FINAL
NOISE STUDY REPORT

SR 50 (CORTEZ BOULEVARD)
PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

SR 50 (Cortez Boulevard)
from Lockhart Road to US 301 (SR 35/Treiman Boulevard)
Hernando County, Florida

ETDM Project Number: 3391
Work Program Item Segment Number: 416732-2
Federal-Aid Project Number: TBD

Florida Department of Transportation
11201 North McKinley Drive
Tampa, Florida 33612

January 2014

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NOTE: CHANGE IN PROJECT TERMINI JANUARY 2014

The Florida Department of Transportation (FDOT), District Seven, conducted a Project Development and Environment (PD&E) Study to determine the engineering and environmental effects of the proposed improvement to State Road 50 (SR 50) [Cortez Boulevard] from Lockhart Road to US 301 (SR 35/Treiman Boulevard) in Hernando County, Florida. The Preferred Alternative involves widening SR 50 (Cortez Boulevard) from four to six lanes from west of I-75 to US 98 (SR 700/McKethan Road), and from two to four lanes from US 98 (SR 700/McKethan Road) to US 301 (SR 35/Treiman Boulevard).

Initially, there were no plans for federal funding of the project since it was developer-driven. The original project was to result in approval of a State Environmental Impact Report (SEIR) with study limits from Lockhart Road (west of I-75) to US 301 (SR 700/McKethan Road). However, the slowed economy has delayed the initiation of the planned developments, so developers will not be making roadway improvements. In addition, after the September 27, 2012 Public Hearing, the Hernando County Metropolitan Planning Organization (MPO) elevated this project in its list of priorities. As a result, FDOT is seeking approval from the Federal Highway Administration in order to qualify the project for federal funding. Therefore, in order to maintain logical termini, the western project limit was revised from Lockhart Road to west of I-75.

The portion of SR 50 (Cortez Boulevard) in the area of the I-75 interchange (from station 968+50 to station 1027+00) is exempt from this study, as it was evaluated under the I-75 PD&E Study (FPID 411014-1). The portion of SR 50 (Cortez Boulevard) west of I-75 that is not included in the I-75 PD&E Study will be evaluated under a future PD&E study from SR 50 from Brooksville Bypass/SR 50A (Eastern Intersection)/East Jefferson Street to I-75, currently programmed for fiscal year 2013/2014. Therefore, the proposed western study limit is now identified as west of I-75 (see Project Location Map).

Consequently, please note that supporting documents, including Traffic Report, Noise Study Report, Historic Resources Update Survey Technical Memorandum, Air Quality Technical Memorandum, Comments and Coordination Report, and Preliminary Stormwater Management Facility Report evaluated the original study limits.

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1.0 INTRODUCTION

The Florida Department of Transportation (FDOT), District Seven, conducted a Project Development and Environment (PD&E) Study to determine the engineering and environmental effects of the proposed improvement to State Road 50 (SR 50) [Cortez Boulevard] from Lockhart Road to US 301 (SR 35/Treiman Boulevard) in Hernando County, Florida.

1.1 PURPOSE

The purpose of the study was to provide documented environmental and engineering analyses to assist FDOT in reaching a decision on the type, location, and conceptual design of the necessary improvements in order to accommodate future traffic demand in a safe and efficient manner. The study also satisfied the requirements of FDOT and followed the process outlined in the FDOT *Project Development and Environment Manual*[1].

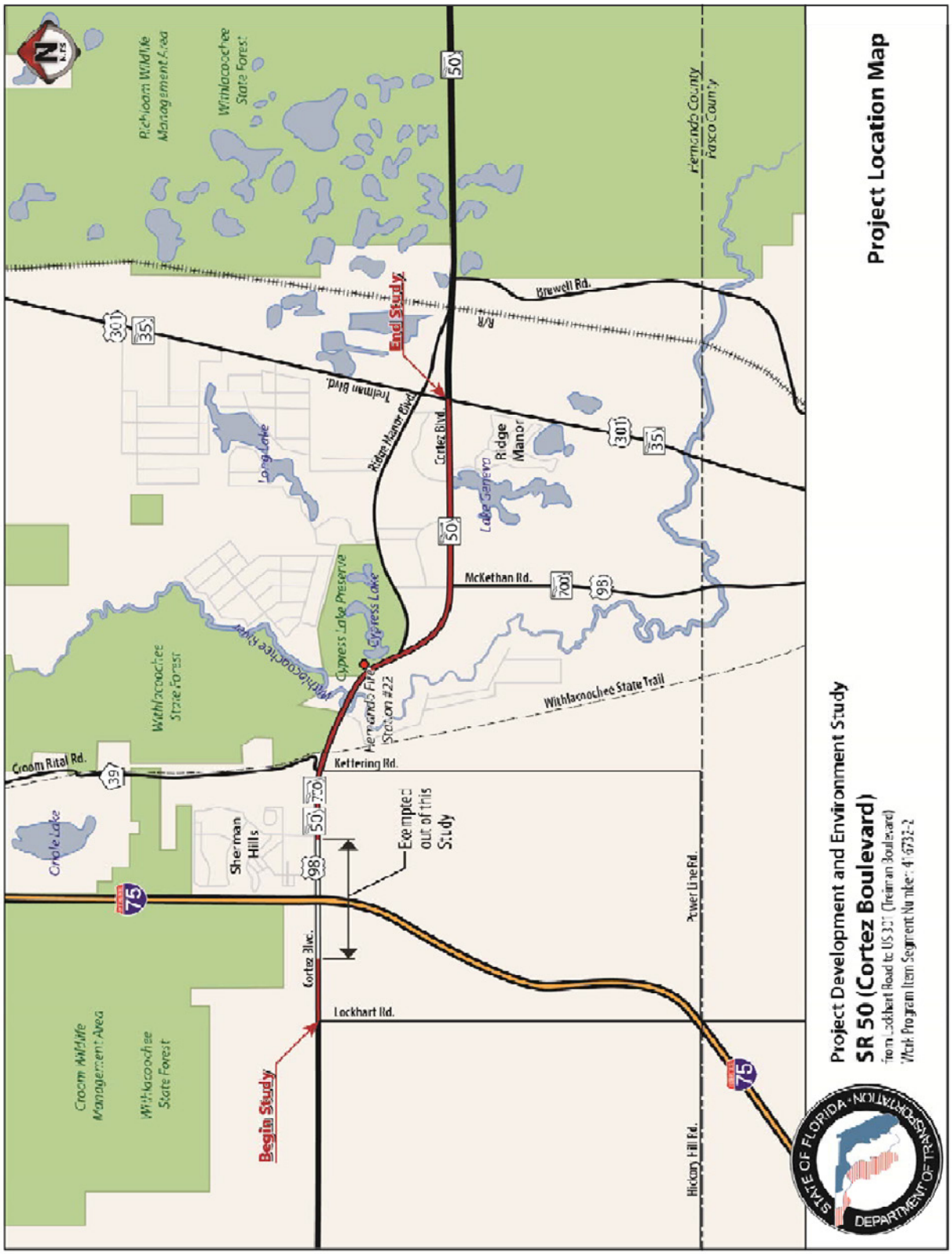
This study documented the need for the improvements and presented the procedures utilized to develop and evaluate various improvement alternatives. Information relating to the engineering and environmental characteristics essential for development of alternative alignments and analytical decisions was collected. Design criteria were established and preliminary alternative alignments were developed. The comparison of alternative alignments was based on a variety of parameters utilizing a matrix format. This process identified the Recommended Alternative that minimizes natural, physical, and socio-economic impacts, while providing the necessary future transportation improvements. The study also solicited input from the community and users of the facility. The design year for the analysis is 2035.

1.2 PROJECT DESCRIPTION

SR 50 (Cortez Boulevard) is proposed to be widened from four to six lanes from west of I-75 to US 98 (SR 700/Treiman Boulevard) and from two to four lanes from US 98 (SR 700/Treiman Boulevard) to US 301 (SR 35/Treiman Boulevard) within Hernando County, Florida (Roadway ID 08 070 000). The study limits extend from Lockhart Road easterly to US 301 (SR 35/Treiman Boulevard), as shown in **Figure 1-1**. Interstate 75 (I-75) ramp terminal intersections and approaching segments (length 0.9 miles [mi]) were exempted out of this study since those improvements were analyzed as part of the I-75 PD&E Study, Financial Project Identification Number (FPID): 411014-1. The total length of the project (including the I-75 interchange area) is approximately 6.3 mi. The project is within the Brooksville SE and Saint Catherine United States Geological Survey (USGS) quadrangle maps (map numbers 3719 and 3718, respectively). The project is within Township 22 South, Range 20 East, Section 36; Township 22 South, Range 21 East, Sections 31, 32, and 33; and Township 23 South, Range 21 East, Sections 1, 2, 3, 4, 5, 6, 10, 11, and 12 of the Public Land Survey System (PLSS).

A prior PD&E study was approved on September 28, 1989, for the segment of SR 50 (Cortez Boulevard) from SR 50/SR 50A to US 301 (SR 35/Treiman Boulevard). That study recommended the roadway be widened to four lanes. The only segment that hasn't been improved to four lanes is from US 98 (SR 700/McKethan Road) to US 301 (SR 35/Treiman Boulevard), which currently remains a two-lane undivided rural roadway.

Figure 1-1: Project Location Map



1.3 EXISTING DESIGNATIONS

SR 50 (Cortez Boulevard) is part of the State Highway System (SHS) and has a Functional Classification of Rural Principal Arterial. There are no grade separated interchanges (other than I-75) along the project. The facility's access management classification is Access Class 3, Restrictive, from Lockhart Road to east of Kettering Road (Mile Post [MP] 5.250) and Access Class 4, Non-Restrictive, from east of Kettering Road (MP 5.250) to US 301.

SR 50 (Cortez Boulevard) has a Strategic Intermodal System (SIS) designation of SIS Corridor and also a Florida Intrastate Highway System (FIHS) designation from US 19 to I-75. SR 50 is a Federal Aid Road on the National Highway System (NHS) from US 19 to I-75, and is part of the Surface Transportation Program (STP) from I-75 to US 301. In addition, the entire length of SR 50 within Hernando County has been designated a hurricane evacuation route by the Florida State Emergency Response Team (SERT) and is identified as an evacuation route in the Hernando County Comprehensive Plan. The Hernando County Metropolitan Planning Organization (MPO) *Congestion Management Process 2010 State of the System Report*[2] has designated SR 50 (Cortez Boulevard) in the study area as a truck route.

2.0 METHODOLOGY

As required by Florida Statute 335.17, a traffic noise study was performed in accordance with Title 23 Code of Federal Regulations Part 772 (23 CFR 772), *Procedures for Abatement of Highway Traffic Noise and Construction Noise*[3]. The analysis applied procedures and followed methodology established in the FDOT *Project Development and Environment Manual*, Part 2, Chapter 17 (May 2011).

2.1 MODEL AND NOISE METRICS

Noise levels were predicted using the latest Federal Highway Administration (FHWA) Traffic Noise Model (TNM), version 2.5. All measured and predicted noise levels are expressed in decibels (dB) using an "A"-scale [dB(A)] weighting. This scale most closely approximates the response characteristics of the human ear to traffic noise. All noise levels are reported as hourly equivalent noise levels [Leq(h)], which can be compared directly to criteria levels established by FHWA. The Leq(h) is defined as the equivalent steady-state sound level that, in a given hourly period, contains the same acoustic energy as the time-varying sound for the same hourly period.

2.2 TRAFFIC DATA

Traffic noise is heavily dependent on traffic speed with the amount of noise generated by traffic increasing as the vehicle speed increases. The Level of Service (LOS) C condition is considered the maximum traffic volume that will allow vehicles to maintain the posted speed limit. Traffic data used in the noise analysis was developed from the *Final Traffic Report*[4]. Demand traffic volumes forecasted for SR 50 (Cortez Boulevard) in the design year (2035) exceeded the LOS C condition for the build project scenario. Therefore, LOS C volumes for SR 50 (Cortez Boulevard) were used when predicting noise levels at noise sensitive sites for design year (2035) build conditions.

Existing (2011) and design year (2035) no-build conditions were also evaluated. Demand traffic volumes for SR 50 (Cortez Boulevard) were used when predicting noise levels at noise sensitive sites for existing conditions. LOS C traffic volumes for SR 50 (Cortez Boulevard) were used when predicting noise levels at noise sensitive sites for design year (2035) no-build conditions.

Vehicle volumes were divided between autos, medium trucks and heavy trucks using truck factors derived from the *Final Traffic Report*. Also, vehicle volumes were divided into directional traffic flow using directional factors derived from the traffic report. As a worst-case, the higher directional flow of traffic was always assigned to the through lane direction in closest proximity to noise sensitive sites. The existing posted speed limit on SR 50 (Cortez Boulevard) was used when predicting noise levels for existing and design year 2035 no-build conditions. For design year (2035) build conditions, the expected posted speed limit was derived from the design speed for SR 50 (Cortez Boulevard) (i.e., design speed minus 5 miles per hour [mph]). Traffic volumes, truck factors, directional factors and vehicle speed are provided in **Appendix A**.

2.3 NOISE ABATEMENT CRITERIA

FHWA has established noise levels at which noise abatement must be considered for various types of noise sensitive sites. These noise levels are referred to as the Noise Abatement Criteria (NAC). As shown in **Table 2-1**, NAC vary by activity category. Noise abatement measures must be considered when predicted traffic noise levels for design year build conditions approach or exceed NAC. FDOT defines "approach" as within 1 dB(A) of FHWA criteria. For comparison purposes, typical noise levels associated with common indoor and outdoor activities are provided in **Table 2-2**.

Table 2-1: FHWA Noise Abatement Criteria

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

Source: 23 CFR Part 772, *Procedures for Abatement of Highway Traffic Noise and Construction Noise*, FHWA, 2010.

Noise abatement must also be considered when a substantial increase in traffic noise would occur as a direct result of the transportation improvement project. FDOT defines a substantial increase as 15 or more dB(A) above existing conditions. A substantial increase typically occurs in areas where existing traffic noise is a minor component of the noise environment but would become a major component for the build condition. SR 50 (Cortez Boulevard), I-75, US 98 (SR 700/McKethan Road) and US 301 (SR 35/Treiman Boulevard) are notable noise sources for noise sensitive sites adjacent to those existing highways. A comparison between existing noise levels and predicted design year (2035) build condition noise levels was made at all noise sensitive sites to identify substantial increases.

Table 2-2: 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)	---70---	Vacuum Cleaner at 10 ft
Gas Lawn Mower at 100 ft		Normal Speech at 3 ft
Commercial Area	---60---	
Heavy Traffic at 300 ft		Large Business Office
	---50---	Dishwasher Next Room
Quiet Urban Daytime		
	---40---	Theatre, Large Conference Room (Background)
Quiet Urban Nighttime		Library
Quiet Suburban Nighttime	---30---	Bedroom at Night, Concert Hall (Background)
Quiet Rural Nighttime	---20---	
	---10---	
	---0---	
Lowest Threshold of Human Hearing		Lowest Threshold of Human Hearing

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

2.4 NOISE SENSITIVE SITES

Noise sensitive land uses along SR 50 (Cortez Boulevard) are mostly residential including single-family homes and an apartment complex which are both classified as Activity Category B of the NAC. Other noise sensitive land uses within the project limits include:

- Activity Category C – United Methodist Church (playground), Anchor Church/Ridge Manor Christian Academy (day care, outdoor playground), Ridge Manor Oaks Golf and Country Club
- Activity Category D – All Faiths United Church of Christ, Ridge Manor Community Center, United Methodist Church, Ridge Manor Medical Clinic, Anchor Church, Ridge Manor Family Medicine, Family Dental Care
- Activity Category E – Days Inn Motel, Ridge Manor Motel, lounge with outdoor seating

Retail businesses, service shops, emergency services and utility facilities (all in Activity Category F) also border SR 50 (Cortez Boulevard). As stipulated in 23 CFR 772, Activity Category F land uses do not require a noise analysis. Numerous undeveloped parcels of property (Activity Category G) border SR 50 (Cortez Boulevard). Noise contours discussed below in Section 2.5.3 indicate where a noise impact may occur once a vacant parcel has been permitted for development. Once permitted, the NAC and the noise contour for the appropriate Activity Category can be applied.

Consistent with the FDOT *Project Development and Environment Manual*, receptor points representing the noise sensitive sites were located as follows:

- Residential receptor points were placed at the edges of buildings closest to the major traffic noise source.
- Receptor points for churches, the community center, medical facilities, and motels were placed at the edges of buildings closest to the major traffic noise source.
- Receptor points for playgrounds and lounge were placed at the outdoor use area.
- Ridge Manor Oaks Golf and Country Club Hole #3 was represented by a grid of 279 receptor points placed at 15-foot (ft) intervals.
- Ground floor receptor sites were assumed to be 5 ft above the ground elevation.

2.5 NOISE ABATEMENT CONSIDERATION

As stipulated by 23 CFR 772, noise abatement was considered at all noise sensitive sites that were predicted to approach or exceed NAC. Noise abatement measures evaluated during the PD&E phase of this project included traffic management techniques, alignment modifications, buffer zones, land use controls and noise barriers.

2.5.1 Traffic Management Measures

Traffic management measures involve prohibiting/limiting truck traffic or reducing the speed limit. The Hernando County MPO *Congestion Management Process 2010 State of the System Report* has designated SR 50 (Cortez Boulevard) as a truck route. Consequently, prohibiting truck traffic is not considered a viable noise abatement measure. The existing and proposed speed limits are consistent with the designation of a portion of SR 50 (Cortez Boulevard) as a SIS and support the goal of accommodating future traffic demand in a safe and efficient manner. A substantial reduction in speed limit for the purpose of noise abatement is not a viable noise abatement measure.

2.5.2 Alignment Modifications

Alignment modification involves orienting the roadway at sufficient distances from noise sensitive sites to minimize traffic noise. The proposed horizontal alignment of SR 50 (Cortez Boulevard) utilizes existing right-of-way (ROW). The existing vertical alignment of SR 50 (Cortez Boulevard) must be maintained to accommodate existing cross street and driveway connections. Consequently, alignment modification is not a viable noise abatement measure.

2.5.3 Buffer Zones

As properties in the vicinity of a highway are developed, providing a buffer between a highway and future noise sensitive development can minimize or eliminate noise impacts. This abatement measure can be implemented through local land use planning. The distance between the

proposed highway and location where traffic noise levels approach the NAC for Activity Categories A, B, C and E was determined to facilitate future land use planning that is compatible with the noise environment. For the proposed design, the distance between the nearest through lane of SR 50 (Cortez Boulevard) and the location where traffic noise levels would approach the NAC for a particular Activity Category are provided in **Table 2-3**. The distance does not account for any reduction in noise levels that may be provided by topographic features, berms, privacy walls or intervening structures. The distance also does not account for traffic noise generated on roads other than SR 50 (Cortez Boulevard). For any new development or redevelopment occurring in the future, local officials can use the noise contour information to establish buffer zones thereby minimizing or avoiding noise impacts at sensitive land uses.

Table 2-3: Noise Contours

Segment of SR 50	Distance from Edge of the Nearest SR 50 Travel Lane		
	Activity Category A 56 dB(A) Noise Contour	Activity Category B/C 66 dB(A) Noise Contour	Activity Category E 71 dB(A) Noise Contour
West of Lockhart Rd.	354 feet	92 feet	33 feet
Lockhart Rd. to Kettering Rd.	475 feet	137 feet	51 feet
Kettering Rd. to US 98	637 feet	212 feet	102 feet
US 98 to US 301	517 feet	153 feet	70 feet

2.5.4 Noise Barriers

Barriers reduce noise levels by blocking the sound path between a roadway and noise sensitive site. To effectively reduce traffic noise, a noise barrier must be relatively long, continuous (with no intermittent openings) and of sufficient height. Noise barriers located along the ROW line were evaluated for heights ranging from 8 to 22 feet in 2-ft increments. For a particular height, the length of a barrier was optimized to minimize cost while maintaining at least a 7 dB(A) reduction at one noise sensitive site that has a predicted noise level which approaches or exceeds the NAC.

For a noise barrier to be considered feasible and cost reasonable, the following minimum conditions should be met:

- A noise barrier must provide a minimum noise reduction of 7 dB(A) (noise reduction design goal) at one or more impacted noise sensitive sites with at least one additional impacted noise sensitive site provided a noise reduction of 5 dB(A) or more.
- When evaluating a noise barrier at residences, the cost of the noise barrier should not exceed $42,000 per benefited residence. When evaluating non-residential uses, the cost of the noise barrier should not exceed $995,935 per person-hour use per square foot (sq ft) of noise barrier. These are the reasonable cost limits established by FDOT. A benefited noise sensitive site is defined as a site that would experience at least a 5 dB(A) reduction as a result of providing a noise barrier. The current unit cost used to evaluate economic reasonableness is $30 per sq ft, which covers barrier materials and labor.

A noise barrier was evaluated for each noise sensitive site with a predicted noise level that approaches or exceeds NAC for the design year (2035) build conditions. At each noise barrier location, the feasibility (i.e., meeting the noise reduction requirements described above) was established. If feasible, then the cost reasonableness was evaluated.

3.0 RESULTS

The traffic noise analysis included noise model validation. Following validation, noise levels were predicted for existing, design year (2035) no-build conditions and design year (2035) build conditions.

3.1 NOISE MODEL VALIDATION

Noise monitoring was performed on April 25, 2011 to verify the accuracy of TNM predictions for the project area. A Quest Technologies Q300 noise monitor was used to measure noise levels. The monitor was calibrated with a QC-10 calibrator prior to measurements. Traffic data was collected during each monitoring event and used in TNM to predict noise levels. Results of the validation process are summarized in **Table 3-1**. The validation process determined that TNM predicted noise levels within the acceptable limit of 3 dB(A).

Table 3-1: Noise Model Validation

Location	Trial #	Date	Time	Field Measured Level [dB(A)]	Computer Predicted Level [dB(A)]	Decibel Difference [dB(A)]
74 feet south of the nearest SR 50 eastbound travel lane; West of Lockhart Road	1	4-25-2011	1331	64.4	65.8	1.4
	2	4-25-2011	1344	64.6	66.8	2.2
	3	4-25-2011	1357	63.5	65.4	1.9
100 feet south of the nearest SR 50 eastbound travel lane; East of the United Church of Christ	1	4-25-2011	1432	60.1	62.0	1.9
	2	4-25-2011	1446	61.7	63.0	1.3
	3	4-25-2011	1459	62.9	62.8	-0.1

3.2 DESIGN NOISE ANALYSIS

Noise levels were predicted at 182 receptor points representing 183 residences (i.e., single-family homes, multifamily dwellings and apartments), three churches (All Faiths United Church of Christ, United Methodist Church, Anchor Church/Ridge Manor Christian Academy), two motels (Days Inn, Ridge Manor Motel), three medical facilities (Ridge Manor Medical Clinic, Ridge Manor Family Medicine, Family Dental Care), the Ridge Manor Community Center and a lounge with outdoor seating. The Ridge Manor Oaks Golf and Country Club Hole #3 located along US 301 (SR 35/Treiman Boulevard) was represented by a grid of 279 receptor points placed at 15-ft intervals. Predicted noise levels for these noise sensitive sites are provided in **Appendix B**. Results of a representative number of the gridded receptor points are also provided. The locations of the receptor points identified in **Appendix B** are depicted on the aerials found in **Appendix C**. An electronic version of the TNM modeling files is found in **Appendix D**. The alphanumeric identification for each receptor point associated with a noise sensitive site was formulated as follows:

- The letter “N” or “S” identified the receiver as north or south of SR 50 (Cortez Boulevard).

- The numeric symbols identified a receiver point and generally increase from west to east.
- For the grid at the Ridge Manor Oaks Golf and Country Club Hole #3, receptor points were identified by "GC" and numbered by position in the grid.

3.2.1 South of SR 50 (Cortez Boulevard)

South of SR 50 (Cortez Boulevard), exterior noise levels at 7 residences (represented by receptor points RS21, RS22, RS23, RS89 and RS90) were predicted to approach or exceed the NAC for design year (2035) build conditions. Comparing design year build conditions to existing conditions, the greatest predicted increase attributable to the project [9.3 dB(A)] occurred at an apartment near US 301 (SR 35/Treiman Boulevard). A substantial increase attributable to the project was not predicted to occur at any noise sensitive site.

Receptor RS21

Predicted noise levels at one residence, represented by receptor point RS21, exceeds the NAC. Predicted noise levels do not approach or exceed the NAC at any other residence in the immediate vicinity of receptor point RS21. FDOT procedure stipulates that a noise barrier benefit two or more impacted residences to be considered feasible. Consequently, a noise barrier was not feasible at this location because a noise barrier may benefit only one impacted residence.

Receptors RS22 and RS23

Predicted noise levels at two contiguous residences, represented by receptor points RS22 and RS23, approach or exceed the NAC. A noise barrier evaluation determined that at a barrier height of at least 12 feet one impacted residence (RS22) could be provided a noise reduction of more than 7 dB(A) and one additional impacted residence (RS23) could be provided a noise reduction of more than 5 dB(A). Therefore, the noise barrier was determined to be feasible. An evaluation of cost reasonableness is provided in **Table 3-2**. The lowest cost per benefited residence that could be achieved was $96,000. The cost exceeds $42,000 per benefited residence; therefore a noise barrier was determined to not be cost reasonable.

Receptors RS89 and RS90

Predicted noise levels at four contiguous residences, represented by receptor points RS89 and RS90, exceed the NAC. A noise barrier evaluation determined that two residences (RS89) could be provided a noise reduction of at least 5 dB(A) at the maximum noise barrier height of 22 feet. Therefore, a noise barrier was determined to be a feasible abatement measure.

FHWA regulation (23CFR772) and FDOT procedure stipulate that at least one residence be provided the noise reduction design goal of 7 dB(A). At the maximum barrier height of 22 feet, the noise reduction design goal of 7 dB(A) could not be provided at any residence. Consequently, a noise barrier was determined to not be a reasonable abatement measure. The amount of noise reduction that could be provided was limited because of gaps required in a noise barrier to accommodate driveways.

3.2.2 North of SR 50 (Cortez Boulevard)

North of SR 50 (Cortez Boulevard), exterior noise levels at 10 residences (represented by receptor points RN3 through RN5, RN31 through RN35, RN45 and RN47) were predicted to approach or exceed the NAC for design year (2035) build conditions. In addition, predicted noise levels at the portion of Ridge Manor Oaks Golf and Country Club Hole #3 within the project limits along US 301 (SR 35/Treiman Boulevard) were predicted to approach or exceed the NAC for design year (2035) build conditions. Comparing design year build conditions to existing conditions, the greatest predicted increase attributable to the project [8.4 dB(A)] occurred at a residence near US 98 (SR 700/McKethan Road). A substantial increase attributable to the project was not predicted to occur at any noise sensitive site.

Receptors RN3 through RN5

Predicted noise levels at three contiguous residences, represented by receptor points RN3, RN4 and RN5, approach or exceed the NAC. A noise barrier evaluation determined that two residences (RN3 and RN4) could be provided a noise reduction of at least 5 dB(A) at the maximum noise barrier height of 22 feet. Therefore, a noise barrier was determined to be a feasible abatement measure.

FHWA regulation (23CFR772) and FDOT procedure stipulate that at least one residence be provided the noise reduction design goal [7 dB(A)]. At the maximum barrier height of 22 feet, the noise reduction design goal of 7 dB(A) could not be provided at any residence. Consequently, a noise barrier was determined to not be a reasonable abatement measure. The amount of noise reduction that could be provided was limited because of gaps required in a noise barrier to accommodate driveways.

Receptors RN31 through RN35

Predicted noise levels at five contiguous residences, represented by receptor points RN31 through RN35, exceed the NAC. A noise barrier evaluation determined that at a barrier height of at least 16 feet one impacted residence (RN35) could be provided a noise reduction of more than 7 dB(A) and four additional impacted residence (RN31, RN32, RN33 or RN34) could be provided a noise reduction of more than 5 dB(A). Therefore, the noise barrier was determined to be feasible. An evaluation of cost reasonableness is provided in **Table 3-3**. The lowest cost per benefited residence that could be achieved was $119,340. The cost exceeds $42,000 per benefited residence; therefore a noise barrier was determined to not be cost reasonable.

Receptor RN45

The predicted noise level at one residence, represented by receptor point RN45, exceeds the NAC. Predicted noise levels do not approach or exceed the NAC at any other residence in the immediate vicinity of receptor point RN45. FDOT procedure stipulates that a noise barrier benefit two or more impacted residences to be considered feasible. Consequently, a noise barrier was not feasible at this location because a noise barrier may benefit only one impacted residence.

Receptor RN47

The predicted noise level at one residence, represented by receptor point RN47, exceeds the NAC. Predicted noise levels do not approach or exceed the NAC at any other residence in the immediate vicinity of receptor point RN47. FDOT procedure stipulates that a noise barrier benefit two or more impacted residences to be considered feasible. Consequently, a noise barrier was not feasible at this location because a noise barrier may benefit only one impacted residence.

Table 3-2: Noise Barrier Analysis – Receiver Points RS22 and RS23

Barrier Height (ft)	Barrier Length[1] (ft)	Number of Impacted Residences	Amount of Reduction at Impacted and Benefited Residences			Number of Benefited Residences			Average Reduction at all Benefited Residences	Total Cost[4]	Cost per Benefited Residence
			5 - 5.9 dB(A)	6 - 6.9 dB(A)	7 + dB(A)	Impacted[2]	Other[3]	Total			
10	NA	2	0	0	1	1	0	1	NA	NA	NA
12	538		1	0	1	2	0	2	7.1	$193,680	$96,840
14	460		1	0	1	2	0	2	6.4	$193,200	$96,600
16	400		1	0	1	2	0	2	7.2	$192,000	$96,000
18	400		1	0	1	2	0	2	6.3	$216,000	$108,000
20	400		1	0	1	2	0	2	6.5	$240,000	$120,000
22	400		1	0	1	2	0	2	7.0	$264,000	$132,000

[1] Noise barrier length is optimized for a particular height.
[2] Benefited residences with a predicted noise level that approaches or exceeds the NAC.
[3] Benefited residences with a predicted noise level that does not approach the NAC. Boise reduction at these residences is incidental due to proximity of impacted residences.
[4] Unit cost of $30 per sq ft.

Table 3-3: Noise Barrier Analysis – Receiver Points RN31 through RN35

Barrier Height (ft)	Barrier Length[1] (ft)	Number of Impacted Residences	Amount of Reduction at Impacted and Benefited Residences			Number of Benefited Residences			Average Reduction at all Benefited Residences	Total Cost[4]	Cost per Benefited Residence
			5 - 5.9 dB(A)	6 - 6.9 dB(A)	7 + dB(A)	Impacted[2]	Other[3]	Total			
14	NA	5	2	3	0	5	0	5	NA	NA	NA
16	1,605		2	2	1	5	1	6	6.1	$770,400	$128,400
18	1,105		2	2	1	5	0	5	6.3	$596,700	$119,340
20	1,005		1	3	1	5	0	5	6.3	$603,000	$120,600
22	956		1	3	1	5	0	5	6.3	$630,960	$126,192

[1] Noise barrier length is optimized for a particular height.
[2] Benefited residences with a predicted noise level that approaches or exceeds the NAC.
[3] Benefited residences with a predicted noise level that does not approach the NAC. Boise reduction at these residences is incidental due to proximity of impacted residences.
[4] Unit cost of $30 per sq ft.

3.2.3 Ridge Manor Oaks Golf and Country Club along US 301 (SR 35/ Treiman Boulevard)

Predicted noise levels approach or exceed the NAC at Ridge Manor Oaks Golf and Country Club Hole #3 paralleling US 301 (SR 35/Treiman Boulevard) within the project limits. The playing surface of Hole #3 within the project limits is approximately 4.2 acres (ac) and parallels US 301 (SR 35/Treiman Boulevard) for about 1,050 feet. Noise levels within a portion of Hole #3 varying from about 52 to 67 feet wide and bordering the US 301 (SR 35/Treiman Boulevard) ROW were predicted to approach or exceed the NAC of 67 dB(A) for Activity Category C land uses. The impacted portion of Hole #3 accounts for about 30.7 percent (1.3 ac) of the total Hole #3 within the project limits.

A noise barrier was evaluated for the Ridge Manor Oaks Golf and Country Club Hole #3 following procedures documented in *Method to Determine Reasonableness and Feasibility of Noise Abatement at Special Use Locations*[5]. The results of a noise barrier analysis are provided in **Table 3-4**. Depending upon the noise barrier height, the optimized length of the barrier would vary between 1,054 and 1,074 feet. The results show that up to about 89 percent of the total Hole #3 within the project limits, including up to 95 percent of the impacted area, can be provided a noise reduction of 5 dB(A) or more with a reduction of 7 dB(A) or more provided in a portion of Hole #3.

To achieve a cost below $995,935 per person-hour per sq ft of noise barrier (i.e., the upper cost limit considered reasonable) a total of at least 2,640 golfers (barrier height at 12 feet, barrier length at 1,070 feet) would have to use the course on an average day assuming a golfer would spend about 15 minutes within the 1,050 ft section of Hole #3. This number of golfers would exceed the capacity of the golf course. Consequently, a noise barrier is not deemed a reasonable abatement measure.

Table 3-4: Ridge Manor Oaks Golf and Country Club Hole #3 Noise Barrier Analysis

Barrier Height (feet)	Barrier Length (feet)	Total Cost[1]	Impacted and Benefited Portion of Golf Hole #3 Within Project Limits	Total Benefited Portion of Golf Hole #3 Within Project Limits	Average Reduction in Benefited Area [(dB(A)]	Required person-hours of Use Within Benefited Area[2]	Required Person-hours of Use on Hole #3 During an Average Day[3]	Required Number of Golfers During an Average Day at 15 Minutes per Golfer
8	1,074	$257,760	92%	34%	7.9	363 hours	1,067 hours	4,268
10	1,070	$321,000	95%	55%	9.0	452 hours	821 hours	3,284
12	1,070	$385,200	95%	82%	9.0	542 hours	660 hours	2,640
14	1,070	$449,400	95%	86%	9.7	632 hours	735 hours	2,940
16	1,070	$513,600	95%	88%	10.1	722 hours	820 hours	3,280
18	1,054	$569,160	95%	88%	10.5	801 hours	910 hours	3,640
20	1,054	$632,400	95%	89%	10.9	889 hours	999 hours	3,996
22	1,054	$695,640	95%	89%	11.2	978 hours	1,098 hours	4,392

[1] Unit cost of $30 per sq ft of noise barrier.

[2] Assumes all person-hours of use occur in the impacted portion of the park parcel that is benefited. Based on $995,935/person-hour/ft^2 of barrier as the upper limit for cost reasonableness.

[3] Assumes person-hours of use are distributed evenly over the total portion of Hole #3 within the project limits (i.e., assumes even distribution of people on portion of Hole #3 within the project limits).

4.0 CONCLUSIONS

4.1 NOISE IMPACTS

Within the project limits, outdoor noise levels at 17 residences and Ridge Manor Oaks Golf and Country Club Hole #3 were predicted to approach or exceed the NAC for design year (2035) build conditions. Comparing design year (2035) build conditions to existing conditions, the greatest predicted increase attributable to the project was 9.3 dB(A). A substantial increase attributable to the project was not predicted to occur at any noise sensitive site.

4.2 STATEMENT OF LIKELIHOOD

Noise abatement measures were determined to be not feasible at 3 residences. At the remaining 14 residences and Ridge Manor Oaks Golf and Country Club Hole #3, noise barriers were feasible but were not reasonable (i.e., the noise reduction design goal could not be achieved or a noise barrier was not cost reasonable). Therefore, there are no commitments concerning noise barrier evaluation during the design phase of this project. A land use review will be performed during the Design phase of the project to ensure that all noise-sensitive land uses that have received a building permit prior to the project's Date of Public Knowledge are evaluated. Notably, there was no ongoing construction observed during field reviews performed when establishing existing land use (April 25, 2011 and February 1, 2012).

5.0 CONSTRUCTION NOISE AND VIBRATION

Some of the existing land uses adjacent to SR 50 (Cortez Boulevard) are identified on the FDOT listing (PD&E Manual Table 17.3) of noise- and vibration-sensitive sites (e.g., residences, medical facilities). Construction activities for the proposed roadway improvements are not expected to have any substantial noise or vibration impact. If additional sensitive land uses develop adjacent to the roadway prior to construction, increased potential for noise or vibration impacts could result. It is anticipated that the application of the *FDOT Standard Specifications for Road and Bridge Construction*[6] will minimize or eliminate potential construction noise and vibration impacts. However, should unanticipated noise or vibration issues arise during the construction process, the Project Engineer, in coordination with the District Noise Specialist and the Contractor, will investigate additional methods of controlling these impacts.

6.0 PUBLIC COORDINATION

Land use controls are a means of preventing or minimizing traffic noise impacts in areas of future development. For design year (2035) build conditions, the predicted distances between the nearest through lane of SR 50 (Cortez Boulevard) and location where traffic noise levels would approach the NAC for Activity Categories A, B, C and E are provided in **Table 2-3**. The contours do not account for any shielding of noise provided by structures or the effects of site specific topographic features. The distance also does not account for traffic noise generated on roads other than SR 50 (Cortez Boulevard).

A copy of this noise study report will be provided to local officials for the purpose of facilitating compatibility between land development and highways. The noise contours can be used to determine areas where noise sensitive land uses would be incompatible with noise generated from traffic on SR 50 (Cortez Boulevard). When considering development of currently undeveloped properties (Activity Category G), this information can be applied to establish buffers between SR 50 (Cortez Boulevard) and noise sensitive development or used to determine when noise abatement should be provided as part of a noise sensitive development.

7.0 REFERENCES

1. *Project Development and Environment Manual*; Florida Department of Transportation; Tallahassee, Florida; 2013.

2. *Congestion Management Process 2010 State of the System Report*; Hernando County Metropolitan Planning Organization; December 20, 2010.

3. *Procedures for Abatement of Highway Traffic Noise and Construction Noise*; Federal Highway Administration; July 2010.

4. *Final Traffic Report*; Atkins North America, Inc.; Tampa, Florida; January 2014.

5. *A Method to Determine Reasonableness and Feasibility of Noise Abatement at Special Use Locations*; Florida Department of Transportation; Tallahassee, Florida; 2009.

6. *Standard Specifications for Road and Bridge Construction*; Florida Department of Transportation; Tallahassee, Florida; 2014.

APPENDIX A

TRAFFIC DATA

Traffic-Hourly Vehicle Volume by Lane

Design Year (2035) Build

Traffic Segment	Number of Lanes	LOS C ADT	Demand ADT	Peak Direction Hourly			Off-Peak Direction Hourly			% MT	% HT	K-factor	D-factor	Bi-directional Hourly	Speed
				Cars	MT	HT	Cars	MT	HT						
SR 50 West of Lockhart Rd. (west of Bruce St)	4	24,465	64,400	599	17	35	497	14	29	2.56%	5.44%	9.74%	54.68%	2,383	45
SR 50 West of Lockhart Rd. (East of Bruce St)	6	38,220	64,400	624	17	37	517	14	31	2.56%	5.44%	9.74%	54.68%	3,723	45
SR 50 Lockhart road to I-75	6	38,220	81,300	624	17	37	517	14	31	2.56%	5.44%	9.74%	54.68%	3,723	45
SR 50 I-75 to BronsonBlvd/Windemere Rd	6	38,220	83,200	624	16	38	517	13	31	2.40%	5.60%	9.74%	54.68%	3,723	45
SR 50 Bronson/Windemere Rd. to Kettering Rd	6	38,220	56,400	624	16	38	517	13	31	2.40%	5.60%	9.74%	54.68%	3,723	45
SR 50 Kettering Rd to US 98	6	36,400	45,600	595	16	36	493	13	30	2.40%	5.60%	9.74%	54.68%	3,545	60
SR 50 US 98 to US 301	4	24,465	24,800	599	16	36	497	13	30	2.40%	5.60%	9.74%	54.68%	2,383	60
SR 50 East of US 301	4	23,300	15,300	375	8	24	311	7	20	2.00%	6.00%	9.74%	54.68%	1,490	55
US 98 South of SR 50	2	9,800	22,400	480	13	29	398	10	24	2.40%	5.60%	9.74%	54.68%	955	55
US 98 North of SR 50	2	9,800	3,100	152	4	9	126	3	8	2.40%	5.60%	9.74%	54.68%	302	30
US 301 South of SR 50	2	9,800	19,400	480	11	30	398	9	25	2.16%	5.84%	9.74%	54.68%	955	55
US 301 North of SR 50	2	9,800	16,700	480	11	30	398	9	25	2.16%	5.84%	9.74%	54.68%	955	55

Design Year (2035) No Build

Traffic Segment	Number of Lanes	LOS C ADT	Demand ADT	Peak Direction Hourly			Off-Peak Direction Hourly			% MT	% HT	K-factor	D-factor	Bi-directional Hourly	Speed
				Cars	MT	HT	Cars	MT	HT						
SR 50 West of Lockhart Rd. (west of Bruce St)	4	24,465	64,400	599	17	35	497	14	29	2.56%	5.44%	9.74%	54.68%	2,383	55
SR 50 West of Lockhart Rd. (East of Bruce St)	4	24,465	64,400	599	17	35	497	14	29	2.56%	5.44%	9.74%	54.68%	2,383	55
SR 50 Lockhart road to I-75	4	24,465	81,300	599	17	35	497	14	29	2.56%	5.44%	9.74%	54.68%	2,383	45
SR 50 I-75 to BronsonBlvd/Windemere Rd	4	24,465	83,200	599	16	36	497	13	30	2.40%	5.60%	9.74%	54.68%	2,383	45
SR 50 Bronson/Windemere Rd. to Kettering Rd	4	23,300	56,400	571	15	35	473	12	29	2.40%	5.60%	9.74%	54.68%	2,269	45
SR 50 Kettering Rd to US 98	4	23,300	45,600	571	15	35	473	12	29	2.40%	5.60%	9.74%	54.68%	2,269	55
SR 50 US 98 to US 301	2	9,800	24,800	480	13	29	398	10	24	2.40%	5.60%	9.74%	54.68%	955	55
SR 50 East of US 301	2	9,800	15,300	480	10	31	398	9	26	2.00%	6.00%	9.74%	54.68%	955	55
US 98 South of SR 50	2	9,800	22,400	480	13	29	398	10	24	2.40%	5.60%	9.74%	54.68%	955	55
US 98 North of SR 50	2	9,800	3,100	152	4	9	126	3	8	2.40%	5.60%	9.74%	54.68%	302	30
US 301 South of SR 50	2	9,800	19,400	480	11	30	398	9	25	2.16%	5.84%	9.74%	54.68%	955	55
US 301 North of SR 50	2	9,800	16,700	480	11	30	398	9	25	2.16%	5.84%	9.74%	54.68%	955	55

Existing

Traffic Segment	Number of Lanes	LOS C ADT	Demand ADT	Peak Direction Hourly			Off-Peak Direction Hourly			% MT	% HT	K-factor	D-factor	Bi-directional Hourly	Speed
				Cars	MT	HT	Cars	MT	HT						
SR 50 West of Lockhart Rd. (west of Bruce St)	4	24,465	13,300	324	8	17	275	7	14	2.24%	4.76%	9.69%	54.03%	1,289	55
SR 50 West of Lockhart Rd. (East of Bruce St)	4	24,465	13,300	324	8	17	275	7	14	2.24%	4.76%	9.69%	54.03%	1,289	55
SR 50 Lockhart road to I-75	4	24,465	16,800	409	10	21	348	8	18	2.24%	4.76%	9.69%	54.03%	1,628	45
SR 50 I-75 to BronsonBlvd/Windemere Rd	4	24,465	20,200	422	11	26	407	11	25	2.40%	5.60%	8.92%	50.89%	1,802	45
SR 50 Bronson/Windemere Rd. to Kettering Rd	4	23,300	13,700	286	7	17	276	7	17	2.40%	5.60%	8.92%	50.89%	1,222	45
SR 50 Kettering Rd to US 98	4	23,300	13,400	280	7	17	270	7	16	2.40%	5.60%	8.92%	50.89%	1,195	55
SR 50 US 98 to US 301	2	9,800	7,300	305	8	19	294	8	18	2.40%	5.60%	8.92%	50.89%	651	55
SR 50 East of US 301	2	9,800	5,700	232	6	17	211	5	16	2.25%	6.75%	8.54%	52.35%	487	55
US 98 South of SR 50	2	9,800	6,600	316	11	25	262	9	20	3.00%	7.00%	9.74%	54.68%	643	55
US 98 North of SR 50	2	9,800	900	54	1	3	54	1	3	2.40%	5.60%	13.04%	50.31%	117	30
US 301 South of SR 50	2	9,800	4,900	234	4	10	178	3	8	1.57%	4.23%	8.92%	56.72%	437	55
US 301 North of SR 50	2	9,800	4,900	256	4	11	184	3	8	1.57%	4.23%	9.53%	58.10%	467	55

APPENDIX B

PREDICTED NOISE LEVELS

Predicted Noise Levels

Receiver Identification	Aerial Sheet	Noise Sensitive Site Represented	Existing Condition (dBA)	2035 No-Build Design Year Condition (dBA)	2035 Build Design Year Condition (dBA)	Difference Between Build and Existing (dBA)	NAC Approached or Exceeded
Noise Sensitive Sites South of SR 50 (Cortez Boulevard)							
RS1	Sheet 1	1 Residence	59.3	62.2	60.9	1.6	No
RS2	Sheet 1	1 Residence	58.8	61.7	60.6	1.8	No
RS3	Sheet 1	1 Residence	58.6	61.4	60.5	1.9	No
RS4	Sheet 1	1 Residence	58.5	61.4	60.6	2.1	No
RS5	Sheet 1	1 Residence	58.7	61.6	60.9	2.2	No
RS6	Sheet 1	1 Residence	59.0	61.9	61.3	2.3	No
RS7	Sheet 1	1 Residence	58.7	61.6	61.1	2.4	No
RS8	Sheet 1	1 Residence	58.6	61.5	61.0	2.4	No
RS9	Sheet 1	1 Residence	58.7	61.6	61.2	2.5	No
RS10	Sheet 1	1 Residence	59.4	62.2	61.9	2.5	No
RS11	Sheet 1	1 Residence	59.4	62.3	62.0	2.6	No
RS12	Sheet 1	1 Residence	58.7	61.5	61.3	2.6	No
RS13	Sheet 1	1 Residence	59.3	62.2	62.0	2.7	No
RS14	Sheet 1	1 Residence	59.3	62.2	62.0	2.7	No
RS15	Sheet 1	1 Residence	54.3	57.2	56.3	2.0	No
RS16	Sheet 1	1 Residence	54.9	57.8	57.3	2.4	No
RS17	Sheet 1	1 Residence	55.3	58.1	58.0	2.7	No
RS18	Sheet 6	1 Residence	55.4	58.3	61.7	6.3	No
RS19	Sheet 6	1 Residence	56.5	59.4	62.7	6.2	No
RS20	Sheet 6	1 Residence	58.2	61.1	64.9	6.7	No
RS21	Sheet 6	1 Residence	60.5	63.5	67.2	6.7	Yes
RS22	Sheet 6	1 Residence	61.7	64.7	68.5	6.8	Yes
RS23	Sheet 6	1 Residence	59.9	62.9	66.7	6.8	Yes
RS24	Sheet 7	1 Residence	52.1	54.9	58.1	6.0	No
RS25	Sheet 7	1 Residence	55.4	58.2	61.8	6.4	No
RS26	Sheet 7	1 Residence	54.7	57.5	61.2	6.5	No
RS27	Sheet 7	1 Residence	56.8	59.7	64.4	7.6	No
RS28	Sheet 7	1 Residence	52.8	55.6	59.7	6.9	No
RS29	Sheet 7	1 Residence	51.7	54.5	58.5	6.8	No
RS30	Sheet 9	1 Residence	53.4	55.5	57.6	4.2	No
RS31	Sheet 9	1 Residence	51.1	52.7	54.0	2.9	No
RS32	Sheet 9	1 Residence	56.7	58.7	60.7	4.0	No
RS33	Sheet 9	1 Residence	55.8	57.6	59.2	3.4	No
RS34	Sheet 9	1 Residence	55.4	57.0	58.0	2.6	No
RS35	Sheet 9	1 Residence	54.8	56.3	57.0	2.2	No
RS36	Sheet 9	1 Residence	54.7	56.2	56.8	2.1	No
RS37	Sheet 9	1 Residence	54.8	56.3	56.6	1.8	No
RS38	Sheet 9	1 Residence	54.7	56.1	56.3	1.6	No
RS39	Sheet 9	1 Residence	55.1	56.5	56.3	1.2	No
RS40	Sheet 9	1 Residence	60.2	61.5	60.0	-0.2	No
RS41	Sheet 9	1 Residence	61.4	62.7	60.9	-0.5	No
RS42	Sheet 9	1 Residence	59.1	60.4	58.9	-0.2	No
RS43	Sheet 9	1 Residence	55.9	57.2	56.5	0.6	No
RS44	Sheet 9	1 Residence	53.0	54.4	54.4	1.4	No
RS46	Sheet 9	1 Residence	54.5	55.8	55.3	0.8	No
RS47	Sheet 9	1 Residence	53.0	54.4	54.7	1.7	No
RS48	Sheet 9	1 Residence	52.3	53.7	53.8	1.5	No
RS49	Sheet 9	1 Residence	52.4	53.8	53.8	1.4	No

Predicted Noise Levels

Receiver Identification	Aerial Sheet	Noise Sensitive Site Represented	Existing Condition (dBA)	2035 No-Build Design Year Condition (dBA)	2035 Build Design Year Condition (dBA)	Difference Between Build and Existing (dBA)	NAC Approached or Exceeded
RS50	Sheet 9	1 Residence	51.8	53.3	53.9	2.1	No
RS51	Sheet 9	1 Residence	51.8	53.2	53.5	1.7	No
RS52	Sheet 9	1 Residence	52.2	53.4	53.8	1.6	No
RS53	Sheet 9	1 Residence	55.6	56.8	56.7	1.1	No
RS54	Sheet 9	1 Residence	54.7	55.9	56.4	1.7	No
RS55	Sheet 9	1 Residence	47.7	49.0	50.1	2.4	No
RS56	Sheet 8	1 Residence	51.5	53.9	58.3	6.8	No
RS57	Sheet 8	1 Residence	51.6	53.8	58.9	7.3	No
RS58	Sheet 11	1 Residence	51.1	53.0	58.2	7.1	No
RS59	Sheet 11	1 Residence	51.5	53.4	58.6	7.1	No
RS60	Sheet 11	1 Residence	52.7	54.5	59.7	7.0	No
RS61	Sheet 11	1 Residence	52.0	53.8	58.9	6.9	No
RS62	Sheet 11	1 Residence	52.8	54.5	59.6	6.8	No
RS63	Sheet 11	1 Residence	52.3	54.1	59.2	6.9	No
RS64	Sheet 11	1 Residence	52.6	54.3	59.4	6.8	No
RS65	Sheet 11	1 Residence	52.6	54.3	59.4	6.8	No
RS66	Sheet 11	1 Residence	52.5	54.2	59.2	6.7	No
RS67	Sheet 11	1 Residence	51.4	53.3	59.2	7.8	No
RS68	Sheet 11	1 Residence	51.5	53.3	59.3	7.8	No
RS69	Sheet 11	1 Residence	50.8	52.7	58.6	7.8	No
RS70	Sheet 11	1 Residence	50.2	52.0	57.2	7.0	No
RS71	Sheet 11	1 Residence	51.1	52.7	57.7	6.6	No
RS72	Sheet 11	1 Residence	49.2	51.0	56.2	7.0	No
RS73	Sheet 11	1 Residence	51.1	52.7	57.6	6.5	No
RS74	Sheet 11	1 Residence	51.0	52.7	57.6	6.6	No
RS75	Sheet 11	1 Residence	50.9	52.6	57.6	6.7	No
RS76[1]	Sheet 11	All Faiths United Church of Christ (indoor)	36.5	38.1	44.7	8.2	No
RS77	Sheet 11	1 Residence	50.0	51.7	57.1	7.1	No
RS78	Sheet 12	1 Residence	50.5	52.2	57.4	6.9	No
RS79[1]	Sheet 12	Ridge Manor Community Center (indoor)	32.7	34.3	40.8	8.1	No
RS80	Sheet 12	1 Residence	51.2	52.9	58.0	6.8	No
RS81	Sheet 12	1 Residence	51.8	53.4	58.4	6.6	No
RS82	Sheet 12	1 Residence	51.8	53.5	58.4	6.6	No
RS83	Sheet 12	1 Residence	51.4	53.1	58.0	6.6	No
RS84	Sheet 12	1 Residence	51.2	52.9	57.8	6.6	No
RS85	Sheet 12	1 Residence	50.1	51.9	57.0	6.9	No
RS86	Sheet 12	1 Residence	49.7	51.5	56.7	7.0	No
RS87	Sheet 12	United Methodist Church (playground)	54.7	56.3	61.4	6.7	No
RS88[1]	Sheet 12	United Methodist Church (indoor)	35.2	36.8	43.2	8.0	No

Predicted Noise Levels

Receiver Identification	Aerial Sheet	Noise Sensitive Site Represented	Existing Condition (dBA)	2035 No-Build Design Year Condition (dBA)	2035 Build Design Year Condition (dBA)	Difference Between Build and Existing (dBA)	NAC Approached or Exceeded
RS89	Sheet 15	2 Apartments	60.1	61.8	69.4	9.3	Yes
RS90	Sheet 15	2 Apartments	60.3	62.1	68.9	8.6	Yes
RS91[1]	Sheet 15	Ridge Manor Medical Clinic (indoor)	36.8	38.9	45.9	9.1	No
RS92 Hotel	Sheet 15	Ridge Manor Motel (Four Rooms)	56.9	60.1	61.3	4.4	No
RS93 Hotel	Sheet 15	Ridge Manor Motel (Four Rooms)	56.0	59.5	59.5	3.5	No
RS94 Hotel	Sheet 15	Ridge Manor Motel (Four Rooms)	55.6	59.3	58.8	3.2	No
RS95	Sheet 15	1 Residence	50.6	54.6	54.9	4.3	No
RS96	Sheet 15	1 Residence	50.0	54.0	54.5	4.5	No
RS97	Sheet 15	1 Residence	49.9	54.0	54.5	4.6	No
RS98	Sheet 15	1 Residence	49.9	54.0	54.4	4.5	No
RS99	Sheet 15	2 Apartments	56.8	58.4	65.8	9.0	No
RS100	Sheet 15	2 Apartments	57.0	59.1	64.8	7.8	No
RS101	Sheet 9	1 Residence	52.2	53.4	54.2	2.0	No
RS102	Sheet 9	1 Residence	52.0	53.2	54.3	2.3	No
RS103	Sheet 15	Lounge	59.3	63.2	62.4	3.1	No
Noise Sensitive Sites North of SR 50 (Cortez Boulevard)							
RN1	Sheet 1	1 Residence	59.8	62.7	61.0	1.2	No
RN2	Sheet 1	1 Residence	57.2	60.1	59.2	2.0	No
RN3	Sheet 1	1 Residence	65.8	68.6	67.5	1.7	Yes
RN4	Sheet 1	1 Residence	64.5	67.3	66.6	2.1	Yes
RN5	Sheet 1	1 Residence	64.7	67.4	66.4	1.7	Yes
RN6	Sheet 1	1 Residence	63.4	66.1	65.6	2.2	No
RN7	Sheet 1	1 Residence	62.3	64.7	65.1	2.8	No
RN8	Sheet 1	1 Residence	59.1	61.0	60.9	1.8	No
RN9	Sheet 3	Days Inn	56.4	58.6	60.8	4.4	No
RN10	Sheet 3	Days Inn Pool	56.1	58.4	60.6	4.5	No
RN11	Sheet 6	1 Residence	57.7	60.6	64.5	6.8	No
RN12	Sheet 6	1 Residence	54.8	57.7	61.2	6.4	No
RN13	Sheet 6	1 Residence	54.6	57.4	60.9	6.3	No
RN14	Sheet 6	1 Residence	53.2	56.1	59.3	6.1	No
RN15	Sheet 8	1 Residence	50.6	53.2	56.7	6.1	No
RN16	Sheet 8	1 Residence	49.9	52.3	56.6	6.7	No
RN17	Sheet 11	1 Residence	49.3	51.2	55.8	6.5	No
RN18	Sheet 8	1 Residence	55.6	58.2	61.2	5.6	No
RN19	Sheet 8	1 Residence	55.0	57.6	60.8	5.8	No
RN20	Sheet 8	1 Residence	54.2	56.9	60.4	6.2	No
RN21	Sheet 8	1 Residence	53.6	56.3	59.7	6.1	No
RN22	Sheet 8	1 Residence	54.3	57.0	60.7	6.4	No
RN23	Sheet 8	1 Residence	54.3	57.0	60.7	6.4	No
RN24	Sheet 8	1 Residence	53.9	56.5	60.4	6.5	No
RN25	Sheet 8	1 Residence	53.7	56.3	60.4	6.7	No
RN26	Sheet 8	1 Residence	52.7	55.1	59.2	6.5	No
RN27	Sheet 8	1 Residence	52.7	55.1	59.4	6.7	No

Predicted Noise Levels

Receiver Identification	Aerial Sheet	Noise Sensitive Site Represented	Existing Condition (dBA)	2035 No-Build Design Year Condition (dBA)	2035 Build Design Year Condition (dBA)	Difference Between Build and Existing (dBA)	NAC Approached or Exceeded
RN28	Sheet 8	1 Residence	53.0	55.2	59.7	6.7	No
RN29	Sheet 11	1 Residence	53.2	55.2	59.7	6.5	No
RN30	Sheet 11	1 Residence	53.5	55.4	59.7	6.2	No
RN31	Sheet 8	1 Residence	61.4	64.3	69.2	7.8	Yes
RN32	Sheet 8	1 Residence	61.6	64.5	69.4	7.8	Yes
RN33	Sheet 8	1 Residence	61.1	64.0	69.0	7.9	Yes
RN34	Sheet 8	1 Residence	60.9	63.7	68.9	8.0	Yes
RN35	Sheet 8	1 Residence	60.0	62.6	68.4	8.4	Yes
RN36	Sheet 11	1 Residence	53.2	55.0	59.1	5.9	No
RN37	Sheet 11	1 Residence	50.9	52.6	57.7	6.8	No
RN38	Sheet 11	1 Residence	51.3	53.0	56.7	5.4	No
RN39	Sheet 11	1 Residence	52.9	54.5	58.1	5.2	No
RN40	Sheet 11	1 Residence	51.9	53.5	56.8	4.9	No
RN41	Sheet 11	1 Residence	56.2	57.8	60.8	4.6	No
RN42	Sheet 11	1 Residence	56.6	58.1	60.8	4.2	No
RN43	Sheet 11	1 Residence	56.1	57.6	60.5	4.4	No
RN44	Sheet 11	1 Residence	59.3	60.9	64.3	5.0	No
RN45	Sheet 11	1 Residence	62.0	63.6	66.7	4.7	Yes
RN46	Sheet 11	1 Residence	60.7	62.2	64.5	3.8	No
RN47	Sheet 11	1 Residence	62.1	63.6	66.8	4.7	Yes
RN48	Sheet 11	1 Residence	53.0	54.6	58.3	5.3	No
RN49	Sheet 11	1 Residence	50.7	52.3	56.3	5.6	No
RN50	Sheet 11	1 Residence	51.2	52.9	57.1	5.9	No
RN51[1]	Sheet 12	Anchor Church (indoor)	29.6	31.2	34.8	5.2	No
RN52	Sheet 12	3 Residences	48.3	50.1	54.2	5.9	No
RN53	Sheet 12	2 Residences	49.4	51.1	55.3	5.9	No
RN54	Sheet 12	2 Residences	49.4	51.2	55.4	6.0	No
RN55	Sheet 12	2 Residences	51.6	53.2	57.0	5.4	No
RN56	Sheet 12	2 Residences	51.6	53.2	57.0	5.4	No
RN57	Sheet 12	2 Residences	54.2	55.8	59.4	5.2	No
RN58	Sheet 12	2 Residences	54.3	55.8	59.4	5.1	No
RN59	Sheet 12	3 Residences	54.5	56.0	59.4	4.9	No
RN60	Sheet 12	3 Residences	55.1	56.6	60.0	4.9	No
RN61	Sheet 12	1 Residence	55.8	57.6	61.6	5.8	No
RN62	Sheet 12	1 Residence	56.6	58.5	61.8	5.2	No
RN63	Sheet 12	1 Residence	51.2	53.6	57.4	6.2	No
RN64	Sheet 13	1 Residence	52.7	56.6	56.7	4.0	No
RN65	Sheet 13	1 Residence	51.8	55.6	56.4	4.6	No
RN66	Sheet 13	1 Residence	49.2	52.9	53.8	4.6	No
RN67	Sheet 13	1 Residence	53.6	57.4	58.0	4.4	No
RN68	Sheet 13	1 Residence	54.5	58.3	58.8	4.3	No
RN69	Sheet 13	1 Residence	49.1	52.9	54.1	5.0	No
RN70	Sheet 13	1 Residence	54.0	57.8	58.7	4.7	No
RN71	Sheet 13	1 Residence	55.0	58.8	59.4	4.4	No
RN72	Sheet 13	1 Residence	51.8	55.6	56.3	4.5	No
RN73	Sheet 13	1 Residence	50.8	54.6	55.2	4.4	No
RN74	Sheet 13	1 Residence	49.6	53.5	54.0	4.4	No

Predicted Noise Levels

Receiver Identification	Aerial Sheet	Noise Sensitive Site Represented	Existing Condition (dBA)	2035 No-Build Design Year Condition (dBA)	2035 Build Design Year Condition (dBA)	Difference Between Build and Existing (dBA)	NAC Approached or Exceeded
RN75	Sheet 13	1 Residence	49.4	53.3	53.8	4.4	No
RN76	Sheet 13	1 Residence	48.5	52.3	52.8	4.3	No
RN77	Sheet 13	1 Residence	53.5	56.2	58.4	4.9	No
RN78[1]	Sheet 3	Ridge Manor Family Medicine (indoor)	35.1	37.8	41.2	6.1	No
RN79[1]	Sheet 8	Family Dental Care (indoor)	35.6	38.4	42.6	7.0	No
RN80	Sheet 12	Anchor Church Playground	54.6	56.2	59.8	5.2	No
Ridge Manor Oaks Golf and Country Club							
GC13	Sheet 13	Golf Hole #3Fairway	62.4	66.0	66.6	4.2	Yes
GC19			61.8	65.4	66.0	4.2	Yes
GC42			62.2	65.8	66.3	4.1	Yes
GC49			62.5	66.1	66.6	4.1	Yes
GC70			62.7	66.3	66.7	4.0	Yes
GC77			62.8	66.4	66.8	4.0	Yes
GC96			62.9	66.5	66.9	4.0	Yes
GC103			62.9	66.5	67.1	4.2	Yes
GC120			63.0	66.6	67.3	4.3	Yes
GC128			62.0	65.6	66.0	4.0	Yes
GC142			62.0	65.7	66.2	4.2	Yes
GC151			62.0	65.7	66.2	4.2	Yes
GC164			62.1	65.7	66.3	4.2	Yes
GC173			62.1	65.7	66.4	4.3	Yes
GC188			62.1	65.7	66.4	4.3	Yes
GC197			62.1	65.8	66.4	4.3	Yes
GC212			62.1	65.8	66.4	4.3	Yes
GC221			62.2	65.8	66.5	4.3	Yes
GC238			62.2	65.8	66.5	4.3	Yes
GC247			62.2	65.8	66.4	4.2	Yes
GC263			62.2	65.8	66.4	4.2	Yes
GC272			62.2	65.8	66.3	4.1	Yes

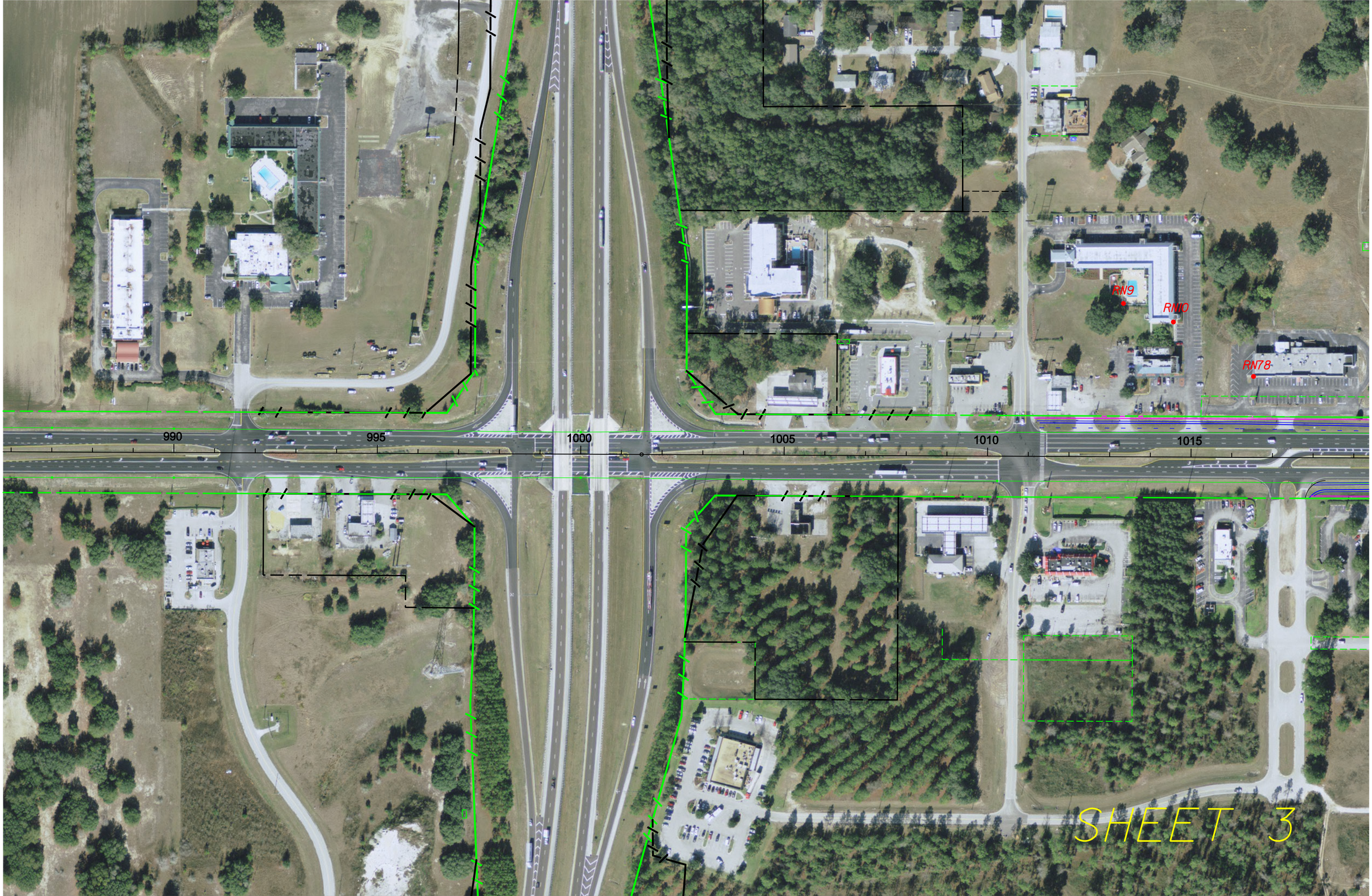
[1] No outdoor area of frequent human use noted. Building type is masonry. Indoor noise level determined using building noise reduction factors documented in *Highway Traffic Noise: Analysis and Abatement Guidance* (FHWA, January 2011).

APPENDIX C

PROJECT AERIALS WITH RECEPTOR LOCATIONS

RN1
RN2
RN3
RN4
RN5
RN6
RN7
RN8
925
930
935
940
945
950
955
RS1
RS2
RS3
RS4
RS5
RS6
RS7
RS8
RS9
RS10
RS11
RS12
RS13
RS14
RS15
RS16
RS17
Lockhart Rd
SHEET 1


RN8
955
960
965
970
975
980
985
SHEET 2


RN9
RN10
RN78
990
995
1000
1005
1010
1015
SHEET 3

1020
1025
1030
1035
1040
1045
1050
PC STA. 1046+28.36
CURVE CL SR50-1
CURVE DATA CL SR50-1
PI STA. = 1060+22.34
Δ = 27° 29' 46" (RT)
D = 1° 00' 20"
T = 1,393.99
L = 2,734.26
R = 5,697.58
PC STA. = 1046+28.36
PT STA. = 1073+62.61
SHEET 4

1050
1055
1060
1065
1070
1075
1080
CURVE CL SR50-1
CURVE DATA CL_SR50-1
PI STA. = 1060+22.34
Δ = 27° 29' 46" (RT)
D = 1° 00' 20"
T = 1,393.99
L = 2,734.26
R = 5,697.58
PC STA. = 1046+28.36
PT STA. = 1073+62.61
100'
PT STA. 1073+62.61
SHEET 5

CURVE DATA CL_SR50-2
PI STA. = 1103+18.90
Δ = 41° 41' 29" (RT)
D = 2° 16' 43"
T = 957.46
L = 1,829.66
R = 2,514.48
PC STA. = 1093+61.44
PT STA. = 1111+91.11

599.82'
236.55'
100'
122.56'
100'
132.81'
100'
PC STA 1093+61.44
168'
47.51'
CURVE CL SR50-2
147'
100'
PT STA 1111+91.11

1080
1085
1090
1095
1100
1105
1110

RN1
RN2
RN3
RN4
RS18
RS19
RS20
RS21
RS22
RS23
RS24
RS25
RS26

N

SHEET 6

CURVE DATA CL_SR50-2
PI STA. = 1103+18.90
Δ = 41° 41' 29" (RT)
D = 2° 16' 43"
T = 957.46
L = 1,829.66
R = 2,514.49
PC STA. = 1093+61.44
PT STA. = 1111+91.11

CURVE CL SR50-2

PT STA. 1111+91.11

PC STA. 1126+53.80

CURVE CL SR50-3

CURVE DATA CL_SR50-3
PI STA. = 1139+95.11
Δ = 69° 16' 06" (LT)
D = 2° 57' 02"
T = 1,341.31
L = 2,347.63
R = 1,941.86
PC STA. = 1126+53.80
PT STA. = 1150+01.43

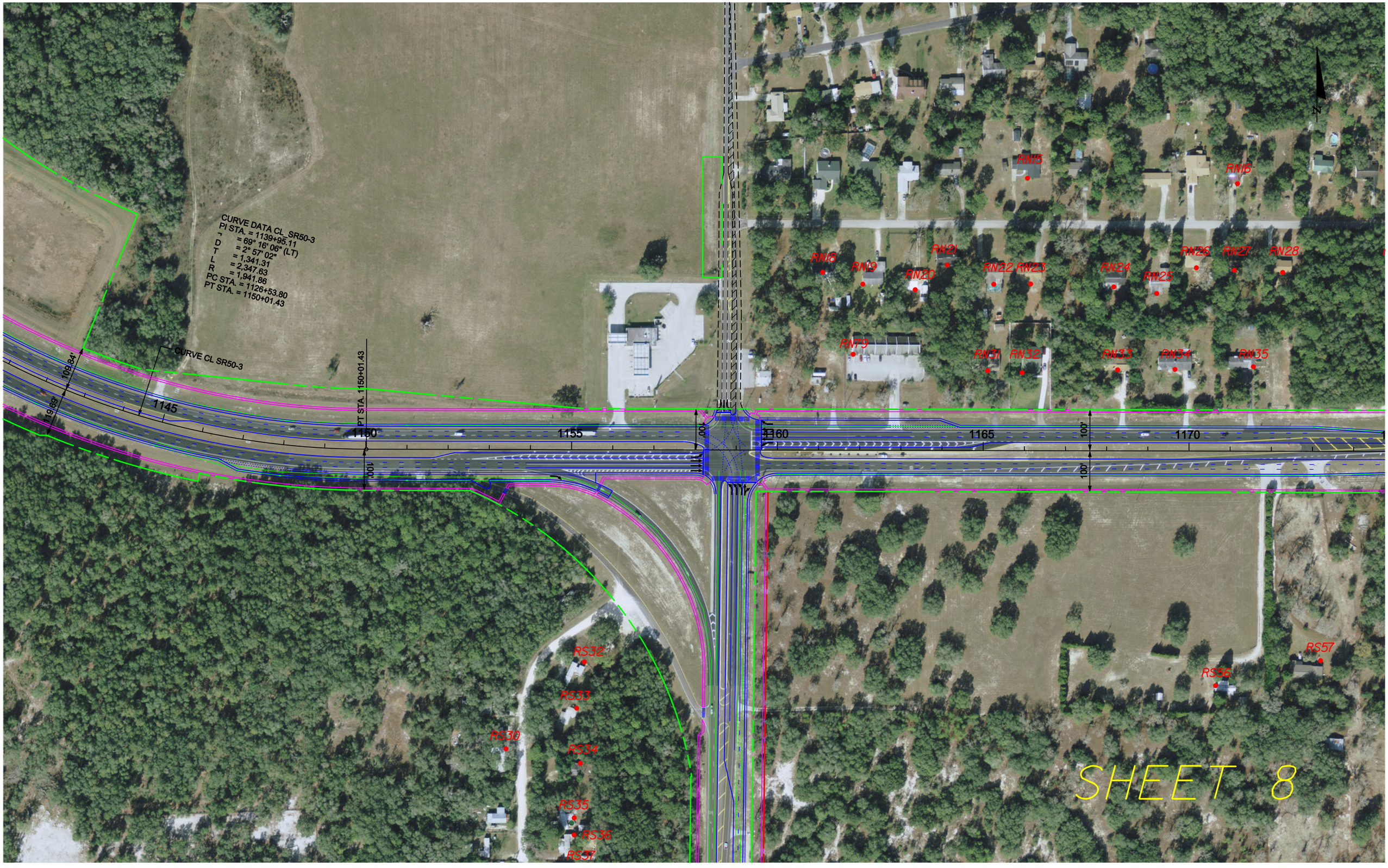
1110 1115 1120 1125 1130 1135

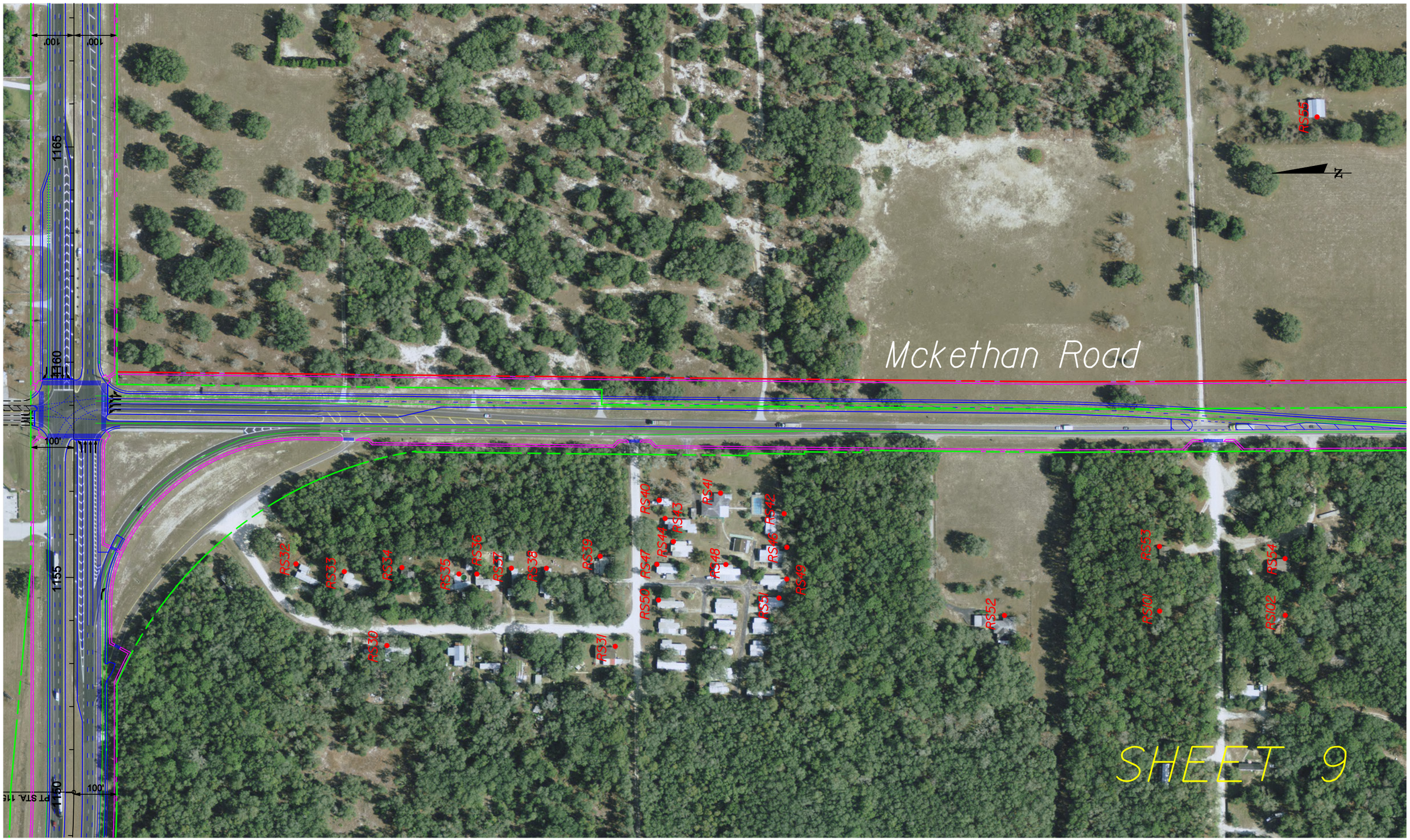
100' 100' 100' 100' 100' 100'

116.4' 126.25' 132.59' 119.89' 139.21'

RS24 RS25 RS26 RS27 RS28 RS29

SHEET 7


CURVE DATA CL_SR50-3
PI STA. = 1139+95.11
= 69° 16' 06" (LT)
D = 2° 57' 02"
T = 1,341.31
L = 2,347.63
R = 1,941.86
PC STA. = 1126+53.80
PT STA. = 1150+01.43
CURVE CL SR50-3
PT STA. 1150+01.43
109.84'
19.89'
100'
1145
1150
1155
1160
1165
1170
RN15
RN16
RN18
RN19
RN20
RN21
RN22
RN23
RN24
RN25
RN26
RN27
RN28
RN29
RN31
RN32
RN33
RN34
RN35
RS32
RS33
RS30
RS34
RS35
RS36
RS37
RS56
RS57
SHEET 8


Mckethan Road
SHEET 9
RS55
N
100'
100'
1165
1160
1155
1150
100'
RS30
RS31
RS32
RS33
RS34
RS35
RS36
RS37
RS38
RS39
RS40
RS41
RS42
RS43
RS44
RS46
RS47
RS48
RS49
RS50
RS51
RS52
RS53
RS54
RS101
RS102

RS55

Mckethan Road

RS53

RS54

RS101

RS102

SHEET 10


N
RN29
RN30
RN36
RN37
RN38
RN39
RN40
RN41
RN42
RN43
RN44
RN45
RN46
RN47
RN48
RN49
RN50
1175
1180
1185
1190
1195
1200
1205
RS57
RS58
RS59
RS60
RS61
RS62
RS63
RS64
RS65
RS66
RS67
RS68
RS69
RS70
RS71
RS72
RS73
RS74
RS75
RS76
RS77
SHEET 11


RN50
RN52
RN53
RN54
RN55
RN56
RN57
RN58
RN59
RN60
RN80
RN51
RN61
RN62
RN63
N
1205
1210
1215
1220
1225
1230
1235
RS79
RS88
RS87
RS89
RS99
RS90
RS100
RS91
RS92
RS93
RS94
RS78
RS80
RS81
RS82
RS83
RS84
RS85
RS86
US 301
SHEET 12


RM61
RM62
RM63
RM64
RM65
RM66
RM67
RM68
RM69
RM70
RM71
RM72
RM73
RM74
RM75
RM76
RM77
GC13
GC19
GC42
GC49
GC70
GC77
GC96
GC103
GC120
GC128
GC142
GC151
GC164
GC173
GC188
GC197
GC212
GC221
GC238
GC247
GC263
GC272
US 301
N
1245
SHEET 13


RW76
RW75
RW74
RW73
RW72
US 301
SHEET 14


RS98
RS97
RS96
RS95
RS103
US 301
RS89
RS99
RS88
RS100
RS90
RS91
RS94
RS93
RS92
RM61
RM62
1230
1235
1240
1245
SHEET 15


RS98
RS97
RS96
RS95
US 301
SHEET 16

APPENDIX D

TNM MODELING FILES (CD INCLUDED)