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RANDALL ROAD AT HOPPS ROAD INTERSECTION IMPROVEMENT

Kane County Division of Transportation

Section #19-00511-00-CH

PHASE I ENGINEERING STUDY

TRAFFIC NOISE ANALYSIS REPORT

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1.0 INTRODUCTION

1.1 PROJECT OVERVIEW

This traffic noise study was prepared to evaluate the effect of the proposed roadway improvements on traffic noise along Randall Road and cross streets within the project limits. Traffic noise was assessed using the typical procedures outlined in Chapter 26-6.05(c) (Traffic Noise Analysis) of the Illinois Department of Transportation (IDOT) Bureau of Design and Environment (BDE) Manual and the IDOT Highway Traffic Noise Assessment Manual (2017).

This project primarily consists of an intersection improvement at Randall Road and Hopps Road and a grade separation at the Canadian National Railroad (CNRR) within the City of Elgin, Village of South Elgin, and Elgin Township in Kane County, Illinois (see Figure 1). The project also includes adding a through lane along Randall Road and an intersection improvement at Randall Road and Gyorr Avenue. Randall Road is a north-south principal arterial roadway and part of the Strategic Regional Arterial (SRA) system (SRA) under the jurisdiction of the Kane County Division of Transportation (KDOT). Project limits are between Gyorr Avenue on the south and the signalized Walmart Entrance intersection on the north (approximately 1900-ft south of Bowes Road), a distance of approximately one mile. Hopps Road is an east-west minor collector/arterial under the jurisdiction of the City of Elgin. Gyorr Avenue is an east-west local road under the jurisdiction of the Village of South Elgin.

Existing Conditions

The existing typical section of Randall Road is two 12-ft lanes in each direction, separated by a 4-ft wide flush striped median and bound by 10-ft asphalt shoulders within 155-ft right-of-way (ROW). There is a barrier median south of Gyorr Avenue and at the Walmart entrance, ranging in width from 4-ft to 24-ft. Just beyond the northern and southern project limits, Randall Road widens out to three 12-ft lanes in each direction. Approximately 650-ft north of the signalized intersection with Gyorr Avenue and 2,000-ft south of the intersection with Hopps Road, Randall Road crosses the existing CNRR at-grade.

The existing typical section of Hopps Road west of Randall Road consists of one 11.5-ft through lane in each direction with 2-ft aggregate shoulders within 50-ft ROW. East of Randall Road, the existing typical section of Hopps Road consists of one 12-ft lane in each direction, separated by a 12-ft wide flush striped median and bound by concrete curb & gutter.

The existing intersection of Randall Road and Hopps Road is signalized with an intersection angle of approximately 45-degrees. There are dedicated left and right turn lanes in both the northbound and southbound direction along Randall Road and dedicated left turn lanes in both the eastbound and westbound direction along Hopps Road.

The existing intersection of Randall Road and Gyorr Avenue is signalized. The existing typical section of Gyorr Avenue consists of one 12-ft through lane in each direction, separated by a 12-ft to 18-ft barrier median in 80-ft ROW. Dedicated 12-ft right and left turn lanes are provided at both approaches to Randall Road.

Proposed Improvements

The proposed improvements include a realignment of Randall Road and Hopps Road to improve the intersection angle to 75-degrees and remove superelevation from the intersection. Approaching Hopps Road, Randall Road will be realigned to the west to improve the intersection angle and the northbound and southbound left turn lanes will be lengthened. In addition to the intersection improvements, a grade separation of Randall Road over the CNRR is proposed. The proposed bridge structure will span the 80-ft wide CNRR ROW and provide 23-ft vertical clearance the entire width of the ROW. As part of the improvements, the project will also add a third lane in each direction along Randall Road, tying into existing six-lane sections at both the north and south project limits. The proposed typical section of Randall Road will include three 12-ft wide lanes in each direction separated by an 18-ft to 30-ft wide barrier median.

Hopps Road will be reconstructed for approximately 1,500-ft at the intersection with Randall Road. Hopps Road is proposed to be realigned to the north to improve the intersection angle with Randall Road. Existing channelization at the intersection will be improved to provide dedicated right turn lanes and longer left turn lane storage.

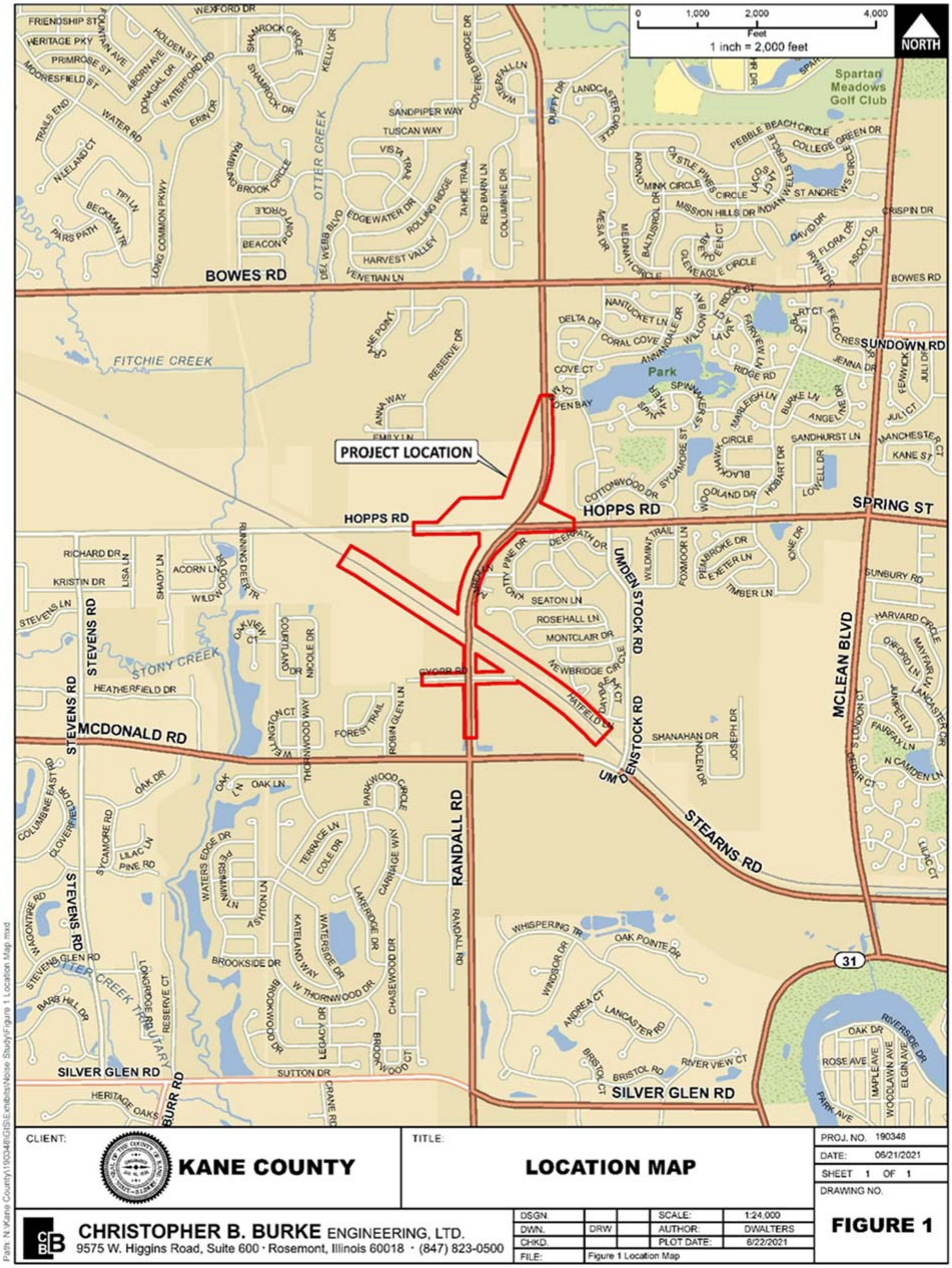
Gyorr Avenue will be reconstructed for approximately 650-ft at the intersection with Randall Road. The existing typical section will remain, with one through lane in each direction and dedicated right and left turn lanes at the intersection.

The traffic noise study was prepared to evaluate the effect of the proposed roadway improvements on traffic noise along the Randall Road at Hopps Road project corridor. The project is considered a Type I noise project since the proposed improvements include roadway reconstruction with the addition of through traffic lanes along Randall Road. The study evaluated existing and future traffic noise conditions, and potential noise abatement options, as appropriate.

The traffic noise study was completed using the Federal Highway Administration (FHWA) approved Traffic Noise Model (TNM) Version 2.5. This modeling program is approved by FHWA for use on traffic noise analyses throughout the country.

The federal and state noise regulations are discussed in Section 1.3. The identified noise sensitive receptors are discussed in Section 2.0. The noise analysis methodology, field noise measurement results, and TNM results are discussed in Section 3.0. The noise abatement analysis is discussed in Section 4.0. Construction noise is discussed in Section 5.0. A summary (with conclusions) is provided in Section 6.0.

Figure 1. Location Map



1.2 TRAFFIC NOISE DEFINITION

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. Sound is composed of a wide range of frequencies. However, the human ear is not uniformly sensitive to all frequencies. Therefore, the "A" weighted decibel scale was devised to correspond with the ear's sensitivity. The resulting unit of measurement is the dB(A).

The equivalent sound level is the steady-state, A-weighted sound level, which contains the same amount of acoustic energy as the actual time-varying, A-weighted sound level over a specified period of time. If the time period is 1 hour, the descriptor is the hourly equivalent sound level or L_{eq}(h), which is widely used by state highway agencies as a descriptor of traffic noise. L_{eq}(h) is based on the energy average, not a noise level average. Highway traffic noise can be relatively constant, but does contain peaks and valleys over a specified period of time depending on the vehicle composition, spacing, and other variables.

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

1.3 TRAFFIC NOISE REGULATIONS

Traffic noise analyses are required for all Type I projects. The federal regulations define Type I projects as one of the following:

- The construction of a highway on new location;
- The physical alteration of an existing highway where there is either (1) a substantial horizontal alteration (i.e., a project that halves the distance between the traffic noise source and the closest receptor between the existing condition to the future build condition); or (2) a substantial vertical alteration (i.e., a project that removes shielding – therefore, exposing the line-of-sight between the receptor and the traffic noise source);
- The addition of a through-traffic lane(s). This includes the addition of a through-traffic lane that functions as a High Occupancy Vehicle (HOV) lane, High Occupancy Toll (HOT) lane, bus lane, or truck climbing lane;
- The addition of an auxiliary lane, except when the auxiliary lane is a turn lane;
- The addition or relocation of interchange lanes or ramps added to a quadrant to complete an existing partial interchange;
- Restriping existing pavement for the purpose of adding a through-traffic lane or an auxiliary lane; or
- The addition of a new or substantial alteration of a weigh station, rest stop, ride-share lot, or toll plaza.

If any part of a project is determined to be a Type I noise project, then the entire project area (as described in the project's environmental documentation) is a Type I noise project. This project would be considered a Type I noise project since the proposed improvements include roadway reconstruction with the addition of through traffic lanes at Randall Road. (Note: Although still a Type I noise project, based on the TNM results [Section 3.3], the vertical alteration of Randall Road associated with the grade separation over the CNRR is not "substantial" from a Type I defining perspective.)

Traffic noise levels for Type I noise projects are predicted using the FHWA approved TNM, as required by FHWA regulations. The use of TNM is the only FHWA approved method for determining future traffic noise levels. TNM 2.5 is approved by FHWA for use throughout the country. Field noise measurements are required as part of the analysis to validate the noise levels predicted using TNM for the existing scenario. If the field noise measurements are within 3 dB(A) of the TNM results for the existing scenario, then the noise model is considered to be validated.

The federal regulations also establish noise levels where noise abatement should be evaluated. Separate noise abatement criteria (NAC) based upon land use are used by FHWA to assess potential noise impacts. A traffic noise impact occurs when build noise levels approach, meet, or exceed the NAC listed in Table 1. In determining the applicable noise activity category for the study area, existing land use was reviewed. Figure 2-1 and Figure 2-2 depict the existing and anticipated future land use. Figure 3-1 and Figure 3-2 depict existing land use with corresponding FHWA activity categories.

Table 1. Noise Abatement Criteria – Hourly Weighted Sound Level

Activity Category [1]	L_{eq}(h)	Evaluation Location	Activity Description
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	67	Exterior	Residential.
C	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	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. From Figure 2-1 & 2-2 and Figure 3-1 & 3-2 (near the proposed intersection improvements): Residential = Category B; Public/Semi-Public = C; Commercial = Category E or F; Agriculture = F or G; Transportation/Communication/Utility (Infrastructure) = F; and Open Space = G. Land uses mapped as "Unassigned/Unknown" or "Exempt" were classified based on observations made during our August 17, 2021 field visit.

Figure 2-1. Existing Land Use

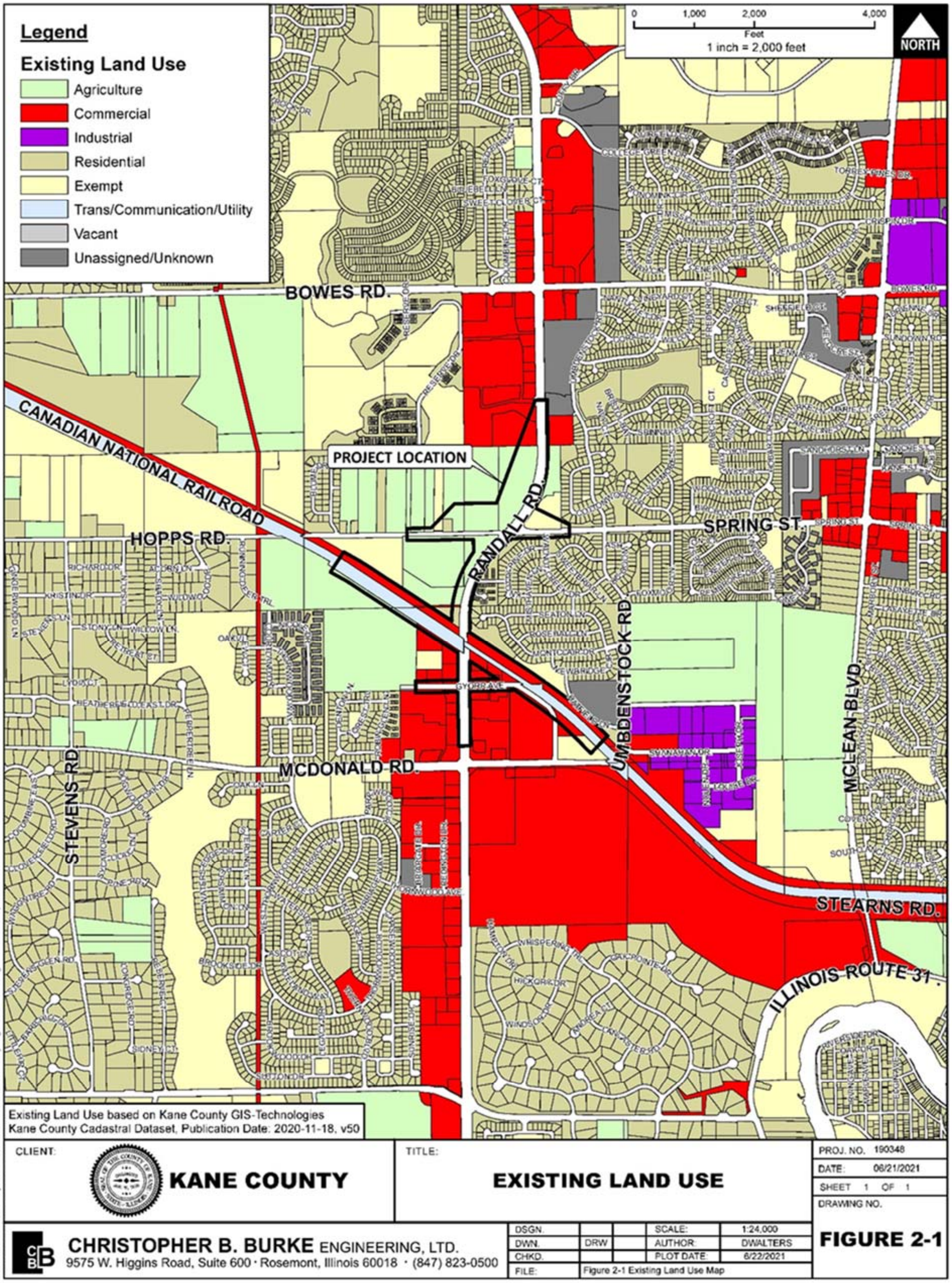


Figure 2-2. Future Land Use

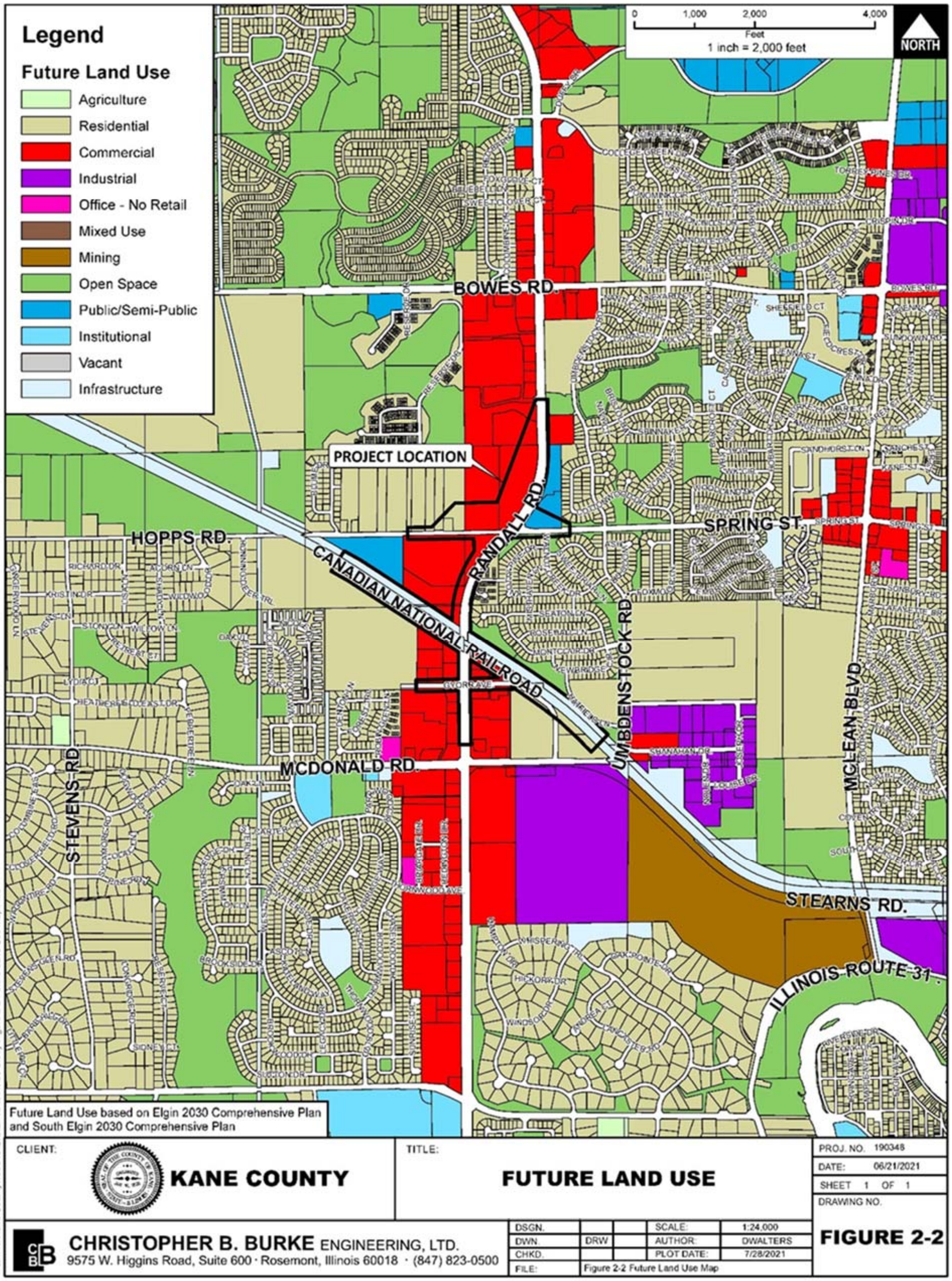


Figure 3-1. Land Use Map with Activity Categories

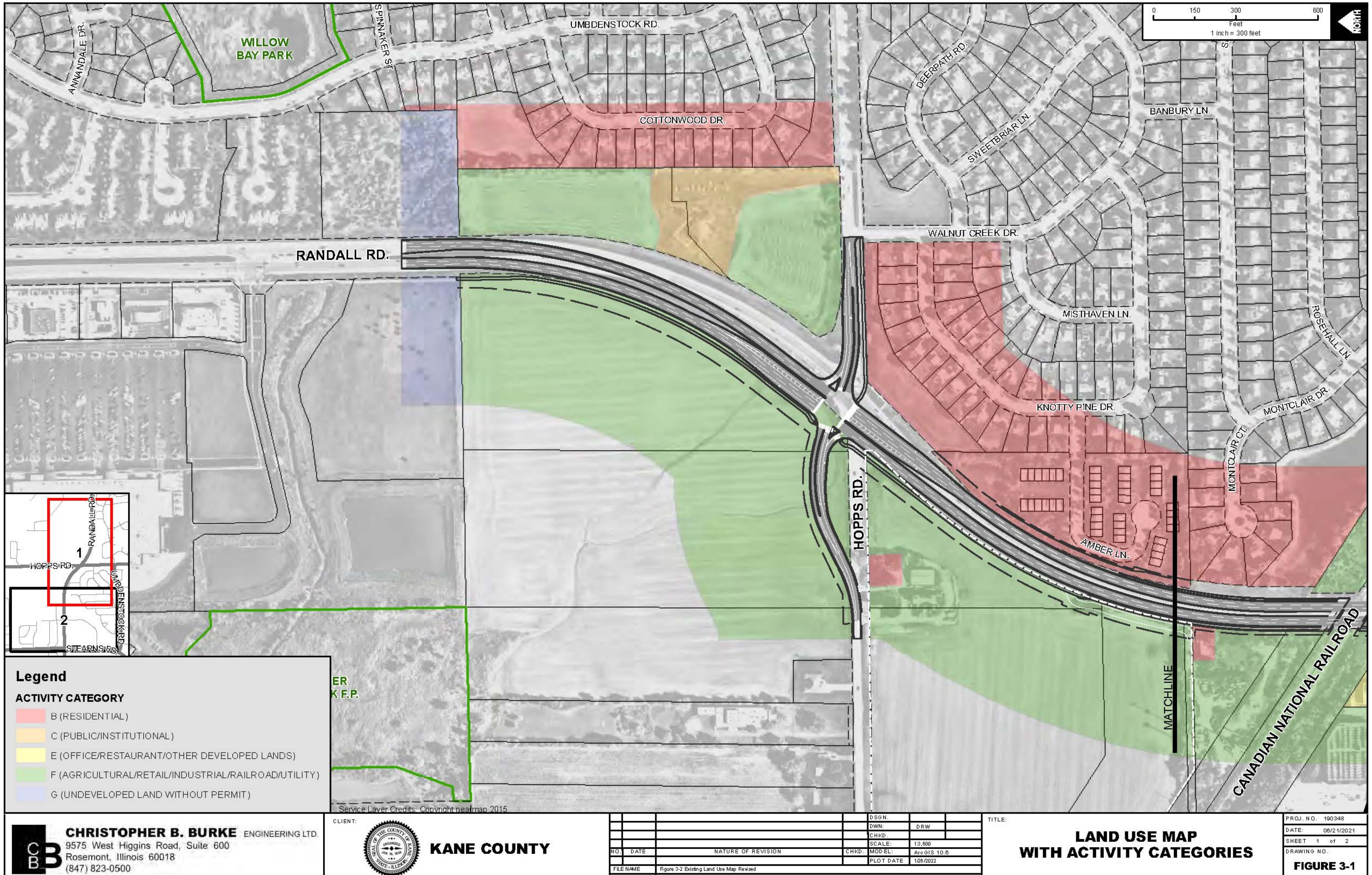
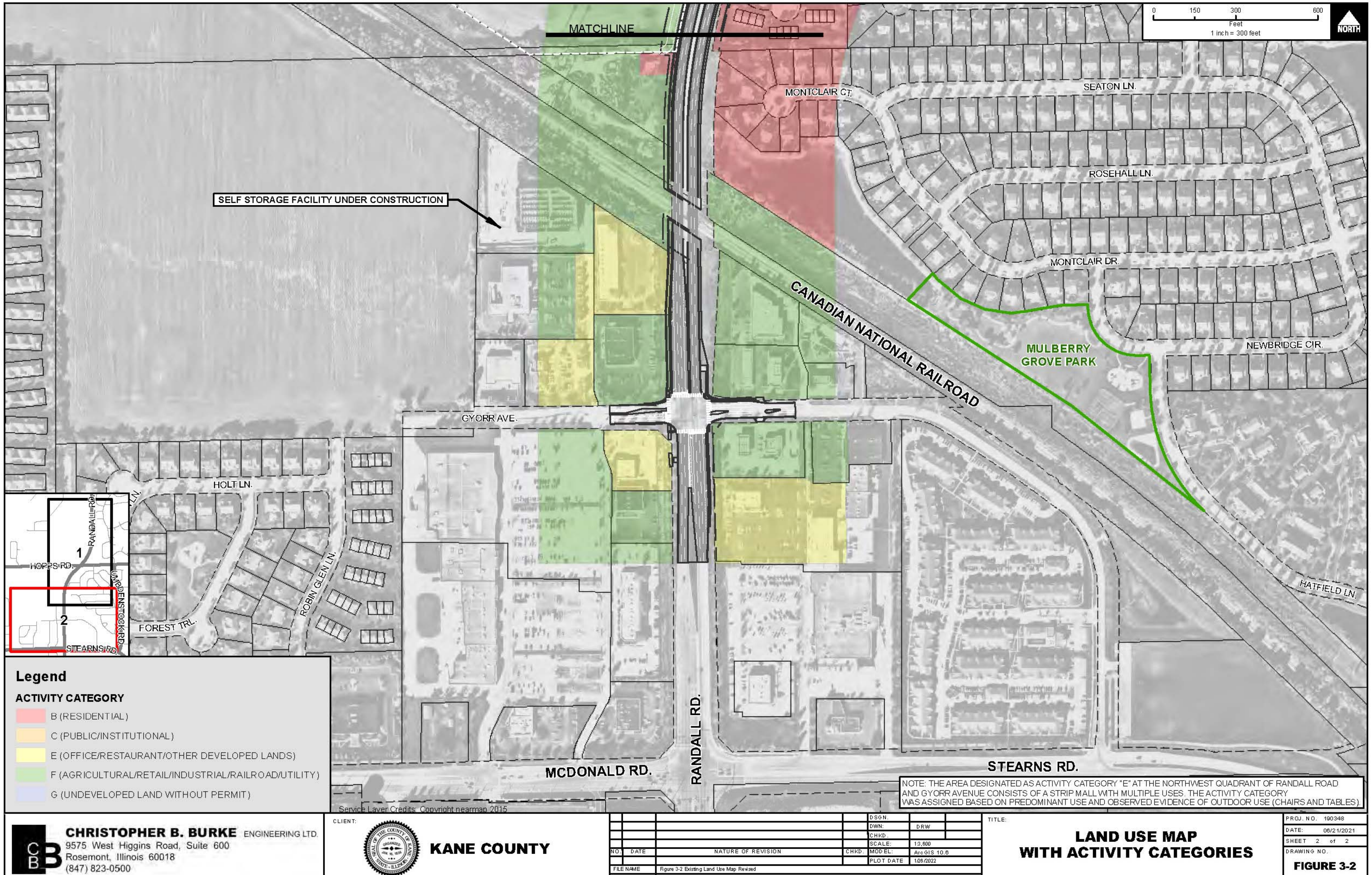


Figure 3-2. Land Use Map with Activity Categories (continued)



Based on the FHWA regulations, State Highway Authorities are allowed to establish the noise level determined to approach the NAC and the increase in noise levels determined to be a substantial increase. IDOT defines noise impacts as follows:

- Design-year traffic noise levels are predicted to approach, meet, or exceed the NAC, with approach defined as 1 dB(A) less than the NAC; or
- Design-year traffic noise levels are predicted to substantially increase (15 dB(A) or greater) over existing noise levels.

Although Phase I Engineering is being led by the Kane County Division of Transportation (KDOT), the roadways to be improved by this project are under the jurisdiction of multiple agencies:

- Randall Road is under the jurisdiction of and maintained by KDOT;
- Hopps Road is under the jurisdiction of and maintained by the City of Elgin; and
- Gyorr Avenue is under the jurisdiction of and maintained by the Village of South Elgin.

Federal funding is anticipated to be used for subsequent phases of project development. To be eligible for federal funds, the Phase I study (including this Traffic Noise Study) will follow IDOT policy.

2.0 NOISE RECEPTOR SELECTION

A receptor is a discrete or representative location of a common noise environment (CNE) for noise-sensitive land uses. Within the project limits, nine (9) potential receptor locations were identified as representative of the study area within 500 feet of the proposed improvements. A site visit was completed by Christopher B. Burke Engineering, Ltd (CBBEL) on August 17, 2021 to confirm existing land use and receptor locations.

Land use varies throughout the project corridor. The existing land use along Randall Road is primarily commercial south of the CNRR and residential or agricultural to the north. There is a residential subdivision located on the east side of Randall Road between the CNRR and Hopps Road. The King of Glory Lutheran Church is located on the northeast quadrant on the intersection of Randall Road and Hopps Road. North of the King of Glory Lutheran Church parcel is a primarily vacant/open space commercial lot (near the north project limits) with a relatively small, abandoned building (±480 sq ft). This commercial lot was for sale at the time of our site visit. The west side of Randall Road from the CNRR to the north project limits consists of farmland and commercial open space (e.g., maintained outlots and constructed stormwater management facilities). Land use along Hopps Road is primarily agricultural with a few single-family residences west of Randall Road and residential east of Randall Road. Land use along Gyorr Avenue is primarily commercial. The existing land use is shown in Figure 2-1.

The future land use is shown in Figure 2-2. The future land use map shows much of the existing agricultural land located west of Randall Road as future commercial or residential. The primarily vacant/open space commercial lot (with the abandoned building) located near the north project limits (east of Randall Road) is shown as commercial in the future condition. At the time of our site visit, a selfstorage facility was being constructed at a vacant parcel located south of the CNRR and west of Randall Road (see Figure 4-2).

Undeveloped areas were reviewed to determine if there are any existing permits for development. Based on coordination with Kane County, a concept plan depicting a multi-family development at the southwest quadrant of Randall Road and Hopps Road has been submitted for review (see Figure 4-1). The conceptual plan for the multi-family development proposes fifteen (15) 20-unit two story buildings with parking, a clubhouse, swimming pool, dog run, and stormwater management facilities. The conceptual plan also includes a 4.2 acre commercial area with additional parking and stormwater management facilities. The current land use is predominantly agricultural. Coordination regarding the multi-family development was initiated years ago, but the project is still in the conceptual stage and a formal permit application has not been submitted to Kane County. Based on coordination with Kane County, there do not appear to be any other current plans or permits for undeveloped lands located adjacent to the proposed roadway improvements.

Based on the existing land use along the project corridor, receptor locations were selected to represent the land uses with established NAC. For this project, receptors include residential areas (land use activity category B); places of worship (land use activity category C); and restaurants, offices, and miscellaneous uses (land use activity category E). The other properties located along the project corridor are characterized as land use activity category F or G. A receptor location was not designated at commercial properties (activity category E) that did not appear to have an exterior use area (e.g., picnic tables, benches, groups of tables) at the time of our evaluation. Activity category F does not have an established NAC. Unpermitted vacant/undeveloped land (activity category G) also does not have an established NAC. Activity categories and their descriptions are included in Table 1 (above).

The traffic noise study evaluates the project corridor using CNEs. Within each of the CNEs, the receptor located closest to the roadway was typically selected to represent the CNE, thereby representing the worst-case traffic noise condition. The represented receptors within the CNEs will have similar traffic noise levels as the selected receptor. CNEs and noise receptors were located a maximum of 500 feet from the edge of the nearest existing roadway with proposed improvements, as roadway noise impacts (if present) are typically within this distance.

Nine (9) potential representative receptors were selected along the project corridor. Table 2 lists the receptor and CNE number, the receptor type, the FHWA activity category and NAC associated with the receptor, and the approximate distance to the nearest existing roadway edge of pavement (with proposed improvements). Figure 4-1 and Figure 4-2 include an aerial photograph of the project corridor with the representative receptors and CNEs. Representative receptor locations are between 53 feet and 314 feet from existing roadway edge of pavement and represent potential exterior human use areas. Generally, if noise monitoring is to be completed, between 25% and 50% of the receptor locations selected for noise modeling purposes should be evaluated by noise monitoring. As part of this study, noise monitoring was completed at four (4) receptors (gray shading in Table 2), in order to include approximately 44% of the receptor locations. The selected receptors are spread from south to north throughout the project corridor.

Table 2. Noise Receptor Locations

Receptor/ CNE	Receptor Type [1]	Activity Category/ NAC, dB(A)	Distance from Nearest Existing Project Roadway Edge of Pavement, ft	Nearest Existing Project Roadway	Approximate Ground Surface Elevation, ft
1A	Restaurant	E/72	70	Gyorr Avenue	804
2	SFR [2]	B/67	71	Randall Road	806
3 [3]	SFR	B/67	53	Hopps Road	806
4 [3]	Restaurant	E/72	81	Randall Road	806
5	SFR	B/67	92	Randall Road	807
6 [3]	MFR	B/67	66	Randall Road	808
7	SFR	B/67	180	Randall Road	804
8	Place of worship	C/67	225	Randall Road	812
9 [3]	SFR	B/67	314	Randall Road	799

1. SFR = Single-Family Residence; MFR = Multi-Family Residence
2. Per discussion with property owner, the SFR at this location is not currently in use. The property is primarily used for material storage.
3. Noise monitoring locations are shaded in gray.

Figure 4-1. Noise Receptor Locations

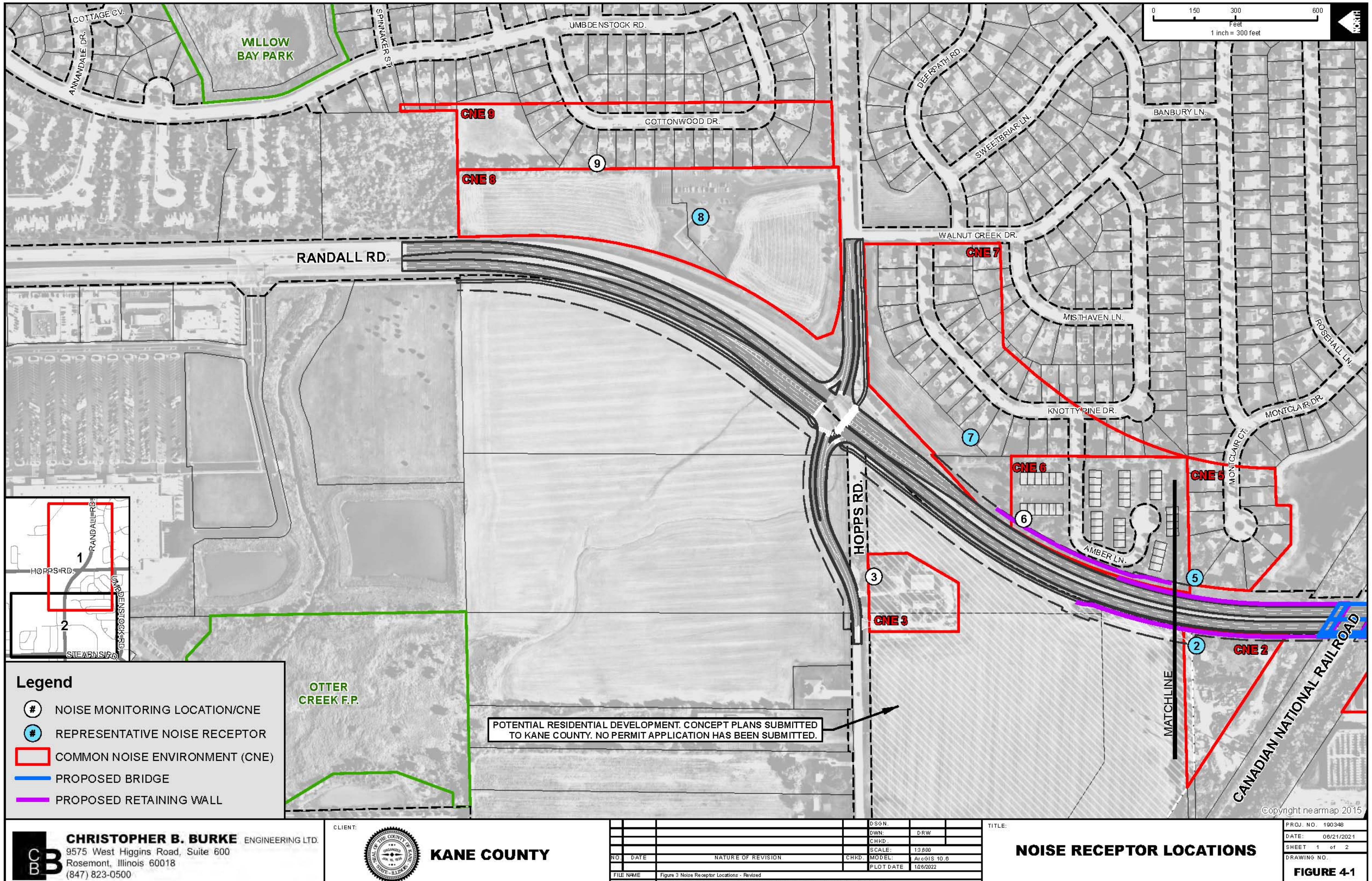
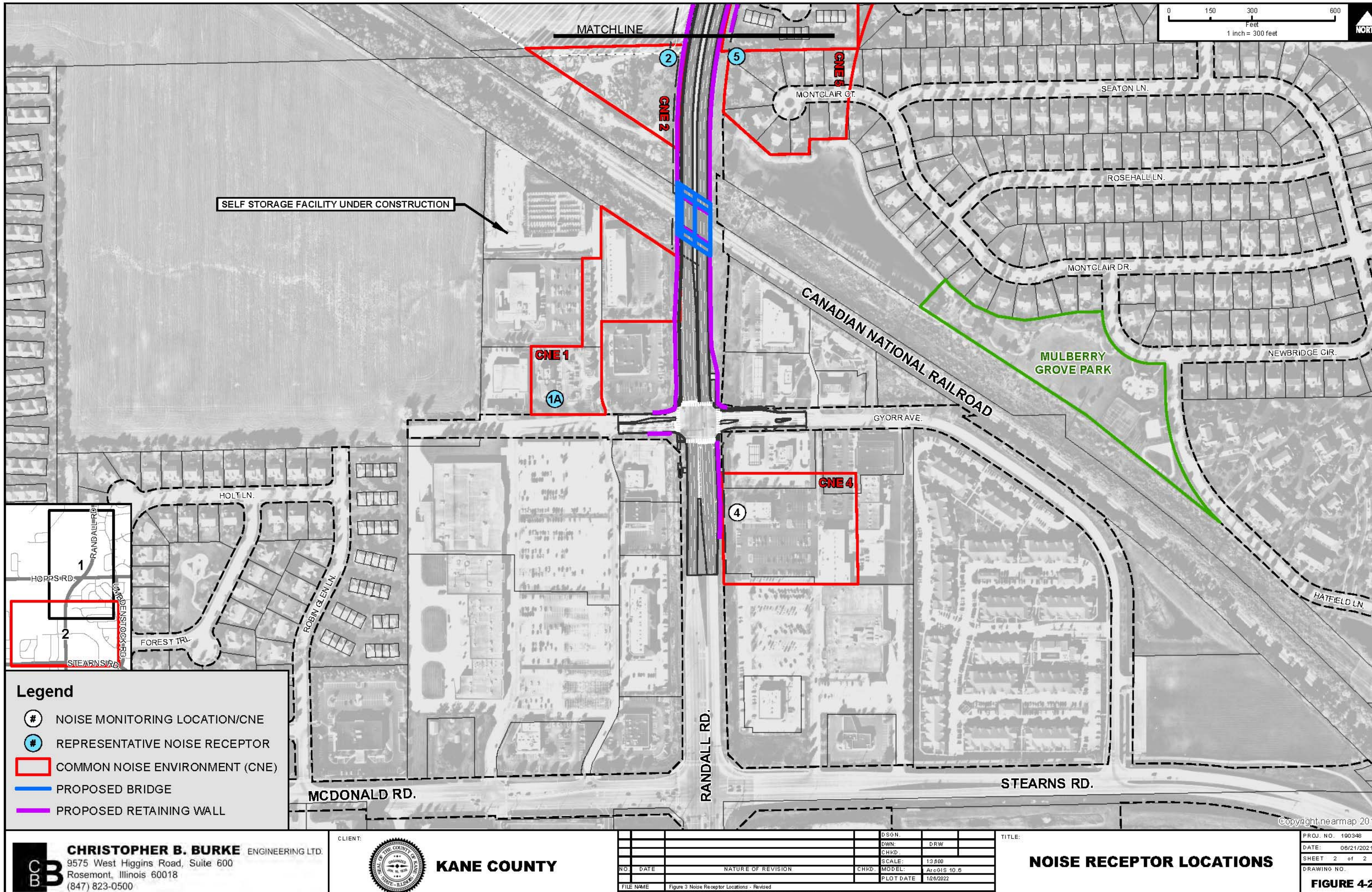


Figure 4-2. Noise Receptor Locations (continued)



3.0 NOISE ANALYSIS

3.1 FIELD NOISE MEASUREMENTS

Noise level measurements at representative locations are used to characterize existing noise conditions and are used to validate the TNM for analysis of future No-Build and Build conditions. Traffic noise levels recorded during field measurement are representative of the traffic characteristics (volume, speed, and composition) for the time period measured, and need to be considered when evaluating noise levels as typical for the area. In addition, the noise levels are also influenced by other noise sources in the area other than the traffic noise and the characteristics of the location, such as existing berms or structures blocking sound. Noise monitoring was completed at receptors R3, R4, R6, and R9 in order to include 44% of the receptor locations. The four selected receptors are spread throughout the project corridor and include three residential (single-family and multi-family) receptor locations and one restaurant.

3.1.1 Instrumentation

A Larson Davis 831 Class I precision sound level meter was used for monitoring the actual noise level. The L_{eq} was recorded for the "A" weighted scale. L_{eq} is the equivalent level of sound (in decibels or dB(A)) which represents the level of sound held constant over a specified period of time. This reflects the same amount of energy as the actual fluctuating noise over that time period. The sound level meter was positioned on a tripod approximately five (5) feet above the ground surface and at least 10 feet from any reflecting surface. The sound level meter was set in a location where outdoor human activity would typically occur. One 12-minute noise measurement was taken at each receptor. The sound level meter was calibrated before and after each use.

3.1.2 Traffic Volumes

Traffic volumes along the nearest project corridor roadways were counted during field monitoring at receptors R3, R4, R6, and R9. The number of cars and trucks were recorded separately along with any other noise sources observed during monitoring. The traffic volumes were counted for each direction during the 12-minute noise monitoring period. The traffic volumes counted were extrapolated from the 12-minute volumes to an hour (60 minutes) to estimate the hourly traffic. The resulting traffic volumes were compared to the traffic counts used in TNM (see Section 3.2.1).

3.1.3 Time and Day for Measurements

Noise monitoring is attempted during periods of peak travel times when volumes are higher, but not necessarily during stop and go traffic. Traffic may be stop and go during a typical rush-hour period at a reduced travel speed or stopped and therefore not producing peak noise. Noise monitoring was completed at receptors R3, R4, R6, and R9 on Wednesday, September 29, 2021 between the hours of 9 AM to 12 PM. Traffic was moving steadily through the corridor during the measurements.

3.1.4 Weather Conditions

The weather conditions during the field noise monitoring are shown in Table 3. Weather conditions can affect the noise measurement readings. Monitoring cannot be performed when there is snow cover or when the pavement is wet due to rain or snow. Noise measurements should not be taken if the wind speed exceeds 12 mph. A wind screen was used at all times during the monitoring to reduce potential wind noise. The conditions during the monitoring are summarized as follows:

Table 3. Weather Conditions During the Noise Monitoring

Condition	Required	Actual [1]
Pavement	Dry	Dry
Relative Humidity	5% to 90%	47% to 55%
Temperature	14° to 122° F	74° to 81° F
Wind Speed	Less than 12 mph	1 to 3 mph

1. Actual data was collected during field measurements on September 29, 2021.

The weather conditions during the noise monitoring were within the recommended ranges for all parameters listed.

3.1.5 Noise Monitoring Results

Table 4 summarizes the noise monitoring results for the four locations monitored in the field. The monitored noise levels ranged from 53 dB(A) to 66 dB(A). The monitoring results were compared to the existing conditions TNM results to validate the TNM model for use in analyzing the 2050 No-Build and Build conditions. In general, noise monitoring results should be within ±3 dB(A) of the TNM generated results for the model to be considered validated. Refer to Section 3.3.1 for further discussion on the validation. The impact analysis and abatement evaluation were completed using the 2050 Build TNM results.

Table 4. Noise Monitoring Results

Receptor	Distance from Nearest Existing Project Roadway Edge of Pavement, ft	Nearest Existing Project Roadway	Monitored Noise Level, dB(A) [1]
R3	53	Hopps Road	60
R4	81	Randall Road	64
R6	66	Randall Road	66
R9	314	Randall Road	53

1. Rounded to nearest whole dB(A).

3.2 NOISE ANALYSIS METHODOLOGY

Modeling of the traffic noise levels at the nine (9) receptors located within the project limits was completed using TNM. Prediction of noise levels is one step in assessing potential noise impacts and abatement strategies. Traffic noise levels for the nine (9) receptor sites were predicted using existing (2020) and future (2050) traffic volumes.

Inputs into TNM include traffic volume, traffic mix (cars, medium trucks, and heavy trucks), receptor distance, elevation, and operating traffic speeds during free-flowing conditions. Information sources used in the analysis are briefly described in the following subsections.

3.2.1 Traffic Volumes

Project area roadway AM and PM peak hour traffic volumes for existing (2020) conditions were obtained from traffic counts completed by Fish Transportation Group in February 2020. The travel pattern along Randall Road is heavier northbound in the AM and southbound in the PM. The total hourly traffic volumes for Randall Road were greater during the PM peak hour compared to the AM. Peak hour traffic volumes were extrapolated to 2050 No-Build and 2050 Build conditions using Chicago Metropolitan Agency for Planning (CMAP) Average Daily Traffic (ADT) volumes and projections.

The objective of the traffic noise analysis is to predict the worst hour traffic noise conditions. The traffic data that should be used are the highest volumes of traffic that can travel at the highest possible speed for the particular roadway, which is generally approximated by Level of Service (LOS) “C” conditions. This is typically represented by the Design Hourly Volume (DHV). The DHV traffic data was input into TNM.

The traffic volume estimates from the noise monitoring sessions were compared to the DHV used for the noise modeling. The automobile volumes counted during the monitoring ranged from 55% to 85% of the estimated peak-hourly volumes used in the TNM existing scenario model. The medium truck volumes ranged from 88% to 500% of the estimated peak-hourly volumes used in the TNM existing scenario model. The heavy truck volumes ranged from 176% to 617% of the estimated peak-hourly volumes used in the TNM existing scenario model. Totaling the sites, the number of vehicles estimated from the noise monitoring was approximately 71% of the TNM existing scenario model traffic counts. Trucks accounted for approximately 6% of the traffic during noise monitoring and approximately 2% of the traffic during the traffic counts used in the model.

3.2.2 Traffic Composition

Three types of vehicles, including cars, medium trucks, and heavy trucks, are input into TNM. Truck composition for the project corridor roadways was determined based the February 2020 traffic counts. Passenger cars were the predominant vehicle type observed during the traffic counts (approximately 98% overall). Medium and heavy trucks accounted for about 2% of the traffic. Truck traffic was approximately 63% medium trucks and 37% heavy trucks.

3.2.3 Receptor Distance/ Elevation

The selected representative receptors include a mixture of land uses: primarily residential, but also consisting of restaurants and a place of worship. Table 2 provides a summary of the representative receptors. The distance of each representative receptor from the existing edge of pavement of project area roadways varies from 53 feet at Receptor R3 to 314 feet at Receptor R9. The ground surface elevation of each representative receptor varies from 799 feet at Receptor R9 to 812 feet at Receptor R8. The distance and elevation of each receptor directly affects the predicted traffic noise level.

3.2.4 Speed Conditions

The operating speed during free flow conditions was used for the noise analysis and has been input into the model. The existing posted speed limit for Randall Road is 45 mph. Field observations during noise monitoring confirmed free-flowing traffic moving at approximately the posted speed limit for Randall Road. In the vicinity of the Randall Road intersection, the operating speed limit was observed to be approximately 35 mph for Hopps Road, and this observed speed was input into the model. For Gyorr Avenue, 30 mph was used as the operating speed.

3.3 TNM RESULTS

Based on the above methodology, Existing (2020), No-Build (2050), and Build (2050) traffic noise levels were predicted for the nine (9) receptor sites using TNM.

3.3.1 Existing Conditions and TNM Validation

The TNM existing scenario output results were compared to the traffic noise monitoring results for the four monitored receptors to validate the accuracy of the TNM model, which is shown in Table 5. Since the monitored noise levels are within 3 dB(A) of the TNM predicted noise levels for existing conditions, the TNM model is validated. The difference between the modeled and monitored results range from -1 to +3 dB(A).

Table 5. Noise Monitoring Results and TNM Validation

Receptor	Distance from Nearest Existing Project Roadway Edge of Pavement, ft	Nearest Existing Project Roadway	Modeled Existing Noise Level, dB(A) [1, 2]	Monitored Noise Level, dB(A) [1]	Difference Between Modeled and Monitored Noise Levels, dB(A)
R3	53	Hopps Road	59	60	-1
R4	81	Randall Road	67	64	+3
R6	66	Randall Road	68	66	+2
R9	314	Randall Road	56	53	+3

1. Rounded to the nearest whole dB(A).
2. Based on traffic data collected during the noise monitoring. The noise levels above may vary from other Existing Model TNM results.

3.3.2 2050 No-Build and Build Conditions

Table 6 presents the projected 2050 No-Build and Build condition noise levels for the nine (9) receptor sites, along with the predicted noise levels for existing conditions.

The predicted existing noise levels range from 56 dB(A) at R9 to 68 dB(A) at R6. The projected 2050 No-Build traffic noise levels range from 57 dB(A) at R9 to 69 dB(A) at R6. Generally, receptor noise levels increase an average of 1 dB(A) from the existing scenario to the No-Build scenario due to an increase in traffic volumes.

The projected 2050 Build traffic noise levels range from 58 dB(A) at R9 to 70 dB(A) at R6. Generally, receptor noise levels increase an average of 1 dB(A) from the existing scenario due to an increase in traffic volumes and construction of additional traffic lanes. In the vicinity of the proposed grade separation at the CNRR, the representative receptor noise levels are predicted to decrease 5-6 dB(A) from the existing scenario. For receivers that are located below the elevation of the roadway, the edge of pavement and proposed parapet wall can act as a noise barrier. In the vicinity of the grade separation, the footprint of Randall Road (including a sidewalk and multi-use path) is being widened. A wider, elevated footprint typically results in a more significant break in the roadway-receiver line of sight, and can result in lower noise levels at the receiver. One receptor location (R6) approaches, meets, or exceeds the FHWA NAC, and therefore warrants a noise abatement analysis. In addition to traffic noise levels approaching the NAC, a noise abatement analysis is warranted if traffic noise levels increase 15 dB(A) or more between the existing and build scenarios at a receptor, regardless if the NAC is approached. None of the representative receptors meet this criterion as the largest increase is 2 dB(A).

Table 6. Noise Impact Summary – TNM Modeling Results

Receptor	Distance from Nearest Existing Project Roadway Edge of Pavement, ft	Nearest Existing Project Roadway	Existing Noise Level, dB(A)	2050 No-Build Noise Level, dB(A)	2050 Build Noise Level, dB(A)	Difference Between Build and Existing, dB(A)	Impacted [1, 2]
R1A	70	Gyorr Avenue	59	60	60	+1	No
R2	71	Randall Road	66	67	60	-6 [3]	No
R3	53	Hopps Road	60	62	61	+1	No
R4	81	Randall Road	66	68	68	+2	No
R5	92	Randall Road	66	68	61	-5 [3]	No
R6	66	Randall Road	68	69	70	+2	***Yes***
R7	180	Randall Road	62	64	63	+1	No
R8	225	Randall Road	61	62	60	-1 [4]	No
R9	314	Randall Road	56	57	58	+2	No

1. "***Yes***" indicates the noise levels approach, meet, or exceed the NAC in the 2050 Build condition.
2. See Table 2 for "Receptor Type" and NAC. See Figure 4-1 and Figure 4-2 for receptor locations.
3. Build condition in the vicinity of R2 and R5 includes a proposed rise in elevation and a parapet wall.
4. Proposed improvements near R8 include a roadway alignment shift west, further from the receptor.

3.4 REVIEW OF POTENTIAL DEVELOPMENT AND INFORMATION FOR LOCAL OFFICIALS

Based on coordination with Kane County, there are no existing permits (or submitted permit applications) for development of the vacant/undeveloped lands within the project limits. In accordance with IDOT guidance, undeveloped lands for which no permit has been obtained were evaluated for traffic noise under the 2050 Build condition. The 66 dB(A) noise level contour was estimated for undeveloped activity category B and C potential land uses and the 71 dB(A) noise level contour was estimated for undeveloped activity category E potential land uses. The purpose of the evaluation is to determine the traffic noise levels if the land were to be developed so that local officials can take traffic noise into consideration during planning of the development. Coordination with local officials having jurisdiction over vacant/undeveloped land located adjacent to the proposed roadway improvements will occur near the date of the Public Information Meeting to present the results of the traffic noise study, including the estimated future noise levels as shown in the noise contour exhibits at Appendix B.

Figure 2-1 and Figure 2-2 depict existing and future land use along the project corridor. Figure 3-1 through Figure 4-2 depict the vacant/undeveloped lands. As discussed in Section 2.0, a concept plan for a multi-family development at the southwest quadrant of Randall Road and Hopps Road has been submitted to Kane County for review. The concept plan also includes a 4.2 acre commercial area. These types of land uses typically belong to FHWA activity category B, E, or F. Activity categories B and E are described above; activity category F does not have an associated NAC hourly weighted sound level.

4.0 NOISE ABATEMENT ANALYSIS

4.1 ABATEMENT ALTERNATIVES

Traffic noise abatement measures were considered for the one impacted receptor listed in Table 6 that approaches, meets, or exceeds the appropriate FHWA NAC in the 2050 Build Condition.

The most feasible noise abatement measure for this project would be a noise barrier wall based on the substantially greater ROW width required to accommodate an earthen berm, or to accommodate the depth and density of landscaping that would be required to provide noise abatement. Noise barriers placed adjacent to the roadway would attenuate traffic-related noise and would be the most practical noise abatement measure for this project. An effective noise barrier must be tall enough to break the line-of-sight between the receptor and source. The length of an effective noise barrier typically extends beyond the last receptor four times the distance between the receptor and noise barrier. Noise barriers have a zone of effectiveness, or shadow zone, which is generally within 200 feet of the noise barrier. Therefore, less noise reduction is achieved as the distance between the receptor and the noise barrier increases.

TNM was used to perform the noise barrier feasibility and reasonability evaluation for the impacted receptor. When determining if an abatement measure is feasible and reasonable, the noise reduction achieved, number of benefited receptors, total cost, and total cost per benefited receptor are considered.

4.2 FEASIBILITY AND REASONABILITY

Noise abatement options were analyzed in conformance with FHWA requirements at Title 23 Code of Federal Regulations Part 772 for the impacted receptor. In order for a noise abatement option to be constructed, it must meet both the feasibility and reasonability criterion, described below.

4.2.1 Feasibility

The feasibility evaluation of a noise abatement measure considers a combination of acoustical and engineering factors. The acoustical portion of the IDOT policy, as required by FHWA regulations, considers noise abatement to be feasible if it can be constructed and would achieve at least a 5 dB(A) traffic noise reduction for at least two impacted receptors.

4.2.2 Reasonability

Per FHWA regulations, a noise abatement measure is determined to be reasonable when all three of the following factors are met:

- Reasonableness Criterion 1 - IDOT's traffic noise reduction design goal of at least 8 dB(A) for at least one benefited receptor is achieved;
- Reasonableness Criterion 2 - The highway traffic noise abatement measure is cost effective; and

- Reasonableness Criterion 3 - The viewpoints of the benefited receptors (property owners and residents) are considered, if all other criteria are achieved.

A noise abatement measure is considered cost-effective to construct if the noise wall construction cost per benefited receptor is less than the allowable cost per benefited receptor. A benefited receptor is the recipient of an abatement measure that receives a noise reduction of 5 dB(A) or greater. The FHWA regulations allow each State Highway Authority to establish cost criteria for determining cost effectiveness.

IDOT policy establishes the actual cost per benefited receptor. The current unit cost used by IDOT to determine the estimated build cost for noise barriers is $30 per square foot, which includes engineering, materials, and installation. The estimated build cost does not include utility relocation, drainage, and ROW costs to accommodate the barriers. The base value for the allowable noise abatement cost is $30,000 per benefited receptor, which can be increased based on three factors as summarized below:

- The absolute noise level of the benefited receptors in the design year build scenario before noise abatement;
- The incremental increase in noise level between the existing noise level at the benefited receptor and the predicted build noise level before noise abatement; and
- The date of development compared to the construction date of the highway.

These factors are considered for all benefited receptors. Table 7, Table 8, and Table 9 present the allowable adjustments for each factor.

Table 7. 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

Table 8. 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

Table 9. 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.

If a noise abatement option is feasible, achieves the IDOT noise reduction design goal, and achieves the cost-effective criterion, then the benefited receptors will be solicited for their opinion on the construction of the noise wall.

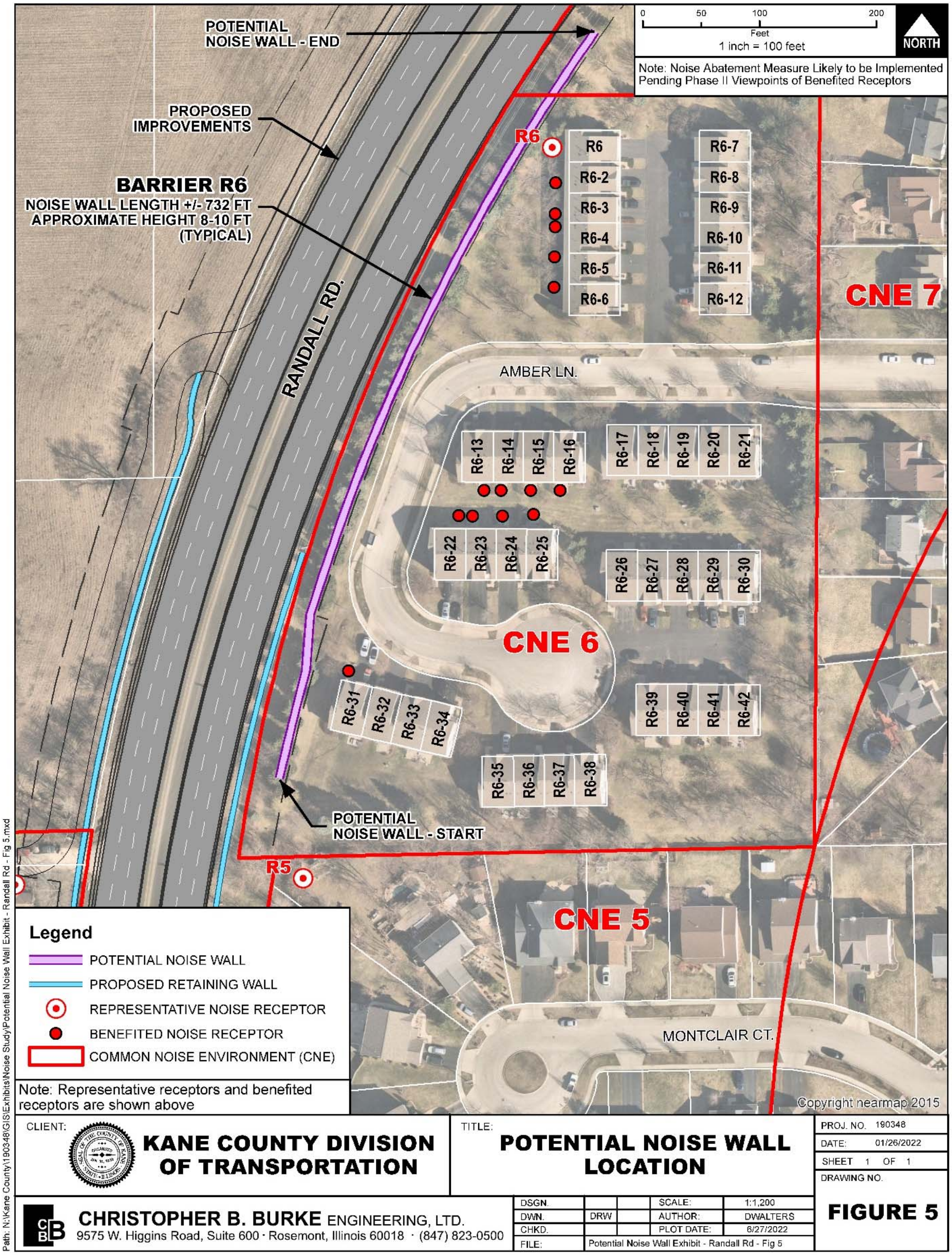
4.3 NOISE WALL ANALYSIS

TNM was used to perform the noise wall feasibility and reasonability check for the impacted receptor. Noise abatement was considered at the one impacted receptor, R6 (see Table 6).

Noise abatement was considered feasible at R6. The location of the potential noise wall that was evaluated is shown in Figure 5. When determining if an abatement measure is feasible and reasonable, the noise reduction achieved, number of benefited receptors, total cost, and total cost per benefited receptor are considered.

Generally, a proposed noise abatement measure should provide traffic noise reduction to as many impacted receptors as possible and provide as much noise reduction as possible while remaining within the economic reasonability criterion. A receptor does not need to be impacted to receive a benefit from a noise barrier.

Figure 5. Potential Noise Wall Location



The R6 Barrier was considered feasible since a 5 dB(A) traffic noise reduction was achieved for at least two impacted receptors. The R6 Barrier was also considered reasonable with respect to the traffic noise reduction design goal of at least 8 dB(A) for at least one benefited receptor. The R6 Barrier was evaluated for cost-effectiveness (see Table 10 and Table 11). See Appendix A for additional information regarding predicted noise levels calculated with TNM, including Build condition noise reduction with the potential noise barrier.

Table 10. R6 Barrier Adjusted Cost Per Benefited Receptor Calculations

Benefited Receptor Number	Existing Noise Level, dB(A)	Build Noise Level, dB(A)	Increase in Noise Existing to Build, dB(A)	Homes Built Before Roadway, Yes/No	Absolute Noise Level Adjustment Factor	Increase in Noise Adjustment Factor	New Alignment/ Const. Date Adjustment Factor	Cumulative Reasonableness Adjustment Factors	Total Adjusted Allowable Cost Per Receptor
R6	68	70	2	No	$1,000	$0	$0	$1,000	$31,000
R6-2	67	69	2	No	$0	$0	$0	$0	$30,000
R6-3	66	67	1	No	$0	$0	$0	$0	$30,000
R6-4	66	67	1	No	$0	$0	$0	$0	$30,000
R6-5	65	66	1	No	$0	$0	$0	$0	$30,000
R6-6	64	65	1	No	$0	$0	$0	$0	$30,000
R6-13	61	62	1	No	$0	$0	$0	$0	$30,000
R6-14	60	61	1	No	$0	$0	$0	$0	$30,000
R6-15	58	59	1	No	$0	$0	$0	$0	$30,000
R6-16	56	57	1	No	$0	$0	$0	$0	$30,000
R6-22	64	65	1	No	$0	$0	$0	$0	$30,000
R6-23	63	64	1	No	$0	$0	$0	$0	$30,000
R6-24	60	62	2	No	$0	$0	$0	$0	$30,000
R6-25	58	59	1	No	$0	$0	$0	$0	$30,000
R6-31	66	65	-1 [1]	No	$0	$0	$0	$0	$30,000
Average for Noise Barrier					$67	$0	$0	$67	$30,067

1. Build Condition in the vicinity of R6-31 includes a proposed rise in elevation and a parapet wall.

Table 11. R6 Barrier Cost Reasonableness Evaluation

Benefited Receptors [1]	Barrier Length, ft	Average Barrier Height, ft	Estimated Noise Wall Cost [2]	ROW/Easement Cost Required for Construction of Noise Barrier	Estimated Total Noise Wall Cost	Estimated Cost per Benefited Receptor	Average Allowable Cost per Benefited Receptor	Likely to be Implemented
15	732	8.2	$180,072	$252,600	$432,672	$28,845	$30,067	Yes

1. Includes the outdoor use areas anticipated to receive at least a 5 dB(A) reduction.
2. Based on the IDOT policy value of $30 per square foot.

Based on the evaluation of the R6 Barrier presented in Table 10 and Table 11, the potential noise wall is considered cost-effective since the actual cost per benefited receptor does not exceed the average adjusted allowable cost per benefited receptor (assuming $30 per square foot of noise wall).

The feasible and cost-effective noise wall being considered for CNE 6 (see Figure 5) will be presented at a Public Information Meeting scheduled for August 2022. The benefited receptors will be solicited for their opinion (i.e., viewpoint solicitation) on the construction of the noise wall during Phase II (final design) of the project. Viewpoint solicitation may include voting packets mailed to each benefited receptor, a public meeting to discuss the potential noise wall, etc.

There are 15 benefited receptors at CNE 6. Benefited receptors include both property owners and renters/leasers residing on the benefited property. While as many responses as possible are desired during the viewpoint solicitation process, the goal during Phase II will be to obtain responses from at least one-third (33%) of the potential number of votes. Up to two attempts will be made to receive responses. The voting result can be determined after the first round of voting if viewpoints from at least 33% of the potential votes have been received.

For a potential noise abatement measure to be implemented, greater than 50% of the responses must be in favor of the measure. Viewpoints will be tallied for the potential noise barrier being considered. A response from the first row of homes located adjacent to the potential noise barrier will be counted as four votes, and a response from properties located further back from the roadway (i.e., not adjacent to the potential noise barrier) will be counted as two votes. For this project, all of the benefited receptors are considered first row.

As previously stated, the noise barrier was determined to meet the feasibility criteria, the noise reduction design goal, and the cost effectiveness criteria as identified in Table 11. In order to determine if the noise barrier will be implemented, viewpoints solicitation still needs to occur. Viewpoints solicitation will occur after the project’s final design is approved. If the project’s final design is different from the preliminary design, 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. To assist the Phase II Engineer with detailed design and preparation of final contract plans, the top of barrier elevations for the potential noise wall are included at Appendix C.

5.0 CONSTRUCTION NOISE

Trucks and machinery used for construction produce noise that 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 IDOT’s Standard Specifications for Road and Bridge Construction as Article 107.35.

6.0 SUMMARY AND CONCLUSION

Along the corridor, the predicted existing noise levels range from 56 dB(A) at R9 to 68 dB(A) at R6. The projected 2050 No-Build traffic noise levels range from 57 dB(A) at R9 to 69 dB(A) at R6. Generally, receptor noise levels increase an average of 1 dB(A) from the existing scenario to the No-Build scenario due to an increase in traffic volumes. The projected 2050 Build traffic noise levels range from 58 dB(A) at R9 to 70 dB(A) at R6. Generally, receptor noise levels increase an average of 1 dB(A) from the existing scenario due to an increase in traffic volumes and construction of additional traffic lanes. In the vicinity of the proposed grade separation at the CNRR, the representative receptor noise levels are predicted to decrease 5-6 dB(A) from the existing scenario.

One receptor location (R6) approaches, meets, or exceeds the FHWA NAC, and therefore warrants a noise abatement analysis. In addition to traffic noise levels approaching the NAC, a noise abatement analysis is warranted if traffic noise levels increase more than 14 dB(A) between the existing and build scenarios at a receptor, regardless if the NAC is approached. None of the representative receptors meet this criterion as the largest increase is 2 dB(A).

Within CNE 6, noise abatement was considered feasible since a 5 dB(A) traffic noise reduction was achieved for at least two impacted receptors. The R6 Barrier was also considered reasonable with respect to the traffic noise reduction design goal of at least 8 dB(A) for at least one benefited receptor. The R6 Barrier was evaluated for cost-effectiveness. Based on the evaluation of the R6 Barrier, the potential noise wall is considered cost-effective since the actual cost per benefited receptor does not exceed the average adjusted allowable cost per benefited receptor.

Based on the traffic noise analysis and noise abatement evaluation conducted, highway traffic noise abatement measures are likely to be implemented based on preliminary design. The noise barriers determined to meet the feasibility criteria, the noise reduction design goal, and cost effectiveness reasonableness criteria are identified in Table 11. The final reasonableness criterion, the viewpoints solicitation, will be deferred until Phase II Design upon the approval of the project’s final design. If it subsequently develops during final design that constraints not foreseen in the preliminary design or public input substantially change, the abatement measures may need to be modified or removed from the project plans. A final decision on the installation of abatement measure(s) will be made upon completion of the project’s final design and the public involvement process.

Coordination with local officials having jurisdiction over vacant/undeveloped land located adjacent to the proposed roadway improvements will occur near the date of the Public Information Meeting to present the results of the traffic noise study.

Appendix A

TNM Output Files

CBBEL
PMK, TNM 78279

6 December 2021
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: 190348
RUN: Ex Cond - Validation, Randall at Hopps
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver													
Name	No.	#DUs	Existing LAeq1h	No Barrier						With Barrier			
				LAeq1h		Increase over existing		Type Impact		Calculated LAeq1h	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc				Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB			dBA	dB	dB	dB
R1	1	1	0.0	0.0	71	0.0	15	inactive		0.0	0.0	8	0.0
R2	2	1	0.0	0.0	66	0.0	15	inactive		0.0	0.0	8	0.0
R3	3	1	0.0	58.6	66	58.6	15	----		58.6	0.0	8	-8.0
R4	4	1	0.0	66.9	71	66.9	15	----		66.9	0.0	8	-8.0
R5	5	1	0.0	0.0	66	0.0	15	inactive		0.0	0.0	8	0.0
R6	6	1	0.0	67.7	66	67.7	15	Snd Lvl		67.7	0.0	8	-8.0
R7	7	1	0.0	0.0	66	0.0	15	inactive		0.0	0.0	8	0.0
R8	8	1	0.0	0.0	66	0.0	15	inactive		0.0	0.0	8	0.0
R9	9	1	0.0	56.4	66	56.4	15	----		56.4	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	9	0.0	0.0	0.0
All Impacted	1	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

RESULTS: SOUND LEVELS **190348**

CBBEL **24-Jan-22**

PMK, TNM 78279 **TNM 2.5**

Calculated with TNM 2.5

RESULTS: SOUND LEVELS

PROJECT/CONTRACT: **190348**

RUN: **Existing Condition, Randall at Hopps**

BARRIER DESIGN: **INPUT HEIGHTS**

ATMOSPHERICS: **68 deg F, 50% RH**

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver												
Name	**No.**	**#DUs**	**Existing LAeq1h**	**No Barrier**					**With Barrier**			
				LAeq1h		**Increase over existing**		**Type**	**Calculated**	**Noise Reduction**		
				Calculated	**Crit'n**	**Calculated**	**Crit'n Sub'l Inc**	**Impact**	**LAeq1h**	**Calculated**	**Goal**	**Calculated minus Goal**
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
R1A	10	1	0.0	58.6	71	58.6	15	----	58.6	0.0	8	-8.0
R2	2	1	0.0	65.5	66	65.5	15	----	65.5	0.0	8	-8.0
R3	3	1	0.0	59.6	66	59.6	15	----	59.6	0.0	8	-8.0
R4	4	1	0.0	65.9	71	65.9	15	----	65.9	0.0	8	-8.0
R5	5	1	0.0	66.0	66	66.0	15	Snd Lvl	66.0	0.0	8	-8.0
R6	6	1	0.0	67.8	66	67.8	15	Snd Lvl	67.8	0.0	8	-8.0
R7	7	1	0.0	62.4	66	62.4	15	----	62.4	0.0	8	-8.0
R8	8	1	0.0	60.8	66	60.8	15	----	60.8	0.0	8	-8.0
R9	9	1	0.0	55.6	66	55.6	15	----	55.6	0.0	8	-8.0
R6-2	13	1	0.0	66.6	66	66.6	15	Snd Lvl	66.6	0.0	8	-8.0
R6-3	14	1	0.0	65.9	66	65.9	15	----	65.9	0.0	8	-8.0
R6-4	15	1	0.0	65.6	66	65.6	15	----	65.6	0.0	8	-8.0
R6-5	16	1	0.0	64.9	66	64.9	15	----	64.9	0.0	8	-8.0
R6-6	17	1	0.0	64.3	66	64.3	15	----	64.3	0.0	8	-8.0
R6-13	18	1	0.0	61.3	66	61.3	15	----	61.3	0.0	8	-8.0
R6-14	19	1	0.0	60.0	66	60.0	15	----	60.0	0.0	8	-8.0
R6-15	20	1	0.0	57.8	66	57.8	15	----	57.8	0.0	8	-8.0
R6-16	21	1	0.0	56.4	66	56.4	15	----	56.4	0.0	8	-8.0
R6-22	22	1	0.0	63.7	66	63.7	15	----	63.7	0.0	8	-8.0
R6-23	23	1	0.0	62.7	66	62.7	15	----	62.7	0.0	8	-8.0
R6-24	24	1	0.0	60.3	66	60.3	15	----	60.3	0.0	8	-8.0
R6-25	25	1	0.0	58.3	66	58.3	15	----	58.3	0.0	8	-8.0
R6-31	26	1	0.0	65.9	66	65.9	15	----	65.9	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	26	0.0	0.0	0.0
All Impacted	4	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

RESULTS: SOUND LEVELS **190348**

CBBEL **28-Jan-22**

PMK, TNM 78279 **TNM 2.5**

Calculated with TNM 2.5

RESULTS: SOUND LEVELS

PROJECT/CONTRACT: **190348**

RUN: **No Build Condition, Randall at Hopps**

BARRIER DESIGN: **INPUT HEIGHTS**

ATMOSPHERICS: **68 deg F, 50% RH**

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	No Barrier LAeq1h Crit'n	Increase over existing Calculated	Increase over existing Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Noise Reduction Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
R1A	10	1	0.0	60.1	71	60.1	15	----	60.1	0.0	8	-8.0
R2	2	1	0.0	67.1	66	67.1	15	Snd Lvl	67.1	0.0	8	-8.0
R3	3	1	0.0	62.2	66	62.2	15	----	62.2	0.0	8	-8.0
R4	4	1	0.0	67.5	71	67.5	15	----	67.5	0.0	8	-8.0
R5	5	1	0.0	67.5	66	67.5	15	Snd Lvl	67.5	0.0	8	-8.0
R6	6	1	0.0	69.3	66	69.3	15	Snd Lvl	69.3	0.0	8	-8.0
R7	7	1	0.0	64.0	66	64.0	15	----	64.0	0.0	8	-8.0
R8	8	1	0.0	62.4	66	62.4	15	----	62.4	0.0	8	-8.0
R9	9	1	0.0	57.1	66	57.1	15	----	57.1	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Noise Reduction Avg	Noise Reduction Max
		dB	dB	dB
All Selected	19	0.0	0.0	0.0
All Impacted	3	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

RESULTS: SOUND LEVELS 190348

CBBEL 28-Jan-22

PMK, TNM 78279 TNM 2.5

Calculated with TNM 2.5

RESULTS: SOUND LEVELS

PROJECT/CONTRACT: 190348

RUN: Build Condition, Randall at Hopps

BARRIER DESIGN: ROW_Max NRDG(2)_I

ATMOSPHERICS: 68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver												
Name	No.	#DUs	Existing LAeq1h	No Barrier					With Barrier			
				LAeq1h		Increase over existing		Type	Calculated	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc	Impact	LAeq1h	Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
R1A	10	1	0.0	59.6	71	59.6	15	----	59.6	0.0	8	-8.0
R2	2	1	0.0	59.9	66	59.9	15	----	59.9	0.0	8	-8.0
R3	3	1	0.0	61.4	66	61.4	15	----	61.4	0.0	8	-8.0
R4	4	1	0.0	67.7	71	67.7	15	----	67.7	0.0	8	-8.0
R5	5	1	0.0	60.8	66	60.8	15	----	60.5	0.3	8	-7.7
R6	6	1	0.0	69.9	66	69.9	15	Snd Lvl	60.9	9.0	8	1.0
R7	7	1	0.0	63.1	66	63.1	15	----	63.0	0.1	8	-7.9
R8	8	1	0.0	59.9	66	59.9	15	----	59.9	0.0	8	-8.0
R9	9	1	0.0	57.9	66	57.9	15	----	57.9	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	9	0.0	1.0	9.0
All Impacted	1	9.0	9.0	9.0
All that meet NR Goal	1	9.0	9.0	9.0

RESULTS: SOUND LEVELS 190348

CBBEL 28-Jan-22

PMK, TNM 78279 TNM 2.5

Calculated with TNM 2.5

RESULTS: SOUND LEVELS

PROJECT/CONTRACT: 190348

RUN: Build Condition, Randall at Hopps

BARRIER DESIGN: ROW_Max NRDG(2)_I

ATMOSPHERICS: 68 deg F, 50% RH

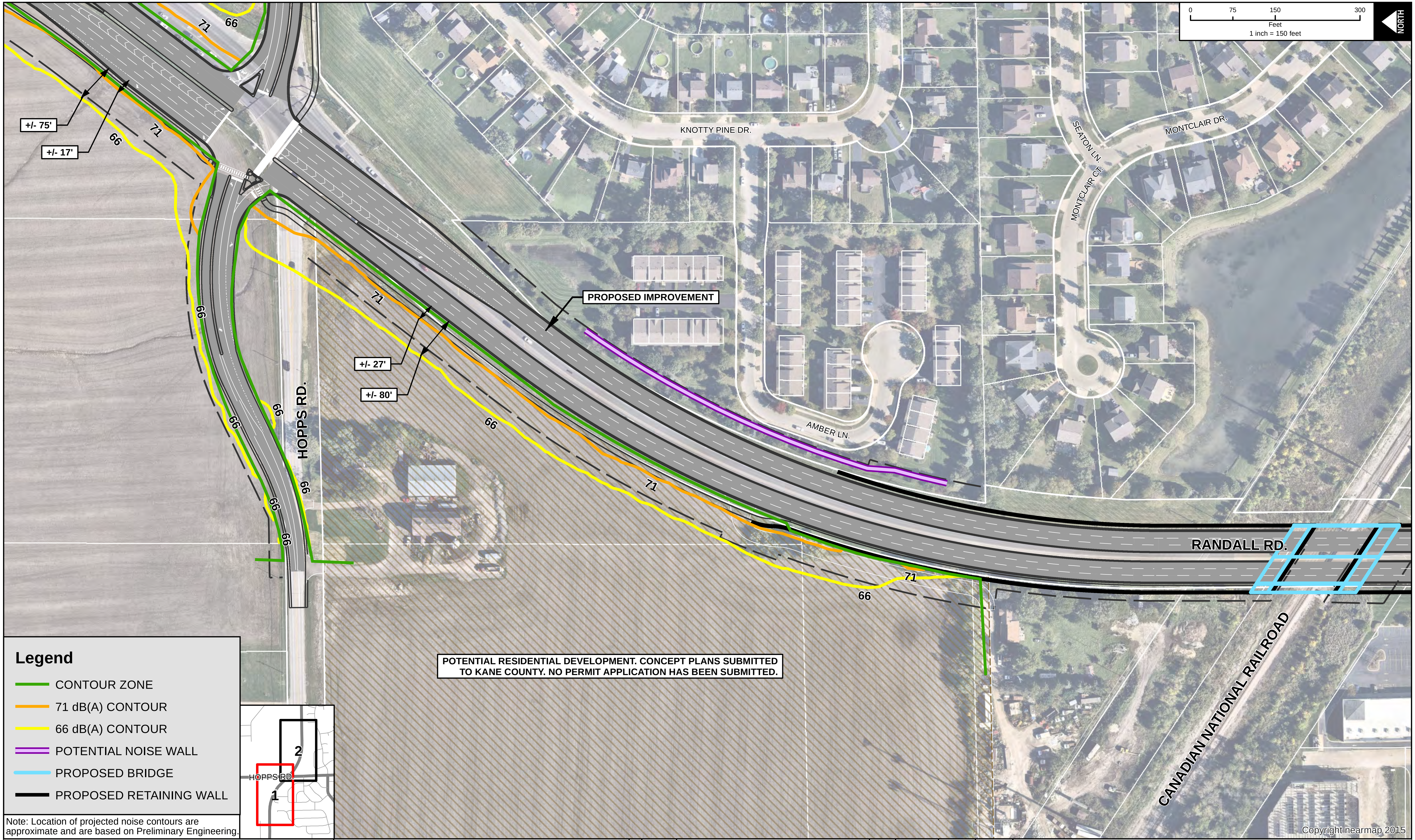
Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver												
Name	No.	#DUs	Existing LAeq1h	No Barrier					With Barrier			
				LAeq1h		Increase over existing		Type Impact	Calculated LAeq1h	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc			Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
R6	6	1	0.0	69.9	66	69.9	15	Snd Lvl	60.9	9.0	8	1.0
R6-2	24	1	0.0	68.5	66	68.5	15	Snd Lvl	61.0	7.5	8	-0.5
R6-3	25	1	0.0	67.3	66	67.3	15	Snd Lvl	59.8	7.5	8	-0.5
R6-4	26	1	0.0	67.0	66	67.0	15	Snd Lvl	59.5	7.5	8	-0.5
R6-5	27	1	0.0	65.8	66	65.8	15	----	58.9	6.9	8	-1.1
R6-6	28	1	0.0	65.3	66	65.3	15	----	58.4	6.9	8	-1.1
R6-13	36	1	0.0	62.4	66	62.4	15	----	56.6	5.8	8	-2.2
R6-14	37	1	0.0	61.1	66	61.1	15	----	55.6	5.5	8	-2.5
R6-15	38	1	0.0	59.1	66	59.1	15	----	54.1	5.0	8	-3.0
R6-16	39	1	0.0	57.4	66	57.4	15	----	52.9	4.5	8	-3.5
R6-22	45	1	0.0	64.9	66	64.9	15	----	59.1	5.8	8	-2.2
R6-23	46	1	0.0	63.6	66	63.6	15	----	57.9	5.7	8	-2.3
R6-24	47	1	0.0	61.6	66	61.6	15	----	55.8	5.8	8	-2.2
R6-25	48	1	0.0	59.3	66	59.3	15	----	54.0	5.3	8	-2.7
R6-31	55	1	0.0	65.2	66	65.2	15	----	60.7	4.5	8	-3.5

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	33	0.0	3.8	9.0
All Impacted	4	7.5	7.9	9.0
All that meet NR Goal	1	9.0	9.0	9.0

Appendix B

TNM 2050 Noise Contours for Coordination with Local Officials



CHRISTOPHER B. BURKE ENGINEERING LTD.
9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
(847) 823-0500

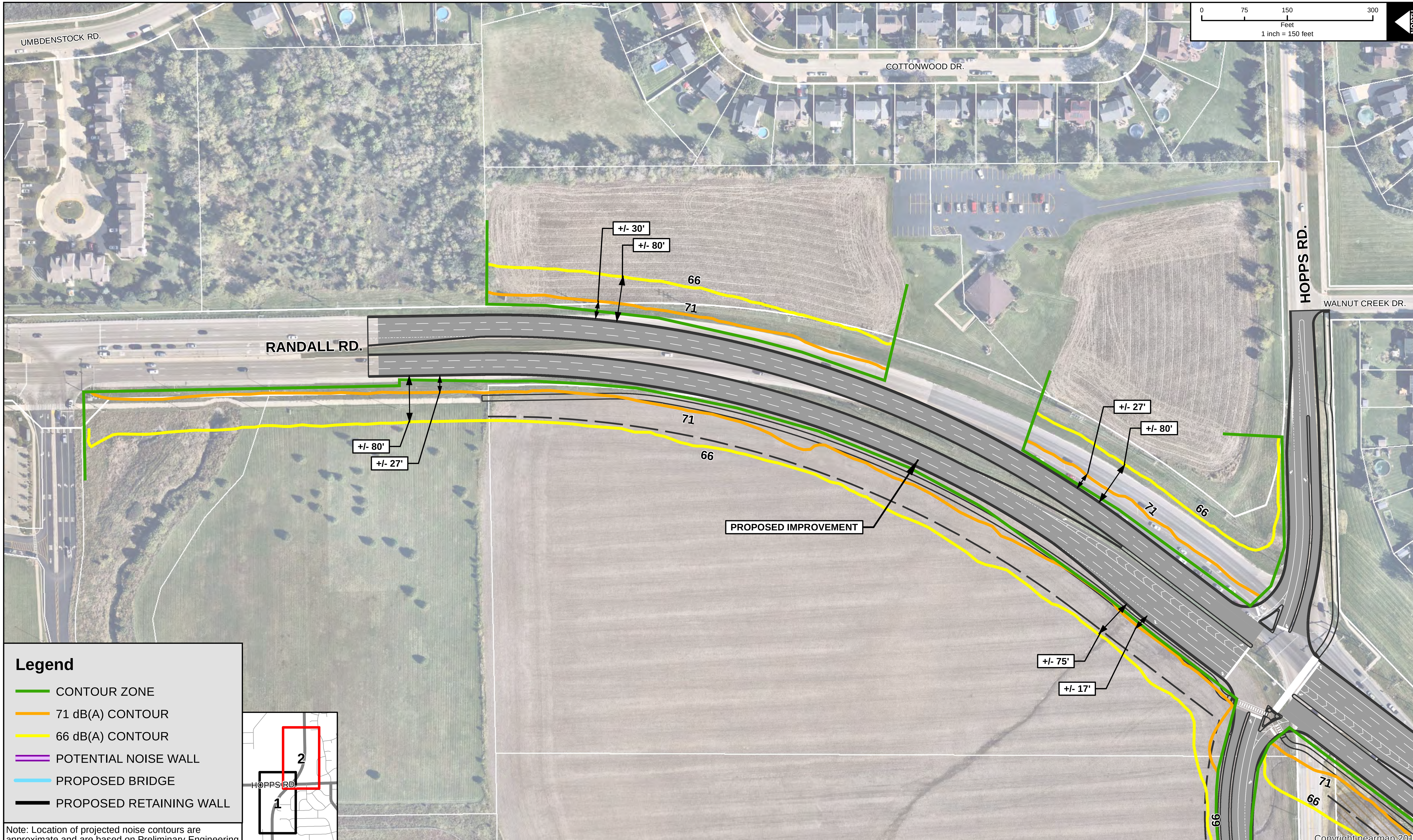
CLIENT: KANE COUNTY

NO.	DATE	NATURE OF REVISION	CHKD.		
				DSGN.	
				DWN:	DRW
				CHKD.	
				SCALE:	1:1,800
				MODEL:	ArcGIS 10.6
				PLOT DATE	2/8/2022

FILE NAME: Noise Contour Exhibits
PATH: N:\Kane County\190348\GIS\Exhibits\Noise Study\Noise Contour Exhibits.mxd

TITLE: PROJECTED NOISE CONTOURS

PROJ. NO. 190348
DATE: 02/02/2022
SHEET 1 of 2
DRAWING NO. FIGURE B-1



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KANE COUNTY

NO.	DATE	NATURE OF REVISION	CHKD.		
				DSGN.	
				DWN:	DRW
				CHKD.	
				SCALE:	1:1,800
				MODEL:	ArcGIS 10.6
				PLOT DATE	2/8/2022

FILE NAME: Noise Contour Exhibits
PATH: N:\Kane County\190348\GIS\Exhibits\Noise Study\Noise Contour Exhibits.mxd

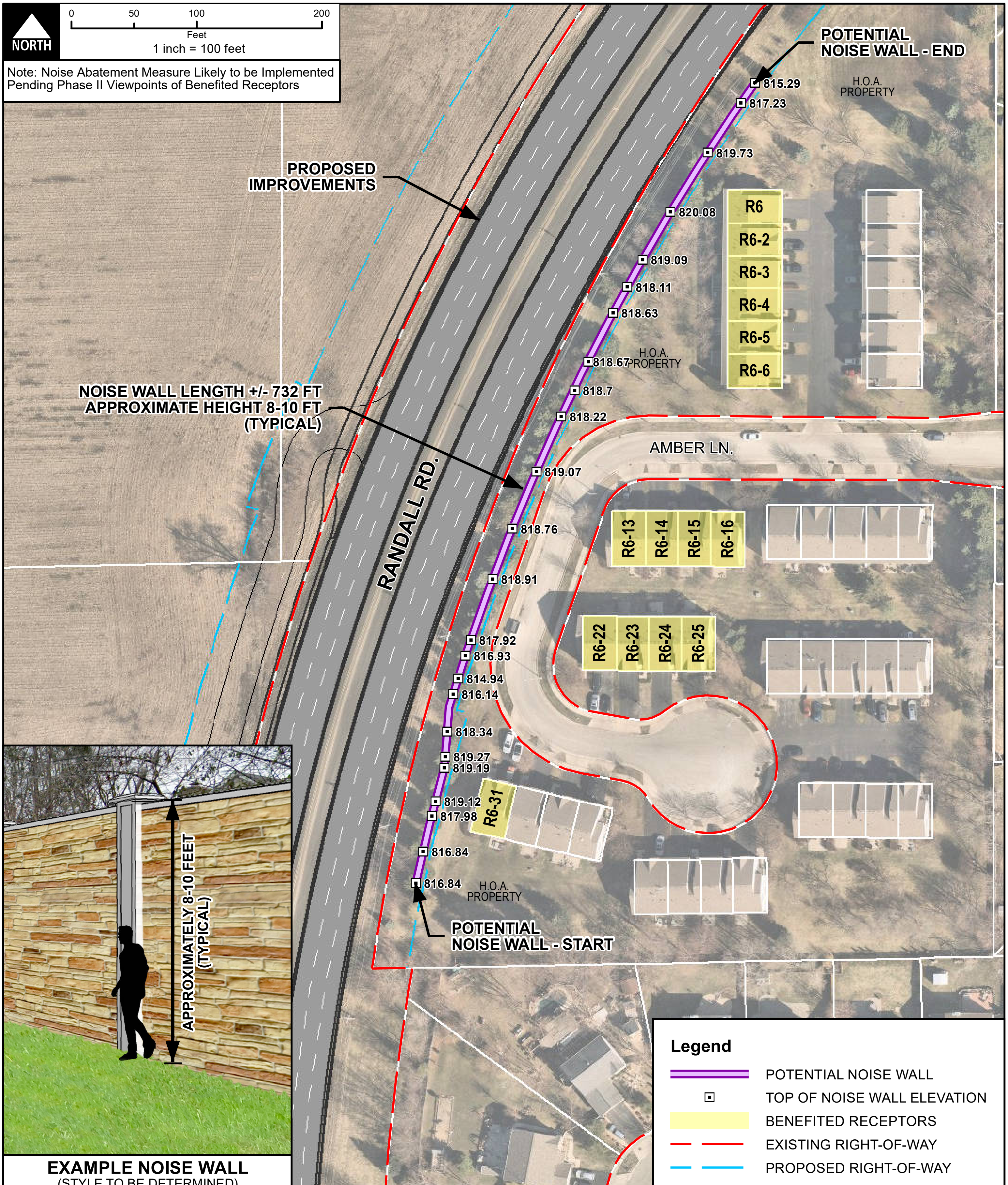
TITLE:

PROJECTED NOISE CONTOURS

PROJ. NO. 190348
DATE: 02/02/2022
SHEET 2 of 2
DRAWING NO.
FIGURE B-2

Appendix C

Top of Wall Elevations for Feasible and Reasonable Barriers



CLIENT: **KANE COUNTY DIVISION OF TRANSPORTATION**	TITLE: **POTENTIAL NOISE WALL TOP OF WALL ELEVATIONS**	PROJ. NO. 190348	
		DATE: 01/27/2022	
		SHEET 1 OF 1	
		DRAWING NO.	
CHRISTOPHER B. BURKE ENGINEERING, LTD. 9575 W. Higgins Road, Suite 600 · Rosemont, Illinois 60018 · (847) 823-0500	DSGN.	SCALE:	1:1,200
	DWN. DRW	AUTHOR:	DWALTERS
	CHKD.	PLOT DATE:	8/1/2022
	FILE: Noise Wall Benefited Receptors		

FIGURE C-1

Path: N:\Kane County\190348\GIS\Exhibits\Noise Study\Noise Wall Benefited Receptors.mxd