 200 attendees yearly through CPD courses. The Ear Institute has over 40 different ongoing research projects, including translational, multidisciplinary and discovery research. Together with the recently opened UCL Hospitals (UCLH) Royal National Ear Nose and Throat Hospital (RNENT) and Eastman Dental Hospital on Huntley Street, the Institute comprises the largest specialist centre for ear, nose, throat, hearing and balance research and service in Europe.

The Ear Institute is also the lynchpin of the National Institute for Health Research UCL/UCLH Biomedical Research Centre Deafness and Hearing Problems theme, which aims to develop and deliver transformative treatments for people with hearing and balance disorders and is built upon the unique partnership of the Ear Institute and the RNENT. The Ear Institute works closely with RNENT and UCLH teams to deliver world-class diagnostic studies and trials of innovative hearing treatments (for examples see REGAIN, TACT and AUDIBLE-S trials).

The Ear Institute occupies a collection of buildings adjacent to 330 Gray's Inn Road comprising 332 and 334-336 Gray's Inn Road and 75 Wicklow Street. The buildings contain specialist, bespoke laboratories where very sensitive audiology research is undertaken, and a Biological Services Unit (BSU). The nature of the research within the Ear Institute dictates operations that are particularly sensitive to noise and vibration.

Impacts on the Institute's operations

Noise and vibration

The Ear Institute contains a wide range of research equipment that is extremely noise and vibration sensitive, and a Biological Services Unit (BSU) for which environmental conditions must be maintained according to animal welfare, ethics and governance standards legally mandated by the Home Office. Some of the Ear Institute's research would be impossible to

continue even in the case where short periods of exceedance of the noise and vibration criteria occurred. For these areas, the implications of exceedances of the criteria could be irreparable damage to the research and inability to safely comply with Home Office regulatory requirements. Consequently, the Ear Institute appointed Sheppard Robson and Ramboll in April 2021 to assess the potential impacts arising from the Applicant's proposals, in order to:

- Assess dependency between the BSU (Biological Services Unit) and other specialist functions within the Ear Institute.

- Establish the noise and vibration criteria for the Ear Institute that should not be exceeded during the construction and subsequent operational phases of the development to avoid significant impact.

- Determine the potential impact of construction works in comparison to the established criteria.

The key findings of the noise and vibration assessments, both of which are appended in full to this letter, show that during the demolition and construction phases which last for approximately 14 months, there are significant risks of exceedances for long periods of time for a wide range of Ear Institute activities. This includes exceedances of noise level criteria in highly sensitive hearing booths where hearing is tested and within long term research areas where exceedances may result in aborted work, as well as vibration level criteria exceedances in Imaging departments housing highly sensitive electron microscopes. It is therefore considered unfeasible that the proposed construction works could be carried out without exceeding the noise and vibration levels required for the Ear Institute's research operations to remain unaffected. These noise and vibration level criteria and the basis for their justification are set out in the documents appended to this letter.

A separate study by Sheppard Robson reviewed the spatial and operational requirements of the Ear Institute in order to inform any decant and mitigation strategy. Within this study, the feasibility of partial decant was assessed. However, this study illustrated the critical interdependency of the Ear Institute's operations, with access to the BSU and other specialist spaces in the Ear Institute essential for continuity of research. Given the extent of the predicted noise and vibration impacts on the most sensitive parts of the facility, the Sheppard Robson study demonstrates that it is not considered feasible for the Ear Institute to retain any of their operations on site during construction. Consequently, the impacts of construction works will require the decant of the entirety of the Ear Institute's operations throughout the demolition and construction phase of development.

In the operational phase of the development, the Ramboll study concludes that it will be feasible to achieve the noise and vibration criteria, provided the applicant commits to meeting the UCL noise and vibration criteria set out in the appendices to this letter, and appropriate mitigation measures are incorporated into the Applicant's proposals to meet the criteria. For example, appropriate vibration isolation will be required for plant and noise limits and should be in place for spaces that have the potential to generate high noise levels such as bars with music and plant rooms. It is therefore critical that the Council insists that robust

measures are put in place to ensure that over the lifetime of the development, these thresholds will not be exceeded.

Security & Overlooking

The Ear Institute previously raised significant concerns over the impact that the proposed development would have upon security. This was supported by feedback from the Home Office Inspector who raised concerns that the proposed development would compromise the security of the BSU and the research at the Institute. The movement of animals in and out of the Ear Institute is a point of vulnerability and this occurring in public sight was of significant security concern and risk.

In order to address this concern, the Ear Institute has secured the acquisition of land that will facilitate the delivery of a new servicing yard. This will require planning permission and whilst early pre-application discussions have been positive, it is critical that planning permission is secured, so that the new Service Yard can be constructed to maintain operations.

Access and egress

We previously advised that the demolition of 330 Gray's Inn Road would result in the Ear Institute being without a secure and safe means of fire escape from the existing plant room. Through the acquisition of land from Royal Free to facilitate a new Service Yard, a new secure and safe fire escape route has been agreed.

Relocation of flues

The demolition of 330 Gray's Inn Road will require the relocation of the existing flues currently attached to the wall between 332 and 330 Gray's Inn Road and which overhang the development site. The height and location of the flues will be determined by complex flue dispersal modelling. The Ear Institute has been working with the Applicant to identify an appropriate new location, which will be subject to planning permission. Although a new location for the flues has not yet been identified, we understand that the Applicant has agreed responsibility for securing planning permission for the relocation of the flues and that this will be secured through a Neighbourly Agreement that is being negotiated with the Applicant. As set out further below, in order to provide comfort to the Ear Institute that these commitments are delivered upon, we would request that the Neighbourly Agreement should be in place prior to any works being implemented.

Impact on funding and research

The Ear Institute is involved in ongoing research projects that will be severely impacted by the proposed development, jeopardising legal obligations for delivery of research objectives to UK governmental and non-governmental funding agencies including UK Research and Innovation (UKRI) Research Councils, the National Institute for Health Research (NIHR), and the Wellcome Trust. Future funding is also likely to be jeopardised if these impacts are not appropriately mitigated. We therefore request that, in the event that the Council is minded to approve the application, the following measures are secured through appropriately worded Planning Conditions and Section 106 Planning Obligations.

Construction Phase

- UCL to provide Applicant with a set of site criteria for an alternative site for the Institute for decant during the construction of the development.
- Applicant to source sites that meet the provided criteria and present these to UCL.
- Applicant to secure decant of the Ear Institute at the Applicant's cost to a suitable alternative premises (complying with the site criteria and approval by UCL) before commencement of development.
- Applicant to cover all costs for the decant move, including for extensions to research projects due to decant-related delays and repair of any decant-related damage to sensitive equipment.
- Applicant to enter into a Neighbourly Agreement with UCL before commencement of development.
- Commencement of development not to include any carve-outs and extend to any noise/vibration generating activities.
- Decant obligations to be contained within the S106 (and enforceable by the Council) and the Neighbourly Agreement (and enforceable by UCL).

Occupation Phase

- Before commencement of development, the Applicant will submit a detailed plan to the Council and UCL for monitoring noise and vibration impacts on the Ear Institute during the occupational phase of the development.
- Detailed plan to include measurable targets / limits on noise and vibration (in line with the critical thresholds outlined in Ramboll's report dated 20 May 2021).
- Applicant to pay all costs in respect of monitoring the plan.
- A mechanism for checking as-built development before it occupies to establish if designed measures work and remedial measures if they don't.
- The plan needs to identify mitigation measures if the noise limits are breached, including permanent decant of the Ear Institute to appropriate alternative facilities at the Applicant's cost or as a worst-case scenario, the eviction of any occupiers causing the breaches.
- Occupational obligations to be contained within the S106 (and enforceable by the Council) and the Neighbourly Agreement (and enforceable by UCL).

The Ear Institute and its partners are firmly of the view that these obligations are critical to protecting the future operations of the world-leading research that they undertake, which impacts on patients and public across the globe.

Conclusion

In conclusion, without appropriate measures in place, planning permission should be refused on grounds that the Ear Institute's operations will be irrevocably compromised, and the ongoing delivery and future funding of research programmes will be put in serious doubt. This directly conflicts with the strategic aims of the London Plan and Camden's Local Plan

policies, by undermining the strategic importance of London's cluster of world-leading medical research and academic institutions of which the Ear Institute forms an integral component. UCL hopes the mitigation measures suggested will allow the development to progress, whilst also ensuring the existing and ongoing operational activity of the Ear Institute is protected during and post-construction.

Yours sincerely

Professor Alan J Thompson
Dean, Faculty of Brain Sciences, UCL UCL Pro-Vice-Provost

Professor Jonathan Gale
Director of UCL Ear Institute

Cc:

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Cllr Pat Callaghan – Cabinet Member for Healthy & Caring Camden
Cllr Danny Beales – Cabinet Member for Investing in Communities and an Inclusive Economy

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UCL

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Report

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May 2021

UCL EAR INSTITUTE

NOISE AND VIBRATION ASSESSMENT OF ADJACENT CONSTRUCTION

RAMBOLL Bright ideas. Sustainable change.

UCL EAR INSTITUTE
NOISE AND VIBRATION ASSESSMENT OF ADJACENT CONSTRUCTION

Project name	**UCL Ear Institute**
Project no.	**1620012267**
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Prepared by	**Simon Taylor / Lynden Spencer-Allen**
Checked by	**Craig Barson**
Approved by	**Lynden Spencer-Allen**
Description	**Report summarising the Ear Institute noise and vibration sensitivity and an assessment of the potential impact of adjacent construction activities.**

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CONTENTS

1. INTRODUCTION AND AIMS

Ramboll has been appointed by UCL to provide noise and vibration consultancy to assess the potential impact of development adjacent to the UCL Ear Institute on Gray's inn Road.

The former Royal National Throat Nose and Ear Hospital site has been purchased and a planning application to redevelop the site for hotel, office and residential use has been submitted by Groveworld. The site has a direct boundary with the UCL Ear Institute which houses research facilities and equipment that are very sensitive to noise and vibration. Figure 1 shows the location of the Ear Institute and the adjacent development.

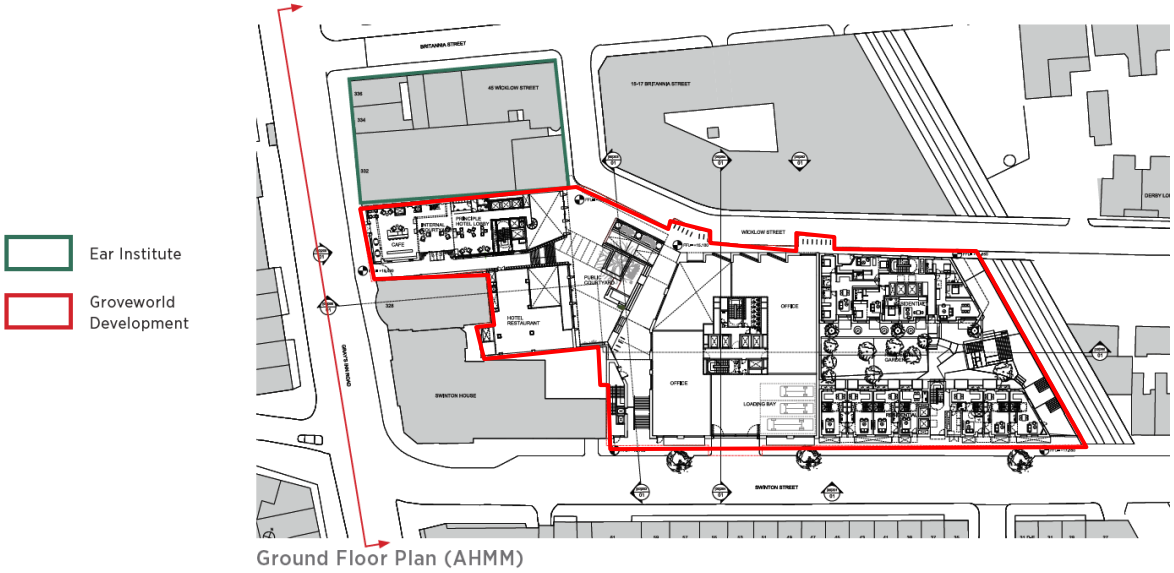


Figure 1 – Extract from Groveworld planning documents overmarked with the location of the Ear Institute and the Groveworld development

UCL are concerned that the construction and operational phases of the proposed development could significantly impact the research being undertaken in the Ear Institute. Ramboll were commissioned in April 2021 to provide a study of the potential impacts on behalf of UCL.

This report presents the findings of the study and is intended to:

- Establish the noise and vibration criteria for the Ear Institute that should not be exceeded during construction and operational phases to avoid significant impact;
- To determine the potential impact of construction works in comparison to the established criteria.

This report is prepared for the exclusive use of UCL and should not be used in whole or in part by any third parties without the express permission of Ramboll in writing.

2. NOISE AND VIBRATION CRITERIA FOR OPERATION OF THE EAR INSTITUTE

Noise and vibration criteria for the Ear Institute have been established through the following methodology:

- Review of the Baseline Noise and Vibration Survey Report (Hann Tucker, 2020) and the criteria contained within the report;
- With reference to published standards for similar research environments;
- Based on Ramboll's experience of similar facilities;
- Feedback from the users on the use of the spaces and the required levels;
- Review of the proposed criteria against the baseline measurements to verify these are currently being achieved.

The detailed methodology is included within a Noise and Vibration Briefing Note. The summaries of the established criteria are set out below with reference to the location plan below:

Figure 2 – Ear Institute Floor Plans with reference locations annotated

2.1 Noise Criteria

The noise criteria are based upon national guidance, criteria at other UCL research facilities and acoustic good practice. The criteria are shown in Table 2-1.

Table 2-1 Noise Criteria for each space type

Ref	Name	Noise Criteria
A	Research space	45 dBL_{Aeq}
B	Imaging	45 dBL_{Aeq}
C	Auditory Booths	0 dBHL
D	Research space	45 dBL_{Aeq}
E	Auditory Booths	0 dBHL
F	Workshops	55 dBL_{Aeq}
G	Auditory Booths	0 dBHL
H	Tissue Culture	45 dBL_{Aeq}
I	Research space	N/A
J	Laboratories	45 dBL_{Aeq}
K	Laboratories	45 dBL_{Aeq}
L	Laboratories	45 dBL_{Aeq}
	Offices	40 dBL_{Aeq}
	Seminar Room	35 dBL_{Aeq}
	Lecture Theatre	30 dBL_{Aeq}

It should be noted that as an Ear Institute, the facility houses areas that are particularly sensitive to noise, this includes a number of areas containing hearing booths used for hearing tests. Area A is especially sensitive to exceedances of the criteria due to the type of research being undertaken. Whilst there may be opportunities to agree short periods of higher noise levels for many of the areas, area A cannot be subject to any periods of higher noise levels. Higher noise levels, even for short periods, could result in the research being impossible to carry out.

2.2 Vibration Criteria

Based on good practice the vibration requirements for the spaces are specified based on the generic VC criteria which are widely used for laboratory and sensitive research environments (see Appendix 1). The VC criteria specified in Table 2-2 apply to short term vibration transient events as well as longer term average vibration levels.

Table 2-2- Vibration criteria for each space type

Ref	Name	Vibration Criteria
A	Research space	VC-A
B	Imaging	VC-D
C	Auditory Booths	VC-B
D	Research space	VC-B
E	Auditory Booths	ISO-1
F	Workshops	N/A
G	Auditory Booths	VC-A VC-D (within isolated room away from resonant frequency)
H	Tissue Culture	VC-B
I	Research space	N/A
J	Laboratories	VC-B
K	Laboratories	VC-B
L	Laboratories	VC-B

It should be noted that area A is especially sensitive to exceedances of the criteria due to the type of research being undertaken. Whilst there may be opportunities to agree short periods of higher vibration levels for many of the areas, area A cannot be subject to any periods of higher vibration levels. Higher vibration levels, even for short periods, could result in the research being impossible to carry out.

3. SUMMARY OF THE PROPOSED DEVELOPMENT

The planning application drawings have been reviewed to understand the proposed development and, in particular, the proposals immediately adjacent to the Ear Institute.

The frontage of the former hospital on Gray's Inn Road is to be retained along with the zone immediately behind this. Further east on the plot and immediately adjacent to the Ear Institute a double storey basement is proposed which would form the substructure to the hotel. Figure 3 shows the proposed basement extent in relation to the Ear Institute building.

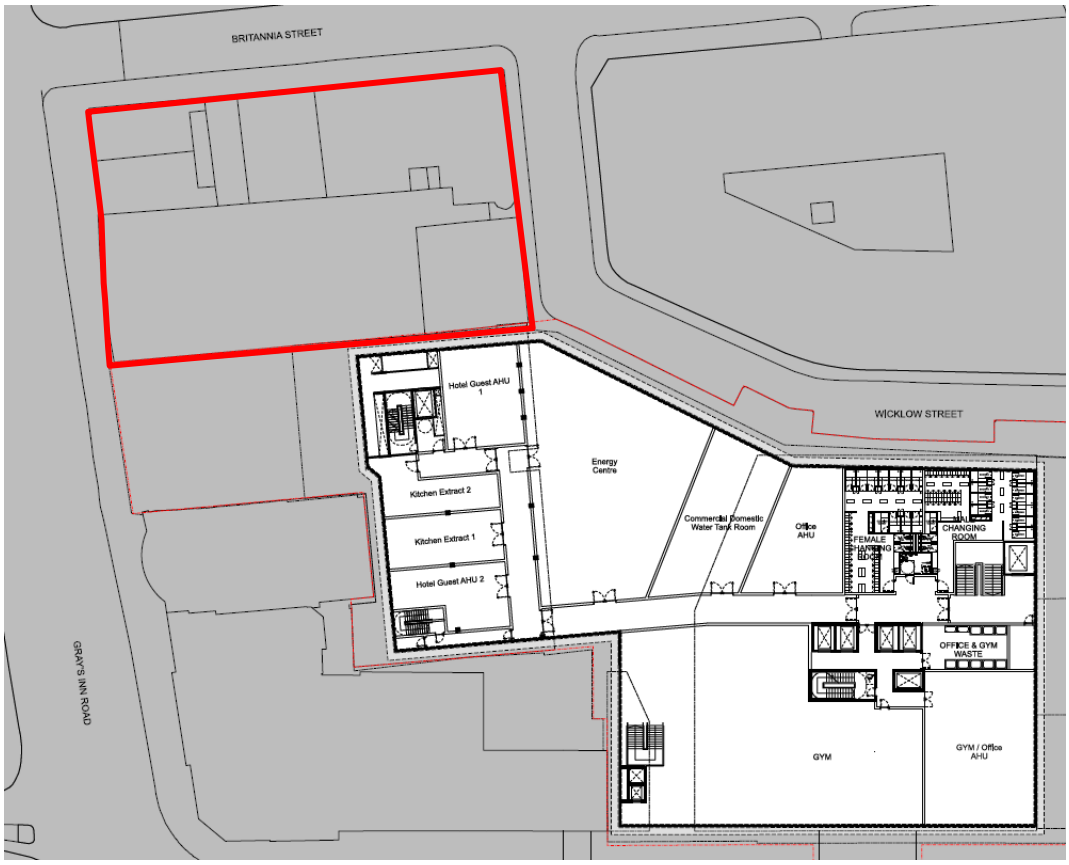


Figure 3 – Extract from the Planning application GA drawings showing the proposed basement extent with the Ear Institute shown highlighted in red

Figure 4 shows an extract from the planning application drawing showing a section through the hotel and the double basement underneath.

Figure 4 - Extract from the planning application elevation and section drawings showing the proposed hotel and double basement underneath (note the Ear Institute is not shown on this section)

3.1 Construction Phase Programme

The planning application includes a Construction Management Plan (CMP) which gives an indication of the construction programme that has been taken from the traffic generation assessment (refer to Figure 5). Whilst this is preliminary it has been used to provide some context of what the potential construction periods may be which are set out below:

- Demolition 6 months
- Foundations 8 months
- Substructure and frame 8 months
- Envelope 8 months
- Fit out and finishing 10 months

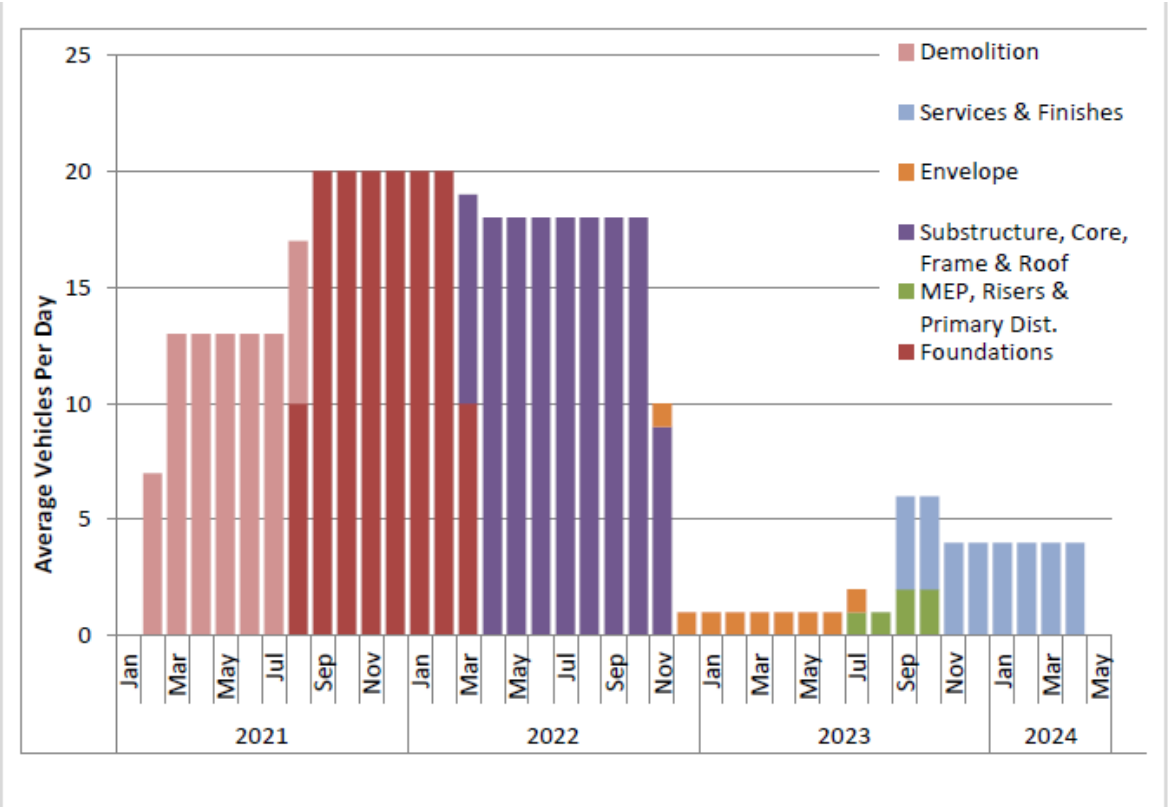


Figure 5 – Extract from the planning application Construction Management Plan to determine the likely construction programme.

4. RISK OVERVIEW OF THE STAGES

Based on Ramboll's experience of similar assessments, the summary of the likely phases of impact are summarised below. This is based on the assumed activities set out in the sections below.

Phase	Noise Risk	Vibration Risk
Demolition		
Piling and basement		
Substructure		
Superstructure		
Fit Out		
Operation		

4.1 Demolition phase

Demolition is required immediately adjacent to the Ear Institute building to remove the adjacent walls and foundations.

4.2 Piling and basement construction phase

Large piling rigs will be required in very close proximity to the Ear Institute to form a secant piled retaining wall. The methodology used can significantly impact the vibration levels produced especially if casings are needed to be installed and removed due to ground conditions.

Once the piled retaining wall is constructed a significant excavation operation will be required to remove the soil.

4.3 Substructure construction phase

Significant concrete pours and construction of the concrete substructure will be required with potential compaction of fill material.

4.4 Superstructure construction phase

Construction of the upper storeys will require construction methods with less energy imparted on the ground but significant numbers of deliveries.

5. CONSTRUCTION STAGE NOISE ASSESSMENT

There are two types of noise receptor within the Institute; those that can be disturbed by excessive noise, for example offices, lab areas, and those where control of noise levels is critically important, i.e. if noise limits are exceeded, up to several months of work could be invalidated. Noise criteria are presented in Table 5-1. Noise criteria are based upon the most relevant guidance documents.

Room type	Sensitivity	Criterion	Notes
Research (Area A)	Critical	45 dBL_{Aeq}	Set to account for tonal / sudden noise characteristics
Hearing booths	Critical	0 dBHL	No noise can be audible to the most sensitive subjects
Imaging	Critical / Medium	65dBA / 45 dBL_{Aeq}	65 dBA for SEM, 45dBA for human comfort & good communication
Labs	Medium	45 dBL_{Aeq}	Human comfort & clear communication
Offices	Medium	40 dBL_{Aeq}	Human comfort & clear communication
Seminar	High	35 dBL_{Aeq}	Human comfort & clear communication
Lecture Theatre	High	30 dBL_{Aeq}	Human comfort & clear communication

Table 5-1 Noise sensitivity of Institute spaces

5.1 Construction Noise sources

There is risk to operations within the Institute from both structure borne noise and airborne noise from close construction works.

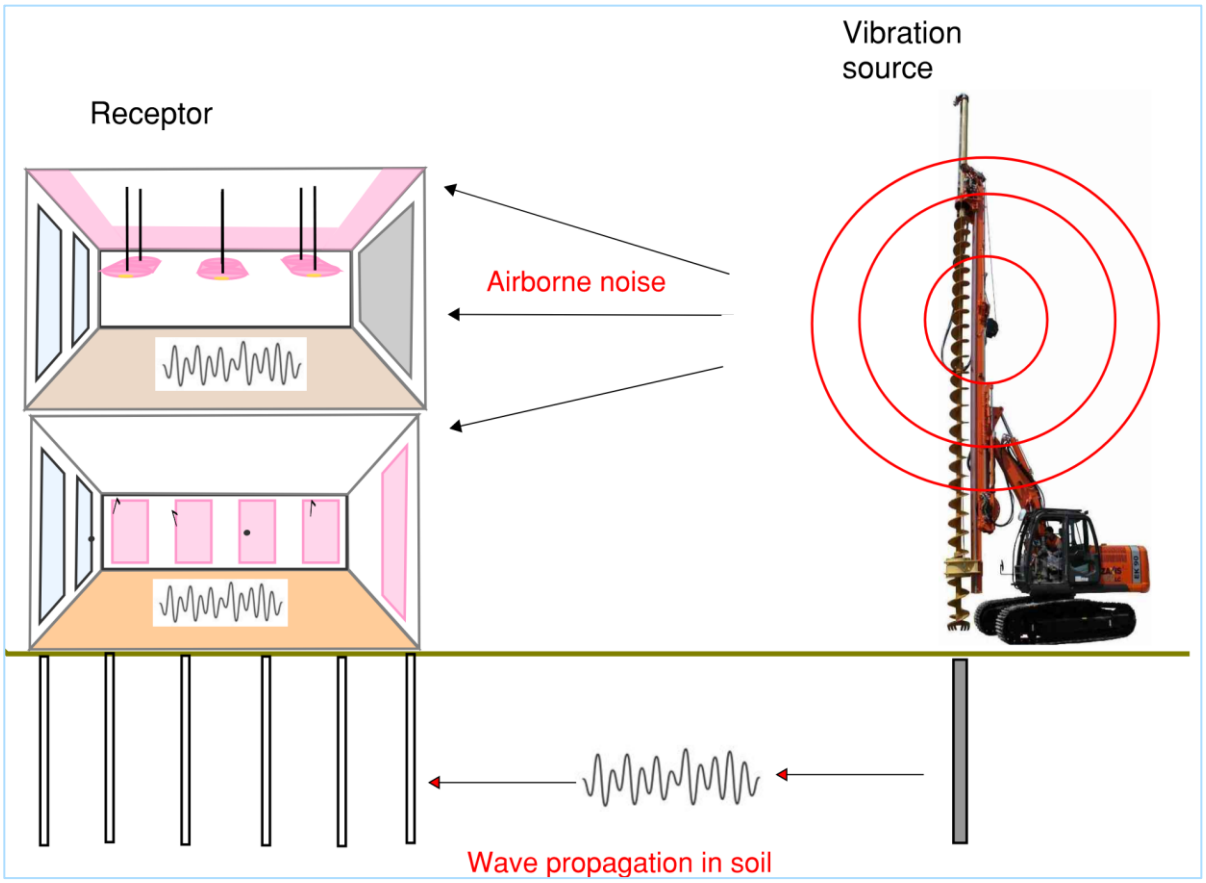


Figure 6 - Noise propagation principle

Structure borne noise is created when energy (e.g. from hammers, drills, etc) gets into the building structure (e.g. through direct party wall works) and re-radiates as noise. It is also created when vibration in the ground enters the building structure via the foundations.

Opening up works were undertaken to the party / adjacent wall to the Institute. Noise levels were measured during these opening up works in various spaces throughout the institute, by the developer's agent.

5.2 Construction Noise Assessment

The developers noise measurements are compared to the Institute's criteria in Table 5-2. Colours on figures represent a 'RAG' system where red indicates highest risk/impact/sensitivity, amber-medium and green-low.

It can be seen from the results that critical criteria are exceeded in some areas.

Ref	Name	Measured noise levels dBA		Criteria	Risk
		Baseline (Room No., level)	During works (Room No., level)		
A	Research Space	B25 - 39 / 40	B25 - up to 62	45 dBL_{Aeq}*	
		B24 - 50	B24 – 47/48	45 dBL_{Aeq}*	
B	Imaging		Assumed similar to A	45 dBL_{Aeq}*	
C	Auditory Booths	B36 - 29	B36 - 31	45 dBL_{Aeq}	
D	Research space	B39 -??	B39 - 34	45 dBL_{Aeq}	
E	Auditory Booths	122 – 13+	122 - 13+	0dBhL**	
	Outside booth	123 - 27	123 – 50	30	
	Anechoic chamber	125 – 14+	125 – 14+	0dBhL**	
G	Auditory Booths	117 - 37	117 - 39	45 dBL_{Aeq}* 0dBhL** (booth)	
H	Tissue Culture		Assumed similar to E/G	45 dBL_{Aeq}*	
J	Laboratories	216 - 40	216 - 42	45 dBL_{Aeq}	++
K	Laboratories		Assumed noise level lower than J	45 dBL_{Aeq}	
L	Laboratories		Assumed similar to J	45 dBL_{Aeq}	++
Office Areas	Lecture Theatre	G37 – 33	G37 – 34	30 dBL_{Aeq}	
	Office	G23 - 36	G23 – 52 to 60	40 dBL_{Aeq}	
	Seminar Room	G33 - 40	G33 - 46	35 dBL_{Aeq}	

Notes

Criteria

* BSU criteria adjusted for construction noise considers tonality/impulsiveness

** 0dBHL suggested as criteria as ultrasonic frequencies are considered to be sufficiently attenuated as they travel through the structure. The actual requirement is 'inaudibility' to the most sensitive subjects being tested.

Other criteria based on typical guidance and UCL IoN DRI

Measurements

+ Measurement at noise floor of SLM, however it was noted that noise was audible

++ Noise levels likely to be higher when works are closer in proximity

Table 5-2 Noise assessment

5.3 Opening up works

Noise levels measured during opening up works are based on small openings with limited tools and considered 'indicative', however, are unlikely to be representative of actual demolition works. Actual demolition noise levels are likely to be higher, especially when works are adjacent.

Figure 7 - Opening up works

Clear cavities between the two buildings can be seen in the opening up works photos. This suggests that noise levels measured during opening up works are not necessarily structure borne in origin, but are likely from a combination of airborne noise very close to the façade and structure borne noise through any structural connections.

5.4 Construction Noise Assessment – High level findings

Noise risk primarily related to 'party wall' works and from re-radiated noise from vibration producing activities such as piling and vibro-compaction.

Noise attenuates as distance to the works increases. Both in terms of distance of construction activities to the Institute and distance of the rooms within the Institute to the 'party wall'.

Ultrasonic noise from construction is attenuated by the structure.

There is significant risk to some institute activities during demolition works.

Figure 8 - Noise risk areas

5.5 Construction Noise Summary – Area A Research

The noise level limit for tonal/impulsive noise, such as construction noise, of 45 $dBL_{Aeq,5mins}$ cannot be exceeded in these rooms.

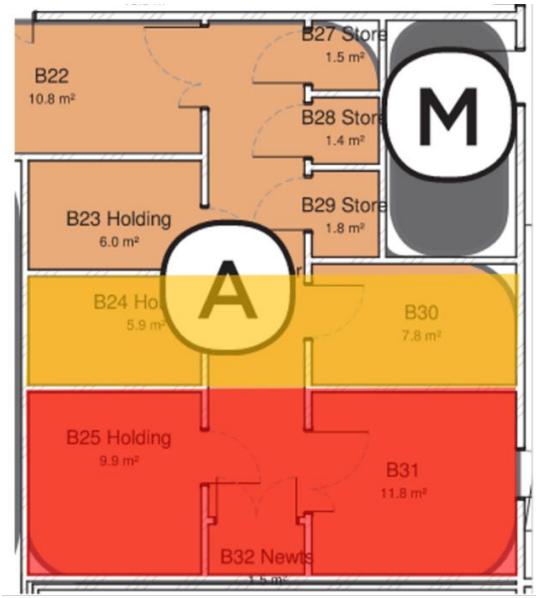
Based upon the measured noise levels during opening up works:

- Rooms B25 and B31 are high risk >50dBA +tonal
- Rooms B24 and B30 are medium risk >45dBA +tonal

Potential significant risk to asset behaviour during demolition works, and also during piling and substructure within 50m.
Potential timescale – 14 months.

It should be noted that there is significant concern within the Institute that asset behaviours have been impacted by the opening up works.

Figure 9 - Area A summary



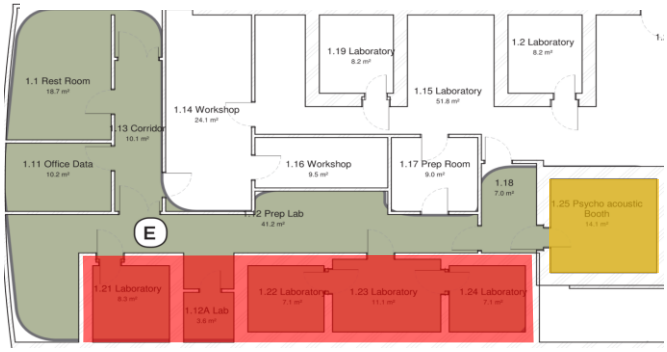
5.6 Construction Noise Summary – E Human Booths and Anechoic Chamber

The facility operates with extremely low background noise levels, therefore any construction noise that can be heard will interfere with tests.

Potential significant risk to hearing tests during demolition works, and also during piling and substructure works.

Potential timescale – 14 months.

Figure 10 - Human booths summary



5.7 Construction Noise Summary – B Imaging

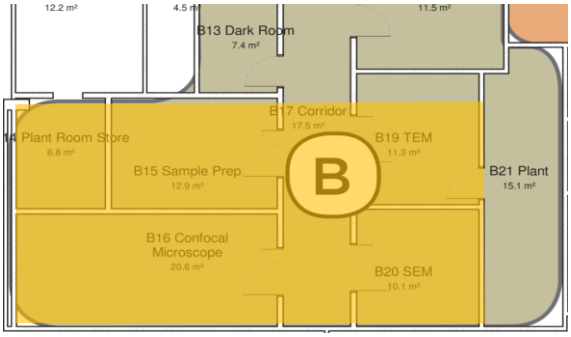
Primarily risk of disturbance to users, rather than experiments during demolition works.

SEM manufacturer criteria of <65dBA should be met at all times.

Risk increases with proximity to party wall.

Potential timescale – 14 months.

Figure 11 - Imaging summary

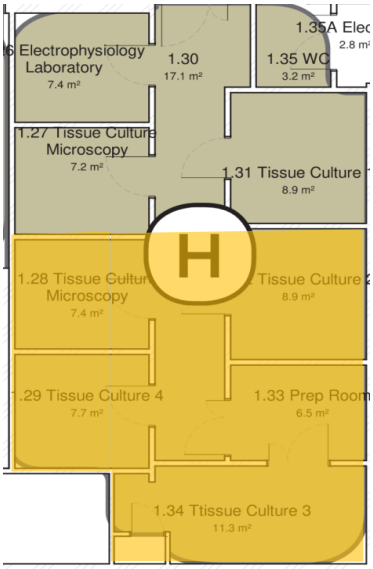


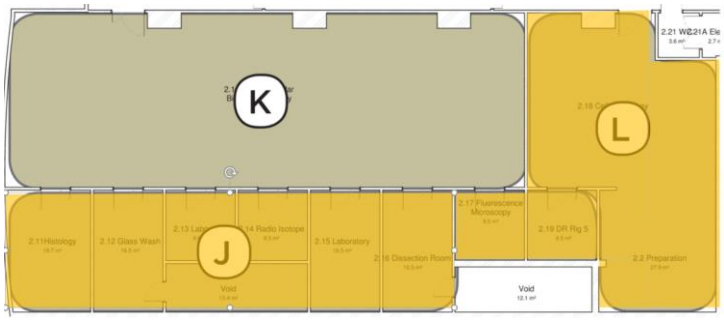
5.8 Construction Noise Summary - Areas H/K/J/L

Primarily risk of disturbance to users, rather than experiments, during demolition works. Risk increases with proximity to party wall.

Potential timescale – 14 months.

Figure 12 - H/K/J/L summary





5.9 Construction Noise Summary - Areas C/G Hearing Booths

High sensitivity locations. However, distance from party wall mitigates noise risk during demolition. Nonetheless there is still some potential noise risk from vibro-compaction/piling close to the Institute.

Potential timescale – 14 months.

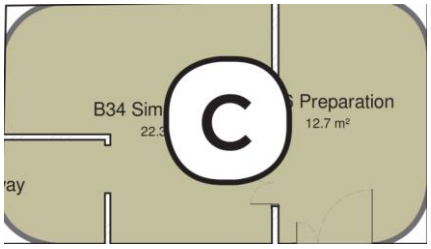


Figure 13 - C/G summary

5.10 Construction Noise Summary - Office Areas

Noise at a level likely to cause significant disturbance to concentration, conversations and telephone/Video calls during demolition works.

Noise levels in Offices were measured up to 60 dBL_{Aeq}, noise levels in Seminar room were measured at 46 dBL_{Aeq}.

BS8233:2014 provides a table of maximum steady noise levels for reliable conversation. Based upon the table, it can be seen that with a noise level of 60dBL_{Aeq}, raised voices would be required to communicate effectively with someone just 1m away.

In reality, the situation is significantly worse, as the construction noise is not steady but impulsive, intermittent and tonal, and therefore much more disturbing than steady noise. This is clearly demonstrated in the data where L_{AFmax} levels above 70 dB were measured in the Seminar room.

Noise at this level would make the Seminar room unusable.

Potential timescale – 14 months.

Figure 15 – Offices Summary

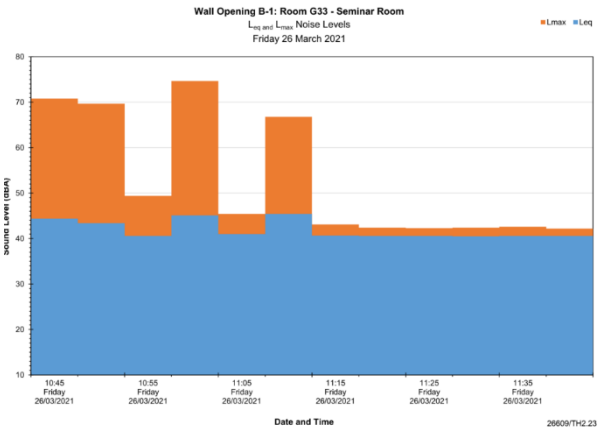


Figure 17 - comparison of steady and maximum noise levels

5.11 Groveworld – Noise and Vibration Management Plan

Groveworld's acoustic consultant, Hann Tucker, has produced a draft Noise and Vibration Management Plan (Document reference - 26609/NMP1 Dated 09 May 2021).

The document recognises that there will be construction noise and vibration at a level that will impact the activities undertaken in the Institute.

Mitigation proposed to control noise levels is standard, rather than specific to a highly noise sensitive receptor, and includes:

- A commitment to BPM (typical of all construction sites)

- Limiting noisy periods (typical in central London, but lengthens construction period)

Normal site hours will be limited to 08:00-18:00 Monday to Friday, 08:00-13:00 Saturday. Mitigation measures propose to restrict the noisier works to a '2 hours on 2 hours off' basis, with noisy periods set as 08:00-10:00, 12:00-14:00 and 16:00-18:00.

- Limiting 'airborne' noise levels at the facade

Time	Relevant Time Period	Averaging Time, T	Noise Insulation Trigger Level dBA $L_{eq,T}$.
Monday to Friday	7am to 8am	1h	70
	8am to 6pm	10h	75
	6pm to 7pm	1h	70
	7pm to 10pm	3h	65
	10pm to 7am	1h	55
Saturday	7am to 8am	1h	70
	8m to 1pm	5h	75
	1pm to 2pm	1h	70
	2pm to 10pm	3h	65
	10pm to 7am	1h	55
Sunday and Public Holidays	7am to 9pm	1h	65
	9pm to 7am	1h	55
Table E.2 - The above levels are intended to be measured at a distance of 1m away from the nearest effected windows of eligible dwellings.			

Table 5-3 - Reproduced from Groveworld Draft NVMP

- Does not consider mitigation for structure borne noise or offer any advice on how the Institute's internal noise criteria will be achieved.

5.12 Operational Noise from the development

As stated previously, the Institute undertakes critical research that is highly sensitive to noise. In some cases, individual experiments may last for periods of months. It is understood that the Groveworld development proposes a hotel with basement plant room adjacent to the Institute.

It is not known at this point whether the hotel proposes to have function rooms, bars, nightclubs or other rooms that have the potential to generate high noise levels.

The Institute requires noise levels to be controlled to meet critical noise limits in some spaces. It is therefore essential that the developer ensures that noise from the operation of any proposed facilities allows the Institute's critical noise criteria to be achieved at all times.

The National Planning Policy 2019 (NPPF) states " *Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed."*

In this situation, the Institute is the existing business and the developer is the 'agent of change'. The Institute was designed to be able to operate within its current environment without noise from nearby premises impacting its critical operations.

The key phrase is "*Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established."*

Therefore, as the 'agent of change' it is the developer, Groveworld's, responsibility to:
"'provide suitable mitigation before the development has been completed",
"*ensure that new development can be integrated effectively with existing businesses"*

6. CONSTRUCTION STAGE VIBRATION ASSESSMENT

Assessment of the potential impact of the construction stage activities on the Ear Institute is based on Ramboll's understanding of the likely construction methods.

The assessment has been carried out in line with BS5228-2 and the Measurement and Assessment of Groundborne Noise and Vibration (ANC, 2020). In addition to the data contained within these documents, measurement data from Ramboll's experience has also been used to provide additional vibration source data.

Three locations in the Ear Institute have been used as examples of the potential impact and these are shown in Figure 18. These are area references A, B and G.

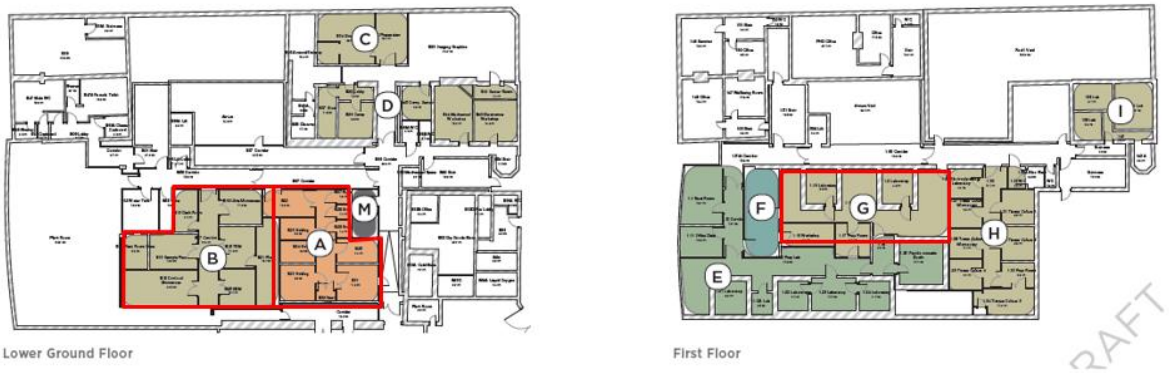


Figure 18 – Three locations selected for construction vibration impact assessment

6.1 Vibration criteria in PPV

Since construction vibration impacts are typically measured in Peak Particle Velocity (PPV) the vibration criteria established need to be converted into PPV for comparison with the predicted levels.

The methodology used for this is based on a number of reasonable assumptions in terms of the frequency content of construction sources. Details of the methodology used are set out in Appendix 2. The resulting criteria are shown in the table below.

VC Band	PPV (mm/s)
ISO-1	0.37
VC-A	0.19
VC-B	0.09
VC-D	0.02

6.2 Assessment of construction vibration impacts

The methodology in BS5228-2 has been used to establish PPV levels for different vibration sources at varying offsets based on free field conditions.

The predicted levels in the building have been altered based on the guidance within the ANC guidance as set out below:

- For the lower ground floor the free-field PPV levels have been reduced by 6dB based on Table 8.1 of the ANC guidance. The actual coupling loss could be higher or lower than this and so this level is used a reasonable assumption for the assessment.
- For upper floors the reduction in vibration level associated with foundation level could be subject to amplification on upper floors at some frequencies. If this occurred, the reduction in vibration levels at foundation level could be offset by amplification at upper floors and hence no reduction on free-field PPV levels has been used.

Since the sources of construction vibration will move around the site, a range of distances has been used as the basis of the assessment. Figure 19 shows the approximate offsets on the site from Areas A and B for guidance.

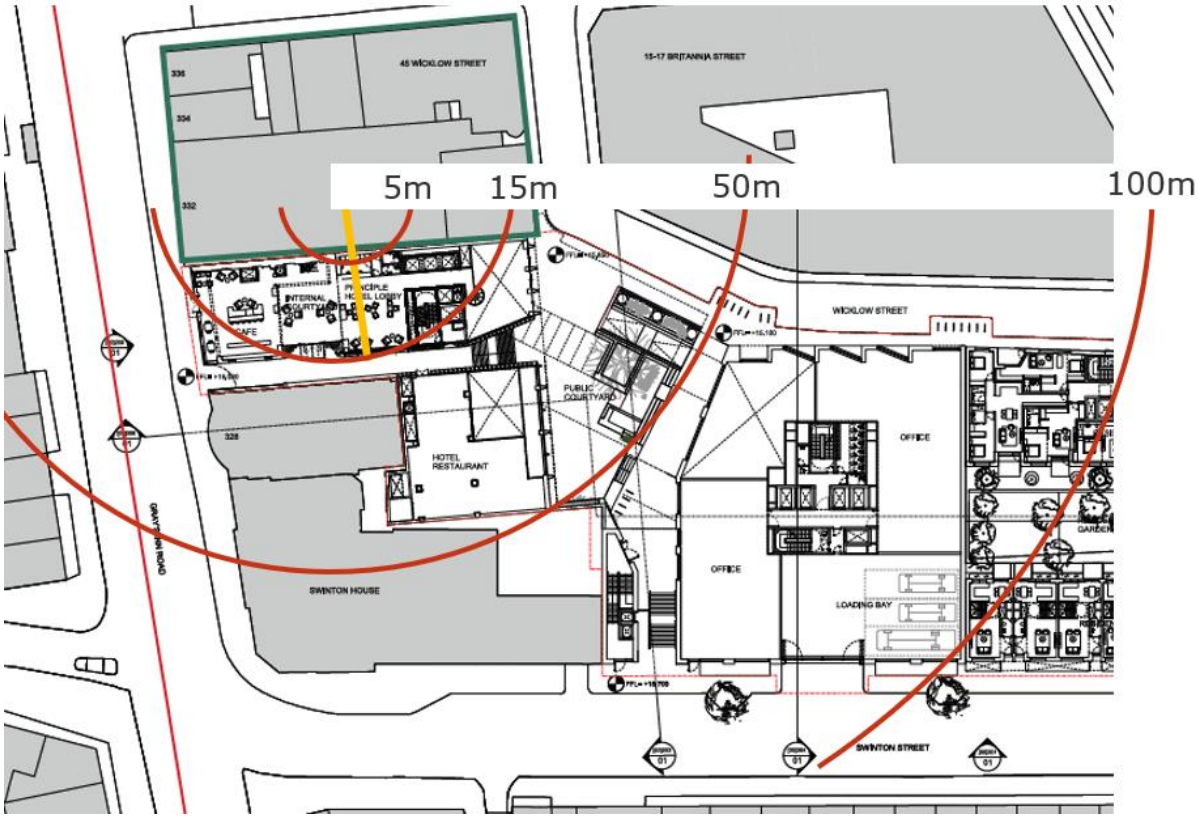


Figure 19 – Approximate radial distances from sensitive areas within the UCL Ear Institute

Figure 20 and Figure 21 show the predicted vibration levels at the four offset distances for a variety of construction sources that could be envisaged on site. Figure 20 shows the vibration levels for the ground floor and Figure 21 the upper floors.

Legend		
	>Human Perception	PPV > 0.37 mm/s
	Human Perception	0.19 mm/s < PPV< 0.37 mm/s
	Approx. VC-A	0.09 mm/s <PPV< 0.19 mm/s
	Approx. VC- B	0.02 mm/s <PPV< 0.09 mm/s
	Approx. VC-D	PPV < 0.02 mm/s

	BS 5228-2 2009: Code of practice for noiise and vibration control on construction and open sites		Table D.6 BS 5228-2 2009, historic data 95th %-ile	Transportation and Construction Vibration Guidance Manual (September 2013) - California Department of Transportation Division of Environmental Analysis				From previous measurements	
Distance from activity [m]	Vibratory compaction (steady state)	Vibratory compaction (start up and run down)	Rotary Bored piling	Vibratory pile driving	Vibratory roller	Large Bulldozer	Loaded trucks	360-degree excavator operating	360-degree excavator digging
	PPV on slab on grade (accounting for building reduction) [mm/s]								
5	3.87	3.61	1.18	13.13	1.65	1.80	1.53	1.51	2.48
15	0.96	1.08	0.35	3.92	0.49	0.54	0.46	0.45	0.74
50	0.17	0.24	0.09	1.04	0.13	0.14	0.12	0.12	0.20
100	0.08	0.13	0.05	0.59	0.07	0.08	0.07	0.07	0.11

Figure 20 – Predicted PPV levels within the UCL Ear Institute due to a variety of construction activities at varying offsets

Legend		
	> Human Perception	PPV > 0.37 mm/s
	Human Perception	0.19 mm/s < PPV< 0.37 mm/s
	Approx. VC-A	0.09 mm/s <PPV< 0.19 mm/s
	Approx. VC- B	0.02 mm/s <PPV< 0.09 mm/s
	Approx. VC-D	PPV < 0.02 mm/s

	BS 5228-2 2009: Code of practice for noiise and vibration control on construction and open sites		Table D.6 BS 5228-2 2009, historic data 95th %-ile	Transportation and Construction Vibration Guidance Manual (September 2013) - California Department of Transportation Division of Environmental Analysis				From previous measurements	
Distance from activity [m]	Vibratory compaction (steady state)	Vibratory compaction (start up and run down)	Rotary Bored piling	Vibratory pile driving	Vibratory roller	Large Bulldozer	Loaded trucks	360-degree excavator operating	360-degree excavator digging
	PPV on Upper floor (accounting for building reduction and upper floor amplification) [mm/s]								
5	7.74	7.22	2.36	26.25	3.31	3.59	3.07	3.03	4.95
15	1.91	2.15	0.70	7.84	0.99	1.07	0.92	0.90	1.48
50	0.35	0.49	0.19	2.09	0.26	0.29	0.24	0.24	0.39
100	0.16	0.25	0.11	1.17	0.15	0.16	0.14	0.13	0.22

Figure 21 - Predicted PPV levels within the UCL Ear Institute due to a variety of construction activities at varying offsets

6.3 Assessment of Impact on Area A

The vibration criterion for Area A is VC-A with a very strict requirement not to be exceeded even for short periods of time. This approximately corresponds to a PPV level of 0.19mm/s which has been used to compare with the predicted vibration levels. This PPV level should not be taken as an absolute criterion and any detailed assessment and measurements should be based on the VC-A criterion directly.

It is seen that at 5m and 15m offsets all the construction activities could exceed this level by more than an order of magnitude. At 50m offset many of the activities could be carried out without exceeding this PPV level although some would still need consideration.

Given the number of activities that would cause exceedances, **significant impact** could occur over the demolition, piling and substructure periods meaning **at least 14 months of disruption** based on the approximate programme of works. The levels of vibration predicted would cause the research in this space to be impossible to be carried out.

It is considered very unlikely that, for the proposed works, vibration levels could be mitigated to be below the required vibration criteria at all times.

6.4 Assessment of Impact on Area B

The vibration criteria for Area B is VC-D. This is eight times more onerous than VC-A and is therefore much more sensitive and a PPV level of 0.02mm/s has been used on which to base the assessment. There may be short periods when higher vibration levels could be tolerated subject to agreement.

It is seen that there is a predicted significant exceedance from all vibration sources at offsets up to 50m. At 5m offset piling could cause vibration levels 40 times higher than the limit. At 15m the levels could be 16 times higher than the criterion. Even at 100m away there could be impacts from activities although the prediction accuracy at these offsets is less certain and site trials is likely to give a better understanding of the longer distance impacts.

Given the number of activities that would cause exceedances, **significant impact** could occur over the demolition, piling and substructure periods meaning **at least 14 months of disruption** based on the approximate programme of works.

It is considered very unlikely that, for the proposed works, vibration levels could be mitigated to be below the required vibration criteria even if short periods of elevated vibration levels were agreed.

6.5 Assessment of Impact on Area G

The vibration criteria for Area G is VC-A with the criteria within the isolated booths being VC-D away from the resonant peaks of the isolation system. For the purposes of this assessment VC-A is used, noting that there are also more sensitive spaces which already benefit from isolation systems. VC-A approximately corresponds to a PPV level of 0.19mm/s which has been used to compare with the predicted vibration levels

It is seen that, if amplification occurs on the upper floors due to some frequency content in the construction sources, vibration levels on upper floors could be higher than the VC-A for all sources up to 50m away. At 5m and 15m offsets the criterion could be exceeded by a very significant margin.

Given the number of activities that would cause exceedances, **significant impact** could occur over the demolition, piling and substructure periods meaning **at least 14 months of disruption** based on the approximate programme of works.

It is considered very unlikely that, for the proposed works, vibration levels could be mitigated to be below the required vibration criteria even if short periods of elevated vibration levels were agreed.

7. OPERATIONAL PHASE REQUIREMENTS AND ASSESSMENT

Based on the planning application drawings and the proposed adjacent uses, a review of the potential impact of the proposed development has been undertaken.

From a vibration perspective the key potential risks identified are:

- The proximity of the lifts;
- The plant rooms within the basement;
- Increased traffic on the surrounding roads.

It is considered viable that these risks can be controlled in the design to limit noise and vibration impact to levels below the operational criteria set out within this report.

It is critical that the developer includes mitigation measures within their design to achieve the required noise and vibration levels within the Ear Institute. If mitigation is not included there could be ongoing continuous impacts on the Ear Institute.

8. CONCLUSIONS

This study has been carried out to assess the potential noise and vibration impacts on the UCL Ear Institute of development on the adjacent site.

The Ear Institute contains extremely noise and vibration sensitive research by the nature of the work undertaken. Some of this research would be impossible even if short periods of exceedance of the criteria occurred. For these areas the implications of exceedances of the criteria could be irreparable damage to the research and not being able to comply with regulatory requirements.

The noise and vibration assessments have shown that during demolition, piling and substructure works there are significant risks of exceedance for long periods of time and for a wide range of activities.

It is considered extremely unlikely that the proposed construction works could be carried out without exceeding the noise and vibration levels required within the spaces. In some areas short periods of relaxation of the criteria may be possible to agree but the length of these are not likely to be viable to carry out the extent of works required. Area A cannot tolerate any periods of exceedance of its criteria.

In the operational phase of the development it should be possible to achieve the noise and vibration criteria within the Ear Institute provided appropriate mitigation measures are included in the adjacent development. It is critical for the operation of the Ear Institute that the developer commits to the development’s operation not causing exceedances of the Ear Institute criteria.

APPENDIX 1
GENERIC VC CRITERIA DESCRIPTIONS

Criterion Curve	Amplitude μm/s	Description of use
Workshop (ISO-8)	800	Distinctly perceptible vibration. Appropriate to workshops and non sensitive areas.
Office (ISO-4)	400	Perceptible vibration. Appropriate to offices and non sensitive areas.
Residential day (ISO-2)	200	Barely perceptible vibration. Appropriate to sleep areas in most instances. Usually adequate for computer equipment, hospital recovery rooms, semiconductor probe test equipment, and microscopes less than 40x.
Operating theatre (ISO-1)	100	Vibration not perceptible. Suitable in most instances for surgical suites, microscopes to 100x and for other equipment of low sensitivity.
VC-A	50	Adequate in most instances for optical microscopes to 400x, microbalances, optical balances, proximity and projection aligners, mass spectrometers other than MALDI and quadrupole or high-resolution, conventional spectrophotometers, etc.
VC-B	25	Appropriate for inspection and lithography equipment (including steppers) to 3 μm line widths, microtomes and cryotomes for 5-10 micron slices, most tissue and cell culture, except as noted below.
VC-C	12.5	Appropriate standard for optical microscopes to 1000x, lithography and inspection equipment (including moderately sensitive electron microscopes) to 1 μm detail size, TFT-LCD stepper/scanner processes, digital imaging and /or fluorescence with optical microscope, high-precision balances measuring quantities less than 1mg, MALDI mass spectrometer, nano-drop spectrophotometers, microtomes and cryotomes for slices <5 microns, tissue and cell culture of the following types: hanging drop, unstirred layers, embryonic stem cells, weakly adherent cells, very long-term cultures, chemotaxis, invasion assays.
VC-D	6.25	Suitable in most instances for demanding equipment, including many electron microscopes (SEMs and TEMs) and E-Beam systems, microinjection, micromanipulation, electrophysiology, confocal microscopy, quadrupole and other high-resolution mass spectrometers.
VC-E	3.12	A challenging criterion to achieve. Assumed to be adequate for the most demanding of sensitive systems including long path, laser-based, small target systems, E-Beam lithography systems working at nanometer scales, and other systems requiring extraordinary dynamic stability.

APPENDIX 2
VIBRATION CRITERIA CONVERSION TO PPV

This appendix sets out further details on the methodology for the vibration criteria conversion from VC levels to PPV.

The VC criteria are specified as one third octave frequency band RMS levels. PPVs on the other hand are peak vibration levels across all frequencies. In order to convert from VC to PPV some assumptions need to be made. The steps taken are set out below.

Tonal vibration sources are a special case as the energy is concentrated at one frequency band and as such the equivalent peak vibration levels in the VC frequency band would correspond closely to the PPV level. Most construction sources are not tonal and any that are should be avoided in this situation. As such tonal sources are not covered by the PPV conversion used.

The conversion is based on more broadband vibration sources. A review of one third octave band frequency measurements undertaken by Ramboll for construction sources has been reviewed to establish an appropriate assumption for the frequency content of typical vibration sources. This was found to be approximately over 7 one-third octave bands. A square root sum of squares addition was used to combine the vibration levels from each band to a single RMS vibration level which was then converted to peak as shown below.

Conversion from VC band to PPV		
VC-A	50	µm/s
No. 1/3 oct bands	7	
SRSS for RMS across bands	132	
Peaking factor	187	[x sqrt 2]
PPV equivalent	0.19	mm/s

This approach leads to the PPV equivalent levels used within the main report.

As a cross check data from a construction site which is currently being monitored for both PPV and VC bands was used to validate this approach. From that site a PPV of 0.05mm/s was equivalent to a VC-C performance showing the conversion is reasonable.

APPENDIX 3
ACOUSTIC GLOSSARY

Decibel
The ratio of sound pressures which we can hear is a ratio of 10^6 (one million:one). For convenience, therefore, a logarithmic measurement scale is used. The resulting parameter is called the 'sound pressure level' (L_p) and the associated measurement unit is the decibel (dB). As the decibel is a logarithmic ratio, the laws of logarithmic addition and subtraction apply.

A-weighted decibel
The unit generally used for measuring environmental, traffic or industrial noise is the A-weighted sound pressure level in decibels, denoted dB(A). An A-weighting network can be built into a sound level measuring instrument such that sound levels in dB(A) can be read directly from a meter. The weighting is based on the frequency response of the human ear and has been found to correlate well with human subjective reactions to various sounds. It is worth noting that an increase or decrease of approximately 10 dB corresponds to a subjective doubling or halving of the loudness of a noise, and a change of 2 to 3 dB is subjectively barely perceptible.

Equivalent continuous sound level
Another index for assessment for overall noise exposure is the equivalent continuous sound level, L_{eq}. This is a notional steady level which would, over a given period of time, deliver the same sound energy as the actual time-varying sound over the same period. Hence fluctuating levels can be described in terms of a single figure level.

Frequency
The rate of repetition of a sound wave. The subjective equivalent in music is pitch. The unit of frequency is the Hertz (Hz), which is identical to cycles per second. A thousand hertz is often denoted kHz, e.g. 2 kHz = 2000 Hz. Human hearing ranges approximately from 20 Hz to 20 kHz. For design purposes, the octave bands between 63 Hz to 8 kHz are generally used. The most commonly used frequency bands are octave bands, in which the mid frequency of each band is twice that of the band below it. For more detailed analysis, each octave band may be split into three one-third octave bands or in some cases, narrow frequency bands.

Maximum noise level
The maximum noise level identified during a measurement period. Experimental data has shown that the human ear does not generally register the full loudness of transient sound events of less than 125 ms in duration. Fast time weighting has an exponential time constant of 125 ms which reflects the ear's response. The maximum level measured with fast time weighting is denoted as $L_{AMax,f}$. Slow time weighting (S) with an exponential time constant of 1s is used to allow more accurate estimation of the average sound level on a visual display.

University College London - Ear Institute

Impact Assessment of the Neighbouring Development

6706-SRA-XX-XX-RP-A-00003 29/06/2021 P02 - FINAL ISSUE

SHEPPARD ROBSON

CONTENTS

1.0 INTRODUCTION

1.1 Project Overview

Sheppard Robson Architects have been appointed by UCL Estates to develop, in consultation with end users, an Options Appraisal / Feasibility Study to clarify the spatial requirements of the Ear Institute (EI). This study is required to inform the potential decant and mitigation strategy for the Ear Institute in response to the proposed development of the adjacent building.

This report is required because the UCL Ear Institute has been advised by the Home Office that their Biological Services Unit (BSU) activity cannot remain in-situ at 332 Grays Inn Road during the construction phase of the proposed neighbouring development. There is also potential disruption in the long-term, due to noise and vibration resulting from the change in use of the surrounding buildings. In addition to the BSU itself, some research activities will need to remain in the vicinity of the BSU if it is decanted. There is also possible disruption to non BSU spaces and this study will identify these.

1.2 Background

The Ear Institute was constructed in 2005 as a specialist auditory research unit at 332 Grays Inn Road.

The Royal National Throat, Nose and Ear Hospital (RNTNEH), the site of associated clinical activities, previously to the south of the EI, relocated to Phase 5 of the UCLH development programme at its Huntley Street site in 2019. As part of the RNTNEH closure, some UCL facilities that were based in the building including student study space, library and academic areas were relocated to other UCL buildings.

Groveworld (commercial developer) purchased the former RNTNEH site (330 Gray's Inn Road (GIR) from UCLH/ RFT/RFC in December 2018. Groveworld have proposals to develop a mixed-use scheme on the site, with a 14-storey hotel to the front (adjoining 332 Grays Inn Road), a public courtyard, offices and residential buildings. The project is due to be heard at Planning Committee in summer 2021. UCL is currently undertaking discussions with Groveworld and the local planning authority on issues relating the development that will directly impact the EI. Also, copies of the planning drawings of the scheme have been made available to the team.

1.3 Brief

The brief has evolved since the initial appointment brief that was provided to Sheppard Robson. This is due to the nature of the ongoing discussion between UCL Estates and Groveworld, and also the development of the programme. The brief for this report is summarised below:

1. Engage with the EI User team and ascertain the spatial and specialist requirements for the core, interdependent activities which must be co-located as part of any decant/refurbishment plans.

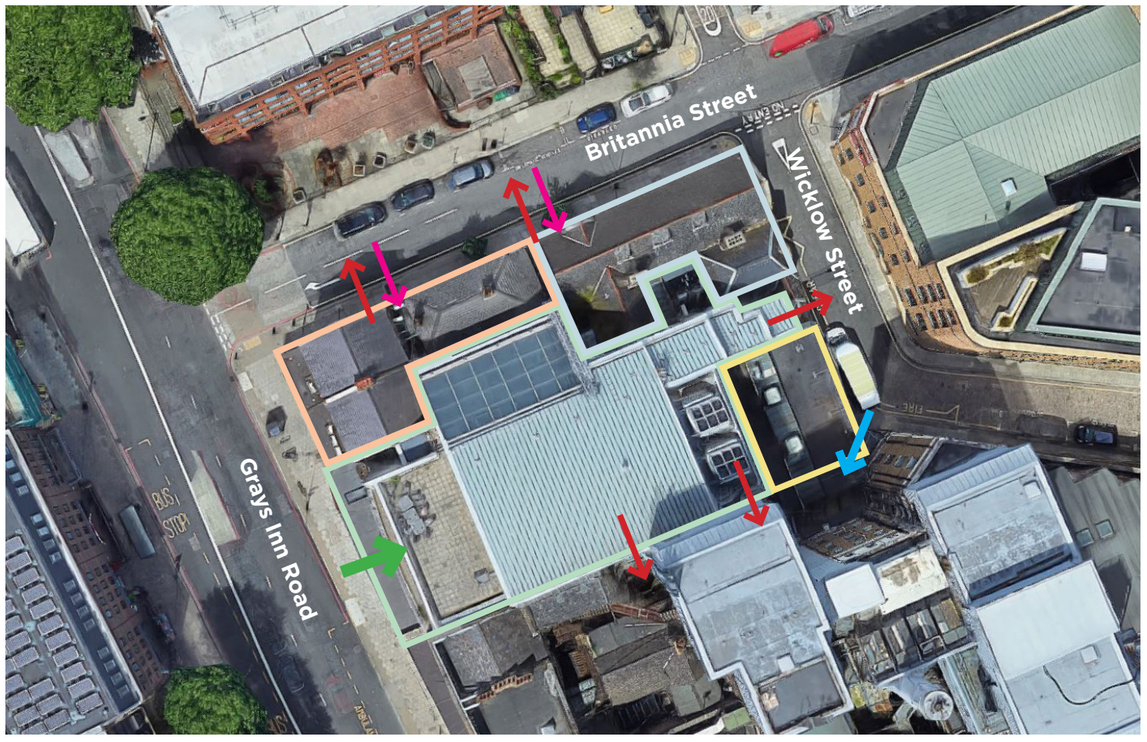
2. Determine spatial and specialist requirements for the total existing Ear Institute activities across 332, 334-336 GIR, and 75 Wicklow Street.

3. Develop option strategies for the provision of a new Delivery/Goods Yard for the Ear Institute to replace the existing delivery yard that will be removed by the resultant Groveworld development and clarification of the boundary line.

1.4 Site & Location

The site is located between Grays Inn Road, Britannia Street and Wicklow Street. The Ear Institute was constructed in 2005 as a specialist auditory research unit at 332 Grays Inn Road. The Ear Institute also occupies two connected buildings (75 Wicklow Street and 334-336 Gray's Inn Road).

The three buildings provide a mixture of CL2 and CL3 laboratories, academic offices, teaching space and BSU facilities for the Institute. The site is located next to the old Royal National Throat, Nose and Ear Hospital at 330 Grays Inn Road.



2.0 EXECUTIVE SUMMARY

2.1 Overview

This section summarises the findings in response to the questions posed in the brief, outlines observations and proposes next steps for consideration.

Summary of Conclusions:

Links to the BSU: It has not been possible to separate the different laboratory functions of the Ear Institute into a group who can be decanted and a group who can stay in situ. This is due to the interdependency of the research involving the BSU facility and the rest of the laboratory space in the building and the extent to which all of the laboratories are shared by several users.

Additional Disruption: While the BSU is the immediate focus of concern, due to the regulatory requirement for a decant, there are also several other specialist spaces in the Ear Institute which will be seriously disrupted by construction work. These should also be considered for a decant.

Non-Laboratory Space: There is some non-laboratory space which could remain in situ. However, this would create operational difficulties for the Ear Institute.

Duration of disruption: The programme provided by Groveworld in their draft CMP indicates a total construction programme of 40 months.

Impact of the final Built Condition: The design of the new building includes lifts and mechanical plant adjacent to the party wall. This is adjacent to where the BSU and other specialist laboratories are currently located in the Ear Institute. A further study will be required to evaluate the impact of this.

Service Yard: The sale of part of the current service yard to the adjacent landowner will require the construction of a new service yard. This is essential to the use of the BSU and will need to be carried out before the BSU can re-open.

Additional issues:

- The fume extract flues are currently supported by the existing hospital building. The solution proposed by the developer requires careful assessment as it could affect future fume cupboard use. The construction work may also be adversely affected by fume extract.

- Escape Routes from roof level currently use the light well between the two buildings These have been reviewed and a solution has now been agreed.

2.2 Decant of Facility: Groveworld Development Impacts

Q1 of the brief asked the team to engage with the Principal Investigator (PI) User groups and determine the core interdependencies related to the BSU and other key facilities that would require decant due to the proposed neighbouring construction works.

2.2.1 BSU and Associated Groups: Decant

The BSU is required to cease operations in the Ear Institute due to the planned construction works as part of the neighbouring Groveworld development. Within the Ear Institute there are approximately 8 groups (~30-40 people: ~25-35 full-time researchers plus ~10-15 research project students per year) who rely directly on the BSU facility. There are also a further 2 lab groups (~8-12 people total) who use specialised BSU facilities in external locations and require proximity to that site as well as the EI.

Co-location of 5 of these groups with the associated BSU facility is essential for the continued research work as experiments have an extended duration. Of the other groups, additional PIs need a BSU at least in a connected building for time-sensitive experiments. Two of the PI groups currently pursue similar experiments at the Royal Veterinary College in Camden, due to lack of space at the EI. Their groups also use on-site EI facilities and therefore currently must go back and forth between research sites.

In addition to local BSU facilities, the research typically requires proximity to electrophysiology rigs for measuring brain responses to sound; acoustic isolation booths for measuring hearing sensitivity or behavioural tasks; facilities for immunuhistochemical processing of tissue; and light, confocal, multi-photon or electron microscopy facilities for examining tissue samples. The frequency and usage of these facilities varies between groups and the yearly academic cycle. A summary of the PI Groups and their interdependencies is provided in Section 2.5.

2.2.2 Human Function Lab Groups: Groveworld Development Impacts

Within the Ear Institute there are 7 groups (~20-25 full-time researchers and ~20 research project students per year) engaged in research involving human auditory testing in the EI human function labs. Ongoing research requires access to sound booths, an anechoic chamber, and spaces for receiving and debriefing members of the public participating in the studies. Human auditory testing at the EI is unlikely to be able to continue during noisy construction works, because vibration and noise from the works will disrupt data collection during experiments. Booths will likely not to be suitably designed or tested to withstand construction noise, impact noise and low-frequency vibrations, particularly as these are located in proximity to the party wall.

Several of the key users of the Human Function Labs also have significant research activities in nearby institutes (Queen Square; Royal Vet College, RNTNE hospital). It is critical that any decant site be within suitable travel distance of these locations.

Several users of the Human Function Labs also undertake other BSU forms of auditory research (e.g., clinical/genetics research). Therefore, separation of users of the Human Function Labs from other EI labs in a future decant would require further detailed consideration. Refer to the Summary of Space Usage in Section 2.10

2.2.3 Summary of Decant Requirements

Based on information available at this stage it looks likely that all Groups within the Ear Institute will be affected by the proposed neighbouring construction works.

The duration of the decant period will be determined by: construction programme, extent of noise, vibration and EMI interference, repositioning of existing flues, re-provision of goods/delivery yard/storage and fire escapes etc. All of which will require further study and clarification.

There is the potential for the non-technical areas of the facility located on the north of the site to remain operational during the construction works. This includes professional services offices, student areas and teaching / lecture / seminar rooms. However, this will be subject to confirmation of the level of disruption by the works and provision of fire escapes.

2.3 Overall Spatial Requirements of the Ear Institute on Grays Inn Road site

Q2 of the brief asked to determine the spatial and specialist requirements for the existing Ear Institute. The below gives a breakdown across the site.

Overall Site footprint area: **1113m²**

Current Gross internal area: **3651m²**

Current Net internal area: **1855m²**

BSU (excluding plant): **75m²**

Functional Research Space, exc BSU and circulation: **1013m²** - Refer to Section 2.7 for breakdown

User Groups office / write up area: 322.5m²

The above excludes:

- Teaching: 333.6m²
- Professional Services: 193.4m²
- Circulation
- Storage, including specialist gasses, LN2, general delivery and MEP Plant

2.4 Provision of new Goods Yard

Q3: A proposal for a temporary Goods / Delivery Yard at the rear of the facility is outlined in Section 4. An initial option of converting the existing storage rooms into a goods yard has been rejected by UCL as this is considered impractical. The second, involving demolition of both the storage area and remaining portion of hospital canteen on the upper level and the creation of a new single storey covered delivery yard is the preferred solution and initial designs have been shared with Camden and Groveworld for comment. The proposal would also require planning consent.

2.5 Comments

This report was undertaken without the input of specialist acoustic and vibration engineering assessment of the proposed Groveworld construction works or anticipated ongoing operation impact of the completed development. This has now been carried out separately in the Ramboll study.

As Groveworld don't yet have a contractor on board, detailed construction and interface details of the proposed development with the EI are not available and cannot be assessed.

Service Yard: As noted in the introduction, the current Service Yard will be demolished as a result of the neighbouring development. It will be necessary to demolish the existing area of lower ground floor back-of-house storage and upper floor canteen to the rear of the EI in order to create a new delivery / storage enclosure. This is described in broad strokes in Section 4. We will require further input from a Structural, Services and Fire engineer to determine the exact nature and scope of the works required. A planning application will also be required. A covered secure delivery yard is specified as part of the Home Office requirements for BSU delivery into the facility.

EI Flues at roof level: The existing EI flues exiting the plant room at roof level are currently fixed to the neighbouring building that is to be demolished. A strategy to relocate and re-support these flues will be required in the next stage. A planning application and analysis of the new flue locations will also be required. Refer to section 3.3.

Level 3 Fire Escape: The existing secondary fire escape from the Level 3 plant room is routed down the shared external lightwell between the EI and existing ENT Hospital building. This escape will be demolished as part of the Groveworld development. An alternative fire escape route has now been agreed between UCL and Groveworld.

It is understood that Groveworld have accepted responsibility and costs for relocating both the flues and the fire escapes.

2.6 Next Steps

Items requiring further consideration are outlined in Section 5.

2.7 Area of functional space affected by Groveworld Development

The table below shows the functional spaces affected by the noise and vibrations caused in the construction of the neighbouring development. The cost of a decant has been split into the cost of refurbishing an existing building and the cost of a newly built facility.

	Space Description	Area (m²)	Notes/Spec	Refurb Cost/m² (Provided by QS)	New Build Cost/m² (Provided by QS)
A	BSU	74	BSL Level 2 (TBC) - Refer to Section 9		
B	Imaging	113	ACDP Cat 2		
C	Research - Auditory Booths (x2)	35	ACDP Cat 1		
D/I	Labs and Holding	97	ACPD Cat 2 - Temp and humidity control.		
E	Human Research - Auditory Booths (x4/5)	136	ACDP Cat 1		
F	Workshop	24	Engineering type workshop space.		
G	Research - Auditory Booths (x2)	87	ACDP Cat 2 Laboratory (controlled air flow)		
H	Tissue Culture	83	ACDP Cat 2 Laboratory (1 No. ACDP Cat 3 room)		
J	Histology / Diss/ IM Suite	107	ACDP Cat 2 Laboratory, inc rad iso room		
K	Wet Laboratory	172	ACDP Cat 2 Laboratory		
L	Electro Physiology	86	ADCP Cat 2 Laboratory		
	Grand Total	**1013**			

2.8 Ear Institute total internal areas

The table below shows the total internal areas within the Ear Institute. This is broken down into Net Internal spaces and buffer spaces.

6706 - UCL Ear Institute

Preliminary Schedule of Floor Areas - RICS Code of Measuring Practice 6th Edition 2007

Date: 12/03/2021

	NIA *- net internal*		***Buffer*** *- buffer internal*	
	m²	*ft²*	*m²*	*ft²*
Admin & Finance/Professional Services	193.4	2,082		
BSU	73.6	792		
Office	333	3,579		
Research - Human	136	1,465		
Research - Animal & Insect	761	8,195		
Teaching	334	3,591		
Technical/Engineering	24	259		
Entrance & Circulation			751	8,079
Back of House/Plant			506	5,448
General Stores			66	714
WCs			63	676
Total	**1,855**	**19,963**	**1,386**	**14,917**

Areas Measurement

These areas have been prepared for the sole use of Sheppard Robson Architects LLP's (SR's) client and are approximate and can only be verified by a detailed dimensional survey of the completed building.
They have been measured from the drawing information provided by UCL Estates.

Any decisions to be made on the basis of these predictions, whether as to project viability, pre-letting, lease agreements or otherwise, should include due allowance for the increases and decreases inherent in the design development and building processes. Existing buildings may present anomalies in relation to surveyed/drawn plans that may also effect the stated areas.
All areas are calculated in square metres unless otherwise noted. Where figures are also provided in square feet a conversion factor of 10.764* has been used and the result rounded to the nearest whole number.
Unless otherwise agreed with SR's client in writing, figures relate to the likely areas of the building at the current stage of the design and are calculated using:-
the RICS Code of Measuring Practice 6th edition 2007

2.9 Ear Institute GIA areas

The table below shows the GIA areas within the Ear Institute. This is broken down by level.

6706 - UCL Ear Institute

Preliminary Schedule of Floor Areas - RICS Code of Measuring Practice 6th Edition 2007

Date: 12/03/2021

	GIA *- net internal*	
	m²	*ft²*
Lower Ground Floor	998	10,742
Ground Floor	1003	10,796
First Floor	720	7,750
Second Floor	656	7,061
Third Floor	275	2,960
Total	**3,652**	**39,310**

Areas Measurement

These areas have been prepared for the sole use of Sheppard Robson Architects LLP's (SR's) client and are approximate and can only be verified by a detailed dimensional survey of the completed building.
They have been measured from the drawing information provided by UCL Estates.

Any decisions to be made on the basis of these predictions, whether as to project viability, pre-letting, lease agreements or otherwise, should include due allowance for the increases and decreases inherent in the design development and building processes. Existing buildings may present anomalies in relation to surveyed/drawn plans that may also effect the stated areas.
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Unless otherwise agreed with SR's client in writing, figures relate to the likely areas of the building at the current stage of the design and are calculated using:-
the RICS Code of Measuring Practice 6th edition 2007

2.10 Summary of Space Usage

The table below shows a summary of the Principal Investigators (PI) space and equipment usage throughout the Institute.

A key aspect of the brief was to ascertain those groups that are dependant on the facilities provided by the BSU suite at basement level. This is driven by the requirement for the BSU dependent operations to cease during the planned construction work to the neighbouring site.

Also for consideration are other technical and non-technical areas that will be impacted by either the planned construction works or day to day operation of the proposed neighbouring development.

Key

- Teaching
- BSU
- Research - Human
- Technical/Engineering
- Research - BSU
- Back of House / Deliveries
- Partial/minimal use

Key User	Group Name	A BSU	B Imaging	C Labs - Auditory Booths (x2)	D/I Labs and Holding	E Human Research - Auditory Booths (x4/5)	F Workshop	G Research - Auditory Booths (x2)	H Tissue Culture	J Histology / Diss/ IM Suite	K Wet Laboratory	L Electro Physiology	- Cold Storage	- Teaching/ Lecture Theatre
PI 1	Research Group 1	●	●				●	●	●	●	●	●	●	●
PI 2	Research Group 2					●								●
PI 3	Research Group 3	●		●		●	●	●				○		●
PI 4	Research Group 4	●	●				●		●	●		●		●
PI 5	Research Group 5		●		●		●			●	●		●	●
PI 6	Research Group 6		●						●	●	●	○		●
PI 7	Research Group 7	●							●	●	●	●	●	●
PI 8	Research Group 8	●	●	●			●	●	●	●	●	●	●	●
PI 9	Research Group 9	●	●	●		●	●	●		●	●	●	●	●
PI 10	Research Group 10					●	●			○	○	○	●	●
PI 11	Research Group 11					●	●			●			●	●
PI 12	Research Group 12	●								●	●	●		●
PI 13	Research Group 13	●	●	●					●	●	●		●	●
Imaging Lead	Imaging Group		●							●		●		
BSU Reps	BSU	●												

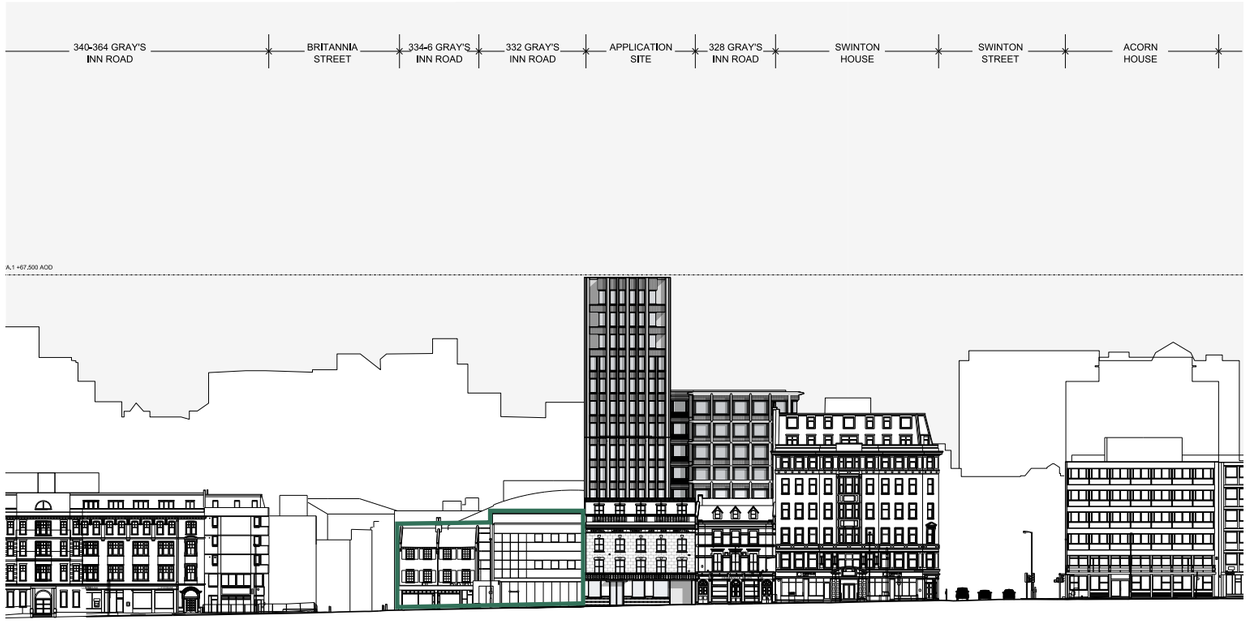
3.0 GROVEWORLD DEVELOPMENT CONSTRAINTS & ISSUES

3.1 Overview

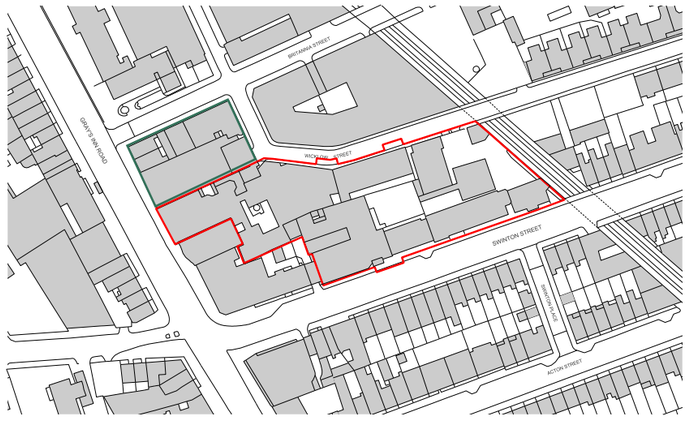
This Section will give details of the potential constraints and issues to the Ear Institute by the Groveworld Development proposed for the neighbouring site.

3.2 Development

The proposed Groveworld Hotel, Office and Residential development directly abuts the south boundary of the Ear Institute. The extend of the development can be seen in the drawings to the right and below.



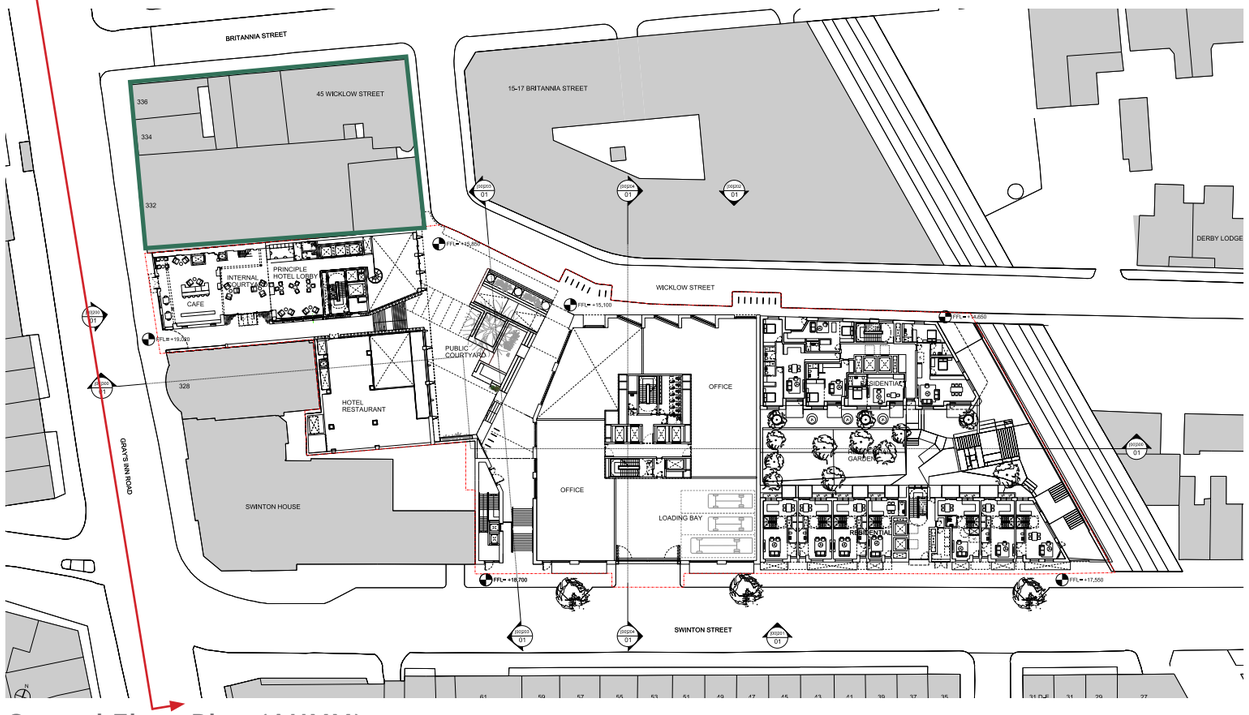
Proposed Street Elevation (AHMM)



Groveworld Development Boundary (AHMM)

Ear Institute

Groveworld Development



Ground Floor Plan (AHMM)

3.3 Key Risks

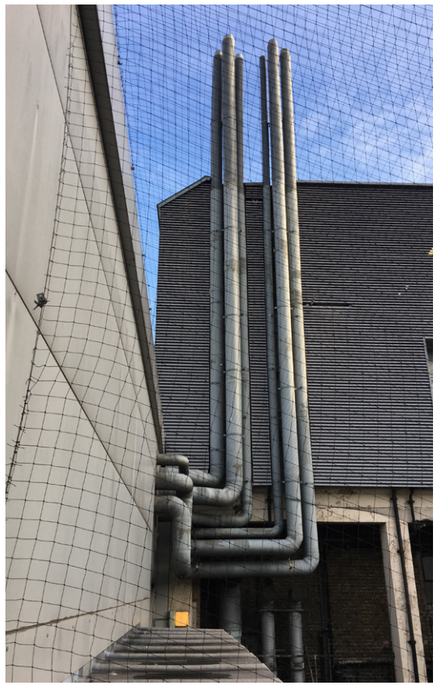
The key risks are noted below. They have been separated into risks during demolition and construction of the Groveworld Development, and risks during the operation of the new neighbouring site.

During demolition and construction:

- Noise, Vibration and EM Interference.
- Temporary removal of the EI's Service Yard which is essential for BSU deliveries. This also affects the EI's gas bottle store.
- Potential interruption to incoming services located in the current Service Yard and the passage between the EI and the RNTNEH hospital.
- Disruption of fire egress from roof plant and Lower Ground Floor into shared lightwell and Service Yard.
- Existing flues to be relocated at roof level. This requires services engineer input. This is a potential planning issue.
- Affect of flues on the construction workers working at and above the Ear Institute roof level.

In operation:

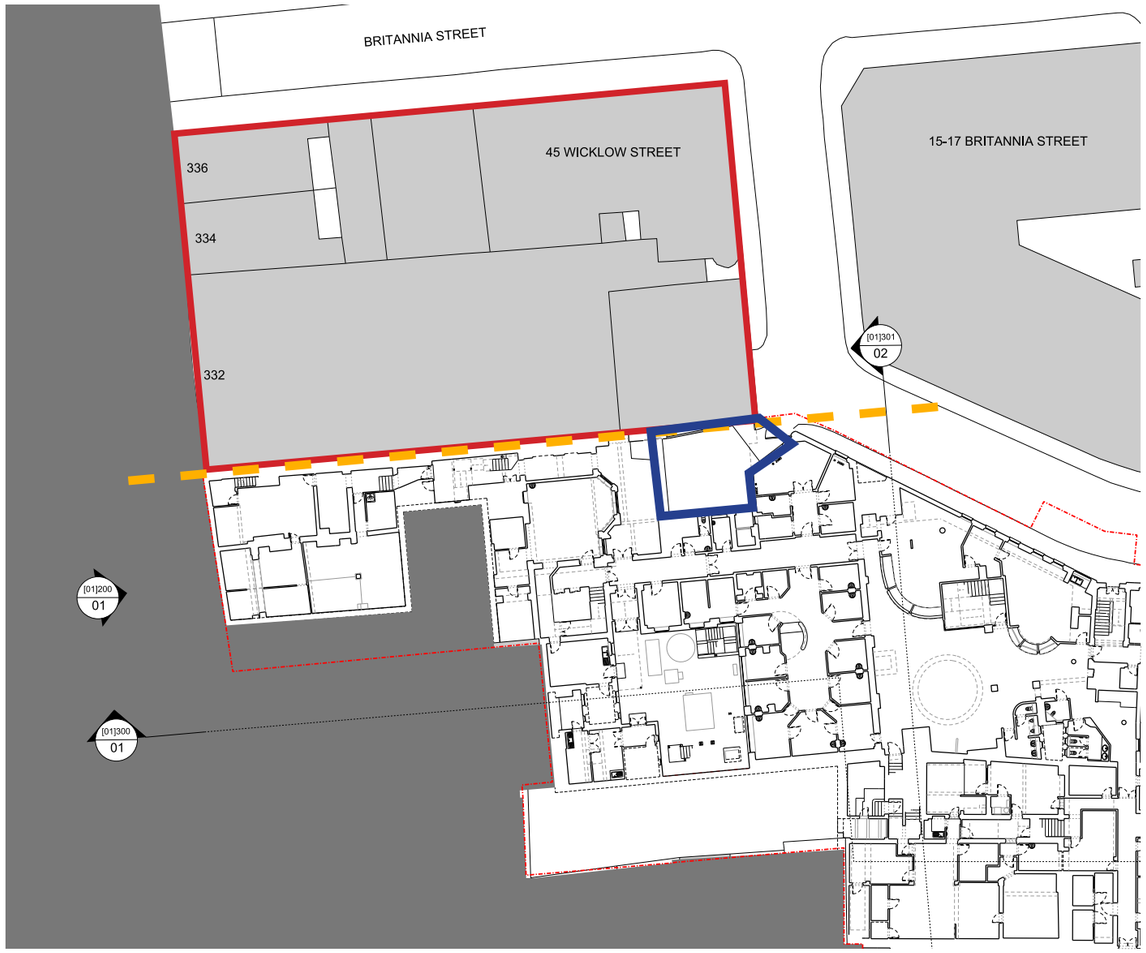
- Noise and vibration from footfall on floorplate, stairwell and lift shafts directly adjacent to party wall.
- Ear Institute flue locations to be confirmed as acceptable adjacent to hotel tower.
- Permanent removal of Service Yard. A replacement required for secure and covered BSU deliveries.
- Alternative fire escape routes now agreed.
- Electro Magnetic radiation from lifts in operation



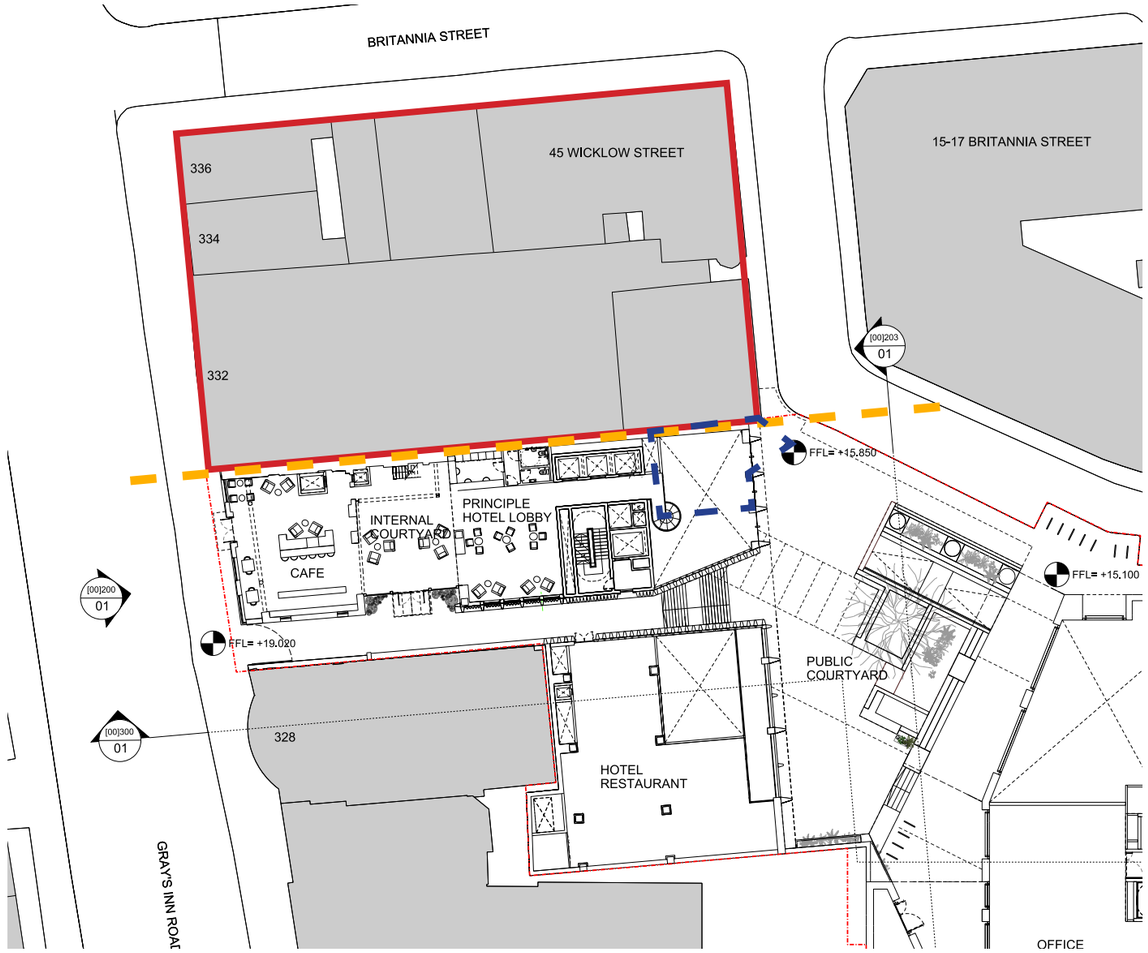
Ear Institute Flues

3.4 Boundary Line

The drawing below shows the existing neighbouring buildings. The current Ear Institute Service Yard to the rear of the Ear Institute is highlighted in blue. The proposed Groveworld Development is shown to the right. The boundary line cuts through the existing Goods Yard, therefore a solution is required to allow the Ear Institute to continue normal operation. The potential solution can be found in section 4.



Existing



Proposed Groveworld Development

Boundary Line

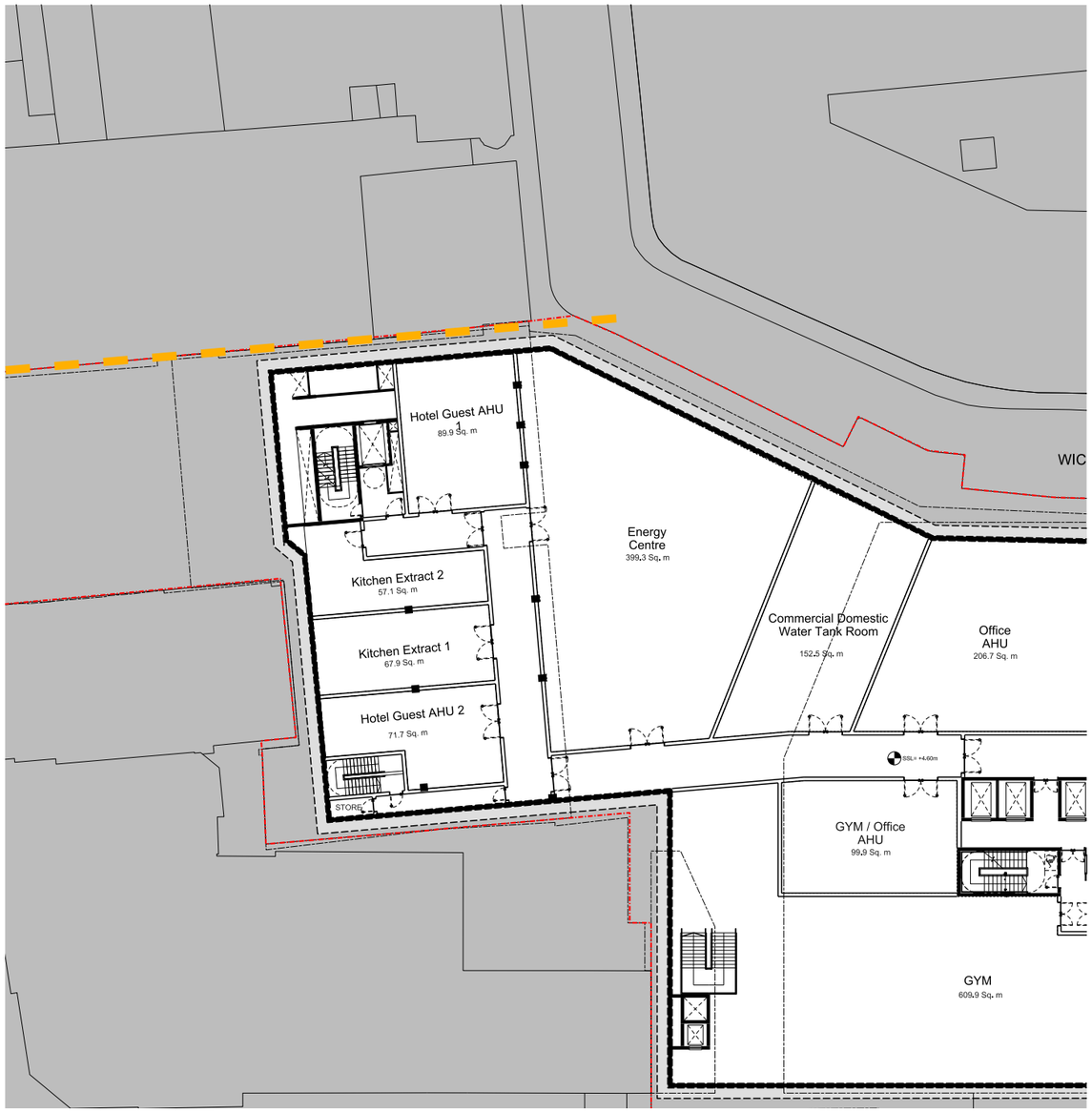
Ear Institute Site

Ear Institute Goods In/Out

Demolished Ear Institute Goods In/Out

3.5 Groveworld basement MEP plant and lift locations

The plans below shows the location of the MEP plant and lifts in the proposed Groveworld Development. The lifts are against the party wall, and Air Handling Units and Energy Centre in the adjacent spaces. Further analysis is needed to ascertain whether these spaces will have an impact on the BSU and research spaces within the Ear Institute on the other side of the party wall.

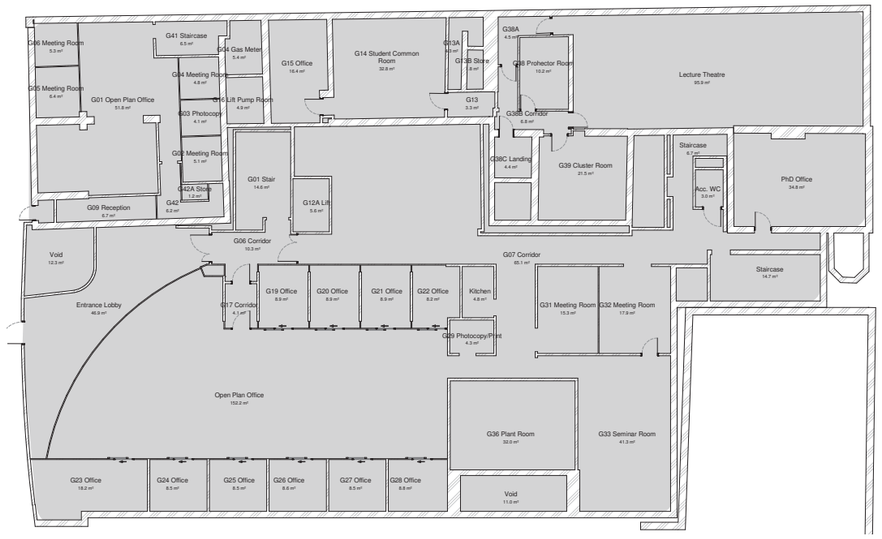


Basement 2 Floor Plan

Basement 1 Floor Plan

3.6 Noise & Vibration Sensitivity

The spaces within the Ear Institute that are the most sensitive to noise and vibration are the research laboratories and holding spaces. The noise and vibration either affects the BSU, the experiments/studies or the sensitive imaging equipment. The below layouts are areas that were highlighted as undertaking activities that are sensitive to vibration and noise - please refer to the vibration / acoustic report produced by Ramboll for further details.



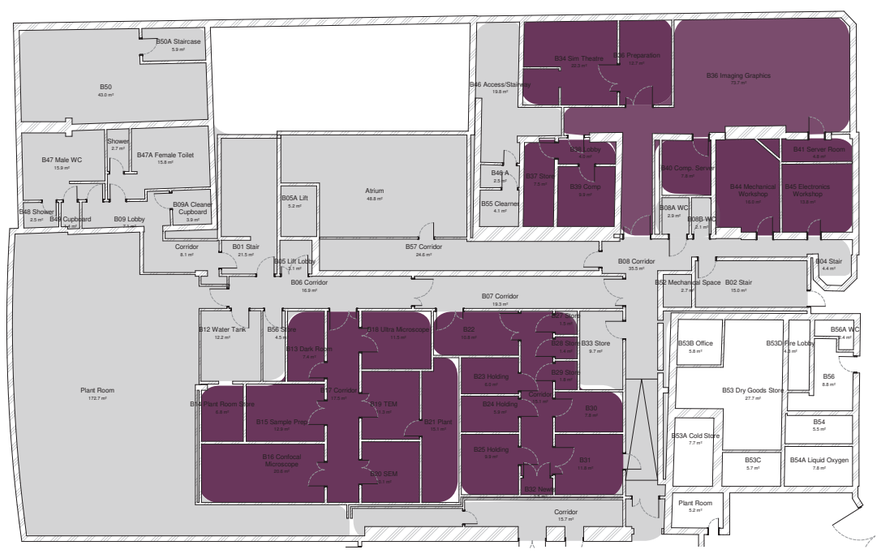
Ground Floor

Lower Ground Floor

Severe Disruption (darker areas are more affected)

Minimal Disruption

Second Floor



First Floor

4.0 SERVICE YARD

4.1 Overview

This section will outline a potential proposal to keep the Ear Institute's Service Yard in operation during and after the Groveworld development is constructed.

4.2 Existing Service Yard

The current deliveries and collection include regular waste disposal, and gas cylinder/liquid nitrogen deliveries. Both of these are usually facilitated by large vehicles that are unable to use the existing goods yard and therefore park on Wicklow Street for a short amount of time. The BSU deliveries require the vehicle to be behind closed doors, covered and unseen from the street.

4.3 Groveworld Proposal

The Groveworld proposal (shown to the right) has a public site entrance and taxi drop-off area on the corner of Wicklow Street. This would increase the footfall and car traffic through Wicklow Street.

Existing Facade

Proposed Development

Boundary Line

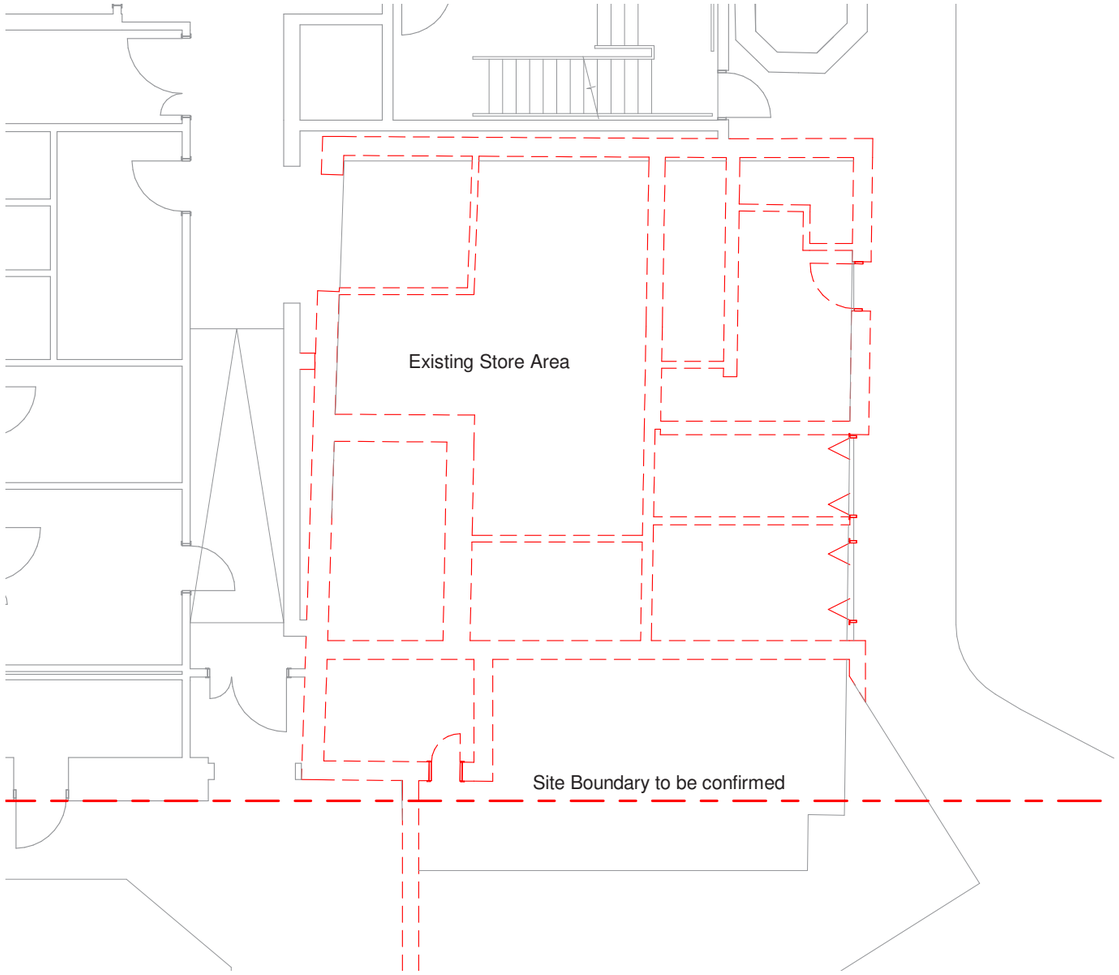
4.4 Ear Institute Service Yard Proposal

The proposed solution would require demolition of all of the existing structure down to the GF slab level. A fence/wall would be erected around a temporary service yard that would allow a small transit van to reverse in and out.

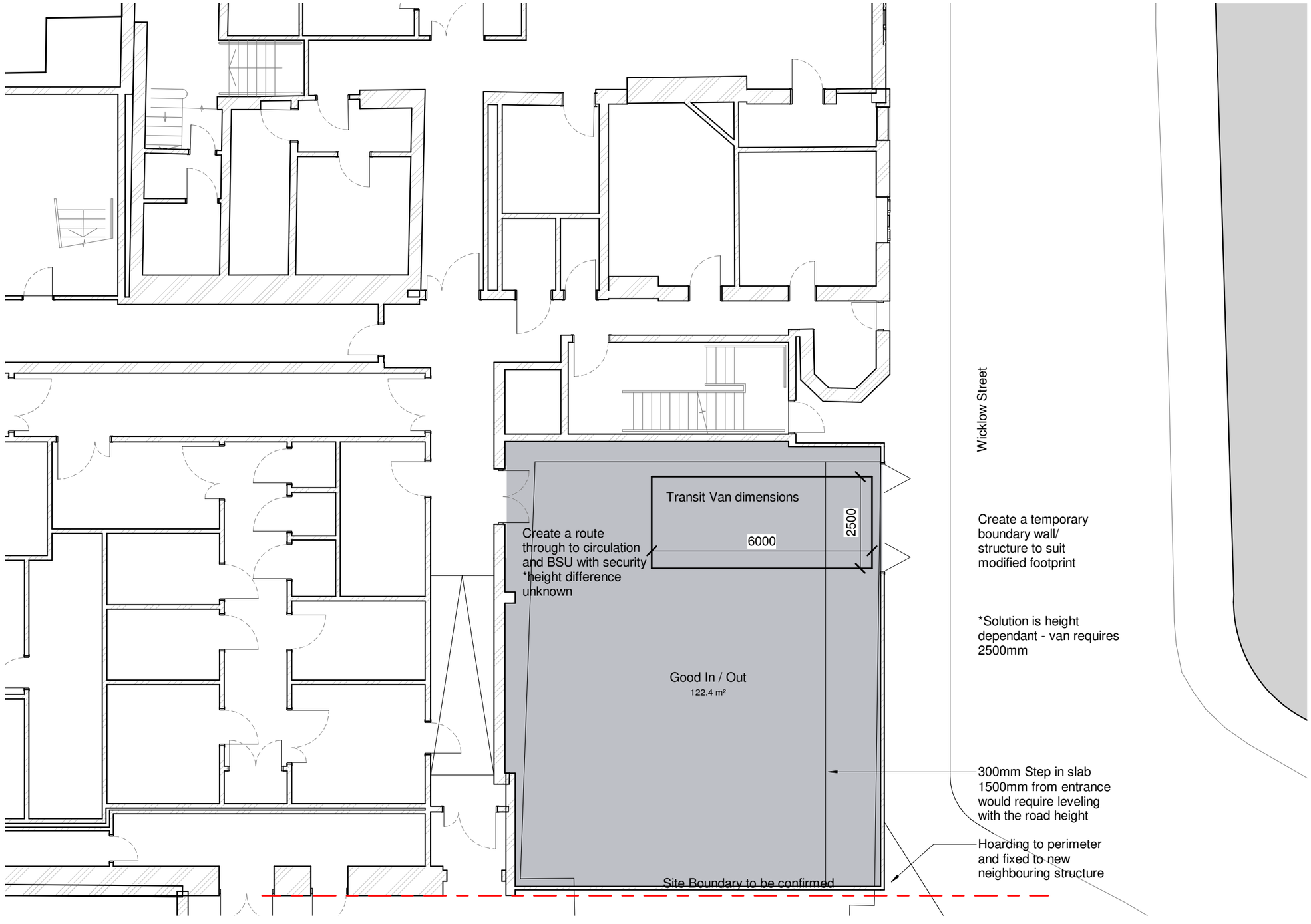
Points for consideration:

- The 300mm step in the slab 1500mm from the entrance would require levelling. This may involve excavation work and there is no information on what is below the current structure.
- The height differences between the new service yard and 332 Grays Inn Road would need to be confirmed to ensure an even level of access or adequate ramps.
- This option will require a planning application.

Massing Axonometric



Demolition Plan - Lower Ground Floor



Proposed Plan - Lower Ground Floor

5.0 NEXT STEPS

5.1 Decant Considerations

- Clarification of Groveworld programme required.
- Impact of works - acoustic, vibration & EMI required.
- Confirm available decant options for PI Groups.
- Review suitability of locations to ensure continued operation of research groups.
- Review items of equipment required to decant with groups or that which can be provide elsewhere.
- Measures to protect equipment remaining in-situ during Groveworld works and period of stand-down to be considered.

5.2 Service Yard Options

Confirmation of boundary condition of Groveworld development required.

Decision on service yard to be confirmed. Proposed option to demolish existing Lower Ground Floor store area adjacent to existing service yard, including partial remains of ground floor canteen above. Provide new single storey service yard extension. Remedial works required to existing areas of EI building left exposed.

5.3 Impact to existing flues at roof level

Flues that exit the Level 3 plant room are currently fixed to sections of building that are to be demolished as part of the Groveworld development. Confirmation as to scope of adaptions required.

Repositioning of existing flues will require planning consent, and further structural, MEP and CFD analysis.

Consideration required to inlet vents that may be impacted by the Groveworld development site works.

It is understood that Groveworld have accepted responsibility and costs for relocating the flues.

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