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Highway Traffic Noise Analysis

248th Avenue Phase I Study
103rd Street to 95th Street
Naperville, Illinois

Section No. 19-00173-00-PV

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EXECUTIVE SUMMARY

The City of Naperville is preparing a Phase I Engineering Study for the improvement of 248th Avenue from just north of 103rd Street to 95th Street within the City in Will County, Illinois. In short, 248th Avenue is proposed to be widened from one lane to two lanes in each direction from approximately 315 feet north of 103rd Street to the south edge of 95th Street, a distance of approximately 4,870 feet. Since the proposed improvement increases the number of through traffic lanes, Federal-aid policy requires that a noise analysis be performed as part of this project. The purpose of the analysis was to evaluate potential noise impacts from the proposed roadway improvements and to consider abatement measures where impacts are identified. Following is a summary of the analysis.

A noise receptor is a discreet point of frequent human use located within a project study area that has the potential to be impacted by future highway noise. For example, the receptor for a single family home is placed on a patio, deck, pool, or other area of frequent outdoor activity. The project area was surveyed and all identified noise receptors within 500 feet of the proposed improvement were assigned to an Activity Category based on land use.

The identified receptors were grouped into Common Noise Environments (CNEs) which are groups of receptors within the same Activity Category that are exposed to similar noise sources. Traffic volumes, terrain & potential for noise abatement were considerations the establishment of CNEs. There are 14 identified CNEs and they are all residential. While there were 8 locations identified as “trail”, there were no receptors identified in these areas, therefore they are not considered to be CNEs.

Within each CNE, a representative receptor was selected to represent the remainder of the receptors within that particular CNE. The representative receptor is located at the worst-case noise receptor under the 2050 Design Year Build condition within the CNE. The representative receptor is typically located on the first row of receptors adjacent to the roadway.

Existing traffic noise levels at representative receptors were modeled, future noise levels were predicted, and if impacts were present, potential noise barriers were analyzed using FHWA’s Traffic Noise Model (TNM), Version 2.5. The Federal noise regulations require the use of FHWA TNM, or any FHWA-approved model that is equivalent to TNM, for all highway traffic noise analyses subject to 23 CFR 772.

A traffic noise impact is expected to occur at the representative receptors in CNEs 1, 3, 6, 9, 10, 14, 17, 19, and 21 because the predicted 2050 Build noise levels approach, meet, or exceed the FHWA Noise Abatement Criterion of 67 decibels (67 dB(A)) at these locations. Noise levels range from 66 dB(A) to 68 dB(A) in these locations. Therefore, a consideration of noise abatement is required at these receptors to determine if the construction of a noise barrier with the proposed improvement would be both feasible and reasonable. The remaining receptors on developed lands are predicted to experience noise levels below the FHWA NAC and IDOT impact criteria, and thus no consideration of abatement is required in these areas.

Modeling of noise abatement barriers was completed at all of these CNEs. Barriers were found to be feasible and acoustically reasonable for CNEs 1, 3, 6, 9, 14, 17, and 21 because modeling indicates that the proposed barrier can achieve a minimum 5-dB(A) reduction for at least 2 impacted receptors in each CNE, as well as an 8-dB(A) reduction for at least one receptor in each CNE. A noise abatement barrier was not found to be feasible at CNE 10 as there are not two impacted receptors, and therefore the barrier cannot achieve at least a 5-dB(A) reduction at two impacted receptors to meet feasibility criteria.

Feasible and acoustically reasonable noise abatement barriers were analyzed for cost reasonableness. Barriers at CNEs 3, 6, 9, and 14 were found to be cost reasonable. Barriers at CNEs 1, 17, 19, and 21 were eligible for cost averaging since their ratio of estimated build cost to adjusted allowable cost was less than 2. Through cost averaging, barriers were found to be cost reasonable at CNEs 1, 17, 19, and 21. Proposed barriers range in length from 545 feet to 1,285 feet and in height from 8 feet to 11 feet. Overall, 74 residences are predicted to receive a benefits of 5 dB(A) or greater if these noise abatement barriers are installed..

Viewpoints will be solicited for each of these barriers and that will determine whether the barriers will be recommended as part of this project. Viewpoint meetings are expected to take place in Summer of 2022. Once viewpoints have been received, results of the viewpoints, and more detailed design of barriers recommended for installation will be provided.

It is possible that modifications to the proposed roadway improvement plans during the final design phase of this project due to constraints not foreseen in the preliminary design phase could result in changes to the noise analysis conclusions. If so, IDOT will determine if revisions to the traffic noise analysis are necessary. A final decision on noise abatement will not be made until the project's final design is approved and the public involvement processes is complete.

I. INTRODUCTION

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The City of Naperville (City) is preparing a Phase I Engineering Study for the improvement of 248th Avenue from just north of 103rd Street to 95th Street within the City in Will County, Illinois. **Exhibits A-1** and **A-2** in **Appendix A** are regional and local project location maps. In short, 248th Avenue is proposed to be widened from one lane to two lanes in each direction from approximately 315 feet north of 103rd Street to the south edge of 95th Street, a distance of approximately 4,870 feet.

A highway traffic noise analysis is required on all Federal-aid highway projects that include the construction of a highway on a new location or the physical alteration of an existing highway that significantly changes either the vertical or the horizontal location or increases the number of through lanes. According to the Code of Federal Regulations (23 CFR 772), with respect to highway traffic noise, this type of project is classified as Type I project (versus a Type II project, which is the consideration of noise abatement along existing highways). Note that IDOT does not maintain a Type II program. The addition of a through lane in each direction makes this a Type I project. Since it is a Type I project, a highway traffic noise analysis must be performed as part of the Phase I Engineering Study. The purpose of a highway noise analysis is to evaluate potential noise impacts from the proposed roadway improvements and to consider abatement measures where impacts are identified.

A. Project Description

Exhibits A-4a and **A-4b** in **Appendix A** may be referenced for existing conditions and the proposed improvement plan on aerial photography.

248th Avenue is a north-south, two-way minor arterial roadway. The south project limit is approximately 350 feet north of 103rd Street and the north project limit is 95th Street. The roadway is under the maintenance and jurisdiction of the City of Naperville. 248th Avenue within the project limits consists of one 11.5-foot through lane in each direction. Left-turn channelization is provided at the intersections of 103rd Street, Honey Locust Drive, Trumpet Avenue, and 95th Street. Right-turn channelization is provided at the intersection of 95th Street. The posted speed limit on 248th Avenue is 45 mph.

The west half of the 248th Avenue right-of-way is approximately 40 to 50 feet wide. Beyond that, there is a 30-foot wide sidewalk easement along the majority of the corridor containing landscaping and a path, which effectively serves as a buffer between the roadway and the residences. These buffer areas are owned by the homeowners associations. The east half of the 248th Avenue right-of-way is approximately 50 to 60 feet wide, and there is a similar 25-foot landscaped buffer easement along a large portion of the east side of the project corridor. There are tall wooden privacy fences on or near the outer edges of the buffer areas on both sides for the majority of the corridor. In total, the right-of-way is generally approximately 100 feet wide, and the width between the fences on both sides of the roadway is between 140 and 160 feet.

South of the project limit, at 103rd Street, 248th Avenue consists of two 11-foot through lanes in each direction with a 17-foot median. The 5-lane cross section continues further south along 248th Avenue. North of the 103rd Street intersection, the roadway narrows to one through lane in each direction as described above. Traffic volumes and posted speeds used in the existing conditions traffic noise model are discussed in Section II-C below.

The proposed improvement on 248th Avenue within the project limits will consist of widening the roadway from a two-lane section to a five-lane section. The proposed design will include a 17-foot landscaped median with left-turn channelization at intersecting streets, and Type B-6.18 curb and gutter along the roadway edges. The proposed design will include some re-alignment of the 248th Avenue centerline to minimize impacts to right-of-way and utilities. Traffic volumes and posted speeds used in the Build conditions traffic noise model are discussed in Section II-C below.

95th Street is an east-west 5-lane minor arterial roadway north of the project limit that consists of two 11-foot through lane in each direction, with a 17-foot to 18-foot landscaped barrier median. At the intersection of 95th Street with 248th Avenue, 10.5-foot left turn lanes are present, as well as an 11-foot right turn lane on the west leg. The posted speed limit on 95th Street is 45 mph. The roadway is under the maintenance and jurisdiction of the City of Naperville.

103rd Street is an east-west two-lane local road south of the project limits that consists of one 11-foot through lane in each direction east of 248th Avenue, and one 16.5-foot through lane in each direction west of 248th Avenue. The posted speed limit on 103rd Street is 35 mph. The roadway is under the maintenance and jurisdiction of the City of Naperville.

B. Highway Traffic Noise Concepts

Sound is produced when pressure waves generated by a vibrating source travel through the air and are of sufficient strength to be capable of causing an auditory response in the human ear and brain. Noise is more of a subjective term, generally used to describe sound coming into contact with the human ear that is either annoying, or perceived as a health hazard. Noise can negatively affect human quality of life if it becomes strong enough to interfere with thought, conversation, and/or sleep. There are three primary characteristics of sound: *magnitude*, *frequency*, and *duration*.

Magnitude refers to the intensity of a sound and is subjectively described by humans in terms of how "loud" or "soft" a particular sound is. Magnitude is quantified in terms of the sound pressure level generated by a vibrating source. Sound pressure level (L), also referred to as "noise level", is measured in units called decibels (dB). The auditory threshold for humans with undamaged hearing is approximately 0 dB, while 140 dB is often described as the threshold of pain. Some common indoor and outdoor sound sources and their approximate noise levels are provided in **Exhibit A-3** in **Appendix A**.

Due to the logarithmic nature of the decibel scale, decibels are not subject to simple mathematical rules. A doubling of the number of sound sources of the same magnitude, such as doubling the number of vehicles on a highway, increases the noise level by 3 dB. The combined noise level of two simultaneous 60-dB sound sources is 63 dB, not 120 dB.

For the average human with normal hearing, a 3-dB change in noise level is barely perceptible, especially if the change occurs gradually over time. A 5-dB change in noise level is perceptible if the change occurs within a short span of time, but less discernable if the change occurs gradually over time. A 10-dB increase or decrease is discernable and subjectively described by most humans as "twice as loud" or "twice as soft" as the original level.

The distance from a sound source is also a factor in its magnitude. With respect to traffic on a typical highway, a doubling of the distance between the highway and the receptor will reduce the noise level by approximately 3 dB to 4.5 dB. For example, if the noise level at 50 feet from a highway is 70 dB, the noise level at 100 feet would be approximately 65.5 dB to 67 dB.

Frequency refers to the length of a sound wave and the number of wavelengths that pass a given point in one second, and is measured in units of Hertz (Hz). Frequency is subjectively described by humans in terms of "pitch". The frequencies on a piano keyboard range from about 32 Hz to 4,000 Hz. When struck, a single key on a piano emits a sound at a single frequency, or a pure tone. A complex tone comprised of many frequencies is emitted when multiple keys are struck simultaneously. If the multiple keys form a musical chord, the sound is harmonious and generally pleasing. Striking multiple non-harmonious keys can produce an unpleasing sound, or noise. Traffic noise is typically comprised of sounds in various non-harmonious frequencies, ranging from the low rumbles of a truck engine to the high-pitched sound of tires on concrete pavement. Most people will characterize higher frequencies as "more annoying" than lower frequencies.

Humans can hear sounds that range in frequency from about 20 Hz to 20,000 Hz. Our auditory response relative to frequency, however, is not linear. The human ear is considerably less sensitive to low frequencies in the 20 Hz to 200 Hz range, and most sensitive in the 1,000 Hz to 6,000 Hz range. In short, to compensate the curvilinear nature of human auditory response vs. frequency, the concept of "A-weighting" is applied to noise measurements so that less weight is given to lower-frequency sounds than those with higher frequencies. As a result, sound pressure levels in the highway noise field are reported as "A-weighted decibels", or dBA.

Duration of highway noise is described in terms of an "equivalent sound pressure level" or Leq. Leq is a constant sound level that would result in the same total sound energy being produced by a time-varying sound level over a specified period of time. For example, a given sound lasting 10 seconds has the same Leq as a sound that has twice the acoustical energy, but lasts only 5 seconds. Highway traffic noise, though it can be a relatively constant "white noise" sound, does contain peaks and valleys depending vehicle mix, spacing, and other variables. To simplify reporting and communication, highway traffic noise is reported in one-hour equivalent sound pressure levels, or Leq(h).

Other factors which influence the magnitude, frequency and/or duration of highway sound levels at a given receptor include vehicle volumes, speeds, acceleration, and truck percentage; atmospheric effects (temperature, wind, humidity, and pressure); the intervening topography and ground type (i.e., pavement vs. grass); and intervening buildings or other barriers. Vegetation can lower noise levels; however, a very dense stand of vegetation between 100 and 200 feet in width and 16 to 18 feet tall would be required to obtain a perceivable noise reduction of 5 dB. A single row of trees or bushes would not perceptibly reduce noise, and vegetation is not considered an abatement measure.

C. Highway Traffic Noise Policies

The analyses of the traffic noise impacts and mitigation for this project comply with FHWA's December 2011 publication, *Highway Traffic Noise: Analysis and Abatement Guidance*. This document was published to provide guidance in applying the Federal regulations contained in 23 CFR 772, *Procedures for Abatement of Highway Traffic Noise and Construction Noise*. The analyses are also consistent with Illinois Department of Transportation's (IDOT's) 2017 update of its June 2011 publication, *Highway Traffic Noise Assessment Manual*, which is also based on the latest 23 CFR 772 regulations and the

Federal guidance document. This manual is a companion to IDOT's noise policy, which is contained in Chapter 26 of IDOT's Bureau of Design and Environment manual.

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According to the Code of Federal Regulations (23 CFR 772), traffic noise impacts occur when the predicted noise levels approach, meet, or exceed the FHWA Noise Abatement Criteria (NAC) or when the predicted noise levels substantially exceed the existing noise levels. The following table contains the FHWA NAC (source: *Highway Traffic Noise Assessment Manual*, IDOT, 2017 Edition).

Table I-1

FHWA NOISE ABATEMENT CRITERIA - HOURLY WEIGHTED SOUND LEVEL

Activity Category	$L_{eq}(h)$	Evaluation Location	Description of Activity Category
A	57	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B[1]	67	Exterior	Residential.
C[1]	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails and trail crossings.
D	52	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E[1]	72	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F.
F	---	---	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	---	---	Undeveloped lands that are not permitted.

[1] **Includes undeveloped lands permitted for this activity category.**

The FHWA policy provides state highway agencies with flexibility to establish their own definitions of approach and substantial increase. State highway agencies must establish a definition of approach that is at least 1 dB(A) less than the NAC for the appropriate activity category. IDOT has established the following criteria that define the occurrence of a traffic noise impact:

- Design-year traffic noise levels are equal to or greater than one decibel less than the FHWA NAC.
- Design-year traffic noise levels are 15 dB(A) or more above existing traffic-generated noise levels.

It should be noted that the FHWA NAC are not goals for noise attenuation design. The NAC are noise impact thresholds that, if approached, met, or exceeded, require the consideration of noise abatement. A predicted reduction in noise levels with the installation of a noise barrier may or may not result in a noise level that falls below the FHWA NAC.

II. METHODOLOGY

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A. Evaluation of Land Uses and Activity Category Assignment

According to FHWA and IDOT policies and guidance, highway traffic noise impacts do not typically occur more than 500 feet from heavily traveled freeways or more than 100 to 200 feet from lightly traveled roads. IDOT's policy requires that land uses within 500 feet of proposed improvements be initially reviewed for receptors.

The land uses within the project area were evaluated based on field visits, aerial photography, land use and zoning maps, and other online resources, and assigned to an FHWA Traffic Noise Analysis Activity Category based on the descriptions in **Table A-1**. **Exhibit A-4a** and **A-4b** illustrates the project area land uses and their respective FHWA Activity Categories.

As shown, the area is predominantly residential in nature with respect to zoning and land use. Residential properties within 500 feet of the project were classified into Activity Category B. All Trails were classified into Activity Category C. Utilities and water resources (detention areas) were categorized into Activity Category F. Vacant property was categorized into Activity Category G. There are no locations within the project area identified as Activity Categories A, D or E. See **Table A-1** for descriptions of Activity Categories.

Tables A-1 and **A-2** in **Appendix A** state the development status, zoning, business/property owner names, addresses, activity category description, and if applicable, FHWA Noise Abatement Criterion for each of the land use areas. **Table A-1** lists noise sensitive land uses (Activity Categories A through E if applicable), and **Table A-2** lists non-noise sensitive land uses (Activity Categories F and G).

B. Determination of Receptor Locations and Common Noise Environments

A noise receptor is a discrete point of frequent human use located within a project study area that has the potential to experience a traffic noise impact under future traffic and the proposed roadway improvement. For example, per IDOT policy, the receptor for a single family home is placed on a patio, deck, pool, or other area of frequent outdoor activity that is typically closest to the nearest roadway. A building entrance can also qualify as a receptor in some instances. Receptors are located five feet above the ground, as this represents the height of the average human ear. In the case of multi-story, multi-family buildings with upper-floor balconies, each upper floor balcony is also considered a receptor.

The land use areas described in Section II.A above were evaluated and discrete receptor locations were identified within areas classified as Activity Category B. Receptors were placed on patios, front porches, other entryways, or other points of outdoor frequent human use based on the procedure described above. Receptor points are shown on **Exhibit A-5a** and **A-5b** as black circles. While there are eight locations classified as Activity Category C (Trail), there are no receptors identified within these areas.

The identified receptors were grouped into Common Noise Environments (CNEs) which are groups of receptors within the same Activity Category that are exposed to similar noise sources. Traffic volumes, terrain & potential for noise abatement were considerations the establishment of CNEs. The CNEs identified for this project are illustrated on **Exhibit A-5a** and **A-5b** and listed in **Table A-1**. There are 14, CNEs with identified receptors, and all are Activity Category B (residential). Since no receptors were identified in the Activity Category C (Trail) areas, these areas are not considered CNEs.

Within each CNE, a *representative* receptor was selected to initially represent the remainder of the receptors within that particular CNE. The representative receptor is located at the worst-case noise receptor under the 2050 Build condition within the CNE. The representative receptor is typically located on the first row of receptors adjacent to the roadway. The representative receptors for developed properties are shown as yellow dots on **Exhibit A-5a** and **A-5b**.

The distances from the roadway to each representative receptor varies along the corridor. On the west side of 248th Avenue, there are 56 residential properties adjacent to the roadway. The distance from the receptor to the center of the nearest through lane varies from 70 feet to 100 feet for the existing condition with a typical distance of approximately 90 feet. The proposed condition varies from 60 feet to 80 feet with a typical distance of approximately 70 feet. On the east side of 248th Avenue, there are 29 residential properties adjacent to the roadway. The distances from the receptor to the center of the nearest through lane in the existing condition varies from 75 feet to 135 feet with a typical distance of approximately 90 feet. The proposed condition varies from 65 feet to 125 feet with a typical distance of approximately 80 feet. See **Table A-4** for a list of representative receptors and summary of the distances between receptors and the existing and proposed roadways.

C. Traffic Noise Model and Inputs

Existing traffic noise levels at receptors were modeled, future noise levels were predicted, and if impacts were present, potential noise barriers were analyzed using FHWA's Traffic Noise Model (TNM), Version 2.5. The Federal noise regulations require the use of FHWA TNM, or any FHWA-approved model that is equivalent to TNM, for all highway traffic noise analyses subject to 23 CFR 772.

The sole source of noise in TNM is motorized vehicles. The volumes input into TNM can be broken down into passenger cars, medium trucks, heavy trucks, busses, and motorcycles. Within the model, simulated noise is emitted at three vertical sub-source points: 1) at the ground, to represent tire-pavement noise, 2) five feet above the ground, to represent the engine of a truck, and 3) twelve feet above the ground, to represent the top of the exhaust stack of a truck. Emission levels vary depending on vehicle type and speed inputs. No other sources of noise, other than traffic, are modeled in TNM.

The noise modeling process used traffic volumes collected as part of the Phase I engineering study which are available under separate cover. A review of the existing traffic counts found that the highest hourly traffic volumes on most of the roadway segments within the study area occur during the evening peak commuter hour, and thus the evening peak hour was chosen as the critical hour for analysis in the noise modeling effort. Design year 2050 traffic projections were obtained from the Chicago Metropolitan Agency for Planning (CMAP) as part of the Phase I engineering study. Projections include anticipated traffic volumes associated with the potential Islamic Center of Naperville (ICN) development. CMAP projections were used to develop 2050 No-Build and 2050 Build projected traffic volumes for use in future conditions noise modeling, and are also available under separate cover.

As described in Section I.B, other factors which influence highway sound levels at a given receptor include the intervening topography and ground type, and intervening buildings, vegetation, or other barriers. All of these factors are modeled in TNM based on topographic surveys, aerial photography, and field visits. In addition, TNM models variations in sound emission levels to due to roadway grades and acceleration away from a traffic control device. It should be noted that TNM does not account for temperature, humidity or wind variations, which can have a notable effect on noise levels, though primarily at distances greater than about 500 feet from the highway.

III. TRAFFIC NOISE ANALYSIS FOR DEVELOPED LANDS

A. TNM Results

TNM was used to model Existing, 2050 No-Build, and 2050 Build conditions, and to identify where noise impacts would be expected to occur on developed lands (including undeveloped lands that have an approved building permit) as part of the proposed roadway improvements. Following is a summary of the noise analyses for developed lands.

1. Existing Conditions and Validation of TNM Model

Existing Conditions - The modeled sound levels for the Existing conditions predicted by TNM provide a baseline for comparison to predicted noise levels under 2050 Build conditions to determine if noise impacts are expected to occur as a result of the proposed improvement. Determining existing noise levels with the TNM computer model is a valid technique at locations where existing noise levels are predominantly from traffic on the adjacent roadway (FHWA, 2011).

Validation of Existing Conditions TNM Model - Noise monitoring was performed at five validation locations within the study area. FHWA regulations and IDOT noise policy require that TNM models used to represent existing conditions be validated using field measurements of existing highway noise. The number of validated measurement locations must be equal to or greater than 25% of the number of receptors that require validating for the overall model to be considered validated. Based on IDOT policy, a measured noise level should be within 3 dB(A) of modeled results at 25% of the receptors subject to validation for the model to be considered validated. If the Existing condition TNM model is validated, it is considered valid for use in predicting future noise levels at the particular project location.

The five noise monitoring points selected for this project for model validation purposes are shown on **Exhibit A-5a** and **A-5b**. Monitoring was done at the same points representative receptors, or if not feasible (due to potential building reflections), at an equivalent offset very near the representative receptor. Monitoring locations were 65 to 85 feet from the nearest existing roadway edges of pavement. All measurements were taken using a Class I Sound Level Meter and were obtained on Tuesday December 8, 2020. Monitoring occurred between the hours of 12 P.M. and 5 P.M., and measurements would have been suspended if congestion slowed the free-flow movement of traffic or other major noise factors occurred, however that did not become the case. All measurements were taken during dry weather conditions when wind speeds were less than 12 mph. One 15-minute noise sample was obtained for all five validation points. Traffic volumes adjacent to the monitoring locations were counted during monitoring sessions and were used in the validation TNM model.

Noise monitoring results for validation are summarized in **Table A-3**. The field-measured noise levels ranged from 58 to 65 dB(A) at the chosen monitoring points. The noise levels predicted by the Existing condition TNM model at these same points were 58 to 62 dB(A). Each of these discrete points had measured values within 3 dB(A) of their predicted noise level in the TNM Validation model, and therefore the Existing condition model is considered validated.

Existing Conditions Noise Levels - As shown in **Table A-4,** the modeled Existing conditions P.M. peak hour Leq for the Existing conditions ranged from 61 dB(A) to 64 dB(A) at the fourteen identified residential representative receptors.

TNM files and PDF files of the input and output for the Validation and Existing condition models can be provided upon request.

2. 2050 No-Build Condition

Traffic noise at each representative receptor was also predicted for the 2050 No-Build condition using TNM. The 2050 No-Build condition is a scenario in which projected 2050 traffic volumes travel on existing roadways. 2050 No-Build noise levels were predicted using TNM for the fourteen receptor locations. The 2050 No-Build condition sound levels are useful for public information and when reporting on environmental impacts in the environmental documentation.

Table A-4 lists the modeled 2050 No-Build conditions noise levels for the weekday P.M. peak hour at developed common noise environments predicted by TNM. At each of the 14 representative receptors, 2050 No-Build noise levels are predicted to increase by only 1 dB(A) over existing conditions. This means that in the absence of the proposed improvement, noise levels will increase imperceptibly by the design year over existing conditions at these receptors.

TNM files and PDF files of the input and output for the Validation and Existing condition models can be provided upon request.

3. 2050 Build Alternative and Identification of Impacts

Traffic noise at each chosen receptor on developed lands was also predicted for the 2050 Build conditions in the TNM computer model. The 2050 Build condition uses projected 2050 traffic volumes and proposed alignments, geometrics, and roadway characteristics for the proposed improvement and the major intersecting roadways.

Table A-4 also lists the modeled 2050 Build conditions noise levels for the weekday P.M. peak hour at developed common noise environments predicted by TNM. The 2050 Build condition noise levels are predicted to range from 62 to 68 dB(A), a 0 to 5 dB(A) increase over the Existing condition. The increases at various receptors are due to the addition of the new roadway lanes, as well as background traffic volume increases. At six of the 14 representative receptors, the predicted increase between Existing and the 2050 Build condition ranges from 0 to 3 dB(A). Since changes in noise levels of 3 dB(A) or less are not perceptible to humans with normal hearing, especially when they occur gradually over time, it can be generally concluded that the noise levels predicted to occur after the improvement is in place will not be noticeably different than noise levels under Existing Conditions at these locations. At the other eight of 14 representative receptors, the predicted increase between Existing conditions and 2050 Build conditions is 4 to 5 dB(A). A 5 dB(A) change in noise levels is perceptible to humans with normal hearing, but likely less perceptible because the change will occur over a span of several years.

At 13 of the 14 representative receptor locations, the 2050 Build condition noise levels are predicted to be no more than 3 dB(A) greater than the 2050 No-Build condition. Again, changes in noise levels of 3 dB(A) or less are not perceptible to humans with normal hearing. At one of the 14 receptors, the 2050 Build condition is predicted to be 4 dB(A) greater than the 2050 No-Build, which is still one decibel below what is typically considered a perceptible change in noise levels.

Traffic noise impacts are expected to occur at the representative receptors in CNEs 1, 3, 6, 9, 10, 14, 17, 19, and 21 because the predicted 2050 Build noise level approaches, meets, or exceeds the FHWA Noise Abatement Criterion at these locations. Therefore, a consideration of noise abatement is required at these 9 CNEs to determine if the construction of a noise barrier with the proposed improvement would be both feasible and reasonable. The remaining receptors on developed lands listed in **Table A-4** are predicted to experience noise levels below the FHWA NAC and IDOT impact criteria, and thus no consideration of abatement is required in these areas.

TNM files and PDF files of the input and output for the Validation and Existing condition models can be provided upon request.

B. Traffic Noise Abatement Analysis

At representative receptors with predicted traffic noise impacts due to the proposed improvement, FHWA and IDOT require consideration of traffic noise abatement in the form of a noise barrier. **Exhibit A-6** in **Appendix A** illustrates the noise abatement consideration process based on FHWA and IDOT policies. A noise barrier must be both feasible and reasonable to be recommended for construction as part of the highway improvement. Sections 1 and 2 below describe the abatement consideration process, and Section 3 below summarizes the results.

1. Feasibility

The two primary considerations regarding barrier feasibility include physical feasibility, and acoustic feasibility. The physical feasibility of the construction of a noise barrier involves engineering considerations such as safety; sight distance; topography; access requirements for driveways, sidewalks, and paths; the presence of local cross streets; drainage; utilities; and maintenance. Regarding acoustic feasibility, the IDOT noise policy requires that a noise reduction (sometimes called “insertion loss”) of 5 dB(A) be realized by at least two impacted receptors within a given CNE for a noise barrier wall to be considered feasible.

The acoustic effectiveness of a noise barrier is dependent on several factors. It must be tall enough to break the “line of sight” between the noise source and the receptor, with the highest noise source generally being the top of a truck or bus exhaust stack, at 12 feet above the pavement. A general rule-of-thumb is that a noise barrier that just breaks the line of sight will result in a 5 dB(A) reduction in sound level at the receptor, with each additional two feet of barrier height reducing the noise level by an additional 1 dB(A). A barrier must also be long enough to prevent too much sound from traveling around the ends of the barrier. Breaks in a wall that are required for driveway openings tend to considerably reduce the acoustic effectiveness and quite often result in a wall that is not acoustically feasible. The barrier must also be constructed of a material that is sufficiently dense to reduce sound transmission through the barrier.

A noise barrier is generally most acoustically effective when placed either close to the receptor, or close to the noise source. The least-effective location is mid-way between them. The placement of a barrier near the edge of the roadway generally requires safety features such as guardrails or barriers, in addition to a consideration of sight distance lines. Noise barriers located near the right-of-way line are generally preferable, especially if the topography is higher than the roadway, thus requiring a shorter barrier wall.

2. Reasonableness

A feasible noise barrier is reasonable if it satisfies all of the three reasonableness criteria that follow.

- <u>Noise Reduction Design Goal</u> - To be reasonable based on the noise reduction design goal criterion, an 8-dB(A) noise reduction must be achieved for at least one benefited receptor. This receptor does not necessarily need to be an impacted receptor, however in most situations it is the same. The noise reduction design goal should be achieved for as many receptors as possible while remaining within the economic reasonableness criterion.

- <u>Cost-Effectiveness</u> - To be cost-effective, the construction cost of a noise barrier must not exceed $30,000 per benefited receptor. A benefited receptor is one that would receive a 5-dB(A) or greater reduction in noise level as a result of barrier construction. Based on IDOT noise policy, the current cost of a noise barrier in the cost-reasonableness determinations is $30 per square foot of face of wall. The base value of $30,000 per benefited receptor can be adjusted upward based on a) the degree of absolute future noise levels, b) the degree of the increase in noise levels between existing and future build conditions, and c) whether or not the project is on a new alignment or the receptor existed prior to the original construction of the highway. The following tables from IDOT's *Highway Traffic Noise Assessment Manual* (2017 Edition) contain the required adjustments.

  In cases where some barriers on a project are found to be cost-reasonable, but others are not, cost averaging of noise abatement among CNEs may be used when conducting the reasonableness evaluation. Noise abatement may achieve the cost-reasonableness criterion if the collective average estimated build cost of noise abatement per benefited receptor is less than the collective average adjusted allowable cost per benefited receptor.

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Table III-1
Adjustments to Cost-Effectiveness Criterion
Absolute Noise Level Consideration

Predicted Build Noise Level Before Noise Abatement	Dollars Added to Base Value Cost per Benefited Receptor
Less than 70 dB(A)	$0
70 to 74 dB(A)	$1,000
75 to 79 dB(A)	$2,500
80 dB(A) or greater	$5,000

Increase in Noise Level Consideration

Incremental Increase in Noise Level Between the Existing Noise Level and the Predicted Build Noise Level Before Noise Abatement	Dollars Added to Base Value Cost per Benefited Receptor
Less than 5 dB(A)	$0
5 to 9 dB(A)	$1,000
10 to 14 dB(A)	$2,500
15 dB(A) or greater	$5,000

New Alignment / Construction Date Consideration

Project is on new alignment OR the receptor existed prior to the original construction of the highway	Dollars Added to Base Value Cost per Benefited Receptor
No for both	$0
Yes for either	$5,000

Note: No single optional reasonableness factor shall be used to determine that a noise abatement measure is unreasonable.

- Viewpoints of Benefited Receptors - The viewpoints of the property owners and residents (renters) benefited by a noise barrier determined to be feasible, be cost-effective, and meet the 8-dB(A) noise reduction design goal, must be solicited to determine their preferences for or against the installation of a noise barrier. This is typically achieved using written letters, or at presentations at public meetings when there are a larger number of benefited property owners/residents. Greater than 50% of the votes received must be in favor of the noise barrier for it to be included in the proposed improvement. “Property Owner” is defined as an individual or group of individuals that holds a title, deed, or other legal documentation of ownership of a property or residence.

For each noise barrier determined to be both feasible and reasonable, a statement of likelihood will be included in the technical report and environmental document.

3. Identification of Noise Abatement Measures Likely to be Installed

Determinations were made at each location as to whether a noise barrier would be recommended for construction based on the previously-described feasibility and reasonableness criteria. All CNEs, their representative receptors, other receptors, and the potential noise barriers that were analyzed are shown on **Exhibit A-4a**. Details on these analyses are provided in **Appendix B**. A summary of the results of this analysis can be seen below in Table III-2.

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Table III-2
Summary of Abatement Considerations for Receptors Anticipated to Experience a Noise Impact

CNE No.	Noise Barrier Feasible?	Noise Barrier Reasonable?			Recommended for Installation?
		Noise Reduction Design Goal?	Cost Effective?	Over 50% of Viewpoints in favor?	
1	Yes	Yes	Yes	TBD	TBD
3	Yes	Yes	Yes	TBD	TBD
6	Yes	Yes	Yes	TBD	TBD
9	Yes	Yes	Yes	TBD	TBD
10	**No**	n/a	n/a	n/a	n/a
14	Yes	Yes	Yes	TBD	TBD
17	Yes	Yes	Yes	TBD	TBD
19	Yes	Yes	Yes	TBD	TBD
21	Yes	Yes	Yes	TBD	TBD

The construction of a noise barrier is considered feasible at all CNEs predicted to experience a noise impact, excluding CNE 10, because a wall that would achieve a 5-dB(A) insertion loss for at least two impacted receptors can physically be constructed. A noise barrier is not feasible at CNE 10 because there is only one impacted receptor and therefore, feasibility criteria cannot be met. At all CNEs at which a noise barrier would be feasible, a noise barrier can be constructed that would meet the 8-dB(A) noise reduction design goal reasonableness criterion for at least one receptor within the CNE. A noise barrier would be cost-effective at each of the impacted CNEs either on its own or through cost averaging in the corridor.

Since a noise barrier is feasible, and meets both the noise reduction design goal and the cost effectiveness reasonableness criteria at eight CNE locations, the viewpoints of the residents benefited by these potential noise barriers will be solicited at special meetings anticipated to be held in the Summer of 2022, pending IDOT review of this revised highway traffic noise analysis report and meeting preparation. Copies of meeting materials will be included in **Appendix D** once meetings and subsequent comment periods have concluded. At each meeting, a presentation will be made to inform the residents about the project, highway noise concepts and applicable policies, and the results of the analyses. A Viewpoint Form will be distributed to each benefited resident, requesting that the resident indicate a preference for or against the installation of a noise wall adjacent to his or her neighborhood. The form will subsequently be mailed to those who were not in attendance.

At the close of the comment period, if greater than the required 1/3 of benefited residents within each CNE have submitted a Viewpoint Form, and greater than 50% of those that submitted a form are **in favor** of the construction a noise wall adjacent to their neighborhood, noise barriers will be recommended for installation.

TNM input files and PDF files of the barrier analyses can be provided if requested.

It is possible that modifications to the proposed roadway improvement plans made during the design phase of this project could result in changes to the noise analysis conclusions. Therefore, a final determination regarding the construction of noise barriers as part of this improvement shall not be made until the design phase of the project is completed.

IV. HIGHWAY TRAFFIC NOISE LEVELS ON UNDEVELOPED LANDS

FHWA encourages local governments to practice compatible land use planning and control with respect to traffic noise in the vicinity of highways. FHWA has developed a document called "Entering the Quiet Zone: Noise Compatible Land Use Planning". Local Agencies are encouraged to review this document to learn more about noise compatible planning concepts. The document, in addition to other compatible planning materials, can be viewed on the FHWA website at:

http://www.fhwa.dot.gov/environment/noise/noise_compatible_planning/.

FHWA and IDOT policies require that noise levels under future build conditions be predicted on undeveloped/non-permitted properties to aid local officials in future land use planning/development.

Undeveloped properties which have received a building permit by the governing agency prior to the date of the NEPA environmental approval are evaluated in the same manner as if the property was already developed. On undeveloped properties which have not received a building permit by the date of NEPA document approval, design-year noise analyses are performed to determine an approximate offset from the roadway at which future noise levels might equal or exceed the FHWA NAC.

There are two areas considered to be Activity Category "G" within the project limits. They are undeveloped/non-permitted properties with the potential to develop in the future. They are labeled in the exhibits and tables as G1 and G2. See **Table A-2** for a description and location of these areas.

Using TNM, the offset beyond which a noise level equaling or exceeding the FHWA NAC might be expected was interpolated. The offsets beyond which 66-dB(A) and 71-dB(A) noise levels might be expected are reported and shown as a "contour" line at these locations on **Exhibit A-7a**. No contour line is shown if the impact offset is predicted to fall within the roadway right-of-way. Should the 2050 Build improvements be constructed, and should a building permit be issued for these properties, areas of frequent outdoor human use located beyond the illustrated contour lines are likely to be compatible with future highway noise based on FHWA and IDOT noise policies.

Appendix C contains additional details on the analysis of noise levels on undeveloped lands. IDOT noise policy requires that noise analysis results for undeveloped lands be provided to local agency representatives so that the communities can protect future land development from becoming incompatible with highway traffic noise levels. **Appendix C** will contain draft text for a letter that must be sent to the local agency's community development department. (Note: this coordination will take place once the highway traffic noise analysis report is finalized.)

V. CONSTRUCTION NOISE

Trucks and machinery used for construction produce noise which may affect some land uses and activities during the construction period. Residents along the alignment will at some time experience perceptible construction noise from implementation of the project. To minimize or eliminate the effect of construction noise on these receptors, mitigation measures have been incorporated into the Illinois Department of Transportation's Standard Specifications for Road and Bridge Construction as Article 107.35.

In addition, IDOT's Highway Traffic Noise Assessment Manual identifies strategies for minimization and abatement of construction noise which should be considered and implemented if feasible during the Design and Construction phases of this project. They include the following methods that can be applied through construction staging, sequencing of operations, and/or alternative construction methods:

Construction Staging

- Route construction traffic away from sensitive receptors as feasible.
- Operate equipment as far from sensitive receptors as feasible.

Sequence of Operations

- Conduct louder operations during the day, and not during the night when people are much more sensitive to noise. Note that IDOT's Standard Specifications for Road and Bridge Construction restrict most construction activities that are within 1,000 feet of an occupied residence to the period between 7 A.M. and 10:00 P.M. The City of Naperville's ordinance is more restrictive and requires that construction activities that are within 1,000 feet of a residence be limited to the period between 7 A.M. and 7 P.M.
- Conduct multiple loud operations at the same time, since the total noise level from multiple activities will not substantially increase the total combined noise level. The purpose of this strategy is to reduce the duration of loud noise levels.
- For major construction activities, the City of Naperville will work with the Contractor to the extent possible to minimize construction noise.

Alternative Construction Methods

- Evaluate alternative pile driving methods, as this is a major noise contributor.
- Evaluate quieter demolition methods.
- Use special muffler systems or enclose equipment through the use of curtains. The IDOT Standard Specifications, at a minimum, require that all engines and engine-driven equipment used for hauling or construction shall be equipped with an adequate muffler in constant operation and properly maintained to prevent excessive or unusual noise.

VI. INTERNET LINKS TO TRAFFIC NOISE REFERENCE MATERIALS

Note: Adobe may not allow links to PDFs on IDOT's website. Therefore, the link text may need to be copied and pasted directly into an internet browser.

Highway Traffic Noise: Analysis and Abatement Guidance (Federal Highway Administration [FHWA], January 2011):

https://www.fhwa.dot.gov/environment/noise/regulations_and_guidance/analysis_and_abatement_guidance/

Procedures for Abatement of Highway Traffic Noise and Construction Noise (23 CFR 772)

https://www.ecfr.gov/cgi-bin/text-idx?SID=55f864534c64b2fb313b9e3c785343df&mc=true&node=se23.1.772_119&rgn=div8

Highway Traffic Noise Assessment Manual (Illinois Department of Transportation [IDOT], 2017)

https://idot.illinois.gov/Assets/uploads/files/Doing-Business/Manuals-Guides-&-Handbooks/Highways/Design-and-Environment/Environment/Highway%20Traffic%20Noise%20Assessment%20Manual%202017.pdf

Bureau of Design and Environment Manual, Chapter 26 (IDOT, 2010 and Revised)

https://idot.illinois.gov/Assets/uploads/files/Doing-Business/Manuals-Guides-&-Handbooks/Highways/Design-and-Environment/Design%20and%20Environment%20Manual,%20Bureau%20of.pdf

Entering the Quiet Zone: Noise Compatible Land Use Planning (FHWA, May 2002)

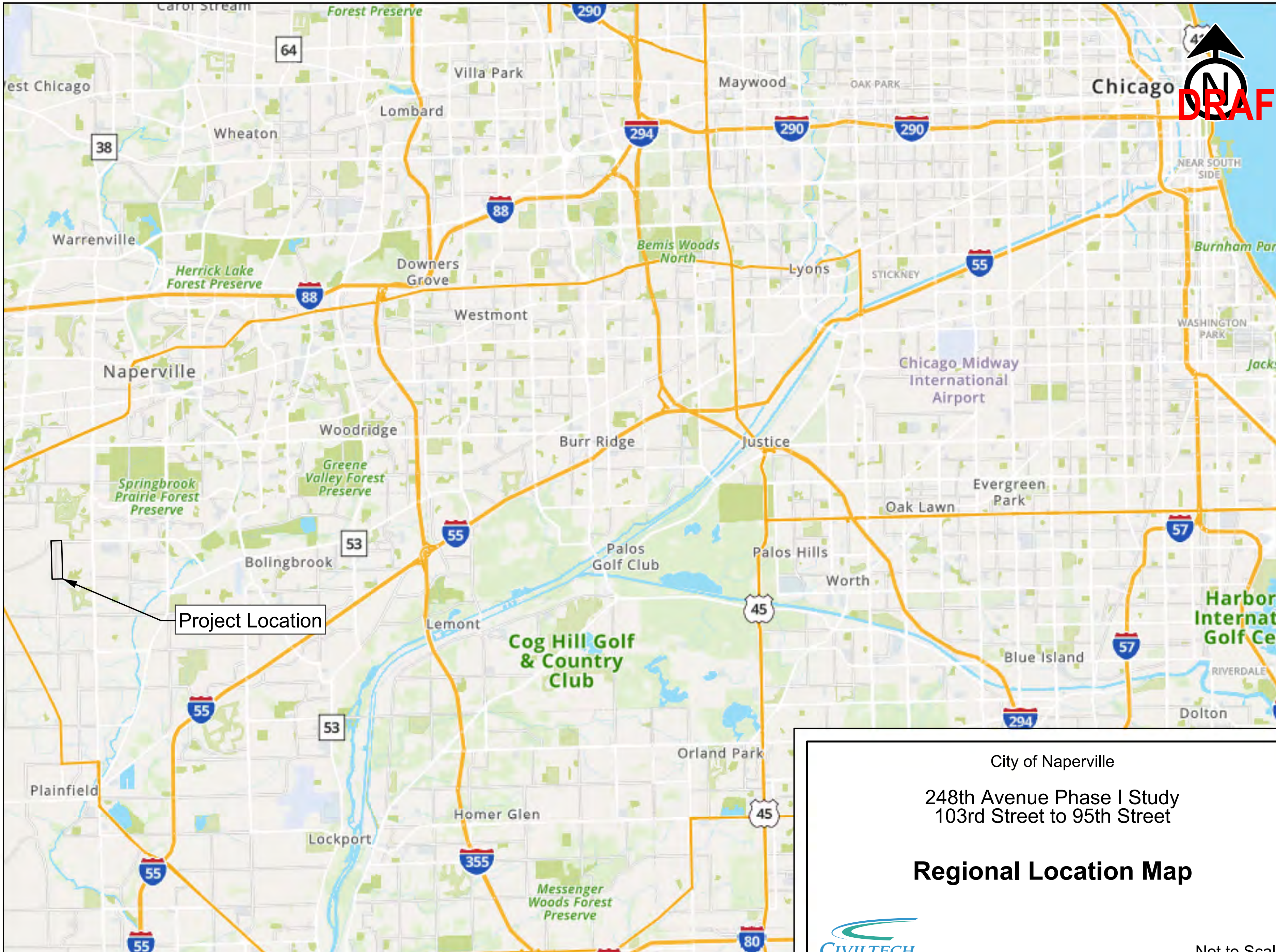
https://www.fhwa.dot.gov/environment/noise/noise_compatible_planning/federal_approach/land_use

FHWA Traffic Noise Model Version 2.5 (FHWA, April 2004)

https://www.fhwa.dot.gov/environment/noise/traffic_noise_model/tnm_v25/

Standard Specifications for Road and Bridge Construction (IDOT, April 2016)

https://idot.illinois.gov/Assets/uploads/files/Doing-Business/Manuals-Guides-&-Handbooks/Highways/Construction/Standard-Specifications/Standard%20Specifications%20for%20Road%20and%20Bridge%20Construction%202016.pdf



City of Naperville

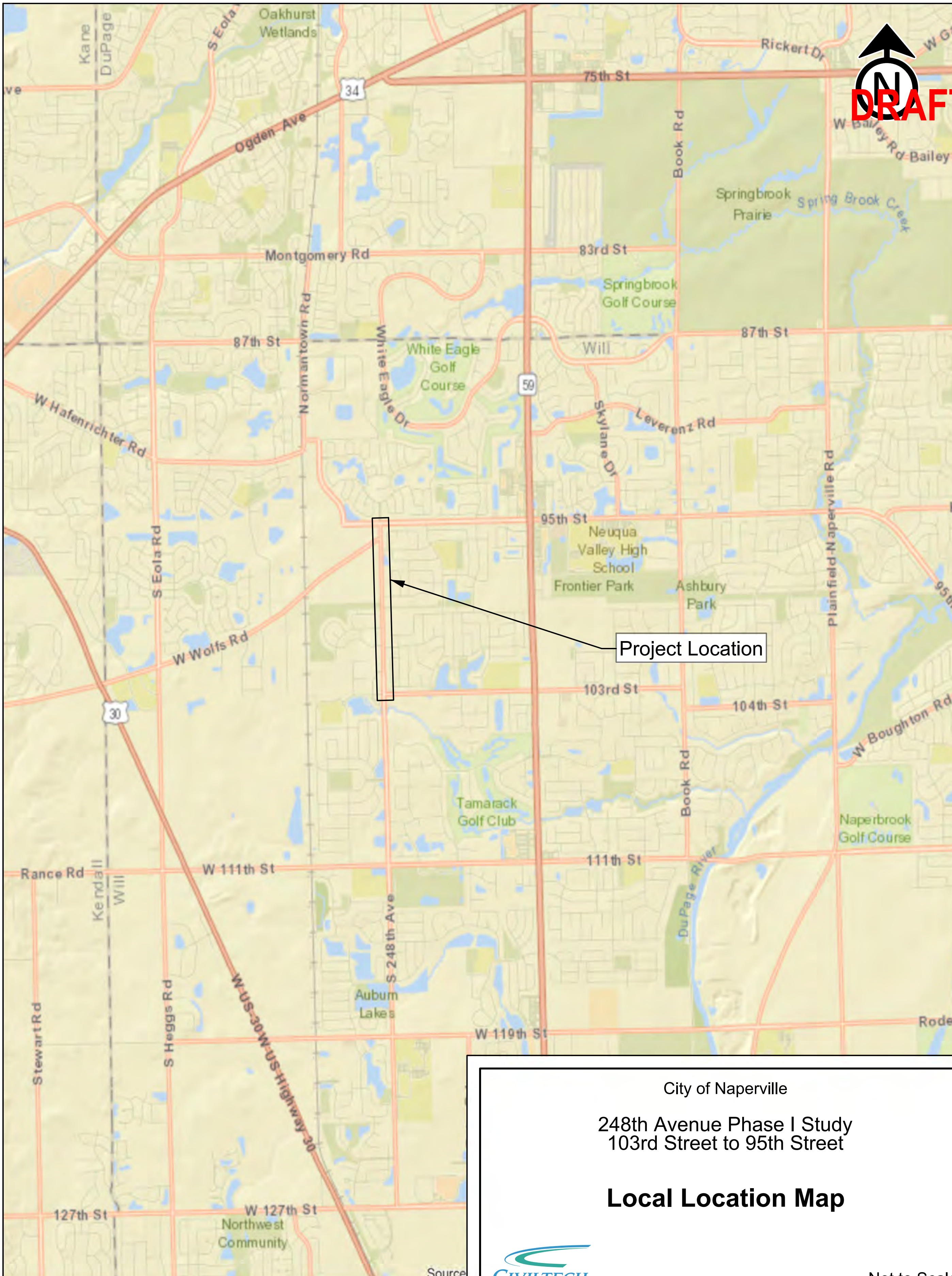
248th Avenue Phase I Study
103rd Street to 95th Street

Regional Location Map

CIVILTECH

Not to Scale

Exhibit A-1



City of Naperville

248th Avenue Phase I Study
103rd Street to 95th Street

Local Location Map

CIVILTECH

Not to Scale

Exhibit A-2

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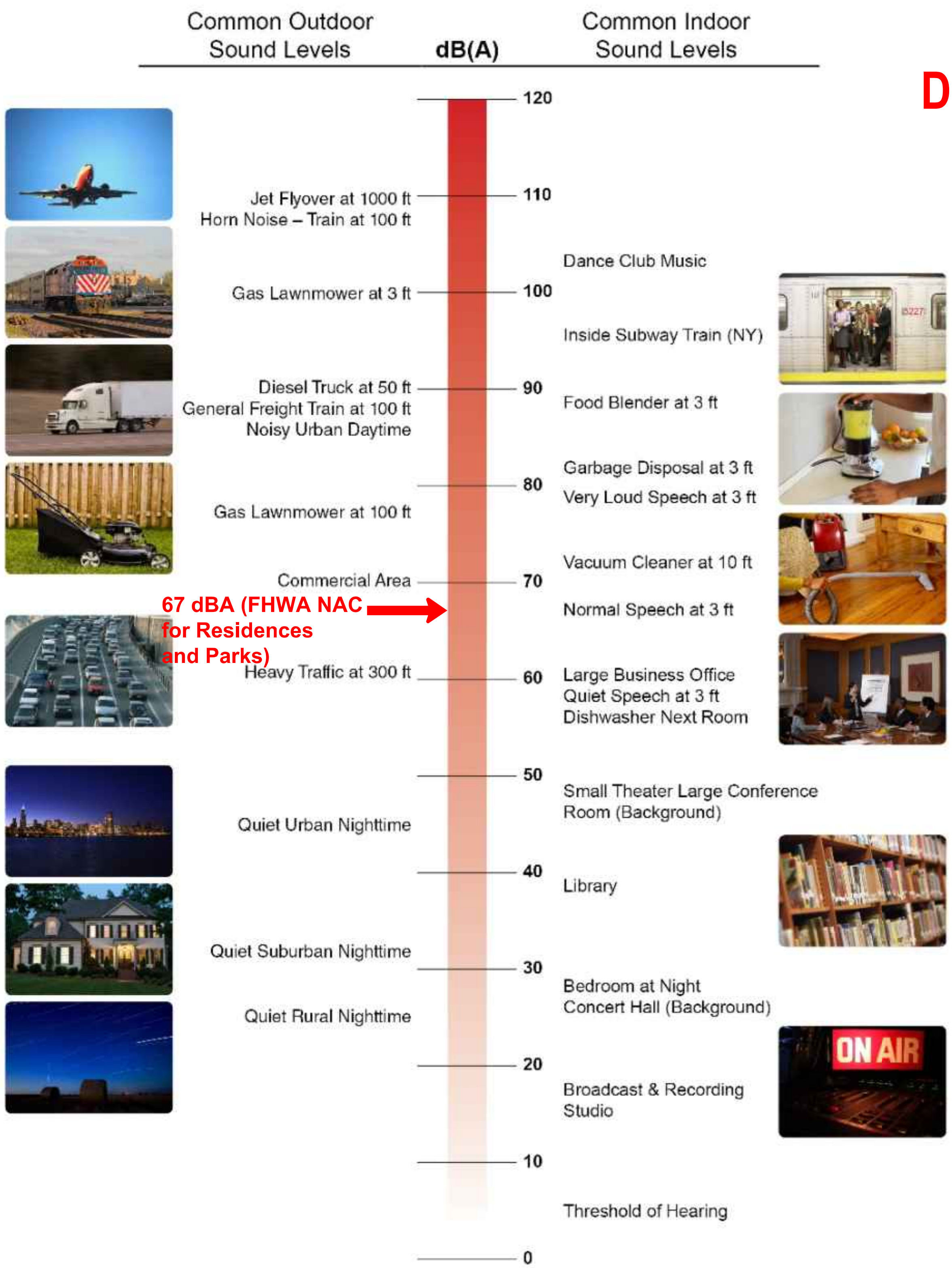


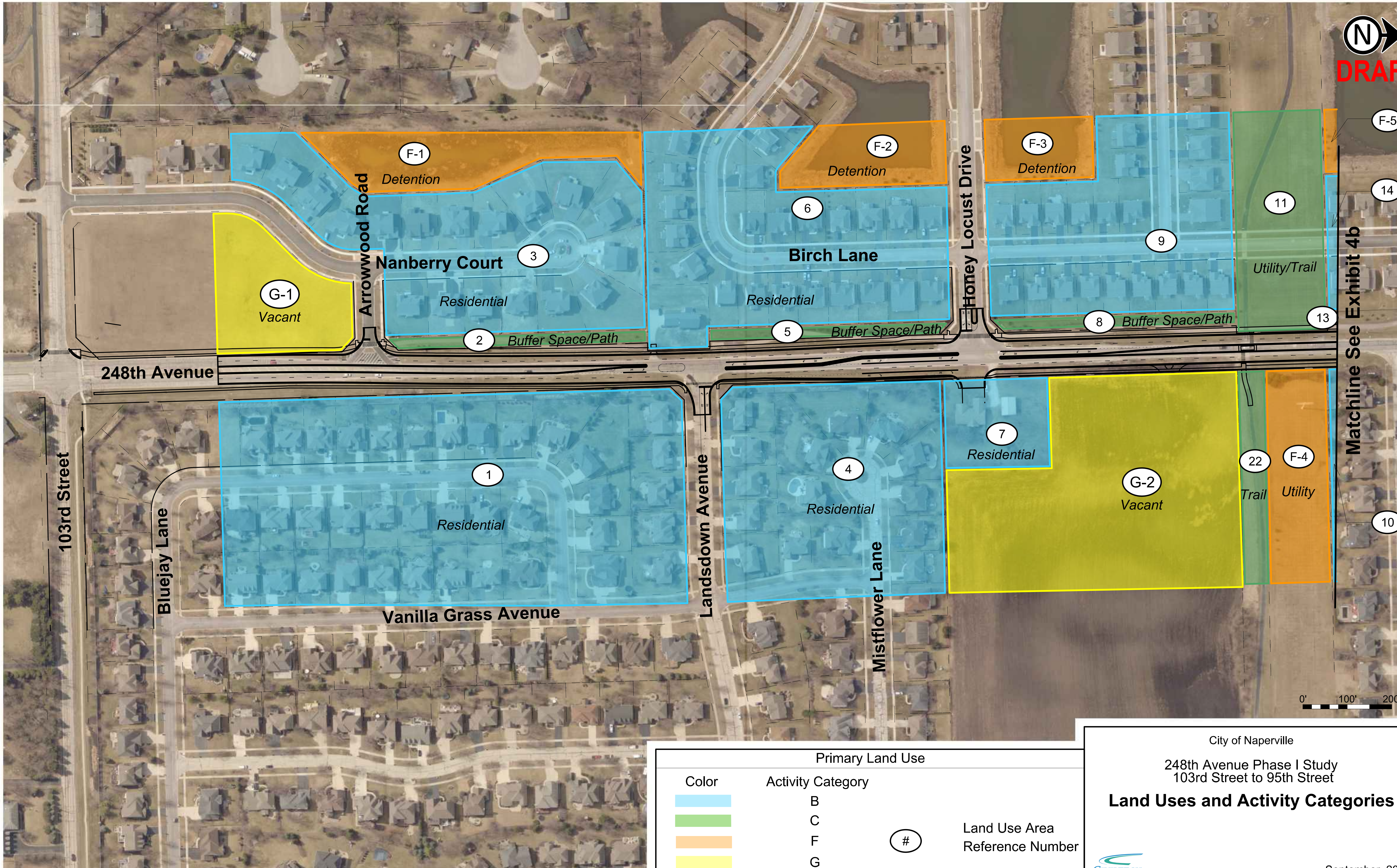
City of Naperville

248th Avenue Phase I Study
103rd Street to 95th Street

Common Outdoor and Indoor Noise Levels

CIVILTECH

Exhibit A-3



City of Naperville

248th Avenue Phase I Study
103rd Street to 95th Street

Land Uses and Activity Categories

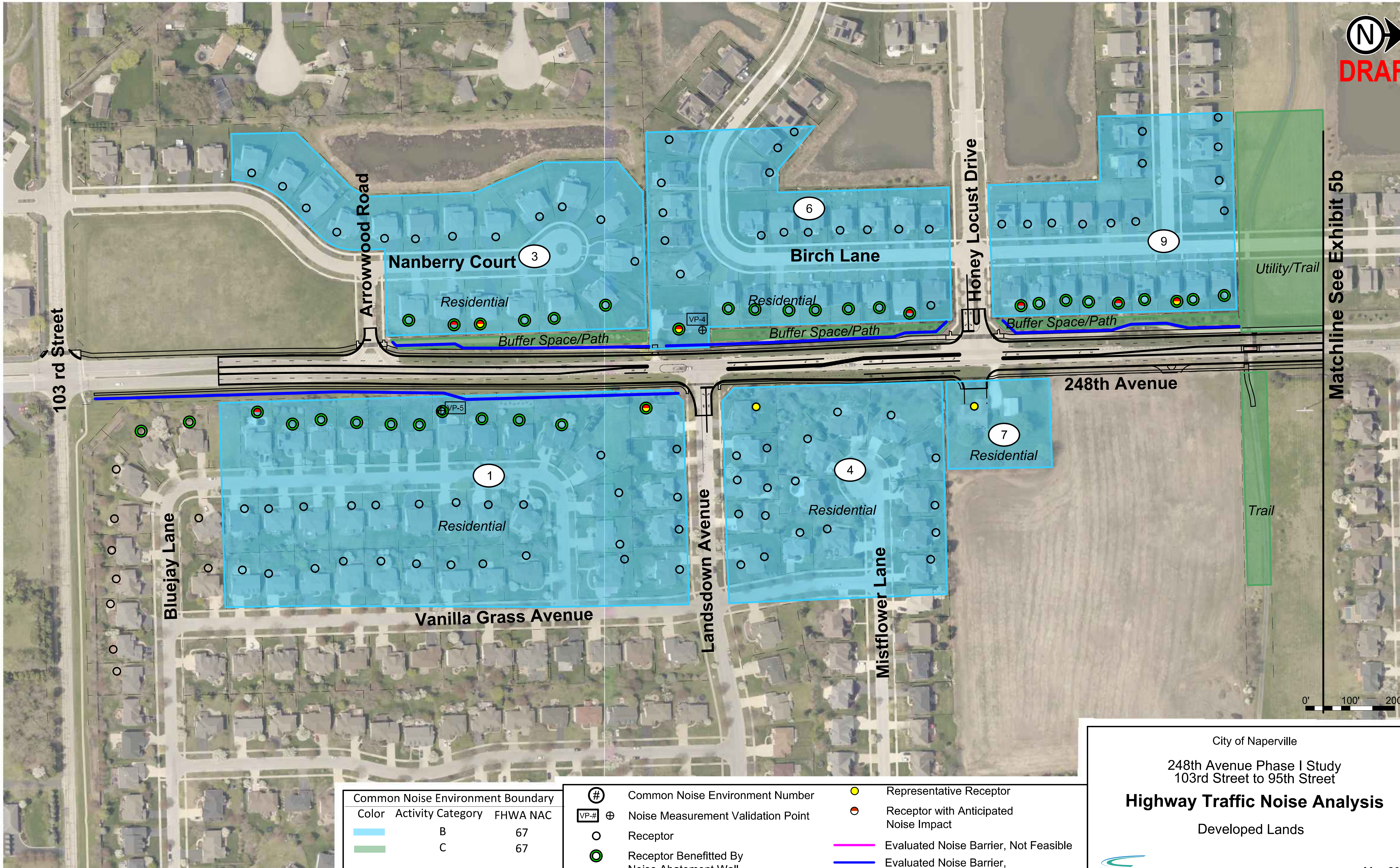
CIVILTECH

September, 2021

Exhibit A-4a


DRAFT
N
Empress Drive
Trumpet Avenue
Birch Lane
Lobo Lane
248th Avenue
Lapp Lane
Hollis Circle
Sunburst Lane
Grassmere Road
Highknob Circle
95th Street
F-5
Detention
F-6
Detention
F-7
Detention
10
12
13
14
15
16
17
18
19
20
21
Residential
0'
100'
200'
Primary Land Use
Color
Activity Category
B
C
F
G
Existing Centerline
#
Land Use Area
Reference Number
City of Naperville
248th Avenue Phase I Study
103rd Street to 95th Street
Land Uses and Activity Categories
CIVILTECH
September, 2021

Exhibit A-4b



Common Noise Environment Boundary		
Color	Activity Category	FHWA NAC
(light blue)	B	67
(green)	C	67

- Common Noise Environment Number
- VP-# Noise Measurement Validation Point
- Receptor
- Receptor Benefitted By Noise Abatement Wall
- Representative Receptor
- Receptor with Anticipated Noise Impact
- Evaluated Noise Barrier, Not Feasible
- Evaluated Noise Barrier, Feasible & Reasonable

City of Naperville

248th Avenue Phase I Study
103rd Street to 95th Street

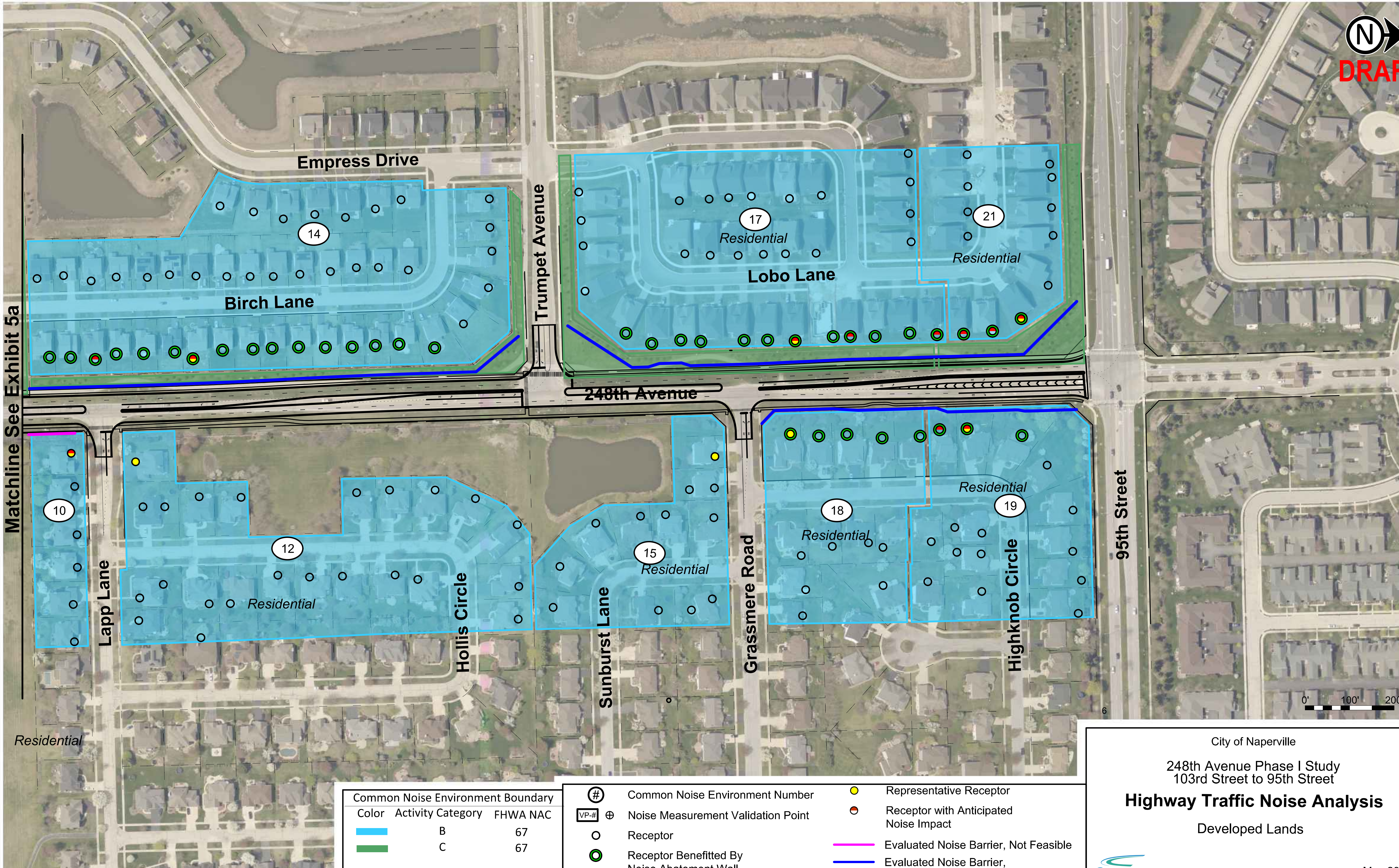
Highway Traffic Noise Analysis

Developed Lands

CIVILTECH

May 2022

Exhibit A-5a



Common Noise Environment Boundary		
Color	Activity Category	FHWA NAC
(light blue)	B	67
(green)	C	67

- Common Noise Environment Number
- VP-# Noise Measurement Validation Point
- Receptor
- Receptor Benefitted By Noise Abatement Wall
- Representative Receptor
- Receptor with Anticipated Noise Impact
- Evaluated Noise Barrier, Not Feasible
- Evaluated Noise Barrier, Feasible & Reasonable

City of Naperville

248th Avenue Phase I Study
103rd Street to 95th Street

Highway Traffic Noise Analysis

Developed Lands

CIVILTECH

May 2022

Exhibit A-5b

NOISE ABATEMENT CONSIDERATION PROCESS

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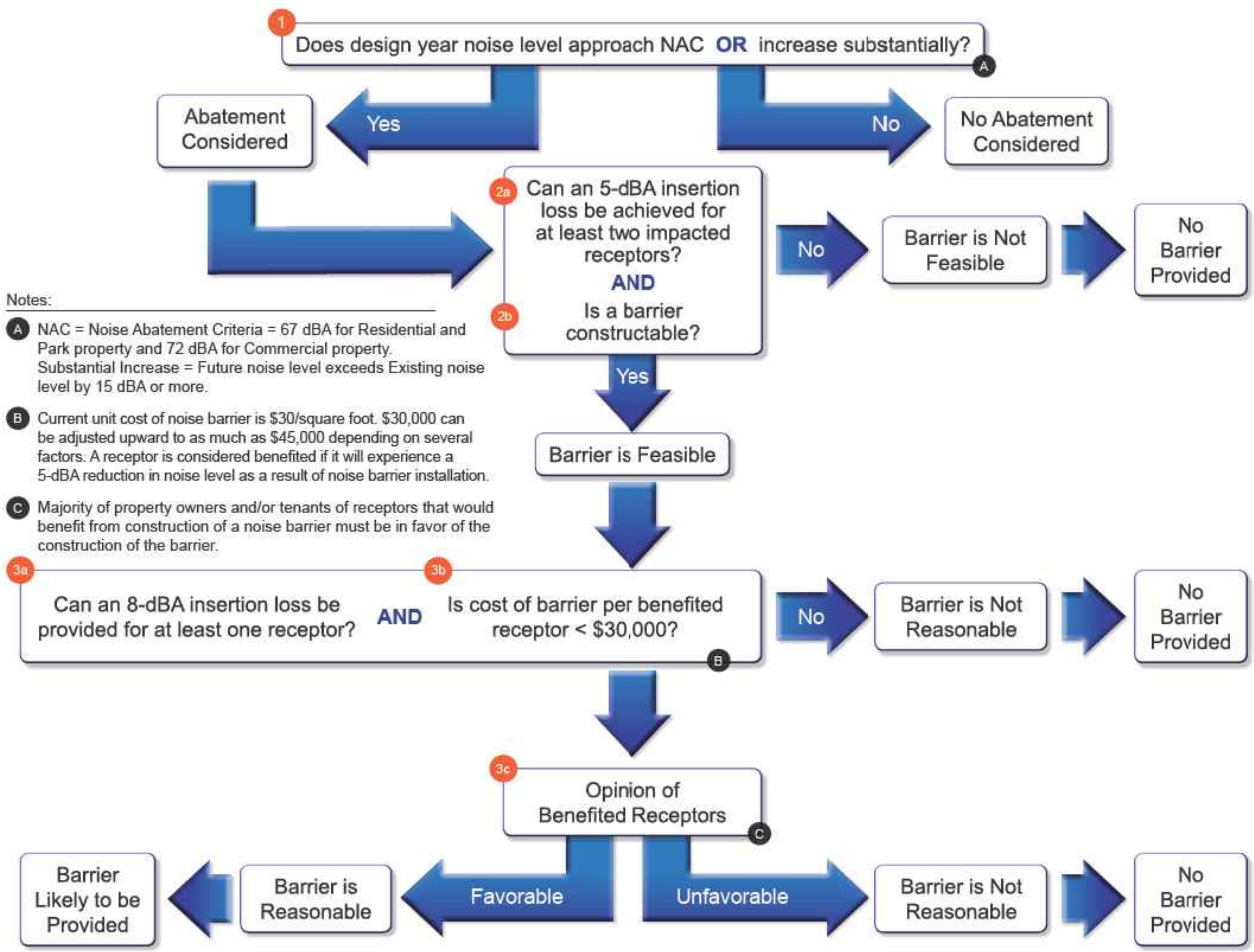
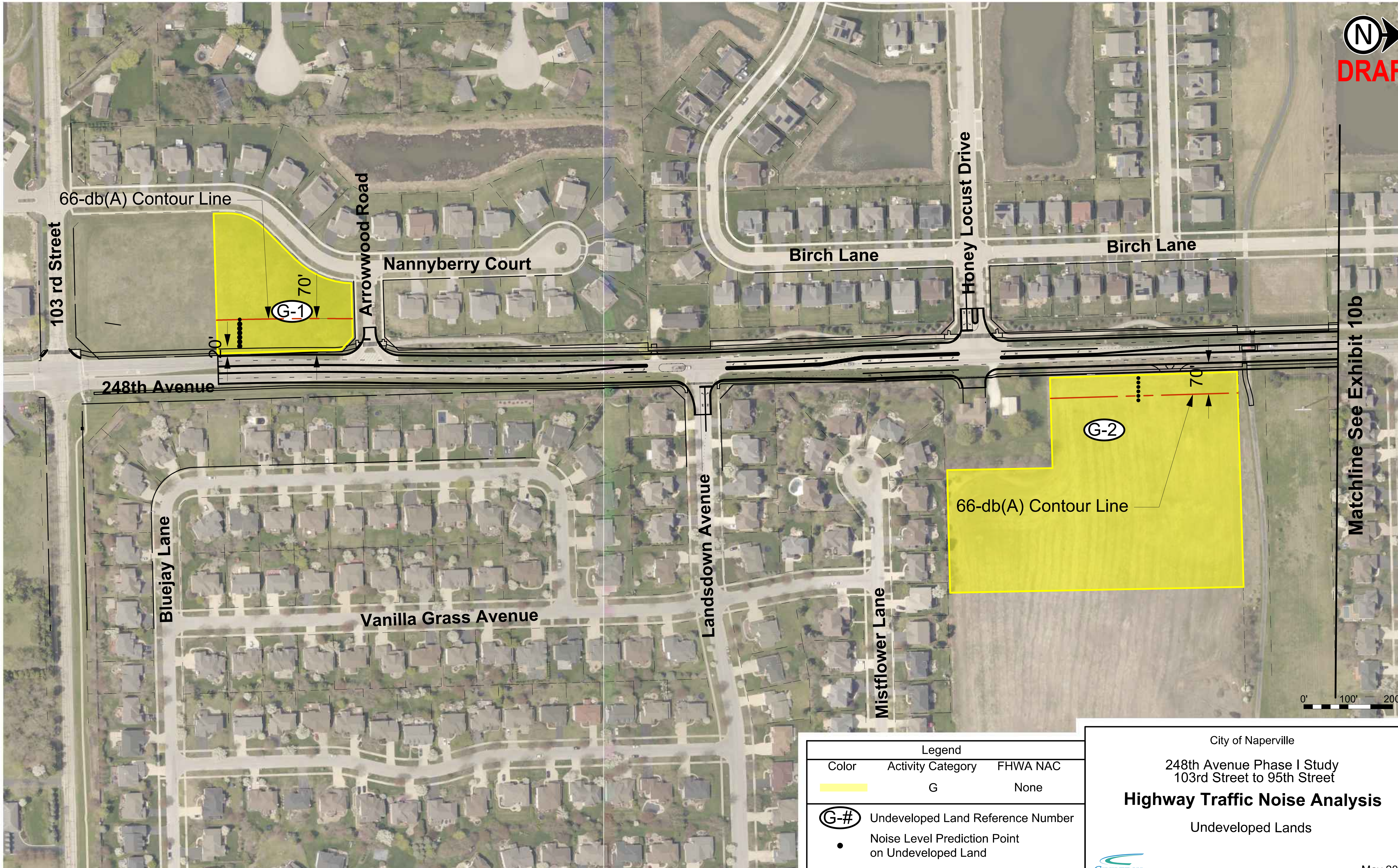


City of Naperville

248th Avenue Phase I Avenue
103rd Street to 95th Street

Noise Abatement Consideration Process

Exhibit A-6



Legend

Color	Activity Category	FHWA NAC
(yellow)	G	None

G-# Undeveloped Land Reference Number

• Noise Level Prediction Point on Undeveloped Land

— — Noise Contour

City of Naperville

248th Avenue Phase I Study
103rd Street to 95th Street

Highway Traffic Noise Analysis

Undeveloped Lands

CIVILTECH

May 2022

Exhibit A-7a

Legend

Color	Activity Category	FHWA NAC
(yellow)	G	None

G-# Undeveloped Land Reference Number

• Noise Level Prediction Point on Undeveloped Land

— — Noise Contour

City of Naperville

248th Avenue Phase I Study
103rd Street to 95th Street

Highway Traffic Noise Analysis

Undeveloped Lands

CIVILTECH

May 2022

Exhibit A-7b

LAND USES AND ACTIVITY CATEGORIES

Noise Sensitive Areas

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Ref No.	Status	Zoning	Address(es)	Business, Property, or Owner Name(s)	Activity Category Description	Activity Category	FHWA NAC (Leq, dBA)
1	Developed	R-1B, Medium Density Single-Family Residence District	3927-3984 Bluejay Lane 3904-3920 Landsdown Avenue (Even Only) 3519-3551 Vanilla Grass Drive (Odds Only)	Various Private Residences	Residential	B	67
2	Developed (No Receptors)	R-1A, Low Density Single-Family Residence District	n/a	Ashwood Heights Homeowners Association	Trail	C	67
3	Developed	R-1A, Low Density Single-Family Residence District	3804-3915 Nannyberry Court	Various Private Residences	Residential	B	67
4	Developed	R-1B, Medium Density Single-Family Residence District	3903-3919 Landsdown Avenue (Odds Only) 3903-3919 Mistflower Court 3403-3407 Vanilla Grass Drive	Various Private Residences	Residential	B	67
5	Developed (No Receptors)	R-2 Single-Family and Low Density Multiple-Family Residence District	n/a	Ashwood Pointe Sub Homeowners Association	Trail	C	67
6	Developed	R-2 Single-Family and Low Density Multiple-Family Residence District	3603-3663 Birch Lane 9956 248th Avenue	Various Private Residences	Residential	B	67
7	Developed	R-1 Low Density Single-Family Residence District	3540 248th Avenue	Islamic Center of Naperville	Residential	B	67
8	Developed (No Receptors)	R-2 Single-Family and Low Density Multiple-Family Residence District	n/a	Ashwood Pointe Sub Homeowners Association	Trail	C	67
9	Developed	R-2 Single-Family and Low Density Multiple-Family Residence District	3504-3539 Birch Lane 4103-4115 Heartleaf Lane	Various Private Residences	Residential	B	67

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LAND USES AND ACTIVITY CATEGORIES

Noise Sensitive Areas

DRAFT

Ref No.	Status	Zoning	Address(es)	Business, Property, or Owner Name(s)	Activity Category Description	Activity Category	FHWA NAC (Leq, dBA)
10	Developed	R-1B, Medium Density Single-Family Residence District	3424-3444 Lapp Lane	Various Private Residences	Residential	B	67
11	Developed (No Receptors)	n/a	n/a	Commonwealth Edison	Utility/Electrical, Trail	F, C	67
12	Developed	R-1B, Medium Density Single-Family Residence District	3423-3443 Lapp Lane 3351-3392 Hollis Circle 3308-3316 Hollis Circle (Evens Only)	Various Private Residences	Residential	B	67
13	Developed (No Receptors)	R-2 Single-Family and Low Density Multiple-Family Residence District	n/a	Ashwood Pointe Sub Homeowners Association	Trail	C	67
14	Developed	R-2 Single-Family and Low Density Multiple-Family Residence District	3404-3484 Birch Lane 3416-3440 Empress Drive (Evens Only)	Various Private Residences	Residential	B	67
15	Developed	R-1B, Medium Density Single-Family Residence District	3827-3848 Sunburst Lane 3844-3912 Grassmere Road	Various Private Residences	Residential	B	67
16	Developed (No Receptors)	R-2 Single-Family and Low Density Multiple-Family Residence District	n/a	Ashwood Crossing Homeowners Association	Trail	C	67
17	Developed	R-2 Single-Family and Low Density Multiple-Family Residence District	4007-4111 Lobo Lane 3328-3344 Empress Drive (Evens Only) 3307-3315 Empress Drive (Odds Only)	Various Private Residences	Residential	B	67
18	Developed	R-1B, Medium Density Single-Family Residence District	3939-3923 Highknob Circle 3843-3847 Grassmere Road (Odds Only)	Various Private Residences	Residential	B	67

LAND USES AND ACTIVITY CATEGORIES

Noise Sensitive Areas

DRAFT

Ref No.	Status	Zoning	Address(es)	Business, Property, or Owner Name(s)	Activity Category Description	Activity Category	FHWA NAC (Leq, dBA)
19	Developed	R-1B, Medium Density Single-Family Residence District	3905-3924 Highknob Circle 3003-3007 Goldenglow Court	Various Private Residences	Residential	B	67
20	Developed (No Receptors)	R-2 Single-Family and Low Density Multiple-Family Residence District	n/a	Ashwood Crossing Homeowners Association	Trail	C	67
21	Developed	R-2 Single-Family and Low Density Multiple-Family Residence District	4115-4143 Lobo Lane	Various Private Residences	Residential	B	67
22	Developed (No Receptors)	R-1 Low Density Single-Family Residence District	n/a	Naperville Park District	Trail	C	67

Notes:
-Developed properties include those for which building permits have been issued.
- CNE = Common Noise Environment.
- FHWA NAC = Federal Highway Administration Noise Abatement Criterion.

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LAND USES AND ACTIVITY CATEGORIES

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Non-Noise Sensitive Areas

Ref. No.	Status	Zoning	Address(es)	Business, Property, or Owner Name(s)	Activity Category Description	Activity Category	FHWA NAC (Leq, dBA)
Activity Category "F" Locations							
F1	Developed	R-1A, Low Density Single-Family Residence District	N/A	Ashwood Heights Homeowners Association	Utility/ Water Resources	F	-
F2	Developed	R-2 Single-Family and Low Density Multiple-Family Residence District	N/A	Ashwood Pointe Sub Homeowners Association	Utility/ Water Resources	F	-
F3	Developed	R-2 Single-Family and Low Density Multiple-Family Residence District	N/A	Ashwood Pointe Sub Homeowners Association	Utility/ Water Resources	F	-
F4	Developed	R-1B, Medium Density Single-Family Residence District	N/A	Penncross Knoll Homeowners Association	Utility/ Electrical	F	-
F5	Developed	R-2 Single-Family and Low Density Multiple-Family Residence District	N/A	Ashwood Pointe Sub Homeowners Association	Utility/ Water Resources	F	-
F6	Developed	R-1B, Medium Density Single-Family Residence District	N/A	Penncross Knoll Homeowners Association	Utility/ Water Resources	F	-
F7	Developed	R-1B, Medium Density Single-Family Residence District	N/A	Tall Grass Naperville Homeowners Association	Utility/ Water Resources	F	-
Activity Category "G" Locations							
G1	Undeveloped	R-1A, Low Density Single-Family Residence District	N/A	Vacant; Roman Catholic Diocese	Undeveloped Land	G	-

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LAND USES AND ACTIVITY CATEGORIES

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Non-Noise Sensitive Areas

Ref. No.	Status	Zoning	Address(es)	Business, Property, or Owner Name(s)	Activity Category Description	Activity Category	FHWA NAC (Leq, dBA)
G2	Undeveloped	R-1 Low Density Single-Family Residence District	N/A	Vacant; Islamic Center of Naperville	Undeveloped Land	G	-

Notes:
- FHWA NAC = Federal Highway Administration Noise Abatement Criterion.
- Developed properties include those for which building permits have been issued

TRAFFIC NOISE MODEL VALIDATION

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Validation No.	Location	Distance from Roadway (Feet)	Measured Existing Conditions (dBA)	Modeled Existing Conditions (dBA)	Difference Between Measured and Modeled (dBA)	Model Validated
1	CNE 19	100	57	60	3	Yes
2	CNE 14	100	60	58	-2	Yes
3	CNE 10	95	63	60	-3	Yes
4	CNE 6	70	65	62	-3	Yes
5	CNE 1	85	58	61	3	Yes

Notes:
- The decibel values in this chart were generated by the FHWA TNM 2.5 computer program except for the measured existing conditions levels. Measured levels were obtained in the field using a Class I Sound Level Meter. All values represent Leq(h) values of exterior traffic noise, rounded to the nearest decibel (dBA).
- The traffic noise levels predicted by TNM 2.5 use observed traffic during monitoring period
- Distances are measured to center of nearest through travel lane.

MODELED NOISE LEVELS AND IDENTIFICATION OF TRAFFIC NOISE IMPACTS

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Noise-Sensitive Receptor Locations

CNE No.	Representative Receptor Address	Business, Property, or Owner Name(s)	Receptor Distance to Roadway (Feet)		Activity Category Description	Activity Category	FHWA NAC (Leq, dBA)	Modeled Existing Condition (dBA)	2050 Predicted No-Build Condition (dBA)	2050 Predicted Build Condition (dBA)	Build Condition Increase over Existing (dBA)	Consider-ation of Abatement Warranted
			Existing	Proposed								
1	3920 Landsdown Ave.	Neelam Bhargava	80	60	Residential	B	67	62	63	**66**	4	Yes
3	3820 Nannyberry Ct.	Senthil K. Subramaniam	95	75	Residential	B	67	62	63	**66**	4	Yes
4	3919 Landsdown Avenue	Karl L. and Jill D. Scott	80	70	Residential	B	67	62	62	65	3	No
6	9956 S. 248th Avenue	Charles K. Connon LVG TR	70	60	Residential	B	67	64	65	**68**	4	Yes
7	3540 S. 248th Avenue	Islamic Center of Naperville	95	70	Residential	B	67	63	64	63	0	No
9	3512 Birch Lane	Viral Parikh	100	80	Residential	B	67	61	62	**66**	5	Yes
10	3444 Lapp Lane	Rajkiran Morgan L. Mooga	80	65	Residential	B	67	62	63	**66**	4	Yes
12	3443 Lapp Lane	Kiran Tenneti	90	75	Residential	B	67	61	62	65	4	No
14	3460 Birch Lane	Anirban Bagchi	95	75	Residential	B	67	61	62	**66**	5	Yes
15	3912 Grassmere Road	Amit Priyanka Chandra	135	125	Residential	B	67	61	61	62	1	No
17	4043 Lobo Lane	Richard A. Tamborski	95	70	Residential	B	67	62	63	**66**	4	Yes
18	3939 Highknob Circle	Dharmendra Archana Velivela	85	80	Residential	B	67	64	65	65	1	No
19	3917 Highknob Circle	Kostas M. Dovas	75	70	Residential	B	67	64	65	**66**	2	Yes
21	4123 Lobo Lane	Linda M. Love	90	70	Residential	B	67	64	65	**66**	2	Yes

Notes:

MODELED NOISE LEVELS AND IDENTIFICATION OF TRAFFIC NOISE IMPACTS
Noise-Sensitive Receptor Locations

MODELED NOISE LEVELS AND IDENTIFICATION OF TRAFFIC NOISE IMPACTS

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Noise-Sensitive Receptor Locations

CNE No.	Representative Receptor Address	Business, Property, or Owner Name(s)	Receptor Distance to Roadway (Feet)		Activity Category Description	Activity Category	FHWA NAC (Leq, dBA)	Modeled Existing Condition (dBA)	2050 Predicted No-Build Condition (dBA)	2050 Predicted Build Condition (dBA)	Build Condition Increase over Existing (dBA)	Consider-ation of Abatement Warranted
			Existing	Proposed								

- CNE = Common Noise Environment.
- FHWA NAC = Federal Highway Administration Noise Abatement Criterion.
- The decibel values in this chart were generated by the FHWA TNM 2.5 computer program. All values represent Leq(h) values of exterior traffic noise, rounded to the nearest decibel (dBA).
- The traffic noise levels predicted by TNM 2.5 use PM peak-hour traffic.
- 2050 Proposed Action noise levels that are **bold and underlined** indicate that the receptor approaches (within 1 dBA), meets, or exceeds the FHWA Noise Abatement Criteria.
- Developed properties include those for which a building permit has been issued.
- Distances are measured to nearest edge of pavement of 248th Avenue.

MODELED NOISE LEVELS AND IDENTIFICATION OF TRAFFIC NOISE IMPACTS
Noise-Sensitive Receptor Locations

APPENDIX B – DEVELOPED PROPERTIES DETAILED ANALYSES

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Following is a detailed summary of the analyses of the developed properties which are predicted to experience a traffic noise impact under 2050 Build conditions. Included below is a discussion of the feasibility and reasonableness of potential noise barriers that were analyzed, as well as a recommendation for or against the construction of a noise barrier as part of the proposed improvements at each Common Noise Environment (CNE). Please see Section III in the main report for more information.

CNE 1

CNE 1 is located on the east side of the roadway between 103rd Street and Landsdown Avenue. The CNE contains 48 receptors. Twelve of these receptors are residences that are directly adjacent to 248th Avenue. The representative receptor is located at 3920 Landsdown Avenue on a patio in the backyard, and is marked with a yellow dot on **Exhibit A-5a**. The yellow dot has a red semicircle on top of it to indicate a predicted noise impact. The other receptors within the CNE are marked as hollow black circles, with those predicted to experience a noise impact also being marked with a red semicircle. As shown in **Table A-4** in **Appendix A**, the modeled noise level at the representative receptor under 2050 Build conditions is 66 dB(A), thus the receptor is predicted to experience a noise impact because the future traffic noise level is greater than or equal to 66 dB(A).

A noise barrier was analyzed at this location. In order to provide an efficient and aesthetic treatment to as many residents as possible, the barrier was extended to completely shield the Tall Grass of Naperville, Unit 2 subdivision, including the area south of the southern project limits. A noise barrier can be physically constructed and is predicted to result in an insertion loss of 5 dB(A) or more at two of the impacted receptors, and therefore the wall is considered feasible. As summarized in **Table B-1**, a noise reduction of 8 dB(A) can be achieved at one or more of the receptors in the CNE, therefore the wall would be reasonable from a noise reduction design goal standpoint. The cost effectiveness of this noise barrier was analyzed. **Table B-3.1** summarizes the adjustments considered to the base $30,000 per benefitted receptor criterion. No adjustments were allowed based on IDOT policy, therefore the average adjusted allowable cost per benefitted receptor is $30,000. As summarized in **Table B-2**, analyses show that an approximately 9-foot tall, approximately 1,285-foot long noise barrier would benefit 13 receptors within CNE 1. The height is reported from the anticipated ground elevation based on preliminary proposed roadway cross-sections. *If this barrier is recommended for installation after viewpoints are solicited, the minimum required height of the wall above the proposed roadway profile grade line (PGL) will be provided in **Table B-7**.*

The 13 benefitted receptors are marked with a green circle on **Exhibit A-5a**. As shown in **Table B-2**, the total cost of this barrier would be $435,243, therefore the cost per benefitted receptor would be $33,480. Since this cost is greater than the allowable cost per benefitted receptor, this noise barrier is not considered to be cost reasonable on its own. As shown in **Table B-4**, the ratio of estimated build cost per benefitted receptor to the adjusted allowable cost per benefitted receptor is 1.12, which makes this barrier eligible for cost averaging. The cumulative estimated build cost per benefitted receptor is $28,400. Since this cost is lower than the cumulative adjusted allowable cost of $30,139 per benefitted receptor, this noise barrier is considered to be cost reasonable through cost averaging.

Since the barrier is feasible, and reasonable from both a noise reduction design goal and cost standpoint, the viewpoints of the benefitted residents in CNE 1 will be solicited at a special meeting in Summer of 2022. Meeting materials will be provided in ***Appendix D*** *once the meeting and its subsequent comment period have concluded. A presentation will be made to inform the residents about the project, highway noise concepts and applicable policies, and the results of the analyses. A Viewpoint Form will be distributed to each benefited resident, requesting that the resident indicate a preference for or against the installation of a noise wall adjacent to his or her neighborhood. The form will be subsequently mailed to those who were not in attendance. If at the close of the comment period, greater than the required 1/3 of benefited residents within CNE 1 have submitted a Viewpoint Form, a second attempt will not be made to solicit viewpoints. Viewpoints from CNE 1 will be summarized in* ***Table B-5****. After weighting of viewpoints based on owner/renter status and whether or not the receptor is on the front row, if greater than 50% of the viewpoints received are* ***in favor*** *of the construction a noise wall, one will be recommended for installation as part of this project and a likelihood statement will be added here.*

CNE 3

CNE 3 is located on the west side of the roadway between 103rd Street and Landsdown Avenue with the majority of the CNE being north of Arrowwood Road. The CNE contains 18 receptors. Six of these receptors are residences that are directly adjacent to 248th Avenue. The representative receptor is located at 3820 Nannyberry Court in the backyard, and is marked with a yellow dot on **Exhibit A-5a**. The yellow dot has a red semicircle on top of it to indicate a predicted noise impact. The other receptors within the CNE are marked as hollow black circles, with those predicted to experience a noise impact also being marked with a red semicircle. As shown in **Table A-4** in **Appendix A**, the modeled noise level at the representative receptor under 2050 Build conditions is 66 dB(A), thus the receptor is predicted to experience a noise impact because the future traffic noise level is greater than or equal to 66 dB(A).

A noise barrier was analyzed at this location. A noise barrier can be physically constructed and is predicted to result in an insertion loss of 5 dB(A) or more at two of the impacted receptors, and therefore the wall is considered feasible. As summarized in **Table B-1**, a noise reduction of 8 dB(A) can be achieved at one or more of the receptors in the CNE, therefore the wall would be reasonable from a noise reduction design goal standpoint. The cost effectiveness of this noise barrier was analyzed. **Table B-3.2** summarizes the adjustments considered to the base $30,000 per benefitted receptor criterion. No adjustments were allowed based on IDOT policy, therefore the average adjusted allowable cost per benefitted receptor is $30,000. As summarized in **Table B-2**, analyses show that an approximately 8-foot tall, approximately 570-foot long noise barrier would benefit 6 receptors within CNE 3. The height is reported from the anticipated ground elevation based on preliminary proposed roadway cross-sections. *If this barrier is recommended for installation after viewpoints are solicited, the minimum required height of the wall above the proposed roadway profile grade line (PGL) will be provided in* ***Table B-7****.*

The 6 benefitted receptors are marked with a green circle on **Exhibit A-5a**. As shown in **Table B-2**, the total cost of this barrier would be $170,750, therefore the cost per benefitted receptor would be

$28,458. Since this cost is less than the allowable cost per benefitted receptor, this noise barrier is considered to be cost reasonable.

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*Since the barrier is feasible, and reasonable from both a noise reduction design goal and cost standpoint, the viewpoints of the benefitted residents in CNE 3 will be solicited at a special meeting in Summer of 2022. Meeting materials will be provided in **Appendix D** once the meeting and its subsequent comment period have concluded. A presentation will be made to inform the residents about the project, highway noise concepts and applicable policies, and the results of the analyses. A Viewpoint Form will be distributed to each benefited resident, requesting that the resident indicate a preference for or against the installation of a noise wall adjacent to his or her neighborhood. The form will be subsequently mailed to those who were not in attendance. If at the close of the comment period, greater than the required 1/3 of benefited residents within CNE 3 have submitted a Viewpoint Form, a second attempt will not be made to solicit viewpoints. Viewpoints from CNE 3 will be summarized in **Table B-5**. After weighting of viewpoints based on owner/renter status and whether or not the receptor is on the front row, if greater than 50% of the viewpoints received are **in favor** of the construction a noise wall, one will be recommended for installation as part of this project and a likelihood statement will be added here.*

CNE 6

CNE 6 is located on the west side of the roadway between Arrowwood Road and Honey Locust Drive. The CNE contains 24 receptors. Nine of these receptors are residences that are directly adjacent to 248th Avenue. The representative receptor is located at 9956 S. 248th Avenue on the front patio of the residence, and is marked with a yellow dot on **Exhibit A-5a**. The yellow dot has a red semicircle on top of it to indicate a predicted noise impact. The other receptors within the CNE are marked as hollow black circles, with those predicted to experience a noise impact also being marked with a red semicircle. As shown in **Table A-4** in **Appendix A**, the modeled noise level at the representative receptor under 2050 Build conditions is 68 dB(A), thus the receptor is predicted to experience a noise impact because the future traffic noise level is greater than or equal to 66 dB(A).

A noise barrier was analyzed at this location. A noise barrier can be physically constructed and is predicted to result in an insertion loss of 5 dB(A) or more at two of the impacted receptors, and therefore the wall is considered feasible. As summarized in **Table B-1**, a noise reduction of 8 dB(A) can be achieved at one or more of the receptors in the CNE, therefore the wall would be reasonable from a noise reduction design goal standpoint. The cost effectiveness of this noise barrier was analyzed. **Table B-3.3** summarizes the adjustments considered to the base $30,000 per benefitted receptor criterion. No adjustments were allowed based on IDOT policy, therefore the average adjusted allowable cost per benefitted receptor is $30,000. As summarized in **Table B-2**, analyses show that an approximately 8-foot tall, approximately 625-foot long noise barrier would benefit 8 receptors within CNE 6. The height is reported from the anticipated ground elevation based on preliminary proposed roadway cross-sections. *If this barrier is recommended for installation after viewpoints are solicited, the minimum required height of the wall above the proposed roadway profile grade line (PGL) will be provided in **Table B-7**.*

The 8 benefitted receptors are marked with a green circle on **Exhibit A-5a**. As shown in **Table B-2**, the total cost of this barrier would be $172,700, therefore the cost per benefitted receptor would be $21,588. Since this cost is less than the allowable cost per benefitted receptor, this noise barrier is considered to be cost reasonable.

*Since the barrier is feasible, and reasonable from both a noise reduction design goal and cost standpoint, the viewpoints of the benefitted residents in CNE 6 will be solicited at a special meeting in Summer of 2022. Meeting materials will be provided in **Appendix D** once the meeting and its subsequent comment period have concluded. A presentation will be made to inform the residents about the project, highway noise concepts and applicable policies, and the results of the analyses. A Viewpoint Form will be distributed to each benefited resident, requesting that the resident indicate a preference for or against the installation of a noise wall adjacent to his or her neighborhood. The form will be subsequently mailed to those who were not in attendance. If at the close of the comment period, greater than the required 1/3 of benefited residents within CNE 6 have submitted a Viewpoint Form, a second attempt will not be made to solicit viewpoints. Viewpoints from CNE 6 will be summarized in **Table B-5**. After weighting of viewpoints based on owner/renter status and whether or not the receptor is on the front row, if greater than 50% of the viewpoints received are **in favor** of the construction a noise wall, one will be recommended for installation as part of this project and a likelihood statement will be added here.*

CNE 9

CNE 9 is located on the west side of the roadway between Honey Locust Drive and the Tall Grass Greenway. The CNE contains 21 receptors. Nine of these receptors are residences that are directly adjacent to 248th Avenue. The representative receptor is located at 3512 Birch Lane on a patio in the back yard of the residence, and is marked with a yellow dot on **Exhibit A-5a**. The yellow dot has a red semicircle on top of it to indicate a predicted noise impact. The other receptors within the CNE are marked as hollow black circles, with those predicted to experience a noise impact also being marked with a red semicircle. As shown in **Table A-4** in **Appendix A**, the modeled noise level at the representative receptor under 2050 Build conditions is 66 dB(A), thus the receptor is predicted to experience a noise impact because the future traffic noise level is greater than or equal to 66 dB(A).

A noise barrier was analyzed at this location. A noise barrier can be physically constructed and is predicted to result in an insertion loss of 5 dB(A) or more at two of the impacted receptors, and therefore the wall is considered feasible. As summarized in **Table B-1**, a noise reduction of 8 dB(A) can be achieved at one or more of the receptors in the CNE, therefore the wall would be reasonable from a noise reduction design goal standpoint. The cost effectiveness of this noise barrier was analyzed. **Table B-3.4** summarizes the adjustments considered to the base $30,000 per benefitted receptor criterion. Based on IDOT policy, an adjustment of $1,000 was allowed for one receptor because the increase between the existing noise level and the predicted noise level before abatement was 5 dB(A). Therefore, the average adjusted allowable cost per benefitted receptor is $30,143. As summarized in **Table B-2**, analyses show that an approximately 9-foot tall, approximately 540-foot long noise barrier would benefit 8 receptors within CNE 9. The height is reported from the anticipated ground elevation based on preliminary proposed roadway cross-sections. *If this barrier is recommended for installation after viewpoints are solicited, the minimum required height of the wall above the proposed roadway profile grade line (PGL) will be provided in **Table B-7**.*

The 8 benefitted receptors are marked with a green circle on **Exhibit A-5a**. As shown in **Table B-2**, the total cost of this barrier would be $191,618, therefore the cost per benefitted receptor would be $23,952. Since this cost is less than the allowable cost per benefitted receptor, this noise barrier is considered to be cost reasonable.

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*Since the barrier is feasible, and reasonable from both a noise reduction design goal and cost standpoint, the viewpoints of the benefitted residents in CNE 9 will be solicited at a special meeting in Summer of 2022. Meeting materials will be provided in **Appendix D** once the meeting and its subsequent comment period have concluded. A presentation will be made to inform the residents about the project, highway noise concepts and applicable policies, and the results of the analyses. A Viewpoint Form will be distributed to each benefited resident, requesting that the resident indicate a preference for or against the installation of a noise wall adjacent to his or her neighborhood. The form will be subsequently mailed to those who were not in attendance. If at the close of the comment period, greater than the required 1/3 of benefited residents within CNE 9 have submitted a Viewpoint Form, a second attempt will not be made to solicit viewpoints. Viewpoints from CNE 9 will be summarized in **Table B-5**. After weighting of viewpoints based on owner/renter status and whether or not the receptor is on the front row, if greater than 50% of the viewpoints received are **in favor** of the construction a noise wall, one will be recommended for installation as part of this* project *and a likelihood statement will be added here.*

CNE 10

CNE 10 is located on the east side of the roadway between the Tall Grass Greenway and Lapp Lane. The CNE contains 6 receptors. One of these receptors is a residence that is directly adjacent to 248th Avenue. This residence is the representative receptor and is located at 3444 Lapp Lane on a patio in the back yard of the residence. It is marked with a yellow dot on **Exhibit A-5b**. The yellow dot has a red semicircle on top of it to indicate a predicted noise impact. The other receptors within the CNE are marked as hollow black circles. There are no other receptors in this CNE that are predicted to experience an impact. As shown in **Table A-4** in **Appendix A**, the modeled noise level at the representative receptor under 2050 Build conditions is 66 dB(A), thus the receptor is predicted to experience a noise impact because the future traffic noise level is greater than or equal to 66 dB(A).

A noise barrier was analyzed at this location. A noise barrier can be physically constructed, but based on modeling, will not provide a 5-dB(A) insertion loss at the representative receptor. Also, as noted above, the representative receptor is the only one that is predicted to experience an impact. Since acoustic feasibility requires that a noise barrier benefits a minimum of two impacted receptors, as summarized in **Table B-1**, a barrier is considered infeasible. No further noise analyses will be performed for CNE 10. A noise barrier **will not be recommended** for installation at this location as part of the project.

CNE 14

CNE 14 is located on the west side of the roadway between the Tall Grass Greenway and Trumpet Avenue. The CNE contains 43 receptors. Seventeen of these receptors are residences that are directly adjacent to 248th Avenue. The representative receptor is located at 3460 Birch Lane on a patio in the back yard of the residence, and is marked with a yellow dot on **Exhibit A-5b**. The yellow dot has a red semicircle on top of it to indicate a predicted noise impact. The other receptors within the CNE are marked as hollow black circles, with those predicted to experience a noise impact also being marked with a red semicircle. As shown in **Table A-4** in **Appendix A**, the modeled noise level at the representative receptor under 2050 Build conditions is 66 dB(A), thus the receptor is predicted to experience a noise impact because the future traffic noise level is greater than or equal to 66 dB(A).

A noise barrier was analyzed at this location. A noise barrier can be physically constructed and is predicted to result in an insertion loss of 5 dB(A) or more at two of the impacted receptors, and therefore the wall is considered feasible. As summarized in **Table B-1**, a noise reduction of 8 dB(A) can be achieved at one or more of the receptors in the CNE, therefore the wall would be reasonable from a noise reduction design goal standpoint. The cost effectiveness of this noise barrier was analyzed. **Table B-3.5** summarizes the adjustments considered to the base $30,000 per benefitted receptor criterion. Based on IDOT policy, an adjustment of $1,000 was allowed for 8 receptors because the increase between the existing noise levels and the predicted noise levels before abatement was 5-dB(A). Therefore, the average adjusted allowable cost per benefitted receptor is $30,571. As summarized in **Table B-2**, analyses show that an approximately 9-foot tall, approximately 1,130-foot long noise barrier would benefit 16 receptors within CNE 14. The height is reported from the anticipated ground elevation based on preliminary proposed roadway cross-sections*. If this barrier is recommended for installation after viewpoints are solicited, the minimum required height of the wall above the proposed roadway profile grade line (PGL) will be provided in* ***Table B-7****.*

The 16 benefitted receptors are marked with a green circle on **Exhibit A-5b**. As shown in **Table B-2**, the total cost of this barrier would be $392,457, therefore the cost per benefitted receptor would be $24,529. Since this cost is less than the allowable cost per benefitted receptor, this noise barrier is considered to be cost reasonable.

Since the barrier is feasible, and reasonable from both a noise reduction design goal and cost standpoint, the viewpoints of the benefitted residents in CNE 14 will be solicited at a special meeting in Summer of 2022. Meeting materials will be provided in ***Appendix D*** *once the meeting and its subsequent comment period have concluded. A presentation will be made to inform the residents about the project, highway noise concepts and applicable policies, and the results of the analyses. A Viewpoint Form will be distributed to each benefited resident, requesting that the resident indicate a preference for or against the installation of a noise wall adjacent to his or her neighborhood. The form will be subsequently mailed to those who were not in attendance. If at the close of the comment period, greater than the required 1/3 of benefited residents within CNE 14 have submitted a Viewpoint Form, a second attempt will not be made to solicit viewpoints. Viewpoints from CNE 14 will be summarized in* ***Table B-5****. After weighting of viewpoints based on owner/renter status and whether or not the receptor is on the front row, if greater than 50% of the viewpoints received are* ***in favor*** *of the construction a noise wall, one will be recommended for installation as part of this project and a likelihood statement will be added here.*

CNEs 17 and 21

CNE 17 is located on the west side of the roadway between Trumpet Avenue and 95th Street. The CNE contains 32 receptors. Twelve of these receptors are residences that are directly adjacent to 248th Avenue. The representative receptor is located at 4043 Lobo Lane on a patio in the back yard of the residence, and is marked with a yellow dot on **Exhibit A-5b**. The yellow dot has a red semicircle on top of it to indicate a predicted noise impact. The other receptors within the CNE are marked as hollow black circles, with those predicted to experience a noise impact also being marked with a red semicircle. As shown in **Table A-4** in **Appendix A**, the modeled noise level at the representative receptor under 2050 Build conditions is 66 dB(A), thus the receptor is predicted to experience a noise impact because the future traffic noise level is greater than or equal to 66 dB(A).

CNE 21 is located on the west side of the roadway between Trumpet Avenue and 95th Street. The CNE contains 12 receptors. Three of these receptors are residences that are directly adjacent to 248th Avenue. The representative receptor is located at 4123 Lobo Lane on a patio in the back yard of the residence, and is marked with a yellow dot on **Exhibit A-5b**. The yellow dot has a red semicircle on top of it to indicate a predicted noise impact. The other receptors within the CNE are marked as hollow black circles, with those predicted to experience a noise impact also being marked with a red semicircle. As shown in **Table A-4** in **Appendix A**, the modeled noise level at the representative receptor under 2050 Build conditions is 66 dB(A), thus the receptor is predicted to experience a noise impact because the future traffic noise level is greater than or equal to 66 dB(A).

A single noise barrier was analyzed to potentially provide abatement to both of these CNEs. A noise barrier can be physically constructed and is predicted to result in an insertion loss of 5 dB(A) or more at two or more of the impacted receptors of each CNE, and therefore the wall is considered feasible. As summarized in **Table B-1**, a noise reduction of 8 dB(A) can be achieved at one or more of the receptors in each CNE, therefore the wall would be reasonable from a noise reduction design goal standpoint. The cost effectiveness of this noise barrier was analyzed. **Table B-3.6** summarizes the adjustments considered to the base $30,000 per benefitted receptor criterion. No adjustments were allowed, per IDOT policy, therefore the average adjusted allowable cost per benefitted receptor is $30,000. As summarized in **Table B-2**, analyses show that an approximately 8-foot tall, approximately 1,220-foot long noise barrier would benefit 15 receptors within CNEs 17 and 21. The height is reported from the anticipated ground elevation based on preliminary proposed roadway cross-sections. *If this barrier is recommended for installation after viewpoints are solicited, the minimum required height of the wall above the proposed roadway profile grade line (PGL) will be provided in **Table B-7**.*

The 15 benefitted receptors are marked with a green circle on **Exhibit A-5b**. As shown in **Table B-2**, the total cost of this barrier would be $486,390, therefore the cost per benefitted receptor would be $32,426. Since this cost is greater than the allowable cost per benefitted receptor, this noise barrier is not considered to be cost reasonable on its own. As shown in **Table B-4**, the ratio of estimated build cost per benefitted receptor to the adjusted allowable cost per benefitted receptor is 1.08, which makes this barrier eligible for cost averaging. The cumulative estimated build cost per benefitted receptor is $27,300. Since this cost is lower than the cumulative adjusted allowable cost of $30,169 per benefitted receptor, this noise barrier is considered to be cost reasonable through cost averaging.

*Since the barrier is feasible, and reasonable from both a noise reduction design goal and cost standpoint, the viewpoints of the benefitted residents in CNEs 17 and 21 will be solicited at a special meeting in Summer of 2022. Meeting materials will be provided in **Appendix D** once the meeting and its subsequent comment period have concluded. A presentation will be made to inform the residents about the project, highway noise concepts and applicable policies, and the results of the analyses. A Viewpoint Form will be distributed to each benefited resident, requesting that the resident indicate a preference for or against the installation of a noise wall adjacent to his or her neighborhood. The form will be subsequently mailed to those who were not in attendance. If at the close of the comment period, greater than the required 1/3 of benefited residents within CNEs 17 and 21 have submitted a Viewpoint Form, a second attempt will not be made to solicit viewpoints. Viewpoints from CNEs 17 and 21 will be summarized in **Table B-5**. After weighting of viewpoints based on owner/renter status and whether or not the receptor is on the front row, if greater than*

*50% of the viewpoints received are **in favor** of the construction a noise wall, one will be recommended for installation as part of this project and a likelihood statement will be added here.*

CNE 18 and 19

CNE 19 is located on the west side of the roadway between Grassmere Road and 95th Street. The CNE contains 15 receptors. Approximately 3 of these receptors are residences that are directly adjacent to 248th Avenue. The representative receptor is located at 3917 Highknob Circle on a patio in the back yard of the residence, and is marked with a yellow dot on **Exhibit A-5b**. The yellow dot has a red semicircle on top of it to indicate a predicted noise impact. The other receptors within the CNE are marked as hollow black circles, with those predicted to experience a noise impact also being marked with a red semicircle. As shown in **Table A-4** in **Appendix A**, the modeled noise level at the representative receptor under 2050 Build conditions is 66 dB(A), thus the receptor is predicted to experience a noise impact because the future traffic noise level is greater than or equal to 66 dB(A).

CNE 18 is located on the east side of the roadway between Grassmere Road and 95th Street. The CNE contains 12 receptors. Five of these receptors are residences that are directly adjacent to 248th Avenue. The representative receptor is located at 3939 Highknob Circle on a patio in the back yard of the residence, and is marked with a yellow dot on **Exhibit A-5b**. The other receptors within the CNE are marked as hollow black circles. As shown in **Table A-4** in **Appendix A**, the modeled noise level at the representative receptor under 2050 Build conditions is 65-dB(A), thus the receptor is not predicted to experience a noise impact because the future traffic noise level is less than 66 dB(A).

While CNE 18 is not predicted to experience a noise impact, a single noise barrier was analyzed to potentially provide abatement to both of these CNEs. The necessary length of the wall for acoustical efficiency in CNE 19 would carry the wall almost completely past CNE 18 as well. In order to provide an efficient and aesthetic treatment to as many residents as possible, the wall was extended to completely shield CNE 18 as well. A noise barrier can be physically constructed and is predicted to result in an insertion loss of 5 dB(A) or more at two of the impacted receptors of CNE 19, and therefore the wall is considered feasible. As summarized in **Table B-1**, a noise reduction of 8 dB(A) can be achieved at one or more of the receptors in CNE 19, therefore the wall would be reasonable from a noise reduction design goal standpoint. The cost effectiveness of this noise barrier was analyzed. **Table B-3.7** summarizes the adjustments considered to the base $30,000 per benefitted receptor criterion. No adjustments were allowed, per IDOT policy, therefore the average adjusted allowable cost per benefitted receptor is $30,000. As summarized in **Table B-2**, analyses show that an approximately 8-foot tall, approximately 720-foot long noise barrier would benefit 8 receptors within CNEs 18 and 19. The height is reported from the anticipated ground elevation based on preliminary proposed roadway cross-sections. *If this barrier is recommended for installation after viewpoints are solicited, the minimum required height of the wall above the proposed roadway profile grade line (PGL) will be provided in **Table B-7**.*

The 8 benefitted receptors are marked with a green circle on **Exhibit A-5b**. As shown in **Table B-2**, the total cost of this barrier would be $254,058, therefore the cost per benefitted receptor would be $31,757. Since this cost is greater than the allowable cost per benefitted receptor, this noise barrier is not considered to be cost reasonable on its own. As shown in **Table B-4**, the ratio of estimated build cost per benefitted receptor to the adjusted allowable cost per benefitted receptor is 1.06, which makes this barrier eligible for cost averaging. The cumulative estimated build cost per benefitted receptor is $25,700. Since this cost is lower than the cumulative adjusted allowable cost of $30,224 per benefitted receptor, this noise barrier is considered to be cost reasonable through cost averaging.

*Since the barrier is feasible, and reasonable from both a noise reduction design goal and cost standpoint, the viewpoints of the benefitted residents in CNEs 18 and 19 will be solicited at a special meeting in Summer of 2022. Meeting materials will be provided in **Appendix D** once the meeting and its subsequent comment period have concluded. A presentation will be made to inform the residents about the project, highway noise concepts and applicable policies, and the results of the analyses. A Viewpoint Form will be distributed to each benefited resident, requesting that the resident indicate a preference for or against the installation of a noise wall adjacent to his or her neighborhood. The form will be subsequently mailed to those who were not in attendance. If at the close of the comment period, greater than the required 1/3 of benefited residents within CNEs 18 and 19 have submitted a Viewpoint Form, a second attempt will not be made to solicit viewpoints. Viewpoints from CNEs 18 and 19 will be summarized in **Table B-5**. After weighting of viewpoints based on owner/renter status and whether or not the receptor is on the front row, if greater than 50% of the viewpoints received are **in favor** of the construction a noise wall, one will be recommended for installation as part of this project and a likelihood statement will be added here.*

NOISE-REDUCTION EFFECTIVENESS OF POTENTIAL NOISE BARRIERS

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Common Noise Envrionments with Noise Impacts

CNE No.	Representative Receptor Address	Business, Property, or Owner Name(s)	2050 Build w/o Barrier (dBA)	Barrier Physically Feasible? (Yes/No)	2050 Build w/Barrier (dBA)	Noise Reduction at Rep. Receptor (dBA)	Noise Reduction at Other Front-Line Receptors (dBA)	Barrier Acoustically Feasible? (Yes/No)	Noise Reduction Design Goal? (Yes/No)
1	3920 Landsdown Ave.	Neelam Bhargava	66	Yes	56	10	5-9	Yes	Yes
3	3820 Nannyberry Ct.	Senthil K. Subramaniam	66	Yes	57	9	6-8	Yes	Yes
6	9956 S. 248th Avenue	Charles K. Connon LVG TR	68	Yes	62	6	2-8	Yes	Yes
9	3512 Birch Lane	Viral Parikh	66	Yes	57	9	1-8	Yes	Yes
10	3444 Lapp Lane	Rajkiran Morgan L. Mooga	66	Yes	64	2	0-1	No	n/a
14	3460 Birch Lane	Anirban Bagchi	66	Yes	56	10	1-9	Yes	Yes
17	4043 Lobo Lane	Richard A. Tamborski	66	Yes	57	9	8-10	Yes	Yes
19	3917 Highknob Circle	Kostas M. Dovas	66	Yes	59	7	4-8	Yes	Yes
21	4123 Lobo Lane	Linda M. Love	66	Yes	56	10	5-9	Yes	Yes

Notes:
- CNE = Common Noise Environment.
- The decibel values in this chart were generated by the FHWA TNM 2.5 computer program. All values represent Leq(h) values of exterior traffic noise, rounded to the nearest decibel (dBA).
- The traffic noise levels predicted by TNM 2.5 use PM peak-hour traffic.

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BARRIER COST-REASONABLENESS SUMMARY

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Barriers that are Feasible and meet the Noise Reduction Design Goal Reasonableness Criterion

CNE No(s).	Number of Benefited Receptors	Barrier Length	Avg. Barrier Height	Barrier Cost	Land	Total Barrier Cost	Barrier Cost Per Benefited Receptor	Allowable Cost Per Benefited Receptor	Is Barrier Cost-Reasonable?
1	13	1285'	8.9'	$341,553	$93,690	$435,243	$33,480	$30,000	No
3	6	570'	8.0'	$136,800	$33,950	$170,750	$28,458	$30,000	Yes
6	8	625'	8.3'	$156,000	$16,700	$172,700	$21,588	$30,000	Yes
9	8	540'	9.4'	$152,118	$39,500	$191,618	$23,952	$30,143	Yes
14	16	1130'	8.7'	$295,947	$96,510	$392,457	$24,529	$30,571	Yes
17 & 21	15	1220'	8.0'	$292,800	$193,590	$486,390	$32,426	$30,000	No
18 & 19	8	720'	8.3'	$179,928	$74,130	$254,058	$31,757	$30,000	No

Notes:
- CNE = Common Noise Environment.
- Barrier cost based on the standardized unit cost of $30/SF per IDOT policy. Actual construction cost will likely be greater.

COST-EFFECTIVENESS ADJUSTMENT FACTORS

DRAFT

Barrier CNE #1

Receptor No.	Existing Conditions (dBA)	Predicted Build Condition (dBA)	Build Increase over Existing (dBA)	New Align-ment?	Receptors Pre-Date Original Con-struction?	Adjustment For Noise Level Factor	Adjustment For Increase In Noise Factor	Adjustment For Build Before Roadway Factor	Total Adjustment Factor Amount	Receptor Benefitted?	Adjusted Allowable Cost Per Benefitted Receptor
1.0	62	66	4	No	No	$0	$0	$0	$0	Yes	$30,000
1.1	61	65	4	No	No	$0	$0	$0	$0	Yes	$30,000
1.2	64	66	2	No	No	$0	$0	$0	$0	Yes	$30,000
1.3	62	64	2	No	No	$0	$0	$0	$0	Yes	$30,000
1.4	62	65	3	No	No	$0	$0	$0	$0	Yes	$30,000
1.5	62	64	2	No	No	$0	$0	$0	$0	Yes	$30,000
1.6	61	63	2	No	No	$0	$0	$0	$0	Yes	$30,000
1.7	60	63	3	No	No	$0	$0	$0	$0	Yes	$30,000
1.8	58	60	2	No	No	$0	$0	$0	$0	Yes	$30,000
1.9	56	59	3	No	No	$0	$0	$0	$0	Yes	$30,000
1.10	56	59	3	No	No	$0	$0	$0	$0	Yes	$30,000
1.11	52	57	5	No	No	$0	$1,000	$0	$1,000	No	-
1.12	48	54	6	No	No	$0	$1,000	$0	$1,000	No	-
1.13	45	50	5	No	No	$0	$1,000	$0	$1,000	No	-
1.14	45	49	4	No	No	$0	$0	$0	$0	No	-
1.15	48	52	4	No	No	$0	$0	$0	$0	No	-
1.16	49	54	5	No	No	$0	$1,000	$0	$1,000	No	-
1.17	50	56	6	No	No	$0	$1,000	$0	$1,000	No	-
1.18	55	59	4	No	No	$0	$0	$0	$0	No	-
1.19	61	65	4	No	No	$0	$0	$0	$0	No	-
1.20	47	50	3	No	No	$0	$0	$0	$0	No	-
1.21	48	50	2	No	No	$0	$0	$0	$0	No	-

COST-EFFECTIVENESS ADJUSTMENT FACTORS

DRAFT

Barrier CNE #1

Receptor No.	Existing Conditions (dBA)	Predicted Build Condition (dBA)	Build Increase over Existing (dBA)	New Align-ment?	Receptors Pre-Date Original Con-struction?	Adjustment For Noise Level Factor	Adjustment For Increase In Noise Factor	Adjustment For Build Before Roadway Factor	Total Adjustment Factor Amount	Receptor Benefitted?	Adjusted Allowable Cost Per Benefitted Receptor
1.22	48	50	2	No	No	$0	$0	$0	$0	No	-
1.23	49	50	1	No	No	$0	$0	$0	$0	No	-
1.24	49	51	2	No	No	$0	$0	$0	$0	No	-
1.25	50	51	1	No	No	$0	$0	$0	$0	No	-
1.26	51	52	1	No	No	$0	$0	$0	$0	No	-
1.27	51	53	2	No	No	$0	$0	$0	$0	No	-
1.28	50	53	3	No	No	$0	$0	$0	$0	No	-
1.29	48	49	1	No	No	$0	$0	$0	$0	No	-
1.30	46	48	2	No	No	$0	$0	$0	$0	No	-
1.31	46	48	2	No	No	$0	$0	$0	$0	No	-
1.32	46	48	2	No	No	$0	$0	$0	$0	No	-
1.33	45	48	3	No	No	$0	$0	$0	$0	No	-
1.34	45	48	3	No	No	$0	$0	$0	$0	No	-
1.35	45	47	2	No	No	$0	$0	$0	$0	No	-
1.36	45	47	2	No	No	$0	$0	$0	$0	No	-
1.37	63	65	2	No	No	$0	$0	$0	$0	Yes	$30,000
1.38	62	64	2	No	No	$0	$0	$0	$0	Yes	$30,000
1.39	58	60	2	No	No	$0	$0	$0	$0	No	-
1.40	55	56	1	No	No	$0	$0	$0	$0	No	-
1.41	55	56	1	No	No	$0	$0	$0	$0	No	-
1.42	54	55	1	No	No	$0	$0	$0	$0	No	-
1.43	55	56	1	No	No	$0	$0	$0	$0	No	-

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COST-EFFECTIVENESS ADJUSTMENT FACTORS

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Barrier CNE #1

Receptor No.	Existing Conditions (dBA)	Predicted Build Condition (dBA)	Build Increase over Existing (dBA)	New Align-ment?	Receptors Pre-Date Original Con-struction?	Adjustment For Noise Level Factor	Adjustment For Increase In Noise Factor	Adjustment For Build Before Roadway Factor	Total Adjustment Factor Amount	Receptor Benefitted?	Adjusted Allowable Cost Per Benefitted Receptor
1.44	54	55	1	No	No	$0	$0	$0	$0	No	-
1.45	53	55	2	No	No	$0	$0	$0	$0	No	-
1.46	50	53	3	No	No	$0	$0	$0	$0	No	-
1.47	48	49	1	No	No	$0	$0	$0	$0	No	-
Average Allowable Cost per Benefitted Receptor											$30,000

COST-EFFECTIVENESS ADJUSTMENT FACTORS

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Barrier CNE #3

Receptor No.	Existing Conditions (dBA)	Predicted Build Condition (dBA)	Build Increase over Existing (dBA)	New Align-ment?	Receptors Pre-Date Original Con-struction?	Adjustment For Noise Level Factor	Adjustment For Increase In Noise Factor	Adjustment For Build Before Roadway Factor	Total Adjustment Factor Amount	Receptor Benefitted?	Adjusted Allowable Cost Per Benefitted Receptor
3.1	61	64	3	No	No	$0	$0	$0	$0	Yes	$30,000
3.2	61	65	4	No	No	$0	$0	$0	$0	Yes	$30,000
3.3	62	66	4	No	No	$0	$0	$0	$0	Yes	$30,000
3.4	62	66	4	No	No	$0	$0	$0	$0	Yes	$30,000
3.5	62	64	2	No	No	$0	$0	$0	$0	Yes	$30,000
3.6	58	62	4	No	No	$0	$0	$0	$0	Yes	$30,000
3.7	50	55	5	No	No	$0	$1,000	$0	$1,000	No	-
3.8	48	52	4	No	No	$0	$0	$0	$0	No	-
3.9	47	51	4	No	No	$0	$0	$0	$0	No	-
3.10	48	51	3	No	No	$0	$0	$0	$0	No	-
3.11	49	53	4	No	No	$0	$0	$0	$0	No	-
3.12	50	53	3	No	No	$0	$0	$0	$0	No	-
3.13	52	54	2	No	No	$0	$0	$0	$0	No	-
3.14	53	55	2	No	No	$0	$0	$0	$0	No	-
3.15	53	56	3	No	No	$0	$0	$0	$0	No	-
3.16	51	54	3	No	No	$0	$0	$0	$0	No	-
3.17	50	53	3	No	No	$0	$0	$0	$0	No	-
3.18	50	52	2	No	No	$0	$0	$0	$0	No	-
Average Allowable Cost per Benefitted Receptor											$30,000

COST-EFFECTIVENESS ADJUSTMENT FACTORS

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Barrier CNE #6

Receptor No.	Existing Conditions (dBA)	Predicted Build Condition (dBA)	Build Increase over Existing (dBA)	New Align-ment?	Receptors Pre-Date Original Con-struction?	Adjustment For Noise Level Factor	Adjustment For Increase In Noise Factor	Adjustment For Build Before Roadway Factor	Total Adjustment Factor Amount	Receptor Benefitted?	Adjusted Allowable Cost Per Benefitted Receptor
6.1	64	68	4	No	No	$0	$0	$0	$0	Yes	$30,000
6.2	52	57	5	No	No	$0	$1,000	$0	$1,000	No	-
6.3	50	54	4	No	No	$0	$0	$0	$0	No	-
6.4	49	52	3	No	No	$0	$0	$0	$0	No	-
6.5	47	50	3	No	No	$0	$0	$0	$0	No	-
6.6	46	49	3	No	No	$0	$0	$0	$0	No	-
6.7	46	49	3	No	No	$0	$0	$0	$0	No	-
6.8	46	49	3	No	No	$0	$0	$0	$0	No	-
6.9	47	50	3	No	No	$0	$0	$0	$0	No	-
6.10	49	53	4	No	No	$0	$0	$0	$0	No	-
6.11	49	53	4	No	No	$0	$0	$0	$0	No	-
6.12	49	53	4	No	No	$0	$0	$0	$0	No	-
6.13	49	54	5	No	No	$0	$1,000	$0	$1,000	No	-
6.14	50	54	4	No	No	$0	$0	$0	$0	No	-
6.15	51	55	4	No	No	$0	$0	$0	$0	No	-
6.16	52	56	4	No	No	$0	$0	$0	$0	No	-
6.17	62	65	3	No	No	$0	$0	$0	$0	No	-
6.18	63	66	3	No	No	$0	$0	$0	$0	Yes	$30,000
6.19	62	65	3	No	No	$0	$0	$0	$0	Yes	$30,000
6.20	62	65	3	No	No	$0	$0	$0	$0	Yes	$30,000
6.21	62	65	3	No	No	$0	$0	$0	$0	Yes	$30,000
6.22	62	64	2	No	No	$0	$0	$0	$0	Yes	$30,000

COST-EFFECTIVENESS ADJUSTMENT FACTORS

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Barrier CNE #6

Receptor No.	Existing Conditions (dBA)	Predicted Build Condition (dBA)	Build Increase over Existing (dBA)	New Align-ment?	Receptors Pre-Date Original Con-struction?	Adjustment For Noise Level Factor	Adjustment For Increase In Noise Factor	Adjustment For Build Before Roadway Factor	Total Adjustment Factor Amount	Receptor Benefitted?	Adjusted Allowable Cost Per Benefitted Receptor
6.23	61	64	3	No	No	$0	$0	$0	$0	Yes	$30,000
6.24	60	63	3	No	No	$0	$0	$0	$0	Yes	$30,000
Average Allowable Cost per Benefitted Receptor											$30,000

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COST-EFFECTIVENESS ADJUSTMENT FACTORS

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Barrier CNE #9

Receptor No.	Existing Conditions (dBA)	Predicted Build Condition (dBA)	Build Increase over Existing (dBA)	New Align-ment?	Receptors Pre-Date Original Con-struction?	Adjustment For Noise Level Factor	Adjustment For Increase In Noise Factor	Adjustment For Build Before Roadway Factor	Total Adjustment Factor Amount	Receptor Benefitted?	Adjusted Allowable Cost Per Benefitted Receptor
9.1	61	65	4	No	No	$0	$0	$0	$0	Yes	$30,000
9.2	60	65	5	No	No	$0	$1,000	$0	$1,000	No	-
9.3	50	55	5	No	No	$0	$1,000	$0	$1,000	No	-
9.4	48	53	5	No	No	$0	$1,000	$0	$1,000	No	-
9.5	47	51	4	No	No	$0	$0	$0	$0	No	-
9.6	46	49	3	No	No	$0	$0	$0	$0	No	-
9.7	46	50	4	No	No	$0	$0	$0	$0	No	-
9.8	47	51	4	No	No	$0	$0	$0	$0	No	-
9.9	49	54	5	No	No	$0	$1,000	$0	$1,000	No	-
9.10	49	54	5	No	No	$0	$1,000	$0	$1,000	No	-
9.11	50	54	4	No	No	$0	$0	$0	$0	No	-
9.12	50	54	4	No	No	$0	$0	$0	$0	No	-
9.13	51	55	4	No	No	$0	$0	$0	$0	No	-
9.14	53	57	4	No	No	$0	$0	$0	$0	No	-
9.15	62	65	3	No	No	$0	$0	$0	$0	No	-
9.16	62	65	3	No	No	$0	$0	$0	$0	Yes	$30,000
9.17	61	65	4	No	No	$0	$0	$0	$0	Yes	$30,000
9.18	62	65	3	No	No	$0	$0	$0	$0	Yes	$30,000
9.19	62	66	4	No	No	$0	$0	$0	$0	Yes	$30,000
9.20	61	65	4	No	No	$0	$0	$0	$0	Yes	$30,000
9.21	61	66	5	No	No	$0	$1,000	$0	$1,000	Yes	$31,000
Average Allowable Cost per Benefitted Receptor											$30,143

COST-EFFECTIVENESS ADJUSTMENT FACTORS

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Barrier CNE #14

Receptor No.	Existing Conditions (dBA)	Predicted Build Condition (dBA)	Build Increase over Existing (dBA)	New Align-ment?	Receptors Pre-Date Original Con-struction?	Adjustment For Noise Level Factor	Adjustment For Increase In Noise Factor	Adjustment For Build Before Roadway Factor	Total Adjustment Factor Amount	Receptor Benefitted?	Adjusted Allowable Cost Per Benefitted Receptor
14.1	61	66	5	No	No	$0	$1,000	$0	$1,000	Yes	$31,000
14.2	60	65	5	No	No	$0	$1,000	$0	$1,000	No	-
14.3	60	65	5	No	No	$0	$1,000	$0	$1,000	Yes	$31,000
14.4	61	66	5	No	No	$0	$1,000	$0	$1,000	Yes	$31,000
14.5	60	65	5	No	No	$0	$1,000	$0	$1,000	Yes	$31,000
14.6	60	65	5	No	No	$0	$1,000	$0	$1,000	Yes	$31,000
14.7	60	65	5	No	No	$0	$1,000	$0	$1,000	Yes	$31,000
14.8	60	64	4	No	No	$0	$0	$0	$0	Yes	$30,000
14.9	60	65	5	No	No	$0	$1,000	$0	$1,000	Yes	$31,000
14.10	60	65	5	No	No	$0	$1,000	$0	$1,000	Yes	$31,000
14.11	60	64	4	No	No	$0	$0	$0	$0	Yes	$30,000
14.12	61	65	4	No	No	$0	$0	$0	$0	Yes	$30,000
14.13	61	65	4	No	No	$0	$0	$0	$0	Yes	$30,000
14.14	61	65	4	No	No	$0	$0	$0	$0	Yes	$30,000
14.15	61	65	4	No	No	$0	$0	$0	$0	Yes	$30,000
14.16	60	64	4	No	No	$0	$0	$0	$0	No	-
14.17	59	62	3	No	No	$0	$0	$0	$0	No	-
14.18	56	60	4	No	No	$0	$0	$0	$0	No	-
14.19	55	57	2	No	No	$0	$0	$0	$0	No	-
14.20	54	56	2	No	No	$0	$0	$0	$0	No	-
14.21	53	55	2	No	No	$0	$0	$0	$0	No	-
14.22	47	50	3	No	No	$0	$0	$0	$0	No	-

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COST-EFFECTIVENESS ADJUSTMENT FACTORS

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Barrier CNE #14

Receptor No.	Existing Conditions (dBA)	Predicted Build Condition (dBA)	Build Increase over Existing (dBA)	New Align-ment?	Receptors Pre-Date Original Con-struction?	Adjustment For Noise Level Factor	Adjustment For Increase In Noise Factor	Adjustment For Build Before Roadway Factor	Total Adjustment Factor Amount	Receptor Benefitted?	Adjusted Allowable Cost Per Benefitted Receptor
14.23	47	50	3	No	No	$0	$0	$0	$0	No	-
14.24	47	50	3	No	No	$0	$0	$0	$0	No	-
14.25	47	50	3	No	No	$0	$0	$0	$0	No	-
14.26	47	50	3	No	No	$0	$0	$0	$0	No	-
14.27	46	50	4	No	No	$0	$0	$0	$0	No	-
14.28	46	50	4	No	No	$0	$0	$0	$0	No	-
14.29	50	53	3	No	No	$0	$0	$0	$0	No	-
14.30	49	53	4	No	No	$0	$0	$0	$0	No	-
14.31	49	53	4	No	No	$0	$0	$0	$0	No	-
14.32	49	53	4	No	No	$0	$0	$0	$0	No	-
14.33	49	53	4	No	No	$0	$0	$0	$0	No	-
14.34	49	53	4	No	No	$0	$0	$0	$0	No	-
14.35	49	53	4	No	No	$0	$0	$0	$0	No	-
14.36	49	53	4	No	No	$0	$0	$0	$0	No	-
14.37	49	53	4	No	No	$0	$0	$0	$0	No	-
14.38	49	53	4	No	No	$0	$0	$0	$0	No	-
14.39	49	53	4	No	No	$0	$0	$0	$0	No	-
14.40	49	54	5	No	No	$0	$1,000	$0	$1,000	No	-
14.41	49	54	5	No	No	$0	$1,000	$0	$1,000	No	-
14.42	49	54	5	No	No	$0	$1,000	$0	$1,000	No	-
14.43	50	55	5	No	No	$0	$1,000	$0	$1,000	No	-
Average Allowable Cost per Benefitted Receptor											$30,571

COST-EFFECTIVENESS ADJUSTMENT FACTORS

DRAFT

Barrier CNE #17 & 21

Receptor No.	Existing Conditions (dBA)	Predicted Build Condition (dBA)	Build Increase over Existing (dBA)	New Align-ment?	Receptors Pre-Date Original Con-struction?	Adjustment For Noise Level Factor	Adjustment For Increase In Noise Factor	Adjustment For Build Before Roadway Factor	Total Adjustment Factor Amount	Receptor Benefitted?	Adjusted Allowable Cost Per Benefitted Receptor
17.1	62	66	4	No	No	$0	$0	$0	$0	Yes	$30,000
17.2	62	65	3	No	No	$0	$0	$0	$0	Yes	$30,000
17.3	62	65	3	No	No	$0	$0	$0	$0	Yes	$30,000
17.4	61	65	4	No	No	$0	$0	$0	$0	Yes	$30,000
17.5	62	65	3	No	No	$0	$0	$0	$0	Yes	$30,000
17.6	59	62	3	No	No	$0	$0	$0	$0	Yes	$30,000
17.7	57	60	3	No	No	$0	$0	$0	$0	No	-
17.8	54	57	3	No	No	$0	$0	$0	$0	No	-
17.9	54	56	2	No	No	$0	$0	$0	$0	No	-
17.10	48	50	2	No	No	$0	$0	$0	$0	No	-
17.11	48	50	2	No	No	$0	$0	$0	$0	No	-
17.12	48	50	2	No	No	$0	$0	$0	$0	No	-
17.13	49	51	2	No	No	$0	$0	$0	$0	No	-
17.14	50	53	3	No	No	$0	$0	$0	$0	No	-
17.15	50	52	2	No	No	$0	$0	$0	$0	No	-
17.16	50	52	2	No	No	$0	$0	$0	$0	No	-
17.17	50	52	2	No	No	$0	$0	$0	$0	No	-
17.18	50	52	2	No	No	$0	$0	$0	$0	No	-
17.19	62	65	3	No	No	$0	$0	$0	$0	Yes	$30,000
17.20	62	65	3	No	No	$0	$0	$0	$0	Yes	$30,000
17.21	62	65	3	No	No	$0	$0	$0	$0	Yes	$30,000
17.22	62	66	4	No	No	$0	$0	$0	$0	Yes	$30,000

COST-EFFECTIVENESS ADJUSTMENT FACTORS

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Barrier CNE #17 & 21

Receptor No.	Existing Conditions (dBA)	Predicted Build Condition (dBA)	Build Increase over Existing (dBA)	New Align-ment?	Receptors Pre-Date Original Con-struction?	Adjustment For Noise Level Factor	Adjustment For Increase In Noise Factor	Adjustment For Build Before Roadway Factor	Total Adjustment Factor Amount	Receptor Benefitted?	Adjusted Allowable Cost Per Benefitted Receptor
17.23	62	65	3	No	No	$0	$0	$0	$0	Yes	$30,000
17.24	62	66	4	No	No	$0	$0	$0	$0	Yes	$30,000
17.25	51	54	3	No	No	$0	$0	$0	$0	No	-
17.26	51	53	2	No	No	$0	$0	$0	$0	No	-
17.27	51	52	1	No	No	$0	$0	$0	$0	No	-
17.28	50	51	1	No	No	$0	$0	$0	$0	No	-
21.1	64	66	2	No	No	$0	$0	$0	$0	Yes	$30,000
21.2	62	66	4	No	No	$0	$0	$0	$0	Yes	$30,000
21.3	62	66	4	No	No	$0	$0	$0	$0	Yes	$30,000
21.4	54	56	2	No	No	$0	$0	$0	$0	No	-
21.5	54	56	2	No	No	$0	$0	$0	$0	No	-
21.6	54	56	2	No	No	$0	$0	$0	$0	No	-
21.7	55	56	1	No	No	$0	$0	$0	$0	No	-
21.8	63	64	1	No	No	$0	$0	$0	$0	No	-
21.9	63	64	1	No	No	$0	$0	$0	$0	No	-
21.10	63	64	1	No	No	$0	$0	$0	$0	No	-
21.11	63	65	2	No	No	$0	$0	$0	$0	No	-
21.12	63	65	2	No	No	$0	$0	$0	$0	No	-
Average Allowable Cost per Benefitted Receptor											$30,000

COST-EFFECTIVENESS ADJUSTMENT FACTORS

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Barrier CNE #18 & 19

Receptor No.	Existing Conditions (dBA)	Predicted Build Condition (dBA)	Build Increase over Existing (dBA)	New Align-ment?	Receptors Pre-Date Original Con-struction?	Adjustment For Noise Level Factor	Adjustment For Increase In Noise Factor	Adjustment For Build Before Roadway Factor	Total Adjustment Factor Amount	Receptor Benefitted?	Adjusted Allowable Cost Per Benefitted Receptor
18.1	64	65	1	No	No	$0	$0	$0	$0	No	-
18.2	64	65	1	No	No	$0	$0	$0	$0	Yes	$30,000
18.3	64	65	1	No	No	$0	$0	$0	$0	Yes	$30,000
18.4	63	64	1	No	No	$0	$0	$0	$0	Yes	$30,000
18.5	63	65	2	No	No	$0	$0	$0	$0	Yes	$30,000
18.6	51	54	3	No	No	$0	$0	$0	$0	No	-
18.7	51	54	3	No	No	$0	$0	$0	$0	No	-
18.8	51	54	3	No	No	$0	$0	$0	$0	No	-
18.9	52	55	3	No	No	$0	$0	$0	$0	No	-
18.10	50	53	3	No	No	$0	$0	$0	$0	No	-
18.11	50	52	2	No	No	$0	$0	$0	$0	No	-
18.12	49	52	3	No	No	$0	$0	$0	$0	No	-
19.1	64	66	2	No	No	$0	$0	$0	$0	Yes	$30,000
19.2	64	65	1	No	No	$0	$0	$0	$0	Yes	$30,000
19.3	52	54	2	No	No	$0	$0	$0	$0	Yes	$30,000
19.4	50	52	2	No	No	$0	$0	$0	$0	No	-
19.5	53	55	2	No	No	$0	$0	$0	$0	No	-
19.6	53	55	2	No	No	$0	$0	$0	$0	No	-
19.7	53	55	2	No	No	$0	$0	$0	$0	No	-
19.8	64	65	1	No	No	$0	$0	$0	$0	No	-
19.9	63	65	2	No	No	$0	$0	$0	$0	No	-
19.10	65	67	2	No	No	$0	$0	$0	$0	No	-

COST-EFFECTIVENESS ADJUSTMENT FACTORS

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Barrier CNE #18 & 19

Receptor No.	Existing Conditions (dBA)	Predicted Build Condition (dBA)	Build Increase over Existing (dBA)	New Align-ment?	Receptors Pre-Date Original Con-struction?	Adjustment For Noise Level Factor	Adjustment For Increase In Noise Factor	Adjustment For Build Before Roadway Factor	Total Adjustment Factor Amount	Receptor Benefitted?	Adjusted Allowable Cost Per Benefitted Receptor
19.11	64	66	2	No	No	$0	$0	$0	$0	No	-
19.12	64	65	1	No	No	$0	$0	$0	$0	No	-
19.13	65	66	1	No	No	$0	$0	$0	$0	No	-
Average Allowable Cost per Benefitted Receptor											$30,000

COST AVERAGING

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CNE No(s).	Number of Benefited Receptors	Total Barrier Cost	Estimated Build Cost per Benefited Receptor	Adjusted Allowable Cost per Benefited Receptor	Ratio of Est. Build/Adjust Allowable	Cumulative Estimated Build Cost/ Benefited	Cumulative Adjusted Allowable Cost/ Benefited	Cost Reasonable?
6	8	$172,700	$21,588	$30,000	0.72	$21,588	$30,000	Yes: Stand Alone
9	8	$191,618	$23,952	$30,143	0.79	$22,800	$30,071	Yes: Stand Alone
14	16	$392,457	$24,529	$30,571	0.80	$23,600	$30,321	Yes: Stand Alone
3	6	$170,750	$28,458	$30,000	0.95	$24,400	$30,271	Yes: Stand Alone
18 & 19	8	$254,058	$31,757	$30,000	1.06	$25,700	$30,224	Yes: Cost-Averaging
17 & 21	15	$486,390	$32,426	$30,000	1.08	$27,300	$30,169	Yes: Cost-Averaging
1	13	$435,243	$33,480	$30,000	1.12	$28,400	$30,139	Yes: Cost-Averaging

Notes:
- CNE = Common Noise Environment.
- Barrier cost based on the standardized unit cost of $30/SF per IDOT policy. Actual construction cost will likely be greater.

- Allowable cost per benefitted receptor based on standardized allowable cost of $30,000 plus any allowable adjustments, per policy. See Tables B-3.1 thorugh B-3.7 for adjustments allowed and calculation of allowable cost per benefitted receptor.

SUMMARY OF VIEWPOINTS OF BENEFITTED RECEPTORS

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CNE No.	Points For	Points Against	Percentage For	Reasonable Based on Viewpoints
1				
3				
6				
9				
14				
17 & 21				
18 & 19				

SUMMARY OF RECOMMENDED NOISE BARRIERS

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CNE No.	Average Height (feet)	Approximate Length (feet)	Total Cost

City of Naperville

248th Avenue Phase I Study

NOISE BARRIER DESIGN

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Barrier Number	TNM Wall Location		Length	Proposed PGL Elevation	Assumed Base of Wall Elevation	Proposed Barrier Height from Ground	Minimum Barrier Height Above PGL
	From Sta.	To Sta.	(feet)	(feet)	(feet)	(feet)	(feet)

APPENDIX C – UNDEVELOPED PROPERTIES DETAILED ANALYSES

Following is a detailed summary of the analyses of the undeveloped properties which are not anticipated to receive a building permit by the anticipated date of NEPA document approval. Design-year noise analyses were performed to determine an approximate offset from the roadway at which future noise levels might approach the FHWA NAC. There are 2 Common Noise Environments within the project limits containing undeveloped/non-permitted properties with the potential to develop in the future. Please see Section IV in the main report for more information.

Area G1 – Common Noise Environment (CNE) G1 contains undeveloped residential lots on the west side of 248th Avenue between 103rd Street and Arrowwood Road. As shown in **Table C-1**, under 2050 Build conditions, highway noise levels at or above the IDOT impact criterion of 66 dB(A) for residential properties (Activity Category B) are not expected to occur beyond approximately 80 feet from the proposed edge of pavement of 248th Avenue. The proposed right-of-way line is 20 feet from the proposed edge of pavement, therefore noise impacts might be expected within 60 feet of the proposed right-of-way line. A contour line illustrating the 66 dB(A) offset is shown on **Exhibit A-7a**. Should the proposed roadway improvements be constructed, and should a building permit be issued for the construction of a home on this property, areas of frequent outdoor human activity located greater than 60 feet from the proposed roadway edge of pavement are likely to be compatible with future highway noise based on FHWA and IDOT noise policies.

Area G2 – Common Noise Environment (CNE) G2 is an undeveloped residential property owned by the Islamic Center of Naperville. It is located between Honey Locust Drive and the Tall Grass Greenway, and is the planned future site of the Islamic Center of Naperville. Since this property has the potential to develop into either residential, religious institutional, or commercial land use, both the 66-dBA and 71-dBA noise contours were determined. As shown on n **Table C-1**, under 2050 Build conditions, highway noise levels at or above the IDOT impact criterion of 71 dBA for less noise-sensitive commercial properties (Activity Category E) are not expected to occur beyond the existing and future right-of-way line of 248th Avenue. Highway noise levels at or above the IDOT impact criterion of 66 dBA for residential properties (Activity Category B) are not expected to occur beyond approximately 70 feet from the proposed edge of pavement of 248th Avenue. A contour line illustrating the 66 dB(A) offset is shown on **Exhibit A-7a**. Should the proposed roadway improvements be constructed, and should a building permit be issued for the construction of commercial or residential land uses on this property, areas of frequent outdoor human activity located beyond the illustrated contour line are likely to be compatible with future highway noise based on FHWA and IDOT noise policies.

MODELED NOISE LEVELS AND IDENTIFICATION OF TRAFFIC NOISE IMPACTS ON UNDEVELOPED/NON-PERMITTED PROPERTIES

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Undeveloped/Non-Permitted Properties

Ref. No.	Undeveloped Property Description/ Location	Zoning	Noise Level Prediction Point Number	Distance from Roadway Proposed Edge of Pavement (feet)	2050 Predicted Build Condition (dBA)
G-1	Vacant; Roman Catholic Diocese	R-1A, Low Density Single-Family Residence District	G1.1	20	73
			G1.2	30	71
			G1.3	40	70
			G1.4	50	69
			G1.5	60	68
			G1.6	70	67
			G1.7	80	66
G-2	Vacant; Islamic Center of Naperville	R-1 Low Density Single-Family Residence District	G2.1	30	70
			G2.2	40	69
			G2.3	50	68
			G2.4	60	67
			G2.5	70	66
			G2.6	80	66

Notes

- The decibel values in this chart were generated by the FHWA TNM 2.5 computer program. All values represent Leq(h) values of exterior traffic noise, rounded to the nearest decibel (dBA).
- The traffic noise levels predicted by TNM 2.5 use P.M. peak-hour traffic.
- Distances are from receptor to the nearest edge of pavement of 248th Avenue.