ILLINOIS TERMINAL EXPANSION | AT THE YARDS CHAMPAIGN

Noise and Vibration Technical Memorandum

Illinois Terminal Expansion at the Yards

Champaign-Urbana Mass Transit District

Champaign, Illinois

October 2020

Technical Memorandum

1.0 Purpose of Memorandum

The purpose of this memorandum is to present the technical assessment of noise and vibration effects for the proposed Illinois Terminal Expansion Project (Project) in Champaign County, Illinois. This noise and vibration impact assessment is to support an Environmental Assessment (EA) following the National Environmental Policy Act (NEPA).

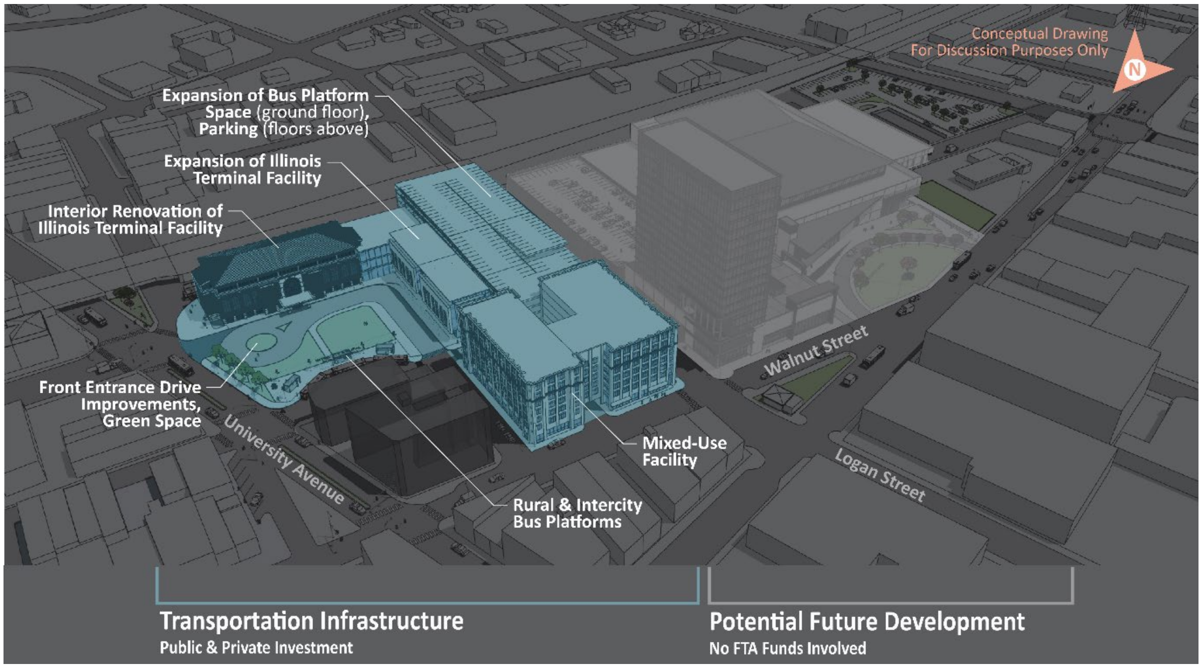
This memo describes the predicted noise and vibration impacts of the proposed Project using the FTA Transit Noise and Vibration Impact Assessment manual. A Noise Screening and General Noise Assessment, as well as a Vibration Screening and General Vibration Assessment were conducted.

2.0 Project Description

FTA awarded MTD a Section 5339 Bus and Bus Facilities grant in 2019 and Urbanized Area Formula 5307 funding to complete the Illinois Terminal Expansion Project evaluated in this EA. Illustrated in blue on Figure 1, the proposed Project includes:

1. Expansion of bus platforms, including dedicated space for rural and intercity services;
2. Construction of controlled pedestrian access to bus platforms and visibility improvements;
3. Interior renovation and expansion of the Illinois Terminal and waiting areas;
4. Construction of a mixed-use structure that connects to Illinois Terminal and includes bus platforms, waiting areas, expanded leasable space, residential units, and a parking deck that supports these uses; and
5. Land acquisition.

Figure 1. Illinois Terminal Expansion Project



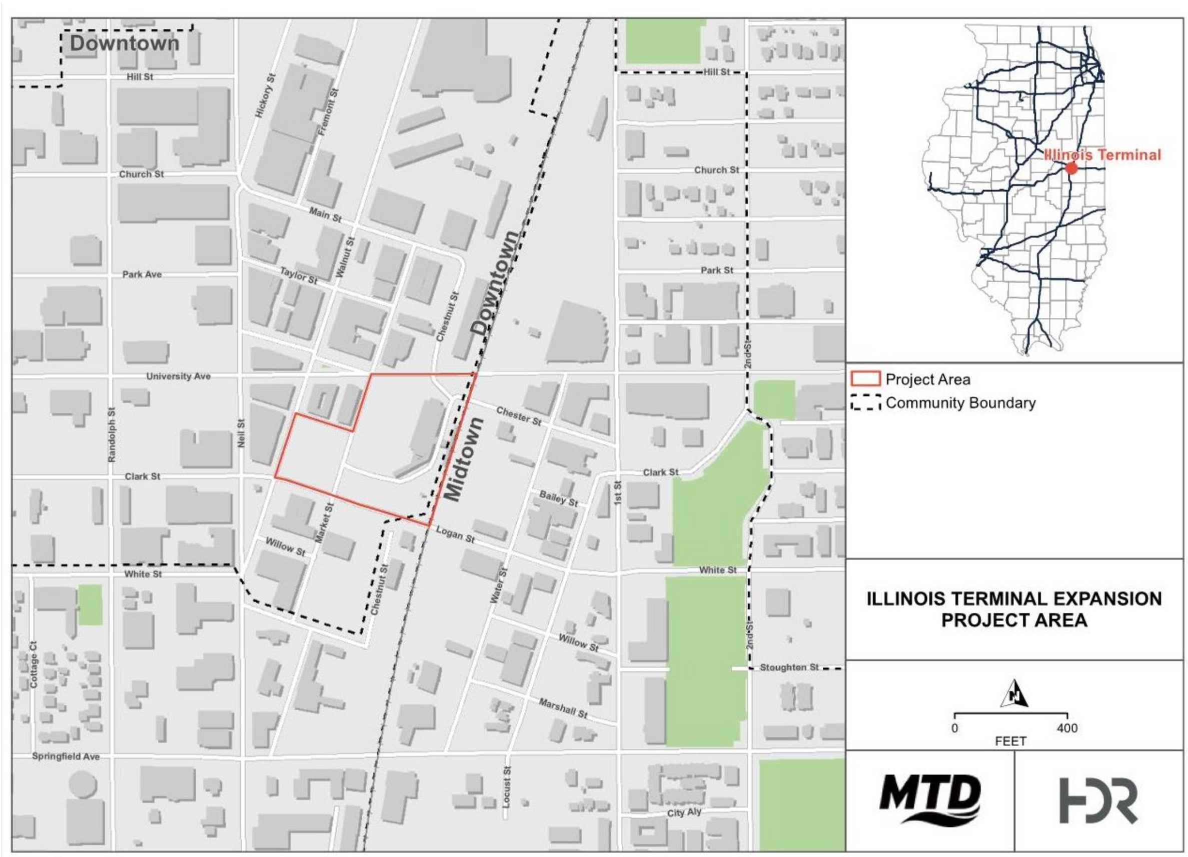
Source: Ratio Architects 2020

The mixed-use structure would be constructed with public and private funding. A portion of the mixed-use structure would be dedicated private residential units and retail space. Under the Joint Development project, FTA funding would potentially contribute to the site preparation, utilities, building foundations, walkways, pedestrian and bicycle access, streetscape improvements, safety and security equipment, and construction of the shell of the mixed-use structure, which would include space for commercial uses. Only private funding would be used to complete the interior build-out (or outfitting) of any private commercial or residential elements.

The area shown in Figure 1 is collectively referred to as "The Yards." However, the area south of Logan Street, shown in grey, would be completed as a separate private project and is not included as part of the proposed Project evaluated in this EA. Information relating to potential future development south of Logan Street is included for informational purposes and to evaluate cumulative effects.

Illinois Terminal is located at 45 East University in downtown Champaign, Illinois The proposed Project limits are depicted on Figure 2 and defined by University Avenue to the north, the Canadian National (CN) railroad tracks to the east, Logan Street to the south, and Walnut Street to the west.

Figure 2. Illinois Terminal Expansion Project Area



Source: HDR 2020

2.1. No Build Alternative

The No Build Alternative is a required alternative as part of the NEPA environmental analysis and is used for comparison purposes to assess the relative benefits and impacts of implementing the proposed Project. The No Build Alternative would not upgrade or expand Illinois Terminal nor would it allow MTD to leverage private investment to increase value and improve quality of life for the community. The No Build Alternative is identified as the "Business as Usual" scenario in the travel modeling and includes potential future private development south of Logan Street. Operational crowding of buses and passenger crowding on platforms and within the waiting areas would continue to increase as the community grows, development in the downtown area progresses, and demand for public transportation rises. Safety of passengers would continue to be a concern for MTD and users of Illinois Terminal as buses compete for platform space, queue on local streets, and load and unload passengers at non-platform areas in parking lots and at double-parked locations.

2.2. Build Alternative

The proposed Project limits are depicted on Figure 2. The potential private development proposed south of Logan Street is not included in the Build Alternative. The Build Alternative would renovate the Illinois Terminal building, expand the Illinois Terminal building (referred to as the mixed-use structure) on existing surface parking lots to the south and southwest, and reconfigure the site layout for better operations and safety.

The following physical elements would be included and are discussed in more detail as outlined below:

1. Expansion of bus platforms, including providing dedicated space for rural and intercity services;
2. Construction of controlled pedestrian access to bus platforms and visibility improvements;
3. Interior renovation and expansion of the Illinois Terminal and waiting areas;
4. Construction of a mixed-use structure that connects to Illinois Terminal and includes bus platforms, waiting areas, expanded area for leasable space, residential units, and a parking deck that supports these uses; and
5. Land acquisition.

Expanded Platforms and Separation of Transportation Modes

The Build Alternative would create dedicated platforms for up to three rural and intercity vehicles along Market Street in front of the Illinois Terminal building, as shown in Figure 3. A bus bay would be created along Market Street to remove the buses from traffic; this would lower the number of crashes that are experienced on Market Street. Pedestrian crossings would be provided to allow for safe access across the circular drive to the rural and intercity platforms along Market Street and at Market Street and Bailey Street.

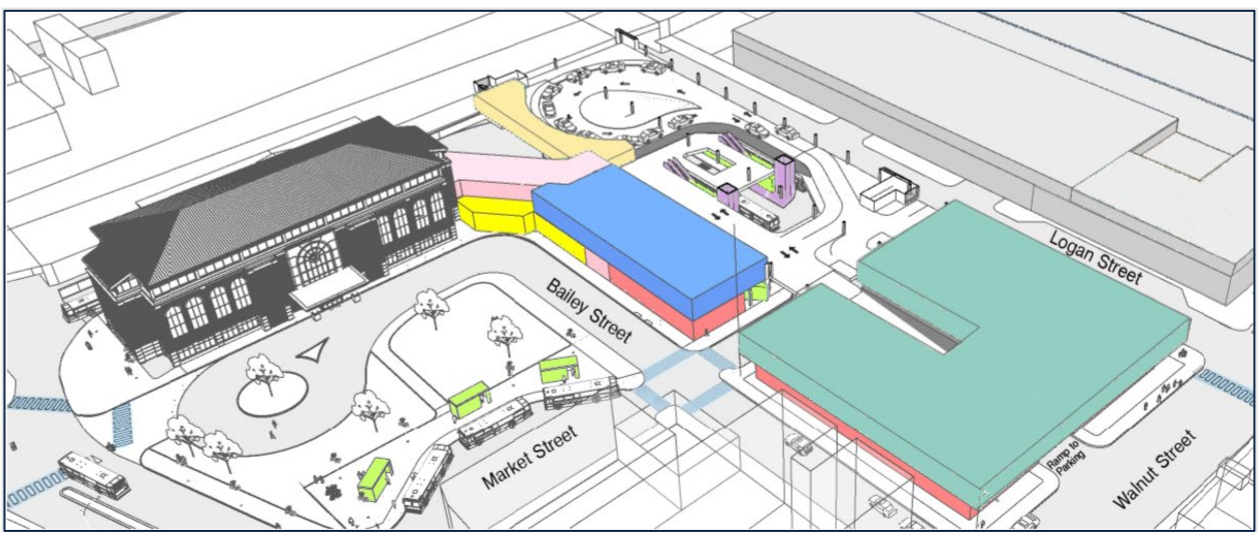
In addition to the three new rural and intercity bus platforms on Market Street, the Build Alternative would increase the number of platforms for dedicated MTD service from 10 to 19, with total capacity for 23 buses. The four existing platforms behind Illinois Terminal are able to accommodate five buses and would remain in their current configuration. Fifteen new dedicated MTD bus platforms would be constructed south of Illinois Terminal and north of Logan Street, shown in Figure 3. The new MTD platforms would be constructed on an existing surface parking lot and would be on the ground floor of a new mixed-use structure

Figure 3. Site Layout and First Floor Plan for Illinois Terminal Expansion

Source: Ratio Architects 2020

The majority of taxi cab and ride share service use at Illinois Terminal is by Amtrak rail passengers. The Build Alternative improves traffic circulation in front of Illinois Terminal by moving taxi and rideshare traffic to a dedicated space on the second floor of the mixed-use structure (Figure 4).

Figure 4. Second Floor Plan for Illinois Terminal Expansion



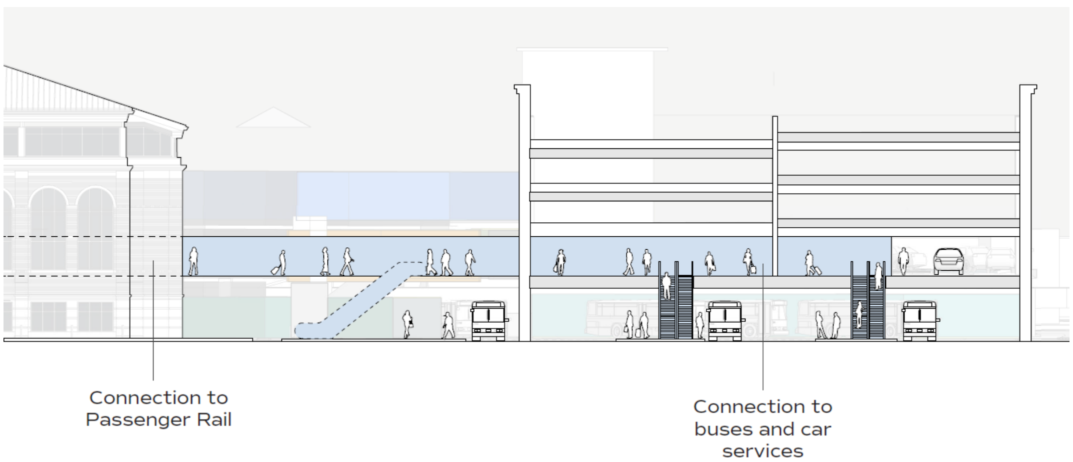
Source: Ratio Architects 2020

Pedestrian and Access Improvements

Highly visible crosswalks would be carefully positioned on the ground floor of the mixed-use structure for pedestrians crossing lanes of bus traffic to enter/exit island platforms (see Figure 3). Abundant lighting in the platform area would be implemented. The viability of installing pedestrian activated flashing beacons at the crosswalks is also being considered as a design feature. Barriers would be installed on the back side of platforms, forcing passengers to utilize the crosswalk as it would be the only entrance/exit to the platform on the ground floor.

As shown in Figure 4 and Figure 5, second floor access would be provided to outer island platforms, Amtrak passenger rail, and rideshare/taxi pickup and drop-off. Vertical circulation elements (stairs, elevators, escalators) would facilitate access to MTD platforms without the need to cross the bus drive. All improvements to Illinois Terminal and the mixed-use structure would be compliant with guidelines of the Americans with Disabilities Act of 1990. Universal design principals would be incorporated to the extent feasible.

Figure 5. Second Floor Pedestrian Connections



Source: Ratio Architects 2020
Note: Elevators not shown.

Interior Renovation of the Existing Illinois Terminal and Waiting Areas

Under the Build Alternative, the interior of the Illinois Terminal would be renovated to accommodate connections to the mixed-use structure and platforms to the south, provide additional passenger waiting areas, and expand tenant spaces. The READY School space on the third floor, CityView Event and Meeting Center on the fourth floor, and other existing office space would be retained in their current configurations. The READY School space on the first and second floor of the Illinois Terminal would be moved to the third floor of the mixed-use structure. Renovations to the interior of the existing Illinois Terminal building would provide the following:

- Expansion of the Amtrak waiting room to accommodate more than 200 passengers;
- Up to 17,000 square feet in amenity and leasable space; and
- Up to 1,750 square feet of bus waiting areas to accommodate 115 passengers.

Mixed-Use Structure

The mixed-use structure would be constructed on three parcels located north of Logan Street between Walnut Street and the Canadian National railroad tracks. As a joint development structure, FTA funding would be used to construct the building shell, including the bus platforms, transit-serving passenger amenities, MTD tenant space, and parking. The interior build-out of private development space for retail and residential uses within the mixed-use structure would be privately funded as part of the joint development agreement. Interior build-out related to transit and transit-serving passenger amenities would utilize FTA funding.

East of Market Street, the mixed-use structure would be five floors and would include a parking deck with approximately 374 parking spaces for use by Illinois Terminal passengers and employees, the public, taxi and ride share services, and residents of the private development. See Figure 6 for the full site layout and Table 1 for a listing of conceptual-level programming.

It is anticipated that 195 spaces of the total 374 spaces in the mixed-use structure would be for transit and transit-supportive uses. Approximately 17 spaces would be marked as reserved for MTD and police parking, Zipcar, and taxi/ride share. Approximately 126 prepay visitor spaces would be available for transit riders, multi-day parking, visitors to Illinois Terminal, and the general public. The parking deck would be managed by the City of Champaign, similar to the existing West parking lot at Illinois Terminal. Multi-day parking would be controlled through check-in procedures at Illinois Terminal. Approximately 179 parking spaces will be allocated to residential use.

Figure 6. Site Layout for Illinois Terminal Expansion.

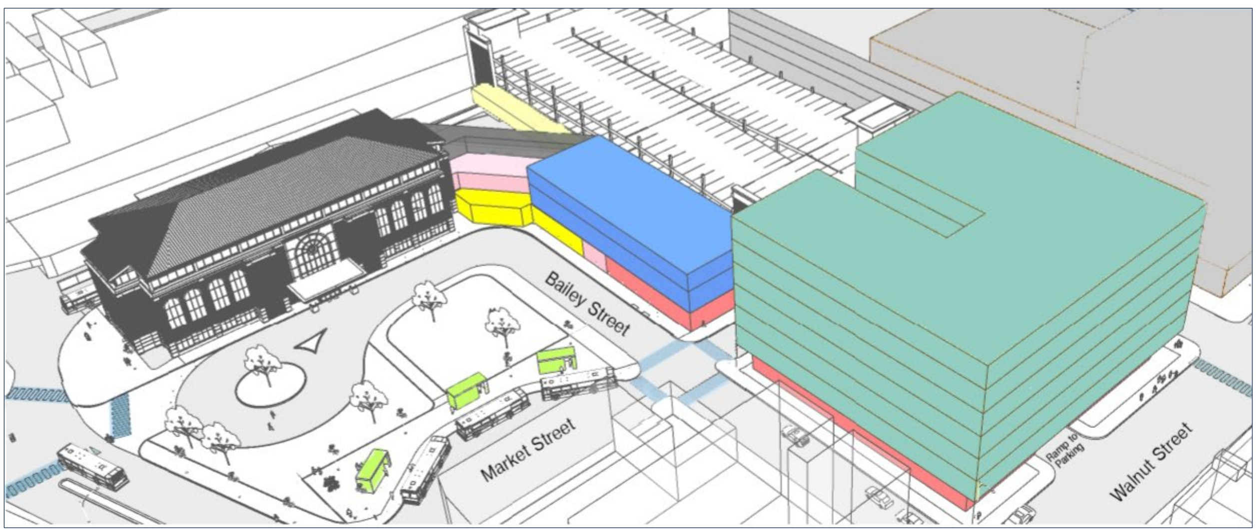


Table 1. Joint Development Mixed-Use Structure Conceptual Plan Elements

Floor	Use	Floor Area (sq. ft.)
1	Transit Amenity	2,160
	Retail	18,650
	15 bus platforms	7,285
	MTD Common	550
	MTD Waiting	2,650

Floor	Use	Floor Area (sq. ft.)
	Retail “Back of House” (storage and employee break rooms)	5,735
2	MTD (leasable space)	8,250
	MTD Common	4,150
	Taxi and Rideshare pickup/drop-off	2,800
	Residential*	27,000
3	MTD (leasable space - READY School)	8,650
	Parking	34,000
	Residential*	27,000
4	Parking	40,000
	Residential *	27,000
5	Parking	40,000
	Residential *	27,000
6	Residential *	27,000
7	Residential *	27,000

*The interior build-out of the private development would be funded separately from the Illinois Terminal Expansion Project

3.0 Legal/Regulatory Context and Methodology

Procedures published by the FTA were used to evaluate the potential for noise and vibration impacts at sensitive receiver locations in the Project Area. The criteria are described in the FTA’s 2018 Transit Noise and Vibration Impact Assessment (FTA Manual). The guidance sets forth the basic concepts, methods, and procedures for evaluating the extent and severity of the noise and vibration impacts resulting from transit projects.

Noise is “unwanted or undesirable sound,” generally measured in terms of loudness. The loudness or magnitude of noise determines its intensity and is measured in decibels (dB). The overall noise level from transit sources is described in A-weighted decibels (dBA). The A-weighted decibel scale was developed to approximate the way the human ear responds to sound levels. Because the decibel is based on a logarithmic scale, a 10-dB increase in noise level is generally perceived as a doubling of loudness, while a 3-dB increase in noise is just barely perceptible to the human ear (FTA 2018).

The equivalent average sound level (L_{eq}) is often used to describe sound levels that vary over time, usually a 1-hour period. Using 24 consecutive 1-hour L_{eq} values, it is possible to calculate daily cumulative noise exposure. A common community noise metric is the Day-Night Average Sound Level (DNL or L_{dn}). The L_{dn} is the 24-hour L_{eq} but includes a 10-dBA adjustment on noise that occurs during nighttime hours (between 10 PM and 7 AM) when sleep interference might be an issue. The L_{dn} is useful when assessing noise in residential areas, or land uses where overnight sleep occurs (FTA 2018).

The proposed project would expand an existing bus and train station where a single railroad track currently exists. FTA thresholds for noise and impacts depend on existing noise levels. As existing noise levels increase, the allowed increase in transit noise exposure decreases.

3.1. Noise Assessment Methodology

- The noise screening, and general assessment consists of the following general steps:
- Establish the Project Area and identify noise-sensitive receptors
- Evaluate the existing conditions and establish corresponding impact thresholds
- Calculate the noise effects due to the proposed Project
- Identify receptors anticipated to experience moderate or severe noise impacts under the Build Alternative.

Noise Screening Assessment Methodology

The purpose of the noise screening assessment is to determine if there are noise-sensitive land uses located close enough to a proposed Project, to require additional assessment to evaluate the potential for noise impacts. Using Table 4-7 in the FTA Manual the project type is selected and the corresponding screening distance for unobstructed line of sight or the presence of intervening buildings is applied. Since this project does not intend to alter the rail services, and the addition of buses would occur whether or not the project is constructed, neither the trains nor the buses need to be analyzed. However, the project does propose to add approximately 134 additional parking spaces within the Project Area that would be directed to a five-floor parking garage. This assessment used the Parking Facilities project type and applied the unobstructed screening distance of 125 feet from the center of the noise generating activity. This analysis assumes that the parking garage structure would shield most of the noise from vehicles using the additional parking spaces. Therefore, the center of the noise generating activity is located at the driveway for the proposed parking garage, from which there is an unobstructed line of sight to locations off-site.

Receptors that are potentially influenced by the noise from the proposed project are those that are described in land use categories 1, 2, or 3, as shown in Table 1. Noise sensitive receptors were identified by reviewing a combination of available land use-related GIS data; available digital aerial photographs; and other area photography, including publicly available internet imagery. Receptors in the Project Area were identified and categorized for noise sensitivity based on the descriptions in Table 2.

Table 2. Noise Land Use Categories

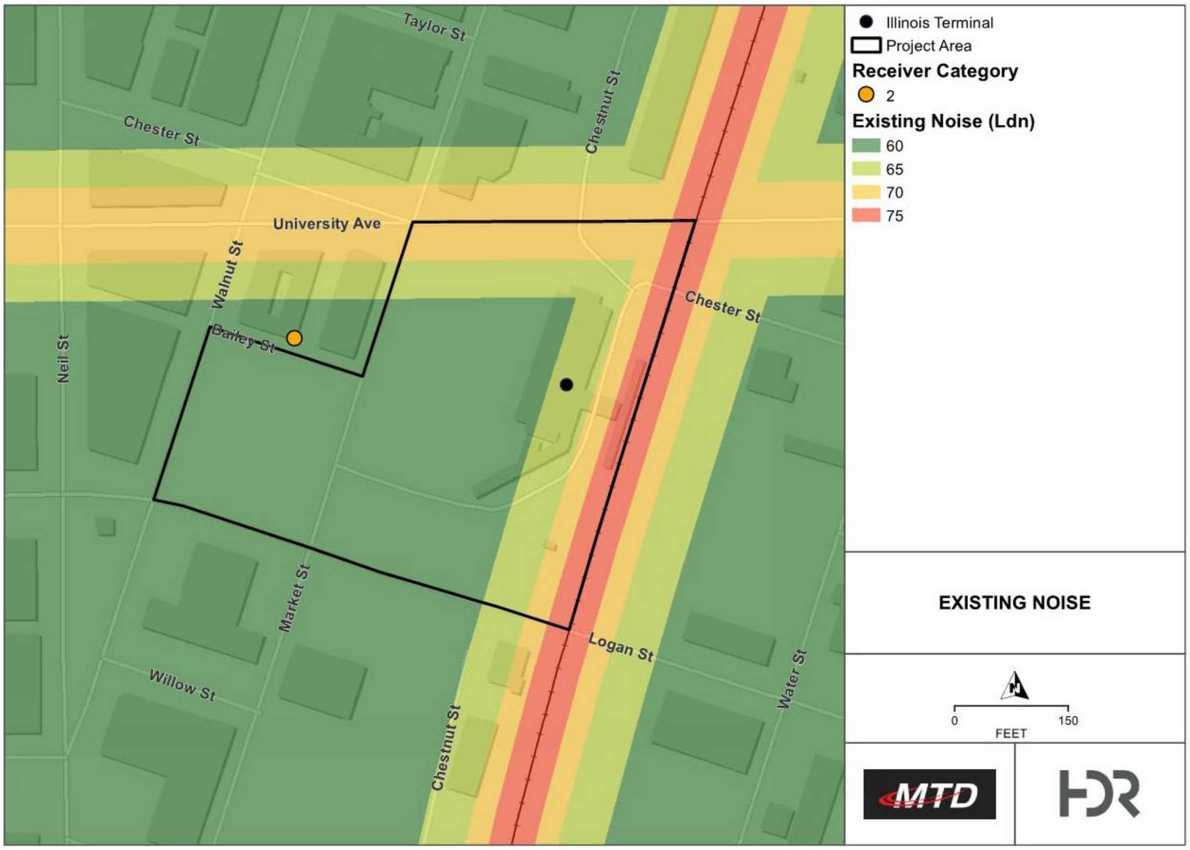
Noise Land Use Category	Description of Land Use Category
1	Land where quiet is an essential element of its intended purpose. Example land uses include preserved land for serenity and quiet, outdoor amphitheaters and concert pavilions, and national historic landmarks with considerable outdoor use. Recording studios and concert halls are also included in this category.
2	This category is applicable to all residential land use and buildings where people normally sleep, such as hotels and hospitals.
3	This category is applicable to institutional land uses with primarily daytime and evening use. Example land uses include schools, libraries, theaters, and churches where it is important to avoid interference with such activities as speech, meditation, and concentration on reading material. Places for meditation or study associated with cemeteries, monuments, museums, campgrounds, and recreational facilities are also included in this category.

Source: FTA 2018

Noise General Assessment Methodology

The first task in the General Noise Assessment methodology is to estimate existing noise levels. The existing noise environment was estimated in accordance with section 4.4, step 5 of the FTA Manual. This estimation considered the proximity to University Avenue, which is located immediately north of the Project Area, and also proximity to the intercity rail line that borders the east side of the Project Area. The estimation also considered a population density of 21,009 people per square mile within the Study Area. Using the distances to the roadway and rail, and the population density, HDR developed estimates of the existing noise levels. Figure 7 illustrates the estimated existing noise environment.

Figure 7. Estimated Existing Noise



Source: Ratio Architects 2020

Utilizing the FTA General Noise Assessment spreadsheet model the impact assessment was performed for each receiver by inputting the estimated existing noise, project data, and receiver data. The average number of automobiles per hour was estimated to be 175 during daytime hours and 50 during nighttime hours.

The noise impact thresholds used for the assessment were based on existing noise levels, and represent the FTA limits of allowable increase in noise levels. FTA's noise impact thresholds provide the framework for identifying the magnitude of the impact. Impact was determined from the FTA General Noise Assessment spreadsheet model and classified for each receiver as none, moderate, or severe. The moderate impact threshold defines areas where the noise would be noticeable, but might not be sufficient to cause a strong, adverse community reaction. The severe impact threshold defines the noise limits above which a substantial percentage of the population would be highly annoyed by new noise.

3.2. Vibration Assessment Methodology

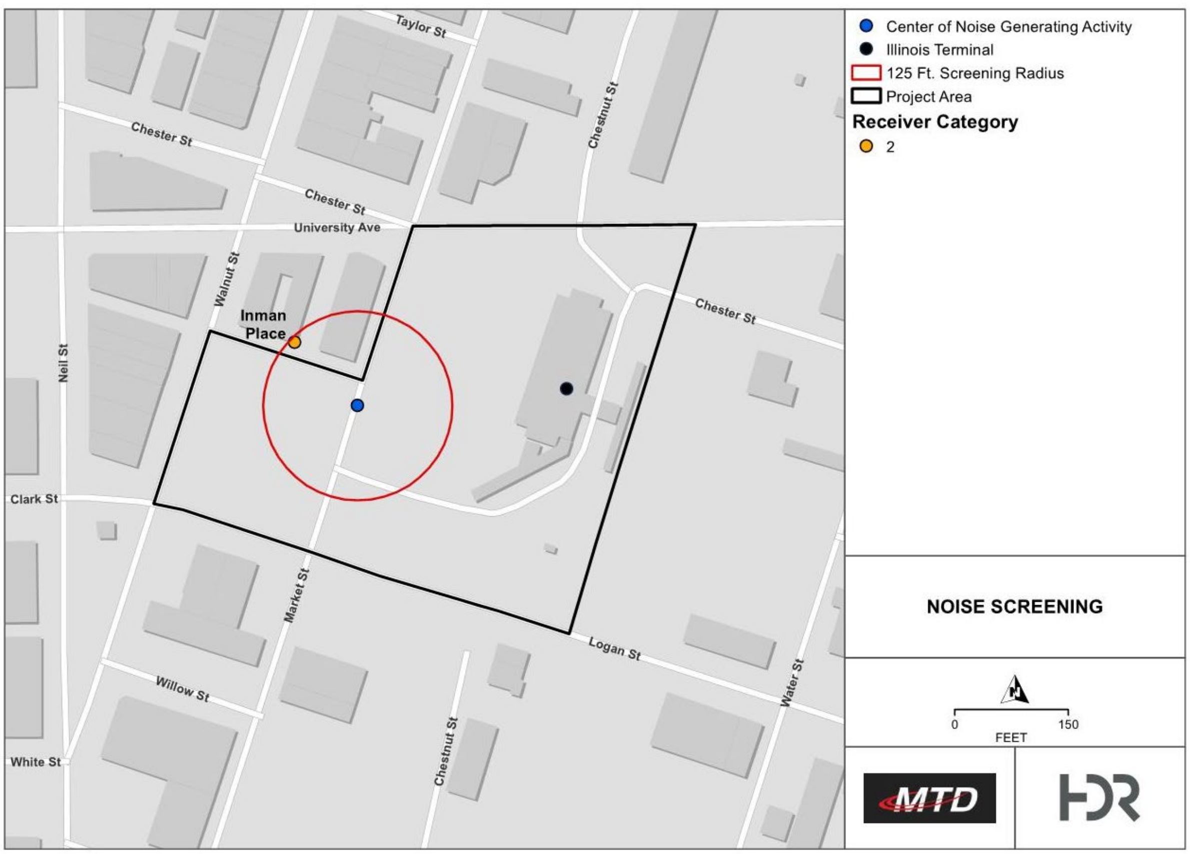
The Project would only change the number of rubber-tired vehicles accessing the parking spaces and does not include changes to the existing rail line or bus service. FTA does not consider passenger cars to be a source of vibration concerns. Therefore, vibration impact assessment related to operations is not necessary, according to Figure 6-3 in the FTA Manual.

Construction vibration for the proposed project site was assessed using the quantitative methods outlined in section 7.2 of the FTA Manual. Quantitative construction vibration analysis is appropriate for projects involving the use of large construction equipment that may result in building damage or prolonged annoyance.

4.0 Existing Conditions

One noise-sensitive receiver was identified during the screening assessment, which is a category 2 land use. This receiver is a multi-floor senior independent living facility called Inman Place. READY school is a land use Category 3 but is excluded from the operational noise analysis because the location is outside of the noise screening distance of 125 feet from the noise generating activity, which is at the entrance to the parking garage. Figure 6 shows the screening distance and noise receiver. Using FTA methods as described in Section 4.1, the existing L_{dn} is 60 dBA at Inman Place.

Figure 8. Noise Screening



Source: HDR 2020

In addition to Inman Place and READY school, there is a radiology clinic that is approximately 200 feet from the western most project boundary that was included in the construction vibration analysis because radiology clinics utilize diagnostic imaging equipment that is sensitive to ground-borne vibration.

5.0 Impacts

The following sections summarize the potential noise impacts of the No Build and the proposed Project.

5.1. No Build Alternative

There would be no change in noise or vibration levels under the No Build Alternative.

5.2. Build Alternative

Noise

Permanent Impacts

Based on the existing L_{dn} of 60 dBA, the moderate noise impact threshold is an L_{dn} of 58 dBA and the severe noise impact threshold is an L_{dn} of 63 dBA. Attachment 1 presents results and impact plots from the FTA General Noise Assessment spreadsheet model. Analysis results indicate that the additional parking spaces under the Build Alternative would result in an L_{dn} of 42 dBA, which is below both the moderate and severe noise impact thresholds. Therefore project-related noise would not cause permanent noise impacts as defined by FTA.

Construction Impacts

The construction noise and vibration assessments used the center of the project site as the origin for construction noise and vibration calculations.

Construction noise was assessed according to Section 7 of the FTA Transit Noise and Vibration Impact Assessment Manual. A quantitative construction assessment was used to estimate construction noise because construction is expected to be longer than a month, and noisy equipment may be used. For projects in the early assessment stage when construction equipment and schedule are undefined, FTA recommends the general assessment option should be used to evaluate construction noise.

Construction equipment most likely to be used during the proposed project was selected for each of the two phases of site development (demolition and construction) based on assumptions made about the existing conditions on-site and the proposed plan. The following scenarios were assessed:

- Demolition: A jackhammer and bulldozer would be the two loudest pieces of equipment used to break up existing concrete and asphalt.
- Construction: An impact pile driver and a generator would be the two loudest pieces of equipment.

Noise levels for each piece of equipment were calculated using Equation 7-1 from the FTA Manual. Individual equipment noise levels were calculated in A-weighted decibels (dBA) for the two loudest pieces of equipment to be used during each proposed project phase. Noise levels were calculated from the center of the proposed project site to the nearest receptors.

There are two sensitive receptors identified near the project site. One receptor is the READY Program school that leases space inside the existing Illinois Terminal on the project site, and was analyzed as a commercial land use according to the general assessment construction noise criteria from Table 7-2 in the FTA Manual. The READY Program school is approximately 83 feet from the center of the Project Area.

The other receptor is Inman Place that is a multi-floor independent senior living facility located across Bailey Street, and was analyzed as a residential land use according to the general assessment construction noise criteria. Inman Place is approximately 226 feet from the center of the project site.

This set of calculations represents the anticipated average noise levels due to the construction equipment being mobile and presumed to operate anywhere within the proposed project site at a given time. Noise levels of combined equipment were then calculated for each phase using decibel addition for comparison to general assessment construction noise criteria from Table 7-2 in the FTA Manual. Results of the construction noise assessment, including FTA general assessment construction noise criteria, are presented in Table 3 below.

Table 3. Quantitative Construction Noise Assessment

Distance	Land Use	Phase	Equipment	Result (dBA)	General Assessment Construction Noise Criteria (dBA)
83 ft. (from center of site)	Commercial	Demolition	Jackhammer and bulldozer	85	Commercial: Day/Night = 100
		Construction	Impact pile drive and generator	97	
226 ft. (from center of site)	Residential	Demolition	Jackhammer and bulldozer	77	Residential: Day = 90; Night = 80
		Construction	Impact pile drive and generator	88	

Source: HDR 2020

The resulting noise for the commercial receptor was 85 dBA and 97 dBA for the demolition phase and construction phase, respectively. Noise levels are below the applicable commercial land use criterion of 100 dBA. The resulting noise for the residential receptor was 77 dBA and 88 dBA for the demolition phase and construction phase, respectively. Construction noise levels are projected to be below the applicable residential land use criterion of 90 dBA for daytime.

Therefore, significant adverse impacts from construction noise are not anticipated at either receptor. However, a more detailed assessment of construction noise may be warranted if there are significant changes to the construction equipment, if noise sources are operated for prolonged periods close to receptors, or if construction activities occur during nighttime hours.

Construction activities would be conducted in accordance with City, State, and Federal guidelines, and would use best practices to limit noise, such as limiting construction activities to normal daytime working hours, limiting idling equipment, and additional preventative actions as the construction plan is finalized.

Vibration

Construction equipment vibration source levels are assessed in terms of peak particle velocity (PPV in/sec) and vibration velocity level (L_V; measured in vibration decibels (VdB), which are compared to FTA criteria for building damage and annoyance, respectively. Per the FTA Manual, construction vibration is assessed for each piece of equipment individually using Equation 7-2 for PPV and Equation 7-3 for L_V. The following scenarios were assessed based on the same assumptions made in the construction noise assessment:

- Demolition: Loaded trucks would be the largest vibrational source.
- Construction: An impact pile driver would be the largest vibrational source.

Similar to the general assessment method for construction noise, vibration levels were calculated at the READY Program school and Inman Place. This set of calculations represents the anticipated average vibration levels due to the construction equipment being mobile and presumed to operate anywhere within the proposed project site at a given time.

A second set of calculations was utilized to represent the maximum vibration levels that may be experienced by sensitive receptors near the proposed project site when vibration sources are operating at the closest proposed project site boundary. Inman Place is approximately 40 feet from the project boundary on Bailey Street. Additionally, there is a radiology clinic that is approximately 200 feet from the western most project boundary.

Radiology clinics utilize diagnostic imaging equipment that is sensitive to ground-borne vibration. The most common types of diagnostic radiology exams include:

- Computed tomography (CT), also known as a computerized axial tomography (CAT) scan, including CT angiography
- Fluoroscopy, including upper GI and barium enema
- Magnetic resonance imaging (MRI) and magnetic resonance angiography (MRA)
- Mammography
- Nuclear medicine, which includes such tests as a bone scan, thyroid scan, and thallium cardiac stress test
- Plain x-rays, which includes chest x-ray
- Positron emission tomography, also called PET imaging, PET scan, or PET-CT when it is combined with CT
- Ultrasound (source - https://medlineplus.gov/ency/article/007451.htm accessed on 10-06-2020).

The construction vibration section in FTA's 2018 guidance document does not provide a discussion of construction vibration thresholds for sensitive equipment like diagnostic imaging equipment. However, Figure 6-2 and Table 6-6 provide the vibration criteria (VC) curves, and an interpretation of them for use in a Detailed Vibration Assessment. HDR reviewed publicly available and reasonably obtainable information to identify an appropriate VC curve for diagnostic imaging equipment. Some magnetic resonance imaging (MRI), a type of diagnostic imaging technology, have vibration tolerance limits that are represented by the VC-C curve (Jersey Future Hospital, 2017). Table 6-6 in the FTA's guidance document interprets the VC-C curve to a maximum Lv of 54 VdB, as measured in the 1/3 octave bands of frequency over the frequency range 8 to 80 Hz.

Table 4 presents FTA's construction vibration criteria from Table 7-5 in the FTA Manual, and it outlines construction vibration criteria for a variety of building types. Although the majority of surrounding receptor buildings appear to be constructed of masonry, they are also likely to contain plaster walls due to their age and are conservatively categorized as Type III buildings for the purpose of damage assessment.

Table 4. FTA Construction Vibration Criteria

Building/Structural Category	Damage Assessment (PPV, in/sec)	Annoyance Assessment (VdB)
I. Reinforced-concrete, steel or timber (no plaster)	0.5	102
II. Engineered concrete and masonry (no plaster)	0.3	98
III. Non-engineered timber and masonry buildings	0.2	94
IV. Buildings extremely susceptible to vibration damage	0.12	90

Source: FTA 2018

Table 5 presents the construction vibration assessment results and facilitates a comparison with FTA construction vibration criteria for building response and human response to vibration.

Table 5. Quantitative Construction Vibration Assessment Results

Distance	Name	Phase	Equipment	Damage Assessment (PPV, in/sec)	Annoyance Assessment (VdB)	Building/ Structural Category	FTA Damage Assessment Criteria (PPV, in/sec)	FTA Annoyance Assessment Criteria (VdB)
83 ft. (from center of site)	READY Program School	Demolition	Loaded trucks	<0.1	70	III. Non-engineered timber and masonry buildings	0.2	94
		Construction	Impact pile driver (upper range)	0.25	96			
			Impact pile driver (typical)	0.11	88			
226 ft. (from center of site)	Inman Place	Demolition	Loaded trucks	<0.1	57	III. Non-engineered timber and masonry buildings	0.2	94
		Construction	Impact pile driver (upper range)	<0.1	83			
			Impact pile driver (typical)	<0.1	75			
40 ft. (from project boundary)	Inman Place	Demolition	Loaded trucks	<0.1	80	III. Non-engineered timber and masonry buildings	0.2	94
		Construction	Impact pile driver (upper range)	0.75	106			
			Impact pile driver (typical)	0.32	98			
	Inman Place	Construction	Sonic pile driver (upper range)	0.36	99	III. Non-engineered timber and	0.2	94

Distance	Name	Phase	Equipment	Damage Assessment (PPV, in/sec)	Annoyance Assessment (VdB)	Building/ Structural Category	FTA Damage Assessment Criteria (PPV, in/sec)	FTA Annoyance Assessment Criteria (VdB)
40 ft. (from project boundary)			Sonic pile driver (typical)	<0.1	87	masonry buildings		
200 ft. (from project boundary)	Radiology Clinic	Demolition	Loaded trucks	0.00	59	III. Non-engineered timber and masonry buildings	0.2	94
		Construction	Impact pile driver (upper range)	<0.1	85			
			Impact pile driver (typical)	<0.1	77			
200 ft. (from project boundary)	Radiology Clinic	Construction	Sonic pile driver (upper range)	<0.1	78	III. Non-engineered timber and masonry buildings	0.2	94
			Sonic pile driver (typical)	<0.1	66			

Comparison of the calculated PPV values to FTA damage assessment criteria values indicates that, on average, when the equipment is operating near the center of the proposed project site, construction vibration from an impact pile driver operating in its upper range would not pose a risk of damage to non-engineered timber and masonry buildings that may have plaster walls. Additionally, PPV values calculated using the minimum distance of 40 feet indicate that impact pile drivers at a typical to upper range and sonic pile drivers operating in the upper range pose a risk of damage to non-engineered timber and masonry buildings when operated in close proximity to proposed Project Area boundaries; however, a sonic pile driver operating at its typical range would be below the FTA construction vibration criteria for damage.

Comparison of the calculated VdB values to FTA annoyance assessment criteria values indicates that when equipment is operating near the center of the proposed project site, construction vibration would pose a risk of annoyance to people on-site at the Illinois Terminal building, including those at the READY Program school, if an impact pile driver is operated near its upper range, but not its typical range. Additionally, operation of an impact pile driver or sonic pile driver at its upper range at the proposed project site boundaries would result in increased annoyance to the residential receptor 40 feet away.

The use of a sonic pile driver at its typical range would not exceed the FTA's annoyance assessment criteria values at 40 feet away.

Using FTA construction vibration assessment methods, the highest project-related construction vibration level is an Lv of 85 VdB from an impact pile driver operating in its upper range at the radiology clinic. This indicates a potential that construction vibration can interfere with use of sensitive diagnostic imaging equipment at the radiology clinic.

6.0 Measures to Avoid or Minimize Harm

The need to mitigate Project operational noise and vibration is not necessary since there are no noise impacts, and because ground-borne vibration is not a concern with passenger vehicles accessing the parking deck. This analysis assumes that the proposed mixed-use building would be designed and constructed to provide indoor noise and vibrational levels that are compatible with overnight sleep and would achieve the FTA's indoor noise and vibration criteria.

Construction noise levels are projected to be just below the FTA's recommended construction noise criterion. A detailed assessment of construction noise may be warranted if there are significant changes to the construction equipment roster or if noise sources are operated for prolonged periods close to receptor buildings.

If impact pile drivers or sonic pile drivers are operated at their upper ranges, potential construction vibration levels could approach or exceed FTA construction vibration criteria posing a risk of damage to non-engineered timber and masonry and could also approach or exceed the vibration tolerances for diagnostic imaging equipment at the radiology clinic.

During final design, MTD and its engineers would consult with the radiology clinic to understand its needs and concerns as it relates to vibration and may decide that a more detailed construction vibration assessment is warranted. Alternatively, MTD would require that the contractor use construction methods and techniques that decrease the amount of vibration experienced at sensitive receptor sites.

At a minimum, MTD will implement the following mitigation measures to minimize the vibration impacts during construction:

- MTD will include noise and vibration performance specifications in construction contract documents that are consistent with City of Champaign ordinances.
- Construction contractors would be required to develop a construction noise and vibration management plan. This may be a singular plan or it may be included in a larger environmental management plan for the construction project. At a minimum, the plan would include the following:
  - Identification of the proposed Project's noise and vibration control objectives and potential components;
  - Summary of noise and vibration-related criteria and local ordinances for construction contractors to abide by;

- Requirement of a pre-construction survey to identify receptors potentially affected by construction noise and vibration and documentation of the pre-construction conditions of particularly susceptible receptors. This would include, at a minimum, the radiology clinic, the READY Program school, and the Inman Place;
- List of potential mitigation measures, a plan to implement mitigation, and an approach for deciding the appropriateness of mitigation by construction activity and receptor;
- Identification of methods to minimize noise impacts on adjacent noise-sensitive stakeholders while maintaining construction progress; and
- Plans for coordination with affected project stakeholders to minimize intrusive construction effects;
- Process to handle and resolve any noise or vibration-related complaints.

7.0 References

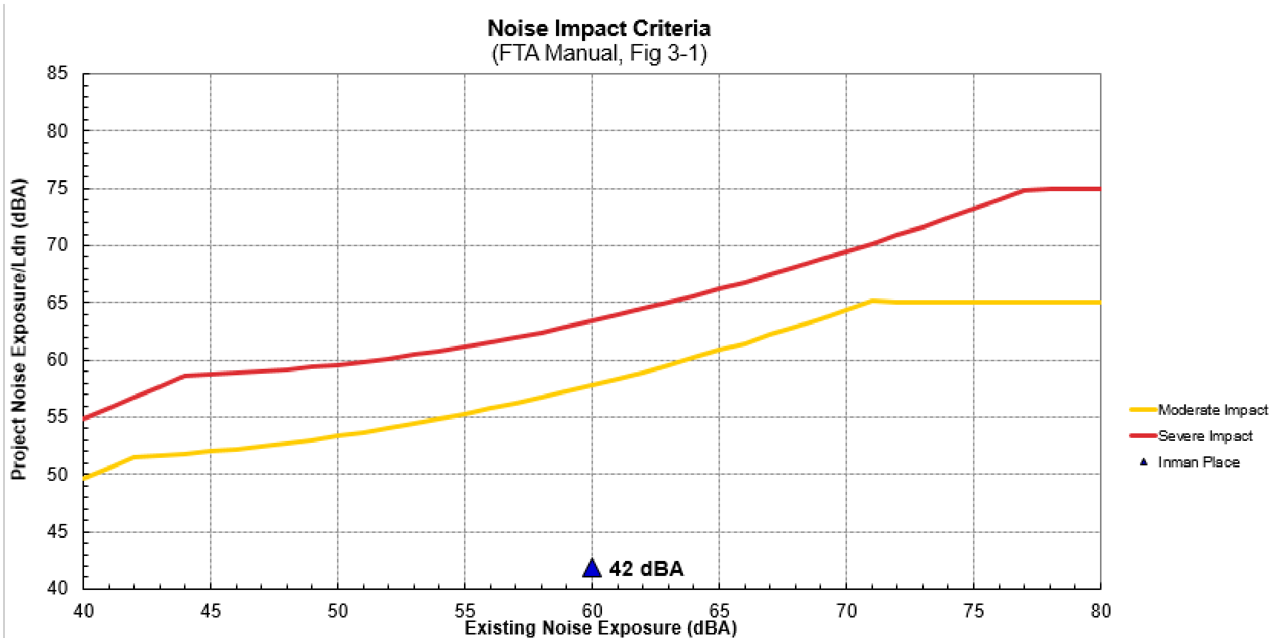
Federal Transit Administration (FTA). 2018. *Transit Noise and Vibration Impact Assessment Manual, FTA Report No. 0123.* Prepared by John A. Volpe National Transportation Systems Center.

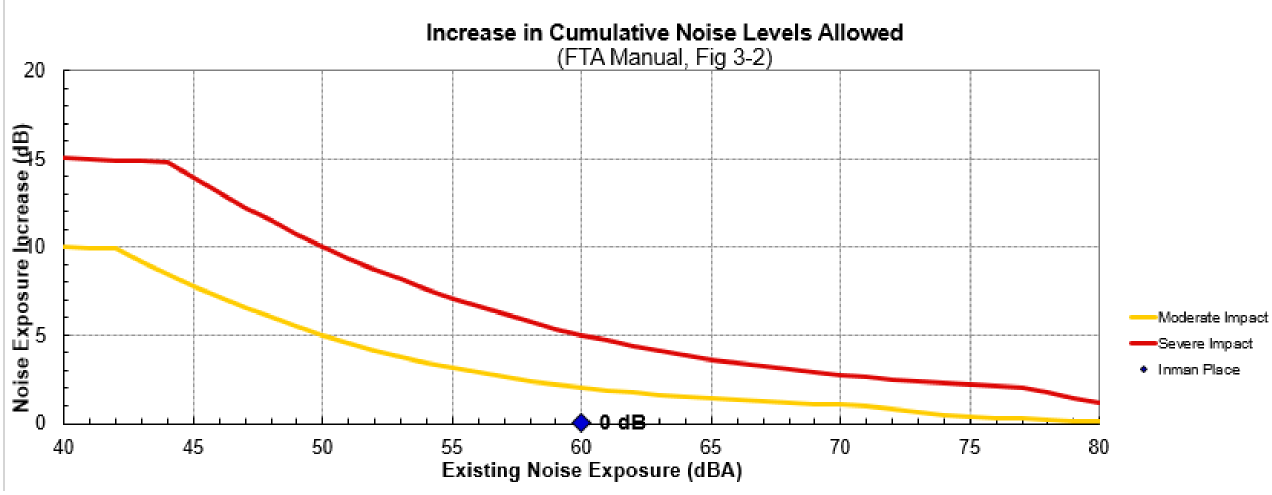
Jersey Future Hospital. 2017. *Environmental Impact Statement, Appendix C –Construction and Demolition Vibration Study.* Prepared by Helen Wilson Consultancy.

Attachment 1. FTA General Noise Assessment Spreadsheet Model Report & Impact Plot

Project: Illinois Terminal
Receiver: Inman Place

Source	Distance	Project Ldn	Existing Ldn	Noise Criteria Mod. Impact	Noise Criteria Sev. Impact	Impact?
1 Parking Garage	118 ft	41.8 dBA	60 dBA	58 dBA	63 dBA	None
2 --	50 ft		60 dBA	58 dBA	63 dBA	
3 --	50 ft		60 dBA	58 dBA	63 dBA	
4 --	70 ft		60 dBA	58 dBA	63 dBA	
5 --	ft		60 dBA	58 dBA	63 dBA	
6 --	ft		60 dBA	58 dBA	63 dBA	
Combined Sources		**42 dBA**	**60 dBA**	**58 dBA**	**63 dBA**	**None**





Source: HDR 2020