

Section 12: Noise & Vibration

12.1 INTRODUCTION

This section of the EIS has been prepared by Byrne Environmental Consulting Ltd to identify and assess the potential noise and vibrational impacts that the redevelopment of O'Devaney Gardens, Dublin 7 may have on the receiving environment during the demolition, construction and operational phases of the proposed redevelopment. This section includes a comprehensive description of the existing ambient baseline noise climate in the vicinity of the subject site, a description of how demolition and construction activities may impact the ambient noise climate and finally, the mitigation measures that shall be implemented to control and minimise the impact that the development may have on ambient noise levels and to demonstrate how the development shall be constructed and operated in an environmentally sustainable manner to provide adequate noise insulation in residential units from external noise sources and from adjoining residential units.

This Section of the EIS has considered comments made by An Bord Pleanála in their Scoping Response ref. JS0007 which relate to the impacts of demolition and construction noise on residents within the Masterplan area and on adjacent areas.

12.2 METHODOLOGY

12.2.1 NOISE IMPACT ASSESSMENT

The existing ambient noise climate in the vicinity of the site has been characterised with information obtained from site specific baseline noise surveys conducted in the vicinity of the subject site. This Noise Impact Assessment presents a comprehensive impact assessment based on the criteria specified in the EPA's *Advice notes on Current Practice in the Preparation of Environmental Impacts Statements* and the *Guidelines on the Information to be contained in Environmental Impact Statements* also published by the EPA and with reference to *ISO 1996,2, 2007: Acoustics – Description, Measurement and Assessment of environmental noise*.

The construction phase noise impact assessment was based with reference to *British Standard BS5228 "Noise Control on Construction and Open Sites"*.

The methodologies applied in this section of the EIS to manage and control demolition and construction related noise have been discussed with and agreed by the Environment Department of Dublin City Council.

The operational phase of the development has been assessed with regard to the appropriate acoustic design of residential units to ensure that they comply with *Chapter 5.0 of the Sustainable Site and Building Design* of the proposed Dublin City Development Plan 2011-2017 which is reproduced as follows:

Acoustic privacy is a measure of sound insulation between dwellings and between external and internal spaces. Designing for acoustic privacy means delivering a high level of amenity by protecting the privacy of residents both within the dwelling and in any private open space.

BS 8233.1999 – Sound Insulation and Noise Reduction for Buildings – Code of Practice – sets out good acoustic planning in section 7.6.13. The following principles are recommended for minimizing disruption from noise in dwellings:

Acoustic Privacy

Utilise the site and building layout to maximize acoustic privacy by providing good building separation within the development and from neighbouring buildings and noise sources.

Arrange units within the development and the internal layout to minimize noise transmission by: locating busy, noisy areas next to each other and quieter areas next to quiet areas.

Keep stairs, lifts, and service and circulation areas away from noise sensitive rooms like bedrooms. Particular attention should be paid to the siting and acoustic isolation of the lift motor room.

Sound absorbent finishes should be used in corridor and stairwell areas to reduce the propagation of noise. Seals or double seals should be used at entry doors to reduce noise transmission from corridors or outside.

Separating walls between bathrooms or toilets and sensitive areas should be designed to minimize acoustic transmission.

Proposals close to noisy places, such as busy streets may need a noise impact assessment and mitigation plan.

12.2.2 VIBRATION IMPACT ASSESSMENT

The most significant potential sources of ground borne vibrations that may be generated during the construction phase of the development will be generated by the following practices:

- Ground preparation excavation activities that require the use of pneumatic rock breakers
- Demolition and concrete foundation excavation activities
- Piling Activities

With respect to the proximity of the closest receptors to the site boundaries, it will be necessary that where construction activities occur that may cause elevated ground vibrations that extend beyond the site boundaries, that a programme of vibration monitoring is conducted to ensure that the potential for cosmetic or structural damage occurring at any receptor is minimized.

In order to determine the potential for either cosmetic or structural damage to occur as a result of construction generated ground vibrations, vibration levels shall be monitored and assessed throughout the demolition and construction phases according to British Standard *BS 7385; Evaluation and measurement for vibration in buildings, Part1 1990 Guide for measurement of vibrations and evaluation of their effects on buildings* and *Part 2 1993 Guide to damage levels arising from ground borne vibration*.

12.3 THE BASELINE ENVIRONMENT

Baseline noise data in the vicinity of O'Devaney Gardens has been obtained from a noise monitoring surveys conducted by Byrne Environmental Consulting Ltd during August 2009. The baseline monitoring locations were selected in accordance with *ISO 1996,2, 2007: Acoustics – Description, Measurement and Assessment of environmental noise* and included locations in proximity to residential dwellings adjacent to the development areas.

Monitoring was conducted on a 24-hour continuous basis at 4 monitoring locations to establish the existing ambient noise levels expressed as Lden values during the daytime, evening and night time periods.

Meteorological conditions during the survey periods were generally cold, dry and with recorded on-site wind speeds of between 2.1m/sec – 3.8m/s.

Noise measurements were conducted using calibrated Bruel & Kjaer 2250 Type 1 Sound Level Analyser systems fitted with BZ-7132 logging software and B&K UA 1404 outdoor microphone kits.

Noise monitoring surveys were conducted under free-field conditions at a height of approximately 1.5m above ground and approximately 3.5m away from reflecting surfaces.

Noise levels are measured using a logarithmic noise scale (decibel) and are denoted dB(A). The "A" indicates that a frequency weighting has been applied to allow for the variation in the sensitivity of the human ear. The noise parameters used to describe the existing ambient noise climate are described as follows:

L_{Aeq} Is the average noise level during the measurement period, which includes all noise events.

L_{den} The day-evening-night composite noise indicator for assessing overall noise annoyance

A description of the baseline noise monitoring locations are presented below in Figure 12.1

The results of the baseline noise monitoring surveys are presented below in Tables 12.1a, 12.1b,12.1c, 12.1d.

Table 12.1a: N1 - O'Devaney Gardens Baseline Noise Survey Results			
Monitoring Location / Period	Recorded 24hr Noise Levels dB(A) Mean LAeq, 60min	Lden dB(A)	Dominant Noise
O'Devaney Gardens 04/03/10	60	64	Road Traffic

Table 12.1b: N2 - O'Devaney Gardens Baseline Noise Survey Results

Monitoring Location / Period	Recorded 24hr Noise Levels dB(A) Mean LAeq, 60min	Lden dB(A)	Dominant Noise
Ashford Street ----- 26/08/09	55	59	Road Traffic

Table 12.1c: N3 - O'Devaney Gardens Baseline Noise Survey Results

Monitoring Location / Period	Recorded 24hr Noise Levels dB(A) Mean LAeq, 60min	Lden dB(A)	Dominant Noise
Montpellier Gardens ----- 04/03/10	55	59	Road Traffic

Table 12.1d: N4 - O'Devaney Gardens Baseline Noise Survey Results

Monitoring Location / Period	Recorded 24hr Noise Levels dB(A) Mean LAeq, 60min	Lden dB(A)	Dominant Noise
St Bricins Hospital ----- 02/03/10	57	61	Internal Traffic

Figure 12.1 O'Devaney Gardens Baseline Monitoring Locations N1 – N4



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12.3.1 ENVIRONMENTAL NOISE CONTEXT

O'Devaney Gardens is situated in an urban setting off the North Circular Road in Dublin 7 in proximity to the Phoenix Park and approximately 1km west of the city centre. The urbanised area in which O'Devaney Gardens is located is a significant source of road traffic related noise. It is noted that there are no major sources of industrial noise within 1km of the site. The ambient noise climate at O'Devaney Gardens may be classified as being typical of an urban environment which varies based on the proximity of site boundaries to major roads such as the North Circular Road. Varying levels of traffic noise influence the existing ambient noise climate at the site during the early morning, daytime and evening periods and to a lesser extent during the night time period after midnight when road traffic volumes decrease.

12.3.2 ENVIRONMENTAL NOISE CHARACTER

N1 O'Devaney Gardens

The noise climate at the western boundary of the O'Devaney Gardens complex is characterised by road traffic noise entering and exiting the area and from traffic noise from The North Circular Road.

N2 Ashford Street

The noise climate at Ashford Street is influenced by passing local road traffic noise.

N3 Montpellier Gardens

The noise climate at Montpellier Gardens is influenced by passing local road traffic noise.

N4 St. Bricin's Hospital

The noise climate at St. Bricin's Hospital is influenced by internal military traffic within the hospital grounds.

12.3.3 SIGNIFICANCE

Based on the recorded baseline noise surveys conducted in the vicinity of the proposed development site, it may be concluded that the existing noise levels are range between being relatively high towards the western site boundary to relatively low towards the eastern site boundary.

12.3.4 SENSITIVITY

The proposed site and the surrounding area can be classified as a noise sensitive location given that there are a number of residential units in O' Devaney Gardens which shall continue to be occupied during the phased redevelopment of the O' Devaney Gardens area. It is therefore important to ensure that there is a good quality noise environment for its continued use. The adjacent existing residential areas are also noise sensitive, and it is also desirable that there is no unacceptable increase in the noise climate during the demolition/construction phases and during the operational phase and that the short term noise exposure during the construction phase is managed and controlled to acceptable levels.

The human ear responds to noise in a non-linear manner. A description of the subjective perception of changes in noise levels is described in Table 12.5. An increase in traffic flow of 50% would result in an increase of noise level of 2 dB. A change in traffic noise of less than 2 dB is however generally not noticeable to the human ear. The noise environment as perceived by residents is therefore only slightly sensitive to the noise generated by marginal increase in traffic flows.

Changes in noise levels of 3 to 5 dB would however be noticeable and, depending on the final noise level, there may be a slight or moderate noise impact. Changes in noise level in excess of 6 dB would be clearly noticeable, and depending on the final noise level, the impact may be moderate or significant.

Traffic noise levels in excess of 60 dB(A) (averaged over the day, evening and night-time period, termed L_{den}) are considered to be potentially intrusive. For new roads projects the National Roads Authority design target is to mitigate when predicted levels exceed 60 dB(A) L_{den} .

Noise at night can prove more disturbing than during daytime. At the site of the proposed development, the noise generated by any future building services associated with any ground floor commercial/retail units within the development needs to be considered. For night-time services noise, it is relevant to consider the WHO (World Health Organisation) guidelines. These suggest levels 45dB(A) or less at night, when measured 1m from the external facade of a noise sensitive location (such as a residential unit, hospital, school or church). In the absence of other national standards, these levels are often used as guideline limits in assessing building services noise impacts.

Table 12.2: Subjective Response to Changes in Noise Level, and Description of Typical Noise Levels		
Change in Noise Level	Subjective Perceived Change	%Change in Loudness
0 dB	No change	0%
1 to 2 dB	Negligible change	10%
3 to 5 dB	Noticeable change	30%
6 to 9 dB	Clearly noticeable	70%
>10 dB	Substantial change	>100% (more than twice as loud)
Level	Description of Traffic Noise	
<45 dB(A)	Very low traffic noise	
45-50 dB(A)	Low level, quiet residential area	
50 - 60 dB(A):	Low to moderate – audible but not intrusive indoors	
60-65 dB(A):	Moderate level, clearly audible, slightly intrusive	
>65 dB(A):	Loud traffic noise – typical busy town centre	
>75 dB(A)	Very loud – close to roadside with fast traffic (motorway)	

Use of the 45dB(A) guideline limit in setting services noise criteria can result in a significant increase in the night time noise level. Consequently, it is generally more appropriate to set a services noise emission target relative to the existing background noise. *BS 4142, "Rating Industrial Noise Affecting Mixed Residential and Industrial Areas"*, sets out a methodology which can be used to establish acceptable levels of services noise.

According to *BS 4142* there is a likelihood of noise complaints when additional noise from a development significantly exceeds the existing background noise level, typically by 10dB or more. When the additional noise is equal to or lower than the background noise, complaints are considered unlikely.

12.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The proposed development involves the demolition of the existing residential flat complexes and the construction of new residential units and retail/commercial units at ground level.

The redevelopment of the site will be conducted in the following phased stages:

Phase 1A 110 residential units in four blocks A to D

Open Space Neighbourhood Park 4,680 sq.m.

Phase 1B	<u>Mixed Use Neighbourhood Centre</u> 1,090 sq.m. supermarket 790 sq.m. ancillary retail units 1,280 sq.m. community and office space 48 elderly housing units
Phase 2	Option 1: 240 residential units Option 2: 120 residential units, 8,000 commercial uses, public open space 1,100 sq.m.

12.4.1 SITE SET UP

The set up of the site prior to works commencing shall include the following:

- Isolation of site from adjoining areas by security hoarding (3m high solid wooden structure)
- Demarcation of site compounds and installation of site offices and staff facilities
- Demarcation of staff car-parking area
- Demarcation of vehicle storage area
- Demarcation of materials storage area
- Demarcation of waste storage area

In addition, at the outset of commencement of site activities, continuous noise monitoring locations shall be identified and established at local noise sensitive receptors to ensure that all site activities are controlled and managed to minimise the noise impact on the receiving environment as detailed below in Section 12.7.

12.4.2 PRE-DEMOLITION WORKS

All buildings shall be stripped of glass, internal fixings, asbestos material prior to demolition and waste materials shall be segregated on site prior to export off-site by an appropriately permitted waste contractor.

12.4.3 DEMOLITION WORKS

Buildings shall be demolished by approved methods and in a manner that reduces the impact on ambient noise levels.

12.4.4 SITE CLEARANCE

Construction and Demolition (C&D) waste shall be segregated as per the requirements of the Waste Management Plan for the site and shall be exported off-site by an appropriately permitted waste contractor.

12.4.5 CONSTRUCTION WORKS

The proposed new residential buildings shall be constructed in a phased basis in a manner that reduces the impact on ambient noise levels.

12.4.6 OPERATIONAL PHASE

The proposed new residential buildings shall be designed and shall be constructed to a high acoustic standard that ensures the following:

- a .Acoustic Privacy between adjoining residential units
- b. Acoustic insulation of residential units from external noise sources, such as traffic noise and social noise and from ground floor retail/commercial activity including extraction vents and air conditioning units.

12.5 PREDICTED IMPACTS OF THE PROPOSED DEVELOPMENT

12.5.1 'DO NOTHING IMPACT'

O'Devaney Gardens is comprised of 9 large blocks of flats which were constructed in the mid 1960's. The existing buildings, due to their age, design and nature of construction are considered to be acoustically inefficient in that the existing residential units suffer from an unacceptable breakthrough of external environmental noise such as road traffic noise and from a lack of acoustic privacy between adjoining units. If the subject site is maintained as a large housing development, residents shall continue to be exposed to external and internal intrusive noise levels which has a detrimental impact on a residents enjoyment of their amenity.

Retrospectively refitting the O'Devaney Gardens Flats to an acceptable acoustic standard that complies with current *Department of the Environment, Heritage and Local Government Building Regulations 1997, Technical Guidance Document E – Sound* would require the replacement of all external windows with acoustically rated windows and the reconstruction of internal party walls and dividing floors. These works would involve major investment and very significant disruption to residents while works were conducted and as such, is not a viable option.

12.5.2 PREDICTED IMPACT

This section identifies the potential impacts that the demolition, construction and the operational phases of the proposed redevelopment may have on the local receiving noise environment, on adjacent residential properties, local retail and commercial activities and on human health.

The demolition works for the Phase 1 site are mostly completed on lands which have recently received Part 8 approval for the removal of the blocks on the north end of the site. It is predicted that the demolition and construction phases shall result in an increase in noise levels in the area as well as introducing tonal and impulsive noise as a result of construction activities such as pneumatic breaking, cutting, excavating, vehicle movements and general manual construction activities.

Site Set-Up

The setting up of the site shall involve the construction of site security hoarding and site compounds, site offices and staff welfare facilities. These

short term activities will have a minimal potential to generate excessive noise levels.

Limited site clearance and ground excavation may also occur at this stage and these activities do have the potential to generate excessive noise levels from the operation of mechanical plant such as excavators and the movement of trucks at the site and on local public roads.

The movement of trucks to and from the site shall result in an increase in the volume HGV's within the immediate area and along the proposed haul routes which will generate additional noise levels.

Demolition Phase

The demolition phase of the re-development of O'Devaney Gardens shall be conducted utilising standard demolition techniques as follows.

Manual Stripping of buildings of internal fixings, metals, glass and asbestos.

This stage of demolition will generate medium levels of noise generated principally as a result of manual works involving hand held power tools. As these works will occur generally within the structures of the buildings, there will not be a significant noise impact from these activities.

Demolition of structures

The demolition of the structures shall be facilitated by the use of mechanical crushers, pneumatic hammers and excavators and the use of manual steel cutting equipment. These activities by their nature shall generate significant noise levels.

Removal of C&D waste from site

With regard to the significant volume of bulky waste material principally comprising of concrete, soil, metal and wood that shall be generated by the demolition of the buildings, there will be a requirement for a significant volume of HGV trucks to remove the material from the site. Based on the associated Traffic Impact Assessment for the proposed development, it is predicted that there will be up to 110 HGV movements per day associated with the Demolition and Construction Phases of the development.

The movement of the on-site C&D waste stockpile by excavator and loading shovel and the subsequent loading of the waste material onto HGV's has the potential to generate increased levels of noise on-site.

The transport of C&D waste from the site by HGV shall generate increased levels of noise both within the site and on local public roads.

The predicted maximum noise levels that will be experienced at the nearest residences as a result of demolition activities have been calculated using the activity L_{Aeq} method outlined in *BS 5228 1:2009 – Code of Practice for noise and vibration control on construction and open sites – Part 1 Noise*

The equivalent continuous sound pressure levels measured at a reference distance of 10 metres for the individual items of plant to be used on-site are presented in Table 12.3 below and the predicted noise levels are presented in Table 12.4.

Table 12.3: Noise Levels Associated with Demolition Activities	
Plant Item	LAeq @ 10m dB(A)
Generator (enclosed)	70
Compressor(enclosed)	73
Tracked Excavator with pneumatic hammer No. 1	78
Tracked Excavator with pneumatic hammer No.2	78
HGV No. 1	77
HGV No. 2	77
Concrete / Steel Cutting Equipment	84

Table 12.4: Predicted Noise Levels from Demolition Activities		
Mean receptor distance from site boundary	Predicted level LAeq dB(A)	Rated Predicted Level +5dB LAeq, 60min dB(A)
40m	61	66

The maximum predicted $L_{Aeq,1hr}$ value of 61dB(A) was calculated at a mean distance of 30m from the closest receptors to the site.

Given the nature of demolition activities which will generate impulsive noise, a tonal penalty of +5 dB(A) is added to the predicted value resulting in a rated $L_{Aeq,1hr}$ value of 66dB(A).

Construction Phase

Construction Activity Noise

During the construction phase there will be extensive site works, involving construction machinery, construction activities on site, and construction traffic, which will all generate noise. The highest noise levels will be generated during the site preparation works, foundation construction activities and on site general construction activities. The construction noise levels will be of a relatively short term duration and will only occur during daytime hours which will serve to minimize the noise impacts at local existing receptors.

The proposed construction phase noise mitigation measures as detailed in Section 12.6 shall ensure that all construction activities are controlled and managed and audited by an independent acoustic consultant to ensure that the mitigation measures are implemented throughout the construction phase.

The predicted maximum noise levels that will be experienced at the nearest residences as a result of construction activities have been calculated using the activity L_{Aeq} method outlined in *BS 5228 1:2009 – Code of Practice for noise and vibration control on construction and open sites – Part 1 Noise*

The equivalent continuous sound pressure levels measured at a reference distance of 10 metres for the individual items of plant to be used on-site are presented in Table 12.5 below and the predicted noise levels are presented in Table 12.6.

Table 12.5: Noise Levels Associated with Construction Activities	
Plant Item	LAeq @ 10m dB(A)
Generator (enclosed)	70
Compressor(enclosed)	73
Tracked Excavator	78
Wheeled Excavator	76
HGV No. 1	77
HGV No. 2	77
Tower Crane	66
Fork Lift	74
Concrete / Steel Cutting Equipment	84

Table 12.6: Predicted Noise Levels from Construction Activities		
Mean receptor distance from site boundary	Predicted level LAeq dB(A)	Rated Predicted Level +5dB LAeq, 60min dB(A)
40m	59	64

The maximum predicted $L_{Aeq,1hr}$ value of 59dB(A) was calculated at a mean distance of 30m from the closest receptors to the site.

Given the nature of demolition activities which will generate impulsive noise, a tonal penalty of +5 dB(A) is added to the predicted value resulting in a rated $L_{Aeq,1hr}$ value of 64dB(A).

Construction Traffic Noise

Based on the assumption of up to 110 HGV movements per day on the haul routes to and from the site along public roads as specified in the TIA, the resulting average traffic noise level at the houses adjacent to the haul routes is calculated as follows:

The predicted noise levels at any receptor located within 5m of the haul route road has been calculated using a standard international acoustical formula as described below.

$$L_{Aeq, T} = SEL + 10\log_{10}(N) - 10\log_{10}(T) + 20\log_{10}(r_1/r_2) \text{ dB}$$

where

- $L_{Aeq, T}$ is the equivalent continuous sound level over time period (T) (3600 sec);
- SEL is the A weighted Sound Exposure Level of the noise event (77dB);
- N is the number of events over the time period T (11);
- r1 is the distance at which SEL is assessed (5m)

r2 is the closest distance to the receptor from the road (5m)

The calculations assumed a typical scenario of 11 truck movements per hour based on a 10 hour working day (7am – 7pm) , a maximum Sound Exposure Level of 77 dB(A) for the trucks and the minimum distance between the local road passing by each of the nearest noise sensitive receptors to the public road (5m).

The maximum predicted $L_{Aeq, 1hr}$ values as a result of the HGV traffic movements at the nearest noise sensitive receptors located along the haul route roads is predicted to be 51dB(A), $L_{Aeq, 1hr}$.

It is not expected that the predicted short-term increase in HGV movements associated with the construction phase of the development will have an adverse impact on the existing noise climate of the wider area or on local receptors and would not increase the L_{den} of any location on O'Devaney Gardens or in the Dublin City Area.

Vibration

Depending on the methods of construction that will be implemented at the site, there will be the potential for vibration impacts to occur as a result of demolition works, ground preparation activities and foundation construction. Ground vibrations shall be monitored at adjacent buildings during demolition and construction works to ensure that vibration levels do not adversely impact any building or structure located in the vicinity of the site.

Operational Phase

The noise aspects to be considered for the completed development can be divided into two categories: noise impacts on neighbouring residential receptors, and noise impacts within the development itself.

The main potential for altering the noise environment would be traffic noise associated with the development. Sounds generated by everyday domestic activities, pedestrians, children, and use of open spaces, are part of everyday living, and are not considered “noise” in the sense of a potential nuisance. This activity noise would not have any potential for impact beyond the boundaries of the site, and negligible potential within the site.

Regarding noise aspects within the proposed development itself, the aspects to be considered are: suitability for residential development, in terms of the existing noise climate and avoidance of potential conflicts in terms of activity noise within the development itself. This includes aspects of commercial noise arising from the proposed ground floor commercial / retail units. Appropriate design of the commercial units to ensure that the building structure provides a very high degree of sound insulation between ground floor units and 1st floor residential units shall ensure that the operation of the commercial units do not have an adverse noise impact on any residential unit.

The operational phase of the development shall be assessed with regard to the appropriate acoustic design of residential units to ensure that they comply

with *Department of the Environment, Building Regulations 1997, Technical Guidance Document E – Sound (as amended)*

Building services noise issues for the residential development are likely to be negligible.

There is potential for the breakthrough of internal noise between adjoining residential units and the intrusion of external environmental noise into residential units and as such the proposed new residential buildings shall be constructed to ensure a high degree of internal acoustic privacy between adjoining units and to a standard that ensures a high degree of acoustic insulation from external noise sources.

There will be up to 360 residential, office and retail car parking spaces included in the entire proposed O'Devaney Gardens development. These vehicle movements shall predominantly occur during peak morning and evening times and will increase the existing ambient noise levels in the area, however given that there shall be three access routes into O'Devaney Gardens the movement of vehicles shall be distributed to different local road networks. It is predicted that the additional traffic movements associated with the entire development will not have an unacceptable noise impact on existing ambient noise levels on existing road networks.

Cumulative Noise Impacts

In accordance with Schedule 6, Part 2(c) of the Planning and Development Regulations 2001, this chapter has considered the cumulative impact of the proposed Phase 1 development in conjunction with future phases of development. This relates to the cumulative impact on the subject site itself and on surrounding sites.

The European Commissions report of May 1999 'Guidelines for the Assessment of Indirect and Cumulative Impacts' as well as Impact Interactions' defines cumulative impact as follows:

"Impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the project".

It is noted that the Scoping Response received from An Bord Pleanála indicates that:

"An assessment of the impact of Phase 1 within the Master Plan area, and the cumulative impact of Phase 1A, Phases 1B and 2 on the surrounding fringe areas bordering the master plan site, should be provided within the EIS".

Phase 1A of the proposed development comprises of:

110 residential units in four blocks A to D
Open Space Neighbourhood Park 4,680 sq.m.

Future phases of development, which will be subject to separate applications for development envisage the following:

Phase 1B	<u>Mixed Use Neighbourhood Centre</u> 1,090 sq.m. supermarket 790 sq.m. ancillary retail units 1,280 sq.m. community and office space 48 elderly housing units
Phase 2	Option 1: 240 residential units Option 2: 120 residential units, 8,000 commercial uses, public open space 1,100 sq.m.

These figures are approximate and are subject to change as the Masterplan for the area progresses during future phases of development. The location of each Phase of development is indicated on the submitted Masterplan prepared by Dublin City Council.

With regard to the cumulative impact of proposed future phases on the noise climate of the O'Devaney Gardens area, future phases of development will take place on a brownfield site and will form part of the comprehensive redevelopment and rejuvenation of the existing social housing on O'Devaney Gardens Lower. In this regard, the cumulative impact of the overall development is expected to be negligible as development is taking place on a previously developed site and the primary residential use of the site is being retained.

It is considered that there will be short to medium term moderate negative impacts associated with the construction phase of the project over all phases of development. It is considered that there will be a long term positive impact as a result of the proposed development, due to the modern residential facilities being provided, the improved visual impact on the surrounding area, improvements to the streetscape and public realm, and the provision of commercial, retail and community floorspace to serve the needs of the local community.

There are currently no proposals for other developments in the immediate vicinity of the subject sites boundaries which would generate increased levels of noise or vibrations.

It is noted that the proposed Metro North development and the proposed DART Underground developments are not located in proximity to the O'Devaney Gardens site and as such, there will be no perceptible noise or vibrational impacts associated with the construction or operational phases of these proposed transport developments.

Noise Impact Assessment Criteria

The recommended construction noise limits for the O'Devaney Gardens Redevelopment Project are presented in Table 12.7. These limits represent a reasonable compromise between the practical limitations in a construction project, and the need to ensure an acceptable ambient noise level for the nearby residents. In addition to the standard workday criterion of 75 dB(A), the criteria specify a reduced limit of 65 dB(A) for work on Saturdays, and 60 dB(A) for evening periods, and Sundays and Bank holidays. While these criteria were developed for roads projects, they are also applicable to general

construction projects. The limits are similar to limits which have previously been employed for construction projects in Ireland.

Period	Times	LAeq (1hr) dB
Monday to Friday 7m-7pm	07.00 to 19.00	75
	19.00 to 07.00	45
Saturday	08.00 to 16.30	65
Sundays and Bank Holidays	08.00 to 16.30	60

The predicted demolition and construction phase noise levels as detailed in Sections 12.5.2 and Tables 12.4 and 12.6 comply with the recommended daytime noise limit values.

12.6 MITIGATION MEASURES

12.6.1 GENERAL CONSTRUCTION SITE MANAGEMENT

The following noise management measures shall be implemented at the site from the outset of site activities to control and manage noise levels during the demolition and operational phases.

- An independent acoustic consultant shall be engaged by the contractor prior to the commencement of site activities to ensure that all noise mitigation measures as specified in this Section of the EIS are implemented and to prepare a site specific *Construction Phase Noise Management Plan*. The Plan shall include all relevant noise and vibration control measures as specified in *BS 5228:1997 – Noise and Vibration Control on Construction and Open Sites*. The Plan shall be submitted to Dublin City Council for approval.
- The nominated contractor shall appoint a designated person to manage all environmental complaints including noise.
- A noise complaint procedure shall be implemented in which the details of any noise related complaint are logged, investigated and where required, measures are taken to ameliorate the source of the noise complaint.
- A 3m solid and continuous wooden hoarding shall be erected around the entire site perimeter and shall serve to be an effective acoustic barrier.
- Appropriate signage shall be erected on all access roads in the vicinity of the site to inform HGV drivers that engines shall not be left idling for prolonged periods and that the use of horns shall be banned at all times.
- HGV's queuing on any local or public road shall not be permitted and it shall be the responsibility of site management to ensure this policy is enforced.

- The hours of operation for the site shall be limited to the following hours:

07:00hrs – 19:00hrs Monday to Friday
07:00hrs – 14:00hrs Saturday
Closed on Sundays and Bank/Public Holidays
- All onsite generator units (if required) used to supply electricity to the site shall be super silenced and located away from any receptor.

12.6.2 DEMOLITION & CONSTRUCTION PHASE NOISE MITIGATION

In order to ensure that the demolition phase of the development does not have an unacceptable impact on existing ambient noise levels, a strictly enforced noise management programme shall be implemented at the site from the outset of demolition activities.

- The principal of controlling noise at source shall be implemented at the site. Best practice mitigation techniques as specified in *BS 5228:1997 – Noise and Vibration Control on Construction and Open Sites* for the Construction and Demolition Sector shall be implemented during the demolition phase and are detailed in this Section.
- A 3m high solid wooden hoarding surrounding the development site shall act as an effective noise barrier.
- All plant where possible shall be low noise rated.
- High noise activities such as pneumatic hammering shall not occur before 09:00hrs and not after 17:00hrs Mondays to Fridays.
- Where necessary the use of enclosures and noise screens shall be used to control noise from plant.
- Plant shall be located away from the closest noise sensitive receptors where practicable.
- All site vehicles shall either be turned off when not in use or throttled down when idle.
- Site plant and vehicles shall be maintained to ensure they are not excessively noisy.
- Vibration sources such as compressors, pumps or generators shall be isolated and placed on anti-vibration pads to minimise ground vibrations and vibrational noise.
- Site offices / cabins shall be grouped together in a manner that forms an additional noise barrier relative to the closest receptors to the site boundaries.
- Noise measurements shall be conducted in accordance with the requirements of *ISO 1996: Acoustics – description and measurement of environmental noise*. The measurement parameters to be recorded

include wind speed, temperature, L_{Aeq} , L_{A90} , L_{A10} and L_{Amax} . Noise measurements shall be conducted at the closest receptors to the site on a routine (weekly) basis to verify the effectiveness of all noise mitigation measures.

12.6.3 DEMOLITION & CONSTRUCTION PHASE VIBRATION MITIGATION

The following demolition and construction phase vibration mitigation measures shall be implemented:

- In order to ensure that site demolition / construction activities are conducted to minimise the vibration impacts on the receiving environment, structural vibration monitoring shall be conducted during the course of the project works. It is proposed that vibration monitoring will be conducted at adjacent properties as required using calibrated vibration monitors and geophones and that audible and visual alarm units may be installed to ensure that if vibration levels approach or exceed specified warning and limit values, site personnel will be alerted to cease at the earliest instance and appropriate mitigation measures may then be implemented to minimise the vibrational impacts of protected structures.
- The transient vibration guide values for cosmetic damage as specified in British Standard *BS 7385: Evaluation and measurement for vibration in buildings, Part 2 1993 Guide to damage levels arising from ground borne vibration* is 15 mm/sec Peak Component Particle Velocity at 4 Hz increasing to 20 mm/sec at 15 Hz. This limit value rises to 50 mm/sec at frequencies of 40 Hz and greater. The applied conservative limit of 12.5 mm/sec PPV (peak particle velocity) applied for this assessment is significantly lower than these levels.
- The limit level of permissible vibration is 12.5 mm/sec (PPV) is specified in *BS 7385 : 1993*. This international standard states that “..the probability of damage tends towards zero at 12.5 mm/sec ppv” and as such it is considered appropriate to adopt this conservative limit value for this assessment, however, a lower limit value of 5 mm/sec (PPV) shall be prescribed for all protected structures in the vicinity of the site.

12.6.4 OPERATIONAL PHASE NOISE MITIGATION

The operational phase of the development is unlikely to have an adverse noise impact on the receiving environment, on the redeveloped residential units during the phased construction programme or on existing residential development adjacent to the site.

It is considered that the design of the development shall result in a positive noise impact in that the residential units shall be constructed to ensure the maximum degree of sound insulation is provided to minimise the breakthrough of external noise such as road traffic and shall offer internal privacy between adjoining residential units and ground floor retail/commercial units.

At the earliest stage during the construction phase, residential test units shall be constructed to their finished level and shall be tested by a suitably qualified independent Acoustic Consultant to ensure that they comply with *Department of the Environment, Building Regulations 1997, Technical Guidance Document E – Sound*. Guidance Document E is currently under review by the DOEHLG and it is expected that a higher specification for airborne sound and impact sound insulation between residential units shall be incorporated into the revised document. Table 12.9 provides detail on the recommended sound insulation values that shall be achieved to ensure acoustic privacy between adjoining residential units.

Table 12.9: Recommended Sound Insulation Limit Values		
Dwelling Houses	Airborne Sound Insulation DnTw dB (minimum values)	Impact Sound Insulation LnTw dB (maximum values)
Floors & Stairs	45	62
Walls	45	N / A

The following operational phase noise mitigation measures shall be implemented:

- Sound Insulation testing shall be conducted following the completion of each phase of the development to further verify compliance with Building Regulations.
- All external windows shall be triple glazed acoustically rated windows and frames to prevent the breakthrough of external noise including road traffic and social noise.
- Passive air vents on all external walls of all residential units shall be acoustically rated baffle filters to reduce the breakthrough of external noise into all residential units.
- All extraction ducting that may be incorporated into the ground floor retail/commercial units shall be appropriately constructed to ensure that vibration borne noise shall not occur within the building.
- All extraction fans serving any retail/commercial unit shall be located away from any residential unit, shall be installed in an acoustic enclosure and shall include acoustic silencers and baffles to minimise noise.
- Heating systems shall be located in the basement of the building structures and shall be contained in sound insulated rooms. All plant shall be set on anti-vibration mounts on floors and walls.
- All ventilation and air extraction systems serving building plant shall be located away from any residential unit and shall include acoustic silencers and baffles to minimise noise.

- All shop/supermarket retail units at ground floor level shall include low noise floor coverings in all retail area and storage areas. Deliveries to all retail units shall be limited to daytime hours. Delivery areas shall be enclosed to ensure that noise shall not adversely impact the closest receptors in Montpellier Gardens to the south of the site.

12.7 MONITORING

This section describes the noise and vibration monitoring methodologies that shall be implemented at the site to ensure that demolition and construction site activities do not cause excessive nuisance or cause cosmetic or structural damage to properties in the vicinity of the site.

In addition, this section also specifies how the constructed residential units shall be tested for sound insulation in compliance with Building Regulations.

12.7.1 PROPOSED NOISE MONITORING PROGRAMME DURING SITE ACTIVITIES

The following noise monitoring measures shall be implemented:

- On commencement of the site demolition / construction activities, noise monitoring shall be conducted in the vicinity of the site to assess the impact that site activities may have on local external noise levels and on ambient noise levels on local receptors.
- It is proposed to conduct continuous noise monitoring surveys to establish the noise impacts of site activities at the closest receptors to the site and to ensure that control measures are implemented if elevated noise levels are recorded.
- All noise monitoring data will be compiled into a technical monitoring report which will include a full assessment of the potential noise impacts arising from site construction activities.
- The environmental noise measurements will be completed in accordance with the requirements of *ISO 1996: Acoustics – description and measurement of environmental noise*. The measurement parameters to be recorded include wind speed, temperature, L_{Aeq} , L_{A90} , L_{A10} and L_{Amax} .

Noise Monitoring Locations

The monitoring locations selected for the noise monitoring survey will be at residential noise sensitive receptors within and adjacent to the site boundaries.

The monitoring locations will be determined according to the guidelines in *ISO 1996 Acoustics - Description and Measurement of Environmental Noise* and the EPA publication, "*Environmental Noise Survey, Guidance Document*".

Noise Monitoring Frequency

Noise monitoring shall be conducted on a continuous basis for a period as required in the vicinity of the residence closest to the phase of site works.

Short term noise measurements will also be conducted as appropriate so as to ensure that all on-site noise sources are identified and an audit of site activities including acoustic enclosures and inspection of individual items of plant will be conducted to ensure that all noise sources are minimised and to ensure that the recommendations of *BS5228* are complied with.

Where pumps, generators or other vital machinery are required to be used overnight, a noise assessment will be conducted to ensure that noise generated is not unacceptable and that any acoustic enclosure fitted is suitable and effective in minimising noise emissions.

12.7.2 PROPOSED VIBRATION MONITORING PROGRAMME DURING SITE ACTIVITIES

In order to ensure that site demolition / construction activities are conducted to minimise the vibration impacts on the receiving environment, it is proposed that a programme of structural vibration monitoring is implemented during the course of the project works. It is proposed that vibration monitoring will be conducted at adjacent properties opposite the site boundaries as required using calibrated vibration monitors and geophones and that audible and visual alarm units may be installed to ensure that if vibration levels approach or exceed specified warning and limit values, site personnel will be alerted to cease at the earliest instance and appropriate mitigation measures may then be implemented to minimise the vibrational impacts of protected structures.

Vibration Monitoring Locations

It is proposed that vibration monitoring will be conducted on the closest properties to any particular phase of groundworks which may involve piling or rockbreaking or other activities that have the potential to generate high levels of ground vibrations.

The monitoring points chosen for locating the geophone of the vibration measuring instrument will be chosen according to the guidelines in British Standard *BS 7385: Evaluation and measurement for vibration in buildings, Part 1 1990 Guide for measurement of vibrations and evaluation of their effects on buildings* and *Part 2 1993 Guide to damage levels arising from groundborne vibration*.

Vibration Monitoring Frequency

Vibration monitoring equipment capable of monitoring on a continuous basis will be installed at locations as described above, throughout the course of the works where particular site activities may cause ground borne vibrations.

12.8 REINSTATEMENT

Reinstatement issues are not relevant to this chapter of the EIS.

12.9 REFERENCES

- *BS 5228:1997 – Noise and Vibration Control on Construction and Open Sites.*
- *EPA publication, “Environmental Noise Survey, Guidance Document”.*
- *ISO 1996-2, 2007 Acoustics – Description, Measurement and Assessment of Environmental Noise*
- *British Standard BS 7385:, Evaluation and measurement for vibration in buildings, Part 1 1990 Guide for measurement of vibrations and evaluation of their effects on buildings and Part 2 1993 Guide to damage levels arising from groundborne vibration.*
- *U.K. Dept. of Transport “Calculation of Road Traffic Noise” (CRTN) methodology from the Design Manual for Roads and Bridges (DMRB)*
- *ISO 9613 “Attenuation of sound during propagation outdoors”.*
- *BS 4142, “Rating Industrial Noise Affecting Mixed Residential and Industrial Areas”.*
- *Department of the Environment, Building Regulations 1997, Technical Guidance Document E – Sound*
- *I.S. EN ISO 717-1: 1997 Acoustics- Rating of sound insulation in buildings and of building elements - Part 1: Airborne Sound Insulation and I.S. EN ISO 140-4:1999 Acoustics - Measurement of Sound Insulation in buildings and of building elements - Part 4: Field measurements of airborne sound insulation between rooms.*
- *I.S. EN ISO 717-2: 1997 Acoustics- Rating of sound insulation in buildings and of building elements - Part 2: Impact Sound Insulation and I.S. EN ISO 140-7:1999 Acoustics - Measurement of Sound Insulation in buildings and of building elements - Part 7: Field measurements of impact sound insulation of floors.*