

An Bord Pleanála Oral Hearing

Irish Water

Greater Dublin Drainage

Response to Noise and Vibration Questions

Noise and Vibration

Dr. Imelda Shanahan (28th March 2019)

**GDD Oral Hearing
Response to Noise and Vibration Questions
Dr. Imelda Shanahan**

Response to issues raised in Fingal County Council Statement of 22 March 2019

- (1) The Fingal County Council submission to the Oral Hearing on 22 March 2019 contained a section at Paragraphs 56-60 dealing with Noise impacts at Connolly Hospital. The submission references points made by Ms Louise McIntyre, Environmental Health Officer and makes a number of points which require clarification by way of response as set out below.

[Fingal Submission Paragraph 56](#)

- (2) *With regard to the Irish Water submission in relation to noise, the matters have been reviewed by the Environmental Health Officer. Comments received relate to the following:-*
- *That the timely investigation of complaints as set out in paragraph 698 shall be more clearly defined, particularly with regard to the hospital and hospice. The applicant should provide clarity on this matter.*
 - *That noise and vibration monitoring as set out in paragraph 705 shall be carried out no greater than 1m from the nearest noise sensitive locations.*

Response

- (3) More detail on how complaints will be investigated and dealt with is set out in the 'Communications' section of the Noise and Vibration Management Plan attached as Schedule 1 to Dr Imelda Shanahan's Witness Statement. Of greater significance is the commitment to communicate in advance of intrusive works with the Hospital / HSE, and indeed with any potentially affected receptors. Communication will also occur following acquisition of actual monitoring data for the works and machinery in use at the facility, so that the Hospital will be fully informed of and involved in the approval of Method Statements and mitigation measures for works carried out in proximity to the hospital and/or hospice.
- (4) Noise and vibration monitoring will be carried out in accordance with the recognised Standard methods at locations suitable for the assessment of impact on the closest sensitive receptors.

[Fingal Submission Paragraph 57](#)

- (5) *The EHO's concerns remain regarding use of the closure of windows within the west wing of Connolly Hospital and St. Francis Hospice as a noise mitigation measure. No indication has been provided regarding temperature regulation/air conditioning within these buildings. This should be clarified.*

Response

- (6) We concur with the statement that it is not appropriate to require windows to be closed for extended periods of time as a noise mitigation measure. In this instance closing the windows has not been proposed as a mitigation measure for noise and vibration. This measure is a mandatory health protection requirement for the prevention of the spread of aspergillosis and is specified as a control measure in the *National Guidelines for the Prevention of Nosocomial Aspergillosis*. An extract from those Guidelines is attached in Appendix 1 of this Additional Statement with the relevant sections highlighted. The Noise and Vibration Chapter, Chapter 15 Volume 3 of the EIAR, and the Irish Water Response to Submissions January 2019 document identified the requirement for closing windows as a health protection measure which conforms to the National Guidelines. Dr Martin Hogan in his Witness Statement also noted that windows should be kept closed to prevent the ingress of dust, and this is for health protection from airborne matter and not for the purpose of noise mitigation.

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- (7) The Noise Impact assessment merely points out that the windows are required to be closed for health protection measures, and consequently this will result in a positive impact in terms of reducing the maximum noise levels that could result indoors at the hospital and hospice. The measures were not and are not proposed for the purpose of noise mitigation but the additional noise mitigation afforded by closed windows is acknowledged in the assessment, but not relied on.
- (8) The *National Guidelines for the Prevention of Nosocomial Aspergillosis* contain a broad suite of recommendations for management of impacts associated with construction works in and around hospitals and those Guidelines are routinely implemented by the HSE in managing projects of this type. Matters such as temperature regulation and ventilation / air conditioning are quite correctly addressed in the Guidelines and will be addressed by the HSE as they do routinely address such matters in managing projects of this type.

Fingal Submission Paragraph 58

- (9) *The EHO recommends that rock breaking and piling should only be carried out during standard construction hours in order to allow hospital and hospice patients respite. It is acknowledged that this will increase the length of the construction project in this area.*

Response

- (10) Irish Water have given a commitment that these works will only be carried out during normal work hours to minimise disturbance at the hospital and the hospice. This commitment is stated at Section 15.4.2 of the EIAR.

Fingal Submission Paragraph 59

- (11) *Regarding paragraph 709 it is agreed that all residents and businesses likely to be effected by these works shall be notified in writing and made aware of the dates and duration of such works prior to commencement of the works. Contact details for the Irish Water point of contact for complaints should be attached.*

Response

- (12) As noted in the EIAR and in the Noise and Vibration Management Plan appended to my earlier Witness Statement, all potentially affected Noise Sensitive Receptors will be notified before the commencement of any works forecast to generate appreciable levels of noise or vibration, explaining the nature and duration of the works, and the monitoring and mitigation measures that are being implemented.

Fingal Submission Paragraph 60

- (13) *It is recommended that condition 13 be retained in full in this regard.*

Response

- (14) Condition 13 contains 7 provisions for the control and management of noise and vibration impacts associated with the construction of the proposed project. Irish Water welcome the recommendations of the Council, but note that Items 13(b) and 13(d) require some clarification as outlined below. In the event that the Board decides to grant permission, it is submitted that these clarifications should be considered.

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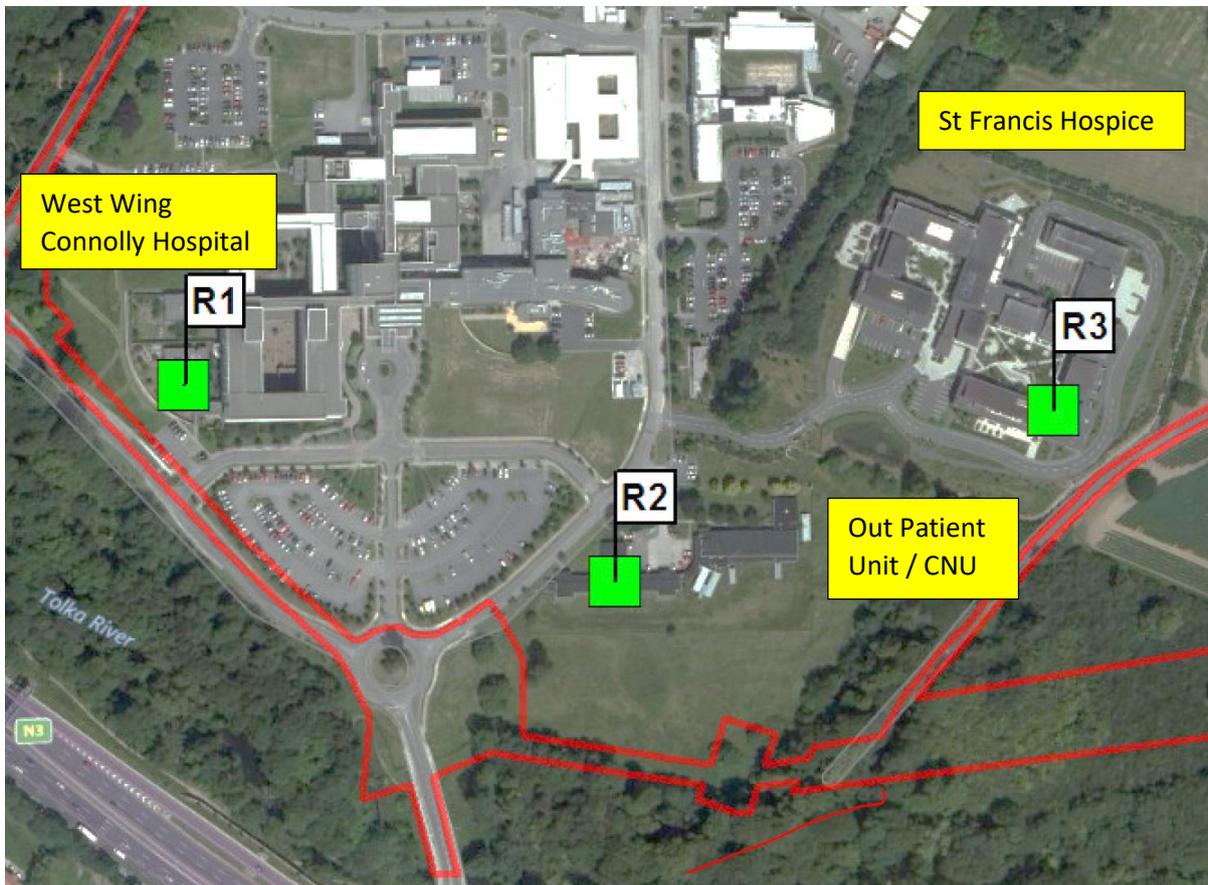
- (15) Condition 13(b) requests that “*The applicant shall submit alternative measures to mitigate noise to the west wing of Connolly Hospital and St Francis Hospice to achieve 70dB(A) during daytime which do not involve the closure of windows*”. As noted above, the closure of windows is a health protection measure which is not being recommended for noise mitigation. The proposed mitigation measures are more than adequate to achieve the required mitigation for compliance with noise limits, and no further alternatives are required or proposed. It is therefore submitted that this type of condition is redundant.
- (16) Condition 13(d) requests that “*The applicant shall provide measures to ensure adequate noise and vibration mitigation to the occupants of the house at Golf Links Road*”. The EIAR sets out a detailed suite of mitigation measures, all consistent with the requirements and recommendations in BS5228, for all potentially affected receptors including the house on Golf Links Road.
- (17) The only situation where conventional mitigation measures might not be adequate is for night time tunnelling works close to that house. The conservative approach adopted in the EIAR predicted groundborne noise from the tunnelling works using an empirical formula. This is likely to significantly over-estimate the potential impact on the house and the residents, and if an unacceptable impact did arise it would be for a very short period of time. The estimated timeframe in the EIAR, based on a tunnelling progression rate of 10m/day, was a *potential* exceedance of the permissible night time noise levels for 10 days. In the unlikely event that this did occur, re-location of the residents for a short period of time as recommended in BS5228 could be implemented.
- (18) Recently acquired data from a micro-tunnelling project on the N7 in limestone rock, which is similar to the ground conditions at Connolly Hospital, indicates that the tunnelling progressed at a rate more than twice as fast as the estimate used in the EIAR, and that measured noise and vibration levels associated with the tunnelling activity were considerably lower than the calculated levels used in the EIAR. The assessment presented in the EIAR is a worst-case conservative assessment which, even if it does arise, can be managed and adequate mitigation measures can be applied. The appropriate mitigation measures for groundborne noise will be selected and applied in accordance with the commitments in the EIAR and the requirements of the relevant standards.
- (19) A more detailed site investigation at the Golf Links Road will be carried out prior to commencement of tunnelling and this detailed information, combined with measurements of the actual ground-borne noise levels associated with micro-tunnelling in other locations, will allow a more refined assessment of potential noise levels associated with this activity to be completed. The recently acquired data at the N7 micro-tunnelling project suggests that the vibration levels, which can be used as an indicator of ground-borne noise, are significantly lower than those predicted using the worst-case assessment scenarios applied in the EIAR. It is therefore reasonable to anticipate that the EIAR predictions are significant overestimates of what will actually occur, and that no significant adverse impact will arise for this location. Consultation with the occupant of the house has occurred and ongoing communication about potential impacts will continue.
- (20) I am confident therefore that the assessment that was reported in the EIAR was conservative and worst case and that the likely impacts for the proposed Project are significantly lower than those projected for the worst-case assessment.

Response to Inspector’s request for Information on St Francis Hospice

- (21) The Inspector has requested that information be provided about the assessment of impact on St Francis Hospice. The construction phase noise and vibration impact on St Francis Hospice is assessed in section 15.4.2 and section 15.4.4 of the EIAR. Noise monitoring for baseline assessment was carried out at the Hospice (Table 15.9) and this noise sensitive receptor (NSR) was included as

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R3 (Table 15.12) in the assessment. An extract from Figure 14.4 is shown below to indicate where the Hospice is relative to Connolly Hospital and the elements of the proposed Project.



- (22) The construction phase noise impacts on the Hospice were addressed as follows:
- (i) Construction Phase noise impacts of the proposed Abbottstown Pumping Station on St Francis Hospice were shown in Table 15.15 to be significantly lower than the adopted and permissible standards for daytime works; no night time construction works for these elements of construction are proposed.
 - (ii) The potential noise impacts associated with construction of the proposed Orbital Sewer at St. Francis' Hospice was specifically included in the impact assessment even though it is located a considerable distance from the proposed orbital sewer route, as this location is considered to have an increased sensitivity to noise impacts. The noise impact for these works was assessed in Table 15.23 where the maximum predicted impact for construction activity was determined to be less than 60dB(A) $L_{Aeq,1hr}$ outside the building, which is very significantly lower than the permissible 70dB(A) $L_{Aeq,1hr}$ standard for weekday and 65dB(A) $L_{Aeq,1hr}$ work on Saturdays.
 - (iii) The assessment of the potential noise impact of micro-tunneling on the Hospice was considered in Section 15.4 under the heading "Trenchless Works (Micro-tunneling)". It was noted in this section of the EIAR that tunnelling works would be required in the grounds of Connolly Hospital over a length of approximately 1km. In the assessment, a screening exercise identified the closest receptors that could be affected by the proposed micro-tunneling works, and specifically for the Connolly Hospital works the

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distance between the identified receptors and the closest boundary of the most significant elements of the works (the construction compound for the launch shaft of the tunnel) is noted in Table 15.25 of the EIAR as being 45m.

- (iv) It is noted that the closest distance to the microtunneling works is 45m from the West Wing of Connolly Hospital and 65m from the Outpatient Unit (which is the approximate future location of the Community Nursing Unit). Predicted noise levels for the different aspects of the microtunnelling works are presented in Table 15.26 of the EIAR (Launch shaft construction works), Table 15.28 of the EIAR (tunnel boring machine construction works – daytime), Table 15.29 of the EIAR (tunnel boring machine construction works – night-time) and Table 15.30 of the EIAR (groundborne noise levels associated with microtunnelling). These tables show that the adopted standards for day and night time works will be met for each element of the microtunneling works at each of the listed locations.
- (v) Although not specifically stated in these Tables, the noise impacts will be lower than those presented in these Tables for the St Francis Hospice which is located further away from the orbital sewer than these identified locations (over 80m from the closest point of the Orbital sewer and 220m from the Pumping Station). With the standard mitigation measures identified in the EIAR, the predicted daytime noise levels at the closest Hospice location would range from 46dB L_{Aeq} to 54dB L_{Aeq} depending on the microtunnelling works occurring compared to the adopted standard of 70dB $L_{Aeq,1hr}$ at the external facades of the building. The predicted night-time noise levels at the closest Hospice location would range from 24dB L_{Aeq} to 44dB L_{Aeq} depending on the microtunnelling works occurring compared to the adopted standards of 45dB $L_{Aeq,1hr}$ at the external facades of the building. Noise levels reduce by approximately 15decibels through an open window and 20 to 45 decibels through a closed window (depending on the type) so the internal noise levels would be less than 29dB(A) and 19dB(A), respectively, for day and night time construction works. Both of these levels are below the recommended night time indoor level of 30dB(A) L_{Aeq} adopted for this assessment.
- (vi) As has been pointed out in the EIAR, in the Response document to submissions (January 2019), in my earlier Witness Statement presented on Thursday 21 March 2019, and in this document, windows are to be closed in accordance with the National Aspergillus control Guidelines and not for noise mitigation. These Guidelines and the recommendations contained in them are routinely and consistently applied by the HSE in managing construction works in and around hospitals, and indeed these Guidelines were followed in the construction works for the Children’s Hospital at the Connolly campus.
- (vii) Ground-borne noise may arise from microtunneling. Table 15.30 presents the calculated groundborne noise levels that may be experienced at the nearest receptors to the microtunnelling activity for all locations where microtunneling will take place. Specifically for the Hospice, the distance to the nearest microtunnelling location is over 80m and the predicted groundborne noise level within the hospice building for the worst-case scenario is 24dB L_{Aeq} which is well within the adopted guide value of 30dB L_{Aeq} . Consequently noise from this source will not be perceptible at the Hospice for either day time or night time tunnelling works.
- (viii) Vibration impacts were addressed in section 15.4 of the EIAR. The Hospice is the closest NSR to the proposed Abbotstown pumping station site and is located more than 220m from the nearest construction site boundary. The most intensive works that could

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be undertaken from a vibration perspective are rock-breaking and piling and these activities will only be carried out during the day as noted in the EIAR. The assessment showed that the potential vibration impacts at this particular location will be below 1 mm/s PPV (Table 15.42) and in fact at that distance will be below the level of human perception (0.3mm/s PPV). Consequently the assessment showed that there will be an imperceptible vibration impact on the Hospice from the proposed construction works.

- (23) The operation phase noise impacts on the Hospice were assessed in Section 15.5.3 where it was determined that there would be no perceptible change to the noise climate as a result of the proposed Abbottstown Pumping Station.
- (24) I am satisfied that the potential impact of the proposed Project on the St Francis Hospice was thoroughly assessed and that no significant adverse impacts will arise due to construction or operation of the proposed Project.



Health Protection Surveillance Centre

NATIONAL GUIDELINES FOR THE PREVENTION OF NOSOCOMIAL ASPERGILLOSIS

A Report of the Aspergillosis Subcommittee of the
Health Protection Surveillance Centre
Scientific Advisory Committee

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Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive



identified, it may be deemed necessary to convene an emergency meeting of the MDT to consider the required action. This may include cessation of the building works until necessary corrective actions have been implemented. The process and procedures for all such cessation of works must be agreed in advance between the healthcare facility, the design team, and the IPCT, and be specified clearly in the contract documents. The instruction to cease must be implemented strictly in accordance with provisions of the contract. IPCTs and other stakeholders should be aware that all instructions to the contractor on site must be issued by the Employers’ Representative under the public works contracts and by the architect under the Royal Institute of the Architects of Ireland (RIAI) contract.

A risk assessment of the patient population risk groups may need to be undertaken in consultation with the patients’ primary care team and recommendations regarding further measures e.g. antifungal prophylaxis considered. An adverse incident form should be completed in the event of either a patient developing IA or a serious breach of safety precautions such that vulnerable patients required or were considered for antifungal prophylaxis.

3.4. Invasive Aspergillosis Risk Assessment Process

There are four steps to the risk assessment process.

Step One: Consider patient risk factors and assign to the correct at-risk group, Group 1-4 (see Section 2.2 for the classification of at-risk patients). If more than one risk group is identified within a specific cohort, select the higher risk group (Section 2.2).

Step Two: Detail the construction activity and assign type: A1, A2, B, C or D (Table 3).

Table 3. Details of the type of construction project activity

Type	Description of the activity
TYPE A1	Minor internal containable activities with no/minimal dust generation This includes, but is not limited to, inspection and non-invasive activities and small-scale activities that create minimal dust. These include, but are not limited to, activities that require removal of ceiling tiles for preliminary visual inspection (limited to 1 tile per 5m ²), painting (no sanding), wall covering, electrical trim work, minor plumbing and other maintenance activities that do not generate dust or require cutting of walls or access to ceilings other than for visual inspection.
TYPE A2	Minor internal small-scale works with some dust generation that can be contained This includes, but is not limited to, minor works on a small scale where dust containment is achieved by using dust barriers and a HEPA-filtered vacuum. Activities that require access to conduit spaces, cutting of walls, woodwork or ceilings where dust migration can be controlled, for example installation or repair of minor electrical work, ventilation components, telephone wires or computer cables. It also includes minor plumbing as well as minor drilling to allow for the erection of brackets and shelving.
TYPE B	Major internal containable activities Any work that generates a moderate level of dust or requires demolition or removal of any fixed building components or assemblies (e.g. counter tops, cupboards, sinks). These include, but are not limited to, activities that require sanding of walls for painting or wall covering, removal of floor-covering, ceiling tiles and stud work, new wall construction, minor duct work or electrical work above ceilings, major cabling activities, and any activity that cannot be completed within a single work shift. This type of activity includes extensive plumbing work. It also includes demolition or removal of a complete cabling system or plumbing and new construction that requires consecutive work shifts to complete.
TYPE C	Minor external non–containable activities External construction activities that generate moderate levels of dust or minor excavations. Such activities include, but are not limited to, digging trial pits and minor foundations, trenching, landscaping, minor construction and demolition work.
TYPE D	Major external non–containable activities External construction activities that generate large levels of dust. Such activities would include, but are not limited to, major soil excavation, demolition of buildings and any other construction activity not covered under Type C.

Step Three: Determine the construction site preventive measures and assign class, 0-III (Table 4).

Table 4. Description of the required infection prevention and control precautions by class
(Please refer to Table 5 for application of relevant Class of Preventive Measures required)

Class 0 Preventive Measures

Dust Control

- Immediately replace ceiling tiles displaced for preliminary visual inspection

Cleaning

- Wet mop and vacuum area as needed and when work is completed
- Wipe horizontal and vertical work surfaces with hot soapy water

Infection Prevention and Control Personnel

- Approval must be sought from IPCT for the construction activity

Patient Risk Reduction

- Minimise exposure of patients in at-risk Group 2 to the construction/renovation area
- Minimise dust and increase cleaning in patient area

**Note: Class 0 preventive measures do not apply to Groups 3-4 at-risk patients.
For further details, please see matrix presented in Table 5.**

Class I Preventive Measures

Dust Control

- Immediately replace ceiling tiles displaced for visual inspection
- Execute work by methods to minimise dust generation from construction or renovation activities
- Provide active means to minimise dust generation and migration into the atmosphere

Cleaning

- Wet mop and vacuum area as needed and when work is completed
- Wipe horizontal and vertical work surfaces with hot soapy water

Infection Prevention and Control Personnel

- Approval must be sought from IPCT for the construction activity and the permit to be issued
- In collaboration with cleaners and technical services, ensure that the construction zone remains sealed and that the cleaning is adequate at all times

Patient Risk Reduction

- Move at-risk patients (Groups 2-4) away from construction zone. If it is not possible to move, for example ICU patients, an impermeable dust barrier should be erected around the construction zone
- Minimise patients' exposure to the construction/renovation area
- Minimise dust and increase cleaning in patient area

Class II Preventive Measures

Dust Control

- Execute work by methods to minimise dust generation from construction or renovation activities
- Erect an impermeable dust barrier from floor to slab/floor
- Ensure windows and doors are sealed
- A separate entrance away from patient traffic should be created for use by construction workers
- Protective clothing should be worn by construction workers and removed when leaving the construction site
- Dust barrier should not be removed until the project is complete

Ventilation of Construction Zone

- Seal windows
- Maintain negative pressure within construction zone by using a portable extract fan
- Ensure air is exhausted directly to the outside where feasible and away from intake vents or filtered through a minimum of an F9 filter
- Ensure the ventilation system is functioning properly and is cleaned if contaminated by soil or dust after construction or renovation project is complete

Debris Removal and Cleaning

- Contain debris in covered containers or cover with either an impermeable or moistened sheet before transporting for disposal
- Remove debris at end of the work day
- An external chute will need to be erected if the construction is not taking place at ground level
- Vacuum work area with HEPA-filtered vacuums daily or more frequently if required

Infection Prevention and Control Personnel

- Approval must be sought from IPCT for the construction activity and the permit to be issued
- In collaboration with cleaners and technical services, ensure that the construction zone remains sealed and that the cleaning is adequate at all times

Patient Risk Reduction

- Move all patients from within the construction zone
- If possible move at-risk patients (Groups 2-4) who are adjacent or near to the construction zone
- Ensure that patients do not go near construction zone
- All windows, doors, air intake and exhaust vents should be sealed in areas of the hospital containing patients who are classified as at increased risk (Groups 2-4), if the construction or demolition work is considered likely to result in *Aspergillus*-contaminated air entering these areas
- High and very high-risk patients (Groups 3-4) should preferably be treated in HEPA-filtered, positive pressure isolation rooms or facilities. Where such facilities are not available, the local IPCT should perform a risk assessment to identify alternative options. This may include neutral pressure isolation rooms (also referred to as a room with positive pressure ventilated lobby (PPVL)) (79, 80). Although these facilities have been validated from an engineering perspective they have not yet been clinically validated for the prevention of nosocomial aspergillosis among at-risk patients, see section 3.5.1 and 3.5.2 for more details.

Traffic Control

- In collaboration with the Technical Services Manager, designate a traffic pattern for construction workers that avoids patient care areas and a traffic pattern for clean or sterile supplies, equipment, patients, staff and visitors that avoids the construction zone
- A traffic path should be designated for the removal of rubble from the construction site which preferably is separate to and away from all hospital-related traffic.

Class III Preventive Measures

Dust Control

- Execute work by methods to minimise dust generation from construction or renovation activities
- Provide active means to minimise dust generation and migration into the atmosphere. During dry weather soil must be regularly dampened for the period involving any ground works

Debris Removal and Cleaning

- Contain debris in covered containers or cover with an impermeable or moistened sheet before transporting for disposal
- Ensure no increased dust within hospital, increased cleaning may be necessary

Infection Prevention and Control Personnel

- Approval must be sought from IPCT for the construction activity and the permit to be issued
- In collaboration with technical services ensure that dust is minimised from the construction site and that the construction site measures are being adhered to
- Ensure that cleaning is adequate to minimise dust within the hospital

Patient Risk Reduction

- No specific requirement for Risk Group 1
- If possible move at-risk patients (Groups 2-4) who are adjacent or near to the construction zone
- Ensure that patients do not go near construction zone
- All windows, doors, air intake and exhaust vents should be sealed in areas of the hospital containing at-risk patients (Groups 2-4), if the construction or demolition work is considered likely to result in *Aspergillus*-contaminated air entering these areas
- High and very high-risk patients (Groups 3-4) should be preferably treated in HEPA-filtered, positive pressure isolation rooms or facilities. Where such facilities are not available the local IPCT should perform a risk assessment to identify alternative options. This may include neutral pressure isolation rooms (also referred to as a room with positive pressure ventilated lobby (PPVL)) (79, 80), although these facilities have been validated from an engineering perspective they have not yet been clinically validated for the prevention of nosocomial aspergillosis among at-risk patients, see section 3.5.1 and 3.5.2 for more details.

Traffic Control

- In collaboration with the Technical Services Manager, designate a traffic pattern for construction workers, that avoids patient care areas and a traffic pattern for clean or sterile supplies, equipment, patients, staff and visitors that avoids the construction zone
- A traffic path should be designated for the removal of rubble from the construction site which preferably is separate to and away from all hospital-related traffic.

Step Four: Verify risk assessment by checking the matrix in Table 5.

Table 5. Matrix of construction project activity type, patient risk group and class of required infection prevention and control precautions

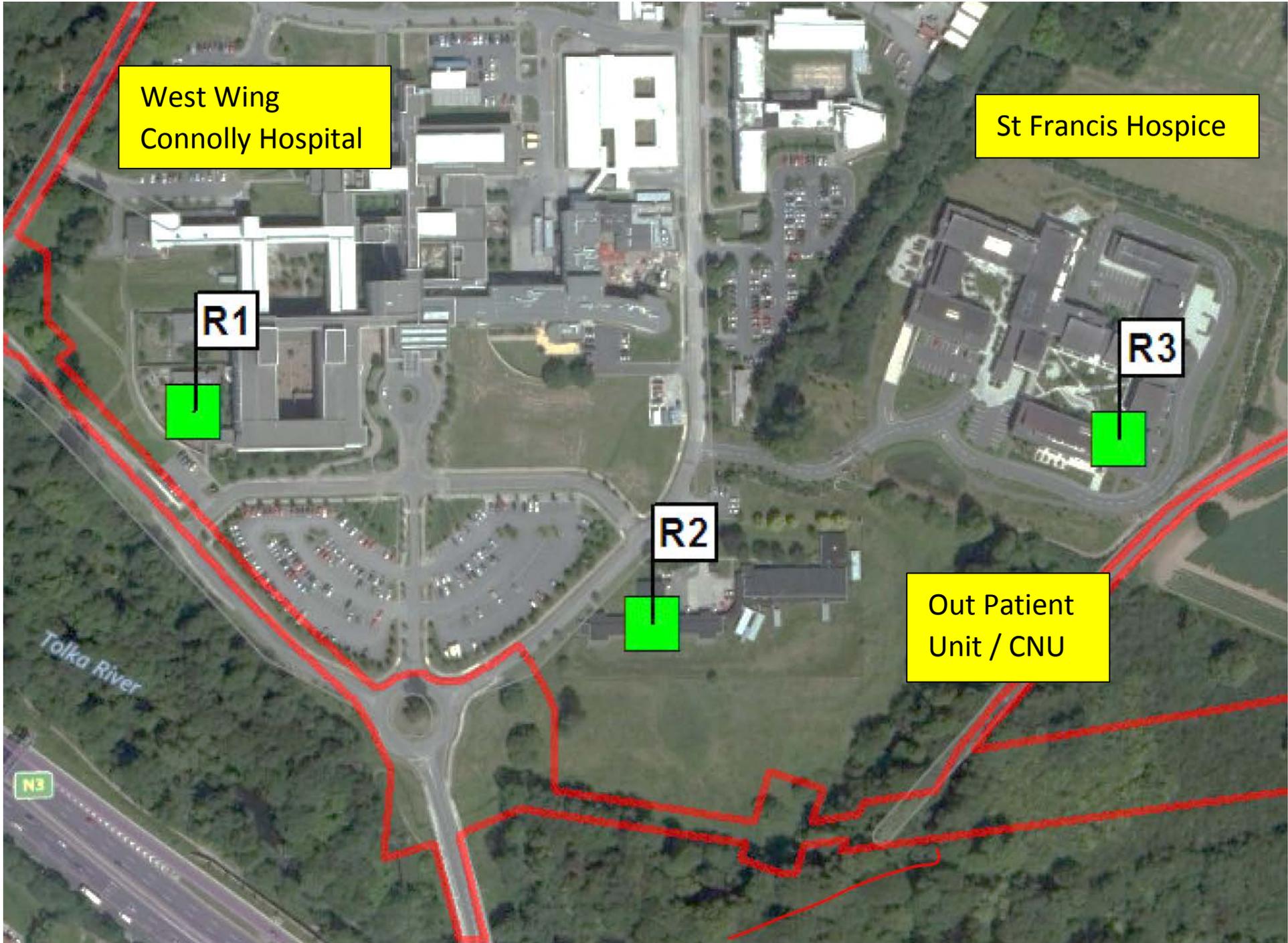
This matrix was adapted from *Infection Control Risk Assessment Matrix of Precautions for Construction & Renovation from the Association of Professionals in Infection Control and Epidemiology (81)*

Patient Risk Group	Construction Activity Type				
	TYPE A1	TYPE A2	TYPE B	TYPE C	TYPE D
Group 1 – No evidence of risk	0	I	I	III	III
Group 2 – Increased risk	0	I	II	III	III
Group 3 – High risk	I	I	II	III	III
Group 4 – Very high risk	I	I	II	III	III

Note that for Type D Activities all patient groups require Class III Preventive measures including closing and sealing of windows

Note 1: Engagement with the IPCT is required irrespective of type of construction activity.

Note 2: This is a guide and if specific risk issues are identified, an individual risk assessment of that issue may be required.



West Wing
Connolly Hospital

St Francis Hospice

R1

R3

R2

Out Patient
Unit / CNU

Tolka River

N3