ATTACHMENT 9

Noise Analysis

Coral Reef Commons

NOISE STUDY REPORT

Habitat Conservation Plan for the Proposed Coral Reef Commons Development
Miami-Dade County, FL

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1.0 Project Location and Description

Ram Development Company is proposing to develop portions of the approximately 138 acre property, formerly known as the University of Miami South Campus, located in unincorporated Miami-Dade County. The property is bounded by SW 152 Street on the north, SW 124 Avenue on the east, US Coast Guard lands on the south and US Government lands on the west (see **Figure 1).** 74 acres of the proposed Coral Reef Commons development are zoned as Low Medium Density Residential and 64 acres are zoned as Business and Office. The southern portion of the subject property will be the Low Medium Density Residential land use while the northern portion represents the Business and Office land use. Of the 138 acres, 43.36 acres are proposed to be preserved with the remaining 85.35 acres being developed by the ultimate build-out. The proposed site will be surrounded by Natural Forest Community preserves and hammocks. The Coral Reef Commons development program accommodates up to 900 residential units, a public school, a public library and 370,000 square feet of shopping center retail and business uses.

2.0 Procedure

This Noise Study Report represents the preliminary analysis of the probable traffic noise impact impacts for the Coral Reef Commons development. This analysis is consistent with the current FDOT *Project Development & Environment Manual (PD&E)* as well as Title 23 Code of Federal Regulations, Part 772 (23 CFR 772). The FDOT *PD&E Manual* establishes official policy on highway noise.

In accordance with the FDOT *PD&E Manual*, the FHWA Traffic Noise Model® (TNM v.2.5) was used to predict future year 2025 hourly equivalent traffic noise levels, $L_{eq(h)}$, for the noise-sensitive receptor locations in the vicinity of the proposed development. This document represents the preliminary analysis of the probable traffic noise impacts within the development as they relate to the proposed traffic noise impact abatement measures.

3.0 Characteristics of Noise

Noise is generally defined as unwanted sound. It is emitted from many natural and man-made sources. Highway traffic noise is usually a composite of noises from engine exhaust, drive train, and tire-roadway interaction.

The magnitude of noise is usually described by a ratio of its sound pressure to a reference sound pressure, which is usually twenty micro-Pascals (20μPa). Since the range of sound pressure ratios varies greatly – over many orders of magnitude, a base-10 logarithmic scale is used to express sound levels in dimensionless units of decibels (dB). The commonly accepted limits of detectable human hearing sound magnitudes is between the threshold of hearing at 0 decibels and the threshold of pain at 140 dB.

Sound frequencies are reported in units of Hertz (Hz), which correspond to the number of vibrations per second of a given tone. A cumulative 'sound level' is equivalent to ten times the base-10 logarithm of the ratio of the sum of the sound pressures of all frequencies to the reference sound pressure. To simplify the mathematical process of determining sound levels, sound frequencies are grouped into ranges, or 'bands.' Sound levels are then calculated by adding the cumulative sound pressure levels within each band – which are typically defined as one 'octave' or '1/3 octave' of the sound frequency spectrum.

The commonly accepted limitation of human hearing to detect sound frequencies is between 20 Hz and 20,000 Hz, and human hearing is most sensitive to the frequencies between 1,000 Hz – 6,000 Hz. Although people are generally not as sensitive to lower-frequency sounds as they are to higher frequencies, most people lose the ability to hear high-frequency sounds as they age. To accommodate varying receptor sensitivities, frequency sound levels are commonly adjusted, or 'filtered', before being logarithmically added and reported as a single 'sound level' magnitude of that filtering scale. The 'A-weighted' decibel filtering scale applies numerical adjustments to sound frequencies to emphasize the frequencies at which human hearing is sensitive, and to minimize the frequencies to which human hearing is not as sensitive.

The A-weighted scale is commonly used in highway traffic noise studies because the typical frequency spectrum of traffic noise is higher in magnitude at the frequencies at which human hearing is most sensitive (1,000 Hz to 6,000 Hz).

Several examples of noise levels expressed in dB(A) are listed in **Table 1**. As shown in **Table 1**, most individuals are exposed to fairly high noise levels from many sources on a regular basis. In order to perceive sounds of greatly varying pressure levels, human hearing has a non-linear sensitivity to sound pressure exposure. For example, doubling the sound pressure results in a three decibel change in the noise level; however, variations of three decibels (3 dB(A)) or less are commonly considered "barely perceptible" to normal human hearing. A five decibel (5 dB(A)) change is more readily noticeable. By definition, a ten-fold increase in the sound pressure level correlates to a 10 decibel (10 dB(A)) noise level increase; however, it is judged by most people as only a doubling of the loudness – sounding "twice as loud".

The degree of disturbance or annoyance from exposure to unwanted sound – noise – depends upon three factors:

1. The amount, nature, and duration of the intruding noise
2. The relationship between the intruding noise and the existing (ambient) sound environment; and
3. The situation in which the disturbing noise is heard

In considering the first of these factors, it is important to note that individuals have varying sensitivity to noise. Loud noises bother some people more than other people, and some individuals become increasingly upset if an unwanted noise persists. The time patterns and durations of noise(s) also affect perception as to whether or not it is offensive. For example, noises that occur during nighttime (sleeping) hours are typically considered to be more offensive than the same noises in the daytime.

With regard to the second factor, individuals tend to judge the annoyance of an unwanted noise in terms of its relationship to noise from other sources (background noise). A car horn blowing at night when background noise levels are low would generally be more objectionable than one blowing in the afternoon when background noise levels are typically higher. The response to noise stimulus is analogous to the response to turning on an interior light. During the daytime an illuminated bulb simply adds to the ambient light, but when eyes are conditioned to the dark of night, a suddenly illuminated bulb can be temporarily blinding.

The third factor – situational noise – is related to the interference of noise with activities of individuals. In a 60 dB(A) environment such as is commonly found in a large business office, normal conversation would be possible, while sleep might be difficult. Loud noises may easily interrupt activities that require a quiet setting for greater mental concentration or rest; however, the same loud noises may not interrupt activities requiring less mental focus or tranquility.

Table 1. Common Indoor and Outdoor Noise Levels

Common Outdoor Noise Levels	Noise Level (dB(A))	Common Indoor Noise Levels
	110	Rock Band
Jet Flyover at 1,000 feet	**100**	Inside Subway Train (NY)
Gas Lawn Mower at 3 feet		
Diesel Truck at 50 feet	**90**	Food Blender at 3 feet
Noisy Urban Daytime	**80**	Garbage Disposal at 3 feet
Gas Lawn Mower at 100 feet	**70**	Vacuum Cleaner at 10 feet
Commercial Area		Normal Speech at 3 feet
	60	
		Large Business Office
Quiet Urban Daytime	**50**	Dishwasher Next Room
Quiet Urban Nighttime	**40**	Small Theater, Large Conference Room (Background)
Quiet Suburban Nighttime		Library
	30	
Quiet Rural Nighttime		Bedroom at Night, Concert Hall (Background)
	20	
		Broadcast and Recording Studio
	10	
	0	Threshold of Hearing

Adapted from Guide on Evaluation and Attenuation of Traffic Noise, American Association of State Highway and Transportation Officials (AASHTO). 1974 (revised 1993).

Over time, individuals tend to accept the noises that intrude into their lives on a regular basis. However, exposure to prolonged and/or extremely loud noise(s) can prevent use of exterior and interior spaces, and has been theorized to pose health risks. Appropriately, regulations exist for noise control or mitigation from many particularly offensive sources, including airplanes, factories, railroads, and highways. For all "Type I" federal, state, or federal-aid highway projects in the State of Florida, traffic and construction noise impact analysis and mitigation assessment is dictated by the FDOT *PD&E Manual*.

4.0 Noise Abatement Criteria

4.1 Title 23 Code of Federal Regulations, Part 772 (23 CFR 772)

The FHWA has developed Noise Abatement Criteria (NAC) and procedures to be used in the planning and design of highways. The purpose of 23 CFR 772 is:

> To provide procedures for noise studies and noise abatement measures to help protect the public's health, welfare and livability, to supply noise abatement criteria, and to establish requirements for information to be given to local officials for use in the planning and design of highways approved pursuant to title 23 United States Code (U.S.C.).

The abatement criteria and procedures are set forth in 23 CFR 772, which also states:

> …in determining and abating traffic noise impacts, primary consideration is to be given to exterior areas.

A summary of the NAC for various land uses is presented in **Table 2: Noise Abatement Criteria**. The L_{eq}, or equivalent sound level, is the equivalent steady-state sound level which in a stated period of time contains the same acoustic energy as a time-varying sound level during the same period. With regard to traffic noise, fluctuating sound levels of traffic noise are represented in terms of L_{eq}, the steady, or 'equivalent', noise level with the same energy.

4.2 Florida Department of Transportation PD&E Manual

Chapter 17 of the FDOT Project Development & Environment Manual (PD&E Manual) constitutes the official FDOT noise policy and procedures for the purpose of meeting the requirements of 23 CFR 772 and applicable state laws. This policy describes the FDOT process that is used in determining traffic noise impacts and abatement measures and the equitable and cost-effective expenditure of public funds for traffic noise abatement. Where the FHWA has given highway agencies flexibility in implementing the 23 CFR 772 standards, this policy describes the FDOT approach to implementation.

4.3 Noise Abatement Criteria

The two categories of traffic noise impacts are defined as 1) those that "approach" or exceed the FHWA Noise Abatement Criteria (NAC), as shown in **Table 2**, and 2) those that represent a "substantial increase" over existing noise levels as defined by FDOT. An impact that represents a "substantial increase" is based on a comparison of the existing noise level [$L_{eq(h)}$] with the predicted increase to noise levels in the design year of 15 dB(A) or more.

Table 2. Noise Abatement Criteria

Activity Category	Activity Criteria[1] $L_{eq(h)}$[2] dB(A)	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, daycare 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, Section4(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. The $L_{eq(h)}$ Activity Criteria values are for impact determination only, and are not design standards for noise abatement measures.
2. 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 $L_{eq(h)}$ being the hourly value of L_{eq}.
3. Includes undeveloped lands permitted for this activity category.

5.0 Existing Noise Environment

Existing traffic noise exposure is relatively unvarying throughout the proposed Coral Reef Commons development. Coral Reef Drive (SW 152nd St) is the dominant noise source for noise sensitive areas in the property.

5.1 Ambient Noise Monitoring

Ambient noise is that noise which is all around us caused by natural and manmade events. It includes the wind, rain, thunder, birds chirping, insects, household appliances, commercial operations, lawn mowers, airplanes, automobiles, etc. It is all noise that is present in a particular area.

To assess ambient noise conditions within the project study area, short-term noise monitoring was conducted. During the noise monitoring, a windshield survey of noise-sensitive land uses and identification of major sources of acoustical shielding was conducted to supplement the mapping provided. The existing land uses within the project area mainly consist of abandoned institutional buildings, over grown fields, and forested areas. Currently, there are not any noise sensitive areas in use in the proposed Coral Reef Commons property.

The purpose of noise monitoring is to gather data that is used to develop a comparison between the monitored results and the output obtained from the noise prediction model. This exercise is performed to validate the model to local conditions so that it can be used with confidence to predict the existing and future noise levels.

Ambient noise measurements were collected on January 29, 2015 using two Norsonic 140 Type I Precision Integrating Sound Level Meters and a Norsonic 116 Type I Precision Integrating Sound Level Meter. The three meters were set up in a geometric array at one of the five measurement sites along Burr Rd. Noise readings were taken for 30 minutes (3 repetitions of 10 minutes) at the remaining four measurement sites. Readings were taken using the A-weighted scale and were reported in decibels (dB(A)). Data collected by the noise meters included time, average noise level (L_{eq}), maximum noise level (L_{max}), and instantaneous peak noise level (L_{pk}) for each interval. Hourly average noise levels ($L_{eq(h)}$) were derived at each location from the L_{eq} values. Existing noise measurements were collected under meteorologically acceptable conditions when the pavement was dry and winds were calm or light. Additional data collected at each monitoring location included atmospheric conditions such as general wind speed and direction, humidity, dew point, pressure, and ambient temperature. Measurements were conducted based on the acceptable collection of existing noise level readings according to the FHWA Report, FHWA-PD-96-046, and "Measurement of Highway Related Noise." Ambient noise measurements obtained in the field ranged between 48 dB(A) and 58 dB(A). **Figure 2** shows the location of the noise monitoring sites. Noise reading field data is included in **Appendix A**.

Noise measurements were obtained at five sites that represent locations throughout the proposed Coral Reef Commons development. The dominant noise source for the first noise measurement (Setup 1.1) was found to be naturally occurring noises such as birds, insects, and wind in surrounding foliage as well as distant traffic noise from Coral Reef Drive. The dominant noise source for the second noise measurement (Setup 2.1) was also found to be naturally occurring noises such as birds, insects, and wind in surrounding foliage as well as distant traffic noise from SW 124th Avenue. The dominant noise source for the third noise measurement (Setup 3.1) was found to be naturally occurring noises such as birds, insects, and wind in surrounding foliage as well as distant traffic noise from Coral Reef Drive. The dominant noise source for the fourth noise measurement (Setup 4.1 - 4.3) was found to be traffic noise from SW 124th Avenue. The dominant noise source for the fifth noise measurement (Setup 5.1) was found to be traffic noise from Coral Reef Drive.

Loudest-hour existing noise levels were assessed as the ambient noise levels obtained at representative locations in the field.[1] Ten minute traffic data (vehicle volume composition and speed) were also recorded on all roadways which were visible from the monitoring sites and significantly contributed to the overall noise level. Traffic was grouped into one of five categories: automobiles, medium trucks, heavy trucks, buses, and motorcycles. The 10-minute traffic data was converted to one hour traffic for validation of the noise model.

Throughout the day, random noise events not related to traffic noise occurred. Multiple small engine planes were observed overhead and distant train horn blasts were heard occasionally. The proposed Coral Reef Commons is located approximately 2.5 miles southeast of the Kendall-Tamiami Executive Airport, and approximately 0.5 miles northeast of the Gold Coast Railroad Museum. The Kendall-Tamiami Executive Airport is one of the busiest general aviation airports in Florida, serving corporate, recreational, flight training, and government agency activities. The Gold Coast Railroad Museum offers train rides throughout the day on many different types of locomotives. Aberrant noise events that occurred during the field measurements were removed where appropriate.

5.2 Validation

Short-term noise monitoring is not a process to determine design year noise impacts or barrier locations. Short-term noise monitoring provides a level of consistency between what is present in real-world situations and how that is represented in the computer noise model. Detailed computer models were created using the Federal Highway Administration Traffic Noise Model® (FHWA TNM v.2.5). The FDOT and FHWA-accepted tolerance for TNM model validation is ±3.0 dB(A). All but two of the measurement locations were validated within FHWA and FDOT tolerances. TNM validation model results are listed in **Table 3**.

The two measurement locations that did not validate were set back approximately 0.3 miles in the property from the nearest road, which may have caused TNM to severely under-predict the noise levels at these locations. It was assumed that traffic noise was not the dominant noise source at these sites.

5.3 Existing Environment

Since there were not any noise-sensitive areas observed during the field visit in the proposed Coral Reef Commons property, it was assumed that the noise levels recorded in the field were representative of the existing noise levels throughout the site.

[1] Per 24.33 CFR 772.5, existing noise levels are defined as "the worst noise hour resulting from the combination of natural and mechanical sources and human activity usually present in a particular area." If the TNM-predicted existing loudest-hour *traffic* noise levels are lower than the hourly-equivalent noise levels obtained in the field, then existing noise levels are assessed as the latter.

Table 3. Short-term Noise Measurements

Setup	Monitored Noise Level dB(A)	Average Noise Level dB(A)	Computed (Modeled) Noise Level dB(A)	Calculated Difference	Validated	Setup Description
1.1	50.5	50.1	42.4	-7.7	No*	Old plant growing facility. Between sites C-13 and C-14.
	49.3					
	50.3					
2.1	49.2	49.4	42.2	-7.2	No*	Access road behind abandoned Building G.
	49.4					
	49.5					
3.1	54.5	54.8	54.5	-0.3	Yes	Access road near western corner of abandoned building. Approximately 400' south of Coral Reef Drive.
	55.2					
	54.7					
4.1	52.6	-	50.1	-2.5	Yes	Along Burr Road. Perpendicular to SW 124th Avenue (Zoo Access Road).
4.2	49.5	-	47.1	-2.4	Yes	
4.3	48.0	-	46.1	-1.9	Yes	
5.1	58.4	58.4	58.9	0.5	Yes	Adjacent to SW 127th Avenue. Approximately 300' southwest of the Coral Reef Drive/SW 127th Avenue intersection.
	57.9					
	58.8					
* Traffic noise was determined not to be the dominant noise source at these sites						

6.0 Procedure for Predicting Future Noise Levels

Traffic noise emission is composed of several variables, including the number, types, and travel speeds of the vehicles, as well as the geometry of the roadway(s) on which the vehicles travel. Additionally, variables such as weather and intervening topography affect the transmission of traffic noise from the vehicle(s) to noise sensitive receptors.

In accordance with industry standards and accepted best-practices, detailed computer models were created using the FHWA TNM v.2.5. The computer models were validated to within acceptable tolerances of field-monitored traffic noise data, and were used to predict traffic noise levels for receptor locations within the proposed Coral Reef Commons development. Traffic noise consists of three primary parts: tire noise, engine noise, and exhaust noise. Of these sources, tire noise is typically the most offensive at unimpeded travel speeds. Sporadic traffic noises such as horns, squealing brakes, screeching tires, etc. are considered aberrant and are not included within the predictive model algorithm.

Traffic noise is not constant; it varies in time depending upon the number, speed, type, and frequency of vehicles that pass by a given receptor. Furthermore, since traffic noise emissions are different for various types of vehicles, the TNM algorithm distinguishes between the source emissions from the following vehicle types: automobiles, medium trucks, heavy trucks, buses, and motorcycles, as shown in **Table 4**. The computer traffic noise prediction model uses the number and type of vehicles on the planned roadway, vehicle speeds, the physical characteristics of the road (curves, hills, depressions, elevations, etc.), receptor location and height, and, if applicable, barrier type, barrier ground elevation, and barrier segment top elevations.

Preliminary site plans of the proposed development were used in this Noise Study Report. The predictions documented in this report are based upon the potential project Year 2025 build-condition peak hour traffic conditions resulting in the loudest predicted hourly-equivalent traffic noise levels for each receptor. Refer to **Appendix B** for a comprehensive list of traffic noise level receptors, and predicted Year 2025 hourly equivalent traffic noise levels. **Appendix C** details the traffic noise model inputs for this analysis.

Table 4. Traffic Noise Model (TNM) Vehicle Classification Types

TNM Vehicle Type	Description
Autos	All vehicles with two axles and four tires, including passenger cars and light trucks, weighing 9,900 pounds or less
Medium Trucks	All vehicles having two axles and six tires, weighing between 9,900 and 26,400 pounds
Heavy Trucks	All vehicles having three or more axles, weighing more than 26,400 pounds
Buses	All vehicles designed to carry more than nine passengers
Motorcycles	All vehicles with two or three tires and an open-air driver / passenger compartment
Sources:	FHWA Measurement of Highway-Related Noise, § 5.1.3 Vehicle Types. FHWA Traffic Monitoring Guide, § 4.1 Classification Schemes

7.0 Traffic Noise Impacts and Noise Contours

Traffic noise impacts occur when the predicted traffic noise levels either: [a] approach or exceed the FHWA noise abatement criteria (with "approach" meaning within 1 dB(A) of the NAC values listed in **Table 2**), or [b] substantially exceed the existing noise levels. FHWA and FDOT require that feasible and reasonable measures be considered to abate traffic noise at all predicted traffic noise impacts. Measures considered include highway alignment selection, traffic systems management, buffer zones, noise walls, and earth berms.

Future build (2025) traffic is not predicted to impact any noise-sensitive receptors within the residential area of the Coral Reef Commons development. The predicted future noise levels range between 51-62 dB(A), which does not approach or exceed FHWA noise abatement criteria (NAC). No traffic noise impacts are predicted to occur due to the Year 2025 traffic associated with the Coral Reef Commons development.

Noise abatement was not studied for this development since no impacts were predicted to occur.

Per 23 CFR 772.9(c) and FDOT Policy, noise contour lines shall not be used for determining highway traffic noise impacts. However, the 71 dB(A) and 66 dB(A) noise level contour information should assist local authorities in exercising land use control over the remaining undeveloped lands, so as to avoid development of incompatible activities adjacent to the roadways within local jurisdiction.

Correlating to the traffic noise impact threshold for FHWA NAC "E" land uses, the 71 dB(A) noise level contour is predicted to occur approximately 65 feet from the center of Coral Reef Drive. Correlating to the traffic noise impact threshold for NAC "B" and "C" land uses, the 66 dB(A) noise level contour is predicted to occur approximately 135 feet from the center of Coral Reef Drive and immediately adjacent to the SW 127th Avenue edge of travel.

8.0 Potential Traffic Noise Abatement Measures

FHWA and FDOT require that feasible and reasonable noise abatement measures be considered and evaluated for the benefit of all impacted build-condition traffic noise receptors. Feasibility and reasonableness are distinct and separate considerations. Feasibility is the consideration as to whether noise abatement measures *can* be implemented. Reasonableness is the consideration as to whether noise abatement measures *should* be implemented. Per FDOT Policy, the following traffic noise abatement measures may be considered: highway alignment selection, traffic systems management, buffer zones, noise barriers (earth berms and noise walls), and noise insulation of Activity Category D land use facilities.

8.1 Highway Alignment Selection

Highway alignment selection for traffic noise abatement measures involves modifying the horizontal and vertical geometry of the proposed facility to minimize traffic noise to noise-sensitive receptors. The proposed alignment was selected based on a minimization of impacts to the surrounding environment, natural and human. Additional highway alignment modifications are not a likely source of noise abatement and are not recommended since there were not any predicted future traffic noise impacts.

8.2 Traffic System Management Measures

Traffic management measures such as prohibition of truck traffic, lowering speed limits, limiting of traffic volumes, and/or limiting time of operation were considered as possible traffic noise impact abatement measures. Prohibition of truck traffic, reduction of the speed limit below the existing and proposed speeds, or screening total traffic volumes would diminish the functional capacity of the surrounding thoroughfares and are not considered practical.

8.3 Buffer Zones

Buffer zones are typically not practical and/or cost effective for noise mitigation due to the substantial amount of right-of-way required, and would not be a feasible noise mitigation measure for this project. Furthermore, if the acquisition of a suitable buffer zone had been feasible, the associated costs would exceed the FDOT Policy reasonable abatement cost threshold per benefited receptor.

8.4 Noise Barriers

Passive noise abatement measures are effective because they absorb sound energy, extend the source-to-receptor sound transmission path, or both. Sound absorption is a function of abatement medium (e.g. earth berms absorb more sound energy than noise walls of the same height because earth berms are more massive). The source-to-receptor path is extended by placement of an obstacle, such as a concrete wall, that sufficiently blocks the transmission of sound waves that travel from the source to the receptor. Noise abatement was not studied for the proposed Coral Reef Commons development since there were not any predicted future traffic noise impacts.

8.5 Noise Insulation

Since no traffic noise impacts for the project are predicted to occur for interior noise-sensitive areas (NAC "D"), interior noise insulation was not considered as a potential traffic noise impact mitigation measure for this Noise Study Report.

9.0 Construction Noise

The predominant construction activities associated with this project are expected to be earth removal, hauling, grading, and paving. Temporary and localized construction noise impacts will likely occur as a result of these activities (refer to **Table 5**). During daytime hours, the predicted effects of these impacts will be temporary speech interference for passers-by and those individuals living or working near the project. During evening and nighttime hours, steady-state construction noise emissions such as from paving operations will be audible, and may cause impacts to activities such as sleep. Sporadic evening and nighttime construction equipment noise emissions such as from backup alarms, lift gate closures ("slamming" of dump truck gates), etc., will be perceived as distinctly louder than the steady-state acoustic environment, and will likely cause severe impacts to the general peace and usage of noise-sensitive areas – particularly residences.

Extremely loud construction noise activities such as usage of pile-drivers and impact-hammers (jack hammer, hoe-ram) will provide sporadic and temporary construction noise impacts in the vicinity of those activities (refer to **Table 5**). Construction activities that will produce extremely loud noises should be scheduled during times of the day when such noises will create as minimal disturbance as possible.

Generally, low-cost and easily implemented construction noise control measures should be incorporated into the project plans and specifications to the extent possible. These measures include, but are not limited to, work-hour limits, equipment exhaust muffler requirements, haul-road locations, elimination of "tail gate banging", ambient-sensitive backup alarms, construction noise complaint mechanisms, and consistent and transparent community communication.

While discrete construction noise level prediction is difficult for a particular receiver or group of receivers, it can be assessed in a general capacity with respect to distance from known or likely project activities. For this project, earth removal, grading, hauling, and paving is anticipated to occur in the vicinity of numerous noise-sensitive receptors. Although construction noise impact mitigation should not place an undue burden upon the financial cost of the project or the project construction schedule, pursuant to the requirements of 23 CFR 772.19:

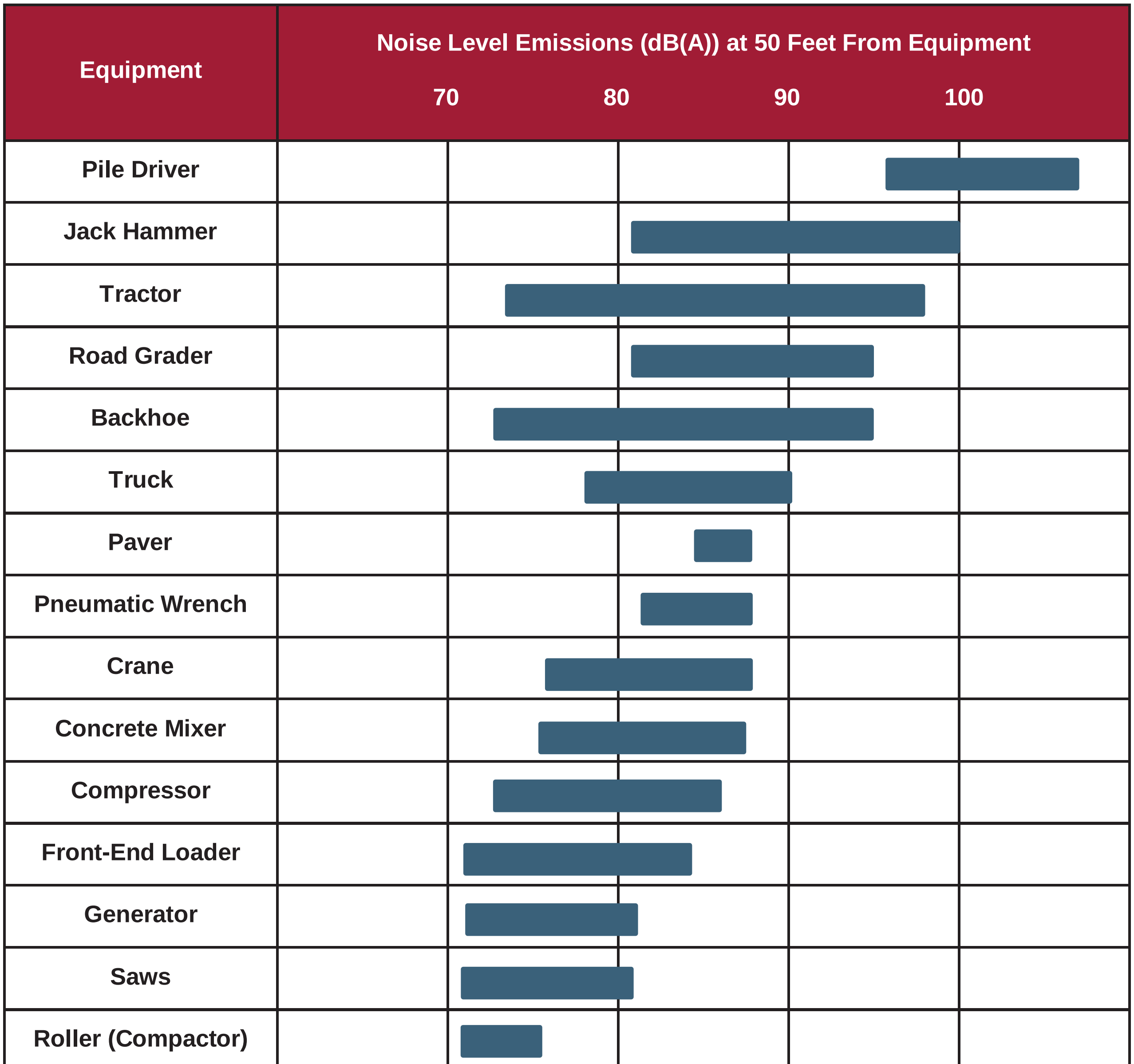
- Earth removal, grading, hauling, and paving activities in the vicinity of residences near the proposed development and surrounding side streets should be limited to weekday daytime hours.

- If meeting the project schedule requires that earth removal, grading, hauling and / or paving must occur during evening, nighttime and / or weekend hours in the vicinity of residential neighborhoods, the Contractor shall notify FDOT as soon as possible. In such instance(s), all reasonable attempts shall be made to notify and to make appropriate arrangements for the mitigation of the predicted construction noise impacts upon the affected property owners and / or residents.

- If construction noise activities must occur during context-sensitive hours in the vicinity of noise-sensitive areas, discrete construction noise abatement measures including, but not limited to portable noise barriers and/or other equipment-quieting devices shall be considered.

For additional information on construction noise, please refer to the FHWA Construction Noise Handbook (FHWA-HEP-06-015) and the Roadway Construction Noise Model (RCNM), available online at: http://www.fhwa.dot.gov/environment/noise/cnstr_ns.htm

Table 5. Construction Equipment Typical Noise Level Emissions



1. Adapted from *Noise Construction Equipment and Operations, Building Equipment, and Home Appliances*. U.S. Environmental Protection Agency. Washington D.C. 1971.
2. Cited noise level ranges are typical for the respective equipment. For "point sources" such as the construction equipment listed above, noise levels generally dissipate at a rate of -6 dB(A) for every doubling of distance. For example, if the noise level from a pile driver at a distance of 50 feet = 100 decibels (dB(A)), then at 400 feet, it will generally be 82 decibels (dB(A)) or less.
3. Due to project safety and potential construction noise concerns, pile driving activities are typically limited to daytime hours.

10.0 Noise-Compatible Land Use

One of the most effective means to prevent future traffic noise impacts is noise-sensitive land-use development. The compatibility of highways and neighboring local areas is essential for continued growth, and can be achieved if local governments and developers require and practice noise-sensitive land-use planning.

Although regulation of land use is not within the purview of FHWA or FDOT, some widely accepted techniques for noise-sensitive land use planning in the vicinity of existing and proposed roadway facilities include:

- Locating retail, industrial, manufacturing, and other noise-compatible land-uses adjacent to highways
- Incorporating effective traffic noise mitigating features, such as earth berms and solid-mass noise walls, as part of residential developments
- Utilization of noise-sensitive architectural design and site planning, such as the orientation of quiet spaces away from roadways
- Required use of sound insulating building materials and construction methods

As indicated in the current FDOT *PD&E Manual*, local jurisdictions with zoning control should use the information contained in this report to develop policies and/or ordinances to limit the growth of noise-sensitive land uses located adjacent to roadways. Furthermore, FDOT encourages the dissemination of this information to all people who may be affected by, or who might influence others affected by, traffic noise.

11.0 Conclusion

Traffic noise and temporary construction noise can be a consequence of transportation projects, especially in areas with proximity to high-volume and high-speed existing steady-state traffic noise sources. This Noise Study Report utilized computer models created with the FHWA Traffic Noise Model software (TNM 2.5), validated to field-collected traffic noise monitoring data, to predict future noise levels and define impacted receptors in the vicinity of the proposed development.

Future build (2025) traffic is not predicted to impact any noise-sensitive receptors within the residential area of the Coral Reef Commons development. The predicted future noise levels range between 51-62 dB(A), which does not approach or exceed FHWA noise abatement criteria (NAC). No traffic noise impacts are predicted to occur due to the Year 2025 traffic associated with the Coral Reef Commons development.

Construction noise impacts – some of them potentially extreme – may occur due to project construction activities. All reasonable efforts should be made to minimize exposure of noise-sensitive areas to construction noise impacts.

This NSR presents a preliminary analysis of all traffic noise impacts in accordance with the FDOT *PD&E Manual*. Noise abatement was not studied for in this NSR since no impacts were predicted to occur within the proposed Coral Reef Commons development.

12.0 References

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Federal Highway Administration. *Highway Traffic Noise Analysis and Abatement Policy and Guidance*. December 2011.

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Lee, Cynthia S.Y. and Fleming, Gregg G. *Measurement of Highway-Related Noise*. U.S. Department of Transportation Research and Special Programs Administration John A. Volpe National Transportation Systems Center Acoustics Facility, DTS-75. Cambridge, MA. May 1996.

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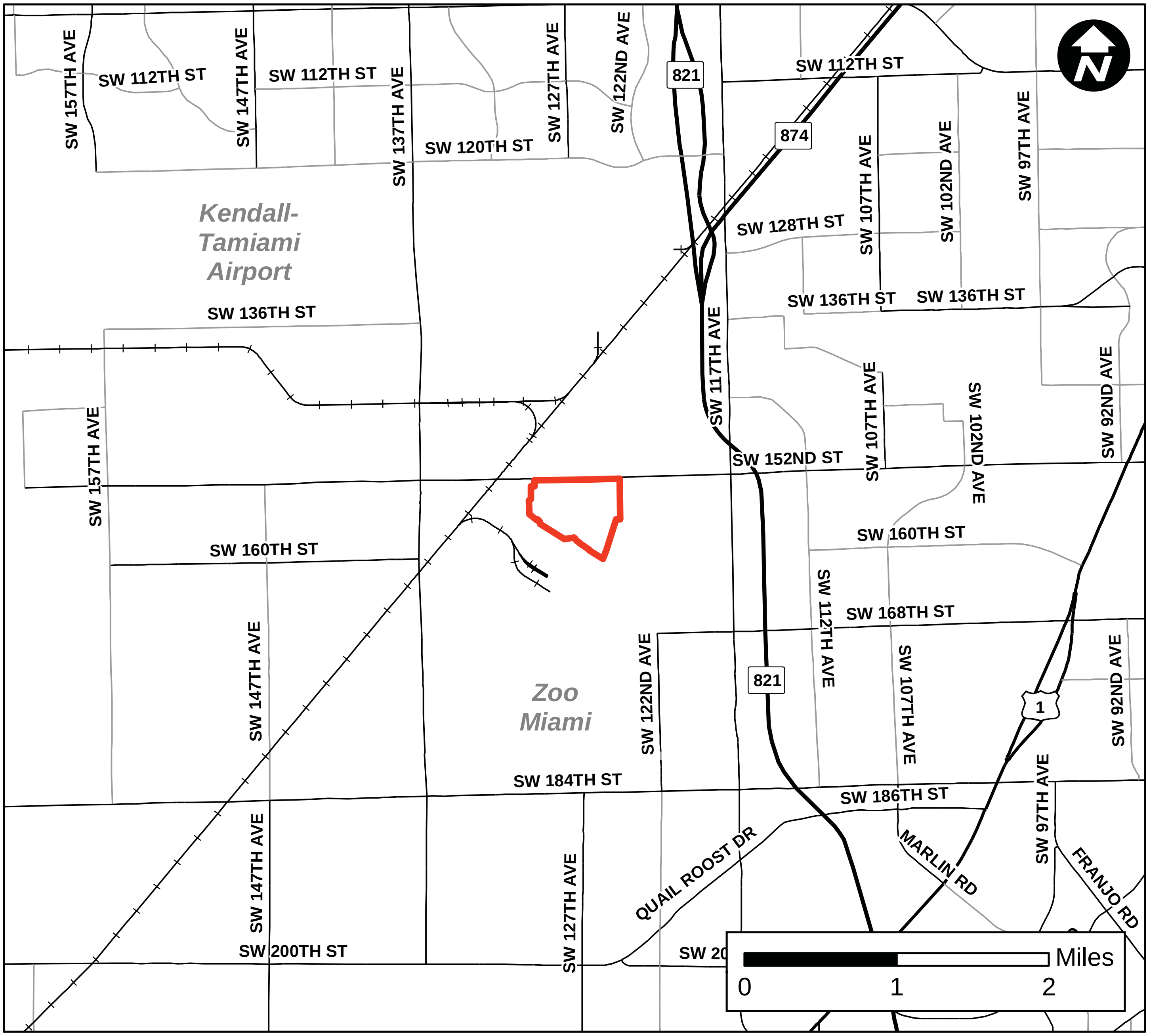
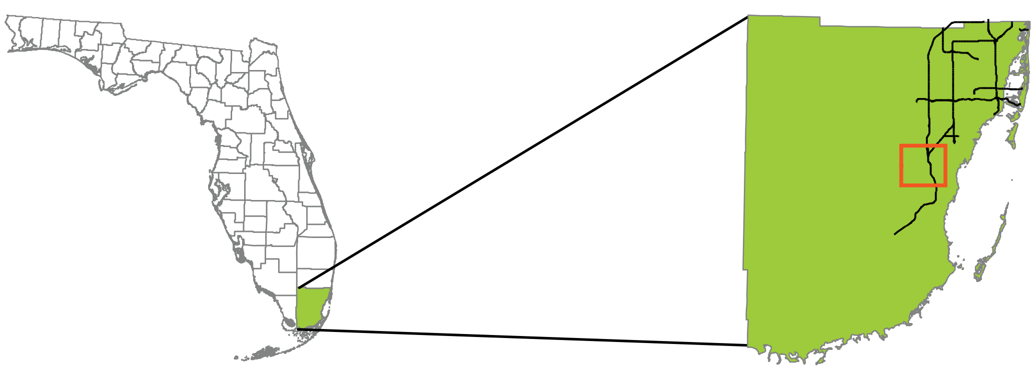
U.S. Environmental Protection Agency. *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances*. Washington, D.C. 1971.

FIGURES





Coral Reef Commons -
UM South Campus
Property Boundary

Figure 1
Vicinity Map
Proposed Coral Reef Commons
University of Miami
South Campus Property
Miami-Dade County

Prepared for: RAM Development Company

Kimley»Horn

Prepared for: RAM Development Company

Coral Reef Commons - UM South Campus Property Boundary

Measurement Locations

Figure 2

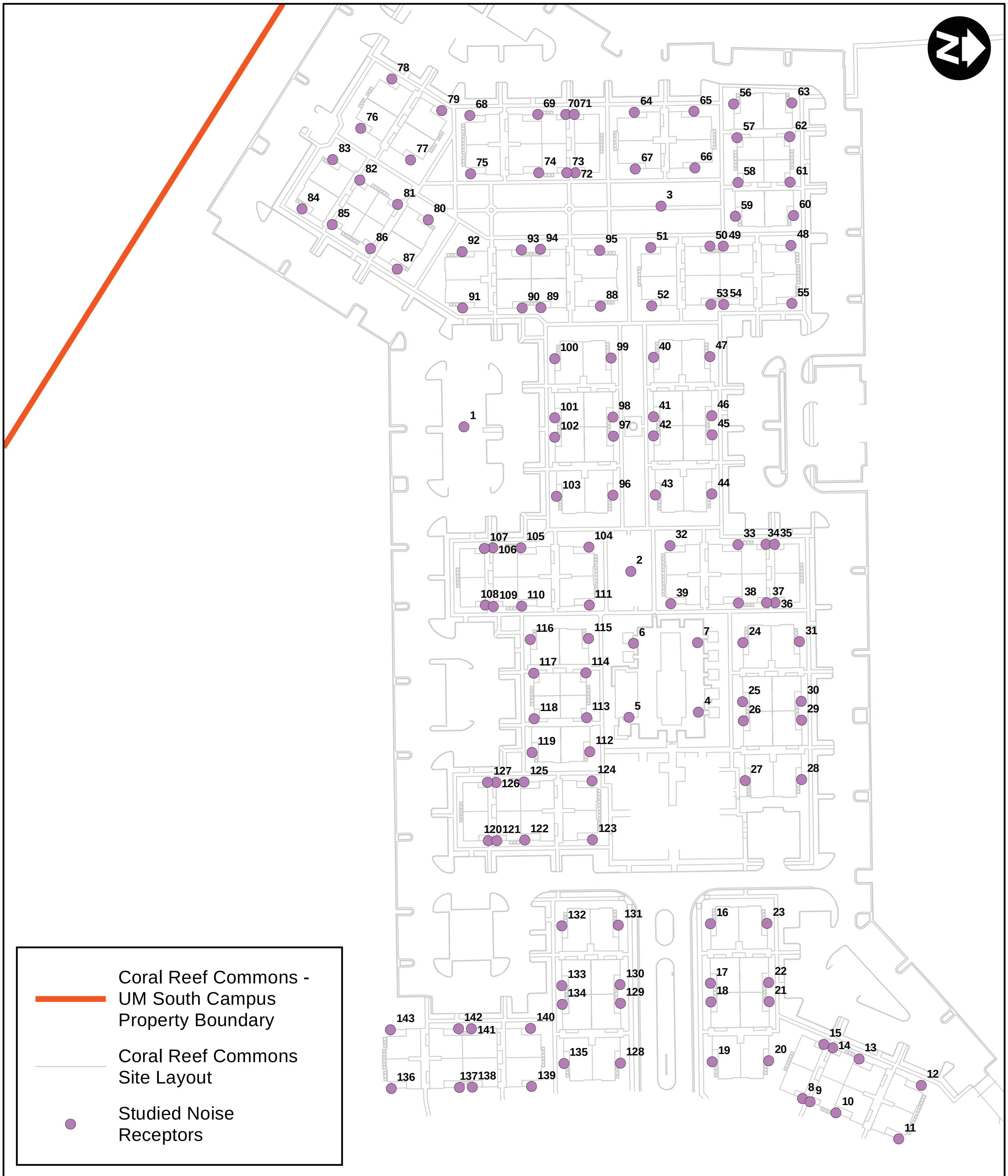
Measurement Locations

Proposed Coral Reef Commons
University of Miami
South Campus Property
Miami-Dade County

Kimley»Horn

Prepared for: RAM Development Company

Figure 3
Site Layout
Proposed Coral Reef Commons
University of Miami
South Campus Property
Miami-Dade County



Feet
0 75 150

Figure 4
Receptor Locations
Proposed Coral Reef Commons
University of Miami
South Campus Property
Miami-Dade County

Prepared for: RAM Development Company

Appendix A

AMBIENT NOISE LEVEL MONITORING

Table A-1: Project Ambient Hourly-Equivalent Sound Level, $L_{eq(h)}$[1]					
Measurement Location	**Land Use**	**Roadway Noise Source(s)**[2]	**Start/Stop Time**	**$L_{eq(h)}$ [dB(A)]**	**Average $L_{eq(h)}$ [dB(A)]**
1.1	Vacant/ Overgrown Property	Coral Reef Drive (Distant)	10:10 -10:20 AM	51	50
			10:21 - 10:31 AM	49	
			10:32 - 10:42 AM	50	
2.1	Vacant/ Overgrown Property	Coral Reef Drive (Distant)	10:55 -11:05 AM	49	49
			11:06 - 11:16 AM	49	
			11:17 - 11:27 AM	50	
3.1	Vacant/ Overgrown Property	Coral Reef Drive (Distant)	11:35 -11:45 AM	55	55
			11:46 - 11:56 AM	55	
			11:57 AM - 12:07 PM	55	
4.1	Vacant/ Overgrown Property	SW 124th Ave (Zoo Access Rd)	1:55 - 2:05 PM	53	-
4.2				50	-
4.3				49	-
5.1	Vacant/ Overgrown Property	Coral Reef Drive (Distant)	2:48 -2:58 PM	58	58
			3:00 - 3:10 PM	58	
			3:12 - 3:22 PM	59	

1. In accordance with FHWA guidance and accepted industry standards, hourly equivalent sound levels, Leq(h), were extrapolated from short-term data collection monitoring sessions, and are expressed in units of A-weighted decibels (dB(A)) rounded to the nearest whole number.
2. For each Setup, noise meters were located at logical locations for the assessment of existing highway traffic noise.

Table A-2: Project Noise Monitoring Sessions Weather Data								
Measurement Location	**Date Collected**	**Temp (ºF)**	**Dew Point (ºF)**	**Pressure (in)**	**Wind Dir.**	**Wind Speed (mph)**	**Relative Humidity**	**Precip. (in)**
1.1	1/29/15	65	53	30.27	NE	4	65	00.00
2.1	1/29/15	68	54	30.27	ENE	8	59	00.00
3.1	1/29/15	68	50	30.29	ENE	7	53	00.00
4.1	1/29/15	72	50	30.23	E	6	46	00.00
4.2	1/29/15							
4.3	1/29/15							
5.1	1/29/15	70	51	30.22	ENE	6	50	00.00

	
Measurement Location 1.1	Measurement Location 2.1
	**Measurements taken in photo restricted area. No pictures available.**
Measurement Location 3.1	Measurement Location 4.1/4.2/4.3
	
Measurement Location 5.1	

NOISE DATA COLLECTION SHEET

Data Collected By : TMH + AMH   Date : 1/29/15

Project : Coral Reef Commons

Location : Measurement Location 1

Location Description : Abandoned plant growing area. Between C-13 + C-14.

ROADWAY DATA

Speed Limit : —

Pavement Type : —

Pavement Condition : —

Other Noises : wind in trees, insects, birds, distant overhead plane, distant traffic, distant train horn @ 10:29

NOISE METER CALIBRATED? (Y) / N

WEATHER DATA

Temp (°F) : 65   Pressure (in) : 30.27

Dew Point (°F) : 53   Precip. (in) : —

Wind Spd. (mph) : 4   Wind Dir. : NE

Relative Humidity (%) : 65

NOISE DATA

Time Start : 10:10, 10:21, 10:32

Time End : 10:20, 10:31, 10:42

Duration : 10 min

Land Use : vacant/overgrown

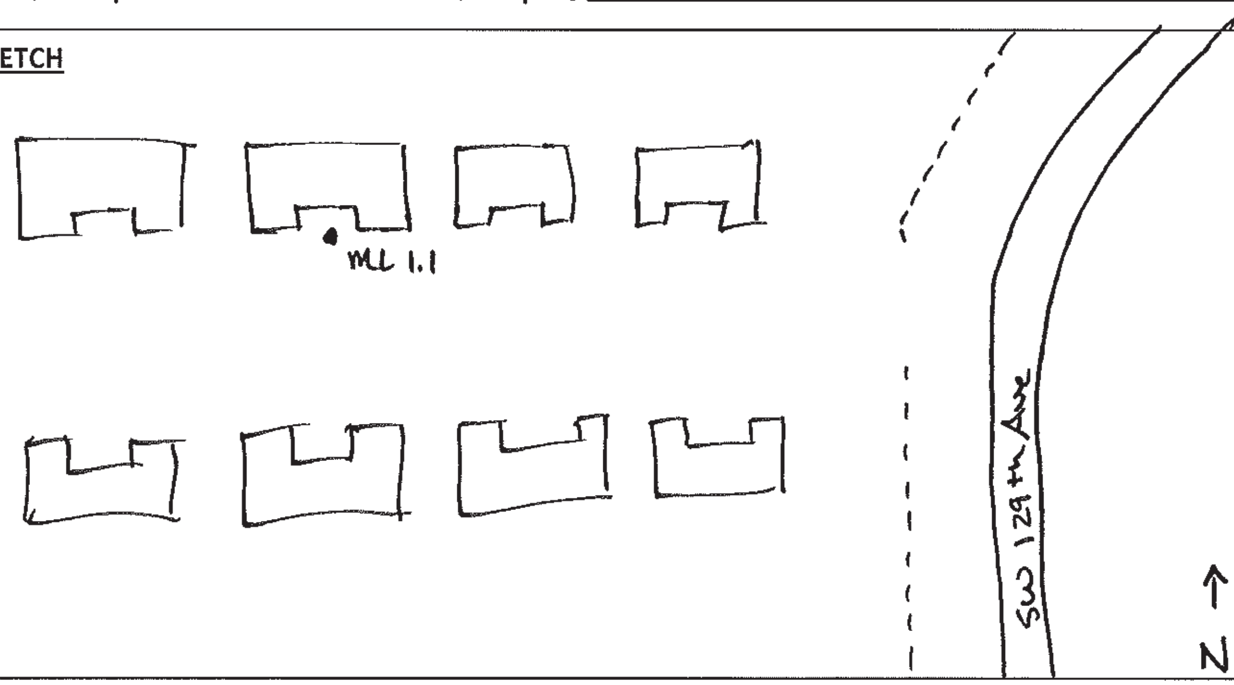
NOISE RESULTS

L_{EQ} : 50.5, 49.3, 50.3 L_{MAX} : 64.4, 55.0, 55.8

TRAFFIC DATA

	Near Lane		Far Lane	
	—	—	—	—
Autos	—	—	—	—
Medium Trucks	—	—	—	—
Heavy Trucks	—	—	—	—
Buses	—	—	—	—
Motorcycles	—	—	—	—

SITE SKETCH



NOISE DATA COLLECTION SHEET

Data Collected By : TMH + AMH

Date : 1/29/15

Project : Coral Reef Commons

Location : Measurement Location 2

Location Description : Access road behind abandoned Building G

ROADWAY DATA

Speed Limit : –

Pavement Type : –

Pavement Condition : –

Other Noises : wind in trees, insects, birds, distant overhead plane @ 11:14 + 11:23, distant train horn @ 11:00, 11:01, 11:03, 11:11, 11:23, distant landscaping equip.

NOISE METER CALIBRATED? (Y)/ N

WEATHER DATA

Temp (°F) : 68

Pressure (in) : 30.27

Dew Point (°F) : 54

Precip. (in) : –

Wind Spd. (mph) : 8

Wind Dir. : ENE

Relative Humidity (%) : 59

NOISE DATA

Time Start : 10:55, 11:06, 11:17

Time End : 11:05, 11:16, 11:27

Duration : 10 min

Land Use : vacant/overgrown

TRAFFIC DATA

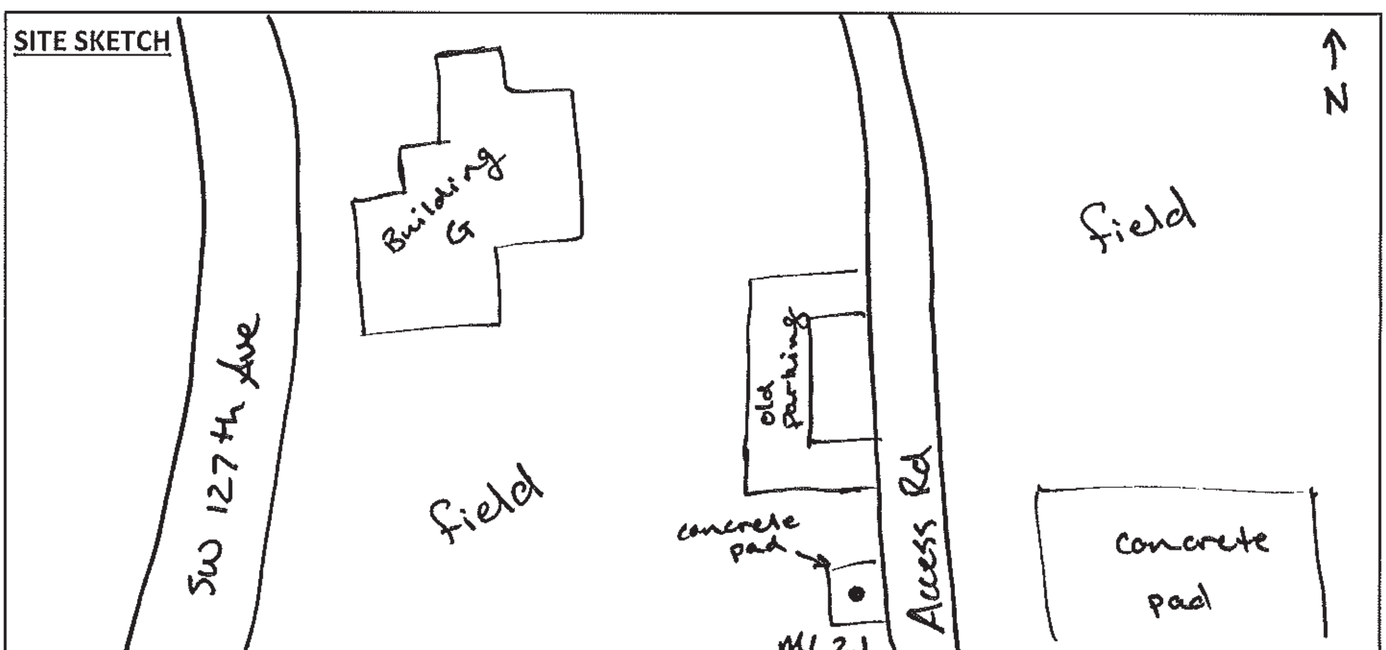
	Near Lane		Far Lane	
	–	–	–	–
Autos	–	–	–	–
Medium Trucks	–	–	–	–
Heavy Trucks	–	–	–	–
Buses	–	–	–	–
Motorcycles	–	–	–	–

NOISE RESULTS

L_{EQ} : 49.2, 49.4, 49.5

L_{MAX} : 56.5, 66.4, 69.7

SITE SKETCH



NOISE DATA COLLECTION SHEET

Data Collected By : TMH + AMH

Date : 1/29/15

Project : Coral Reef Commons

Location : Measurement Location 3

Location Description : Access road dead end near western corner of abandoned building. South of Coral Reef Dr.

ROADWAY DATA

Speed Limit : –

Pavement Type : –

Pavement Condition : –

Other Noises : wind in trees, insects, birds, distant train horn, helicopter @ 12:01, distant overhead plane @ 11:44, 11:51, 11:55, 11:58, 11:59

NOISE METER CALIBRATED? (Y) N

WEATHER DATA

Temp (°F) : 68

Pressure (in) : 30.29

Dew Point (°F) : 50

Precip. (in) : –

Wind Spd. (mph) : 7

Wind Dir. : ENE

Relative Humidity (%) : 53

NOISE DATA

Time Start : 11:35, 11:46, 11:57

Time End : 11:45, 11:56, 12:07

Duration : 10 min

Land Use : vacant/overgrown

TRAFFIC DATA

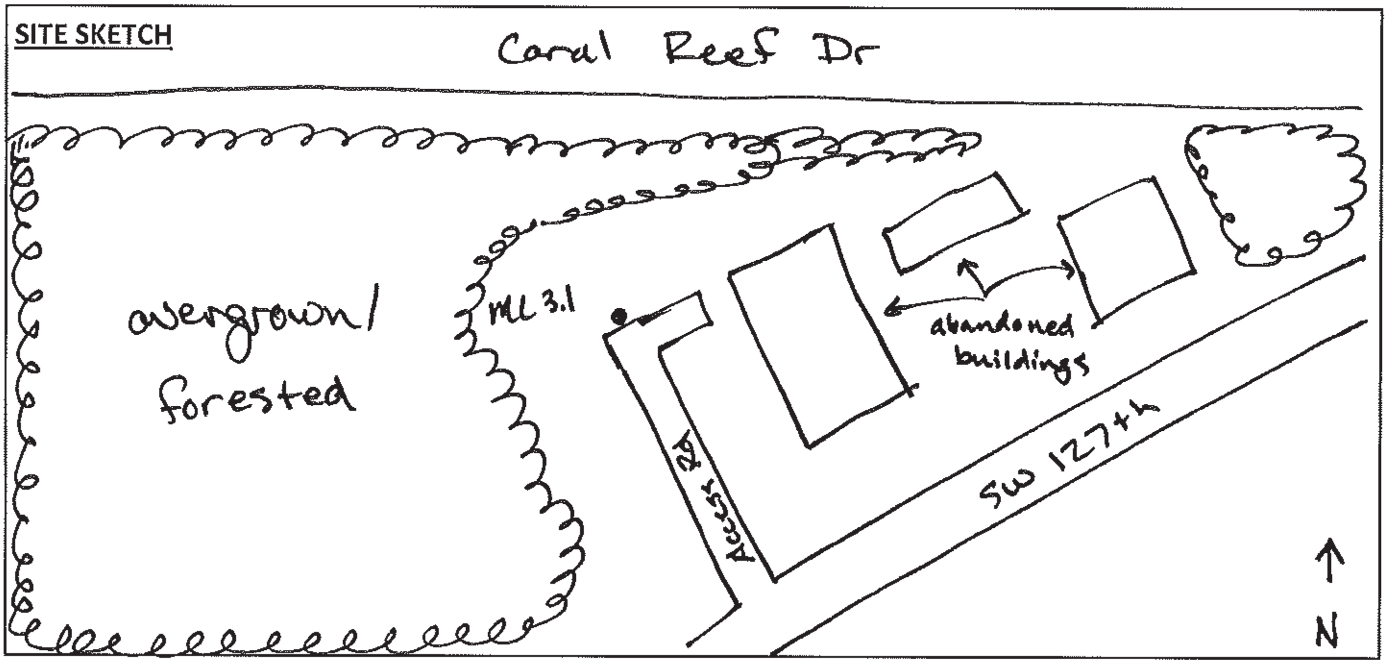
	Near Lane		Far Lane	
	–	–	–	–
Autos	–	–	–	–
Medium Trucks	–	–	–	–
Heavy Trucks	–	–	–	–
Buses	–	–	–	–
Motorcycles	–	–	–	–

NOISE RESULTS

L_{EQ} : 54.5, 55.2, 54.7

L_{MAX} : 65.5, 63.3, 68.6

SITE SKETCH



NOISE DATA COLLECTION SHEET

Data Collected By : TMH + AMH   Date : 1/29/15

Project : Coral Reef Commons

Location : Measurement Location 4

Location Description : Along Burr Rd

ROADWAY DATA

Speed Limit : SW 124th → 35 mph

Pavement Type : normal

Pavement Condition : good

Other Noises : wind in trees, insects, birds

NOISE METER CALIBRATED? (Y)/ N

WEATHER DATA

Temp (°F) : 72   Pressure (in) : 30.23

Dew Point (°F) : 50   Precip. (in) : —

Wind Spd. (mph) : 6   Wind Dir. : E

Relative Humidity (%) : 46

NOISE DATA

Time Start : 1:55

Time End : 2:05

Duration : 10 min

Land Use : vacant

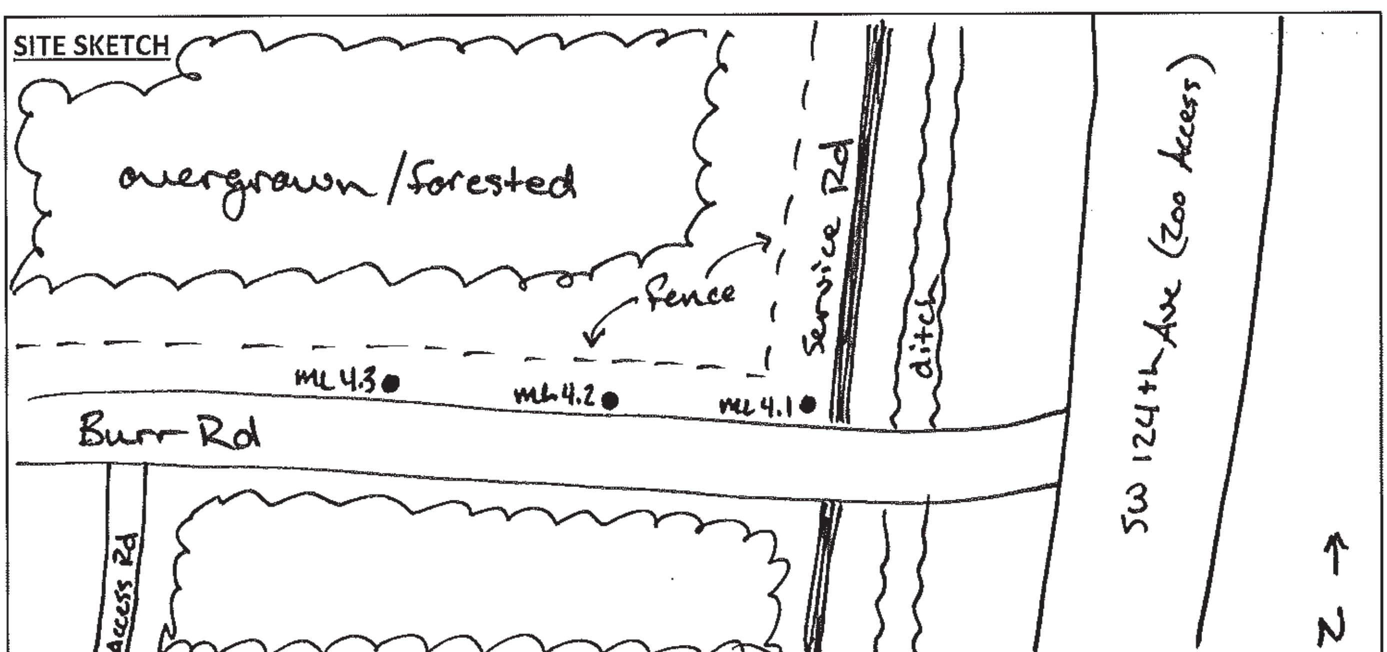
TRAFFIC DATA

	Near Lane		Far Lane	
	SW 124th	—	SW 124th	—
Autos	7	—	10	—
Medium Trucks	0	—	0	—
Heavy Trucks	0	—	0	—
Buses	0	—	1	—
Motorcycles	0	—	0	—

NOISE RESULTS

L_{EQ} : 52.6, 49.5, 48.0 L_{MAX} : 63.1, 64.0, 64.5

SITE SKETCH



NOISE DATA COLLECTION SHEET

Data Collected By : TMH + AMH Date : 1/29/15

Project : Coral Reef Commons

Location : Measurement Location 5

Location Description : Southwest of Coral Reef Drive + SW 127th Avenue intersection

ROADWAY DATA

Speed Limit : Coral Reef Dr → 40 mph

Pavement Type : normal

Pavement Condition : good

Other Noises : wind in trees, insects, birds, distant overhead plane, distant landscaping equip.

NOISE METER CALIBRATED? (Y) N

WEATHER DATA

Temp (°F) : 70 Pressure (in) : 30.22

Dew Point (°F) : 51 Precip. (in) : –

Wind Spd. (mph) : 6 Wind Dir. : ENE

Relative Humidity (%) : 50

NOISE DATA

Time Start : 2:48, 3:00, 3:12

Time End : 2:58, 3:10, 3:22

Duration : 10 min

Land Use : vacant / overgrown

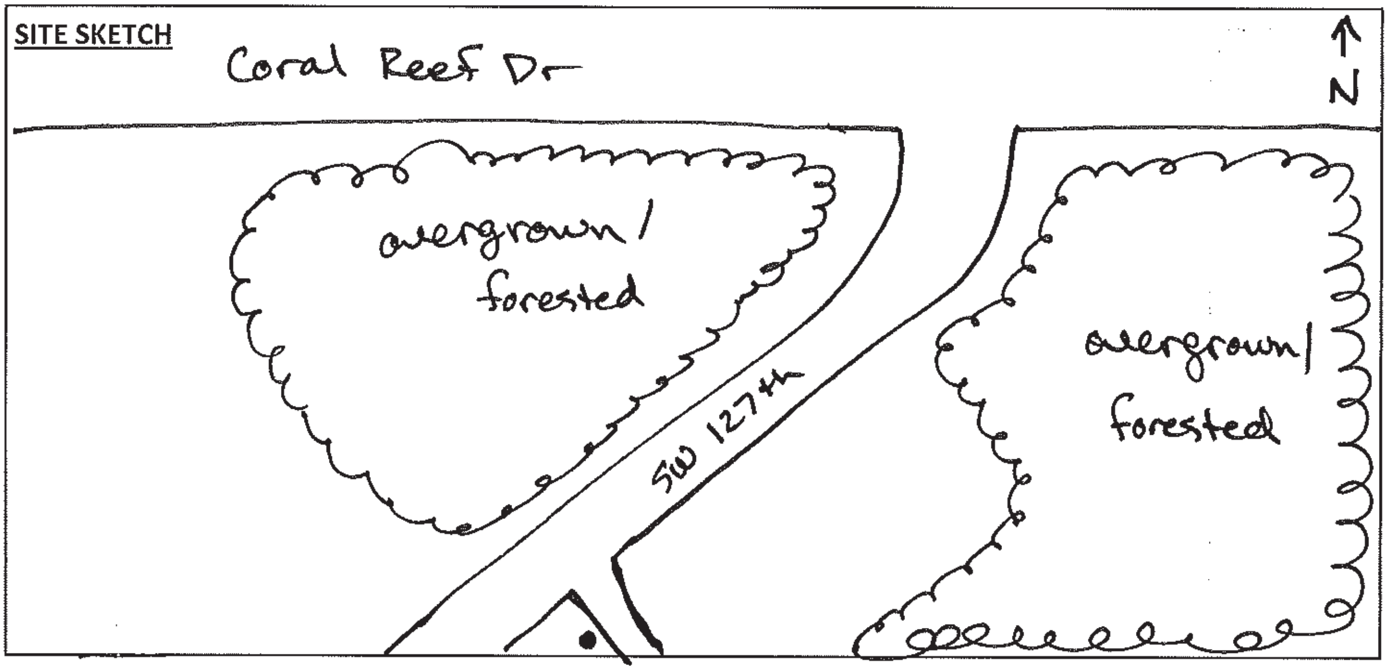
TRAFFIC DATA

	Near Lane		Far Lane	
	Coral Reef	–	Coral Reef	–
Autos	256	–	362	–
Medium Trucks	1	–	7	–
Heavy Trucks	1	–	1	–
Buses	2	–	4	–
Motorcycles	2	–	0	–

NOISE RESULTS

L_{EQ} : 58.4, 57.9, 58.8 L_{MAX} : 64.9, 68.5, 66.5

SITE SKETCH



Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
NVLAP Lab Code: 200625-0

Calibration Certificate No.30911

Instrument:	**Sound Level Meter**	*Date Calibrated:* **4/4/2014**	*Cal Due:* **4/4/2016**	
Model:	**140**	*Status:*	**Received**	**Sent**
Manufacturer:	**Norsonic**	*In tolerance:*	**X**	**X**
Serial number:	**1405531_68650**	*Out of tolerance:*		
Tested with:	**Microphone 1225 s/n 168196** **Preamplifier 1209 s/n 15475**	*See comments:*		
		Contains non-accredited tests: __Yes X No		
Type (class):	**1**	*Calibration service:* __ Basic X Standard		
Customer:	**Kimley-Horn and Associates, Inc.**	*Address:* **3001 Weston Parkway, Cary, NC 27513**		
Tel/Fax:	**919-677-2000 / 919-677-2050**			

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/22/2012
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31052	Oct 7, 2013	Scantek, Inc./ NVLAP	Oct 7, 2014
DS-360-SRS	Function Generator	33584	Sep 30, 2013	ACR Env./ A2LA	Sep 30, 2015
34401A-Agilent Technologies	Digital Voltmeter	US36120731	Sep 30, 2013	ACR Env. / A2LA	Sep 30, 2014
HM30-Thommen	Meteo Station	1040170/39633	Sep 30,2013	ACR Env./ A2LA	Sep 30, 2014
PC Program 1019 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Nov 8, 2013	Scantek, Inc./ NVLAP	Nov 8, 2014

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
24.4 °C	99.570 kPa	46.5 %RH

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	Mariana Buzduga
Signature	Lydon Dawkins	Signature	[signature]
Date	4/4/2014	Date	4/4/2014

Document stored Z:\Calibration Lab\SLM 2014\Nor140_1405531_68650_M1.doc

Results summary: Device complies with following clauses of mentioned specifications:

CLAUSES[1] FROM IEC/ANSI STANDARDS REFERENCED IN PROCEDURES:	RESULT[2,3]	EXPANDED UNCERTAINTY (coverage factor 2) [dB]
CALIBRATION OF SOUND LEVEL METER - ANSI S1.4 CLAUSE 3.2	Passed	0.2
LEVEL LINEARITY TEST - ANSI S1.4-1983, CLAUSE 6.9 & 6.10	Passed	0.25
WEIGHTING NETWORK TEST: A NETWORK - ANSI S1.4-1983 CLAUSE 8.2.1	Passed	0.25
WEIGHTING NETWORK TEST: C NETWORK - ANSI S1.4-1983 CLAUSE 8.2.1	Passed	0.25
WEIGHTING NETWORK TEST: LINEAR NETWORK - ANSI S1.4-1983 CLAUSE 8.2.1	Passed	0.25
OVERLOAD DETECTOR TEST: A-NETWORK - ANSI S1.4-1983 CLAUSE 8.3.1	Passed	0.25
F/S/I/PEAK TEST: STEADY STATE RESPONSE - ANSI S1.4 1983 CLAUSE 6.4	Passed	0.25
FAST-SLOW TEST: OVERSHOOT TEST - ANSI S1.4 1983 CLAUSE 8.4.1	Passed	0.25
FAST-SLOW TEST: SINGLE SINE WAVE BURST - ANSI S1.4 1983 CLAUSE 8.4.1 & 8.4.3	Passed	0.25
IMPULSE TEST: CONTINUOUS SINE WAVE BURST - ANSI S1.4 1983 CLAUSE 8.4.3	Passed	0.25
IMPULSE TEST: SINGLE SINE WAVE BURST - ANSI S1.4 1983 CLAUSE 8.4.1 & 8.4.3	Passed	0.25
PEAK DETECTOR TEST, SINGLE SQUARE WAVE BURST - ANSI S1.4 1983 CLAUSE 8.4.4	Passed	0.25
RMS DETECTOR TEST: CREST FACTOR TEST - ANSI S1.4-1983 CLAUSE 8.4.2	Passed	0.25
RMS DETECTOR TEST: CONTINUOUS SINE WAVE BURST - ANSI S1.4-1983 CLAUSE 8.4.2	Passed	0.25
TIME AVERAGING TEST: AVERAGING FUNCTIONS - ANSI S1.43 CLAUSE 9.3.2	Passed	0.25
LINEARITY TEST - ANSI S1.43 CLAUSE 9.3.3	Passed	0.15
FILTER TEST 1/1OCTAVE: RELATIVE ATTENUATION - IEC 61260, CLAUSE 4.4 & #5.3	Passed	0.25
FILTER TEST 1/3OCTAVE: RELATIVE ATTENUATION - IEC 61260, CLAUSE 4.4 & #5.3	Passed	0.25
SUMMATION OF ACOUSTIC TESTS - ANSI S1.4 CLAUSE 5 USING ACTUATOR	Passed	0.2-0.5

[1] The results of this calibration apply only to the instrument type with serial number identified in this report.

[2] Parameters are certified at actual environmental conditions.

[3] The tests marked with (*) are not covered by the current NVLAP accreditation.

Comments: The instrument was tested and met all specifications found in the referenced procedures.

Note: The instrument was tested for the parameters listed in the table above, using the test methods described in the listed standards. All tests were performed around the reference conditions. The test results were compared with the manufacturer's or with the standard's specifications, whichever are larger.
Compliance with any standard cannot be claimed based solely on the periodic tests.

Tests made with the following attachments to the instrument:

Microphone:	Norsonic 1225 s/n 168196 for acoustical test
Preamplifier:	Norsonic 1209 s/n 15475 for all tests
Other: line adaptor ADP005 (18pF) for electrical tests	
Accompanying acoustical calibrator:	Norsonic 1251 s/n 25766
Windscreen:	none

Measured Data: in Test Report # 30911 of 12 + 1 pages.

Place of Calibration: Scantek, Inc.
6430 Dobbin Road, Suite C
Columbia, MD 21045 USA
Ph/Fax: 410-290-7726/ -9167
callab@scantekinc.com

Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
NVLAP Lab Code: 200625-0

Calibration Certificate No.30912

Instrument:	**Microphone**	*Date Calibrated:* **4/4/2014**	*Cal Due:* **4/4/2016**		
Model:	**1225**	*Status:*	**Received**	**Sent**	
Manufacturer:	**Norsonic**	*In tolerance:*	**X**	**X**	
Serial number:	**168196**	*Out of tolerance:*			
Composed of:		*See comments:*			

Contains non-accredited tests: __Yes _X_ No

Customer: **Kimley-Horn and Associates, Inc.**
Tel/Fax: **919-677-2000/919-677-2050**
Address: **3001 Weston Parkway, Cary, NC 27513**

Tested in accordance with the following procedures and standards:
Calibration of Measurement Microphones, Scantek, Inc., Rev. 11/30/2010

Instrumentation used for calibration: N-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31052	Oct 7, 2013	Scantek, Inc./ NVLAP	Oct 7, 2014
DS-360-SRS	Function Generator	33584	Sep 30, 2013	ACR Env./ A2LA	Sep 30, 2015
34401A-Agilent Technologies	Digital Voltmeter	US36120731	Sep 30, 2013	ACR Env. / A2LA	Sep 30, 2014
HM30-Thommen	Meteo Station	1040170/39633	Sep 30,2013	ACR Env./ A2LA	Sep 30, 2014
PC Program 1017 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1253-Norsonic	Calibrator	28326	Nov 8, 2013	Scantek, Inc./ NVLAP	Nov 8, 2014
1203-Norsonic	Preamplifier	14051	Oct 24, 2013	Scantek, Inc./ NVLAP	Oct 24, 2014
4180-Brüel&Kjær	Microphone	2246115	Oct 15, 2013	NPL-UK / UKAS	Oct 15, 2015

Instrumentation and test results are traceable to SI - BIPM through standards maintained by NPL (UK) and NIST (USA)

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	Mariana Buzduga
Signature	Lydon Dawkins	Signature	[signature]
Date	4/4/2014	Date	4/4/2014

Document stored as: Z:\Calibration Lab\Mic 2014\NOR1225_168196_M1.doc

Results summary: Device was tested and complies with following clauses of mentioned specifications:

CLAUSES / METHODS[1] FROM PROCEDURES		MET[2,3]	NOT MET	NOT TESTED	MEASUREMENT EXPANDED UNCERTAINTY (coverage factor 2)
Open circuit sensitivity (insert voltage method, 250 Hz)		X			See below
Frequency response	Actuator response	X			63 – 200Hz: 0.3 dB 200 – 8000 Hz: 0.2 dB 8 – 10 kHz: 0.5 dB 10 – 20 kHz: 0.7 dB 20 – 50 kHz: 0.9 dB 50 – 100 kHz: 1.2 dB
	FF/Diffuse field responses	X			63 – 200Hz: 0.3 dB 200 – 4000 Hz: 0.2 dB 4 – 10 kHz: 0.6 dB 10 – 20 kHz: 0.9 dB 20 – 50 kHz: 2.2 dB 50 – 100 kHz: 4.4 dB
	Scantek, Inc. acoustical method			X	31.5 – 125 Hz: 0.16 dB 250, 1000 Hz: 0.12 dB 2 – 8 kHz: 0.8 dB 12.5 – 16 kHz: 2.4 dB

[1] The results of this calibration apply only to the instrument type with serial number identified in this report.

[2] Results are normalized to the reference conditions.

[3] The tests marked with (*) are not covered by the current NVLAP accreditation.

Note: The free field/diffuse field characteristics were calculated based on the measured actuator response and adjustment coefficients as provided by the manufacturer. The uncertainties reported for these characteristics may include assumed uncertainty components for the adjustment coefficients.

Comments:	The instrument was tested and met all specifications found in the referenced procedures.

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
23.8 ± 1.1	99.76 ± 0.035	45.8 ± 2.5

Main measured parameters:

Tone frequency (Hz)	Measured[4]/Nominal Open circuit sensitivity (dB re 1V/Pa)	Sensitivity (mV/Pa)
250	-25.84 ± 0.12/ -26.0	51.04

[4] The reported expanded uncertainty is calculated with a coverage factor k=2.00

Tests made with following attachments to instrument and auxiliary devices:

Protection grid mounted for sensitivity measurements
Actuator type: G.R.A.S. RA0014

Measured Data: Found on Microphone Test Report # 30912 of one page.

Place of Calibration: Scantek, Inc.
6430 Dobbin Road, Suite C
Columbia, MD 21045 USA
Ph/Fax: 410-290-7726/ -9167
callab@scantekinc.com

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®

NVLAP Lab Code: 200625-0

Calibration Certificate No.30909

Instrument:	**Sound Level Meter**	*Date Calibrated:* **4/4/2014**	*Cal Due:* **4/4/2016**	
Model:	**116**	*Status:*	**Received**	**Sent**
Manufacturer:	**Norsonic**	*In tolerance:*	**X**	**X**
Serial number:	**25513_021490**	*Out of tolerance:*		
Tested with:	**Microphone 1225 s/n 142416**	*See comments:*		
	Preamplifier 1201 s/n 25360	*Contains non-accredited tests:* __**Yes** _X_ **No**		
Type (class):	**1**	*Calibration service:* __ **Basic** _X_ **Standard**		
Customer:	**Kimley-Horn and Associates, Inc.**	*Address:* **3001 Weston Parkway, Cary, NC 27513**		
Tel/Fax:	**919-677-2000 / 919-677-2050**			

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/22/2012
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31052	Oct 7, 2013	Scantek, Inc./ NVLAP	Oct 7, 2014
DS-360-SRS	Function Generator	33584	Sep 30, 2013	ACR Env./ A2LA	Sep 30, 2015
34401A-Agilent Technologies	Digital Voltmeter	US36120731	Sep 30, 2013	ACR Env. / A2LA	Sep 30, 2014
HM30-Thommen	Meteo Station	1040170/39633	Sep 30,2013	ACR Env./ A2LA	Sep 30, 2014
PC Program 1019 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Nov 8, 2013	Scantek, Inc./ NVLAP	Nov 8, 2014

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
24.2 °C	99.750 kPa	44.5 %RH

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	Mariana Buzduga
Signature	Lydon Dawkins	Signature	[signature]
Date	4/4/2014	Date	4/4/2014

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Results summary: Device complies with following clauses of mentioned specifications:

CLAUSES[1] FROM IEC/ANSI STANDARDS REFERENCED IN PROCEDURES:	RESULT[2,3]	EXPANDED UNCERTAINTY (coverage factor 2) [dB]
CALIBRATION OF SOUND LEVEL METER - ANSI S1.4 CLAUSE 3.2	Passed	0.2
INPUT AMPLIFIER TEST: GAIN TEST / ATTENUATOR SETTING - ANSI S1.4-1983 CLAUSE 5.3	Passed	0.25
LEVEL LINEARITY TEST - ANSI S1.4-1983, CLAUSE 6.9 & 6.10	Passed	0.25
WEIGHTING NETWORK TEST: A NETWORK - ANSI S1.4-1983 CLAUSE 8.2.1	Passed	0.25
WEIGHTING NETWORK TEST: C NETWORK - ANSI S1.4-1983 CLAUSE 8.2.1	Passed	0.25
OVERLOAD DETECTOR TEST: A-NETWORK - ANSI S1.4-1983 CLAUSE 8.3.1	Passed	0.25
F/S/I/PEAK TEST: STEADY STATE RESPONSE - ANSI S1.4 1983 CLAUSE 6.4	Passed	0.25
FAST-SLOW TEST: OVERSHOOT TEST - ANSI S1.4 1983 CLAUSE 8.4.1	Passed	0.25
FAST-SLOW TEST: SINGLE SINE WAVE BURST - ANSI S1.4 1983 CLAUSE 8.4.1 & 8.4.3	Passed	0.25
IMPULSE TEST: CONTINUOUS SINE WAVE BURST - ANSI S1.4 1983 CLAUSE 8.4.3	Passed	0.25
IMPULSE TEST: SINGLE SINE WAVE BURST - ANSI S1.4 1983 CLAUSE 8.4.1 & 8.4.3	Passed	0.25
PEAK DETECTOR TEST, SINGLE SQUARE WAVE BURST - ANSI S1.4 1983 CLAUSE 8.4.4	Passed	0.25
RMS DETECTOR TEST: CREST FACTOR TEST - ANSI S1.4-1983 CLAUSE 8.4.2	Passed	0.25
RMS DETECTOR TEST: CONTINUOUS SINE WAVE BURST - ANSI S1.4-1983 CLAUSE 8.4.2	Passed	0.25
TIME AVERAGING TEST: AVERAGING FUNCTIONS - ANSI S1.43 CLAUSE 9.3.2	Passed	0.25
LINEARITY TEST - ANSI S1.43 CLAUSE 9.3.3	Passed	0.15
SUMMATION OF ACOUSTIC TESTS - ANSI S1.4 CLAUSE 5 USING ACTUATOR	Passed	0.2-0.5

[1] The results of this calibration apply only to the instrument type with serial number identified in this report.

[2] Parameters are certified at actual environmental conditions.

[3] The tests marked with (*) are not covered by the current NVLAP accreditation.

Comments: The instrument was tested and met all specifications found in the referenced procedures.

Note: The instrument was tested for the parameters listed in the table above, using the test methods described in the listed standards. All tests were performed around the reference conditions. The test results were compared with the manufacturer's or with the standard's specifications, whichever are larger.
Compliance with any standard cannot be claimed based solely on the periodic tests.

Tests made with the following attachments to the instrument:

Microphone: Norsonic 1225 s/n 142416 for acoustical test
Preamplifier: Norsonic 1201 s/n 25360 for all tests
Other: line adaptor ADP005 (18pF) for electrical tests
Accompanying acoustical calibrator: Norsonic 1251 s/n 25766
Windscreen: none

Measured Data: in Test Report # 30909 of 10 + 1 pages.

Place of Calibration: Scantek, Inc.
6430 Dobbin Road, Suite C
Columbia, MD 21045 USA
Ph/Fax: 410-290-7726/ -9167
callab@scantekinc.com

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®

NVLAP Lab Code: 200625-0

Calibration Certificate No.30910

Instrument:	**Microphone**	*Date Calibrated:* **4/4/2014**	*Cal Due:* **4/4/2016**
Model:	**1225**		
Manufacturer:	**Norsonic**		
Serial number:	**142416**		
Composed of:			

Status:	**Received**	**Sent**
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes _X_ No

Customer: **Kimley-Horn and Associates, Inc.**
Tel/Fax: **919-677-2000/919-677-2050**

Address: **3001 Weston Parkway,**
Cary, NC 27513

Tested in accordance with the following procedures and standards:
Calibration of Measurement Microphones, Scantek, Inc., Rev. 11/30/2010

Instrumentation used for calibration: N-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31052	Oct 7, 2013	Scantek, Inc./ NVLAP	Oct 7, 2014
DS-360-SRS	Function Generator	33584	Sep 30, 2013	ACR Env./ A2LA	Sep 30, 2015
34401A-Agilent Technologies	Digital Voltmeter	US36120731	Sep 30, 2013	ACR Env. / A2LA	Sep 30, 2014
HM30-Thommen	Meteo Station	1040170/39633	Sep 30,2013	ACR Env./ A2LA	Sep 30, 2014
PC Program 1017 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1253-Norsonic	Calibrator	28326	Nov 8, 2013	Scantek, Inc./ NVLAP	Nov 8, 2014
1203-Norsonic	Preamplifier	14051	Oct 24, 2013	Scantek, Inc./ NVLAP	Oct 24, 2014
4180-Brüel&Kjær	Microphone	2246115	Oct 15, 2013	NPL-UK / UKAS	Oct 15, 2015

Instrumentation and test results are traceable to SI - BIPM through standards maintained by NPL (UK) and NIST (USA)

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	Mariana Buzduga
Signature	Lydon Dawkins	Signature	[signature]
Date	4/4/2014	Date	4/4/2014

Document stored as: Z:\Calibration Lab\Mic 2014\NOR1225_142416_M1.doc

Results summary: Device was tested and complies with following clauses of mentioned specifications:

CLAUSES / METHODS[1] FROM PROCEDURES		MET[2,3]	NOT MET	NOT TESTED	MEASUREMENT EXPANDED UNCERTAINTY (coverage factor 2)
Open circuit sensitivity (insert voltage method, 250 Hz)		X			See below
Frequency response	Actuator response	X			63 – 200Hz: 0.3 dB 200 – 8000 Hz: 0.2 dB 8 – 10 kHz: 0.5 dB 10 – 20 kHz: 0.7 dB 20 – 50 kHz: 0.9 dB 50 – 100 kHz: 1.2 dB
	FF/Diffuse field responses	X			63 – 200Hz: 0.3 dB 200 – 4000 Hz: 0.2 dB 4 – 10 kHz: 0.6 dB 10 – 20 kHz: 0.9 dB 20 – 50 kHz: 2.2 dB 50 – 100 kHz: 4.4 dB
	Scantek, Inc. acoustical method			X	31.5 – 125 Hz: 0.16 dB 250, 1000 Hz: 0.12 dB 2 – 8 kHz: 0.8 dB 12.5 – 16 kHz: 2.4 dB

1 The results of this calibration apply only to the instrument type with serial number identified in this report.

2 Results are normalized to the reference conditions.

3 The tests marked with (*) are not covered by the current NVLAP accreditation.

Note: The free field/diffuse field characteristics were calculated based on the measured actuator response and adjustment coefficients as provided by the manufacturer. The uncertainties reported for these characteristics may include assumed uncertainty components for the adjustment coefficients.

Comments: The instrument was tested and met all specifications found in the referenced procedures.

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
23.7 ± 1.0	99.80 ± 0.015	46.2 ± 2.1

Main measured parameters:

Tone frequency (Hz)	Measured[4] /Nominal Open circuit sensitivity (dB re 1V/Pa)	Sensitivity (mV/Pa)
250	-26.20 ± 0.13/ -26.0	48.98

4 The reported expanded uncertainty is calculated with a coverage factor k=2.00

Tests made with following attachments to instrument and auxiliary devices:

Protection grid mounted for sensitivity measurements
Actuator type: G.R.A.S. RA0014

Measured Data: Found on Microphone Test Report # 30910 of one page.

Place of Calibration: Scantek, Inc.

6430 Dobbin Road, Suite C
Columbia, MD 21045 USA

Ph/Fax: 410-290-7726/ -9167
callab@scantekinc.com

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®

NVLAP Lab Code: 200625-0

Calibration Certificate No.30913

Instrument:	**Acoustical Calibrator**	*Date Calibrated:* **4/4/2014**	*Cal Due:* **4/4/2016**	
Model:	**1251**	*Status:*	**Received**	**Sent**
Manufacturer:	**Norsonic**	*In tolerance:*	X	X
Serial number:	**25766**	*Out of tolerance:*		
Class (IEC 60942):	**1**	*See comments:*		
Barometer type:		*Contains non-accredited tests:* __Yes _X_ No		
Barometer s/n:				
Customer:	**Kimley-Horn and Associates, Inc.**	*Address:* **3001 Weston Parkway, Cary, NC 27513**		
Tel/Fax:	**919-677-2000 / 919-677-2050**			

Tested in accordance with the following procedures and standards:
Calibration of Acoustical Calibrators, Scantek Inc., Rev. 10/1/2010

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31052	Oct 7, 2013	Scantek, Inc./ NVLAP	Oct 7, 2014
DS-360-SRS	Function Generator	33584	Sep 30, 2013	ACR Env./ A2LA	Sep 30, 2015
34401A-Agilent Technologies	Digital Voltmeter	US36120731	Sep 30, 2013	ACR Env. / A2LA	Sep 30, 2014
HM30-Thommen	Meteo Station	1040170/39633	Sep 30,2013	ACR Env./ A2LA	Sep 30, 2014
8903-HP	Audio Analyzer	2514A05691	Dec 12, 2013	ACR Env. / A2LA	Dec 12, 2016
PC Program 1018 Norsonic	Calibration software	v.5.2	Validated March 2011	Scantek, Inc.	-
4134-Brüel&Kjær	Microphone	173368	Nov 8, 2013	Scantek, Inc. / NVLAP	Nov 8, 2014
1203-Norsonic	Preamplifier	14051	Oct 24, 2013	Scantek, Inc./ NVLAP	Oct 24, 2014

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK)

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	Mariana Buzduga
Signature	Lydon Dawkins	Signature	[signature]
Date	4/4/2014	Date	4/4/2014

Document stored as: Z:\Calibration Lab\Cal 2014\NOR1251_25766_M1.doc

Results summary: Device was tested and complies with following clauses of mentioned specifications:

CLAUSES[1] FROM STANDARDS REFERENCED IN PROCEDURES:	MET[2]	NOT MET	COMMENTS
Manufacturer specifications			
Manufacturer specifications: Sound pressure level	X		
Manufacturer specifications: Frequency	X		
Manufacturer specifications: Total harmonic distortion	X		
Current standards			
ANSI S1.40:2006 B.3 / IEC 60942: 2003 B.2 - Preliminary inspection	X		
ANSI S1.40:2006 B.4.4 / IEC 60942: 2003 B.3.4 - Sound pressure level	X		
ANSI S1.40:2006 A.5.4 / IEC 60942: 2003 A.4.4 - Sound pressure level stability	-	-	
ANSI S1.40:2006 B.4.5 / IEC 60942: 2003 B.3.5 - Frequency	X		
ANSI S1.40:2006 B.4.6 / IEC 60942: 2003 B.3.6 - Total harmonic distortion	X		

1 The results of this calibration apply only to the instrument type with serial number identified in this report.

2 The tests marked with (*) are not covered by the current NVLAP accreditation.

Main measured parameters [3]:

Measured[4]/Acceptable[5] Tone frequency (Hz):	Measured[4]/Acceptable[5] Total Harmonic Distortion (%):	Measured [4]/Acceptable Level[5] (dB):
1000.34 ± 1.0/1000.0 ± 10.0	0.1 ± 0.1/ < 3	114.08 ± 0.12/114.0 ± 0.4

3 The stated level is valid at reference conditions.

4 The above expanded uncertainties for frequency and distortion are calculated with a coverage factor k=2; for level k=2.00

5 Acceptable parameters values are from the current standards

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
23.5 ± 1.0	99.79 ± 0.025	45.2 ± 2.2

Tests made with following attachments to instrument:

Calibrator ½" Adaptor Type:1443
Other:

Adjustments: Unit was not adjusted.
Comments: The instrument was tested and met all specifications found in the referenced procedures.

Note: The instrument was tested for the parameters listed in the table above, using the test methods described in the listed standards. All tests were performed around the reference conditions. The test results were compared with the manufacturer's or with the standard's specifications, whichever are larger.
Compliance with any standard cannot be claimed based solely on the periodic tests.

Measured Data: in Acoustical Calibrator Test Report # 30913 of one page.

Place of Calibration: Scantek, Inc.
6430 Dobbin Road, Suite C
Columbia, MD 21045 USA
Ph/Fax: 410-290-7726/ -9167
callab@scantekinc.com

Appendix B

HOURLY EQUIVALENT TRAFFIC NOISE LEVEL TABLES

Receiver ID	Receiver Name	Use	NAC	2025 Build Sound Level [dB(A)]
1	Community Picnic Area	Recreational	C	54
2	Community Playground	Recreational	C	52
3	Community Vegetable Garden	Recreational	C	52
4	Community Pool Area 1	Recreational	C	53
5	Community Pool Area 2	Recreational	C	53
6	Community Pool Area 3	Recreational	C	52
7	Community Pool Area 4	Recreational	C	52
8	Building 1 - Unit A	Residential	B	60
9	Building 1 - Unit B	Residential	B	60
10	Building 1 - Unit C	Residential	B	61
11	Building 1 - Unit D	Residential	B	62
12	Building 1 - Unit E	Residential	B	56
13	Building 1 - Unit F	Residential	B	56
14	Building 1 - Unit G	Residential	B	56
15	Building 1 - Unit H	Residential	B	56
16	Building 2 - Unit A	Residential	B	57
17	Building 2 - Unit B	Residential	B	57
18	Building 2 - Unit C	Residential	B	57
19	Building 2 - Unit D	Residential	B	59
20	Building 2 - Unit E	Residential	B	56
21	Building 2 - Unit F	Residential	B	55
22	Building 2 - Unit G	Residential	B	55
23	Building 2 - Unit H	Residential	B	57
24	Building 3 - Unit A	Residential	B	53
25	Building 3 - Unit B	Residential	B	53
26	Building 3 - Unit C	Residential	B	53
27	Building 3 - Unit D	Residential	B	54
28	Building 3 - Unit E	Residential	B	55
29	Building 3 - Unit F	Residential	B	55
30	Building 3 - Unit G	Residential	B	54
31	Building 3 - Unit H	Residential	B	54
32	Building 4 - Unit A	Residential	B	52
33	Building 4 - Unit B	Residential	B	54
34	Building 4 - Unit C	Residential	B	54
35	Building 4 - Unit D	Residential	B	55
36	Building 4 - Unit E	Residential	B	54
37	Building 4 - Unit F	Residential	B	53
38	Building 4 - Unit G	Residential	B	53

Receiver ID	Receiver Name	Use	NAC	2025 Build Sound Level [dB(A)]
39	Building 4 - Unit H	Residential	B	52
40	Building 5 - Unit A	Residential	B	52
41	Building 5 - Unit B	Residential	B	52
42	Building 5 - Unit C	Residential	B	52
43	Building 5 - Unit D	Residential	B	52
44	Building 5 - Unit E	Residential	B	54
45	Building 5 - Unit F	Residential	B	54
46	Building 5 - Unit G	Residential	B	54
47	Building 5 - Unit H	Residential	B	54
48	Building 6 - Unit A	Residential	B	55
49	Building 6 - Unit B	Residential	B	52
50	Building 6 - Unit C	Residential	B	52
51	Building 6 - Unit D	Residential	B	52
52	Building 6 - Unit E	Residential	B	52
53	Building 6 - Unit F	Residential	B	53
54	Building 6 - Unit G	Residential	B	53
55	Building 6 - Unit H	Residential	B	55
56	Building 7 - Unit A	Residential	B	55
57	Building 7 - Unit B	Residential	B	53
58	Building 7 - Unit C	Residential	B	53
59	Building 7 - Unit D	Residential	B	53
60	Building 7 - Unit E	Residential	B	55
61	Building 7 - Unit F	Residential	B	55
62	Building 7 - Unit G	Residential	B	55
63	Building 7 - Unit H	Residential	B	56
64	Building 8 - Unit A	Residential	B	54
65	Building 8 - Unit B	Residential	B	54
66	Building 8 - Unit C	Residential	B	52
67	Building 8 - Unit D	Residential	B	52
68	Building 9 - Unit A	Residential	B	54
69	Building 9 - Unit B	Residential	B	54
70	Building 9 - Unit C	Residential	B	54
71	Building 9 - Unit D	Residential	B	54
72	Building 9 - Unit E	Residential	B	52
73	Building 9 - Unit F	Residential	B	52
74	Building 9 - Unit G	Residential	B	52
75	Building 9 - Unit H	Residential	B	52
76	Building 10 - Unit A	Residential	B	54

Receiver ID	Receiver Name	Use	NAC	2025 Build Sound Level [dB(A)]
77	Building 10 - Unit B	Residential	B	53
78	Building 10 - Unit C	Residential	B	55
79	Building 10 - Unit D	Residential	B	54
80	Building 11 - Unit A	Residential	B	53
81	Building 11 - Unit B	Residential	B	53
82	Building 11 - Unit C	Residential	B	53
83	Building 11 - Unit D	Residential	B	54
84	Building 11 - Unit E	Residential	B	55
85	Building 11 - Unit F	Residential	B	54
86	Building 11 - Unit G	Residential	B	54
87	Building 11 - Unit H	Residential	B	54
88	Building 12 - Unit A	Residential	B	52
89	Building 12 - Unit B	Residential	B	52
90	Building 12 - Unit C	Residential	B	52
91	Building 12 - Unit D	Residential	B	53
92	Building 12 - Unit E	Residential	B	52
93	Building 12 - Unit F	Residential	B	52
94	Building 12 - Unit G	Residential	B	52
94	Building 12 - Unit H	Residential	B	51
95	Building 13 - Unit A	Residential	B	52
96	Building 13 - Unit B	Residential	B	52
97	Building 13 - Unit C	Residential	B	52
98	Building 13 - Unit D	Residential	B	52
99	Building 13 - Unit E	Residential	B	52
101	Building 13 - Unit F	Residential	B	52
102	Building 13 - Unit G	Residential	B	52
103	Building 13 - Unit H	Residential	B	52
104	Building 14 - Unit A	Residential	B	52
105	Building 14 - Unit B	Residential	B	52
106	Building 14 - Unit C	Residential	B	53
107	Building 14 - Unit D	Residential	B	53
108	Building 14 - Unit E	Residential	B	53
109	Building 14 - Unit F	Residential	B	53
110	Building 14 - Unit G	Residential	B	53
111	Building 14 - Unit H	Residential	B	52
112	Building 15 - Unit A	Residential	B	53
113	Building 15 - Unit B	Residential	B	53
114	Building 15 - Unit C	Residential	B	52

Receiver ID	Receiver Name	Use	NAC	2025 Build Sound Level [dB(A)]
115	Building 15 - Unit D	Residential	B	52
116	Building 15 - Unit E	Residential	B	53
117	Building 15 - Unit F	Residential	B	53
118	Building 15 - Unit G	Residential	B	53
119	Building 15 - Unit H	Residential	B	53
120	Building 16 - Unit A	Residential	B	55
121	Building 16 - Unit B	Residential	B	55
122	Building 16 - Unit C	Residential	B	55
123	Building 16 - Unit D	Residential	B	55
124	Building 16 - Unit E	Residential	B	53
125	Building 16 - Unit F	Residential	B	54
126	Building 16 - Unit G	Residential	B	54
127	Building 16 - Unit H	Residential	B	54
128	Building 17 - Unit A	Residential	B	58
129	Building 17 - Unit B	Residential	B	57
130	Building 17 - Unit C	Residential	B	57
131	Building 17 - Unit D	Residential	B	57
132	Building 17 - Unit E	Residential	B	55
133	Building 17 - Unit F	Residential	B	55
134	Building 17 - Unit G	Residential	B	55
135	Building 17 - Unit H	Residential	B	56
136	Building 18 - Unit A	Residential	B	54
137	Building 18 - Unit B	Residential	B	55
138	Building 18 - Unit C	Residential	B	55
139	Building 18 - Unit D	Residential	B	57
140	Building 18 - Unit E	Residential	B	54
141	Building 18 - Unit F	Residential	B	53
142	Building 18 - Unit G	Residential	B	53
143	Building 18 - Unit H	Residential	B	52

Appendix C

TRAFFIC NOISE MODELS

General

This appendix documents the TNM Inputs used in this Noise Study Report (NSR). The models utilized various TNM object types to approximate the traffic segments assessed for the proposed Coral Reef Commons development:

- Roadways
- Receivers (Receptors)
- Ground Zones
- Barriers
- Terrain Lines

Coordinate System

Each of the TNM Objects was modeled using the North American Datum 1983 (NAD83) horizontal coordinate system, and North American Vertical Datum 1988 (NAVD88).

Modeling Procedure

Roadways:

TNM roadway element widths were selected based upon representation of one (1) or two (2) lanes of traffic per TNM roadway element. For the proposed roadway facility, TNM roadway vertices were selected to represent interval lengths that appropriately represented fluctuations in the horizontal and vertical roadway geometry. TNM roadway elements of various widths were also modeled to represent the existing local roadways. Year 2025 peak hour traffic was added to the roadway elements to determine the potential noise impacts. Detailed traffic information is provided in Appendix D.

Receivers (Receptors):

TNM receiver elements were modeled by assigning a point location to the most sensitive likely "area of frequent human use" for each residence and recreational land use within the project limits. Receivers in the models were assigned a height of 4.92 feet. Noise levels at each discrete receptor were determined by means of modeling individual TNM receivers at all representative locations for "loudest-condition" existing and year 2025 build-condition predicted traffic. A future 2025 build-condition was created to analyze future traffic noise impacts for the proposed development being studied.

Ground Zones:

TNM ground zones were used to define the type and acoustical characteristics of intervening ground, wherever the ground differed from the default ground type. Specifically, ground zones were used to differentiate ground types in parking lots.

Barriers:

TNM barrier elements were used to model buildings throughout the proposed development. The barriers were given various heights depending on the estimated height of the structure.

Terrain Lines:

Terrain lines were input into TNM to define significant changes in grades and/or slopes throughout the noise study areas. The terrain lines were based on elevation data contained in the Triangulated Irregular Network (TIN) associated with the development.

TNM Traffic Noise Level Assessment

The TNM traffic noise level assessment is divided into two tasks:

1. Creation of TNM Validation Model
2. Assessment of Predicted Loudest-Hour Build-Condition Levels

Appendix D

PREDICTED TRAFFIC VOLUMES

Future (2025) Traffic Volumes

Coral Reef Dr EB to Access Rd 3				
Traffic Information		EB Traffic Volumes and Speed		
Peak Hr Vol	2365	Autos	2200	40
Direction	EB	MT	118	40
d	5	HT	47	40
t	2		2365	

Coral Reef Dr EB from Access Rd 3 to Access Rd 2				
Traffic Information		EB Traffic Volumes and Speed		
Peak Hr Vol	2221	Autos	2066	40
Direction	EB	MT	111	40
d	5	HT	44	40
t	2		2221	

Coral Reef Dr EB from Access Rd 2 to SW 127th				
Traffic Information		EB Traffic Volumes and Speed		
Peak Hr Vol	2328	Autos	2165	40
Direction	EB	MT	116	40
d	5	HT	47	40
t	2		2328	

Coral Reef Dr EB from SW 127th				
Traffic Information		EB Traffic Volumes and Speed		
Peak Hr Vol	2203	Autos	2049	40
Direction	EB	MT	110	40
d	5	HT	44	40
t	2		2203	

Access Rd 3 EB from Coral Reef Dr to Access Rd 2				
Traffic Information		EB Traffic Volumes and Speed		
Peak Hr Vol	368	Autos	368	25
Direction	EB	MT	0	25
d		HT	0	25
t			368	

Access Rd 2 SB				
Traffic Information		SB Traffic Volumes and Speed		
Peak Hr Vol	188	Autos	188	25
Direction	SB	MT	0	25
d		HT	0	25
t			188	

Access Rd 3 EB from Access Rd 2 to SW 127th				
Traffic Information		EB Traffic Volumes and Speed		
Peak Hr Vol	556	Autos	556	25
Direction	EB	MT	0	25
d		HT	0	25
t			556	

SW 127th SB from Coral Reef Dr to Access Rd				
Traffic Information		SB Traffic Volumes and Speed		
Peak Hr Vol	564	Autos	564	25
Direction	SB	MT	0	25
d		HT	0	25
t			564	

SW 127th SB from Access Rd to Retail				
Traffic Information		SB Traffic Volumes and Speed		
Peak Hr Vol	1120	Autos	1120	25
Direction	SB	MT	0	25
d		HT	0	25
t			1120	

SW 127th SB from Retail to Residential				
Traffic Information		SB Traffic Volumes and Speed		
Peak Hr Vol	636	Autos	636	25
Direction	SB	MT	0	25
d		HT	0	25
t			636	

Residential				
Traffic Information		NB Traffic Volumes and Speed		
Peak Hr Vol	452	Autos	452	15
Direction		MT	0	15
d		HT	0	15
t			452	

Coral Reef Dr WB from Access Rd 3				
Traffic Information		WB Traffic Volumes and Speed		
Peak Hr Vol	3558	Autos	3380	40
Direction	WB	MT	142	40
d	4	HT	36	40
t	1		3558	

Coral Reef Dr WB from Access Rd 2 to Access Rd 3				
Traffic Information		WB Traffic Volumes and Speed		
Peak Hr Vol	3711	Autos	3526	40
Direction	WB	MT	148	40
d	4	HT	37	40
t	1		3711	

Coral Reef Dr WB from SW 127th to Accress Rd 2				
Traffic Information		WB Traffic Volumes and Speed		
Peak Hr Vol	3764	Autos	3575	40
Direction	WB	MT	151	40
d	4	HT	38	40
t	1		3764	

Coral Reef Dr WB to SW 127th				
Traffic Information		WB Traffic Volumes and Speed		
Peak Hr Vol	3560	Autos	3382	40
Direction	WB	MT	142	40
d	4	HT	36	40
t	1		3560	

Access Rd 3 WB from Access Rd 2 to Coral Reef Dr				
Traffic Information		WB Traffic Volumes and Speed		
Peak Hr Vol	157	Autos	157	25
Direction	WB	MT	0	25
d		HT	0	25
t			157	

Access Rd 2 NB				
Traffic Information		WB Traffic Volumes and Speed		
Peak Hr Vol	107	Autos	107	25
Direction	WB	MT	0	25
d		HT	0	25
t			107	

Access Rd 3 WB from SW 127th to Access Rd 2				
Traffic Information		WB Traffic Volumes and Speed		
Peak Hr Vol	264	Autos	264	25
Direction	WB	MT	0	25
d		HT	0	25
t			264	

SW 127th NB from Access Rd to Coral Reef Dr				
Traffic Information		NB Traffic Volumes and Speed		
Peak Hr Vol	747	Autos	747	25
Direction	NB	MT	0	25
d		HT	0	25
t			747	

SW 127th NB from Retail to Access Rd				
Traffic Information		NB Traffic Volumes and Speed		
Peak Hr Vol	1011	Autos	1011	25
Direction	NB	MT	0	25
d		HT	0	25
t			1011	

SW 127th NB from Residential to Retail				
Traffic Information		NB Traffic Volumes and Speed		
Peak Hr Vol	501	Autos	501	25
Direction	NB	MT	0	25
d		HT	0	25
t			501	

Roundabout				
Traffic Information		NB Traffic Volumes and Speed		
Peak Hr Vol	184	Autos	184	15
Direction		MT	0	15
d		HT	0	15
t			184	