0819.DAS

115 PARKWAY, LONDON, NW1 7PS
DESIGN & ACCESS STATEMENT
16.11.11

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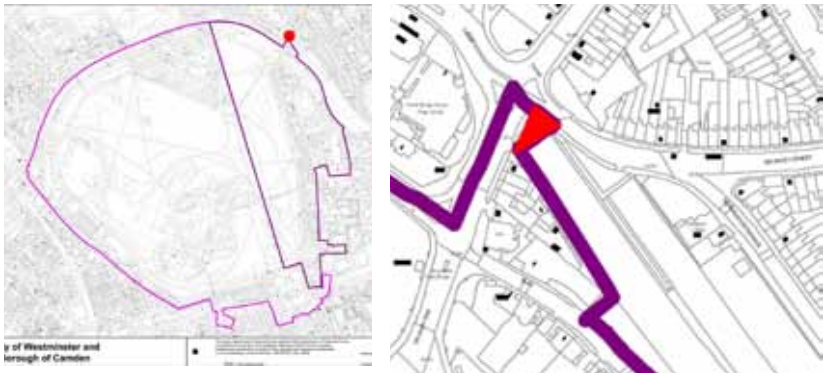
CONTENTS

1_Site Context

The property is located on a prominent intersection between Parkway and Delancey Street, and is within the Regents Park Conservation Area. The Regent's Park Conservation Area and Management Strategy *(Adopted 11.07.11)* gives some description of the local area, as shown below. The application site is roughly triangular in plan with a triangular stand-alone single storey painted brick building, believed to be late Victorian in origin. The site is directly above the railway line out of Euston Station. The building is not listed, nor is it within an Article 4 designated area.

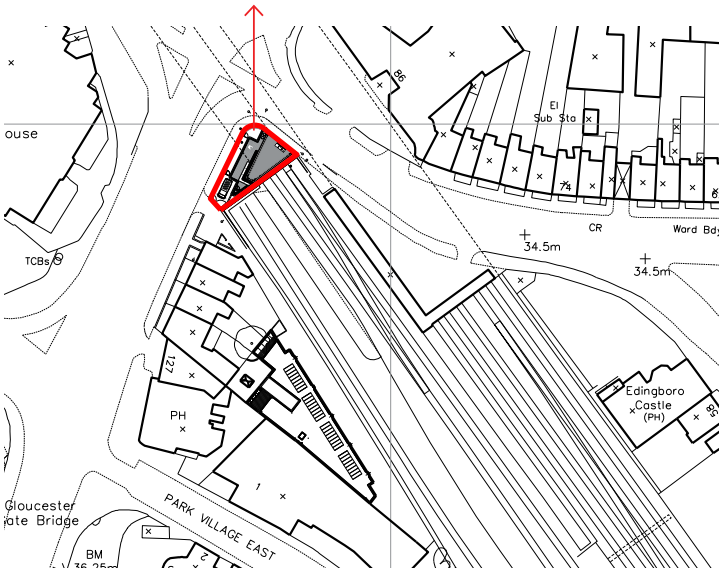
> Park Village East and Park Village West are picturesque precedents for the small suburban villa, closely set in a variety of styles that were to become so popular with the Victorians.
>
> The service area, whilst largely redeveloped in the 20th century, is preserved in the layout of later development, and the physical remains of the canal and basin to the east of Albany Street.



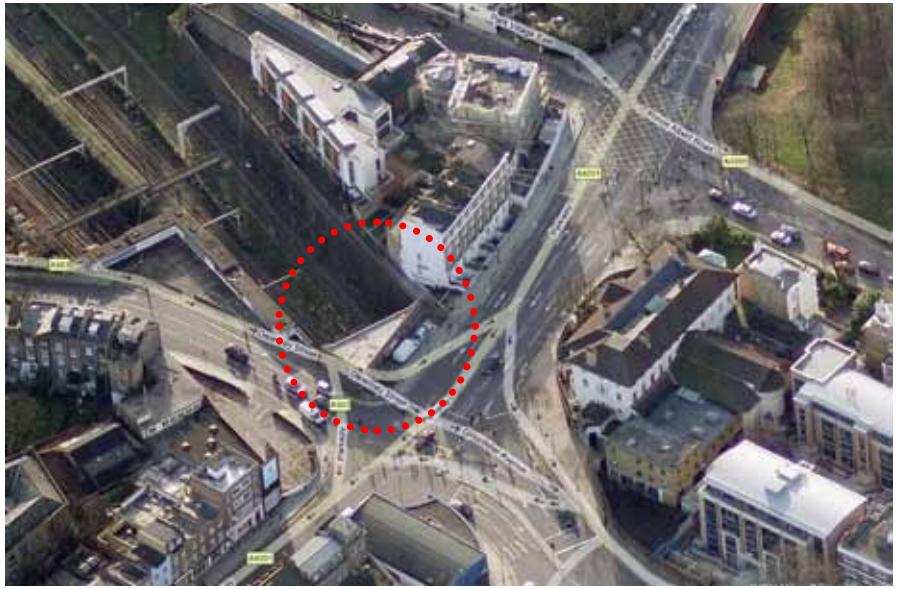
Location within Regents Park Conservation Area maps

The historical map adjacent (from c.1870) shows how the adjacent terrace of houses (grade 2 listed) to the south of the site originally continued to the junction with Delancey Street. However, the terrace was partially demolished when the railway cutting was widened in the 1890's. The resultant island-like site is disjointed from the terrace.

Historical Map with overlaid site outline of 115 Parkway as it is today



Current OS Map showing site outline



Aerial Bing photograph of site,

The Regent's Park Conservation Area and Management Strategy also provides useful points on 'capacity for positive change' as highlighted below.

Capacity for positive change

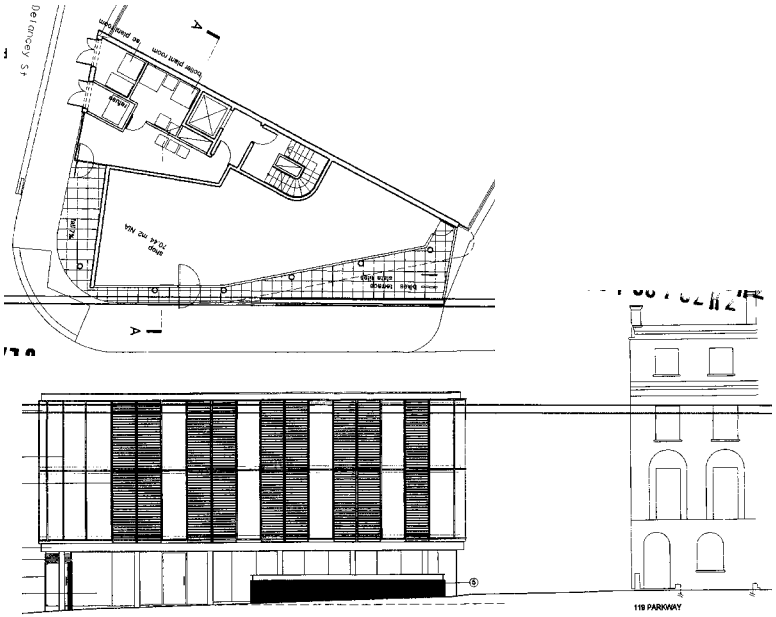
- Quality of Albany Street, with improvement of the streetscape and public realm
- Anticipated redevelopment of much of the post-war rebuilding in due course (particularly on the east side) including opportunity for additional residential accommodation.
- Improvement of the public realm at the edges of the park, particularly in the environs of Gloucester Gate Bridge
- Restoration of the Park gates at Gloucester Gate to the original design

Existing photographs

2_Relevant Planning History

Planning permission was granted in 2002 for the ‘demolition of the existing single storey retail unit and the construction of a three-storey building (over the existing listed tunnel) for retail use (A1) on the ground floor and office (B1) above on the 1st and 2nd floors.’ (CEX0100703 – 17.06.2002. See adjacent drawings downloaded from the Camden planning website).

Other applications for residential developments within the immediate context have been approved in recent years; 117 Parkway was completed by Morrow + Lorraine Architects (formerly JCNM) in 2007 and 86-88 Delancey Street is currently on site.



Previously consented scheme for 115 Parkway.

117 Parkway. Designed by Morrow + Lorraine Architects - completed 2008

86 - 88 Delancey Street. Designed by Nick Baker. Architects - under Construction.

3_The Proposal

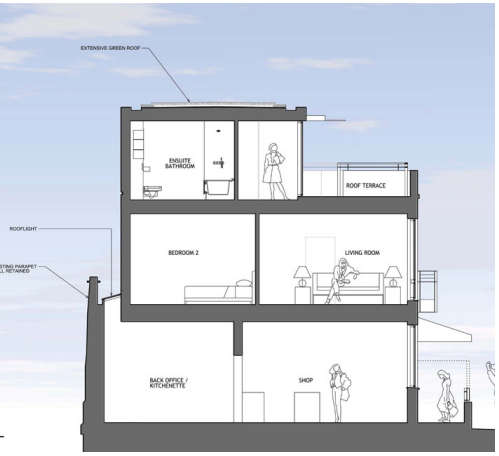
Parkway is a mix of shops and restaurants, many with residential units above. It is considered, therefore, that the proposal to retain retail use at ground floor level whilst adding a single new residential unit above is appropriate to the area. Core Strategy policy CS6 of the Local Development Framework states that housing is regarded as the priority land-use, making housing its top priority. The proposal follows this advice whilst acknowledging the need to protect other uses through the retention of the retail unit.

It is believed that the existing building was originally a ticket office to serve a former train station, but is now used as a florist. Its awkward triangular shape has made it difficult to function as a shop in the traditional sense, and over time it has become more of a storage / preparation space. The proposal aims to make this space more usable as a retail unit with an active frontage attracting passers-by. Its position on a crossroads midway between Camden Town Tube station and Regents Park provides an ideal location for a shop of this nature with enhanced street presence.

Sketch perspective of proposed scheme

Proposed Front Elevation to Parkway

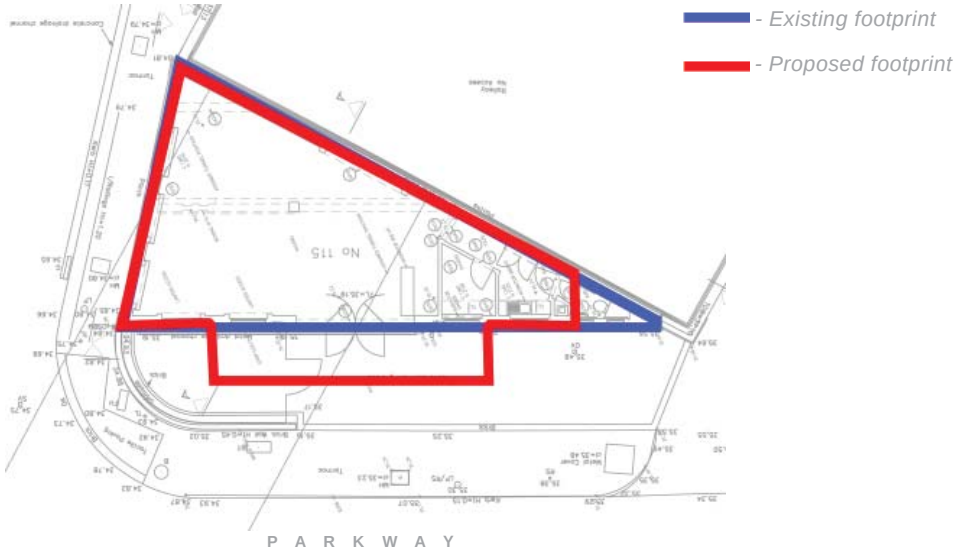
Proposed Side Elevation to Delancey Street



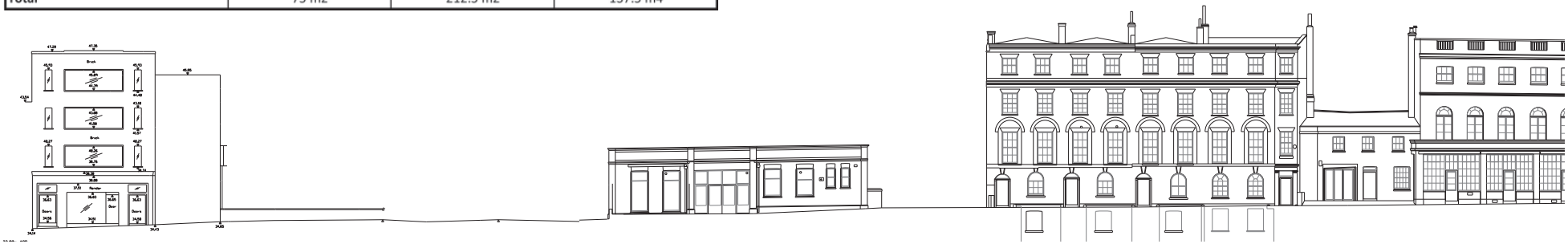
Proposed Cross Section

4_Site Layout

The size of the proposed building is derived from the need to provide practical sizes for the shop and the residential unit, but also gives the building sufficient scale to “hold its own” in relation to the surrounding buildings. The isolated site, defined by surrounding transport routes, does not allow for significant expansion of the footprint of the existing building; instead the proposed building extends vertically and in doing so reinstates a visual link in the disjointed street scene. Accordingly the North West elevation fronting Parkway is retained as the principal elevation. The flanking elevation to Delancey Street is free from fenestration. This protects the occupiers from traffic noise and also ensures no overlooking problems with the proposed new development at no. 86-88.



Schedule of Gross Internal Areas			
	Existing GIA	Proposed GIA	Increase GIA
Retail Unit	75 m2	75 m2	0 m2
Residential Unit	0 m2	137.5 m2	137.5 m3
Total	75 m2	212.5 m2	137.5 m4



Existing Parkway elevation (not to scale)

Proposed Parkway elevation (not to scale)

5_Form & Massing

The proposed building is three storeys in total. The main body of the building is two storeys high, and is approximately the same size on plan as the existing building, but with the addition of a central projecting “bay”. The third floor is a zinc-clad element which is well set back from the main elevation to Parkway. The projecting bay breaks down the overall mass of the building, providing verticality, symmetry and a central focal point. Functionally the proposed bay gives back area to the retail unit lost to the ground floor entrance hallway of the residential unit, retaining a retail unit of 75m2.

- de-cluttering the street scene at the entrances to the area should be a priority while maintaining safe pedestrian movement.

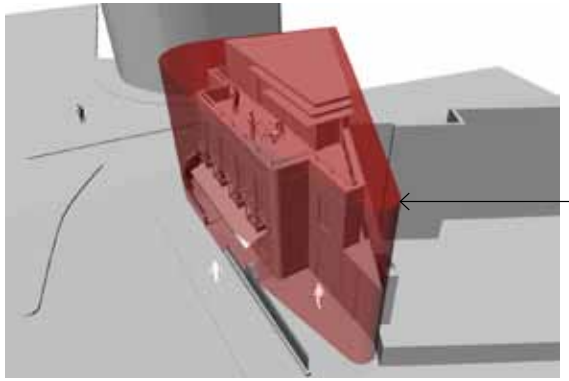
Enhancement schemes for the public realm (The Regent’s Park Conservation Area & Management Strategy pp60).

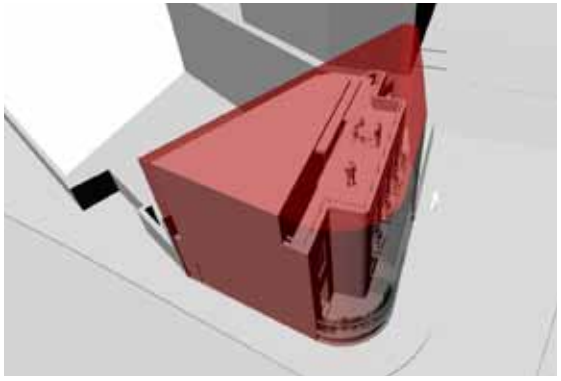
The existing rear wall to the railway abutment is to be retained in the proposed design. The second and third storeys are inset from the railway abutment by approximately 1m. A low wall and railings is proposed to the perimeter of the site which helps to define the property boundary and improve the street scene.

The illustrations opposite show the proposal in comparison with the previously approved scheme which is shaded in red. It is clear that the overall bulk and mass of the proposal is less than the previously approved design.

Aerial view

Photograph of North corner of site highlighting the undefined boundary in the cluttered street scene



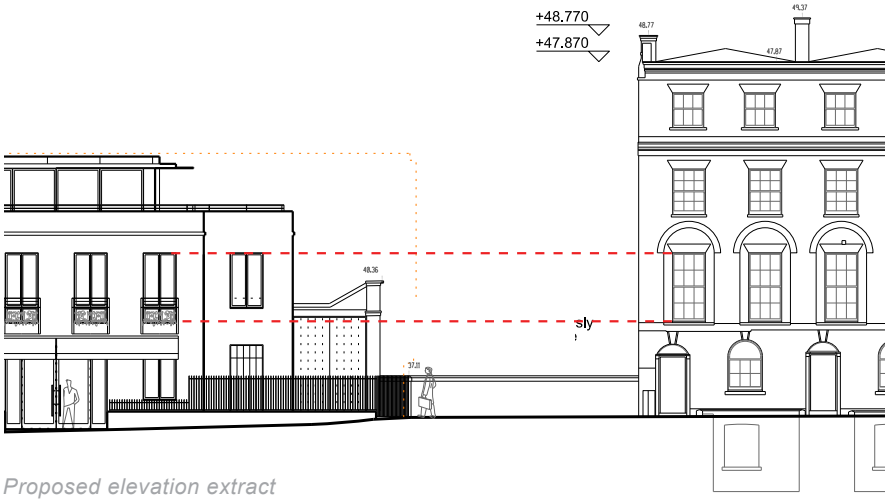


3D massing model showing proposed scheme within previously consented scheme.

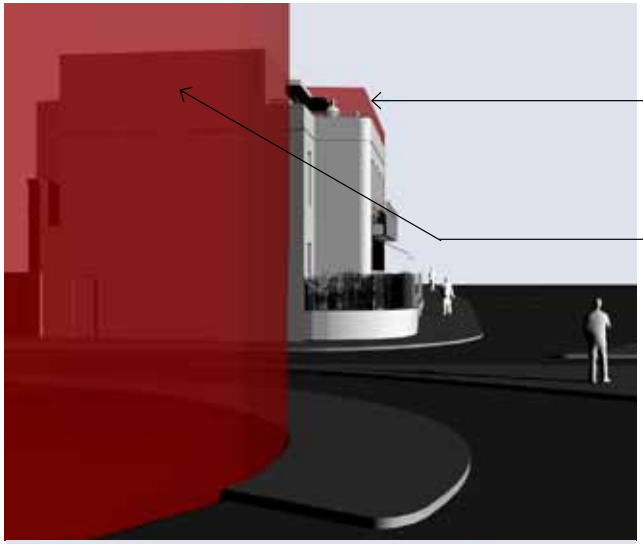
As illustrated in the image opposite, setting the third floor back from the primary elevation fronting Parkway, reduces the bulk and mass of the additional storey.

Cues for rhythm and integration with local context are taken directly from the adjacent listed terrace of flat-fronted houses. The repetition, of large, evenly spaced windows along the principal elevation of the same proportion, size and height as the adjacent terrace, echo what was originally built on the site and help give continuity along Parkway.

It is considered that increase in scale of the proposed building combined with the use of complementary materials and fenestration will make a positive contribution to the conservation area.



Proposed elevation extract



3D massing study illustrating scale of the building in relation to its neighbours

Existing photograph of cut off Georgian terrace.

6_Materials

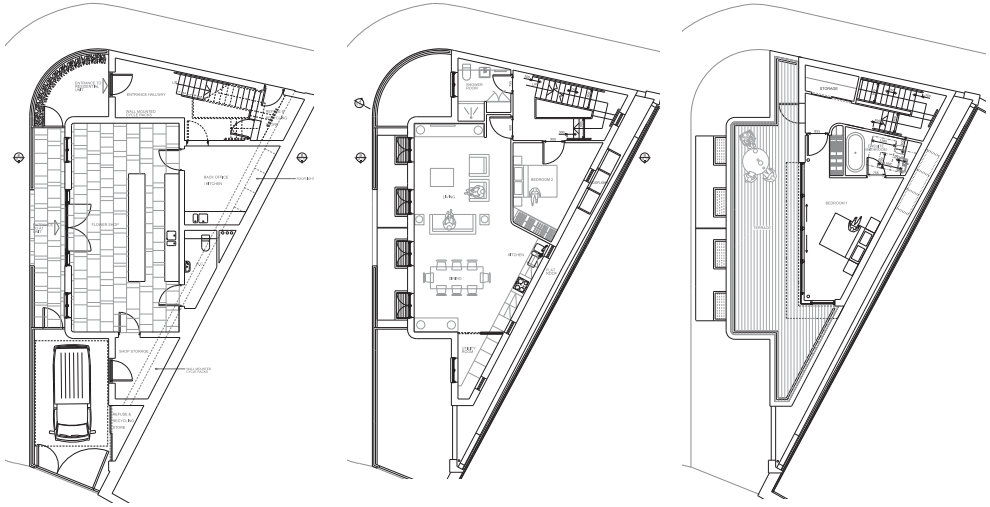
The proposed design reflects the character, scale and building lines of the local area, and also adopts similar materials and colours. A combination of yellow stock brickwork and grey engineering brick is proposed to tie in with the immediate context, whist emphasising the projecting central bay. Grey brick ‘flanks’ frame the central yellow bay and continue around the site boundary to form a low wall to the front of the site. Visually this forms a base for the building to sit on. Above it, black painted metal railings provide enclosure and security. The zinc-clad roof box above (set-back at third floor level) caps the building and is in keeping with roof level finishes in the area. The slender grey aluminium-framed fenestration helps to reinforce rhythm in the facade and give a sense of verticality. The solid hardwood doors, canvas canopy, and integrated window boxes all help to soften the design.

Proposed front elevation to Parkway

7_Internal Layout

The size and layout of the ground floor retail unit remain similar to the existing flower shop, although more rectilinear in format. Public access remains via wide double doors in the centre of the front elevation - secondary trade access is also formed next to the existing retail parking space. The addition of a lobby area, improved back-office / kitchenette and WC will help the flower shop to operate more effectively.

A secure, dedicated entrance to the residential unit is located at the South West corner of the building. The first floor contains living, kitchen, shower room and study / guest bedroom. The smaller second floor is given over to the master bedroom and en suite bathroom, with a terrace looking north-west towards Primrose Hill.



Proposed ground, 1st & 2nd floor plans

8_Car Parking

In line with the pre-application advice received it is understood that the creation of a new unit would probably be required to be car-free, subject to a Section 106 agreement. The existing car parking space for the retail unit is retained; no further spaces are proposed.

9_Cycle Storage

Provision has been made for secure cycle parking for 2 cycles for the retail unit and 2 cycles for the residential unit.

10_Amenity for occupiers & neighbours

The building has been designed such that the overall siting and bulk is more minimal than the previously approved scheme. It follows that the impact on neighbouring buildings will be less. In view of the residential development approved at 86-88 Delancey Street, the design of this proposal does not have windows located in this North East Elevation. Besides issues of overlooking this strategy minimises exposure to traffic noise at the closest point to a surrounding road. External amenity space for the residential unit is provided in the form of a large roof terrace.

11_Air Quality

An Air Quality Assessment has been undertaken, and a full report is attached to this design statement as Appendix 1. The proposal will incorporate mechanical ventilation in line with the suggestions made in this report, as highlighted below.

> Given the exceedence of the predicted annual mean and hourly mean NO_2 concentrations, it is suggested that the installation of mechanical ventilation is considered and possible implementations of measures contributing towards the air quality action plan should be considered.

12_Noise & Vibration

A noise and vibration survey has been carried out, and a full report is attached to this design statement as Appendix 2. The relevant section is extracted below for ease of reference.

> **7. Recommendations**
>
> **7.1 Noise**
>
> In order to meet the indoor noise levels for the reasonable sleeping and listening conditions it is required that thermal double glazing units of at least 33dB, $R_w + C_{tr}$ be fitted in all window openings of the habitable rooms.
>
> For example Velfac100 4/0.76/4-18-6, (i.e. 4/0.76/4 mm laminate/18mm space filled with argon/6mm float glass), sound reduction windows would provide a sound insulation at 34 dB, $R_w + C_{tr}$.
>
> In order to provide adequate insulation against external noise it would be necessary to keep the windows shut, which means that air ventilation without compromising sound insulation of the windows is required. This can be achieved by means of mechanical ventilation.
>
> An acoustically-attenuated supply and extract mechanical ventilation system with heat recovery for the whole dwelling is likely to be most appropriate for this small building development.
>
> **7.2 Vibration**
>
> Vibration levels in suspended floors of the proposed dwelling are likely to meet the requirements even if the floors are constructed of timber, however, floors made of concrete would provide a more comfortable internal environment.
>
> However, should a suspended timber-joist floor be chosen, it should be made as rigid as practicably possible with the joists preferably running parallel to the rear façade of the building, (i.e. perpendicular to the railway tracks below).

The proposal will incorporate:

1. an acoustically-attenuated supply and extract mechanical ventilation system with heat recovery.
2. High performance double-glazed windows providing sound insulation of a minimum of 33dB Rw.

12_Lifetime Homes Statement

The proposals incorporate the 16 criteria of the Lifetime Homes requirements as set out below and in accordance with proposed drawings 0819.20.01-05

1.0 Parking
(No car parking spaces proposed for new residential unit. Existing car parking space for ground floor shop retained as existing).

2.0 Approach to dwelling from Parking
(Not applicable - but direct level access is proposed between car parking space and front entrance doors to shop and residential unit).

3.0 Approach to all Entrances
(Not applicable - but direct level access is proposed between access to property site and front entrance doors to shop and residential unit).

4.0 Entrances
a) Automatic porch security light proposed.
b) Level access proposed over threshold to main entrance to residential hall on ground floor.
c) Effective clear opening widths to doors met (800 / 825mm).
d)Weather protection proposed.
e)External level landing proposed.

5.0 Communal Stairs & Lifts
a) 'Easy going' access stair proposed.
b) Communal lift not a requirement. Potential future provision location identified.

6.0 Internal Doorways & Hallways
New Hallway & Door widths are met.

7.0 Circulation Space
Space provided for turning a wheelchair in dining areas and living rooms and basic circulation for wheelchair users elsewhere.

8.0 Potential for Entrance Level Living Space
Living space provided on first floor 'entrance level',reached by an 'easy going' stair with risers 170mm, 250mm goings, and a width of 900mm measured 450mm above the pitch line.

9.0 Entrance Level Bed-space
Bed-space provided on first floor 'entrance level',reached by an 'easy going' stair as per the above.

10.0 Entrance Level WC & Shower Drainage
Entrance Level WC & Shower Drainage provided on first floor 'entrance level', reached by an 'easy going' stair as per the above.

11.0 Bathroom & WC Walls
Adequate fixings can be provided

12.0 Stair Lift/ Through Floor Lift
a) Potential for stair lift installation incorporated in stair design
b) A suitable space has been identified for a through-the–floor lift from the entrance level to a storey containing a main bedroom and a bathroom satisfying Criterion 14.

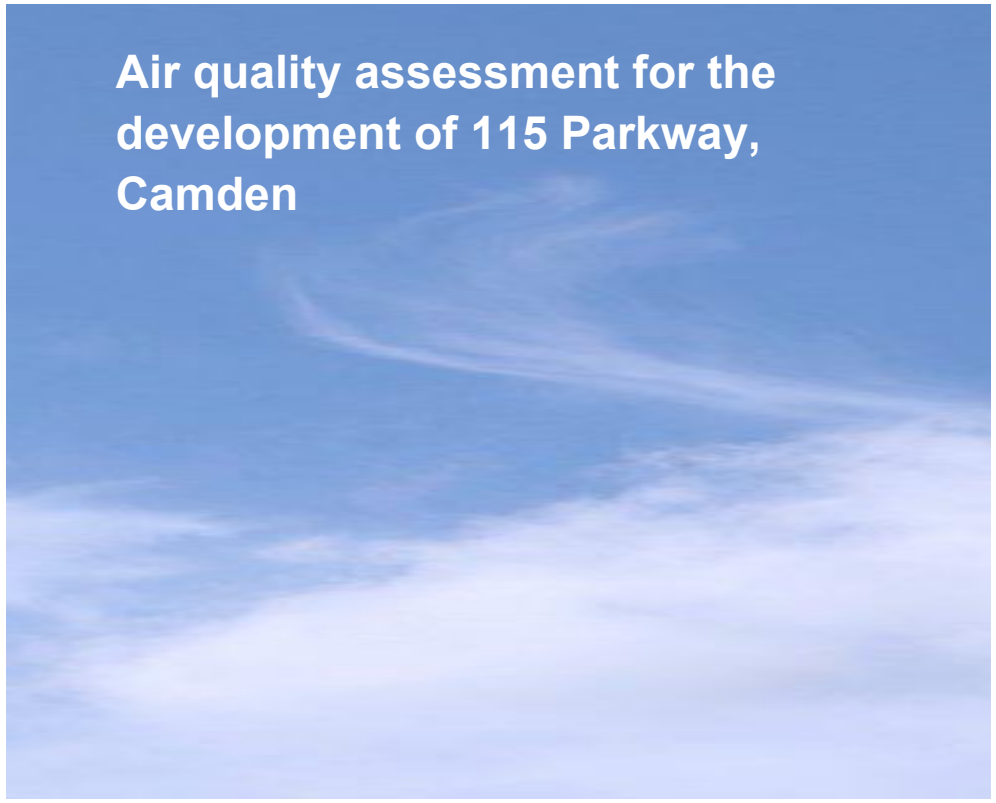
13.0 Potential for fitting hoists & bedroom / bathroom relationship
Structure above a main bedroom and bathroom ceilings designed to be capable of supporting ceiling hoists and the design provides a reasonable route between this bedroom and the bathroom.

14.0 Bathroom Layout
An accessible bathroom, providing ease of access in accordance with the given specification, is provided in the dwelling on the same storey as a main bedroom.

15.0 Window Specification
Windows in the principal living space are designed to allow people to see out when seated. In addition, at least one opening light in each habitable room will be approachable and usable by a wide range of people – including those with restricted movement and reach.

16.0 Controls Fixtures & Fittings
Location of service controls Service controls are proposed to be within a height band of 450mm to1200mm from the floor and at least 300mm away from any internal room corner.

APPENDIX 1: Air Quality Assessment



Report Title	Air quality assessment for the development at 115 Parkway, Camden
Customer	Yucel Investments Limited
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Contents

1 Introduction

Aether has been commissioned by Yucel Investments Limited to undertake an air quality assessment for a proposed development of a three storey multi-purpose unit (ground floor retail, levels 1 and 2 residential) in the London Borough of Camden.

The area suffers from elevated levels of air pollution, primarily due to high levels of traffic. There is only one car parking space associated with the development and therefore developing the site will not cause a significant worsening of air quality, but it is important to assess whether there will be an exceedence of the air quality objectives for particulate matter (PM_{10}) or nitrogen dioxide (NO_2) at the proposed site and then advise whether any action is required to reduce the residents exposure to air pollution. The assessment will utilise the Design Manual for Roads and Bridges (DMRB)[1], a screening tool designed to assess the impact of traffic emissions at sensitive receptor locations.

1.1 Local Air Quality Management

Local authorities are required to periodically review and assess the current and future quality of air in their areas. Where it is determined that an air quality objective is not likely to be met, the authority must designate an Air Quality Management Area (AQMA) and produce an air quality action plan (AQAP).

In 2001, the London borough of Camden declared the entire borough as an AQMA for the annual mean nitrogen dioxide (NO_2) objective and the daily particulate matter (PM_{10}) objective. The proposed development site therefore falls within an AQMA. An updated AQAP has been produced covering the period 2009 – 2012[2]. The plan covers a number of measures to reduce pollution levels including reducing the Council's own transport emissions, encouraging changes in driving behaviour, encouraging the use of low emission vehicles and reducing emissions at construction sites.

1.2 Assessment Criteria

A summary of the air quality objectives relevant to the Parkway development, as set out in the UK Air Quality Strategy[3], is presented in Table 1 below.

1 Highways Agency's Design Manual for Roads and Bridges (DMRB), Volume 11, Section 3, Part 1 Air Quality, May 2007
2 http://www.camden.gov.uk/ccm/cms-service/download/asset/?asset_id=1766857
3 The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (2007), Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland

Table 1: UK Air Quality Objectives for NO_2 and PM_{10}

Pollutant	Concentration	Measured as
Nitrogen Dioxide (NO_2)	40 µg/m^3	Annual mean
	200 µg/m^3	Hourly mean not to be exceeded more than 18 times per year (99.8th percentile)
Particulate Matter (PM_{10})	40 µg/m^3	Annual mean
	50 µg/m^3	24 hour mean not to be exceeded more than 35 times a year (90.4th percentile)

The oxides of nitrogen (NOx) comprise principally of nitric oxide (NO) and nitrogen dioxide (NO_2). Nitrogen dioxide is a reddish brown gas (at sufficiently high concentrations) and occurs as a result of the oxidation of nitric acid (NO), which in turn originates from the combination of atmospheric nitrogen and oxygen during combustion processes. Health based standards for NOx generally relate to NO_2, where acute and long-term exposure may adversely affect the respiratory system.

Particulate matter is a term used to describe all suspended solid matter, sometimes referred to as Total Suspended Particulate matter (TSP). Sources of particles in the air include road transport, power stations, quarrying, mining and agriculture. Chemical processes in the atmosphere can also lead to the formation of particles. Particulate matter with an aerodynamic diameter of less than 10 µm is the subject of health concerns because of its ability to penetrate deep within the lungs and is known in its abbreviated form as PM_{10}.

As defined by the regulations, the air quality objectives for the protection of human health are applicable:

- Outside of buildings or other natural or man-made structures above or below ground; and
- Where members of the public are regularly present.

Using these definitions, the annual mean objectives will apply at locations where members of the public might be regularly exposed such as building facades of residential properties, schools and hospitals and will not apply at the building facades of offices or other places of work, where members of the public do not have regular access. The 24 hour objective will apply at all locations where the annual mean objective would apply together with hotels. The hourly objective will apply at all locations where members of the public could reasonably be expected to spend that amount of time.

1.3 The DMRB Screening Method

Local air quality has been assessed using the Highways Agency's Design Manual for Roads and Bridges (DMRB), a screening tool that can be used to predict concentrations of pollutants in the vicinity of roads. The methodology has been used for many years in support of planning applications for new residential/commercial developments and road building projects.

The DMRB model is only able to provide an estimate of ground level concentrations. The development is three storeys high, with retail space on the ground floor and residential accommodation above; therefore the residents are likely to be exposed to lower pollutants concentrations than those predicted in the assessment.

The screening method predicts annual average ground level concentrations at sensitive receptors by applying average roadside emission dispersion curves and correcting for vehicle type and speed. The screening method incorporated the latest vehicle classifications at the time of publication; however these have now been superseded and the DMRB model is expected to be updated shortly.

The most recent version of the DMRB (1.03c) was issued in July 2007 and requires the following information to assess the impact at sensitive receptor locations:

- Background pollutant concentrations;
- Annual average daily traffic (AADT) flows;
- Annual average speed;
- Distance from road link to sensitive receptor; and
- Fleet composition.

2 Methodology

2.1 Local Pollutant Concentrations

Camden routinely monitors air quality at 3 continuous monitoring sites and has diffusion tubes placed at more than 20 locations passively measuring NO_2 concentrations at roadside, kerbside and background sites. The closest monitoring sites to the proposed development are provided in Table 2 and 3 below. Further details on the calibration and site audits of the continuous monitoring sites can be found in the Progress Reports[4].

The diffusion tubes are supplied and analysed by Gradko Environmental, who participate in the WASP scheme. Whilst diffusion tubes provide an indicative estimate of pollutant concentrations, they tend to under or over read. The data is therefore corrected using a bias adjustment factor. There are two types of bias adjustment factor – local and national. The local factor is derived from co-locating diffusion tubes (usually in triplicate) with continuous monitors, whereas the national factor is obtained from the average bias from all local authorities using the same laboratory. The diffusion tube data presented in Table 2 has been adjusted for laboratory bias using local factors obtained from triplicate tubes placed at the Swiss Cottage site.

4 http://www.camden.gov.uk/ccm/content/environment/air-quality-and-pollution/air-quality/twocolumn/policies-reports-and-research.en?page=2

Table 2: Annual mean NO_2 concentrations recorded in Camden[5].						
Site Name	Site Type	Grid Reference	Distance to Kerb (m)	Annual Mean NO_2 (µg/m^3)		
				2008	2009	2010
Bloomsbury	UB	530120,182034	27	54	54	55
Swiss Cottage	K	526633,184392	3	75	84	82
Shaftesbury Avenue	R	530060, 181290	< 1	78	87	89
Camden Rd*	R	529173, 184129	1	84	73	66.5
Gloucester Av / Parkway*	K	528672, 183642	< 1	57	62	63
Inverness St*	R	528815, 183909	15	42	46	55

Note: * refers to diffusion tube sites. UB = urban background, K = kerbside, R = roadside

The annual mean objective was exceeded at all sites presented in Table 2. Between 2009 and 2010 the roadside site at Swiss Cottage and Camden Road decreased marginally, whereas the other sites presented increased during this period. Data showing whether the hourly objective was met is only available for the continuous monitoring sites. This information is not presented in this report, but the data shows that it was breached at the Swiss Cottage and Shaftesbury Avenue sites in 2010.

Defra has published "year-adjustment" factors for projecting roadside NO_2 concentrations to the year 2020. The Local Air Quality Management Technical Guidance, LAQM.TG(09)[6], advises local authorities to use this information to adjust measured concentrations to future years. These projections are based on pollution climate modelling studies. However, recent analyses of historical monitoring data have identified a disparity between the measured concentrations and the projected decline in concentrations associated with emission forecasts[7]. Trends in ambient NOx and NO_2 concentrations in the UK have generally shown two characteristics: a decrease in concentration from about 1996 to 2002 – 2004, followed by a period of more stable concentrations from 2002 – 2004 to 2009 / 2010. The reason for the levelling off of concentrations is not fully understood and is currently under investigation, but is thought to be due to on road performance of diesel road vehicles, which are not as expected. As a result of the uncertainty, in this study the NO_2 concentrations recorded have not been "year adjusted" to provide an estimate for the occupation year (2013).

Table 3: Annual mean PM_{10} concentrations recorded in Camden[5].						
Site Name	Site Type	Grid Reference	Distance to Kerb (m)	Annual Mean PM_{10} (µg/m^3)		
				2008	2009	2010
Bloomsbury	UB	530120,182034	27	23	19	18
Swiss Cottage	K	526633,184392	3	26	25	26
Shaftesbury Avenue	R	530060, 181290	< 1	29	32	29

5 2010 Air Quality Progress Report for the London Borough of Camden, September 2011.

6 DEFRA, (2009) Part IV of the Environment Act 1995. Local Air Quality Management Technical Guidance LAQM. TG (09). February 2009.

7 http://laqm.defra.gov.uk/documents/Measured%20nitrogen%20oxides%20(NOx)%20and-or%20nitrogen%20dioxide%20(NO2)%20concentrations%20do%20not%20appear%20to%20be%20declining%20in%20line%20with%20national%20forecasts.pdf

PM_{10} monitoring reveals that Camden does not breach the air quality objective for this pollutant, but the Council are currently intending on keeping the AQMA and will review the situation over the next 5 years.

As a comparison, background concentrations have been obtained from the National Air Quality Information Archive (NAQIA) UK Background Air Pollution Maps[8]. These 1 kilometre grid resolution maps are derived from a complex modelling exercise that takes into account emissions inventories and measurements of ambient air pollution from both automated and non-automated sites. The estimated mapped background NO_2 and PM_{10} concentrations around the development site are 36.6µg/m^3 and 20.4µg/m^3 respectively in 2010[9].

The background annual mean NO_2 concentration obtained from the automatic monitor at Bloomsbury is higher than the value obtained from the background maps. This might be expected as the south of the borough (where Bloomsbury is located) experiences higher volumes of traffic and congestion and the most intense levels of development[5]. For PM_{10}, higher background concentrations are predicted by the background maps. In this assessment, the NO2 background value recorded by the Bloomsbury automatic monitoring will be used as it will provide a conservative estimate. For PM_{10}, the background value from the maps will be used again to provide a conservative estimate. Therefore the annual mean concentrations used for NO_2 and PM_{10} respectively are 55µg/m^3 and 20.4µg/m^3. The reliability of these values will be confirmed in the model verification.

2.2 Traffic data

Traffic count data for 2010 has been obtained from the Department for Transport traffic matrix[10]. This is shown in Table 4 below.

Table 4. Traffic data for the baseline year 2010			
Road name	Annual Average Daily Traffic (AADT)	% Heavy Duty Vehicles (HDV)	Speed (kph)
Parkway	17,714	4.5	32
Delancey Street	13,309	5.7	32
Finchley Road *	22,653	10.6	32

Note: * used for model verification

These flows have been projected to 2013 (the expected first full calendar year following completion of the development) using the RTF[11]. This is likely to provide a conservative estimate as traffic flows on these roads have in fact declined between 2006 and 2010[10].
The proposed development includes 1 car parking space; it has been assumed that each space will equate to 2 trips a day (resulting in 4 movements) and the projected flow with the development in

8 NAQIA UK background maps http://laqm.defra.gov.uk/maps/maps2008.html

9 For NO_2, the 2008 data was extracted, as in light of recent findings it is the earliest year available from the most recent background maps and takes into account measurements made in that year, whereas years beyond that are projections, which are subject to considerable uncertainty.

10 http://www.dft.gov.uk/matrix

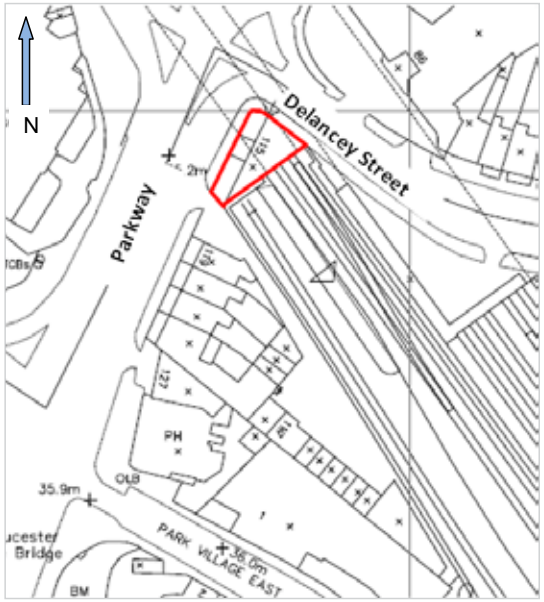
11 http://laqm.defra.gov.uk/documents/RTF-Automated-Traffic-Growth-Calculator-v3-1.xls

2013 is shown in Table 5. Given the very small increase in car movements as a result of the development, only an assessment 'with development' has been undertaken. With no development, the pollutant concentrations will be very similar.

The DMRB screening method requires roads to be split into a series of links, which represent sections where the traffic conditions are reasonably homogenous with regards to flow and average speed. We have assumed an average speed of 32kph on all surrounding roads due to the large amount of traffic lights and congestion during peak hours on these roads.

2.3 Model input data

Figure 1: The location of the development

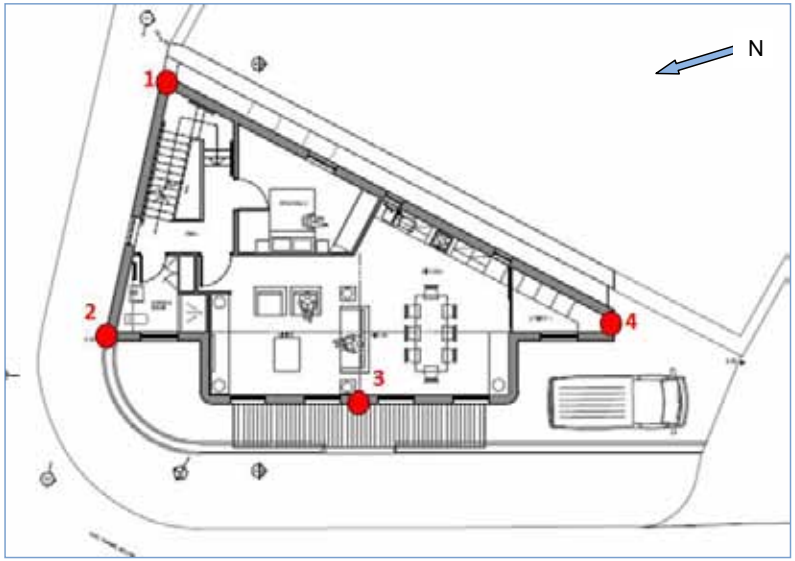


Four sensitive receptor locations have been selected for the assessment:

1. North East façade of the development (overlooking Delancey Street).
2. North West façade of development (overlooking the junction of Delancey Street and Parkway)
3. At the front facade of the development (overlooking Parkway).
4. In the southern corner of the site

These sites have been chosen to reflect the extremities of the site and their proximity to road traffic sources. These are shown in Figure 2 below.

Figure 2: the locations of the receptors used in the modelling.



The DMRB model requires distances to sensitive receptors from the centre of the road link. These have been measured from the Architect's plans and are presented in Table 5 below along with a summary of the other DMRB input parameters for each road link.

Table 5: DMRB input parameters 2013

Link Number	Distance to link centre (m)	AADT	% HDV	Av speed (km/hr)
Receptor 1				
Delancey St	6.3	14,253	5.7	32
Receptor 2				
Delancey St	15.0	14,253	5.7	32
Parkway	6.9	18,969	4.5	32
Receptor 3				
Parkway	13.1	18,969	4.5	32
Receptor 4				
Parkway	14.2	18,869	4.5	32

As discussed in Section 2.1, nationally NOx and NO_2 concentrations have not been declining as expected. Therefore as a conservative measure, DMRB has been run using road traffic emission factors for 2004, but using 2013 traffic flow data. This is because concentrations across the UK have generally been pretty stable across most of the UK since 2004.

DMRB has been used to predict air pollutant concentrations for:

- A 2010 baseline, so that model verification could be undertaken
- In 2013 with development (the expected first calendar year of use following occupation)

2.4 Conversion of NOx to NO_2

The method to convert roadside NOx to NO_2 within the DMRB model was based on measurements made between 1999 and 2001. Recent evidence shows that the proportion of primary NO_2 in vehicle exhaust has increased[12]. This means that the relationship between NOx and NO_2 at the roadside has changed from that currently used in the DMRB model. A new NOx to NO_2 calculator has therefore been developed and is used in conjunction with the DMRB model to obtain a more accurate picture of NO_2 concentrations. This approach has been followed in this assessment.

2.5 Model Verification

Model verification has been undertaken to provide confidence in the modelling results. Most nitrogen dioxide is produced in the atmosphere by nitric oxide (NO) reacting with ozone. It is therefore appropriate to verify the model in terms of NOx (NOx = NO + NO_2). The procedure followed is in accordance with Annex 3 of TG(09).

The predicted results from the DMRB model may differ from measured concentrations for a large number of reasons including uncertainties in the background concentrations, and uncertainties in source activity data such as traffic flows and road transport emission factors.

The monitoring site at Swiss Cottage on Finchley Road has been used in the analysis. This site was chosen as both the development site and the monitoring site are located on the same 'A' road and therefore are in similar locations in terms of traffic movements. The traffic data used in the assessment is provided in Table 4 above.

The model output of 'road NOx' (i.e. the component arising from the local traffic) has been compared to the 'measured road NO_x'. The measured road component has been derived by subtracting the estimated background concentration from the total measured concentration at this location. A similar approach has been followed for PM_{10}.

The results are shown in Table 6 below.

Table 6: NO_x model verification		**PM_{10} model verification**	
Measured total NOx	193µg/m^3	Measured total PM_{10}	26 µg/m^3
Background NOx	99.2µg/m^3	Background PM_{10}	20.4 µg/m^3
'Measured road' NOx	93.8 µg/m^3	'Measured road' PM_{10}	5.6µg/m^3
Modelled road NO_x	52.4 µg/m^3	Modelled road PM_{10}	6.4 µg/m^3
Measured / Modelled	**1.8**	Measured / Modelled	**0.9**

For NO_2, the model is under predicting compared to the roadside monitor and therefore in accordance with Box A3.5 TG (09), a primary adjustment factor has been applied to the DMRB NOx results. A comparison was then made with the nitrogen dioxide concentrations recorded at the Swiss Cottage site. This was done by combining the adjusted NOx concentration with the predicted background NO_2 concentration in the NOx to NO_2 calculator. A secondary adjustment factor of 1.013 was then calculated.

12 http://laqm.defra.gov.uk/tools-monitoring-data/no-calculator.html

3 Results

3.1 Results of the DMRB Assessment

The Tables below present the results of the DMRB assessment for NO_2 and PM_{10} respectively. It is worth noting that the concentrations presented are likely to be 'worst case' as:

- No improvement in the vehicle fleet since 2004 has been taken into account
- A growth in traffic has been assumed between 2010 and 2012, when recent evidence has shown levels to be declining, and
- The concentrations predicted are for ground floor level when the residential accommodation is to be located on floors 1 and 2. .

Nitrogen dioxide:

Table 8: Estimated annual Mean NO_2 concentrations in 2013 at ground level (µg/m^3)	
Receptor	**Annual mean (µg/m^3)**
1	73.0
2	83.9
3	70.9
4	70.4

DMRB estimates annual average NO_2 concentrations to be above well above the annual mean NO_2 objective at all of the receptors modelled. This is in agreement with the concentrations recorded at the monitoring sites nearby. The concentration is predicted to be highest at receptor 2, due to its proximity to both Parkway and Delancey Street.

To give some indication of how annual average NO_2 concentrations might decline with increasing height from ground level, data has been obtained the London Borough of Wandsworth, which placed diffusion tubes measuring NO_2 at the facade of the first, second and third floor of a building on Putney High Street[13]. The concentrations obtained are provided in Table 9 below. If the Putney data is indicative of the Parkway site, then the data would suggest that the annual mean NO_2 concentration would be substantially lower at the residential floors, but still above the annual mean objective.

13 Progress Report 2011 for the London Borough of Wandsworth

Table 9: Results of NO_2 diffusion tubes placed on Putney High Street in 2010.		
	Annual average NO_2 concentrations in 2010 ($\mu g/m^3$)	% reduction compared to ground level
Kerbside	163	
1st floor facade	136	17%
2nd floor facade	118	28%
3rd floor facade	107	34%

DMRB is not able to produce a short-term statistic for NO_2. However the guidance states that authorities may assume that exceedences of the 1 hour objective are only likely to occur where annual mean concentrations are 60$\mu g/m^3$ or above. Therefore, it is likely that this objective will be exceeded too at ground level, as annual mean concentrations are predicted to be well above this amount at all of the receptors modelled.

Particulate matter (PM_{10}):

Table10: Estimated annual Mean PM_{10} concentrations in 2013 at ground level ($\mu g/m^3$)		
Receptor	Total ($\mu g/m^3$)	Number of exceedences of the 24-hour objective
1	21.5	5
2	24.5	11
3	21.1	5
4	21.0	5

DMRB predicts total annual average PM_{10} concentration at all of the receptors modelled to be under 40$\mu g/m^3$, which is below the long-term air quality objective for the protection of human health. In addition, there are less than 35 exceedences of the 24-hour PM_{10} objective at any of the locations modelled.

3.2 Mitigation Measures

The development has been designed so that the habitable rooms are towards the back of the site (i.e. away from the busy A roads), which will help reduce resident's exposure to air pollution.

Going forward, improvements in air quality are expected post 2015 (particularly as a result of tighter emission standards on vehicles with the introduction of Euro VI). Furthermore, Parkway is within the London Borough of Camden's AQMA and an Air Quality Strategy and Improvement Plan was published in 2009 to reduce pollution levels in the future. The 2009 Plan[14] lists the actions identified; these include measures to reduce and manage traffic access to Camden, measures increase the number of car club bays and electric charging point and measures to support the increased role of public transport and cycling[15].

14 http://www.camden.gov.uk/ccm/content/environment/air-quality-and-pollution/air-quality/filestorage/air-quality-action-plan-2009-2012.en

15 http://www.camden.gov.uk/ccm/content/environment/air-quality-and-pollution/air-quality/twocolumn/policies-reports-and-research.en?page=3

However, based on the DMRB results for NO_2, it is recommended that mitigation measures are put in place to reduce the resident's exposure to air pollution. It is suggested that installation of mechanical ventilation may like to be considered; this should use air from the top and rear of the property (near to where receptor 4 is located), where air pollution is expected to be marginally better than at the front of the property.

The London Borough of Camden's Unitary Development Plan[16] states that 'developers should consider measures in the Action Plan such as improving pedestrian and cycling facilities, improving public transport, adopting green travel plans, delivery and distribution by low or zero emission vehicles and providing alternative fuel recharging points, including electric recharging points.' In order to improve pollution levels the developer may like to consider contributing towards one of these measures, although it is understood that the proposed development is only small.

3.2 Mitigating the impacts of the construction phase

Emissions and dust from the construction phase of a development can have a significant impact on local air quality. The Greater London Authority and London Councils have produced guidance to control dust and emissions from construction sites[17]. This guidance is considered to be best practice and therefore it is suggested that the developer for this site refer to this to help reduce the impact of dust and vehicle exhaust emissions and liaise with the Local Authority to come up with an acceptable strategy. In the first instance it is important to evaluate the risks. According to the guidance it is likely that this development would be deemed to be a 'medium' risk, as although only one property is to be developed, there is the potential for emissions and dust to have an intermittent or likely impact on sensitive receptors.

Section 4.3 of the guidance suggests that the following measures are implemented to control dust and emissions during the construction phase:

- Erect solid barriers to the site boundary
- Plan site layout – machinery and dust causing activities should be located away from the sensitive receptors.
- All vehicles to switch off engines – no idling vehicles
- All loads entering and leaving the site to be covered.
- All non road mobile machinery to use ultra low sulphur diesel where available
- Use water as a dust suppressant where applicable.

These are just some of the measures suggested and it is recommended that the developer refers to the Guidance document to obtain more information.

3.4 Summary and Conclusions

An air quality assessment has been undertaken for a proposed development of a three storey multi-purpose unit (ground floor retail, levels 1 and 2 residential) on Parkway in Camden. The London

16 http://www.camden.gov.uk/ccm/cms-service/download/asset?asset_id=2614523

17 http://legacy.london.gov.uk/mayor/environment/air quality/docs/construction-dust-bpg.pdf

Borough of Camden has declared the entire borough an AQMA due to high levels of congestion. This proposed development therefore lies within an AQMA.

A quantitative assessment has been carried out using the DMRB method to determine the impact of emissions from road traffic on sensitive receptors. The proposed development has provision for 1 parking space and therefore the development is unlikely to cause any worsening of air quality. This assessment is therefore concerned with the potential exposure of residents in the new development to elevated concentrations of NO_2 and PM_{10}, the primary pollutants associated with road traffic.

Predicted concentrations have been compared with the air quality objectives. The results of the assessment indicate that the concentrations of NO_2 in 2013 exceed the air quality objectives at the façade on all sides of the development; Concentrations of PM_{10} are predicted to be within the annual mean objective in 2013.

Given the exceedence of the predicted annual mean and hourly mean NO_2 concentrations, it is suggested that the installation of mechanical ventilation is considered and possible implementations of measures contributing towards the air quality action plan should be considered.

APPENDIX 2:
Noise & Vibration Assessment

An Assessment of the impact
of traffic noise and vibration
on the new mixed-use development
at 115 Parkway, London NW1 7PS

* * *

for a planning application

For:

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CONTENT

1. Introduction

Morrow & Lorraine Architects are making a planning application for a new mixed-use development at 115 Parkway, London NW1, which is located on the busy road junction and directly above the main railway line serving Euston Station, see Figure 1.

The planning department of the Camden Council has requested that an acoustic report in accordance with PPG24 “Planning and noise” and the Council’s Local Development Framework (LDF) be submitted with the application, see Appendices A and B respectively.

Noise & Vibration Engineering Limited (NVE) has been commissioned by Morrow & Lorrain Architects to carry out an assessment of the impact of the noise and vibration on the development and prepare an acoustic report.

This report describes the survey, presents results, draws conclusions and gives general recommendations as to noise and vibration mitigating measures required.

2. The Site

The proposed development site is located on a busy road junction between Parkway, Delancy Street and Regent’s Park Road within the mixed residential and commercial area, which lies at the boundary of the Regent’s Park Conservation Area.

The site is situated directly above a railway line near the south portal of a short tunnel. The railway line serves Euston station and consists of several tracks situated approx. 10m below the street level.

The development involves the demolition of the existing single storey retail unit and the construction of a new three-storey building for retail use on the ground floor level with a two-bedroom flat above, see Figure 2.

3. Camden Council’s Noise and Vibration Requirements

Camden Council’s noise and vibration requirements for determining planning applications are given in Development Policy 28 (DP28) “Noise and vibration” of the Local Development Framework, Appendix B.

DP28 sets out the acceptable levels of noise and vibration for sensitive residential developments adjoining railways and roads, which are presented in Tables A, B and C.

Table A gives noise levels on residential sites adjoining railways and roads at and above which planning permission will not be granted.

Table B gives noise levels on residential sites adjoining railways and roads at and above which attenuation measures will be required.

Table C gives vibration levels on residential sites adjoining railways and roads at and above which planning permission will not be granted.

The above tables are presented below:

Table A: Noise levels on residential sites adjoining railways and roads at which planning permission will not be granted

Noise description and location of measurement	Period	Time	Sites adjoining railways	Sites adjoining roads
Noise at 1 metre external to a sensitive façade	Day	0700-1900	74 dB L_{Aeq}12h	72 dB L_{Aeq}12h
Noise at 1 metre external to a sensitive façade	Evening	1900-2300	74 dB L_{Aeq}4h	72 dB L_{Aeq}4h
Noise at 1 metre external to a sensitive façade	Night	2300-0700	66 dB L_{Aeq}8h	66 dB L_{Aeq}8h

Table B: Noise levels on residential streets adjoining railways and roads at and above which attenuation measures will be required

Noise description and location of measurement	Period	Time	Sites adjoining railways	Sites adjoining roads
Noise at 1 metre external to a sensitive façade	Day	0700-1900	65 dB L_{Aeq}12h	62 dB L_{Aeq}12h
Noise at 1 metre external to a sensitive façade	Evening	1900-2300	60 dB L_{Aeq}4h	57 dB L_{Aeq}4h
Noise at 1 metre external to a sensitive façade	Night	2300-0700	55 dB L_{Aeq}1h	52 dB L_{Aeq}1h
Individual noise events several times an hour	Night	2300-0700	>82 dB L_{AMax} (S time weighting)	>82 dB L_{AMAX} (S time weighting)

Table C: Vibration levels on residential sites adjoining railways and roads at which planning permission will not be granted

Vibration description and location of measurement	Period	Time	Vibration levels
Vibration inside critical areas such as a hospital operating theatre	Day, evening and night	0000-2400	0.1 VDV ms-1.75
Vibration inside dwellings	Day and evening	0700-2300	0.2 to 0.4 VDV ms-1.75
Vibration inside dwellings	Night	2300-0700	0.13 VDV ms-1.75
Vibration inside offices	Day, evening and night	0000-2400	0.4 VDV ms-1.75
Vibration inside workshops	Day, evening and night	0000-2400	0.8 VDV ms-1.75

Where dwellings may be affected by ground-borne regenerated noise internally from, for example, railways or underground trains within tunnels, noise levels within the rooms should not be greater than 35dB(A)max

Further details of DP28 that may be relevant to this project are presented in Appendix A.

4. Design Criteria for Indoor Noise and Vibration

The main indoor noise criteria on this project are reasonable sleeping conditions in bedrooms and reasonable listening conditions in other habitable rooms.

Limits for good and reasonable conditions are given in Table 5 "Indoor ambient noise in spaces when they are unoccupied" of BS 8233: 1999 "Sound insulation and noise reduction for buildings", a relevant part of which is shown below:

* BS8233, Table 5 – Indoor ambient noise levels in spaces when they are unoccupied (dB)			
Criterion	Typical situations	Design range, $L_{Aeq,T}$** dB	
		Good	**Reasonable**
Resting/sleeping conditions	Living rooms	30	**40**
	Bedrooms*	30	**35**
* for reasonable standard in bedrooms at night individual noise events should not normally exceed 45dB L_{Amax}.			
** for the daytime T=16 hours, i.e. (07:00-23:00), for the night-time T=8 hours, (i.e. 23:00-07:00)			

From the table above it can be seen that for reasonable sleeping conditions in bedrooms an indoor ambient noise level should not exceed 35dB, $L_{Aeq,8\text{-}h}$ (i.e. over 8-hour night), and for reasonable listening conditions an indoor ambient noise level should not exceed 40dB, $L_{Aeq,16\text{-}h}$, (i.e. over 16-hour day) in all other habitable rooms.

The footnote (*) with respect to individual noise events in Table 1 is incorrectly assigned to a reasonable standard instead of to a good standard, which means that it is not applicable to this project.

Vibration levels at which planning permission will not be granted in Table C of DP28 seems to be the same levels as in the withdrawn BS6472: 1992, which was replaced with a new BS6472-1 on 1st July 2008.

Since there are important changes in the new standard which affect the values in the table for assessing degrees of adverse comment, we therefore use the values of the new standard as the criteria on this project.

Table 1 of BS6472-1: 2008 gives vibration dose value ranges which might result in various probabilities of adverse comments within residential buildings for a 16-hour day and 8-hour night.

Table 1 – Vibration dose value ranges which might result in various probabilities of adverse comment within residential buildings

Place and time	**VDV range within which there is a low probability of adverse comment $m \cdot s^{-1.75}$** ***(Ref. 1)***	VDV range within which adverse comment is possible $m \cdot s^{-1.75}$	VDV range above which adverse comment is likely $m \cdot s^{-1.75}$ ***(Ref. 2)***
Residential buildings 16 h day	**0.2 to 0.4**	0.4 to 0.8	0.8 to 1.6
Residential buildings 8 h night	**0.1 to 0.2**	0.2 to 0.4	0.4 to 0.8

Ref. (1) Below these ranges adverse comment is not expected.
Ref. (2) Above these ranges adverse comment is very likely.

A planning permission will not, therefore, be granted if the vibration in the floor of the proposed dwelling will be equal or exceed the lower value of the VDV range within which there is low probability of adverse comment, see column 2 of Table 1 above.

5. The Noise and Vibration Survey and Results

A noise and vibration survey was carried out by NVE back in March 2008 when the first scheme of a mixed-use development at 115 Parkway was proposed.

Presumably because the road and rail traffic has not changed significantly since March 2008, the Council thinks that the old data is still applicable and could be used for the assessment of the impact of the traffic noise and vibration on the latest development.

5.1 Noise Survey and Results

The noise survey was carried out between 4th and 5th March 2008 and consisted of measuring a level of the noise just outside the front façade of the building and approx. 1.2m above pavement level, see Photo 3. It was cool, dry and calm throughout the survey.

For the survey the following instrumentation was used:

A SIP95 Sound Level Meter (Serial No. 010468) together with a type MK250 Microphone (Serial No. 2943) and type PRE12N Preamplifier (Serial No. 2943) was laboratory calibrated by AV Calibration Ltd in June 2006.

The SLM was checked for calibration just before and after the measurements with a B&K 4231 calibrator (Serial No. 2084931), which was laboratory calibrated by AV Calibration Ltd in June 2006. The meter was also checked with the calibrator for calibration just before and after the measurements. A small drift in the level of noise was found, however, it was within the acceptable range of +/- 0.5 dB.

Results of the survey are presented below for the night, day and evening periods as required by DP28 of the Local Development Framework.

Table 1. Results - Night Period (2300-0700)		
A-Weighted Sound Pressure Level in dB	Leq	Lmax
Period start		
04/03/2008 23:00	67.7	90.4
05/03/2008 00:00	65.8	86.7
05/03/2008 01:00	67.4	99.5
05/03/2008 02:00	70.1	101.4
05/03/2008 03:00	62.2	81.4
05/03/2008 04:00	62.9	81.8
05/03/2008 05:00	65.3	87.2
05/03/2008 06:00	69.0	91.7
Measured Level LAeq, 8-h (dB) façade	**67.0**	
Distance attenuation correction (dB)	(-3)	
External Level at Nearest Sensitive Window (dB)	**64**	**ok**
DP28 Table A - Night Threshold (roads)	**66**	

Table 2. Results - Day Period (0700-1900)		
A-Weighted Sound Pressure Level in dB	Leq	Lmax
Period start		
05/03/2008 07:00	71.4	88.7
05/03/2008 08:00	71.6	88.3
05/03/2008 09:00	71.9	93.5
05/03/2008 10:00	71.5	95.1
05/03/2008 11:00	70.4	90.2
05/03/2008 12:00	77.1	104.6
05/03/2008 13:00	70.1	87
05/03/2008 14:00	72.2	98.7
05/03/2008 15:00	71.5	101.7
04/03/2008 16:00	75.8	106.5
04/03/2008 17:00	70.2	86.1
04/03/2008 18:00	76.4	103.7
Measured Level LAeq, 12-h (dB) façade	**73.2**	
Distance attenuation correction (dB)	(-3)	
External Level at Nearest Sensitive Window (dB)	**70**	**ok**
DP28 Table A - Day Threshold (roads)	**72**	

Table 3. Results - Evening Period (1900-2300)		
A-Weighted Sound Pressure Level in dB	Leq	Lmax
Period start		
04/03/2008 19:00	72.8	99.7
04/03/2008 20:00	68.7	89.3
04/03/2008 21:00	68.3	86.9
04/03/2008 22:00	67.6	85.8
Measured Level LAeq, 4-h (dB) façade	**69.9**	
Distance attenuation correction (dB)	(-3)	
External Level at Nearest Sensitive Window (dB)	**67**	**ok**
DP28 Table A - Evening Threshold (roads and railways)	**72**	

The windows of the habitable rooms will be located at the first and second floor level, see Figure 2. However, the nearest noise-sensitive windows to the passing vehicles will be located at the first floor level. A distance from the near road lane to the window will be approximately twice the distance to the noise measuring location. A distance attenuation correction of -3dB is therefore applied to the measured façade noise levels.

From tables 1, 2 and 3 it can be seen that the maximum estimated noise levels at the nearest residential window will be below the thresholds for the night, day and evening at which planning permission will not be granted, see Table A in clause 3.

Suitable noise attenuation measures will be required because the measured noise levels exceed the thresholds given in Table B presented in clause 3.

Since the noise from urban road traffic and railway traffic at low speeds predominates, an adjustment factor C_{tr} for a low-frequency noise is added to the sound reduction index R_w in order to achieve the overall effective noise reduction for the windows.

Glossary of terms is presented in Appendix C.

In order to ensure that the requirements for the internal noise level in living rooms and bedrooms during the day and night respectively are not exceeded, the external noise would need to be attenuated by a minimum of 30dB. However, in order to allow for a future increase in noise levels an overall effective attenuation of at least 33dB would be appropriate.

5.2 Vibration Survey and Results

The vibration survey was carried out between the 4th and 6th of March 2008 and consisted of measuring a level of the vibration at one location in three orthogonal directions (z-vertical and x & y-horizontal).

Two triaxial vibration sensors were position side-by-side on a concrete floor. Whilst one sensor was continuously measuring vibration to capture a time history in terms of the vector sum of the peak particle velocity, the other sensor measured vibrations in terms of the peak particle velocity in x-, y- and z-axes over a period of 30s during the passage of a train, (a trigger level was set to 0.15 mm/s PPV).

Glossary of Terms is presented in Appendix C.

The location of the vibration sensors is shown Photo 4. The sensors were orientated with respect to the main axes of the building, i.e. Z-vertical, X- horizontal front-to-back, Y– horizontal side-to-side.

For the survey the following instrumentation was used:

For this purpose we used a Vibras-5005 Evaluation Instrument (Serial No. A136) and a MST3004 Digital Triaxial Sensors, 1Hz to 315Hz, (Physical No's. 167 and 173), which were laboratory calibrated by Walesch Electronic (manufacturer), and in addition, a sensor function check was performed just prior to the measurements.

Results of the vibration survey are presented in Appendix D.

Theses consist of a vibration time history in terms of the maximum vector sum of peak particle velocity in mm/s within the consecutive 1s intervals throughout the survey, and a table with vibration levels and dominant frequency in three orthogonal directions for each individual train event. Vibration levels are presented in terms of the maximum particle component velocity in mm/s and the vibration dose value (VDV) in $ms^{-1.75}$.

Results are also summarised in terms of the overall maximum peak component velocity and the overall vibration dose value for the day and the night, see Appendix D.

A maximum measured VDV for the day and night periods in any of the three orthogonal directions are presented Table 4 below.

Table 4. Maximum Measured Vibration Dose Value

	Max. measured VDV ($m/s^{-1.75}$)	Allowable VDV ($m/s^{-1.75}$)	Comments
VDV_{day}	0.0490	0.2	ok
VDV_{night}	0.0258	0.1	ok

From the summary of results it can be seen that the maximum measured VDV for the day and night, (both in the vertical direction), are approximately four times below the level at or above which low probability of adverse comment might be expected in residential buildings during the day or night.

Notwithstanding the above, floor vibrations from some individual train events would, however, be just perceptible to an average human being standing on the floor at the measurement location.

Vibration levels in the mid-span of suspended floors will normally be higher than on the concrete ground floor slabs or the base of the building. For the vertical direction there will be amplification from edge of floor to centre of floor. For the horizontal direction there will be geometric amplification with height.

Up to a three-fold vibration amplification in the vertical direction would typically be expected on suspended timber-joist floors whereas on suspended concrete floors vibration would typically increase up to two-fold. However, for three-storey buildings amplification of vibration in the horizontal direction would not be that significant. In buildings adjacent to railway lines vibration in the horizontal direction perpendicular to the tracks is usually higher than in the parallel direction.

6. Conclusions

We can conclude that as far as the impact of traffic noise and vibration is concerned, a planning permission for a new mixed-use development at 115 Parkway can and should be granted subject to suitable attenuation measures as described below.

7. Recommendations

7.1 Noise

In order to meet the indoor noise levels for the reasonable sleeping and listening conditions it is required that thermal double glazing units of at least 33dB, $R_w + C_{tr}$ be fitted in all window openings of the habitable rooms.

For example Velfac100 4/0.76/4-18-6, (i.e. 4/0.76/4 mm laminate/18mm space filled with argon/6mm float glass), sound reduction windows would provide a sound insulation at 34 dB, $R_w + C_{tr}$.

In order to provide adequate insulation against external noise it would be necessary to keep the windows shut, which means that air ventilation without compromising sound insulation of the windows is required. This can be achieved by means of mechanical ventilation.

An acoustically-attenuated supply and extract mechanical ventilation system with heat recovery for the whole dwelling is likely to be most appropriate for this small building development.

7.2 Vibration

Vibration levels in suspended floors of the proposed dwelling are likely to meet the requirements even if the floors are constructed of timber, however, floors made of concrete would provide a more comfortable internal environment.

However, should a suspended timber-joist floor be chosen, it should be made as rigid as practicably possible with the joists preferably running parallel to the rear façade of the building, (i.e. perpendicular to the railway tracks below).

Figure 1. The site location of the proposed development at 115 Parkway


Figure 2. Plan of the 1st and 2nd floors of the proposed development

Photo 1. Front façade of the existing building at 115 Parkway

Photo 2. Rear façade of the existing building at 115 Parkway

Photo 3. The noise measurement location

Photo 4. The vibration measurement location

APPENDIX A

PPG24 "Planning and noise" – Recommended Noise Exposure Categories (NECs)

When determining planning applications for development which will be exposed to an existing noise source, local planning authorities should consider both the likely level of exposure at the time of the application and any increase that may reasonably be expected in the foreseeable future.

Planning Policy Guidance Note 24 – Planning and Noise gives guidance on noise levels and noise exposure categories and these are used as basis for the most local authorities' standards. Local authorities are concerned to ensure that development proposals do not give rise to unacceptable noise conditions. Local authorities will therefore make careful assessment of likely noise levels before determining planning applications where noise is likely to be present.

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

NEC	Description
A	Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as a desirable level.
B	Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection against noise.
C	Planning permission should not normally be granted. Where it is considered that permission should be given, for example because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.
D	Planning permission should normally be refused.

RECOMMENDED NOISE EXPOSURE CATEGORIES FOR NEW DWELLINGS NEAR EXISTING NOISE SOURCES

NOISE LEVELS[0] CORRESPONDING TO THE NOISE EXPOSURE CATEGORIES FOR NEW DWELLINGS $L_{Aeq,T}$ dB				
	NOISE EXPOSURE CATEGORY			
Noise Source	A	B	C	D
Road traffic 07.00-23.00 23.00-0700	<55 <45	55-63 45-57	63-72 57-66	>72 >66
Rail traffic 07.00-23.00 23.00-0700	<55 <45	55-66 45-59	66-74 57-66	>74 >66
Mixed sources 07.00-23.00 23.00-0700	<55 <45	55-63 45-57	63-72 57-66	>72 >66

Notes:

0) Noise levels: the noise level(s) ($L_{Aeq,T}$) used when deciding the NEC of a site should be representative of typical conditions.

1) Night-time noise levels (23.00-07.00): site where individual noise events regularly exceed 82 dB L_{Amax} (slow time weighting) several times in any hour should be treated as being in NEC C, regardless of the $L_{Aeq,8\text{-}h}$ (except where the $L_{Aeq,T}$ already puts the site in NEC D).

2) Aircraft noise: daytime values accord with contour values adopted by the Department of Transport which relate to levels measured 1.2m above open ground. For the same amount of noise energy, contour values can be up to 2 dB(A) higher than those of other sources because of ground reflection effects.

3) Mixed sources: this refers to any combination of road, rail, air and industrial noise sources. The "mixed source" values are based on the lowest numerical values of the single source limits in the table. The "mixed source" NECs should only be used where no individual noise source is dominant. If the contribution of the individual noise sources to the overall noise level cannot be determined by measurement and/or calculation, then the overall measured level should be used and the site assessed against the NECs for "mixed sources".

APPENDIX B

Camden Council's Development Policy 28 "Noise and vibration"

28.1 Noise and vibration can have a major effect on amenity and health and therefore quality of life. Camden's high density and mixed-use nature means that disturbance from noise and vibration is a particularly important issue in the borough.

28.2 The effect of noise and vibration can be minimised by separating uses sensitive to noise from development that generates noise and by taking measures to reduce any impact. Noise sensitive development includes housing, schools and hospitals as well as offices, workshops and open spaces, while noise is generated by rail, road and air traffic, industry, entertainment (e.g. nightclubs, restaurants and bars) and other uses.

28.3 The Council will only grant planning permission for development sensitive to noise in locations that experience noise pollution, if appropriate attenuation measures are taken, such as double-glazing. Planning permission will not be granted for development sensitive to noise in locations that have unacceptable levels of noise.

Where uses sensitive to noise are proposed close to an existing source of noise, the Council will require an acoustic report to ensure compliance with PPG24: Planning and noise.

28.4 In assessing applications, we will have regard to the Noise and Vibration Thresholds, set out below.

These represent an interpretation of the standards in PPG24 and include an evening period in addition to the day and night standards contained in the PPG, which provide a greater degree of control over noise and vibration during a period when noise is often an issue in the borough.

The Council will seek to ensure that noise and vibration is controlled and managed and will not grant planning permission for development sensitive to noise in locations with noise pollution, unless appropriate attenuation measures are provided.

Development that exceeds Camden's noise and vibration thresholds in Table A and Table C respectively will not be permitted.

APPENDIX C

Glossary of Terms

A-weighted sound pressure level
The unit generally used for measuring and assessing environmental noise is A-weighted sound pressure level in decibels, denoted dB(A). 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(A) corresponds to a subjective doubling or halving of the loudness of a noise, and a change of 2 to 3 dB(A) is subjectively barely perceptible.

$L_{Aeq,T}$	The equivalent continuous sound level is a notional steady sound level which would, over a given period of time, deliver the same sound energy as the actual fluctuating sound over the same period and is denoted $L_{Aeq,T}$. It is the unit which has been adopted to cover many forms of environmental noise from construction and open sites, mineral working, industrial noise and noise from railway trains. It is also by definition the only unit which can measure ambient noise, which itself is defined as the totally encompassing sound in a given situation at a given time usually being composed of sound from many sources near and far.
$L_{A90,\,T}$	The L_{A90} level is that level of sound which is exceeded for 90% of the time period being sampled. L_{A90} is widely considered to be the best method for expressing background noise level.
L_{Amax}	The L_{Amax} is the maximum level of sound over the elementary measurement period, e.g. 125ms
R_w	The single number rating used to describe the sound insulation of building elements. The weighted sound reduction index is defined in BS EN ISO 717-1:1997 'Methods for rating the sound insulation in buildings and of building elements. Method for rating the airborne sound insulation in buildings and of interior building elements'
C_{tr}	Spectrum adaptation term 2 according to BS ISO 717-1, (i.e. an adjustment factor to account for low frequency noise sources such as urban road traffic or railway traffic at low speeds).

Peak particle velocity (PPV)
The maximum instantaneous velocity of a particle at a point during a given time interval.

Peak component particle velocity
The maximum value of any one of three orthogonal component particle velocities measured during a given time interval.

True vector sum of the peak particle velocity
The vectorial summation of the peak velocities in the three mutually perpendicular directions at the same instant of time.

Vibration dose value (VDV)
The fourth root of the definite integral of fourth power of the frequency weighted acceleration over the time interval of vibration exposure, i.e.

$$VDV = \left[\int_0^T a^4(t)dt\right]^{0.25}$$

Where:
VDV is the true vibration dose value in $ms^{-1.75}$
a(t) is the frequency weighted acceleration in ms^{-2}
T is the total duration of vibration exposure in seconds.

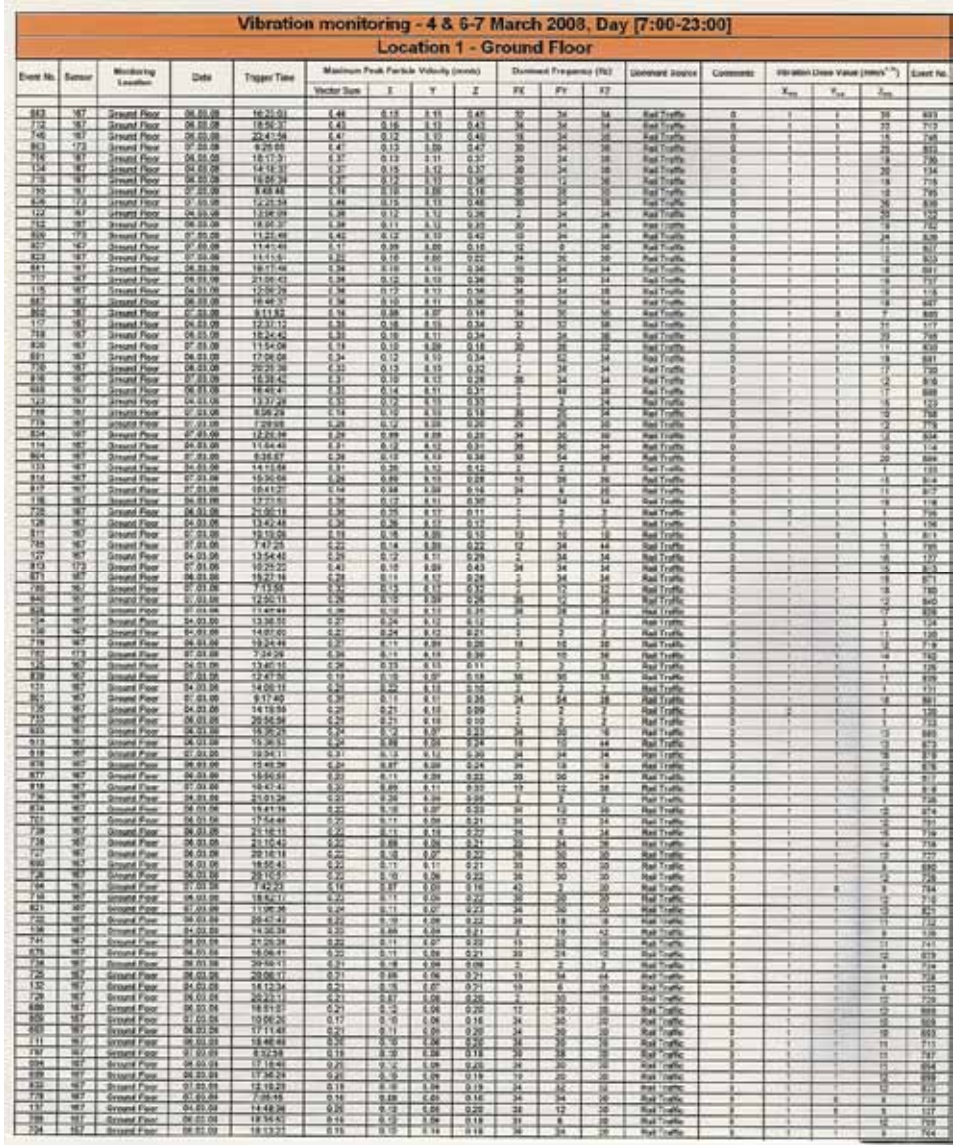
The above combination of the magnitude and duration of vibration is quantified by the vibration dose, and its impact depends also upon the number of events, time of day and location of the recipient. The vibration dose value time-dependency means a two-fold increase in vibration magnitude is equivalent to a 16-fold increase in duration of the vibration.

According to BS6472-1: 2008 the VDV should be determined from the W_b frequency-weighted acceleration for z-axis and the W_d frequency-weighted acceleration for x- & y-axes at a frequencies between 0.5Hz and 80 Hz, where the coordinates are earth-centred.

The weightings are defined in BS 6841 as the frequency weightings required for the general measurement of whole-body vibration with respect to its effects on comfort.

APPENDIX D

Results of the Vibration Survey



Vibration monitoring - 4 & 6-7 March 2008, Day [7:00-23:00]

Location 1 - Ground Floor

Event No.	Sensor	Monitoring Location	Date	Trigger Time	Maximum Peak Particle Velocity (mm/s)				Dominant Frequency (Hz)			Dominant Source	Comments	Vibration Dose Value ($mm/s^{1.75}$)			Event No.
					Vector Sum	X	Y	Z	FX	FY	FZ			X_{VDV}	Y_{VDV}	Z_{VDV}	
632	167	Ground Floor	07.03.08	12:11:51	0.37	0.11	0.36	0.17	38	13	16	Rail Traffic	0	1	1	10	632
705	167	Ground Floor	06.03.08	18:14:21	0.19	0.11	0.06	0.18	34	26	20	Rail Traffic	0	1	1	11	705
717	167	Ground Floor	06.03.08	19:19:04	0.19	0.09	0.06	0.19	34	7	20	Rail Traffic	0	1	1	11	717
837	167	Ground Floor	07.03.08	12:35:46	0.37	0.16	0.11	0.37	40	32	40	Rail Traffic	0	1	1	11	837
721	167	Ground Floor	06.03.08	08:41:31	0.19	0.09	0.05	0.18	34	2	32	Rail Traffic	0	1	1	10	721
696	167	Ground Floor	06.03.08	17:22:12	0.19	0.16	0.06	0.18	17	14	20	Rail Traffic	0	1	1	11	696
773	167	Ground Floor	06.03.08	19:47:03	0.19	0.10	0.04	0.19	34	20	20	Rail Traffic	0	1	1	11	773
830	167	Ground Floor	07.03.08	10:55:58	0.21	0.11	0.07	0.21	18	19	20	Rail Traffic	0	1	1	12	830
798	167	Ground Floor	07.03.08	8:57:43	0.36	0.09	0.09	0.35	18	19	36	Rail Traffic	0	1	1	11	798
724	167	Ground Floor	06.03.08	19:53:48	0.19	0.10	0.05	0.19	18	33	18	Rail Traffic	0	1	1	3	724
826	167	Ground Floor	07.03.08	11:47:49	0.27	0.12	0.06	0.27	14	19	20	Rail Traffic	0	1	1	14	826
722	167	Ground Floor	06.03.08	19:43:58	0.19	0.11	0.06	0.18	28	33	36	Rail Traffic	0	1	1	10	722
696	167	Ground Floor	06.03.08	17:51:43	0.19	0.11	0.07	0.19	40	33	26	Rail Traffic	0	1	1	11	696
697	167	Ground Floor	06.03.08	17:28:19	0.19	0.12	0.07	0.17	16	6	36	Rail Traffic	0	1	1	11	697
720	167	Ground Floor	06.03.08	19:37:03	0.18	0.11	0.06	0.18	36	33	20	Rail Traffic	0	1	1	11	720
716	167	Ground Floor	06.03.08	19:13:48	0.18	0.09	0.06	0.18	36	33	20	Rail Traffic	0	1	1	9	716
796	167	Ground Floor	07.03.08	8:51:06	0.37	0.16	0.12	0.37	18	34	32	Rail Traffic	0	1	1	11	796
836	167	Ground Floor	07.03.08	12:49:58	0.19	0.07	0.09	0.19	18	36	18	Rail Traffic	0	1	1	12	836
700	167	Ground Floor	06.03.08	17:59:18	0.18	0.11	0.06	0.18	38	33	24	Rail Traffic	0	1	1	11	700
675	167	Ground Floor	06.03.08	16:54:54	0.18	0.07	0.09	0.17	34	2	36	Rail Traffic	0	1	1	10	675
675	167	Ground Floor	06.03.08	16:43:02	0.18	0.10	0.06	0.18	12	28	18	Rail Traffic	0	1	1	10	675
692	167	Ground Floor	06.03.08	17:10:50	0.18	0.09	0.12	0.15	6	28	20	Rail Traffic	0	1	1	7	692
787	167	Ground Floor	07.03.08	8:05:31	0.18	0.08	0.09	0.16	38	19	14	Rail Traffic	0	1	1	10	787
793	167	Ground Floor	06.03.08	18:10:47	0.18	0.09	0.06	0.17	34	14	36	Rail Traffic	0	1	1	11	793
782	167	Ground Floor	07.03.08	8:40:44	0.16	0.09	0.05	0.15	12	14	14	Rail Traffic	0	1	1	9	782
809	167	Ground Floor	07.03.08	9:42:36	0.17	0.09	0.05	0.17	34	6	16	Rail Traffic	0	1	1	9	809
721	167	Ground Floor	06.03.08	19:38:36	0.17	0.09	0.06	0.17	16	16	16	Rail Traffic	0	1	1	11	721
831	167	Ground Floor	07.03.08	12:06:56	0.34	0.13	0.11	0.34	18	34	34	Rail Traffic	0	1	1	10	831
742	167	Ground Floor	06.03.08	21:23:33	0.17	0.10	0.06	0.16	34	28	36	Rail Traffic	0	1	1	11	742
805	167	Ground Floor	07.03.08	9:40:17	0.31	0.09	0.11	0.31	18	22	26	Rail Traffic	0	1	1	10	805
745	167	Ground Floor	06.03.08	21:41:08	0.17	0.09	0.05	0.16	34	30	30	Rail Traffic	0	1	1	11	745
825	167	Ground Floor	07.03.08	11:18:35	0.38	0.13	0.11	0.35	18	32	34	Rail Traffic	0	1	1	10	825
806	167	Ground Floor	07.03.08	9:34:44	0.17	0.08	0.06	0.17	16	34	16	Rail Traffic	0	1	1	9	806
780	167	Ground Floor	07.03.08	8:42:03	0.18	0.09	0.06	0.17	34	38	38	Rail Traffic	0	1	1	11	780
807	167	Ground Floor	07.03.08	9:52:38	0.18	0.10	0.06	0.17	34	34	36	Rail Traffic	0	1	1	12	807
690	167	Ground Floor	06.03.08	17:04:58	0.17	0.09	0.06	0.17	32	11	36	Rail Traffic	2	1	1	12	690
714	167	Ground Floor	06.03.08	19:08:31	0.17	0.09	0.07	0.16	34	2	32	Rail Traffic	0	1	1	11	714
823	167	Ground Floor	07.03.08	11:57:31	0.16	0.12	0.06	0.16	18	39	43	Rail Traffic	0	1	1	10	823
744	167	Ground Floor	06.03.08	22:57:16	0.16	0.08	0.07	0.15	12	38	36	Rail Traffic	0	1	1	10	744
843	167	Ground Floor	07.03.08	12:50:15	0.26	0.10	0.09	0.25	36	32	36	Rail Traffic	0	1	1	12	843
780	167	Ground Floor	07.03.08	8:24:46	0.42	0.10	0.13	0.47	18	32	36	Rail Traffic	0	1	1	20	780
794	167	Ground Floor	07.03.08	8:48:21	0.17	0.09	0.06	0.17	34	6	36	Rail Traffic	0	1	1	9	794
799	167	Ground Floor	07.03.08	9:04:26	0.19	0.09	0.05	0.19	34	2	32	Rail Traffic	0	1	1	12	799
684	167	Ground Floor	06.03.08	16:38:00	0.16	0.09	0.06	0.13	12	18	34	Rail Traffic	0	1	1	9	684
827	167	Ground Floor	07.03.08	10:59:22	0.23	0.11	0.08	0.22	36	18	32	Rail Traffic	0	1	1	11	827
783	167	Ground Floor	07.03.08	7:36:34	0.22	0.09	0.08	0.21	34	22	34	Rail Traffic	0	1	1	10	783
791	167	Ground Floor	07.03.08	8:36:17	0.19	0.10	0.06	0.19	34	36	36	Rail Traffic	0	1	1	11	791
673	167	Ground Floor	06.03.08	16:22:26	0.16	0.07	0.06	0.16	18	12	34	Rail Traffic	0	1	1	9	673
713	167	Ground Floor	06.03.08	18:55:06	0.16	0.10	0.10	0.13	36	36	36	Rail Traffic	0	1	1	7	713
772	167	Ground Floor	07.03.08	8:47:40	0.27	0.10	0.09	0.27	40	34	36	Rail Traffic	0	1	1	11	772
780	167	Ground Floor	07.03.08	7:50:06	0.28	0.12	0.10	0.26	2	2	2	Rail Traffic	0	1	1	10	780
689	167	Ground Floor	06.03.08	16:11:32	0.16	0.08	0.07	0.16	34	36	36	Rail Traffic	0	1	1	9	689
672	167	Ground Floor	06.03.08	16:28:53	0.15	0.07	0.05	0.13	14	32	34	Rail Traffic	0	1	0	8	672
121	167	Ground Floor	04.03.08	13:41:36	0.11	0.02	0.03	0.11	0	0	2	Rail Traffic	0	0	0	3	121
113	167	Ground Floor	04.03.08	11:53:43	0.04	0.02	0.03	0.04	0	0	34	Rail Traffic	0	0	0	2	113
119	167	Ground Floor	04.03.08	12:34:01	0.02	0.01	0.01	0.02	0	0	0	Rail Traffic	0	0	0	1	119
129	167	Ground Floor	04.03.08	14:01:18	0.02	0.02	0.01	0.01	0	0	0	Rail Traffic	0	0	0	1	129
139	167	Ground Floor	04.03.08	15:02:37	0.02	0.01	0.02	0.01	0	0	0	Rail Traffic	0	0	0	1	139

Total number of events: 152

Summary of Results

Vibration monitoring - 4 & 6-7 March 2008, Day [7:00-23:00]				
Highest Vector & Components of the above events at Location 1 - Ground Floor				
Source	Maximum Peak Particle Velocity (mm/s)			
	Vector Sum	X	Y	Z
Trains	0.45	0.25	0.15	0.45

Total number of events: 152

BS 6472 Human Response Criteria

Vibration monitoring - 4 & 6-7 March 2008, Day [7:00-23:00]			
Vibration Dose Value for the above events at Location 1 - Ground Floor			
Source	Vibration Dose Value ($mm/s^{1.75}$)		
	X_{VDV}	Y_{VDV}	Z_{VDV}
Trains	0.0034	0.0025	0.0499

Vibration monitoring - 6/7 March 2008, Night [23:00 - 7:00]

Location 1 - Ground Floor

Event No.	Sensor	Monitoring Location	Date	Trigger Time	Maximum Peak Particle Velocity (mm/s)				Dominant Frequency (Hz)			Dominant Source	Comments	Vibration Dose Value ($mm/s^{1.75}$)			Event No.
					Vector Sum	X	Y	Z	FX	FY	FZ			X_{VDV}	Y_{VDV}	Z_{VDV}	
774	167	Ground Floor	07.03.08	06:30:30	0.37	0.12	0.16	0.37	30	34	36	Rail Traffic	0	1	1	10	774
766	167	Ground Floor	07.03.08	01:16:44	0.38	0.15	0.12	0.34	30	36	42	Rail Traffic	0	1	1	11	766
765	167	Ground Floor	07.03.08	01:38:22	0.32	0.16	0.11	0.31	28	38	42	Rail Traffic	0	1	1	10	765
749	167	Ground Floor	06.03.08	23:26:56	0.20	0.26	0.14	0.19	2	2	24	Rail Traffic	0	1	1	10	749
747	167	Ground Floor	06.03.08	23:23:32	0.20	0.25	0.13	0.19	2	2	2	Rail Traffic	0	1	1	9	747
761	167	Ground Floor	06.03.08	23:37:79	0.29	0.24	0.11	0.11	2	2	2	Rail Traffic	0	1	1	11	761
760	167	Ground Floor	06.03.08	23:35:46	0.28	0.24	0.11	0.11	2	2	2	Rail Traffic	0	1	1	3	760
757	167	Ground Floor	06.03.08	23:31:09	0.28	0.24	0.11	0.10	2	2	2	Rail Traffic	0	1	1	2	757
753	167	Ground Floor	06.03.08	23:12:28	0.28	0.24	0.11	0.11	2	2	2	Rail Traffic	0	1	1	1	753
777	167	Ground Floor	07.03.08	06:47:42	0.37	0.16	0.09	0.37	40	34	36	Rail Traffic	0	1	1	10	777
763	167	Ground Floor	06.03.08	23:59:47	0.27	0.15	0.11	0.25	2	2	2	Rail Traffic	0	1	1	2	763
750	167	Ground Floor	06.03.08	23:07:22	0.22	0.19	0.09	0.20	2	2	2	Rail Traffic	0	1	1	1	750
752	167	Ground Floor	06.03.08	23:11:12	0.21	0.18	0.08	0.20	2	2	2	Rail Traffic	0	1	1	1	752
751	167	Ground Floor	06.03.08	23:10:52	0.21	0.18	0.09	0.20	2	2	2	Rail Traffic	0	1	1	1	751
755	167	Ground Floor	06.03.08	23:15:43	0.21	0.17	0.08	0.20	2	2	2	Rail Traffic	0	1	1	1	755
754	167	Ground Floor	06.03.08	23:14:36	0.21	0.18	0.08	0.20	2	2	2	Rail Traffic	0	1	1	1	754
779	167	Ground Floor	07.03.08	06:57:50	0.21	0.13	0.07	0.21	40	32	36	Rail Traffic	0	1	1	11	779
748	167	Ground Floor	06.03.08	23:25:31	0.20	0.17	0.07	0.20	2	2	2	Rail Traffic	0	1	1	1	748
758	167	Ground Floor	06.03.08	23:23:40	0.20	0.17	0.08	0.20	2	2	2	Rail Traffic	0	1	1	1	758
768	167	Ground Floor	07.03.08	01:20:18	0.19	0.09	0.06	0.19	34	32	36	Rail Traffic	0	1	1	11	768
769	167	Ground Floor	07.03.08	01:30:30	0.19	0.12	0.07	0.19	34	32	36	Rail Traffic	0	1	1	11	769
756	167	Ground Floor	06.03.08	23:20:26	0.19	0.13	0.07	0.19	2	2	2	Rail Traffic	0	1	1	1	756
784	167	Ground Floor	07.03.08	06:05:39	0.18	0.09	0.07	0.19	36	20	36	Rail Traffic	0	1	1	7	784

Total number of events: 23

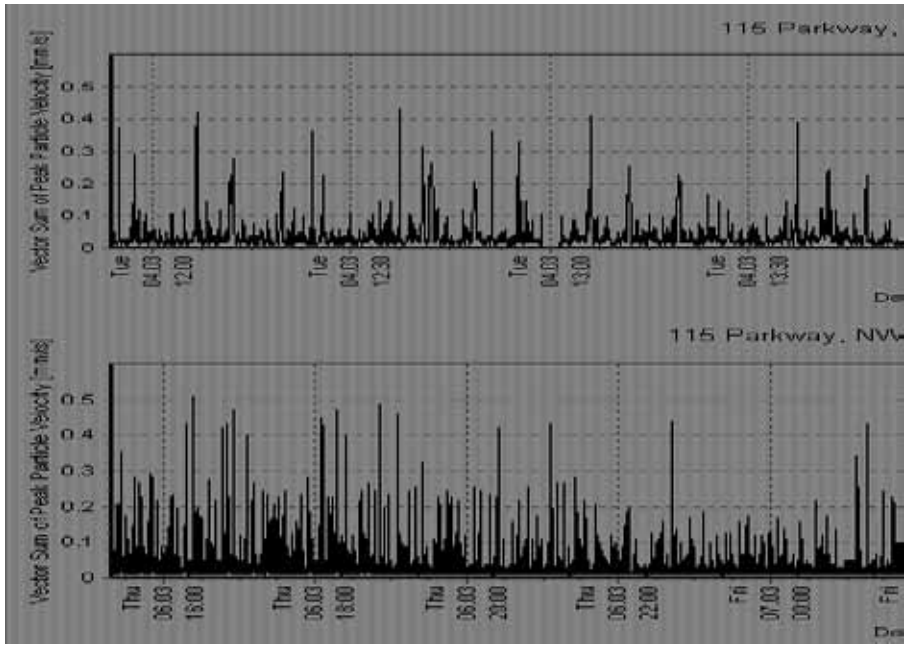
Summary of Results

Vibration monitoring - 6/7 March 2008, Night [23:00 - 7:00]				
Highest Vector & Components of the above events at Location 1 - Ground Floor				
Source	Maximum Peak Particle Velocity (mm/s)			
	Vector Sum	X	Y	Z
Trains	0.37	0.26	0.14	0.37

Total number of events: 23

BS 6472 Human Response Criteria

Vibration monitoring - 6/7 March 2008, Night [23:00 - 7:00]			
Vibration Dose Value for the above events at Location 1 - Ground Floor			
Source	Vibration Dose Value ($mm/s^{1.75}$)		
	X_{VDV}	Y_{VDV}	Z_{VDV}
Trains	0.0027	0.0016	0.0258



VELFAC 200 - Sound reduction windows

Tophung projecting light

Application. Sound reduction windows may be needed in any type of building, usually when positioned next to busy roads, but situations near railways or air flight paths are also common. Efficient glazing is fundamental to noise control. Double-glazing is effective at reducing external noise, but the use of thicker glass or different combinations of glass and laminates can significantly improve performance.

Function. Windows are given an Rw rating indicating the number of decibels by which they will reduce apparent noise. This value is formed by completing a test over a number of different frequencies. A standard VELFAC double glazed unit achieves Rw32, which can be increased to Rw41 by adjusting the thickness of the glass and the glazing rebate, or Rw48 by incorporating an independent internal sash.

Avoid surprises. Thicker glass inherently carries more weight, so sash sizes on acoustic façades are a major consideration. The desired level of acoustic performance may also require a 36 mm glazed unit, which will require a stepped sash profile.

Accessories (page 58-59):

A sound reduction window is available with the same accessories as the chosen opening function. However, the click vent is not suitable in combination with sound reduction windows.

Glazing: 4-16-4
Rw = 32 dB
Rw + C = 31 dB
Rw + Ctr = 27 dB

Glazing: 6-14-4
Rw = 35 dB
Rw + C = 34 dB
Rw + Ctr = 31 dB

Glazing: 3/0.38/3-14-4
Rw = 36 dB
Rw + C = 34 dB
Rw + Ctr = 31 dB

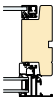
Glazing: 4-26-6
Rw = 37 dB
Rw + C = 35 dB
Rw + Ctr = 31 dB

Glazing: 4/0.76/4-24-4
Rw = 39 dB
Rw + C = 38 dB
Rw + Ctr = 34 dB

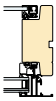
Glazing: 4/0.76/4-16-10
Rw = 41 dB
Rw + C = 39 dB
Rw + Ctr = 37 dB

Glazing: 4/0.76/4-12-4
Rw = 38 dB
Rw + C = 36 dB
Rw + Ctr = 33 dB

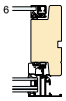
Glazing: 4/0.76/4-10-6
Rw = 39 dB
Rw + C = 37 dB
Rw + Ctr = 34 dB



Glazing: 4-16-4 + 6
Rw = 44 dB
Rw + C = 42 dB
Rw + Ctr = 40 dB



Glazing: 3/0.38/3-14-4 + 6
Rw = 47 dB
Rw + C = 46 dB
Rw + Ctr = 43 dB



Glazing: 4/1/4-10-4 + 6
Rw = 48 dB
Rw + C = 47 dB
Rw + Ctr = 44 dB

Sound reduction terms. The R_w-value indicates the number of decibels by which a window will reduce apparent noise.

R_w+C is an adustment factor to account for high frequency noise sources e.g. living activities (talking, music, radio, TV), railway traffic at medium to high speed, road traffic exceeding 80 kmh, or a jet aircraft.

R_w+C_{tr} is an adjustment factor to account for low frequency noise sources e.g. urban road traffic or railway traffic at low speeds.

VELFAC®

VELFAC 200 - Sash variations

Web No.: 52.324

Sash type: 24 mm standard profile.
Notes: Glazing rebate 24 mm. Simple and robust sash - provides a stylish and uniform façade.

Web No.: 52.1144

Sash type: 24 mm profile with groove.
Notes: Glazing rebate 24 mm. The groove makes the sash appear narrower reducing the visual impact of the frame.

Web No.: 52.328

Sash type: 24 mm wing profile.
Limitations: Not for VELFAC 237 sliding window door. Sidehung opening functions require a minimum of 15 mm tolerance on hinge side.
Notes: Glazing rebate 24 mm. Generates a shadow effect which reduces the visual impact of the frame.

Web No.: 52.394

Sash type: 36 mm step profile.
Limitations: Not for VELFAC 290 façade panels. Sidehung opening functions require a minimum of 15 mm tolerance on hinge side.
Notes: Glazing rebate 36 mm. Well suited for low energy and sound reducing windows and the fitting of integral blinds.

Web No.: 52.395

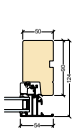
Sash type: 36 mm stepped wing profile.
Limitations: Not for VELFAC 237 sliding window door. Sidehung opening functions require a minimum of 15 mm tolerance on hinge side.
Notes: Glazing rebate 36 mm. Well suited for low energy and sound reducing windows and the fitting of integral blinds - also provides a shadow effect.

VELFAC 200 - Frame variations

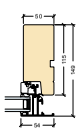
Frame variations. The VELFAC 200 System can be manufactured with a 90 mm, 115 mm or 140 mm deep mainframe. The 115 mm and 140 mm frame are used when special conditions apply, such as large spans, where additional strength is required for higher wind loads, or in new buildings where large cavities must be bridged by the window frame. The 115 mm and 140 mm frames also make it possible to maintain the position of the rear edge of the frame when used in refurbishment projects.

Almost all types of head, cill and jamb can be manufactured in all frame depths, however the following restrictions apply:

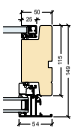
- 140 mm frame is not available as a 15 mm low threshold for patio doors, or for VELFAC 220 glass to glass corner, or as shaped windows
- 2+1 acoustic window with internal sash is only available only with 115 mm frame



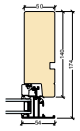
90 mm frame
Web No.: 200.24



115 mm frame
Web No.: 200.31

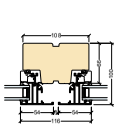


115 mm frame
with internal sash
Web No.: 200.88

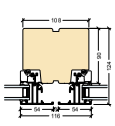


140 mm frame
Web No.: 200.97

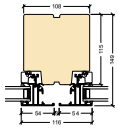
Other variations. VELFAC 200 mullions and transoms are supplied 66 mm deep as standard. Alternative depths are 90 mm and 115 mm.



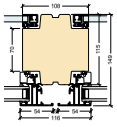
66 mm mullion
Web No.: 200.25
(transom: 200.26)



90 mm mullion
Web No.: 200.94
(transom: 200.92)



115 mm mullion
Web No.: 200.95
(transom: 200.93)



Mullion with inner sash
115 mm only
Web No.: 200.90
(transom: 200.91)

- Scale: 1:5 - these details with specifications can be downloaded as DWG, DXF and PDF files from the drawings section of our website: www.VELFAC.co.uk

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