Round Lake Road Project Development and Environment (PD&E) Study

Noise Study Technical Memorandum

May 7, 2019

LAKE COUNTY, FL
REAL FLORIDA · REAL CLOSE

Stantec

EXECUTIVE SUMMARY

This Noise Study Technical Memorandum was prepared as part of the PD&E study for Round Lake Road from Meadowland Drive in Orange County to North of State Road 44 (Chautauqua Street) in Lake County. In this area the Round Lake Road corridor is a discontinuous north-south two-lane undivided rural collector roadway. The proposed improvements will include the existing portion of Round Lake Road (Meadowland Drive to Wolf Branch Road) as well as continuing the proposed improvements on a new alignment north of Wolf Branch Road to north of State Road (SR) 44 in Lake County. The PD&E study area is in the northeast portion of Lake County to the east of Mount Dora and to the west of Sorento.

The need for proposed improvements was originally evaluated based on an area-wide traffic analysis of future projected traffic volumes along the Round Lake Road corridor, as well as evaluation of other factors including population growth, traffic on other roadways in the study area and completion of the local roadway system. With the extension of the Wekiva Parkway and completion of the interchanges, access to the surrounding communities is an important factor in the development of roadways within the study area. The Round Lake Road extension is anticipated to serve as a major north/south connection for this area.

If future design-year noise levels at noise-sensitive receptors approach, meet, or exceed the Noise Abatement Criteria established by The Federal Highway Administration (FHWA) in 23 CFR 772 or increase 15 dB(A) over existing noise levels as a direct result of the transportation improvement project, noise abatement must be considered. The FHWA Traffic Noise Modeling (TNM) Version 2.5 computer program was used to determine if noise impacts are predicted. If impacts are predicted to occur, a noise abatement evaluation is justified, and, is conducted to determine if abatement is considered reasonable and feasible for any noise-sensitive sites. The format and content of this report are based on the procedures and policy established in Part 2, Chapter 18 “Noise”, of the FDOT PD&E Manual (revised June 2017) and on the regulatory material found in 23 Code of Federal Regulations (CFR), Part 772, and entitled “Procedures for Abatement of Highway Traffic Noise and Construction Noise”, which are available from the FHWA and FDOT. This analysis was only conducted on the recommended alternative alignment.

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PROJECT OVERVIEW

1.0 PROJECT SUMMARY

Lake County is conducting a Project Development and Environment (PD&E) study to evaluate the proposed widening of Round Lake Road from Meadowland Drive to Wolf Branch Road and continuing the proposed improvements on a new alignment north of Wolf Branch Road to north of State Road (SR) 44, a length of approximately five miles. The Round Lake Road PD&E study area is in the northeast portion of Lake County bound by the Lake/Orange County Line to the south, US 441 to the west, CR 44A to the north and CR 437 to the east. In the PD&E study area, Round Lake Road is a discontinuous north-south two-lane undivided rural collector roadway with portions of the roadway facility abutting the City of Mount Dora and unincorporated Lake County. (**Figure 1- Project Location**)

1.1 Project Description

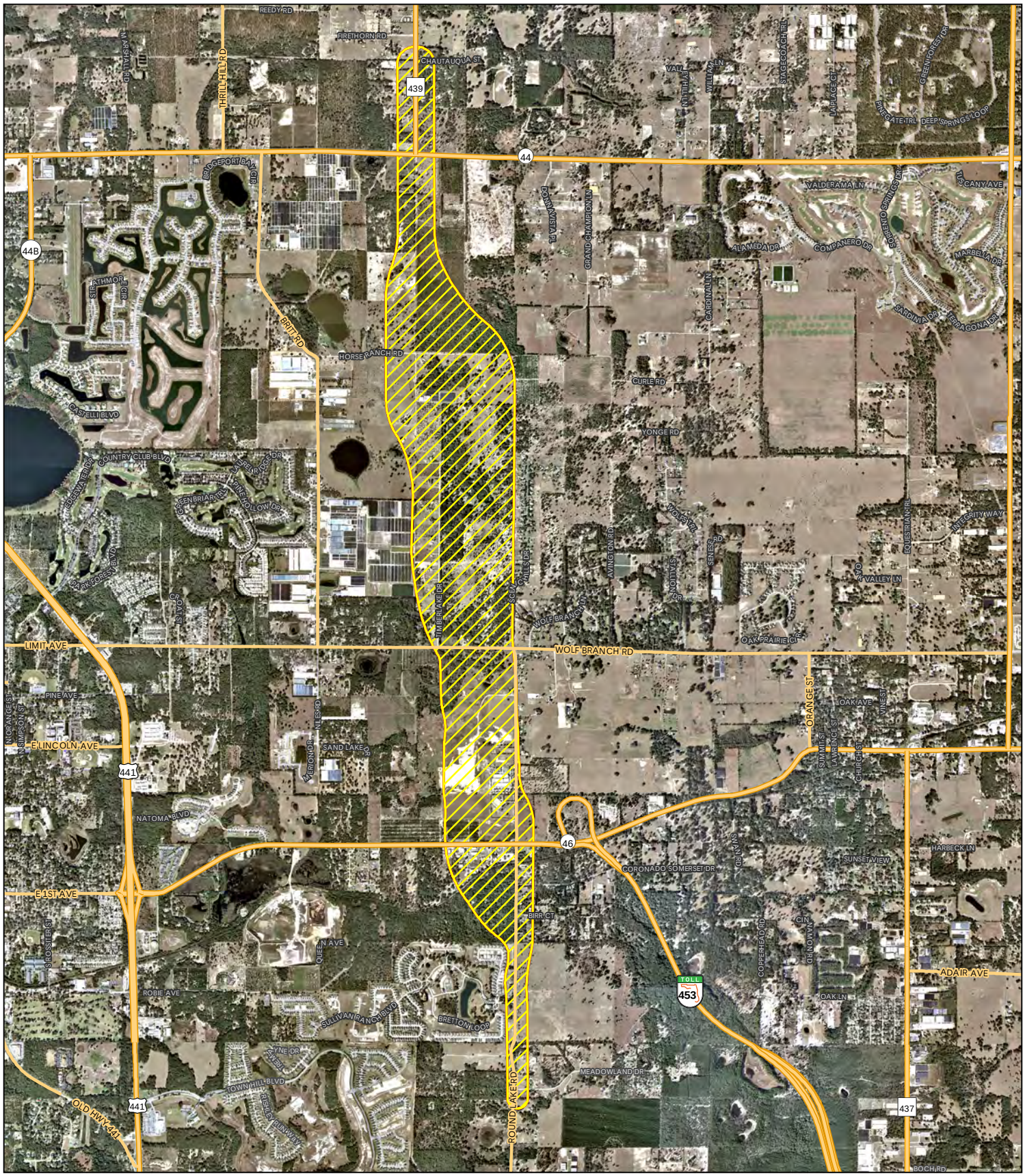
The PD&E study evaluates alternatives to develop a recommendation for a preferred alignment and improvements for Round Lake Road that include widening the existing segments and constructing new segments, resulting in a continuous four-lane divided urban section from Sullivan Ranch Boulevard to SR 44 and an improved two-lane urban section from the County line to Sullivan Ranch Boulevard, for a total length of approximately five miles. The proposed typical section consists of four through lanes separated by a grass median with bicycle lanes and a buffered sidewalk or multi-use trail on each side of the roadway. In addition, the study includes evaluation of short-term improvements to address traffic operations, multi-modal travel, and school access route needs in the study area. The project study area, as depicted in **Figure 1**, includes the following study intersections:

- Round Lake Road at Sullivan Ranch Boulevard
- Round Lake Road at SR 46
- Round Lake Road at Wolf Branch Road
- County Road (CR) 439/Riordan Road @ SR 44
- CR 439 at CR 44A

The intersection at Round Lake Road at Sullivan Ranch Boulevard will be designed as a roundabout to transition from 2 lanes to 4 lanes. The configuration of the other intersections will be evaluated and determined during project design with roundabouts being considered at additional areas.

1.2 Project Purpose

The Round Lake Road PD&E study area is located in the northeastern portion of Lake County, with the Orange County line immediately to the south and the Seminole County line about 10 miles to the east. The study corridor is in an area of Lake County that is experiencing and is anticipated to continue experiencing substantial growth in the future. Economic, land development and transportation projects of significance in this region include the 1,300-acre Wolf Branch Innovation District with industrial, office, retail, residential and institutional land uses, the $1.6 billion, 25-mile Wekiva Parkway (SR 429) construction project, the 15-mile regional multi-use Lake Wekiva Trail and the 2,112-acre Mt. Plymouth-Sorrento Community Redevelopment Area (CRA). With the anticipated completion of the Wekiva Parkway project by 2021, the enhanced infrastructure affords the opportunity to increase the economic vitality of this region.



Round Lake Round PD&E Study Area

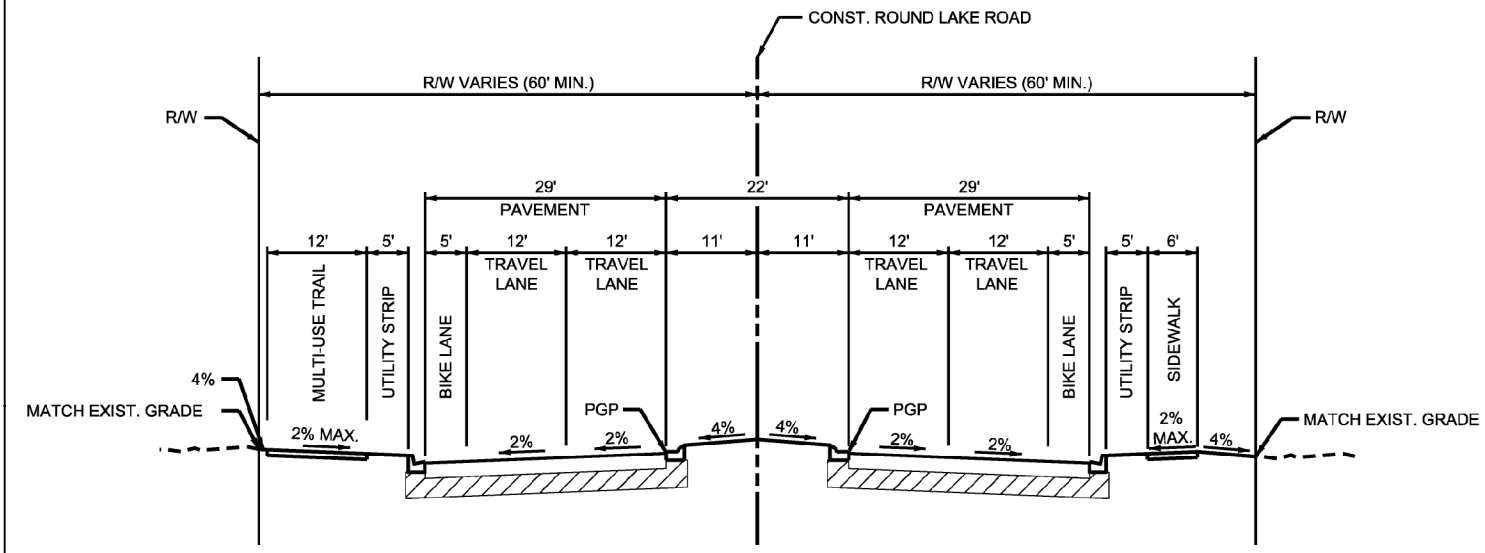
0 1,750 3,500 Feet

1 " = 3,528 '

PROJECT LOCATION

FIGURE 1

ROUND LAKE ROAD
FOUR LANE SECTION



Not to Scale	TYPICAL SECTION	FIGURE 2

2.0 METHODOLOGY

If future design-year noise levels at noise-sensitive receptors approach, meet, or exceed the Noise Abatement Criteria established by The Federal Highway Administration (FHWA) in 23 CFR 772 or increase 15 dB(A) over existing noise levels as a direct result of the transportation improvement project, noise abatement must be considered. The FHWA Traffic Noise Modeling (TNM) Version 2.5 computer program was used to determine if noise impacts are predicted. If impacts are predicted to occur, a noise abatement evaluation is justified, and, is conducted to determine if abatement is considered reasonable and feasible for any noise-sensitive sites. The format and content of this report are based on the procedures and policy established in Part 2, Chapter 18 "Noise", of the FDOT PD&E Manual (revised June 2017) and on the regulatory material found in 23 Code of Federal Regulations (CFR), Part 772, and entitled "Procedures for Abatement of Highway Traffic Noise and Construction Noise", which are available from the FHWA and FDOT.

2.1 Noise Metrics

The noise levels documented in this report are based upon the hourly equivalent sound level [Leq(h)]. The Leq(h) represents the steady-state sound level, which contains the same amount of acoustic energy as the actual time-varying sound level over a one hour period. Sound levels are measured and calculated in decibels (dB(A)), which is a unit of measure used to determine sound intensities. Leq(h) is measured on an A-weighted decibel scale (dB(A)), which is the scale that most closely approximates the response characteristics of the human ear to typical traffic noise levels.

2.2 Traffic Noise Modeling

The Federal Highway Administration's (FHWA) Traffic Noise Modeling (TNM) Version 2.5 computer program was used to determine if noise impacts are predicted. If impacts are predicted to occur, a noise abatement evaluation is justified, and, is conducted to determine if abatement is considered reasonable and feasible for any noise-sensitive sites. This model is the latest version of TNM and was used as required by 23 CFR 772. The model estimates the acoustic intensity at noise receptor sites based upon the roadway design and is influenced by vehicle speed and type. TNM 2.5 predicted noise levels are reported in dB(A) Leq(h). Noise receptor sites were identified throughout the project corridor. Information that was loaded into the noise model to predict existing and projected noise levels includes: roadway geometry; vehicle types, volumes, and speeds; existing barrier and buffer information, propagation path; and, climatic conditions. The results of the validation are shown in Section 3.1.

Noise levels were modeled for the proposed project within the noise sensitive areas (as shown on Figure XX, Noise Sensitive Areas Map) for the future build conditions in the design year 2040 (TNM results are shown in Table X). Chapter 18 of the FDOT PD&E Manual states that "a traffic noise impact occurs when the modeled future highway traffic noise levels approach or exceed the Noise Abatement Criteria (NAC). A traffic noise impact also occurs when modeled future highway traffic noise levels substantially exceed the existing highway traffic noise level, even though the modeled levels may not exceed the NAC. FDOT has determined that the NAC is approached when it is within 1 dB(A) of the appropriate NAC and that a substantial increase occurs when the increase over existing conditions (measured or predicted) is 15dB(A) or greater." For the Noise Sensitive Areas involved in this study, if traffic noise levels exceed or approach the NAC for Category B of 66 dB(A), impacts are said to occur.

2.3 Traffic Data

To predict traffic noise levels and assess impacts, the traffic characteristics that would yield the highest traffic noise impacts is used. The highest traffic volumes and highest traffic speeds will (typically) create the noisiest conditions. Level of Service (LOS) C volumes representing the peak hourly traffic volumes are used, unless traffic analysis demonstrates that this condition will not be reached (LOS C volumes were obtained from the generalized tables of FDOT's Level of Service Handbook (December 2012)). If this is the case, then demand peak hour volumes are to be used. Based upon the design traffic forecasted for the design year of 2040 from the Round Lake Road Design Traffic Memorandum prepared for this project, the roadway is expected to operate at an acceptable level of service and not reach LOS C volumes, so the Demand Peak Hour Volumes were used to model the build (2040) volumes for noise projections. Traffic speeds used were the proposed speed limits for the 2040 Design.

2.4 Noise Abatement Criteria

The FHWA has established seven land use categories that are used to assess the impact of noise on these activities, of which five of these have Noise Abatement Criteria (NAC) to consider. If predicted noise levels approach or exceed the NAC levels, or a substantial noise increase is predicted, noise abatement must be considered. A substantial noise increase occurs when the existing noise level is predicted to be exceeded by 15 dB(A) or more by the project. FDOT defines 'approach' as within 1.0 dB(A) of the FHWA criteria.

Noise sensitive receptor sites include areas where frequent exterior human use occurs. Included are lands which require quiet (Activity Category A), residential areas (Activity Category B), a variety of non-residential land uses such as parks, schools, places of worship, and medical facilities (Activity Category C), and commercial properties with areas of exterior use such as restaurants, hotels, and other places of business (Activity Category E) (Table 1 - Noise Abatement Criteria [NAC]). Activity Category D includes noise sensitive sites that have interior uses but no exterior activities such as hospitals, libraries, recording studios, television studios, and public meeting rooms. Activity Categories F includes developed lands that are not sensitive to highway traffic noise such as agriculture, airports, and industrial and retail facilities. Agriculture facilities were noted within the project area as Activity Category F land uses, which do not require a noise analysis as stipulated in 23 CFR 772. Undeveloped vacant lands (Activity Category G) were also noted in the project corridor. There is not an NAC level for this category either, though FDOT must document highway traffic noise levels for all NAC categories and provide it to local officials.

Table 1: Noise Abatement Criteria

NOISE ABATEMENT CRITERIA [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.

Part 2, Chapter 17 of PD&E Manual (5/24/2011) (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.

For reference, the relationship between typical noise levels and common indoor/outdoor activities is provided in **Table 2**.

Table 2: Typical Noise Levels

COMMON OUTDOOR ACTIVITIES	NOISE LEVEL dB(A)	COMMON INDOOR ACTIVITIES
	---110---	Rock Band
Jet Fly-over at 1000 ft		
	---100---	
Gas Lawn Mower at 3 ft		
	---90---	
Diesel Truck at 50 ft, at 50 mph		Food Blender at 1 m (3 ft)
	---80---	Garbage Disposal at 1 m (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		Library
	---30---	Bedroom at Night, Concert Hall (Background)
Quiet Rural Nighttime		
	---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.

2.5 Noise Abatement Measures

The FHWA requires that noise abatement measures be considered for a proposed project when the predicted noise levels approach, equal, or exceed noise abatement criteria, or, will increase substantially over existing levels. The most common and effective noise abatement measure is the construction of a noise barrier. As noted in 23 CFR 772.13(c)(1), the FHWA requires that, at a minimum, FDOT shall consider noise abatement in the form of a noise barrier. FHWA also considers the following activities as acceptable noise abatement measures.

2.5.1 Alignment Selection

Alignment selection involves the orientation of the project location in such a way as to minimize impacts and costs. For noise abatement, alignment selection is primarily a matter of (a) positioning the roadway at a sufficient distance from the noise-sensitive sites, and, (b) positioning the roadway at a location where other noise abatement techniques, such as a noise abatement wall, could be implemented.

2.5.2 Property Acquisition

Property acquisition for buffer zones alone is considered to be costly. Buffer zones can provide relief from noise impacts by creating added distance between the noise generator and the noise receptor. Methods of applying land use controls to maintain and establish buffered areas through zoning may be established by local jurisdiction.

2.5.3 Land Use Controls

One of the most effective noise abatement measures is the proper implementation of land use controls to minimize future noise impacts. Local jurisdictions with zoning control can implement policies to limit the growth on noise-sensitive land uses adjacent to the roadway.

2.5.4 Traffic Management

Traffic management measures that limit vehicle type, speed, volume, and time of operations can be effective noise abatement measures.

2.5.5 Noise Barriers

Noise barriers reduce noise levels by blocking the sound path between a roadway and noise-sensitive sites. To be effective, barriers have to be continuous, sufficiently long and tall, shield a reasonably sized impacted area or a number of people, and provide appreciable noise level reduction. Noise barriers are to be modeled at locations where noise increases exceeded abatement criteria during the design year and evaluated for feasibility and reasonableness. A wide range of factors are used to evaluate noise abatement measures as reasonable and feasible. Feasibility deals with engineering considerations such as the ability to construct a barrier using standard construction techniques and methods to provide a reduction of at least 5 dB(A) to an impacted receptor site. Additionally, in order for a noise barrier to be considered acoustically feasible, at least two impacted receptor sites must achieve a 5 dB(A) reduction or greater.

When a noise abatement measure such as a sound barrier is determined to be feasible, the reasonableness is then evaluated. Three reasonableness factors must be collectively achieved in order for the noise abatement measure to be deemed reasonable: the achievement of the noise reduction design goal (7 dB(A) for at least one receptor per FDOT criteria), the cost effectiveness of the noise abatement measure, and the

consideration of the viewpoints of the benefited property owners and residents. When examining the cost reasonableness of a modeled noise barrier design for a residential area, the upper limit of $42,000 per benefited receptor has been set by FDOT using the standard construction cost of $30.00 per square foot. A benefited receptor is defined as a noise sensitive site that will obtain a minimum of 5 dB(A) of noise reduction as a result of a specific noise abatement measure whether or not they are predicted as having a noise impact. Only benefited receptor sites can be included in the calculation of a barrier being cost reasonable.

To effectively reduce the noise coming around its ends, a barrier should be at least as long as eight times the distance from the home or receiver to the barrier, with the receiver located at the mid-point of the barrier. Openings in noise barriers for driveway connections or intersecting streets destroy their effectiveness. As noted in 23 CFR 772.13(c)(1), the FHWA requires that, at a minimum, FDOT shall consider noise abatement in the form of a noise barrier.

3.0 TRAFFIC NOISE ANALYSIS

3.1 Noise Model Validation

The purpose of field measuring existing traffic noise levels is to; (1) ensure that traffic noise is the main source of noise, and to validate the TNM input values and verify that the model accurately predicts the existing traffic noise based upon the current conditions, and (2) to estimate existing ambient noise levels along the new alignment section of the project for use in determining impacts when compared to predicted future levels. In order to collect data required, field monitoring was conducted by four noise monitoring specialists in accordance with the FHWA's guidance document "Measurement of Highway-Related Noise" on September 19, 2018. Larson Davis SoundTrack LxT Noise Logging Dosimeters were used to collect sound levels at the location. The average sound level over a one-hour period is considered the Level Equivalent Hourly (Leq(h)) and is used in the noise modeling process. The dosimeter was calibrated on site just prior to the onset of sampling to ensure accuracy and mounted on a tripod at a height of approximately 5 feet which is standard and equivalent to the average height of the human ear.

During the field validation event, noise readings were taken 3 separate times at 15-minute intervals during both the morning (10:00 – 11:30 AM) and afternoon (1:00 – 2:30 PM), periods of non-peak traffic activity. Two locations were used for the collection of noise levels for the purpose of model validation: site 1 was just north of the entrance to the Sullivan Ranch subdivision, beyond the lane to turn into the subdivision, while site 2 was further north on Round Lake Road north of the Round Lake Charter School across the street from the residence at 31512 Round Lake Road. The meter was placed 20 feet from the edge of the pavement in a grassy area of the right of way. The location provided clear sight lines to observe traffic in both directions of the roadway. Additional data recorded included all input parameters necessary to run the computer model such as distance to the edge of the nearest travel lane, roadway width, paved shoulder widths, and local terrain.

In order to gauge traffic volumes during the monitoring periods, traffic counts of the number and type of vehicles traveling in each direction at the monitoring station were recorded. Traffic counts were taken simultaneously during each of the 3 noise recording events. Vehicles were categorized as either 1) passenger cars or light trucks, 2) medium trucks (box or panel trucks with one double-axle) 3) buses, 4) heavy trucks (two or more double-axles) and 5) motorcycles. Field notes were collected to record general weather and environmental conditions, and all unusual or otherwise noteworthy sound events. Traffic speeds for passing vehicles were determined by the use of a radar gun and recording the resulting speeds during timed monitoring runs.

The speeds used in the TNM modeling program for the model validation were based on the average observed speeds of 45 mph for both cars and trucks during the data collection.

Design files were used to establish the input parameters for modeling the roadway, including vertical and horizontal geometry and ground elevations.

The TNM model was validated at the field sampling location along Round Lake Road in two locations as described previously. Field recorded noise levels varied slightly from TNM predictions. As seen in Table 3,

Table 3: TNM Validation Results (dB(A))

Field Recording Station	Run info	Field Recorded	TNM Predicted	Δ	FHWA/FDOT Limit	Validate
Location 1	AM Run 1	66.0	65.2	0.8	3	YES
	PM Run 1	67.6	68.0	0.4	3	YES
Location 2	AM Run 1	63.4	61.4	2.0	3	YES
	PM Run 1	65.1	63.3	1.8	3	YES

3.2 Noise Sensitive Sites

A noise-sensitive receptor is defined as "any property (owner occupied, rented, or leased) where frequent exterior human use occurs." The project was broken up into geographic noise sensitive areas to facilitate the analysis of traffic related noise impacts. Three (3) noise sensitive areas that have the potential to be impacted by the project were identified and are shown on the Noise Sensitive Areas Map, Figure 3. The potentially impacted noise-sensitive sites identified for the project study area consisted only of single family residences. The noise sensitive areas within the study area present a single type of site to model within TNM: single family residences which were modeled using a point to represent each site.

Following is a description of each Noise Sensitive Area:

Noise Sensitive Area 1

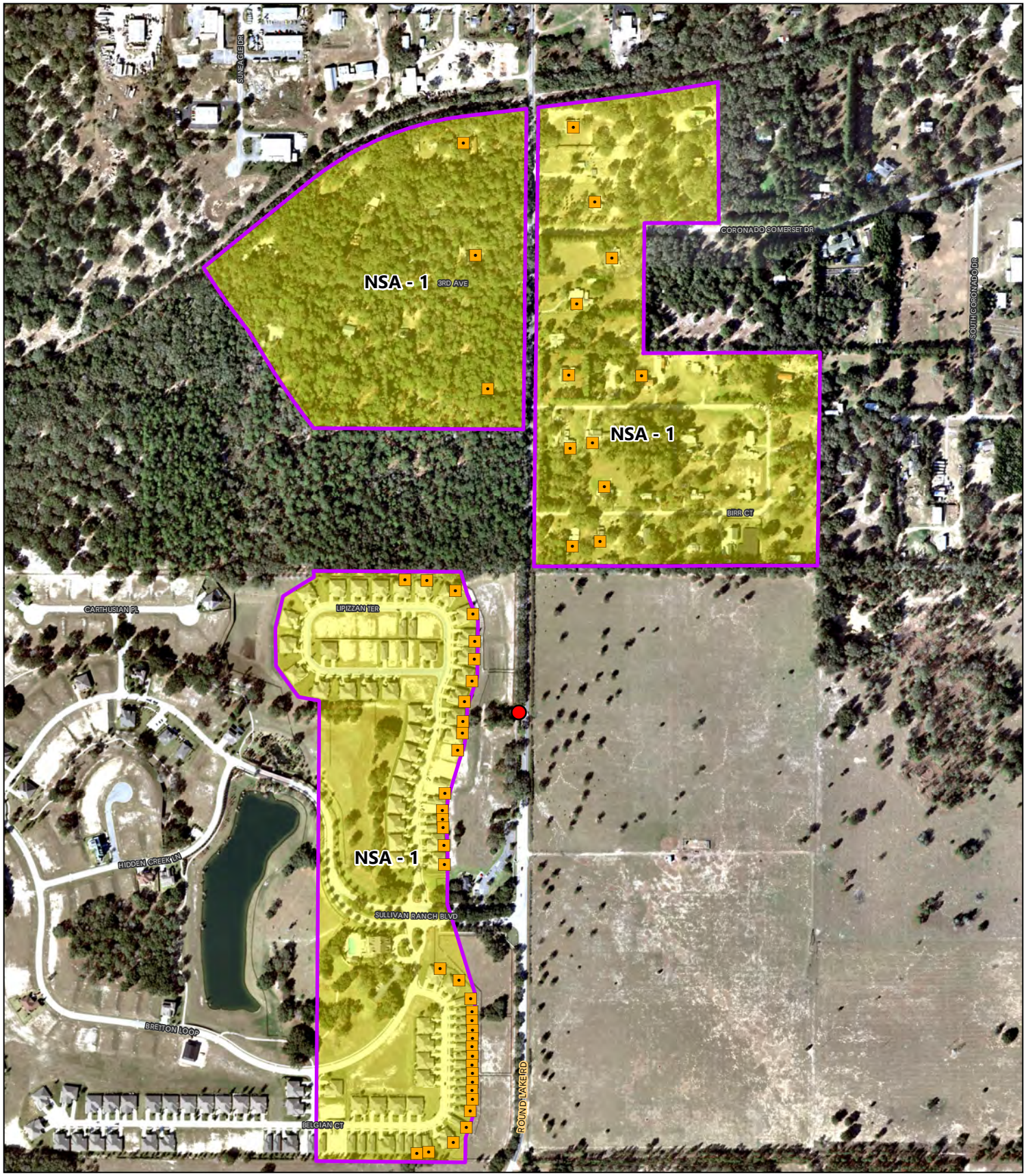
This area contains the residences within Sullivan Ranch and those along both sides of Round Lake Road between Sullivan Ranch and SR 46. This includes 115 residences that were placed into the model.

Noise Sensitive Area 2

This area contains the residences along both sides of Round Lake Road between SR 46 and Wolf Branch Road, the Round Lake Charter School, and Real Life Christian Church. This area contains 11 residences that were modeled for potential noise impacts.

Noise Sensitive Area 3

This area contains the residences in Wolf Branch Estates and Scenic Hills, as well as those on Horse Ranch Road. This area contains 57 residences that were analyzed for noise impacts.

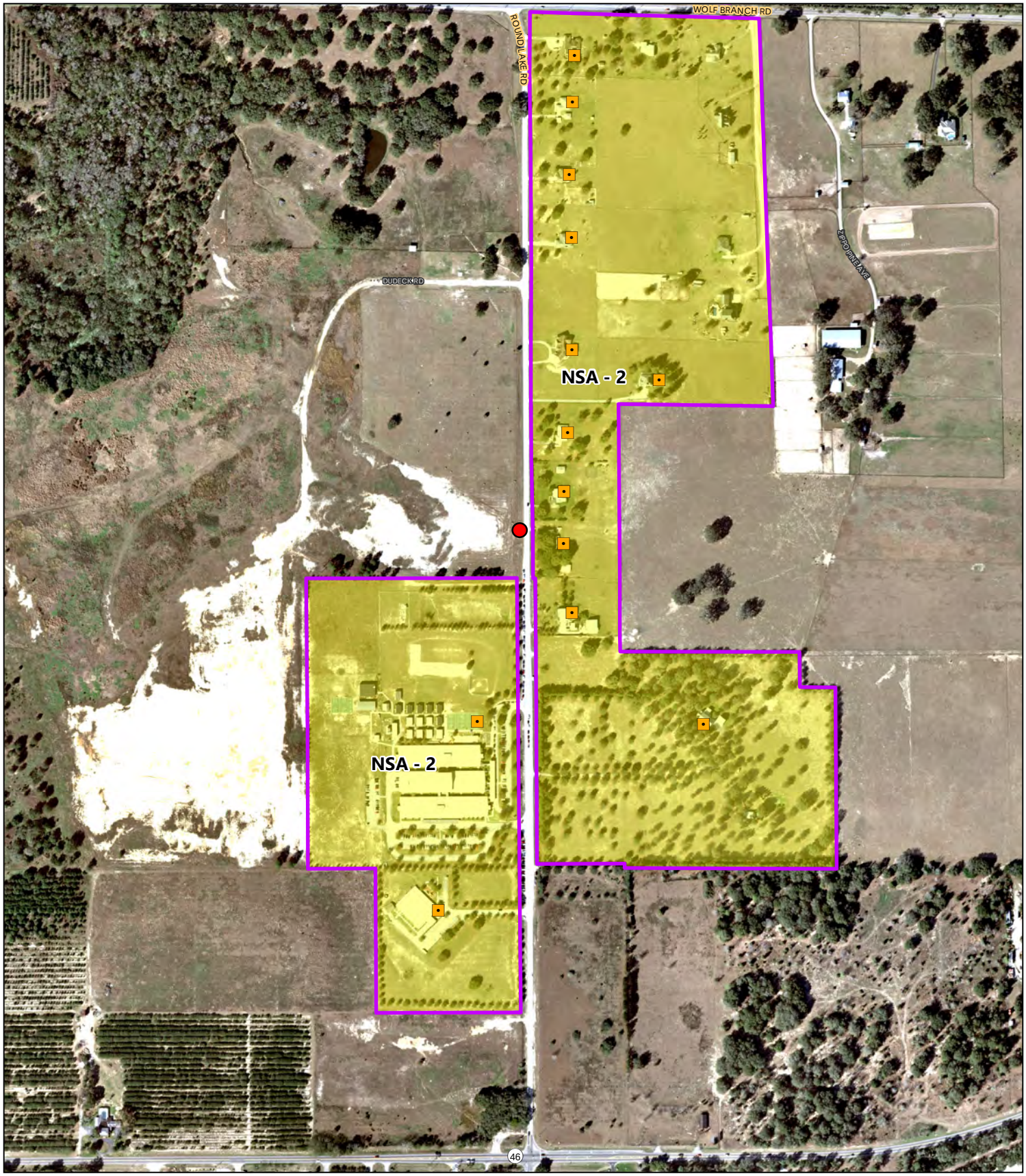


Noise Sensitive Areas Noise Meter Locations Noise Sensitive Receptors

0 300 600 Feet
1 " = 600 '

NOISE SENSITIVE AREAS

Figure 3A

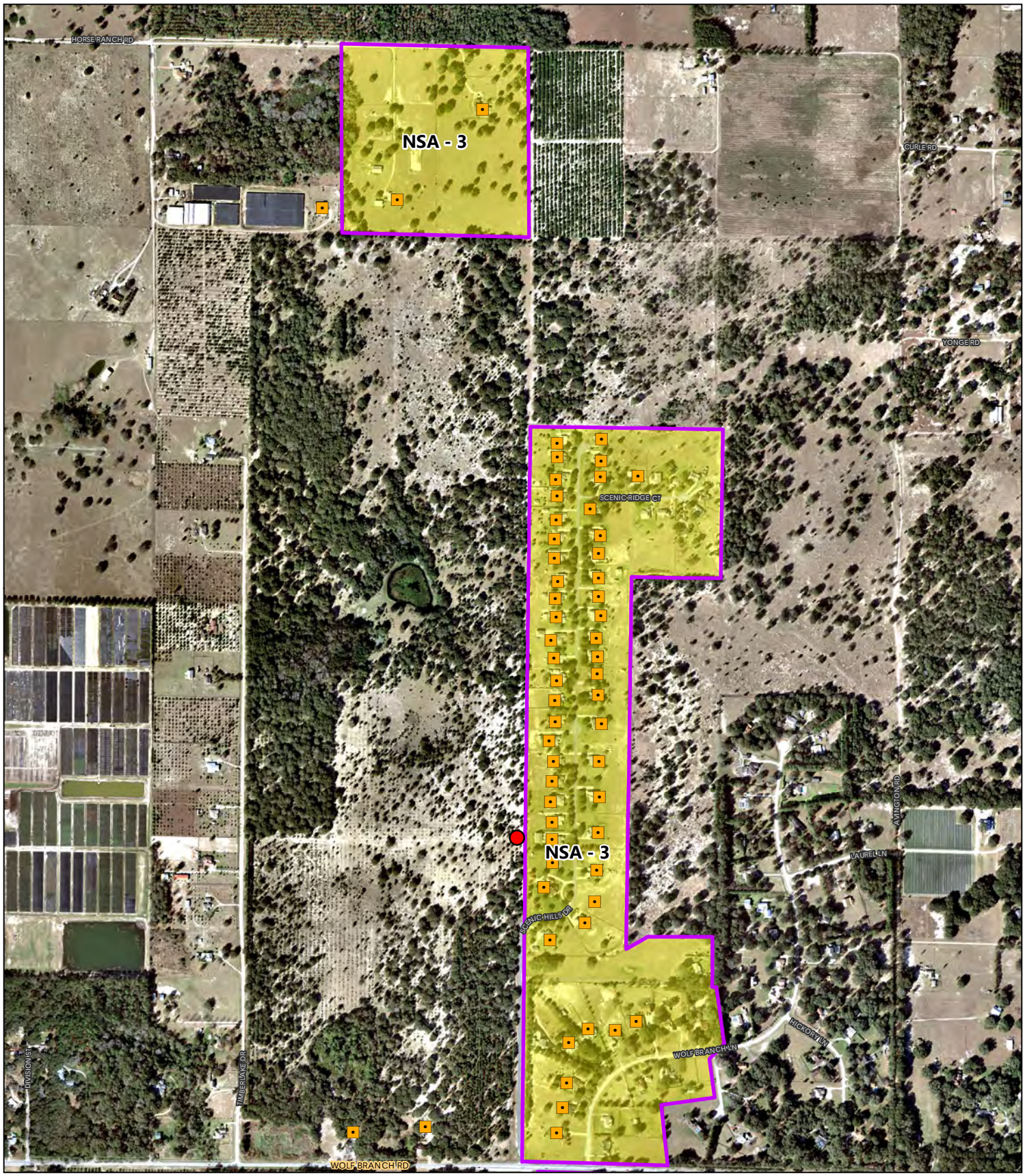


Noise Sensitive Areas Noise Meter Locations Noise Sensitive Receptors

0 300 600 Feet
1 " = 600 '

NOISE SENSITIVE AREAS

Figure 3B



Noise Sensitive Areas Noise Meter Locations Noise Sensitive Receptors

0 925 Feet
1 " = 925 '

NOISE SENSITIVE AREAS

Figure 3C

3.3 Existing Noise Levels

For projects on a new alignment, noise measurements are taken to determine the existing noise levels since existing traffic noise cannot be modeled using TNM. As with the measurements taken for the noise model validation, these measurements were taken in accordance with both FHWA and FDOT Noise Policy. Measurements were collected along the proposed new portion of the corridor (along the new alignment within the open pasture west of Scenic Hill as shown on Figure 5, the Noise Measurement Map). The land use along the proposed new alignment consists the residences in Noise Sensitive Area 3, and of undeveloped land (which does not have a NAC Activity Leq(h)).

Existing noise levels were calculated for those areas along the current alignment of Round Lake Road using TNM. Traffic data used for this modeling was based upon the traffic counts taken during validation events. Representative receptors were used rather than modeling each existing residence.

The field measurements and TNM predicted existing noise levels are shown in Table 4 below:

Table 4: Existing Noise Levels

Location	Noise Measurement or TNM Model Predicted Level	Noise Level in dB(A)
Scenic Hills Area	Noise Meter	43.1
Round Lake Road north of Sullivan Ranch	TNM Predicted	46.4
Round Lake Road north of Charter School	TNM Predicted	55.1
Belgian Court (Sullivan Ranch)	TNM Predicted	51.7
Lipizzan Terrace	TNM Predicted	48.6

4.0 PREDICTED NOISE LEVELS

4.1 Noise Impact Analysis

The three Noise Study Areas consist of receptors that fall exclusively under NAC Category B (residential). Based upon the results of the TNM modeling for existing conditions, there are no receptors that approach or exceed the NAC for this category of 66 dB(A).

Future Noise levels were also predicted for the Build conditions. The noise levels are not predicted to approach or exceed the NAC of 66 dB(A) at any location along the corridor. However, a Significant Increase (> 15 dB(A)) over the existing levels is predicted at several receptors at the northern end of the Scenic Hills residential area.

The Noise Analysis Maps (Figure 6) show the receptors in each noise sensitive area in relation to the proposed project alignment. The 66 dB(A) contour lines are depicted on the map for the purposes of planning. The 66 dB(A) line, which corresponds to Activity Categories B and C, falls approximately 75 feet from the edge of pavement in Noise Sensitive Area 1 and approximately 85 feet from the edge of pavement in Noise Sensitive Areas 2 and 3.

Noise Sensitive Area 1

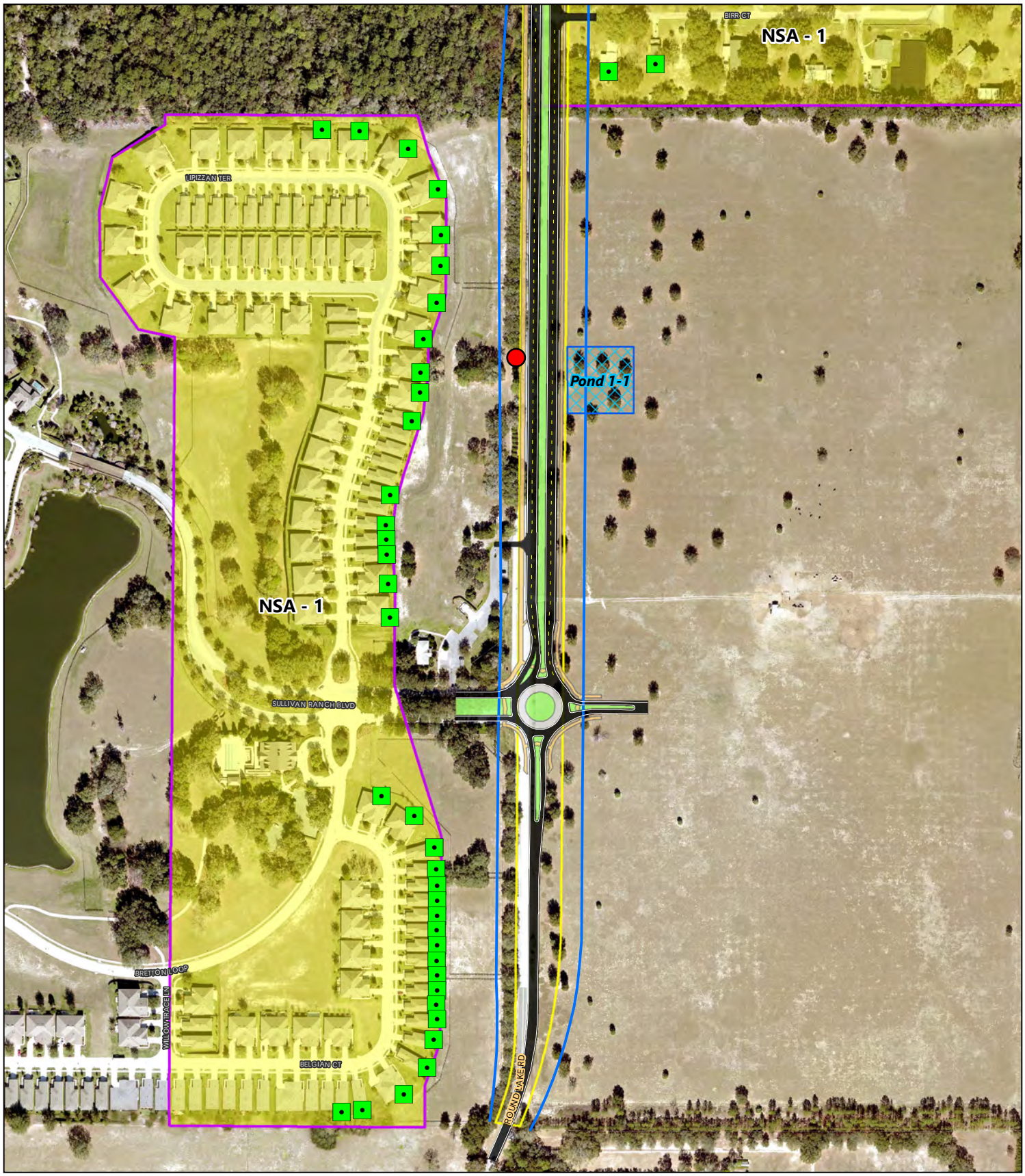
This area represents Activity Categories B and has no sites predicted to be impacted in the Existing Year Model or the Build (Design Year 2040) Model. The predicted existing noise levels for this NSA range from 41.3 dB(A) to 61.6 dB(A). The predicted Build noise levels for this NSA range from 41.3 dB(A) to 63.8 dB(A). No receptors are predicted to approach or exceed the NAC of 66 dB(A) or achieve a Significant Increase (> 15 dB(A) over existing levels.

Noise Sensitive Area 2

This area represents Activity Category B and has no sites predicted to be impacted in the Existing Year Model or the Build (Design Year 2040) Model. The predicted existing noise levels for this NSA range from 48.4 dB(A) to 55.1 dB(A). The predicted Build noise levels for this NSA range from 52.3 dB(A) to 61.6 dB(A). No receptors are predicted to approach or exceed the NAC of 66 dB(A) or achieve a Significant Increase (> 15 dB(A) over existing levels.

Noise Sensitive Area 3

This area represents Activity Category B and has no sites predicted to be impacted in the Existing Year Model or the Build (Design Year 2040) Model. The field measured existing noise was 43.1 dB(A). The predicted Build noise levels for this NSA range from 42.7 dB(A) to 58.5 dB(A). No receptors are predicted to approach or exceed the NAC of 66 dB(A) though five receptors are predicted to achieve a Significant Increase (> 15 dB(A)) over existing levels. Because of this predicted impact, noise abatement was considered for this area.

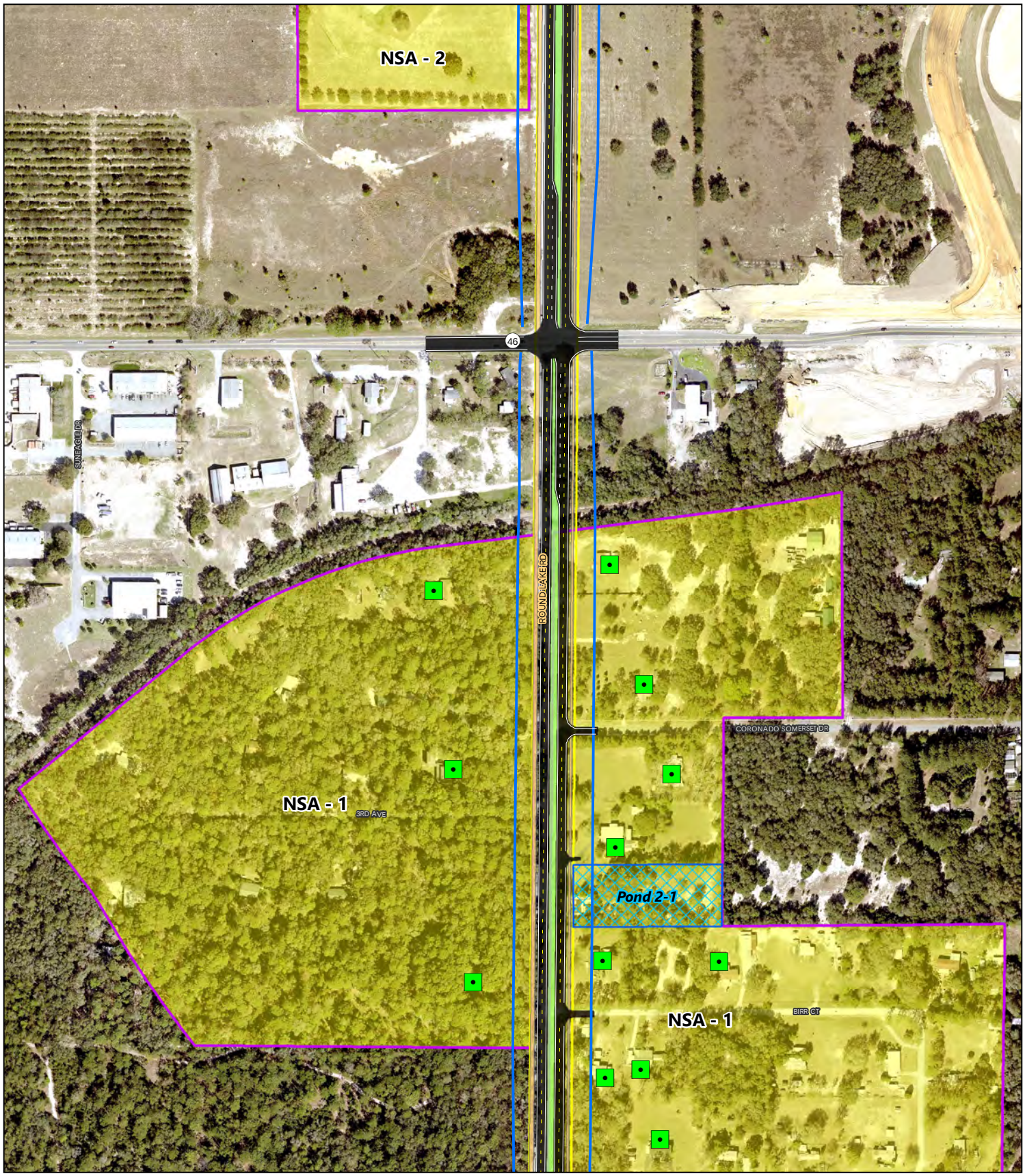


Noise Sensitive Areas | Proposed Right of Way | 66 dB Contour Line | Noise Meter Locations | Receptors Not Impacted | Receptors Impacted

0 350 Feet
1 " = 350 '

NOISE ANALYSIS

Figure 4A

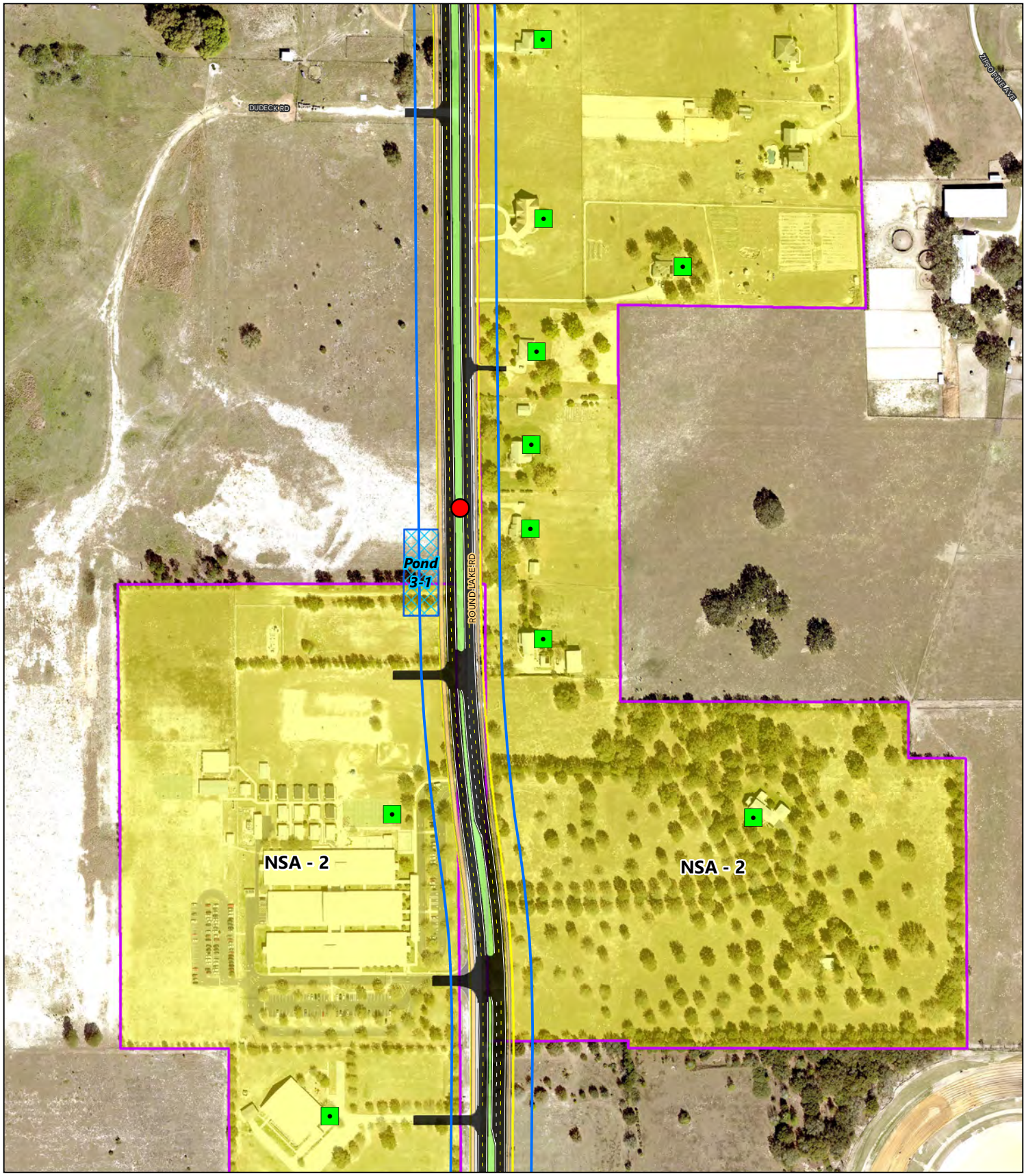


Noise Sensitive Areas | Proposed Right of Way | 66 dB Contour Line | Noise Meter Locations | Receptors Not Impacted | Receptors Impacted

0 375 Feet
1 " = 375 '

NOISE ANALYSIS

Figure 4B



Noise Sensitive Areas | Proposed Right of Way | 66 dB Contour Line | Noise Meter Locations | Receptors Not Impacted | Receptors Impacted

0 375 Feet
1 " = 375 '

N

NOISE ANALYSIS

Figure 4C

Noise Sensitive Areas | Proposed Right of Way | 66 dB Contour Line | Noise Meter Locations | Receptors Not Impacted | Receptors Impacted

0 375 Feet
1 " = 375 '

NOISE ANALYSIS

Figure 4D

Noise Sensitive Areas | Proposed Right of Way | 66 dB Contour Line | Noise Meter Locations | Receptors Not Impacted | Receptors Impacted

0 375 Feet
1 " = 375 '

N

NOISE ANALYSIS

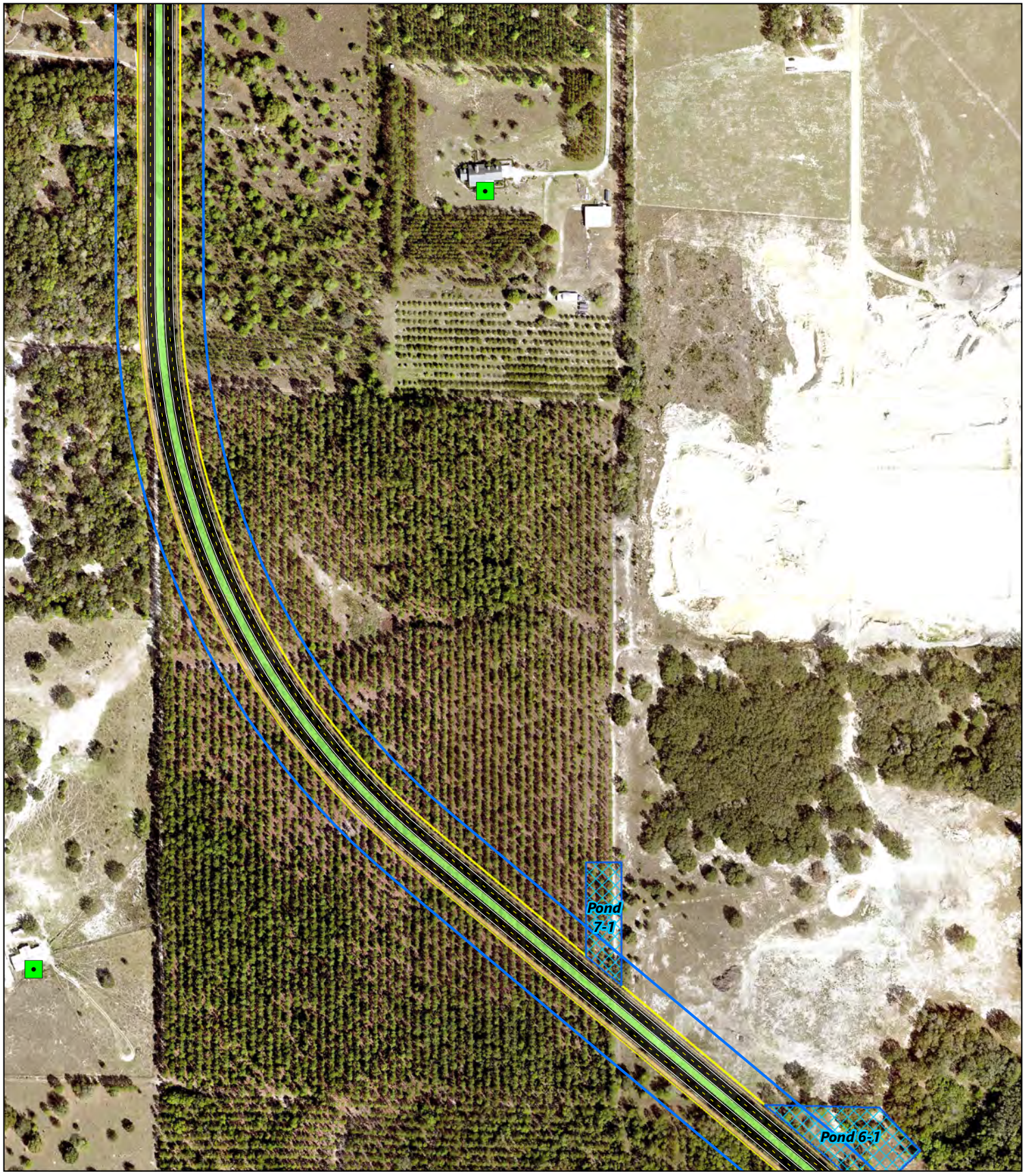
Figure 4E

Noise Sensitive Areas | Proposed Right of Way | 66 dB Contour Line | Noise Meter Locations | Receptors Not Impacted | Receptors Impacted

0 375 Feet
1 " = 375 '

NOISE ANALYSIS

Figure 4F



Noise Sensitive Areas | Proposed Right of Way | 66 dB Contour Line | Noise Meter Locations | Receptors Not Impacted | Receptors Impacted

0 375 Feet
1 " = 375 '

NOISE ANALYSIS

Figure 4G

Noise Sensitive Areas | Proposed Right of Way | 66 dB Contour Line | Noise Meter Locations | Receptors Not Impacted | Receptors Impacted

0 375 Feet
1 " = 375 '

N

NOISE ANALYSIS

Figure 4H

4.2 Noise Abatement Analysis

Noise abatement was considered in the form of sound barriers for NSA 3. The results of the barriers are shown below in the Table 5. Shorter noise barrier configurations did not meet the design goal (2 or more receptors receiving at least 5 dB(A) of benefit with at least one receptor receiving greater than 7 dB(A) of benefit). A barrier would have to be a minimum or 18 feet tall to meet the design goal, and none of the configurations modeled were cost feasible (less than $42,000 per benefited receptor). The best case scenario was for a 22-foot tall ground mounted barrier that was 4,215 feet long, which would provide benefit (at least 5 dB(A) insertion loss) to all five of the impacted receptors and would benefit an additional 19 receptors. At an average cost of $115,903 per benefited receptor, this barrier is significantly higher than the $42,000 per benefited receptor cost threshold. An additional 43 receptors would have to be benefited for this barrier to meet the cost threshold.

Table 5: Noise Barrier Analysis

Barrier Type	Height (feet)	Length (feet)	# of Impacted Receptor	# of Impacted Benefited Receptor	# of Non-Impacted Benefited Receptor	Total # of Benefited Receptors	Avg. Noise Reduction (dBA)	Cost ($30.00 per square foot)	Average Cost per Benefited Receiver	Comment
Ground	8	4,215	5	0	0	0	n/a	$1,011,519	n/a	Does not provide for any benefited receptors
Ground	14	5,620	5	0	11	11	3.3	$2,360,210	$214,564	Does not meet design goal, not cost reasonable
Ground	18	5,620	5	1	12	13	4.0	$2,697,383	$207,491	Not cost reasonable
Ground	18	2,460	5	5	0	5	3.9	1,327,601	$265,520	Not cost Reasonable
Ground	22	5,620	5	5	25	30	5.6	$3,708,902	$123,630	Not cost Reasonable
Ground	22	4,215	5	5	19	24	5.0	$2,781,676	$115,903	Not cost Reasonable
Ground	22	2,460	5	5	7	12	4.7	$1,622,264	$135,189	Not cost Reasonable

5.0 CONCLUSION

Noise Sensitive Area 3 is the only area predicted to have any noise impacts (5 receptors with a greater than 15 dB(A) increase) as a result of the proposed project. None of the noise barrier configurations analyzed met the design goal (at least 2 benefited receptors with a 5 dB(A) insertion loss, at least one receptor receiving greater than a 7 dB(A) insertion loss) and was cost reasonable ($42,000 per benefited receptor). As a result, there appears to be no apparent solutions available to mitigate the noise impacts at Noise Sensitive Area 3.

6.0 CONSTRUCTION NOISE AND VIBRATION

Construction activities for any of the proposed improvements will have temporary noise impacts for those residents and visitors within the immediate vicinity of the project. Noise and vibration impacts will be caused by heavy equipment movement and construction activities such as earth moving and vibratory compaction. Noise control measures should be implemented according to the FDOT's Standard Specifications for Road and Bridge Construction to minimize or eliminate some potential construction noise and vibration impacts. Section 335, F.S., exempts FDOT from compliance with local ordinances. FDOT policy is to follow the requirement of local ordinances to the extent that is reasonable. However, should unanticipated noise or vibration issues arise during the construction process, the Project Engineer will investigate additional methods of controlling these impacts. No construction /vibration sensitive sites were identified during the noise study.

7.0 COMMUNITY COORDINATION

The draft NSR will be made available to the public at the final Public Hearing held in May 2019 at the Board of County Commissioners Chambers in Tavares, Florida.