

Metro North Construction Noise

Elmhurst Convalescent Home Construction Noise Assessment



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I INTRODUCTION

The Metro North project includes a stop at Griffith Avenue to be constructed using the cut and cover method.

Elmhurst Convalescent Home is located about 60m from the construction site as indicated in Figure 1.

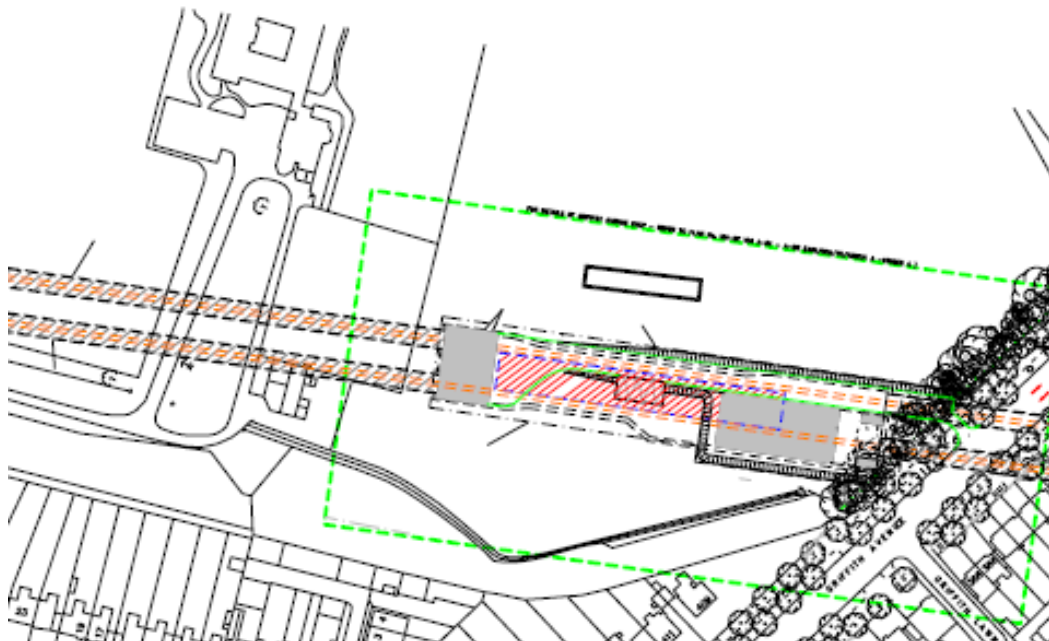


Figure 1 Elmhurst Convalescent Home and the Griffith Avenue Stop Box location.

This report considers noise effect at Elmhurst Convalescent Home, and in particular the mitigation methods that will be available to control noise.

2 NOISE LIMITS

Construction noise impacts are determined in Volume 2, Chapter 4, of the EIS by reference to Table 4.2 which in turn is related to the criteria in Table 4.1 as follows. Impacts of medium or greater magnitude are judged significant, i.e. exceedance of the criteria in Table 4.1 by up to 3 dB, results in no significant effect. Table 4.1 is headed “Noise criteria during the construction phase (at 1m from the façade)” which implies that the criteria represent total noise—construction and baseline combined.

Table 4.1 Noise criteria during the construction phase (at 1m from the façade)

Period over which criterion applies	Noise Impact Criterion ($L_{Aeq, period}$)
- Monday to Friday: Urban areas or near main roads; Day: 07.00 to 19.00	75 dB
Rural areas away from main roads Day: 07.00 to 19.00	70 dB
- Monday to Friday: Evening: 19.00 to 22.00	65 dB
- Monday to Friday: Night: 22.00 to 07.00	The higher of 45 dB or the ambient level.
- Saturday: Day: 08.00 to 16.30 (work outside these hours will be subject to Monday to Friday night time noise levels i.e. the higher of 45dB or the ambient level)	65 dB
- Sundays and Bank Holidays: Day: 08.00 to 16.30 (work outside these hours will be subject to Monday to Friday night time noise levels i.e. the higher of 45dB or the ambient level)	60 dB

Table 4.2 defines the impact ratings that are used in this assessment.

Table 4.2 Definition of noise magnitude ratings

Extent of Noise Impact (Exceedance of Assessment Criteria)	Noise Impact Magnitude	Magnitude Rating
>10dB	Severe	very high
5 to 10dB	Substantial	high
3 to 5dB	Moderate	medium
1 to 3dB	Slight	low
<1dB	No Impact	very low

Tables 4.1 and 4.2 in the EIS as reproduced above are expressed in terms of external noise levels, and do not separately consider hospitals and health facilities.

The Dublin Agglomeration Action Plan Relating to the Assessment and Management of Environmental Noise proposes that an external noise level of 55 dB L_{den} is one criterion for defining a Quiet Area according to the Environmental Noise Directive. The equivalent daytime L_{Aeq} is in the range 55-58 dB.

Guidance on noise instruction from external sources is to be found in the UK Department of Health “Health Technical Memorandum 08-01: Acoustics”, in its table I, as follows:

Table 1 Criteria for noise intrusion from external sources

Room type	Example	Criteria for noise intrusion to be met inside the spaces from external sources (dB)
Ward – single person	Single-bed ward, single-bed recovery areas and on-call room, relatives' overnight stay	40 $L_{Aeq, 1hr}$ daytime 35 $L_{Aeq, 1hr}$ night 45 $L_{Amax, f}$ night
Ward – multi-bed	Multi-bed wards, recovery areas	45 $L_{Aeq, 1hr}$ daytime 35 $L_{Aeq, 1hr}$ night 45 $L_{Amax, f}$ night
Small office-type spaces	Private offices, small treatment rooms, interview rooms, consulting rooms	40 $L_{Aeq, 1hr}$
Open clinical areas	A&E	45 $L_{Aeq, 1hr}$
Circulation spaces	Corridors, hospital street, atria	55 $L_{Aeq, 1hr}$
Public areas	Dining areas, waiting areas, playrooms	50 $L_{Aeq, 1hr}$
Personal hygiene (en-suite)	Toilets, showers	45 $L_{Aeq, 1hr}$
Personal hygiene (public and staff)	Toilets, showers	55 $L_{Aeq, 1hr}$
Small food-preparation areas	Ward kitchens	50 $L_{Aeq, 1hr}$
Large food-preparation areas	Main kitchens	55 $L_{Aeq, 1hr}$
Large meeting rooms (>35 m ² floor area)	Lecture theatres, meeting rooms, board rooms, seminar rooms, classrooms	35 $L_{Aeq, 1hr}$
Small meeting rooms (≤35 m ² floor area)	Meeting rooms, seminar rooms, classrooms, board rooms	40 $L_{Aeq, 1hr}$
Operating theatres	Operating theatres	40 $L_{Aeq, 1hr}$ 50 $L_{Amax, f}$
Laboratories	Laboratories	45 $L_{Aeq, 1hr}$

Notes:

Night is defined as the hours between 23.00 and 07.00.

A $L_{Amax, f}$ limit for short-term events is included for sleeping areas and operating theatres. The intention is that this should apply to events that occur several times during the night (for example passing trains) rather than sporadic events (see paragraphs 2.15–2.17).

Where windows have trickle vents, the criteria would normally apply with the windows closed but trickle vents open. If natural ventilation is provided by means other than trickle vents, the acoustic criteria are to be achieved while the required amount of ventilation is supplied.

To achieve the acoustic criteria on noisy sites, acoustically treated trickle vents or mechanical ventilation may be required.

Sealed

façades may be necessary for the noisiest sites. The acoustic adviser should liaise with the services designer to establish what constitutes the required amount of ventilation, the size of trickle vents, and the acoustic implications of natural ventilation.

Noise from a service yard and other similar activities should be designed not to disturb noise-sensitive accommodation or noise-sensitive receptors outside the site. Where possible, the service yard should be kept away from accommodation, and canopies and other acoustic screening methods should be considered. Without these, it is unlikely that noise-sensitive rooms overlooking a service yard can use trickle vents or openable windows for ventilation. A sealed façade and mechanical ventilation are therefore likely to be required in these locations.

The intrusive noise criteria do not include plant noise from adjacent hospital buildings. This should be considered as mechanical-service noise (see paragraphs 2.23–2.46).

For closed windows with trickle ventilators, and typical construction plant noise spectra, the difference between facade external noise levels and internal noise levels is approximately 30 dB. For partially open windows the difference is about 15 dB.

Thus, taking a daytime criterion of 40 dB $L_{Aeq, 1hr}$, this is equivalent to an external façade noise level of 70 dB with closed windows with trickle ventilators and 55 dB with partially open windows.

3 BASELINE NOISE LEVELS

A noise survey was carried out by the RPA in June 2009. Noise measurements were completed at the following locations:

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- NML #1 - North side of Elmhurst Convalescent home
 - NML #3 - North western corner of Elmhurst Convalescent Home
 - NML #4 - South side of Elmhurst Convalescent Home
 - NML #5 - East corner of Elmhurst Convalescent Home
 - NML #6 - North side of Elmhurst Convalescent Home

All measurements were completed in free field position approximately 3m from the façade of buildings with the exception of NML #6 which was taken approximately 1 metre from the façade of the building.

The measurement results for the noise assessment survey are reported below.

Table 2 Survey monitoring results

Location	Date	Time ^[1]	Measured Noise Levels (dB re (20 x 10 ⁻⁵ Pa)					Tonal Noise ^[2]	Observations
			L _{Aeq,15 min}	L _{A90}	L _{A10}	L _{A max.F}			
NML #1	05/06/09	12:29–12:44	45.9	43.6	47.7	57.5	No	Planes passing overhead; Birds singing; Trees blowing in the wind; Staff and patients in the home slightly audible; Angle grinder operating in the distance from onsite works; Digger slightly audible in the distance; Traffic slightly audible in the distance	
NML #3	05/06/09	13:15 – 13:30	49.0	42.0	52.9	66.6	No	2 angle grinders working intermittently 10-15 metres away within grounds; Birds singing; Trees blowing Cars passing on minor roadway 10m away; Road traffic from Ballymun Road and Griffith Avenue audible (R108 and R102 respectively) ; Digger audible from some distance away; Banging of metal from works within the grounds; People shouting in the distance; Cars driving in and out of the homes car park.	
NML #4	05/06/09	13:34 – 13:49	63.3	43.1	71.1	75.0	Yes	2 angle grinders were working 3 metres away - during the course of monitoring leading to a max of 75.0. Sirens from Garda car in the distance or a helicopter passing overhead may have caused tonal noise. Helicopter passing overhead; Staff and patients in the home audible- windows open; Staff working in the kitchen audible- windows open; Birds singing; Trees blowing in the wind; Noise; Traffic from Ballymun Road audible;	
NML #5	05/06/09	13:51-14:06	46.8	42.8	50.2	63.9	No	Traffic from small private road audible; Helicopter passing overhead; People shouting in the distance; Door slamming inside the home; Traffic from major roads R108 and R102 audible; Metal being banged and angle grinders audible; Dog barking in the distance; Birds singing; Trees blowing in the wind; Siren from Garda car in the distance; Planes flying overhead; Noise from diggers operating in the distance	
NML #6	05/06/09	14:08 – 14:23	46.0	42.9	47.9	62.7	No	Cars passing on nearby private Road; Planes passing overhead; Patients and staff audible – open windows; Birds singing; Trees blowing in the wind; Digger working some distance away; Door slamming nearby; Traffic from R102 and R108 audible; Angle grinder operating intermittently in the distance	

4 METHOD OF CONSTRUCTION

Construction of the Griffith Avenue stop will involve the creation of the retaining walls of the stop box with secant piles or contiguous bored piles. The principal noise impact will occur during the construction of the retaining walls. This report therefore focuses on this part of the work which will take place in the first six months after the main contractor is appointed. Excavation of the stop box will then take place over approximately 12 months, with lower noise levels as much of the plant will be below ground level.

5 NOISE SOURCES

The principal noise sources are the piling rigs, cranes and concrete lorries. The following source data have been used for the retaining wall construction phase.

Source	Lp at 10 m	Number of Items	Source of data BS 5228	% on-time
Crawler Cranes (Piling)	83	2	C.3.14	100
Cranes (service piling)	79	2	C.3.16	100
360 Excavator	76	4	C.2.17	25
Dump Truck (on & offsite)	78	2	C.4.2	100
Crane (Service re bar)	67	1	C.3.28	100
Generator	56	2	C.4.81	100
Concrete Mixer Truck	79	2	C.4.27	100
Concrete Pump Truck	67	1	C.4.24,	50

6 NOISE PREDICTIONS

The noise prediction method provided in BS 5228:2009 allow for the noise attenuating effect of propagation over soft ground over distances of 25m or more, provided that the source and receiver are not more than 2.5m above ground level. These conditions apply in this case, and the effect of soft ground cover is significant at distances of 60 to 200m. At 60m the additional attenuation due to soft ground cover is slightly less than 2 dB(A) and at 200m the attenuation is 4.5 dB(A). Soft ground attenuation is interrupted by a noise barrier, with the result that when the benefit of noise barriers is considered the soft ground attenuation must first be removed from the calculation, which has the effect of reducing the effectiveness of noise barriers in such circumstances.

Without noise barriers (and therefore including soft ground attenuation), the external noise level at the nearest façade of Elmhurst Convalescent Home, at a height of 1.5m is 71 dB $L_{Aeq, 1h}$.

With a 4m high site noise barrier the façade noise level is reduced to 65 dB $L_{Aeq, 1h}$.

Since activities over a period of 1 hour are assumed to be repeated throughout the construction day, the value of $L_{Aeq, 1hr}$ is the same as the value of $L_{Aeq, day}$.

7 CONCLUSIONS

Predictions of construction noise from the noisiest phase of the works for the construction of Griffith Avenue Stop have been made which shows that with a 4m high site noise barrier, the value of $L_{Aeq, 1h}$ outside the façade of the nearest part of Elmhurst Convalescent Home would be 65 dB, about equivalent to an internal figure with partially open windows of 50 dB. Although the outdoor noise level is substantially less than the noise criterion of 70 dB $L_{Aeq, 1h}$ from Table 4.1 in the EIS, the internal noise level would be above the HTM 08-01

guideline value of 40-45 dB $L_{Aeq, 1h}$ with windows open. However, if those windows which face the site were closed the internal noise level would be approximately 35 dB $L_{Aeq, 1h}$. Ventilation could be obtained from open windows in other facades not facing towards Griffith Avenue. This would be for a period of up to six months, after which noise levels would be lower.
