ROADWAY CONCEPTUAL ANALYSIS
NOISE STUDY REPORT

McCulloch Road Widening
from North Orion / Lockwood Boulevard to Tanner Road

Orange County, Florida

Project Number: Y20-832

Prepared For:
ORANGE COUNTY

March 2026

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1.0 INTRODUCTION

Orange County is conducting a Roadway Conceptual Analysis (RCA) for McCulloch Road from North Orion / Lockwood Boulevard to North Tanner Road, which is located in northeast Orange County (Figure 1), a distance of 1.1 miles in length. Existing McCulloch Road is a two-lane, minor arterial roadway located in a suburban area of northeast Orange County Commission District Five. The roadway alignment is straight, and the corridor is surrounded by a mix of housing developments, wetlands, conservation areas, and some commercial development near both ends of the project.

McCulloch Road is a two-lane urban collector that runs east-west with an existing speed of 45 MPH. Within the study area, a continuous 5-foot sidewalk is provided along the south side of McCulloch Road. On the north side of McCulloch Road, a 5-foot sidewalk is provided, generally set back further from the roadway at the northern ROW line except from east of Lockwood Boulevard to west of Keats Way, approximately 1,200 feet. The existing drainage system collects roadway stormwater runoff in curb and gutter and conveys the roadway stormwater runoff to treatment ponds via closed drainage system.

The proposed improvements include widening McCulloch Road from two to four lanes, constructing intersection improvements, providing drainage treatment and providing pedestrian facilities with a shared use path on the south side and sidewalk on the north side of the roadway.

This Noise Study Report documents the methodology, analysis, and findings of the traffic noise evaluation conducted for the proposed improvements. The results will inform decisions regarding potential noise abatement measures and ensure compliance with applicable federal and state noise regulations.

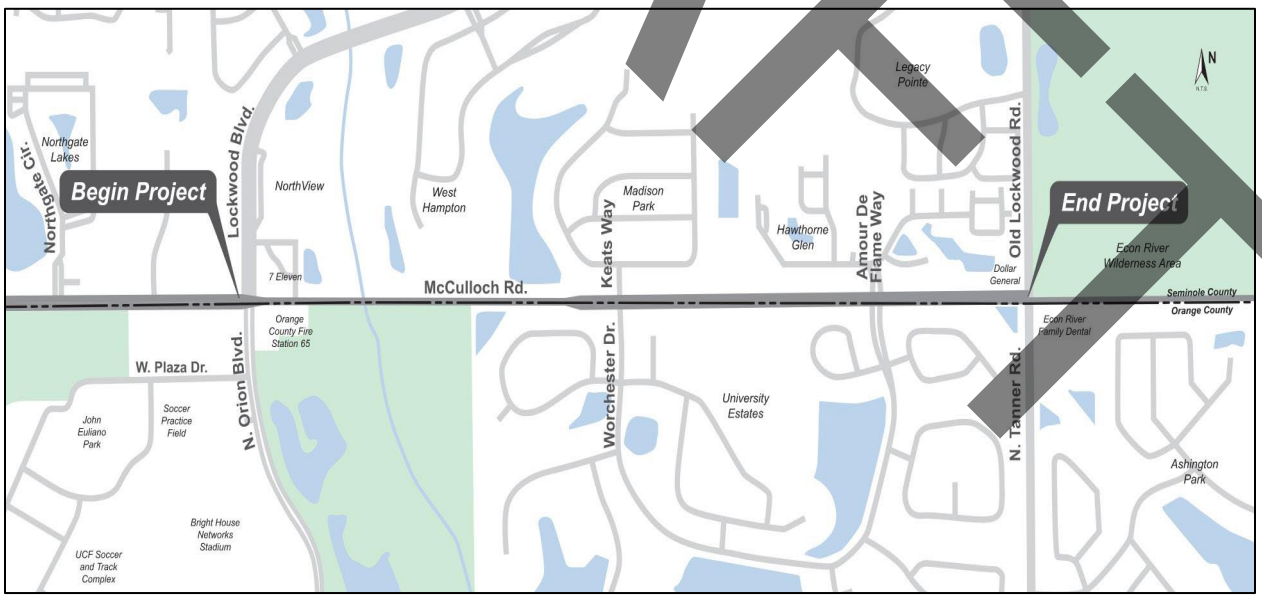


Figure 1: Project Location Map

1.1 Purpose and Need

The purpose and need for the project are based on three key factors:

1) Provide traffic capacity to meet social/economic demands.
2) Be consistent with transportation plans.
3) Enhance safety.

This segment of McCulloch Road is currently operating at an acceptable level of service (LOS), but by the design year 2048, McCulloch Road within the project limits will operate at an unacceptable LOS F. Roadway improvement are needed to provide an acceptable LOS.

The widening of McCulloch Road is included in the Orange County Capital Improvement Program (CIP), the Orange County 2030 Long-Range Transportation Plan (LRTP), and the Orange County Ten-Year Roadway Plan.

Crash reports for the three-year period between December 2016 and November 2021 were obtained and reviewed. A total of 166 crashes occurred within the study corridor. Forty-one (41) crashes occurred at the Orion Rd/Lockwood Blvd intersection over the three-year period, and fifty (50) crashes occurred along the segment from N. Orion Rd/Lockwood Blvd. to Worchester Dr. Capacity and intersection improvements will enhance safety along the corridor.

2.0 METHODOLOGY

The traffic noise study was performed in accordance with *Code of Federal Regulations, Title 23, Part 772 (23 CFR 772) Procedures for Abatement of Highway Traffic Noise and Construction Noise*[1] using methodology established by the Florida Department of Transportation (FDOT) in the *Project Development and Environment Manual*, *Part 2, Chapter 18 (FDOT, July 31, 2024)*[2] and FDOT's *Traffic Noise Modeling and Analysis Practitioners Handbook*[3]. Predicted noise levels were produced using the Federal Highway Administration (FHWA) Traffic Noise Model (TNM), version 2.5.

2.1 Noise Metrics

Noise levels developed for this analysis are expressed in decibels (dB) using an "A"-scale [dB(A)] weighting. This scale most closely approximates the response characteristics of the human ear. All noise levels are reported as hourly equivalent noise levels [Leq(h)]. The Leq is defined as "the equivalent steady-state sound level which in a stated period of time contains the same acoustic energy as the time-varying sound level during the same time period, with Leq(h) being the hourly value of Leq"[1]. Use of the dB(A) and Leq(h) metrics to evaluate traffic noise is consistent with 23 CFR 772[1].

2.2 Traffic Data

Traffic noise is heavily dependent on both traffic speed and traffic volume with the amount of noise generated by traffic increasing as the vehicle speed and number of vehicles increases. The traffic conditions that result in the highest noise levels for roadways are the hourly traffic volumes that

represent Level of Service (LOS) C traffic conditions because they represent maximum service volumes under stable flow conditions.

Traffic volumes and vehicle mix (e.g., cars, medium trucks, heavy trucks, motorcycles, and buses) were predicted for the design year (2048) under the Build condition. For McCulloch Road roadway segments, LOS C hourly traffic volumes were compared to predicted design year demand hourly volumes and the lower of the two was used in the model, consistent with Section 18.2.1.5 of the FDOT PD&E Manual. For ramps, hourly traffic demand volumes were utilized. Traffic volumes and speeds used in the analysis are provided in Appendix A.

2.3 Noise Abatement Criteria and Considerations

Noise-sensitive sites are any property where frequent exterior and/or interior human use occurs and where a lowered noise level would provide a benefit. FHWA has established noise levels at which noise abatement must be considered for various types of noise-sensitive sites. These levels, which are used by the FTE for the purpose of evaluating traffic noise, are referred to as the Noise Abatement Criteria (NAC). As shown in Table 2-1, the NAC vary by activity category. Noise abatement measures are considered when predicted traffic noise levels approach or exceed the NAC. FDOT defines "approach" as within one dB(A) of the applicable FHWA criterion. For comparison purposes, typical noise levels for common indoor and outdoor activities are provided in Figure 2.

Noise abatement measures must also be considered when a substantial increase in traffic noise will occur as a direct result of the transportation project. The FDOT PD&E Manual[2] defines a substantial increase as 15 or more dB(A) above existing conditions. A substantial increase typically occurs in areas where traffic noise is a minor component of the existing noise environment but would become a major component after the project is constructed (e.g., new alignment project). The proposed concept design for this project follows the existing alignment of McCulloch Road and the results from the RCA noise analysis indicated that a substantial increase in traffic noise will not occur.

Table 2-1 – FHWA Noise Abatement Criteria

NOISE ABATEMENT CRITERIA (NAC) [Hourly A-Weighted Sound Level-decibels (dB(A))]				
Activity Category	Activity Leq(h)[1]		Evaluation location	Description of activity category
	FHWA	FDOT		
A	57	56	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[2]	67	66	Exterior	Residential
C[2]	67	66	Exterior	Active sports 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, recreational areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52	51	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[2]	72	71	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.

(Based on Table 1 of 23 CFR Part 772)

[1] The Leq(h) Activity Criteria values are for impact determination only and are not design standards for noise abatement measures.

[2] Includes undeveloped lands permitted for this activity category.

Note: FDOT defines that a substantial noise increase occurs when the existing noise level is predicted to be exceeded by 15 decibels or more as a result of the transportation improvement project. When this occurs, the requirement for abatement consideration will be followed.

Figure 2 – Typical Noise Levels

Common Outdoor Activities	Noise Level dB(A)	Common Indoor Activities
	---110---	Rock Band
Jet Fly-Over 1000 ft.		
	---100---	
Gas Lawn Mower at 3 ft.		
	---90---	
Diesel Truck at 50 ft., at 50 mph		Food Blender at 3 ft.
	---80---	Garbage Disposal at 3 ft.
Noise Urban Area (Daytime)		
Gas Lawn Mower at 100 ft.	---70---	Vacuum Cleaner at 10 ft.
Commercial Area		Normal Speech at 3 ft.
Heavy Traffic at 300 ft.	---60---	
		Large Business Office
Quiet Urban Daytime	---50---	Dishwasher Next Room
Quiet Urban Nighttime	---40---	Theater, Large Conference Room (Background)
Quiet Suburban Nighttime		
	---30---	Library
Quiet Rural Nighttime		Bedroom at Night, Concert Hall (Background)
	---20---	
	---10---	
Lowest Threshold of Human Hearing	---0---	Lowest Threshold of Human Hearing

Source: California Dept. of Transportation; Technical Noise Supplement; Oct 1998; Page 18.

3.0 TRAFFIC NOISE ANALYSIS AND ABATEMENT ASSESSMENT

3.1 Model Verification

To verify the accuracy of the TNM 2.5 noise model, field measurements were taken within the project limits following procedures documented in FHWA's Noise Measurement Field Guide[4] (FHWA, June 2018). Noise monitoring was performed on March 5, 2026, using Larson Davis LxT noise monitors. All monitoring events were 10 minutes in duration, which is consistent with methodology documented in the FDOT PD&E Manual[2]. The noise monitors were calibrated using a CAL200 calibrator before and after each event. Typical vehicle speeds were established by sampling with a Bushnell handheld radar gun. Vehicles generally traveled within 5 miles per hour (mph) of the 45-mph posted speed limit on McCulloch Road. Traffic volumes by vehicle classification were recorded for each monitoring event and then extrapolated to one-hour equivalent volumes for input within the TNM.

One location was used to validate the ability of the TNM to accurately predict traffic noise for this project. The location of the validation site is shown on the project aerials in Appendix C as receptor point VAL-002. Measurements were taken for three validation events at the validation site. The receptor point VAL-002 is located in front of the Madison Park neighborhood on the Westbound side of McCulloch Road at approximately Station 343+00.00.

The results of the monitoring events are summarized in Table 3-1. As shown in Table 3-1, the variance between the measured and predicted noise levels were 3.0 dB or less for all validation events. Therefore, the noise model is predicting traffic related noise for this project within the level of accuracy specified in the FDOT PD&E Manual[2].

Table 3-1 – TNM Validation Results Summary

Location	Validation Event	TNM Predicted (dB(A))	Field Measured (dB(A))	Variance (dB(A))
VAL-002[1] (Location 2)	VS-02-R1	65.1	64.0	1.1
	VS-02-R2	65.3	62.7	2.6
	VS-02-R3	65.7	64.2	1.5

[1] Measurements Taken 3/5/2026.

3.2 Noise-sensitive Sites and Impact Analysis

The analysis evaluated noise-sensitive sites within the project limits, including residential properties and Special Land Use (SLU) areas. Receptors representing these sites were digitized in the noise model in accordance with the FDOT *PD&E Manual*[2]. Receptor placement followed these criteria:

- **Residential receptors:** Located in areas of frequent exterior use (e.g., patio or lanai) or at the corner of the residential building closest to the primary traffic noise source.

- **Special Land Use (SLU) receptors:** Placed in areas with frequent outdoor human use. For large SLU areas, such as parks or schoolyards, receptors were arranged in a grid pattern to capture spatial variability in outdoor use.
- **Representative receptor:** Used to model clusters of residences with similar characteristics, where a single receptor represents multiple sites.
- **Ground floor receptors:** Positioned at a height of 5 feet above ground elevation.

Receptor locations are illustrated on the project aerials in Appendix C.

3.2.1 Receptor Naming System

Each receptor is identified by a unique alphanumeric code that reflects its NAC classification and location:

1. **First Letter:** "B" for residential receptors or "C" for SLU receptors.
2. **Next Two Letters:** indicate the roadway side (e.g., “EB” for eastbound, "WB" for westbound).
3. **Next Two-Digit Number:** Represents the Common Noise Environment (CNE) identifier.
4. **Final Three-Digit Number:** Separated by a dash, this denotes the specific receptor (e.g., BEB02-002 is the 2nd residential receptor in the 2nd CNE on the eastbound side).

Predicted noise levels are included in Appendix B-1 (residential receptors) and Appendix B-2 (SLU receptors), while receptor locations are illustrated on the project aerials in Appendix C.

3.3 Noise Abatement Analysis

To evaluate noise abatement measures, the analysis grouped receptors into Common Noise Environments (CNEs). Noise barriers were considered to mitigate traffic noise by obstructing the sound path between the roadway and noise-sensitive sites. Effective barriers are sufficiently long, continuous (without gaps), and of adequate height.

A noise barrier must meet both feasibility and reasonableness criteria to be considered for construction:

Feasibility Criteria:

- Must provide at least a 5 dB(A) reduction in traffic noise to at least two impacted receptors.

Must consider design, construction, safety, access, ROW constraints, maintenance, drainage, and utility factors.

Reasonableness Criteria:

- Must meet FDOT’s Noise Reduction Design Goal (NRDG), reducing noise at least 7 dB(A) for at least one benefited receptor.
- Must satisfy FDOT’s cost threshold of $64,000 per benefited receptor (defined as a receptor receiving at least a 5 dB(A) reduction). The current unit cost used to evaluate cost reasonableness is $40 per square foot, covering materials and labor.
- Must incorporate community feedback from affected property owners and residents.

Within the project limits, noise barrier locations were assessed based on the following criteria:

- Non-shoulder noise barriers located outside the clear recovery zone but within the ROW were initially considered at heights ranging from 8 to 22 feet in 2-foot increments.
- If a non-shoulder noise barrier could not provide feasible and reasonable abatement for an impacted receptor, a shoulder noise barrier was evaluated.
    - When placed on a structure (e.g., bridge, retaining wall), a shoulder noise barrier was limited to a maximum height of 8 feet.
    - When located on an embankment or ground-mounted, the maximum height was 14 feet.

Noise barriers were evaluated to identify the maximum number of impacted receptors eligible for at least a 5 dB(A) reduction in traffic-related noise. Site-specific constraints, such as overhead utilities, may limit barrier effectiveness, preventing some impacted receptors from achieving the full reduction.

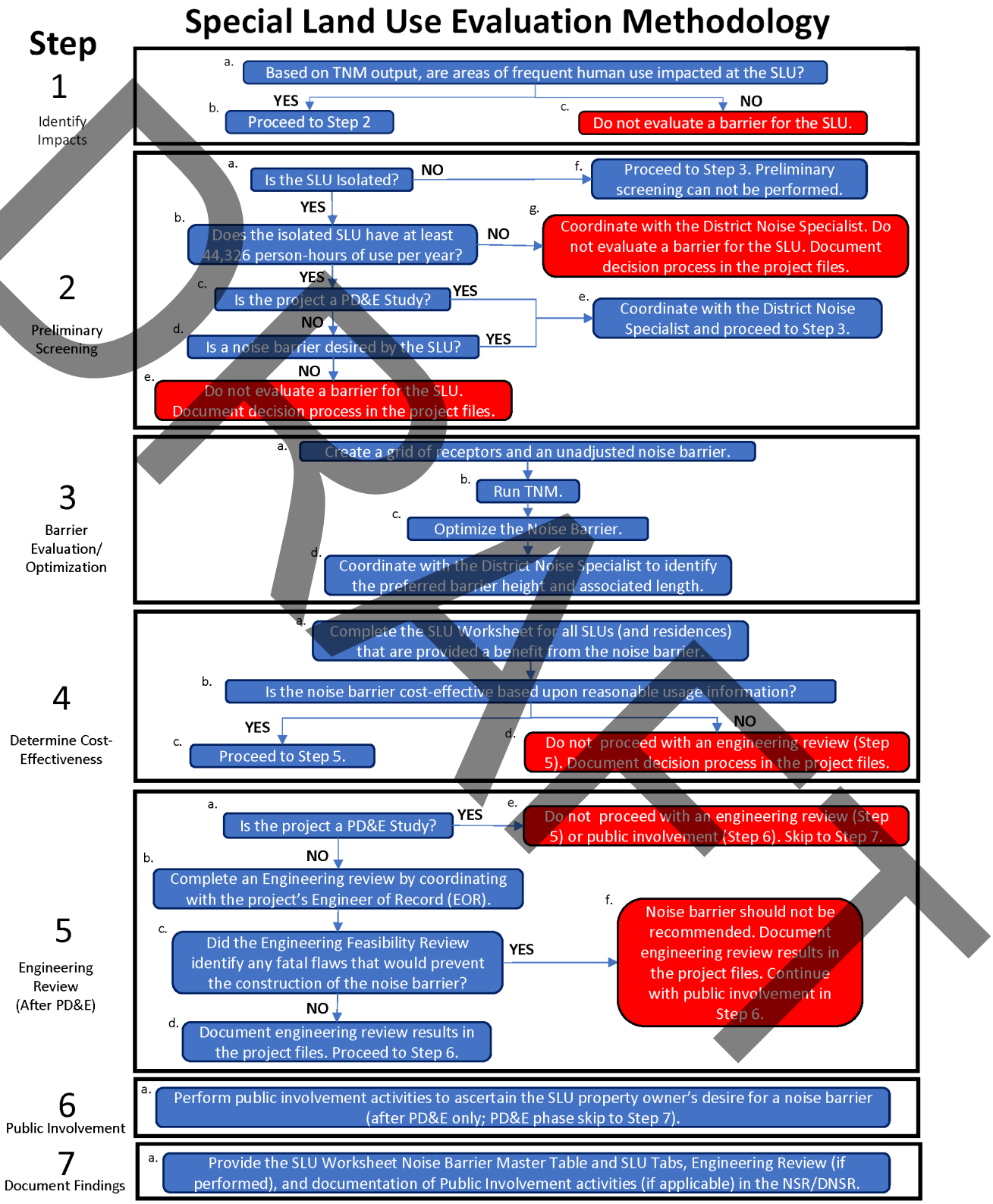
In certain locations, noise barriers may also benefit receptors that are not predicted to approach or exceed the NAC. Since abatement is not required for these receptors, barrier lengths or heights are not increased solely to enhance their benefit. However, if a non-impacted receptor receives noise reduction due to proximity to an impacted receptor, it is included in the cost-reasonableness analysis based on cost per benefited receptor. This evaluation approach is consistent with FHWA noise abatement policy and guidance, including criteria for feasibility, reasonableness, and cost-effectiveness.

3.4 Special Use Site Analysis

The evaluation of noise impacts and potential abatement at Special Land Use (SLU) sites was conducted in accordance with the *FDOT Methodology to Evaluate Highway Traffic Noise at Special Land Uses* (July 2025)[5]. This updated methodology replaces the 1997/2009 guidance and addresses key limitations in the former approach, including outdated NAC references, inconsistent treatment of SLUs and adjacent residences, and the absence of a standardized evaluation template.

SLUs are defined as non-residential noise-sensitive sites that fall under FHWA's Noise Abatement Criteria (NAC) Activity Categories A, C, D, and E. These include schools, parks, places of worship, medical facilities, and other land uses with frequent outdoor human activity. The updated methodology introduces a structured seven-step process—summarized in the SLU Methodology Flowchart (Figure 3)—that begins with identifying impacted SLU receptors and culminates in documentation of findings. The process includes optional screening, barrier optimization, cost-effectiveness analysis, engineering feasibility review, and public involvement.

Figure 3 – SLU Methodology Flowchart



For specific situations that are not addressed by this methodology contact the District's Noise Specialist.

A key enhancement in the updated methodology is the Equivalent Residence (ER) approach, which enables combined evaluation of impacted SLUs and adjacent impacted residential receptors. This approach converts SLU usage into residential equivalents based on person-hours of outdoor use. One ER is defined as 22,163 person-hours per year, based on an average Florida residence with 2.53 occupants available 24 hours per day, year-round. This conversion allows for a unified cost-effectiveness analysis when SLUs and residential receptors are served by the same barrier. This definition is established in FDOT's July 2025 Methodology to Evaluate Highway Traffic Noise at Special Land Uses[5].

To streamline analysis, the methodology includes an optional preliminary screening step to identify isolated or low-usage SLUs that are unlikely to meet abatement criteria. If an SLU does not meet minimum usage thresholds or if the property owner declines abatement consideration during the Design or Design-Build phase, further analysis may be discontinued. For SLUs that proceed to full evaluation, noise barriers must meet FDOT's feasibility and reasonableness criteria, including a cost threshold of $64,000 per benefited receptor or ER and a unit cost of $40 per square foot. The analysis also incorporates FDOT's Noise Reduction Design Goal (NRDG), which requires a minimum 7 dB(A) reduction for at least one benefited receptor or ER.

The SLU evaluation process, including ER calculations, barrier optimization, and cost-effectiveness results, is documented in Appendix D. This documentation follows the standardized format provided in the FDOT methodology to ensure consistency and transparency across projects.

3.5 Common Noise Environments on Eastbound Side of McCulloch Road

3.5.1 University Estates (CNE EB01 and EB02)

University Estates is located on the eastbound side of McCulloch Road, between North Orion and Tanner Road. This area is shown on sheets 2 and 3 of the project aerials located in Appendix C. In this area, 24 NAC B receptor points representing 106 residences were included in the noise model. Predicted noise levels are not expected to approach or exceed the applicable Noise Abatement Criteria (NAC) under the Build condition for the design year (2048). Predicted noise levels range from 47.4 to 63.6 dB(A), and are not expected to approach or exceed the NAC for the Build Condition in Design Year (2048). Predicted noise levels are shown in Appendix B-1.

3.6 Common Noise Environments on Westbound Side of McCulloch Road

3.6.1 Northview (CNE WB01)

Northview is located on the westbound side of McCulloch Road, between Lockwood Boulevard and station 316+00.00. This area is shown on sheet 1 of the project aerials located in Appendix C. The noise model for this area includes one NAC C receptor (1.75 ERs) representing one outdoor pool. Predicted noise levels are not expected to approach or exceed the applicable Noise Abatement Criteria (NAC) under the Build condition for the design year (2048). Because a minimum of two impacted noise-sensitive locations must be benefitted for noise abatement to be considered feasible, noise abatement

was not evaluated for this segment. Predicted noise levels are shown in Appendix B-2 for SLU sites. The SLU ER calculations are provided in Appendix D on sheet WB01-01.

3.6.2 West Hampton (CNE WB02)

West Hampton is located on the westbound side of McCulloch Road, between station 320+00.00 and station 328+00.00. This area is shown on sheet 1 of the project aerials located in Appendix C. In this area, five NAC B receptor points representing 15 residences were included in the noise model. Predicted noise levels are not expected to approach or exceed the applicable Noise Abatement Criteria (NAC) under the Build condition for the design year (2048). Predicted noise levels range from 50.6 to 56.9 dB(A) and are not expected to approach or exceed the NAC for the Build Condition in Design Year (2048). Predicted noise levels are shown in Appendix B-1.

3.6.3 Madison Park (CNE WB03)

Madison Park is located on the westbound side of McCulloch Road, between station 331+00.00 and station 344+00.00. This area is shown on sheet 2 of the project aerials located in Appendix C. In this area. 11 NAC B receptor points representing 105 residences were included in the noise model. Predicted noise levels are not expected to approach or exceed the applicable Noise Abatement Criteria (NAC) under the Build condition for the design year (2048). Predicted noise levels range from 43.2 to 64.6 dB(A) and are not expected to approach or exceed the NAC for the Build Condition in Design Year (2048). Predicted noise levels are shown in Appendix B-1.

3.6.4 Hawthorne Glen (CNE WB04)

Hawthorne Glen is located on the westbound side of McCulloch Road, between station 345+00.00 and Old Lockwood Road. This area is shown on sheets 2 and 3 of the project aerials located in Appendix C. In this area, 18 NAC B receptor points representing 116 residences, and one NAC C receptor (1.75 ERs), representing the community pool were included in the noise model. Predicted noise levels are not expected to approach or exceed the applicable Noise Abatement Criteria (NAC) under the Build condition for the design year (2048). Predicted noise levels range from 45.4 to 65.7 dB(A) and are not expected to approach or exceed the NAC for the Build Condition in Design Year (2048). Predicted noise levels are shown in Appendix B-1 for residential sites and shown in Appendix B-2 for SLU sites. The SLU ER calculations are provided in Appendix D on sheet WB04-01.

4.0 CONCLUSIONS

Within the project limits, noise levels were predicted at 58 NAC B receptors representing 342 residences and two NAC C SLU receptors representing two areas of outdoor use. Noise levels are not predicted to approach or exceed the NAC under the 2048 Build condition at any noise sensitive sites within the project limits, and therefore noise abatement was not considered for any of the communities along McCulloch Road.

4.1 Statement of Likelihood

Based on the noise analyses performed to date, traffic noise impacts are not predicted to occur as a result of the project's current design. Therefore, noise barriers are not recommended for further evaluation as part of this project at this time.

A land use review will be performed during the design phase to identify all noise-sensitive sites that may have received a building permit subsequent to the noise study, but prior to the project's Date of Public Knowledge (DPK). The date that Roadway Conceptual Analysis is approved by the Orange County Board of County Commissioners. If the review identifies noise-sensitive sites that have been permitted prior to the DPK, then those sensitive sites will be evaluated during the design phase for traffic noise impacts and abatement considerations.

5.0 CONSTRUCTION NOISE AND VIBRATION

During the construction phase of the proposed project, short-term noise may be generated by stationery and mobile construction equipment. The construction noise will be temporary at any location and will be controlled by adherence to the most recent edition of FDOT's Standard Specifications for Road and Bridge Construction[4].

Using the listing of sensitive sites found in FDOT's Project Development and Environment Manual, residents were identified as the only land use potentially sensitive to vibration that could occur during construction. If during final design it is determined that measures to control vibration are necessary, the project's construction provisions can be modified as needed.

6.0 PUBLIC INVOLVEMENT

Public involvement activities were integrated into the study process providing the opportunity for property owners, residents, businesses, government entities and agencies to share their concerns and ideas with Orange County. A Public Involvement Plan (PIP) was developed and was carried out as an integral part of the project and provides an overview of the outreach approach for the study. The purpose of the PIP was to guide the public outreach process in establishing and maintaining communication with the public throughout the study and incorporating public input during the alternative evaluation.

Public involvement activities began when the project started in October 2021 and continued throughout the study process. All input received served as valuable information that was taken into consideration for the refinement of the alternatives and the development of the Preferred Alternative. A key aspect of the PIP for this project included meetings with interested parties other than the Federal and State environmental, permit and review agencies.

A Public Meeting for the McCulloch Road project was held on February 23, 2026, at University Carillon United Methodist Church in Oviedo, FL, where noise and noise abatement concerns were raised. The

meeting consisted of an open house that allowed informal discussions between the project team and the public, followed by a presentation and an open question and answer forum.

7.0 REFERENCES

1. **Federal Highway Administration**. *Procedures for Abatement of Highway Traffic Noise and Construction Noise.* Title 23, Code of Federal Regulations, Part 772 (23 CFR Part 772). Washington, D.C.: FHWA, July 13, 2010.
2. **Florida Department of Transportation**. *Project Development and Environment (PD&E) Manual – Part 2, Chapter 18.* Tallahassee, FL: FDOT, Jul. 31, 2024.
3. **Florida Department of Transportation**. *Traffic Noise Modeling and Analysis Practitioners Handbook.* Tallahassee, FL: FDOT, July 2025.
4. **Federal Highway Administration**. *Noise Measurement Handbook.* Washington, D.C.: FHWA, Jun. 2018.
5. **Florida Department of Transportation.** *Methodology to Evaluate Highway Traffic Noise at Special Land Uses.* Tallahassee, FL: FDOT, July 2025.
6. **Florida Department of Transportation**. *Standard Specifications for Road and Bridge Construction.* Tallahassee, FL: FDOT, Jul. 2023.

Appendix A

Traffic Data

Highway Traffic Noise: Traffic Data

Project/Data Information

Project Name	McCulloch Road RCA Study
Project Number	Y21-832
Condition	Existing
Year	2021
Source	McCulloch Road DTTM Aug 2022
Preparer [Traffic Engineer]	Kevin Knudsen
Prepared Date	1/19/2026
Notes	

Traffic Segment Number	Roadway Name	From	To	Roadway Type	Number of Lanes *In 1 direction	LOS C Peak Hour Peak Direction (PHPD)	Demand Two-Way AADT	Demand Hourly Volumes (DHV) Peak Hour Peak Direction (PHPD)	% Autos	% Medium Trucks	% Heavy Trucks	% Buses	% Motorcycles	Standard K-factor	D-factor	Posted Speed (mph)	LOS C vs. DHV Comparison	Peak Direction Volume* *Used on both sides for LOS C	Off-Peak Direction Volume* *DHV only
	Roadway Details					**Traffic Details**											**Raw Traffic Data Selection & Off-Peak Calculation**		
1	McCulloch Road	Orion Blvd	Tanner Road	Other	1	970		856	97.8%	1.3%	0.4%	0.2%	0.3%	9.00%	57.28%	45	DHV	856	638
2	Tanner Road	Ashington Glen Dr	McCulloch Road	Other	1	970		914	98.0%	1.1%	0.4%	0.2%	0.3%	9.00%	64.64%	40	DHV	914	500
3	Old Lockwood Blvd	McCulloch Road	Hestia Loop	Other	1	970		297	95.3%	2.6%	1.1%	0.7%	0.3%	9.00%	64.64%	35	DHV	297	162

Highway Traffic Noise: Traffic Data

Project/Data Information

Project Name	McCulloch Road RCA Study
Project Number	Y21-832
Condition	No-Build
Year	2048
Source	McCulloch Road DTTM Aug 2022
Preparer [Traffic Engineer]	Kevin Knudsen
Prepared Date	1/19/2026
Notes	

	Roadway Details					**Traffic Details**										**Raw Traffic Data Selection & Off-Peak Calculation**		
Traffic Segment Number	**Roadway Name**	**From**	**To**	**Roadway Type**	**Number of Lanes** *In 1 direction	**LOS C Peak Hour Peak Direction (PHPD)**	**Demand Hourly Volumes (DHV) Peak Hour Peak Direction (PHPD)**	**% Autos**	**% Medium Trucks**	**% Heavy Trucks**	**% Buses**	**% Motorcycles**	**Standard K-factor**	**D-factor**	**Posted Speed (mph)**	**LOS C vs. DHV Comparison**	**Peak Direction Volume*** *Used on both sides for LOS C	**Off-Peak Direction Volume*** *DHV only
1	McCulloch Road	Orion Blvd	Tanner Road	Other	1	970	1,547	97.8%	1.3%	0.4%	0.2%	0.3%	9.00%	57.28%	45	LOS C	970	N/A
2	Tanner Road	Ashington Glen Dr	McCulloch Road	Other	1	970	1,652	98.0%	1.1%	0.4%	0.2%	0.3%	9.00%	64.64%	40	LOS C	970	N/A
3	Old Lockwood Blvd	McCulloch Road	Hestia Loop	Other	1	970	535	95.3%	2.6%	1.1%	0.7%	0.3%	9.00%	64.64%	35	DHV	535	293

Highway Traffic Noise: Traffic Data

Project/Data Information

Project Name	McCulloch Road RCA Study
Project Number	Y21-832
Condition	Build
Year	2048
Source	McCulloch Road DTTM Aug 2022
Preparer [Traffic Engineer]	Kevin Knudsen
Prepared Date	1/19/2026
Notes	

Roadway Details						Traffic Details										Raw Traffic Data Selection & Off-Peak Calculation		
Traffic Segment Number	**Roadway Name**	**From**	**To**	**Roadway Type**	**Number of Lanes** *In 1 direction	**LOS C Peak Hour Peak Direction (PHPD)**	**Demand Hourly Volumes (DHV) Peak Hour Peak Direction (PHPD)**	**% Autos**	**% Medium Trucks**	**% Heavy Trucks**	**% Buses**	**% Motorcycles**	**Standard K-factor**	**D-factor**	**Posted Speed (mph)**	**LOS C vs. DHV Comparison**	**Peak Direction Volume*** *Used on both sides for LOS C	**Off-Peak Direction Volume*** *DHV only
1	McCulloch Road	Orion Blvd	Tanner Road	Other	2	1,700	1,913	97.8%	1.3%	0.4%	0.2%	0.3%	9.00%	57.28%	45	LOS C	1700	N/A
2	Tanner Road	Ashington Glen Dr	McCulloch Road	Other	1	970	2,042	98.0%	1.1%	0.4%	0.2%	0.3%	9.00%	64.64%	40	LOS C	970	N/A
3	Old Lockwood Blvd	McCulloch Road	Hestia Loop	Other	1	970	663	95.3%	2.6%	1.1%	0.7%	0.3%	9.00%	64.64%	35	DHV	663	363

Appendix B-1 – Residential Properties

Predicted Noise Levels

Predicted Noise Levels

Common Noise Environment (CNE)	Rec. Point	No. of Units	NAC	NAC Criteria (dBA)	FDOT Criteria (dBA)	2021 Existing LAeq1h (dBA)	2048 No-Build LAeq1h (dBA)	2048 Build LAeq1h (dBA)	Increase	NAC Approach or Exceeded	Subst. Increase (>15dB(A))	Description
XX.X	Impacted Receptor											
EB01	BEB01-001	3	B	67	66	50.5	50.9	53.0	0.4	No	No	University Estates
EB01	BEB01-002	3	B	67	66	59	59.4	59.6	0.4	No	No	University Estates
EB01	BEB01-003	3	B	67	66	62.3	62.7	63.6	0.4	No	No	University Estates
EB01	BEB01-004	3	B	67	66	47.3	47.7	49.8	0.4	No	No	University Estates
EB01	BEB01-005	10	B	67	66	49.5	49.9	51.8	0.4	No	No	University Estates
EB01	BEB01-006	3	B	67	66	60.3	60.7	62.8	0.4	No	No	University Estates
EB01	BEB01-007	2	B	67	66	58.9	59.3	61.1	0.4	No	No	University Estates
EB01	BEB01-008	2	B	67	66	49	49.4	51.7	0.4	No	No	University Estates
EB01	BEB01-009	3	B	67	66	61.3	61.8	63.6	0.5	No	No	University Estates
EB01	BEB01-010	4	B	67	66	45	45.4	47.7	0.4	No	No	University Estates
EB01	BEB01-011	6	B	67	66	56.5	56.9	58.2	0.4	No	No	University Estates
EB01	BEB01-012	5	B	67	66	49.7	50.2	52.6	0.5	No	No	University Estates
EB02	BEB02-001	3	B	67	66	58.8	59.3	59.9	0.5	No	No	University Estates
EB02	BEB02-002	5	B	67	66	45.3	45.7	47.8	0.4	No	No	University Estates
EB02	BEB02-003	5	B	67	66	50.4	50.9	52.4	0.5	No	No	University Estates
EB02	BEB02-004	4	B	67	66	60.1	60.6	61.9	0.5	No	No	University Estates
EB02	BEB02-005	3	B	67	66	51.9	52.3	54.0	0.4	No	No	University Estates
EB02	BEB02-006	4	B	67	66	47.5	47.9	49.9	0.4	No	No	University Estates
EB02	BEB02-007	4	B	67	66	59.3	59.7	61.7	0.4	No	No	University Estates
EB02	BEB02-008	7	B	67	66	47.8	48.2	50.3	0.4	No	No	University Estates
EB02	BEB02-009	9	B	67	66	45.6	45.9	47.4	0.3	No	No	University Estates
EB02	BEB02-010	5	B	67	66	59.6	60	62.0	0.4	No	No	University Estates
EB02	BEB02-011	6	B	67	66	54.9	55.3	56.8	0.4	No	No	University Estates
EB02	BEB02-012	4	B	67	66	52	52.3	53.5	0.3	No	No	University Estates
WB02	BWB02-001	3	B	67	66	47.6	48	51.4	0.4	No	No	West Hampton
WB02	BWB02-002	3	B	67	66	53.3	53.8	56.9	0.5	No	No	West Hampton
WB02	BWB02-003	4	B	67	66	46.9	47.3	50.6	0.4	No	No	West Hampton
WB02	BWB02-004	2	B	67	66	50.1	50.5	53.7	0.4	No	No	West Hampton
WB02	BWB02-005	3	B	67	66	47.3	47.7	51.1	0.4	No	No	West Hampton
WB03	BWB03-001	7	B	67	66	49.3	49.7	52.7	0.4	No	No	Madison Park
WB03	BWB03-002	3	B	67	66	61.2	61.6	64.6	0.4	No	No	Madison Park
WB03	BWB03-003	18	B	67	66	40.3	40.8	43.2	0.5	No	No	Madison Park
WB03	BWB03-004	4	B	67	66	60.2	60.6	64.2	0.4	No	No	Madison Park
WB03	BWB03-005	12	B	67	66	53.3	53.8	56.3	0.5	No	No	Madison Park
WB03	BWB03-006	22	B	67	66	40.9	41.4	43.8	0.5	No	No	Madison Park
WB03	BWB03-007	18	B	67	66	42.8	43.2	45.8	0.4	No	No	Madison Park
WB03	BWB03-008	5	B	67	66	61	61.5	64.6	0.5	No	No	Madison Park
WB03	BWB03-009	5	B	67	66	56.7	57.1	60.2	0.4	No	No	Madison Park
WB03	BWB03-010	6	B	67	66	43	43.5	45.8	0.5	No	No	Madison Park
WB03	BWB03-011	5	B	67	66	49.9	50.4	53.0	0.5	No	No	Madison Park
WB04	BWB04-001	12	B	67	66	55.8	56.2	58.3	0.4	No	No	Hawthorne Glen
WB04	BWB04-002	3	B	67	66	45.8	46.3	49.1	0.5	No	No	Hawthorne Glen
WB04	BWB04-003	12	B	67	66	44.7	45.2	47.5	0.5	No	No	Hawthorne Glen
WB04	BWB04-004	3	B	67	66	62.9	63.3	65.7	0.4	No	No	Hawthorne Glen
WB04	BWB04-006	3	B	67	66	61.4	61.9	65.4	0.5	No	No	Hawthorne Glen
WB04	BWB04-007	2	B	67	66	61.2	61.7	65.3	0.5	No	No	Hawthorne Glen
WB04	BWB04-008	10	B	67	66	42.5	42.9	45.4	0.4	No	No	Hawthorne Glen
WB04	BWB04-011	12	B	67	66	52.7	53.2	55.8	0.5	No	No	Hawthorne Glen
WB04	BWB04-012	2	B	67	66	61.7	62.2	65.6	0.5	No	No	Hawthorne Glen
WB04	BWB04-015	2	B	67	66	61.9	62.4	65.6	0.5	No	No	Hawthorne Glen
WB04	BWB04-019	1	B	67	66	56.4	56.9	59.5	0.5	No	No	Hawthorne Glen
WB04	BWB04-021	10	B	67	66	48.4	48.9	51.2	0.5	No	No	Hawthorne Glen
WB04	BWB04-023	2	B	67	66	61.8	62.3	65.5	0.5	No	No	Hawthorne Glen
WB04	BWB04-025	2	B	67	66	60.9	61.4	65.6	0.5	No	No	Hawthorne Glen
WB04	BWB04-027	10	B	67	66	51.7	52.2	55.0	0.5	No	No	Hawthorne Glen
WB04	BWB04-028	6	B	67	66	55.3	55.8	58.0	0.5	No	No	Hawthorne Glen
WB04	BWB04-029	12	B	67	66	50.5	51.7	53.9	1.2	No	No	Hawthorne Glen
WB04	BWB04-030	12	B	67	66	55.2	57.3	59.5	2.1	No	No	Hawthorne Glen

Appendix B-2 – Special Land Use Sites

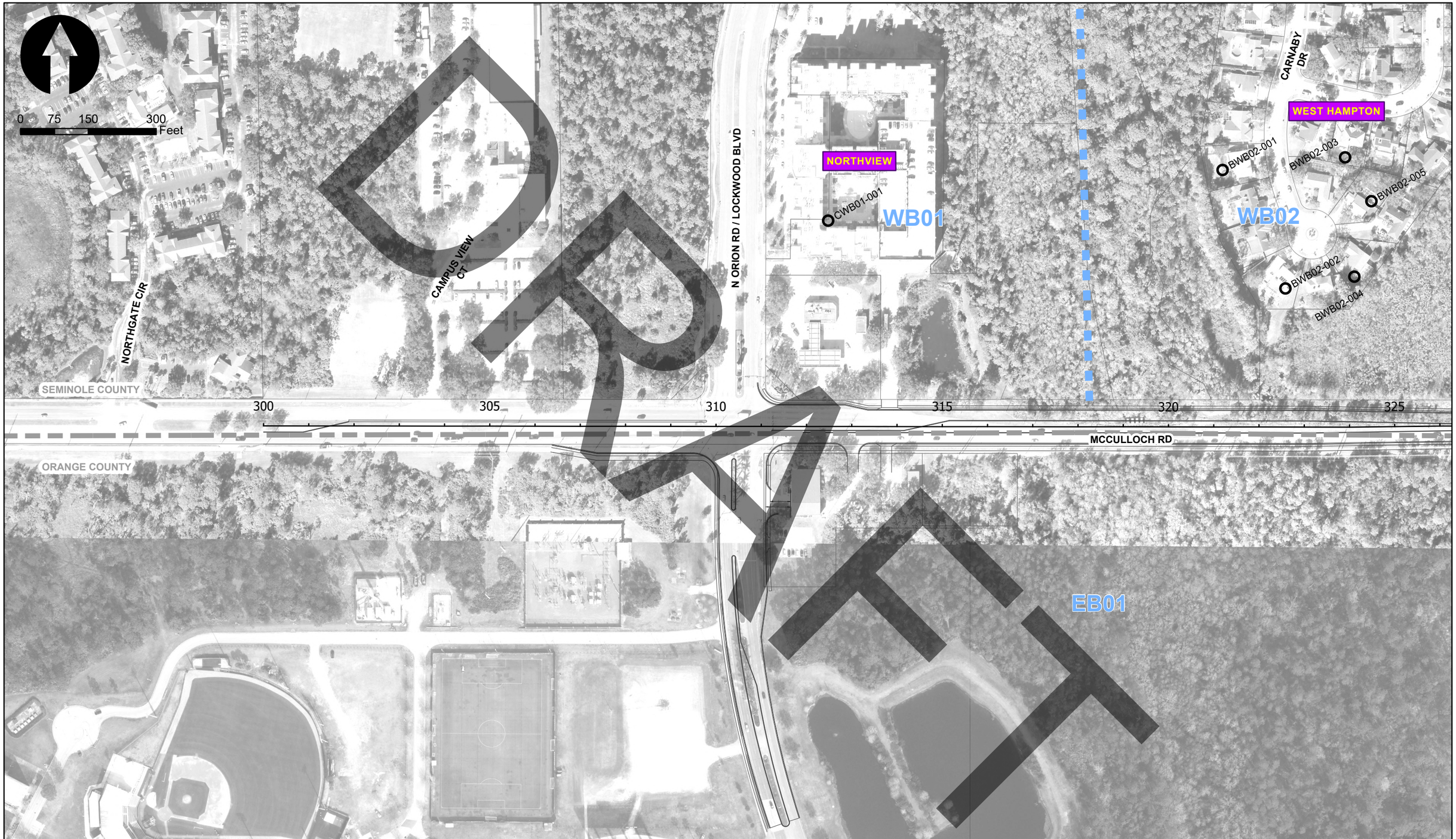
Predicted Noise Levels

Predicted Noise Levels

Common Noise Environment (CNE)	Rec. Point	No. of Units	NAC	NAC Criteria (dBA)	FDOT Criteria (dBA)	2021 Existing LAeq1h (dBA)	2048 No-Build LAeq1h (dBA)	2048 Build LAeq1h (dBA)	Increase	NAC Approach or Exceeded	Subst. Increase (>15dB(A))	Description
XX.X	Impacted Receptor											
WB01	CWB01-001	1.75	C	67	66	45.9	46.4	48.8	0.5	No	No	Northview Outdoor Pool
WB04	CWB04-016	1.75	C	67	66	52.4	52.8	55.2	0.4	No	No	Hawthorne Glen Pool

Appendix C

Project Aerials



Not Impacted
Validation Site
Common Noise Environment
Existing Privacy Walls
County Boundary

NOISE SPECIALIST
Jeff Jones, GISP Ardurra 3452 Lake Lynda Drive, Suite 200 Orlando, Florida 32817 P 407.971.8850

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION	
COUNTIES	*PROJECT NUMBER*
ORANGE SEMINOLE	Y21-832

PROJECT AERIALS

McCulloch Road
from Lockwood Road to Tanner Road

Sheet No.
1

○ Not Impacted	▪ ▪ Common Noise Environment	——— County Boundary	
○ Validation Site	⊢ Existing Privacy Walls		

NOISE SPECIALIST	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION		PROJECT AERIALS	Sheet No.
Jeff Jones, GISP Ardurra 3452 Lake Lynda Drive, Suite 200 Orlando, Florida 32817 P 407.971.8850	COUNTIES	PROJECT NUMBER	McCulloch Road from Lockwood Road to Tanner Road	2
	ORANGE SEMINOLE	Y21-832		

0 75 150 300 Feet

WB04

HAWTHORNE GLEN

BWB04-021
BWB04-017
BWB04-018
BWB04-019
BWB04-020
BWB04-022
BWB04-023
BWB04-024
BWB04-025
BWB04-026
BWB04-027
BWB04-028
BWB04-029
BWB04-030

MAIDENHAIR CV

PITCH PINE CIR

OLD LOCKWOOD RD

Existing Privacy Wall

Existing Privacy Wall

360 365 370 375

SEMINOLE COUNTY

ORANGE COUNTY

MCCULLOCH RD

Existing Privacy Wall

BEB02-007
BEB02-010
BEB02-011
BEB02-008
BEB02-006
BEB02-009
BEB02-012

EB02

WORCHESTER DR

LYMINGTON CIR

UNIVERSITY ESTATES

TANNER RD

Not Impacted
Validation Site
Common Noise Environment
Existing Privacy Walls
County Boundary

NOISE SPECIALIST
Jeff Jones, GISP
Ardurra
3452 Lake Lynda Drive, Suite 200
Orlando, Florida 32817
P 407.971.8850

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

COUNTIES	PROJECT NUMBER
ORANGE SEMINOLE	Y21-832

PROJECT AERIALS
McCulloch Road
from Lockwood Road to Tanner Road

Sheet No. 3

Appendix D

Special Land Use

Equivalent Residence Worksheets

SLU NAME	WB01.01
SLU DESCRIPTION	Lakeview Outdoor Pool
NAC	C

SLU Equivalent Residence (ER) Identification

Step	Sub-Step	Description	Value
		Average Single-Family Residence in Florida - Person Hours per Year	
A1	a	Average number of people in a single-family residence in Florida (US CENSUS, 2017-2021 data)	2.57
	b	Hours a single-family residence is available for use (24 hours x 365 days)	8,760
	c	**Residential Person-Hours per Year Available for Use**	22,513
		SLU Person Hours per Year	
A2	a	Average number of users per day *in the area evaluated* at the SLU	108
	b	Approximate daily hourly usage by each person *in the area evaluated* at the SLU (Aproximate Pool Capacity 18 * 12 hours/day * 50% average useage rate = 108 person hours)	1
	c	Number of days per week the SLU is operational	7
	d	Number of weeks per year the SLU is operational	52
	e	**Person-Hours per Year Available for Use at the SLU**	39,312
		SLU Area Evaluated Equivalent Residence (ER)	
A3	a	**Equivalent Residence (ER)**	**1.75**
		SLU Receptor Equivalent Residence (ER)	
A4	a	Identify the number of receptors evaluated at the SLU	1
	b	Individual Receptor Equivalent Residence (i.e., each receptor point evaluated is worth…)	1.75

SLU NAME	WB04.01
SLU DESCRIPTION	Hawthorne Glen Outdoor Pool
NAC	C

SLU Equivalent Residence (ER) Identification

Step	Sub-Step	Description	Value
		Average Single-Family Residence in Florida - Person Hours per Year	
A1	a	Average number of people in a single-family residence in Florida (US CENSUS, 2017-2021 data)	2.57
	b	Hours a single-family residence is available for use (24 hours x 365 days)	8,760
	c	**Residential Person-Hours per Year Available for Use**	22,513
		SLU Person Hours per Year	
A2	a	Average number of users per day *in the area evaluated* at the SLU	108
	b	Approximate daily hourly usage by each person *in the area evaluated* at the SLU (Aproximate Pool Capacity 18 * 12 hours/day * 50% average useage rate = 108 person hours)	1
	c	Number of days per week the SLU is operational	7
	d	Number of weeks per year the SLU is operational	52
	e	**Person-Hours per Year Available for Use at the SLU**	39,312
		SLU Area Evaluated Equivalent Residence (ER)	
A3	a	**Equivalent Residence (ER)**	**1.75**
		SLU Receptor Equivalent Residence (ER)	
A4	a	Identify the number of receptors evaluated at the SLU	1
	b	Individual Receptor Equivalent Residence (i.e., each receptor point evaluated is worth…)	1.75