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**Appendix H**  
**Noise and Vibration Study**



# Capitol Expressway Light Rail Project

## NOISE AND VIBRATION STUDY FOR CELR- BRT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT



prepared by:

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Final  
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**VTA CAPITOL EXPRESSWAY LIGHT RAIL****NOISE AND VIBRATION STUDY FOR SUPPLEMENTAL ENVIRONMENTAL  
IMPACT STATEMENT*****EXECUTIVE SUMMARY***

This study updates the environmental analysis regarding noise and vibration impacts for the Santa Clara Valley Transportation Authority (VTA) Capitol Expressway Light Rail (CELR) Project (Project). This report has drawn primarily on the noise and vibration study prepared for the first CELR Supplemental Environmental Impact Report (EIR) in 2007, which was conducted according to FTA's Guidelines on *Transit Noise and Vibration Impact Assessment* (May 2006). Additional information has been taken from the studies for the Santa Clara-Alum Rock (SCAR) Transit Improvement Project Final EIR, and the Transportation Study for the CELR SEIR that was completed by AECOM in 2010. The purpose of this memorandum is to provide an assessment of the potential noise and vibration impacts for the No Build (Year 2035 which includes BRT), the Light Rail Transit (LRT) Alternative, and the LRT Alternative – Ocala Station option (no Ocala Station) to support an EIS.

This analysis has identified the following noise impacts:

- No-Build: A total of 151 impacts with 67 moderate impacts in the Southbound direction and 84 moderate impacts in the Northbound direction
- LRT Alternative: With the proposed aerial and embankment structure sound walls, a total of 151 impacts with 67 moderate impacts in the Southbound direction, and in the Northbound direction 83 moderate impacts and 1 severe impact. Table 1 summarizes the number of noise impacts and the effects of proposed and potential mitigation measures.
- Ocala Station Option: same as the LRT Alternative

**Table 1 Summary of Noise Impacts and Effects of Mitigation Measures for the LRT Alternative**

Type of Impact	Number of Affected Properties				
	No Mitigation	With Approved Sound Walls <sup>a</sup>			
		Proposed Project	Add Wayside Sound Walls	Add Quieter Pavement	Add Quieter Pavement AND Sound Insulation
Moderate	113	150	85	2 (b)	0
Severe	38	1 (b)	1 (b)	0	0
Total	151	151	86	2 (b)	0
Note					
(a): Includes aerial structure and embankment sound walls previously approved in the SEIR					
(b): Sound insulation would eliminate this noise impact					

The Project includes aerial structure and embankment sound walls previously approved through the SEIR process. Additional noise control measures that could be considered include wayside sound walls along the Capitol Expressway to reduce traffic noise and sound insulation where the existing conditions, sight-safety issues or structural limitations could make some at-grade sound wall configurations infeasible. Since the Project includes repaving Capitol Expressway and future traffic noise increase would be a factor in determining noise impacts, an additional noise

control measure that could be considered includes the use of a quieter pavement. These additional noise control measures would have the following effects for the LRT Alternative or the Ocala Station Option:

- New wayside sound walls along Capitol Expressway would eliminate 65 moderate impacts (this may not be feasible, due to right-of-way issues)
- Sound insulation would reduce noise impacts at homes near Ocala Avenue.
- Quieter pavement would reduce the noise from traffic on Capitol Expressway. An open-graded, rubberized hot asphalt mix (RHMA-O) would provide at least 2 dBA noise reduction compared to conventional asphalt concrete. A gap-graded (1/2") rubberized hot asphalt mix (RHMA-G) would provide approximately 2 dBA noise reduction. The use of a quieter pavement which provides long-term 2 dBA noise reduction would eliminate 148 moderate impacts and one (1) severe impact.
  - With quieter pavement, sound insulation at two (2) home near Ocala Avenue (on Vermont Court and Home Gate Drive) would eliminate the remaining two (2) moderate noise impacts.

The vibration analysis was originally conducted in January 2007 (WIA, 2007). That analysis identified 26 homes where vibration impacts would occur along the LRT alternative. Of these homes, 14 would be mitigated with vibration control such as Tire Derived Aggregate (TDA), but 12 of which would require additional mitigation to reduce the vibration below the impact criteria. Additional mitigation will be required to eliminate these residual impacts, and further studies will be conducted during Final Engineering to determine the effectiveness of using a deeper TDA layer, or other measures, as discussed in the January 2007 report.

In this analysis, the differences between the LRT Alternative and Ocala Station Option are reviewed, with the result that there would be no difference in the vibration impact between the two options. Thus, the vibration impacts are summarized as follows:

- No Build: No impacts
- LRT Alternative: 26 Impacts, of which 12 Residual Impacts require additional mitigation
- Ocala Station Option: same as the LRT Alternative.

This analysis has assumed the same level of construction noise and vibration impacts as previously presented in the January 2007 report, which indicates that the FTA Construction Noise Criteria would be potentially exceeded at homes within 270 feet of pile driving activity, and the FTA Construction Vibration guidelines for homes within 144 feet of the pile driving activity.

## 1. INTRODUCTION

This report updates the environmental analysis of noise and vibration impacts for the Santa Clara Valley Transportation Authority (VTA) Capitol Expressway Light Rail (CELR) Project (Project). A Noise and Vibration Study for the Supplemental Environmental Impact Report (EIR) was prepared in January 2007 (WIA, 2007) according to FTA's Guidelines on *Transit Noise and Vibration Impact Assessment* (May 2006). Since then, VTA has decided to prepare an Environmental Impact Statement (EIS) in order to be eligible for federal funds. The purpose of this memorandum is to provide an assessment of the potential noise and vibration impacts for the No Build (Year 2035), the Light Rail (LRT) Alternative, and the Light Rail Alternative – Ocala Station Option (no Ocala Station) to support the analysis for an EIS.

The LRT Alternative is similar to the project described in the CELR SEIR. The major difference is that the EIS includes an option without an Ocala Avenue Station based on the following policy and project implementation considerations:

- 1) ridership levels do not meet VTA's standard for new Light Rail construction as defined in the Transit Sustainability Policy; and
- 2) a future Bus Rapid Transit (BRT) station will be located at Ocala Avenue that can be constructed without the need to acquire private property and will meet Policy criteria.

Thus, some changes could occur in the operational noise and vibration near Ocala Avenue for the Ocala Station option. Appendix B contains some drawings which compare the horizontal alignments for the LRT Alternative and the Ocala Station Option.

This study will also address changes in the No-Build Alternative as a result of planned improvements to bus services along the Capitol Expressway corridor, which are addressed in the Santa Clara-Alum Rock (SCAR) Transit Improvement Project Final EIR; the noise and vibration analysis for that project was completed in 2008 (m'oc, 2008). The Bus Rapid Transit (BRT) improvements will be implemented by VTA as a separate project, and thus the BRT is considered part of the No-Build condition.

In this report, the following information is presented:

- Ambient noise survey – updated in 2010 from original 2001 and 2006 measurements
- No-Build projections for the year 2035 (which include growth in traffic and the BRT)
- Noise projections for the year 2035 with the LRT Alternative and Ocala Station Option
- Vibration projections for the year 2035, LRT Alternative and Ocala Station Option
- Effect of noise control measures to reduce the noise impacts

## 2. SETTING AND OPERATIONAL CONDITIONS

The existing noise environment is dominated by traffic on Capitol Expressway. Capitol Expressway is an 8-lane facility with 6 mixed flow lanes and 2 carpool lanes. Light rail would operate primarily in the median of Capitol Expressway and would involve the removal of the 2 carpool lanes in order to minimize right-of-way acquisition. For the CELR Final EIR and SEIR, ambient noise data was collected at five locations in 2001 and 2006. The SCAR analysis (m'oc 2008) did not update this ambient noise information. Thus, due to the amount of time that has

elapsed, the ambient noise environment was measured in January and May 2010 to obtain current information on the ambient noise environment. The results of this noise survey indicate that the noise environment is unchanged since the previous studies, as shown in Table 2. This surprising result is likely due to the changes in traffic. Based on the traffic study conducted in 2009 (AECOM 2010), the traffic volume in the project corridor in the last four years (from 2005 through 2009) has decreased by approximately 20 to 30%. In order for the noise levels to be essentially unchanged since 2001, it is inferred from the noise data that there was a small increase in noise between 2001 when the noise measurements were originally taken to 2005 corresponding to rapid growth that was experienced throughout the San Francisco Bay Area.

Due to logistical constraints, the long-term results were repeated at only three locations (SEIR, N-1 and N-2). Plots of the measured hourly noise levels from these long-term surveys at locations N-1 and N-2 and SEIR are included in the Appendix. For locations N-3 and N-4, where the original measurements had been collected at the backyards of residences<sup>1</sup>, we measured the ambient on the sidewalk in front of the houses and compared the original and updated results. Simple traffic modeling with the FTA Traffic Noise Model (TNM) indicated that a 7 to 9 dBA difference is expected between the backyard and front sidewalk locations, which matched the noise measurement results. Thus, we conclude that the noise environment in 2010 has been largely unchanged since the previous measurements were conducted in 2001 and 2006. Figure 1 illustrates the noise measurement locations.

**Table 2 Comparison of Previous and Current Ambient Noise Exposure Levels**

Label	Location	Land Use	Previous		2010 <sup>c</sup>		Comment
			Measured Peak Hour Leq	Ldn or Lday	Measured Peak Hour Leq	Ldn or Lday	
SEIR	Highwood Street <sup>b</sup>	Residential	64	67	64-65	66-67	
N-1	Bambi Lane <sup>a</sup>	Residential	70	72	70	72	
N-2	Capitol Court <sup>a</sup>	Residential	71	73	71	73	
N-3	Greenstone Circle <sup>a</sup>	Residential	66	67	[66]	[67]	Sound wall
N-4	Supreme Drive <sup>a</sup>	Residential	64	65	[64]	[65]	Sound wall
N-5	Cunningham Park <sup>a</sup>	Park	57	59	(57)	(59)	Earth Berm

a: Originally measured October 31 to November 1, 2001  
b: Originally measured July 2006  
c: In 2010, 15-minute short-term samples and multi-day continuous monitoring  
(n) no measurements, extrapolated value from other data  
[n] new noise data used to extrapolate current Leq and Ldn

<sup>1</sup> Locations N-3 and N-4 were originally measured in residential backyards protected from Capitol Expressway noise by sound walls. To estimate the current condition without venturing onto private property, noise measurements were taken at the front of the house on the public sidewalk. Thus, the 2010 measurements were taken further away from Capitol Expressway than the original measurements, and the 2010 measurements were also potentially shielded by the row of houses in addition to the sound wall. The TNM model was used to estimate the effect of these two variant conditions from the original noise measurements.



**FIGURE 1 PROJECT AREA AND NOISE MEASUREMENT LOCATIONS**

The soil conditions along the CELR corridor are such that higher than expected vibration levels are expected from the LRT. (WIA 2007) The predicted vibration levels are primarily based on measurements made along the operating VTA system, with additional measurement data acquired along the CELR corridor in 2006 to characterize the vibration propagation of the Project area soils, the ambient vibration, and vibration from aerial and at-grade sections of the existing VTA system. In this report, we have used the same vibration analysis previously conducted for the 2007 analysis, with the exception of speed and alignment differences for the Ocala Station Option. The vibration analysis utilizes vibration Line Source Response curves derived from measurements conducted in June 2006. This work was conducted to confirm the results obtained during the EIR work at Ryan Elementary School which indicated that higher than expected vibration propagation characteristics for the area. More details and information are provided in the Appendix for the 2007 analysis report.

This analysis has been made using the same operational and structural assumptions used for the 2007 analysis:

<b><u>Operational Parameter</u></b>	<b><u>Value</u></b>
Train Speed	55 mph, except 30 to 35 mph through stations, 35 mph near Ocala Station, and 4 mphs acceleration/deceleration
Headways (each direction)	10 minutes (6:00 A.M. to 7:30 PM) 15 minute (7:30 PM to 11:30 PM) 30 minutes (11:30 PM to 1:30 A.M. and 4:30 A.M. to 6:00 A.M.)
Train consist	Peak: 3 cars (6:00 A.M. to 9:00 A.M., 3:30 PM to 7:30 PM) Base: 1 car (9:00 A.M. to 3:30 PM) Owl: 1 car (4:30 A.M. to 6:00 A.M., 7:30 PM to 1:30 A.M.)
Trackwork	At-grade: ballasted track on concrete ties At-grade: ballasted track with panels (grade crossings and stations) Embankment: ballasted track on concrete ties Aerial: direct fixation fasteners, no sound barrier assumed

### **3 ASSESSMENT CRITERIA**

#### *3.1 Noise Assessment Criteria*

The noise criteria in the FTA Guidance Manual are presented in terms of A-weighted noise exposure. These criteria were developed specifically for transit noise sources on fixed guideways. The criteria for impact are based on the existing noise level and the predicted project noise level. A noise impact is determined by the threshold at which the percentage of people highly annoyed by the project becomes measurable, and a severe noise impact is defined by the threshold at which a significant percentage of people would be highly annoyed by the project noise.

The FTA criteria are presented in Figure 2. These criteria are separated into three Land Use Categories, which are applicable to parks (Category 1), residential land use (Category 2) and institutional land use (Category 3). Further details regarding the FTA Criteria are provided in the previous reports. The land use surrounding the CELR alignment is primarily residential, which falls into FTA Land Use Category 2. Occupants of residential land use are generally more sensitive to noise which occurs at night, thus the noise exposure metric used is the Day Night Noise Level, Ldn. Churches and schools are included in FTA Land Use Category 3, which uses the peak-hour equivalent noise level metric, Leq.

Figure 2 illustrates the noise level at which the Project Noise generates a noise impact, and this threshold is based on the existing noise level. Thus, for Land Use Category 2, an existing noise environment of 65 Ldn would experience a Moderate Impact with a Project noise level of 61 Ldn or greater. A Severe Impact would occur for this area with a Project noise level greater than 66

Ldn. The total noise level (Project + Existing noise) is referenced in the FTA Guidance Manual as the “cumulative”<sup>2</sup> noise level, derived from the logarithmic sum of the Project and Existing noise levels. In this example, a Project noise level of 65 Ldn would generate a “cumulative” noise level of 68 Ldn, representing an increase of 3 dBA over the existing noise environment. However, for this analysis the Year 2035 noise condition has been assessed, which combines the Project + Existing + Growth for a true cumulative analysis.

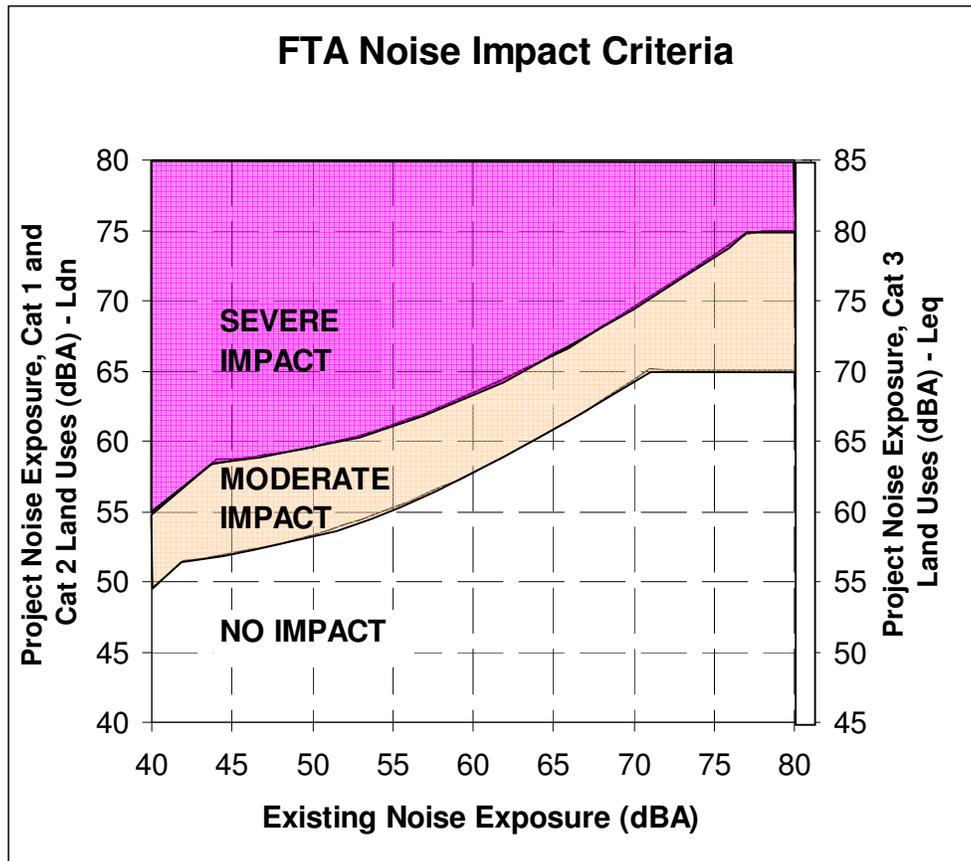


FIGURE 2 FTA Impact Criteria

Based on the existing noise environment, Table 3 presents the applicable noise impact criteria.

**Table 3 Summary of FTA Noise Criteria Along Capitol Expressway Alignment - Allowable Project Noise Levels**

Representative Receptor and Area	Existing Noise Level, Ldn (Leq)	Project Noise Impact Criteria – Project Only	
		Land Use Category 2 (Ldn)	Land Use Category 3 (Leq)
N-SEIR Capitol at Highwood (No Existing Barrier)	67 (64)	Moderate: 63 to 67 Severe: >67	Moderate: 66 to 70 Severe: >70
N-1 Capitol Ave at Bambi Ln (No Existing Barrier)	72 (70)	Moderate: 66 to 71 Severe: >71	Moderate: 70 to 74 Severe: >74
N-2 Capitol Ave at Capitol Ct (No Existing Barrier)	73 (71)	Moderate: 66 to 71 Severe: >71	Moderate: 71 to 75 Severe: >75
N-3 Capitol Expwy at Greenstone Cir	67 (66)	Moderate: 63 to 67	Moderate: 67 to 72

<sup>2</sup> This definition of cumulative does not include the addition of other noise sources from other approved projects or growth, which may be necessary for a CEQA analysis.

(With Existing Barrier)		Severe: >67	Severe: >72
N-4 Capitol Expwy at Supreme Dr (With Existing Barrier)	65 (64)	Moderate: 61 to 66 Severe: >66	Moderate: 66 to 70 Severe: >70
N-5 Cunningham Park (with existing berm)	57 (59)	Moderate: 57 to 62 Severe: >62	Moderate: 63 to 67 Severe: >67

Table 4 presents the same criteria summarized in Table 3 with respect to the allowable cumulative noise level increase over the existing noise environment. From this table, the allowable increase in noise level (Project + Existing) can be ascertained for each representative noise environment. Note that for existing noise environments of Ldn 72 to 73, a noise increase of only 0.6 to 0.8 dBA would constitute a moderate noise impact.

**Table 4 Summary of FTA Noise Criteria Along Capitol Expressway Alignment - Allowable Cumulative Noise Increase**

Representative Receptor and Area	Existing Noise Level, Ldn (Leq)	Project Noise impact Criteria – Noise Increase	
		Land Use Category 2 (Ldn)	Land Use Category 3 (Leq)
N-SEIR Capitol at Highwood (No Existing Barrier)	67 (64)	Moderate: 1.2 Severe: >3.2	Moderate: 3.6 Severe: >7.5
N-1 Capitol Ave at Bambi Ln (No Existing Barrier)	72 (70)	Moderate: 0.8 Severe: >2.5	Moderate: 2.7 Severe: >5.8
N-2 Capitol Ave at Capitol Ct (No Existing Barrier)	73 (71)	Moderate: 0.6 Severe: >2.4	Moderate: 2.6 Severe: >5.6
N-3 Capitol Expwy at Greenstone Cir (With Existing Barrier)	67 (66)	Moderate: 1.2 Severe: >3.2	Moderate: 3.3 Severe: >6.8
N-4 Capitol Expwy at Supreme Dr (With Existing Barrier)	65 (64)	Moderate: 1.4 Severe: >3.6	Moderate: 3.6 Severe: >7.5
N-5 Cunningham Park (with existing berm)	57 (59)	Moderate: 2.7 Severe: >6.2	Moderate: 4.9 Severe: >9.4

### 3.2 Vibration Assessment Criteria

This analysis uses the same vibration assessment criteria used previously for the CELR SEIR. In that report, two methods were used: General Assessment and Detailed Analysis. Initial vibration impacts were determined using the General Assessment criterion, and for cases where this criterion was exceeded, further review was undertaken to determine whether the impact could be substantiated by evaluating the vibration using Detailed Analysis methods. Additional information about these methods is found in the technical report for the SEIR (WIA 2007). For General Assessment, the criterion is 72 dB re: 1 micro-inch/second (VdB) for Land Use Category 2 buildings.

## 4 ANALYSIS METHODOLOGY

### 4.1 Noise

The future year noise levels were determined by calculating an incremental increase over the existing noise environments attributable to the increased traffic volumes on Capitol Expressway. The traffic volume data was obtained from a study prepared by AECOM (AECOM, 2010). Noise from traffic is directly proportional to the traffic volume, all other factors remaining the same, and a 100% increase in volume would generate a 3 dBA increase in noise. Further, the bus noise component for the BRT was included for the No Build based on the results of the SCAR analysis, which indicates that the BRT will contribute 58 to 61 dBA  $L_{dn}$  to the noise environment. Table 5 summarizes the anticipated noise increases at four intersections based on the traffic study volumes. For the future noise analysis, the future year 2035 noise levels were combined with the LRT options. As shown in Table 5, the effect of *future traffic only* would generate almost a 3 dBA noise increase for the No Build scenario. For the LRT alternatives, the effect of future traffic would generate a noise increase of 1.4 to 2.3 dBA over the existing noise levels. As indicated in Table 4, the effect of the *future traffic only* would generate a moderate noise impact at Category 2 receptors.

**Table 5 Traffic Noise Increase over Existing (2010) for Year 2035 Study Conditions**

Road Section	Expected Baseline Noise Increase (Year 2035) - dBA		
	No Build	Base LRT	LRT w/ No Ocala Station
Near Capitol Ave and Capitol Expressway	2.0	1.4	1.4
Capitol Expressway South of Story Ave	2.3	1.8	1.8
Capitol Expressway Near Ocala Ave	2.3 to 2.5	2.1 to 2.2	2.1 to 2.2
Capitol Expressway North of Cunningham	2.7	2.3	2.3

As noted above, the base Light Rail Alternative noise analysis uses the same parameters used for the 2007 CELR SEIR, with the addition of the aerial and embankment structure sound walls which were incorporated into the Project as part of the SEIR process. With the Ocala Station option, the LRT component is unchanged from the 2007 CELR. With no Ocala Station, the horizontal track alignment has been adjusted, and the trains would operate at through speeds up to 35 mph. These operational noise estimates were combined with the expected traffic-noise component to estimate the future noise levels for the Light Rail alternatives.

### 4.2 Vibration

For the vibration analysis, there is no other baseline change in vibration, so only the area affected by the Ocala Station Option has been reanalyzed for this report. As noted above, the horizontal distances from the light rail track to the nearby buildings has been updated for the No-Ocala Station option, with operational speeds of 35 mph.

## 5 NOISE IMPACTS AND CONTROL MEASURES

Tables 6 and 7 summarize the noise impacts for the project for the No Build (Year 2035) and the LRT Alternative (No Build + LRT) with and without the Ocala LRT Station, respectively.

**Table 6 Estimated Noise Impacts for the No Build Condition**

Direction/Section Vicinity	Receiver (#)	Exist.	No Build	Noise Increase Impact Thresholds		Number of Impacts	
				Moderate	Severe	Moderate	Severe
SB 10+80 to 11+60 Lombard Ave. to Capitol Expwy.	SFR (5)	67	<i>69.0</i>	1.2	3.2	5	0
SB 13+90 to 23+00 Excalibur Dr. to Story Rd.	SFR (40)	72	<i>74.3</i>	0.8	2.5	40	0
SB 24+20 to 31+70 Foxdale Lp. to Ocala Ave.	SFR (19) and MFR (3)	67	<i>69.5</i>	1.2	3.2	22	0
NB 10+00 to 13+90 Westboro Dr. to Highland Dr.	SFR (17)	67	<i>69.0</i>	1.2	3.2	17	0
NB 20+20 to 31+10 Kollmar Dr. to S. Capitol Ave.	SFR (36) and MFR (1)	73	<i>75.3</i>	0.6	2.4	37	0
NB 31+30 to 35+80 Evermont Ct and Home Gate Dr.	SFR (30)	65	<i>67.7</i>	1.4	3.6	30	0
Total Impacts:						151	0
SFR: Single-Family Residence MFR: Multi-Family Residence <i>Italics</i> : Future Noise Values exceed the Moderate Noise Impact Threshold <b>Italics and Bold</b> : Future Noise Values exceed the Severe Noise Impact Threshold							

5.1 *No-Build*

The noise increase for the No-Build condition would be caused by the increased traffic and the implementation of the VTA BRT. The traffic study (AECOM 2010) indicates that the traffic volume along Capitol Expressway would increase by over 60% during the morning and afternoon commute periods. A traffic increase of 100% would generate a noise increase of 3 dBA, and the expected effect of the No Build case is shown in Table 6, where the No Build case would increase the noise by 2.0 to 2.7 dBA over the existing conditions. This increase would be sufficient to cause a Moderate Noise Impact for all Category 2 receptors (residential) in the study area. In several areas, the noise increase would be just short of a Severe Noise Impact by fractions of a decibel. As shown in Table 6, there would be a total of 151 moderate impacts, with 67 in the Southbound direction and 84 in the Northbound direction.

5.2 *LRT Alternative*

Table 7 illustrates the noise impact of the project for the LRT Alternative with the approved aerial and embankment sound walls; a Severe Impact would be generated for only one (1) home along the alignment. While the future traffic volume increase would not be quite as great as the No Build case, in many cases the relative contribution of the LRV noise would be small compared to the contribution generated by future traffic (see highlighted entries). More details are provided in Appendix C. With no aerial and embankment sound walls, there would be 113 Moderate impacts and 38 Severe impacts.

**Table 7 Estimated Noise Impacts for the LRT Alternative and Ocala Station Option – With Sound Walls on Aerial Structure and Embankments**

Direction/Section Vicinity	Receiver (#)	Exist.	Future w/LRT			Noise Increase Impact Thresholds		Number of Impacts	
			Traffic Only	LRV Only	Total	Mod.	Sev.	Mod.	Sev.
SB 10+80 to 11+60 Lombard Ave. to Capitol Expwy.	SFR (5)	67	<b>68.4</b>	59 – 64 (AG)	<i>69.2 – 69.6</i>	1.2	3.2	5	0
SB 13+90 to 23+00 Excalibur Dr. to Story Rd.	SFR (40)	72	<b>73.8</b>	58 – 60 (AE)	<i>73.9 – 74.0</i>	0.8	2.5	40	0
SB 24+20 to 31+70 Foxdale Lp. to Ocala Ave.	SFR (19) and MFR (3)	67	<b>69.1</b>	58 – 65 (AG)	<i>69.2 – 69.7</i>	1.2	3.2	22	0
NB 10+00 to 13+90 Westboro Dr. to Highwood Dr.	SFR (17)	67	<b>68.4</b>	56 – 64 (AG) 60 – 62 (AE)	<i>68.6 – 69.2</i> <i>68.6 – 69.1</i>	1.2	3.2	17	0
NB 20+20 to 31+10 Kollmar Dr. to S. Capitol Ave.	SFR (36) and MFR (1)	73	<b>74.8</b>	67 – 68 (AE) 61 – 63 (AG)	<i>74.9 – 75.0</i> <i>74.9 – 75.1</i>	0.6	2.4	37	0
NB 31+30 to 35+80 Evermont Ct and Home Gate Dr.	SFR (30)	65	<b>67.2 – 67.3</b>	58 – 64 (AG)	<i>67.4 – 67.6</i>	1.4	3.6	29	1
Total Impacts:								150	1
SFR: Single-Family Residence MFR: Multi-Family Residence AG: At-Grade trackway AE: Aerial trackway <i>Italics:</i> Future Noise Values exceed the Moderate Noise Impact Threshold <b>Italics and Bold:</b> Future Noise Values exceed the Severe Noise Impact Threshold Yellow shading indicates that the noise source is a dominant contributor									

**5.3 Ocala Station Option**

Without Ocala Station, there would be some minor differences in traffic volume, but the traffic noise increase would be essentially unchanged, and the primary difference for this Option would be the difference in horizontal alignment and LRV operating speed near Ocala Avenue. The net difference would be approximately a 0.1 dBA increase over the LRT Alternative, but the noise impacts would be the same as the LRT Alternative as summarized in Table 7. More details are provided in Appendix C.

**5.4 Control Measures**

Sound control measures can be characterized as techniques to control the **Source Noise** (applied where the noise is generated), the **Path Noise** (applied in the pathway between the source and receiver) or the **Receiver Noise** (applied at the residence or receiver). The project analysis considers the following noise control measures to mitigate these noise impacts:

- LRV skirts or other on-vehicle or on-rail noise control (Source Noise)
  - VTA has not previously implemented skirts on the system, but such devices could potentially provide 6 to 10 dB noise reduction of the LRV noise for at-grade or aerial structure LRV operations. However, this measure would have no effect on the traffic noise increase, and for this Project the cumulative benefit would be typically 1 to 2 dBA, with a few places where the cumulative benefit would be as high as 4 to 5 dBA.
  - The standard VTA vehicle currently uses resilient wheels, and the analysis already includes this condition in the base noise estimates.

- Quieter pavement installation (Source Noise)
  - Capitol Expressway will be repaved as a result of modifications to the roadway as part of the project
  - Addresses only noise from the traffic on Capitol Expressway
  - Current studies on pavements in California indicate that a 4.5 dBA noise reduction can be sustained over time with Rubberized Hot Mix Asphalt – Open graded (RHMA-O) compared to conventional Asphalt Concrete (AC) installations
  - For the purposes of this analysis, a conservative estimate of 2 dBA noise reduction has been used for RHMA-O
  - Gap graded asphalt pavements (RHMA-G) would be expected to provide 2 to 3 dBA noise reduction, which is 1.5 to 2.5 dBA less than than RHMA-O
  - No noise reduction benefit would be expected for dense graded asphalt (DGAC)
- Embankment or Aerial structure sound walls (Path Noise)
  - Address only noise from the LRV
  - Typically 2.7 to 3 ft above top-of-rail
  - Typically provides 5 to 8 dBA noise reduction of the LRV noise depending on geometry. However, this measure would have no effect on the traffic noise increase, and the cumulative benefit is typically 1 to 2 dBA, with a few places where the cumulative benefit would be as high as 4 to 5 dBA.
- Ballast at Guideway (Path Noise)
  - Already included for at-grade segments, and considered part of the base noise estimate
- Wayside sound walls (Path Noise)
  - Primarily addresses traffic noise from Capitol Expressway especially where LRT is on aerial structure
  - Would be installed at the roadway right-of-way (may not be feasible due to right-of-way issues)
  - Generally not allowable at the private property line due to access or constructability issues, or because existing sound walls may be present
  - Typically on the order of 6 to 10 feet high to block line of sight from residences to traffic noise sources
  - Typically provides 5 dBA noise reduction of traffic noise for first or second story receptors, respectively, depending on geometry
    - New wayside barriers along Capitol Expressway would eliminate 65 Moderate noise impacts
  - Generally not applicable for some at-grade LRV sections, due to existing sound barriers at residential properties or sight-safety considerations
- Home insulation projects (Receiver Noise)
  - Replaces and improves the sound insulation properties of nearby homes
  - Typically improves existing sound insulation by 5 to 8 dBA based on previous work by VTA
  - Interior Design Goal based on California Sound Insulation Standards – requires an interior sound exposure no greater than 45 Ldn
  - This technique would be used in areas where a) sound barriers cannot be constructed due to safety issues or b) an existing masonry sound wall currently

provides a substantial amount of noise reduction, and cannot be extended in height

- o Does not reduce exterior noise at affected back or side yards

As mentioned previously, since modifications would be made to the roadway, the Project includes repaving Capitol Expressway with an overlay of asphalt. Based on current studies in California, an open-graded, rubberized asphalt layer (RHMA-O) on a freeway can provide an initial noise reduction of 6 dBA, compared to conventional asphalt, leveling out to 4.5 dBA after 11 years. (Rymer, 2010) A study conducted in San Rafael determined that an initial noise reduction of 6 dBA was also possible for an arterial highway (Illingworth and Rodkin, 2003), which has lower operational speeds than a freeway, and would be more appropriate for comparison to the Capitol Expressway. Gap-graded<sup>3</sup> rubberized asphalt (RHMA-G) does not perform as well as RHMA-O; it appears to provide approximately 2 to 3 dBA noise reduction compared to conventional dense-graded asphalt concrete (Illingworth and Rodkin, 2005), but long-term results are not available at this time. Thus, the Project noise levels are presented in Table 8 with a 2 dBA noise reduction to conservatively model the effect of an RHMA-O/G overlay on Capitol Expressway. In conjunction with the aerial and embankment sound walls Table 8 indicates there would be only 2 Moderate impacts; these impacts would require sound insulation to eliminate.

**Table 8 Estimated Noise Impacts for the LRT Alternative and Ocala Station Option – with Aerial/Embankment Sound Walls and RHMA**

Direction/Section Vicinity	Receiver (#)	Exist.	Future w/LRT			Noise Increase Impact Thresholds		Number of Impacts	
			Traffic Only	LRV Only	Total	Mod.	Sev.	Mod.	Sev.
SB 10+80 to 11+60 Lombard Ave. to Capitol Expwy.	SFR (5)	67	66.4	59 – 64 (AG)	66.8 – 67.6	1.2	3.2	0	0
SB 13+90 to 23+00 Excalibur Dr. to Story Rd.	SFR (40)	72	71.8	58 – 60 (AE)	72.0 – 72.1	0.8	2.5	0	0
SB 24+20 to 31+70 Foxdale Lp. to Ocala Ave.	SFR (19) and MFR (3)	67	67.1	58 – 65 (AG)	67.2 – 68.0	1.2	2.5	0	0
NB 10+00 to 13+90 Westboro Dr. to Highwood Dr.	SFR (17)	67	66.8	56 – 64 (AG) 60 – 62 (AE)	66.8 – 67.7 67.1 – 67.5	1.2	3.2	0	0
NB 20+20 to 31+10 Kollmar Dr. to S. Capitol Ave.	SFR (36) and MFR (1)	73	72.8	67 – 68 (AE) 61 – 63 (AG)	73.0 – 73.1 73.2 – 73.3	0.6	2.4	0	0
NB 31+30 to 35+80 Evermont Ct and Home Gate Dr.	SFR (30)	65	65.2 – 65.3	58 – 64 (AG)	65.6 – 67.5	1.4	3.6	2	0
Total Impacts:								2	0
SFR: Single-Family Residence MFR: Multi-Family Residence AG: At-Grade trackway AE: Aerial trackway <i>Italics</i> : Future Noise Values exceed the Moderate Noise Impact Threshold <i>Italics and Bold</i> : Future Noise Values exceed the Severe Noise Impact Threshold Yellow shading indicates that the noise source is a dominant contributor									

<sup>3</sup> With aggregate size no greater than 1/2” in diameter

## 6 VIBRATION IMPACTS AND CONTROL MEASURES

Table 9 summarizes the vibration impacts for the LRT Alternative and the Ocala Station Option. More details on the LRT Alternative analysis are included in the January 2007 report prepared for the SEIR. As shown in Table 9, while the vibration levels would be slightly higher near Ocala Avenue for the Ocala Station Option, the level of vibration impact is the same for both the LRT Alternative and the Ocala Station Option. Detailed vibration estimates are included in Appendix C. The vibration effects would be as follows:

- LRT Alternative: 26 Impacts, of which 11 Residual Impacts require additional mitigation
- Ocala Station Option: same as the LRT Alternative.

**Table 9 Estimated Vibration Impacts for VTA CELR Project**

Direction/Section Vicinity	Receiver (#)	General Analysis Vibration Impact Criteria (VdB)	Estimated Vibration (VdB)	Structure	Number of Impacts	Comments
SB 10+80 to 11+60 Lombard Ave. to Capitol Expwy.	SFR (5)	72	69 - 81	AG, E	3	
SB 13+90 to 23+00 Excalibur Dr. to Story Rd.	SFR (40)	72	63 - 81	E, AE, AG	8	
SB 24+20 to 31+70 Foxdale Lp. to Ocala Ave.	SFR (19) and MFR (3)	72	69 - 83	AG	10	
NB 10+00 to 13+90 Westboro Dr. to Highwood Dr.	SFR (17)	72	59 - 82	AG, E	5	
NB 20+20 to 31+10 Kollmar Dr. to S. Capitol Ave.	SFR (36) and MFR (1)	72	69 - 76	AE, E, AG	0	Vibration does not exceed Detailed Analysis Criteria
NB 31+30 to 35+80 Evermont Ct and Home Gate Dr.	SFR (30)	72	66 - 75	AG	0	Vibration does not exceed Detailed Analysis Criteria
				<i>Total Impacts:</i>		26
SFR: Single-Family Residence MFR: Multi-Family Residence AG: At-Grade trackway E: Embankment AE: Aerial trackway <i>Italics: Future Vibration Values exceed the General Analysis Impact Threshold</i>						

### 6.1 Control Measures

- Inclusion of vibration control measures such as Tire Derived Aggregates (TDA) would be utilized to reduce the vibration impacts and eliminate vibration impact at 14 homes, as shown in Table 10.
- For the remaining 12 homes that could experience a residual vibration impact, it is possible that a deeper TDA layer could eliminate the impact, or possibly a floating slab trackbed could be utilized. The effects of a TDA layer are based on field tests conducted of a TDA layer installation along the Vasona Corridor. To determine whether a change in the TDA layer design would improve the vibration reduction, it would be necessary to model the deeper layer design. Thus, further investigation will be conducted during Final Engineering to model effects of a deeper TDA layer. More information on these control measures is included in the January 2007 report (WIA 2007).

**Table 10 Estimated Vibration Levels for VTA CELR Project with Vibration Control**

Direction/Section Vicinity	Receiver (#)	General Analysis Vibration Impact Criteria (VdB)	Estimated Vibration with TDA (VdB)	Residual Number of Impacts	Comments
SB 10+80 to 11+60 Lombard Ave. to Capitol Expwy.	SFR (5)	72	70 - 76	0	With TDA, vibration does not exceed Detailed Analysis Criteria
SB 13+90 to 23+00 Excalibur Dr. to Story Rd.	SFR (40)	72	75 - 77	2	Even with TDA, vibration would still exceed Detailed Analysis Criteria at some homes
SB 24+20 to 31+70 Foxdale Lp. to Ocala Ave.	SFR (19) and MFR (3)	72	75 - 79	9	Even with TDA, vibration would still exceed Detailed Analysis Criteria at some homes
NB 10+00 to 13+90 Westboro Dr. to Highwood Dr.	SFR (17)	72	77 - 81	1	Even with TDA, vibration would still exceed Detailed Analysis Criteria at some homes
NB 20+20 to 31+10 Kollmar Dr. to S. Capitol Ave.	SFR (36) and MFR (1)	72	NA	0	
NB 31+30 to 35+80 Evermont Ct and Home Gate Dr.	SFR (30)	72	NA	0	
			<i>Total Impacts:</i>	12	
SFR: Single-Family Residence MFR: Multi-Family Residence <i>Italics: Future Vibration Values exceed the General Analysis Impact Threshold</i>					

## 7 CONSTRUCTION IMPACTS

Construction noise and vibration impacts are discussed in the January 2007 report. The primary cause of impact would be pile driving activities. We expect that the impacts would remain unchanged from the analysis presented in 2007 which indicates that the FTA Construction Noise Criteria would be potentially exceeded at homes (57) and churches (2) within 270 feet of pile driving activity, and the FTA Construction Vibration guidelines for homes (59) and churches (2) within 144 feet of the pile driving activity.

### Noise and Vibration Control Measures

As discussed in the 2007 report, a combination of the following measures should be considered if reasonable and feasible to reduce noise and vibration impacts from pile driving:

1. **Noise Shield:** A pile driving noise shield could be effective at reducing the pile driving noise by a minimum 5 dBA, depending on the size of the shield and how well it surrounds the pile and hammer. A portable shield/barrier could be implemented to provide a nominal 10 dBA noise reduction.
2. **Pre-Drilling Piles:** Pre-drilling a portion of the hole may provide a means to reduce the duration of impact pile driving, and should be explored. Reducing the total impact time to an aggregate duration of no more than 2 hours per day will reduce the equivalent noise level by 6 dBA to a range of 80 to 90 dBA ( $L_{eq}$ ) at a distance of 100 ft.

3. Non-Impact Piles or Cast in Drilled Hole (CIDH) piles: Using the Soil-Mix or CIDH method would reduce the vibration below the FTA Criteria. We recommend this technique be considered for homes which would be within 75 ft of pile driving.
4. Reduced Impact Pile Driving Time: Limiting the hours per day of impact pile driving would reduce the equivalent noise level and would reduce potential work interference.
5. Excessive Vibration: If pile driving amplitudes exceed the building threshold criteria, cosmetic repair work may be required at nearby buildings. A detailed pre-construction crack survey is recommended at homes and businesses where these criteria are expected to be exceeded, and vibration monitoring, crack monitors and photo documentation is recommended during pile driving activity.
6. Relocating Items on Shelves: Since items on shelves and walls may move during pile driving activity, we recommend that nearby residents be advised (through community outreach process) that they should move fragile and precious items off of shelves and walls for the duration of the impact pile driving. Achievement of standards for building damage would not eliminate annoyance, since the vibration would still be quite feelable.
7. Advance Notification (Work Interference): The impact pile driving vibration may cause interference with persons working at home or the office on their computers. We recommend that the nearby residents and businesses be advised in advance of times when piles would be driven, particularly piles within 160 ft of any occupied building, so that they may plan accordingly, if possible.
8. Notification of Pile Driving Schedule: Nearby residents and businesses should be kept up to date on the expected pile driving schedule. In particular, these notifications should be made with home-bound residents, homes where there is day-time occupancy (e.g., work at home, stay-at-home parents) and offices/commercial businesses where extensive computer/video monitor work is conducted.

### **Contractor Controls**

In addition to the above list of specific noise and vibration control measured, the following are recommended for inclusion in the Contractor specifications for the Indicator and Production pile driving programs if reasonable and feasible:

- Comply with the equivalent noise levels (Leq) limits [ref. FTA 2006 p. 12-8] and a maximum noise level limits of 90 dBA (slow) or 125 dBC (fast) for residential buildings,
- Comply with the maximum vibration limits [ref. FTA 2006 Table 12-3],
- Perform a detailed survey and photo documentation prior to construction of all potentially affected wood-frame buildings within 135 ft of the piling activity,
- Coordinate and perform noise and vibration monitoring at a representative sampling of potentially affected buildings along the Project corridor,
- Install crack monitors where appropriate and provide photo documentation at all potentially affected buildings during pile driving activity and through construction,
- Community Notification and Involvement:
  - provide a minimum four-week advance notice of start of piling operations to all affected receptors (e.g., internet, phone and fax), and regular, up-to-date

communications. This includes education of the public on the expected noise and vibration,

- provide a knowledgeable Community Liaison to Respond to Questions and Complaints regarding pile driving noise and vibration,
- provide assistance as needed to nearby residents or offices who may require help relocating valuable items off shelves.

**REFERENCES**

AECOM, *Transportation Study for the Supplemental Impact Report*, July 2010.

Illingworth & Rodkin, *Noise Evaluation of the Pavement Rehabilitation Project on the 4th Street "Miracle Mile,"* report prepared by P. Donovan for the City of San Rafael Department of Public Works, December 2003.

Illingworth & Rodkin, *Sound Intensity Measurements in Fresno County, State Route 33 California*, memo prepared by P. Donovan for Caltrans, October 2005.

mo'c Physics Applied, *Santa Clara-Alum Rock Transit Corridor Noise and Vibration Study*, July 2008.

B. Rymer at Caltrans, correspondence on March 3 and 4, 2010 regarding test section on I-80 near UC Davis.

Wilson, Ihrig & Associates, Inc., *Noise and Vibration Study for Supplemental Environmental Impact Review*, January 2007.

**APPENDIX A – Noise Measurement Results**

**Table A1 Comparison of Previous and Current Ambient Noise Exposure Levels**

Label	Location	Land Use	Previous		2010 <sup>c</sup>		Comment
			Measured Peak Hour Leq	Ldn or Lday	Measured Peak Hour Leq	Ldn or Lday	
SEIR	Highwood Street <sup>b</sup>	Residential	64	67	64-65	66-67	
N-1	Bambi Lane <sup>a</sup>	Residential	70	72	70	72	
N-2	Capitol Court <sup>a</sup>	Residential	71	73	71	73	
N-3	Greenstone Circle <sup>a</sup>	Residential	66	67	[66]	[67]	Sound wall
N-4	Supreme Drive <sup>a</sup>	Residential	64	65	[64]	[65]	Sound wall
N-5	Cunningham Park <sup>a</sup>	Park	57	59	(57)	(59)	Earth Berm

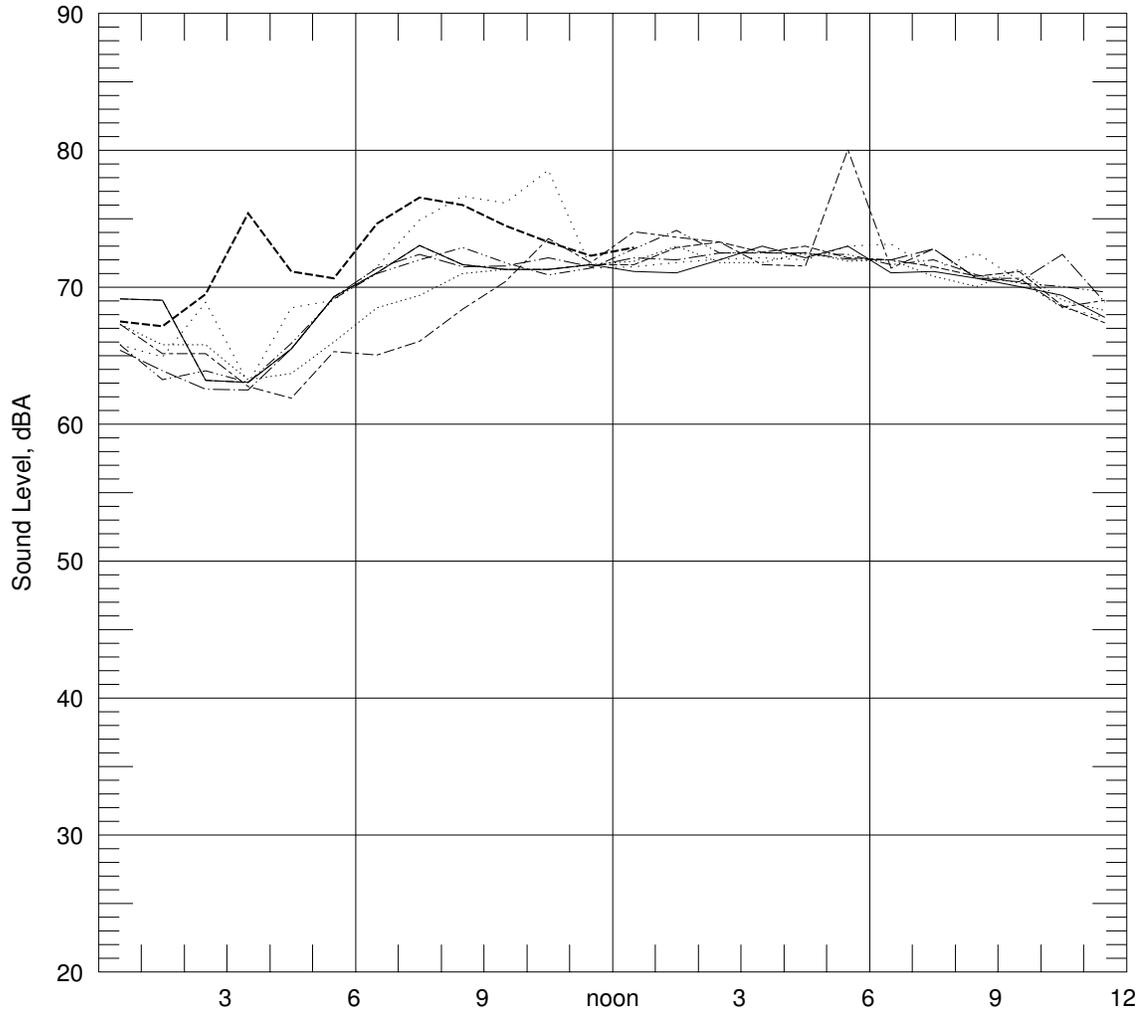
a: Originally measured October 31 to November 1, 2001  
b: Originally measured July 2006  
c: In 2010, 15-minute short-term samples and multi-day continuous monitoring  
(n) no measurements, extrapolated value from other data  
[n] new noise data used to extrapolate current Leq and Ldn

Short-term measurements were taken at N-3 and N-4, but since WIA was unable to replicate the original measurement locations, these results were reviewed for their reasonableness. To achieve this, WIA developed a simple model using Traffic Noise Model (TNM) to analyze the effect of a row of houses between the original noise measurement locations and the 2010 measurement locations taken on the front sidewalk. The original measurements for N-3 and N-4 were taken in the backyards of residences, shielded from Capitol Expressway by masonry sound walls. The TNM model indicated that we should expect the sound at the front sidewalks, further from Capitol Expressway than the original noise measurement locations and further shielded by a row of homes, should be approximately 7 dBA less than the noise in the backyard locations. The consequence of this analysis was that WIA determined that the short-term measurements conducted in 2010 were consistent with the measurement data obtained in 2001.

**Table A2 Comparison of Noise Measurements (12:45 to 1:30PM) – Leq (dBA)**

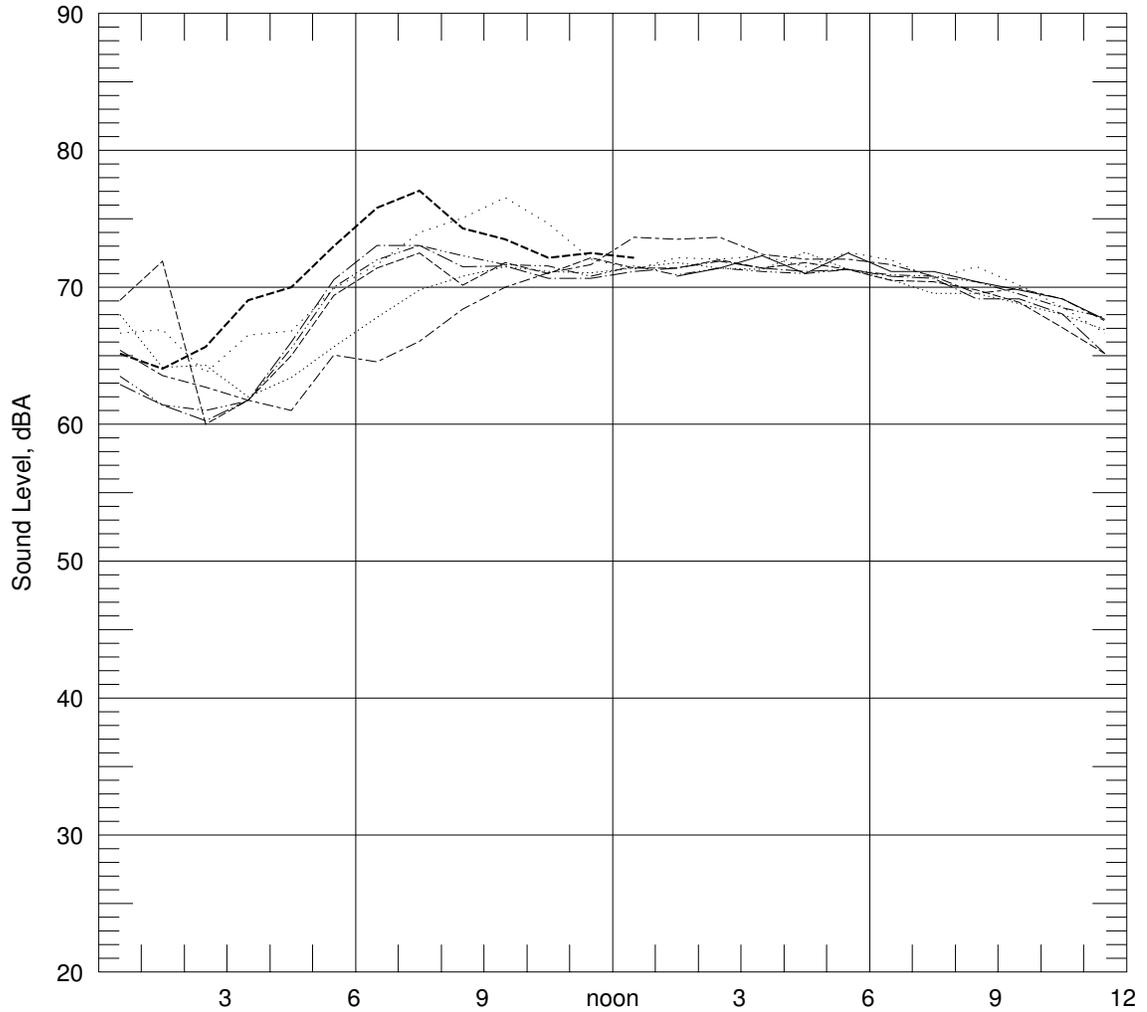
Location	Original Survey in Residential Backyard	January 2010 at front Sidewalk	January 2010 Adjusted for Backyard	Comment
Greenstone Circle	64 to 65	54 to 55	61 to 62	Given the margin of error for daily and local variations, this is about the same
Supreme Drive	62	54 to 57	61 to 64	Given the margin of error daily and local variations, this is about the same

Location N-5 was originally measured on the east side of an earth berm in the Cunningham Park complex. Now, that park area is fenced off and not easily accessible.



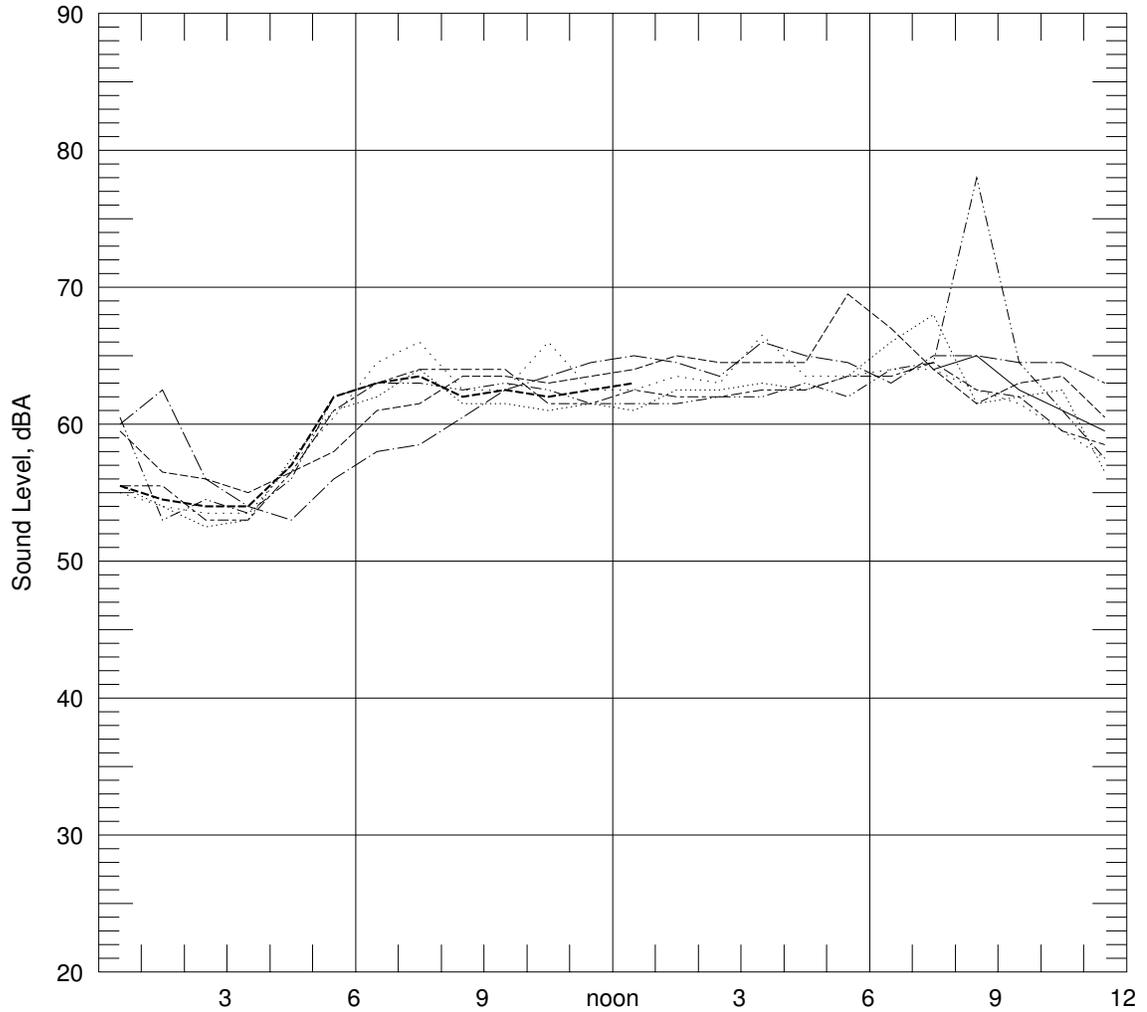
- Leq Tue, 12 Jan to Wed, 13 Jan at eir n-1
- - - - - Leq Wed, 13 Jan at eir n-1
- · - · - Leq Thu, 14 Jan at eir n-1
- · - · - Leq Fri, 15 Jan at eir n-1
- · · · · Leq Sat, 16 Jan at eir n-1
- · - · - Leq Sun, 17 Jan at eir n-1
- · · · · Leq Mon, 18 Jan at eir n-1
- - - - - Leq Tue, 19 Jan at eir n-1

1 HOURLY SUMMARY, EQUIVALENT NOISE LEVELS, LOCATION N-1



- Leq Tue, 12 Jan at NEIR2
- - - Leq Wed, 13 Jan at NEIR2
- · - Leq Thu, 14 Jan at NEIR2
- · - Leq Fri, 15 Jan at NEIR2
- · · Leq Sat, 16 Jan at NEIR2
- · - Leq Sun, 17 Jan at NEIR2
- · · Leq Mon, 18 Jan at NEIR2
- - - Leq Tue, 19 Jan at NEIR2

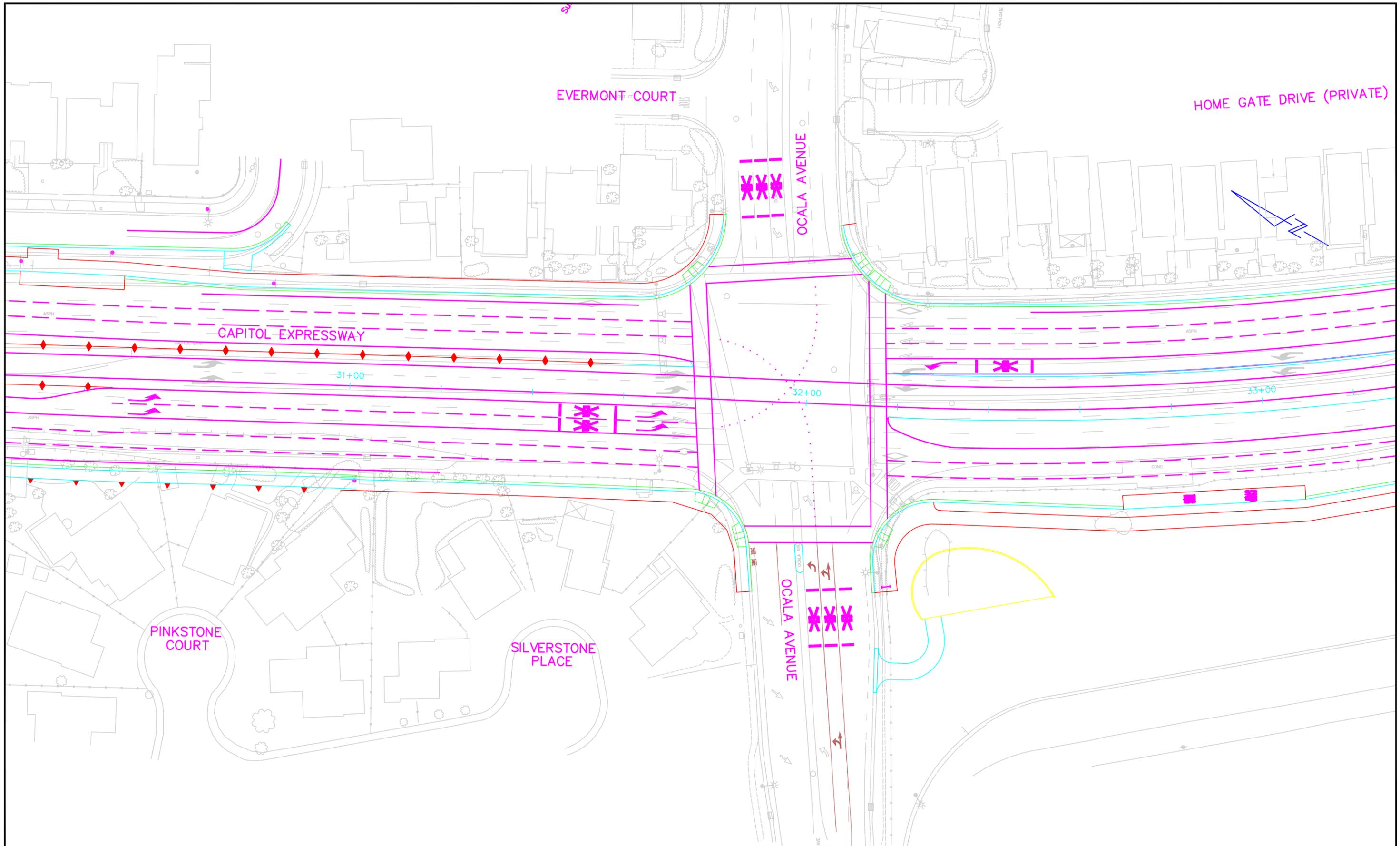
2 HOURLY SUMMARY, EQUIVALENT NOISE LEVELS, LOCATION N-2



- Leq Fri, 30 Apr at HIGHWOOD DR
- Leq Sat, 1 May at HIGHWOOD DR
- .-.-.-.- Leq Sun, 2 May at HIGHWOOD DR
- ..... Leq Mon, 3 May at HIGHWOOD DR
- ..... Leq Tue, 4 May at HIGHWOOD DR
- Leq Wed, 5 May at HIGHWOOD DR
- ..... Leq Thu, 6 May at HIGHWOOD DR
- Leq Fri, 7 May at HIGHWOOD DR

3 HOURLY SUMMARY, EQUIVALENT NOISE LEVELS, LOCATION NSEIR

**APPENDIX B – Alignment Drawing – Compare at Ocala Option**





**APPENDIX C – Detailed Analysis Results, Noise and Vibration**

**TABLE C-1 SUMMARY OF PREDICTED PROJECT NOISE LEVELS - CELR AND BRT (YEAR 2035) W/BARRIERS APPROVED FROM SEIR 2007 ANALYSIS**

Station Number	Location/Street (ID)	Noise Levels (dBA) - $L_{dn}$ or $L_{eq}^2$						Impact Criteria - Noise Increase over Existing		Impact Level						Comment	
		Existing	No-Build (w/BRT)	Increase Over Existing	LRT w/ Ocala Option	Increase Over Existing	LRT no Ocala Option	Increase Over Existing			No-Build (BRT)		LRT (base)		LRT (no Ocala)		
									Moderate	Severe	Moderate	Severe	Moderate	Severe	Moderate		Severe
Southbound																	
10+80	SFR on Lombard Ave.	67	69.0	2.0	69.2	2.2			1.2	3.2	x	--	x	--			
10+80	SFR on Lombard Ave.	67	69.0	2.0	68.8	1.8			1.2	3.2	x	--	x	--			
11+20	SFR on Lombard Ave.	67	69.0	2.0	68.7	1.7			1.2	3.2	x	--	x	--			1
11+40	SFR on Capitol Ave	67	69.0	2.0	68.7	1.7			1.2	3.2	x	--	x	--			1
11+60	SFR on Capitol Ave	67	69.0	2.0	68.7	1.7			1.2	3.2	x	--	x	--			1
13+90	SFR on Excalibur Dr.	72	74.3	2.3	73.9	1.9			0.8	2.5	x	--	x	--			1
14+10	SFR on Excalibur Dr.	72	74.3	2.3	73.9	1.9			0.8	2.5	x	--	x	--			1
14+30	SFR on Excalibur Dr.	72	74.3	2.3	73.9	1.9			0.8	2.5	x	--	x	--			1
14+60	SFR on Capitol Ave	72	74.3	2.3	74.0	2.0			0.8	2.5	x	--	x	--			1
14+75	SFR on Capitol Ave	72	74.3	2.3	74.0	2.0			0.8	2.5	x	--	x	--			1
14+90	SFR on Capitol Ave	72	74.3	2.3	74.0	2.0			0.8	2.5	x	--	x	--			1
15+60	SFR on Capitol Ave	72	74.3	2.3	74.0	2.0			0.8	2.5	x	--	x	--			1
16+00	SFR on Capitol Ave	72	74.3	2.3	73.9	1.9			0.8	2.5	x	--	x	--			1
16+20	SFR on Capitol Ave	72	74.3	2.3	73.9	1.9			0.8	2.5	x	--	x	--			1
16+30	SFR on Capitol Ave	72	74.3	2.3	73.9	1.9			0.8	2.5	x	--	x	--			1
16+50	SFR on Capitol Ave	72	74.3	2.3	73.9	1.9			0.8	2.5	x	--	x	--			1
16+60	SFR on Capitol Ave	72	74.3	2.3	73.9	1.9			0.8	2.5	x	--	x	--			1
16+80	SFR on Capitol Ave	72	74.3	2.3	73.9	1.9			0.8	2.5	x	--	x	--			1
16+90	SFR on Capitol Ave	72	74.3	2.3	73.9	1.9			0.8	2.5	x	--	x	--			1
17+10	SFR on Capitol Ave	72	74.3	2.3	73.9	1.9			0.8	2.5	x	--	x	--			1
17+20	SFR on Capitol Ave	72	74.3	2.3	73.9	1.9			0.8	2.5	x	--	x	--			1
17+40	SFR on Capitol Ave	72	74.3	2.3	73.9	1.9			0.8	2.5	x	--	x	--			1
17+50	SFR on Capitol Ave	72	74.3	2.3	73.9	1.9			0.8	2.5	x	--	x	--			1
17+70	SFR on Capitol Ave	72	74.3	2.3	73.9	1.9			0.8	2.5	x	--	x	--			1
17+90	SFR on Capitol Ave	72	74.3	2.3	74.0	2.0			0.8	2.5	x	--	x	--			1
18+00	SFR on Capitol Ave	72	74.3	2.3	74.0	2.0			0.8	2.5	x	--	x	--			1
18+20	SFR on Capitol Ave	72	74.3	2.3	74.0	2.0			0.8	2.5	x	--	x	--			1
18+40	SFR on Capitol Ave	72	74.3	2.3	74.0	2.0			0.8	2.5	x	--	x	--			1
18+50	SFR on Capitol Ave	72	74.3	2.3	74.0	2.0	Same as LRT Alternative		0.8	2.5	x	--	x	--	Same as LRT Alternative		1
20+70	SFR on Logsdan Way (2)	72	74.3	2.3	74.0	2.0			0.8	2.5	x	--	x	--			1
20+90	SFR on Logsdan Way	72	74.3	2.3	74.0	2.0			0.8	2.5	x	--	x	--			1
21+00	SFR on Logsdan Way	72	74.3	2.3	74.0	2.0			0.8	2.5	x	--	x	--			1
21+20	SFR on Logsdan Way	72	74.3	2.3	74.0	2.0			0.8	2.5	x	--	x	--			4
21+30	SFR on Logsdan Way	72	74.3	2.3	74.0	2.0			0.8	2.5	x	--	x	--			4
21+60	SFR on Logsdan Way	72	74.3	2.3	74.0	2.0			0.8	2.5	x	--	x	--			4
21+70	SFR on Logsdan Way	72	74.3	2.3	74.0	2.0			0.8	2.5	x	--	x	--			4
21+90	SFR on Logsdan Way	72	74.3	2.3	74.0	2.0			0.8	2.5	x	--	x	--			4
22+00	SFR on Logsdan Way	72	74.3	2.3	74.0	2.0			0.8	2.5	x	--	x	--			4
22+20	SFR on Logsdan Way	72	74.3	2.3	74.0	2.0			0.8	2.5	x	--	x	--			4
22+40	SFR on Logsdan Way	72	74.3	2.3	74.0	2.0			0.8	2.5	x	--	x	--			4
22+60	SFR on Logsdan Way	72	74.3	2.3	74.0	2.0			0.8	2.5	x	--	x	--			4
22+70	SFR on Logsdan Way	72	74.3	2.3	74.0	2.0			0.8	2.5	x	--	x	--			4
22+90	SFR on Logsdan Way	72	74.3	2.3	74.0	2.0			0.8	2.5	x	--	x	--			4
23+00	SFR on Logsdan Way	72	74.3	2.3	73.9	1.9			0.8	2.5	x	--	x	--			4
24+20	MFR on Foxdale Lp	67	69.5	2.5	69.4	2.4			1.2	3.2	x	--	x	--			4
24+90	MFR on Foxdale Lp	67	69.5	2.5	69.4	2.4			1.2	3.2	x	--	x	--			4
25+90	MFR on Foxdale Lp	67	69.5	2.5	69.4	2.4			1.2	3.2	x	--	x	--			4
27+10	SFR on Greenstone Ct.	67	69.5	2.5	69.4	2.4			1.2	3.2	x	--	x	--			4
27+20	SFR on Greenstone Ct.	67	69.5	2.5	69.6	2.6			1.2	3.2	x	--	x	--			4
27+40	SFR on Greenstone Ct.	67	69.5	2.5	69.6	2.6			1.2	3.2	x	--	x	--			4
27+60	SFR on Greenstone Ct.	67	69.5	2.5	69.4	2.4			1.2	3.2	x	--	x	--			4
28+00	SFR on Whitestone Ct.	67	69.5	2.5	69.5	2.5			1.2	3.2	x	--	x	--			4
28+20	SFR on Whitestone Ct.	67	69.5	2.5	69.7	2.7			1.2	3.2	x	--	x	--			4
28+40	SFR on Whitestone Ct.	67	69.5	2.5	69.4	2.4			1.2	3.2	x	--	x	--			4
28+90	SFR on Bluestone Ct.	67	69.5	2.5	69.5	2.5			1.2	3.2	x	--	x	--			4
29+10	SFR on Bluestone Ct.	67	69.5	2.5	69.6	2.6			1.2	3.2	x	--	x	--			4
29+20	SFR on Bluestone Ct.	67	69.5	2.5	69.4	2.4			1.2	3.2	x	--	x	--			4
29+70	SFR on Brownstone Ct.	67	69.5	2.5	69.5	2.5	69.5	2.5	1.2	3.2	x	--	x	--	x	--	4

WILSON HRIG & ASSOCIATES

VTA CELR SEIS

**TABLE C-1 SUMMARY OF PREDICTED PROJECT NOISE LEVELS - CELR AND BRT (YEAR 2035) W/BARRIERS APPROVED FROM SEIR 2007 ANALYSIS**

Station Number	Location/Street (ID)	Noise Levels (dBA) - L <sub>dn</sub> or L <sub>eq</sub> <sup>2</sup>							Impact Criteria - Noise Increase over Existing		Impact Level						Comment
		Existing	No-Build (w/BRT)	Increase Over Existing	LRT w/ Ocala Option	Increase Over Existing	LRT no Ocala Option	Increase Over Existing			No-Build (BRT)		LRT (base)		LRT (no Ocala)		
									Moderate	Severe	Moderate	Severe	Moderate	Severe	Moderate	Severe	
29+90	SFR on Brownstone Ct.	67	69.5	2.5	69.5	2.5	69.5	2.5	1.2	3.2	x	--	x	--	x	--	4
30+00	SFR on Brownstone Ct.	67	69.5	2.5	69.4	2.4	69.4	2.4	1.2	3.2	x	--	x	--	x	--	4
30+40	SFR on Pinkstone Ct.	67	69.5	2.5	69.4	2.4	69.4	2.4	1.2	3.2	x	--	x	--	x	--	4
30+70	SFR on Pinkstone Ct.	67	69.5	2.5	69.4	2.4	69.4	2.4	1.2	3.2	x	--	x	--	x	--	4
30+80	SFR on Pinkstone Ct.	67	69.5	2.5	69.4	2.4	69.4	2.4	1.2	3.2	x	--	x	--	x	--	4
31+30	SFR on Silverstone Ct.	67	69.5	2.5	69.3	2.3	69.3	2.3	1.2	3.2	x	--	x	--	x	--	4
31+50	SFR on Silverstone Ct.	67	69.5	2.5	69.2	2.2	69.2	2.2	1.2	3.2	x	--	x	--	x	--	4
31+70	SFR on Silverstone Ct.	67	69.5	2.5	69.2	2.2	69.2	2.2	1.2	3.2	x	--	x	--	x	--	4
Northbound																	
10+00	SFR on Capitol/Wilbur (NA)	67	69.0	2.0	68.6	1.6	Same as LRT Alternative	1.2	3.2	x	--	x	--	Same as LRT Alternative	1		
10+40	SFR on Capitol/Wilbur	67	69.0	2.0	69.0	2.0		1.2	3.2	x	--	x	--				
10+60	SFR on Capitol Ave.	67	69.0	2.0	68.9	1.9		1.2	3.2	x	--	x	--				
10+80	SFR on Capitol Ave.	67	69.0	2.0	68.9	1.9		1.2	3.2	x	--	x	--				
11+00	SFR on Capitol Ave.	67	69.0	2.0	69.0	2.0		1.2	3.2	x	--	x	--				
11+20	SFR on Capitol Ave.	67	69.0	2.0	69.2	2.2		1.2	3.2	x	--	x	--				
11+40	SFR on Capitol/Westboro	67	69.0	2.0	68.7	1.7		1.2	3.2	x	--	x	--				
11+80	SFR on Capitol/Westboro	67	69.0	2.0	68.6	1.6		1.2	3.2	x	--	x	--				
12+10	SFR on Capitol Ave.	67	69.0	2.0	68.6	1.6		1.2	3.2	x	--	x	--				
12+30	SFR on Capitol Ave.	67	69.0	2.0	69.0	2.0		1.2	3.2	x	--	x	--				
12+50	SFR on Capitol Ave.	67	69.0	2.0	69.0	2.0		1.2	3.2	x	--	x	--				
12+60	SFR on Capitol Ave.	67	69.0	2.0	69.0	2.0		1.2	3.2	x	--	x	--				
12+80	SFR on Capitol/Highwood	67	69.0	2.0	69.0	2.0		1.2	3.2	x	--	x	--				
13+40	SFR on Capitol/Highwood	67	69.0	2.0	69.1	2.1		1.2	3.2	x	--	x	--				
13+60	SFR on Capitol Ave.	67	68.6	1.6	68.7	1.7		1.2	3.2	x	--	x	--				
13+80	SFR on Capitol Ave.	67	68.6	1.6	68.7	1.7		1.2	3.2	x	--	x	--				
13+90	SFR on Capitol Ave.	67	68.6	1.6	69.0	2.0		1.2	3.2	x	--	x	--				
17+30	Church	71	73.3	2.3	73.8	2.8		2.6	5.6	--	--	x	--				
18+00	Church	71	73.3	2.3	73.7	2.7		2.6	5.6	--	--	x	--				
20+20	MFR 2719 Kollmar	73	75.3	2.3	75.0	2.0		0.6	2.4	x	--	x	--				
20+80	SFR on S. Capitol/Sussex	73	75.3	2.3	74.9	1.9		0.6	2.4	x	--	x	--				
21+20	SFR on S. Capitol/Sussex	73	75.3	2.3	74.9	1.9		0.6	2.4	x	--	x	--				
21+50	SFR on S. Capitol/Tudor	73	75.3	2.3	75.0	2.0		0.6	2.4	x	--	x	--				
21+90	SFR on S. Capitol/Tudor	73	75.3	2.3	75.0	2.0		0.6	2.4	x	--	x	--				
22+20	SFR on S. Capitol/Capitol Ct	73	75.3	2.3	75.0	2.0		0.6	2.4	x	--	x	--				
22+60	SFR on S. Capitol/Capitol Ct	73	75.3	2.3	75.1	2.1		0.6	2.4	x	--	x	--				
22+90	SFR on S. Capitol/murtha	73	75.3	2.3	75.1	2.1		0.6	2.4	x	--	x	--				
23+40	SFR on S. Capitol/murtha	73	75.3	2.3	75.1	2.1		0.6	2.4	x	--	x	--				
23+70	SFR on S. Capitol/Bristol	73	75.3	2.3	75.1	2.1		0.6	2.4	x	--	x	--				
24+20	SFR on S. Capitol/Bristol	73	75.3	2.3	75.1	2.1		0.6	2.4	x	--	x	--				
24+50	SFR on S. Capitol/Dublin	73	75.3	2.3	75.1	2.1	0.6	2.4	x	--	x	--					
24+90	SFR on S. Capitol/Dublin	73	75.3	2.3	75.1	2.1	0.6	2.4	x	--	x	--					
25+10	SFR on S. Capitol/Belfast	73	75.3	2.3	75.1	2.1	0.6	2.4	x	--	x	--					
25+60	SFR on S. Capitol/Belfast	73	75.3	2.3	75.1	2.1	0.6	2.4	x	--	x	--					
25+80	SFR on S. Capitol/Coventry	73	75.3	2.3	75.1	2.1	0.6	2.4	x	--	x	--					
26+40	SFR on S. Capitol/Coventry	73	75.3	2.3	75.1	2.1	0.6	2.4	x	--	x	--					
26+70	SFR on S. Capitol/Cornwall	73	75.3	2.3	75.1	2.1	0.6	2.4	x	--	x	--					
27+20	SFR on S. Capitol/Cornwall	73	75.3	2.3	75.1	2.1	0.6	2.4	x	--	x	--					
27+60	SFR on S. Capitol Ave.	73	75.3	2.3	75.0	2.0	0.6	2.4	x	--	x	--					
27+70	SFR on S. Capitol Ave.	73	75.3	2.3	75.0	2.0	0.6	2.4	x	--	x	--					
27+90	SFR on S. Capitol Ave.	73	75.3	2.3	75.0	2.0	0.6	2.4	x	--	x	--					
28+10	SFR on S. Capitol Ave.	73	75.3	2.3	75.0	2.0	0.6	2.4	x	--	x	--					
28+30	SFR on S. Capitol/Woodmoor	73	75.3	2.3	75.1	2.1	0.6	2.4	x	--	x	--					
28+60	SFR on S. Capitol/Woodmoor	73	75.3	2.3	75.0	2.0	0.6	2.4	x	--	x	--					
28+90	SFR on S. Capitol Ave.	73	75.3	2.3	75.1	2.1	0.6	2.4	x	--	x	--					
29+00	SFR on S. Capitol Ave.	73	75.3	2.3	75.0	2.0	0.6	2.4	x	--	x	--					
29+30	SFR on S. Capitol Ave.	73	75.3	2.3	75.1	2.1	0.6	2.4	x	--	x	--					
29+50	SFR on S. Capitol Ave.	73	75.3	2.3	75.0	2.0	0.6	2.4	x	--	x	--					
29+60	SFR on S. Capitol Ave.	73	75.3	2.3	75.1	2.1	0.6	2.4	x	--	x	--					

WILSON IHRIG & ASSOCIATES

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**TABLE C-1 SUMMARY OF PREDICTED PROJECT NOISE LEVELS - CELR AND BRT (YEAR 2035) W/BARRIERS APPROVED FROM SEIR 2007 ANALYSIS**

Station Number	Location/Street (ID)	Noise Levels (dBA) - L <sub>dn</sub> or L <sub>eq</sub> <sup>2</sup>							Impact Criteria - Noise Increase over Existing		Impact Level						Comment
		Existing	No-Build (w/BRT)		Increase Over Existing		LRT w/ Ocala Option	Increase Over Existing			No-Build (BRT)		LRT (base)		LRT (no Ocala)		
			No-Build (w/BRT)	Increase Over Existing	Moderate	Severe			Moderate	Severe	Moderate	Severe	Moderate	Severe			
		Existing	No-Build (w/BRT)	Increase Over Existing	LRT w/ Ocala Option	Increase Over Existing	Moderate	Severe	Moderate	Severe	Moderate	Severe	Moderate	Severe			
29+80	SFR on S. Capitol Ave.	73	75.3	2.3	75.0	2.0	75.1	2.1	0.6	2.4	x	--	x	--	x	--	
30+00	SFR on S. Capitol Ave.	73	75.3	2.3	75.0	2.0	75.1	2.1	0.6	2.4	x	--	x	--	x	--	
30+20	SFR on S. Capitol Ave.	73	75.3	2.3	75.0	2.0	75.1	2.1	0.6	2.4	x	--	x	--	x	--	
30+30	SFR on S. Capitol Ave.	73	75.3	2.3	75.0	2.0	75.1	2.1	0.6	2.4	x	--	x	--	x	--	
30+50	SFR on S. Capitol Ave.	73	75.3	2.3	75.0	2.0	75.1	2.1	0.6	2.4	x	--	x	--	x	--	
30+70	SFR on S. Capitol Ave.	73	75.3	2.3	75.0	2.0	75.0	2.0	0.6	2.4	x	--	x	--	x	--	
31+10	SFR on S. Capitol Ave.	73	75.3	2.3	74.9	1.9	75.0	2.0	0.6	2.4	x	--	x	--	x	--	
31+30	SFR Vermont Ct.	65	67.7	2.7	67.6	2.6	67.6	2.6	1.4	3.6	x	--	x	--	x	--	4
31+50	SFR Vermont Ct.	65	67.7	2.7	67.6	2.6	67.6	2.6	1.4	3.6	x	--	x	--	x	--	3,4
32+00	SFR Vermont Ct.	65	67.7	2.7	68.8	3.8	68.8	3.8	1.4	3.6	x	--	x	<b>x</b>	x	<b>x</b>	3,4, 6
32+20	SFR on Home Gate Dr.	65	67.7	2.7	68.6	3.6	68.6	3.6	1.4	3.6	x	--	x	--	x	--	4
32+30	SFR on Home Gate Dr.	65	67.7	2.7	67.5	2.5	67.5	2.5	1.4	3.6	x	--	x	--	x	--	4
32+40	SFR on Home Gate Dr.	65	67.7	2.7	67.5	2.5	67.5	2.5	1.4	3.6	x	--	x	--	x	--	4
32+50	SFR on Home Gate Dr.	65	67.7	2.7	67.4	2.4	67.5	2.5	1.4	3.6	x	--	x	--	x	--	4
32+60	SFR on Home Gate Dr.	65	67.7	2.7	67.4	2.4	67.5	2.5	1.4	3.6	x	--	x	--	x	--	4
32+70	SFR on Home Gate Dr.	65	67.7	2.7	67.4	2.4	67.5	2.5	1.4	3.6	x	--	x	--	x	--	4
32+80	SFR on Home Gate Dr.	65	67.7	2.7	67.4	2.4	67.5	2.5	1.4	3.6	x	--	x	--	x	--	4
32+90	SFR on Home Gate Dr.	65	67.7	2.7	67.4	2.4	67.5	2.5	1.4	3.6	x	--	x	--	x	--	4
33+00	SFR on Home Gate Dr.	65	67.7	2.7	67.4	2.4	67.5	2.5	1.4	3.6	x	--	x	--	x	--	4
33+10	SFR on Home Gate Dr.	65	67.7	2.7	67.4	2.4	67.5	2.5	1.4	3.6	x	--	x	--	x	--	4
33+20	SFR on Home Gate Dr.	65	67.7	2.7	67.4	2.4	67.5	2.5	1.4	3.6	x	--	x	--	x	--	4
33+30	SFR on Home Gate Dr.	65	67.7	2.7	67.5	2.5	67.6	2.6	1.4	3.6	x	--	x	--	x	--	4
33+40	SFR on Home Gate Dr.	65	67.7	2.7	67.5	2.5	67.5	2.5	1.4	3.6	x	--	x	--	x	--	4
33+50	SFR on Home Gate Dr.	65	67.7	2.7	67.4	2.4	67.5	2.5	1.4	3.6	x	--	x	--	x	--	4
33+60	SFR on Home Gate Dr.	65	67.7	2.7	67.4	2.4	67.5	2.5	1.4	3.6	x	--	x	--	x	--	4
33+70	SFR on Home Gate Dr.	65	67.7	2.7	67.4	2.4	67.5	2.5	1.4	3.6	x	--	x	--	x	--	4
33+80	SFR on Home Gate Dr.	65	67.7	2.7	67.4	2.4	67.5	2.5	1.4	3.6	x	--	x	--	x	--	4
33+90	SFR on Home Gate Dr.	65	67.7	2.7	67.4	2.4	67.5	2.5	1.4	3.6	x	--	x	--	x	--	4
34+20	SFR on Supreme Dr	65	67.7	2.7	67.5	2.5	67.6	2.6	1.4	3.6	x	--	x	--	x	--	4
34+60	SFR on Supreme Dr	65	67.7	2.7	67.5	2.5	67.7	2.7	1.4	3.6	x	--	x	--	x	--	4
34+80	SFR on Supreme Dr	65	67.7	2.7	67.5	2.5	67.6	2.6	1.4	3.6	x	--	x	--	x	--	4
35+00	SFR on Supreme Dr	65	67.7	2.7	67.5	2.5	67.6	2.6	1.4	3.6	x	--	x	--	x	--	4
35+20	SFR on Supreme Dr	65	67.7	2.7	67.5	2.5	67.6	2.6	1.4	3.6	x	--	x	--	x	--	4
35+40	SFR on Supreme Dr	65	67.7	2.7	67.5	2.5	67.6	2.6	1.4	3.6	x	--	x	--	x	--	4
35+50	SFR on Supreme Dr	65	67.7	2.7	67.5	2.5	67.6	2.6	1.4	3.6	x	--	x	--	x	--	4
35+70	SFR on Supreme Dr	65	67.7	2.7	67.5	2.5	67.6	2.6	1.4	3.6	x	--	x	--	x	--	4
35+80	SFR on Supreme Dr	65	67.7	2.7	67.5	2.5	67.6	2.6	1.4	3.6	x	--	x	--	x	--	4

Notes:

- at= At-Grade, ae= Aerial or Embankment
- 1: With Proposed Sound Barriers (based on design approved for SEIR)
- 2: Noise Exposure Metric for non-residential areas is L<sub>eq</sub>, rather than L<sub>dn</sub>
- 3: Grade Crossing
- 4: Noise Reduction from Existing Sound Wall Included in Calculations
- 5: Residual Moderate Noise Impact
- 6: Window insulation program would eliminate impact

**TABLE C-2 SUMMARY OF PREDICTED PROJECT NOISE LEVELS - CELR AND BRT (YEAR 2035) W/PROPOSED BARRIERS FROM SEIR 2007 ANALYSIS AND QUIETER PAVEMEN**

Station Number	Location/Street (ID)	Noise Levels (dBA) - $L_{dn}$ or $L_{eq}^2$						Impact Criteria - Noise Increase over Existing		Impact Level				Comment	
		Existing	No-Build (w/BRT)	Increase Over Existing	LRT w/ Ocala Option	Increase Over Existing	LRT no Ocala Option	Increase Over Existing	No-Build (BRT)		LRT (base)		LRT (no Ocala)		
									Moderate	Severe	Moderate	Severe	Moderate		Severe
10+80	SFR on Lombard Ave.	67	69.0	2.0	67.6	0.6		1.2	3.2	x	--	--	--		
10+80	SFR on Lombard Ave.	67	69.0	2.0	67.0	0.0		1.2	3.2	x	--	--	--		
11+20	SFR on Lombard Ave.	67	69.0	2.0	66.8	-0.2		1.2	3.2	x	--	--	--		1
11+40	SFR on Capitol Ave	67	69.0	2.0	66.9	-0.1		1.2	3.2	x	--	--	--		1
11+60	SFR on Capitol Ave	67	69.0	2.0	66.8	-0.2		1.2	3.2	x	--	--	--		1
13+90	SFR on Excalibur Dr.	72	74.3	2.3	72.0	0.0		0.8	2.5	x	--	--	--		1
14+10	SFR on Excalibur Dr.	72	74.3	2.3	72.0	0.0		0.8	2.5	x	--	--	--		1
14+30	SFR on Excalibur Dr.	72	74.3	2.3	72.0	0.0		0.8	2.5	x	--	--	--		1
14+60	SFR on Capitol Ave	72	74.3	2.3	72.1	0.1		0.8	2.5	x	--	--	--		1
14+75	SFR on Capitol Ave	72	74.3	2.3	72.0	0.0		0.8	2.5	x	--	--	--		1
14+90	SFR on Capitol Ave	72	74.3	2.3	72.0	0.0		0.8	2.5	x	--	--	--		1
15+60	SFR on Capitol Ave	72	74.3	2.3	72.0	0.0		0.8	2.5	x	--	--	--		1
16+00	SFR on Capitol Ave	72	74.3	2.3	72.0	0.0		0.8	2.5	x	--	--	--		1
16+20	SFR on Capitol Ave	72	74.3	2.3	72.0	0.0		0.8	2.5	x	--	--	--		1
16+30	SFR on Capitol Ave	72	74.3	2.3	72.0	0.0		0.8	2.5	x	--	--	--		1
16+50	SFR on Capitol Ave	72	74.3	2.3	72.0	0.0		0.8	2.5	x	--	--	--		1
16+60	SFR on Capitol Ave	72	74.3	2.3	72.0	0.0		0.8	2.5	x	--	--	--		1
16+80	SFR on Capitol Ave	72	74.3	2.3	72.0	0.0		0.8	2.5	x	--	--	--		1
16+90	SFR on Capitol Ave	72	74.3	2.3	72.0	0.0		0.8	2.5	x	--	--	--		1
17+10	SFR on Capitol Ave	72	74.3	2.3	72.0	0.0		0.8	2.5	x	--	--	--		1
17+20	SFR on Capitol Ave	72	74.3	2.3	72.0	0.0		0.8	2.5	x	--	--	--		1
17+40	SFR on Capitol Ave	72	74.3	2.3	72.0	0.0		0.8	2.5	x	--	--	--		1
17+50	SFR on Capitol Ave	72	74.3	2.3	72.0	0.0		0.8	2.5	x	--	--	--		1
17+70	SFR on Capitol Ave	72	74.3	2.3	72.0	0.0		0.8	2.5	x	--	--	--		1
17+90	SFR on Capitol Ave	72	74.3	2.3	72.0	0.0		0.8	2.5	x	--	--	--		1
18+00	SFR on Capitol Ave	72	74.3	2.3	72.0	0.0		0.8	2.5	x	--	--	--		1
18+20	SFR on Capitol Ave	72	74.3	2.3	72.0	0.0		0.8	2.5	x	--	--	--		1
18+40	SFR on Capitol Ave	72	74.3	2.3	72.0	0.0		0.8	2.5	x	--	--	--		1
18+50	SFR on Capitol Ave	72	74.3	2.3	72.1	0.1	Same as LRT Alternative	0.8	2.5	x	--	--	--	Same as LRT Alternative	1
20+70	SFR on Logsdon Way (2)	72	74.3	2.3	72.1	0.1		0.8	2.5	x	--	--	--		1
20+90	SFR on Logsdon Way	72	74.3	2.3	72.1	0.1		0.8	2.5	x	--	--	--		1
21+00	SFR on Logsdon Way	72	74.3	2.3	72.1	0.1		0.8	2.5	x	--	--	--		1
21+20	SFR on Logsdon Way	72	74.3	2.3	72.1	0.1		0.8	2.5	x	--	--	--		4
21+30	SFR on Logsdon Way	72	74.3	2.3	72.1	0.1		0.8	2.5	x	--	--	--		4
21+60	SFR on Logsdon Way	72	74.3	2.3	72.1	0.1		0.8	2.5	x	--	--	--		4
21+70	SFR on Logsdon Way	72	74.3	2.3	72.1	0.1		0.8	2.5	x	--	--	--		4
21+90	SFR on Logsdon Way	72	74.3	2.3	72.1	0.1		0.8	2.5	x	--	--	--		4
22+00	SFR on Logsdon Way	72	74.3	2.3	72.0	0.0		0.8	2.5	x	--	--	--		4
22+20	SFR on Logsdon Way	72	74.3	2.3	72.0	0.0		0.8	2.5	x	--	--	--		4
22+40	SFR on Logsdon Way	72	74.3	2.3	72.1	0.1		0.8	2.5	x	--	--	--		4
22+60	SFR on Logsdon Way	72	74.3	2.3	72.0	0.0		0.8	2.5	x	--	--	--		4
22+70	SFR on Logsdon Way	72	74.3	2.3	72.1	0.1		0.8	2.5	x	--	--	--		4
22+90	SFR on Logsdon Way	72	74.3	2.3	72.1	0.1		0.8	2.5	x	--	--	--		4
23+00	SFR on Logsdon Way	72	74.3	2.3	72.0	0.0		0.8	2.5	x	--	--	--		4
24+20	MFR on Foxdale Lp	67	69.5	2.5	67.6	0.6		1.2	3.2	x	--	--	--		4
24+90	MFR on Foxdale Lp	67	69.5	2.5	67.6	0.6		1.2	3.2	x	--	--	--		4
25+90	MFR on Foxdale Lp	67	69.5	2.5	67.6	0.6		1.2	3.2	x	--	--	--		4
27+10	SFR on Greenstone Ct.	67	69.5	2.5	67.5	0.5		1.2	3.2	x	--	--	--		4
27+20	SFR on Greenstone Ct.	67	69.5	2.5	67.9	0.9		1.2	3.2	x	--	--	--		4
27+40	SFR on Greenstone Ct.	67	69.5	2.5	67.8	0.8		1.2	3.2	x	--	--	--		4
27+60	SFR on Greenstone Ct.	67	69.5	2.5	67.6	0.6		1.2	3.2	x	--	--	--		4
28+00	SFR on Whitestone Ct.	67	69.5	2.5	67.7	0.7		1.2	3.2	x	--	--	--		4
28+20	SFR on Whitestone Ct.	67	69.5	2.5	68.0	1.0		1.2	3.2	x	--	--	--		4
28+40	SFR on Whitestone Ct.	67	69.5	2.5	67.7	0.7		1.2	3.2	x	--	--	--		4
28+90	SFR on Bluestone Ct.	67	69.5	2.5	67.8	0.8		1.2	3.2	x	--	--	--		4
29+10	SFR on Bluestone Ct.	67	69.5	2.5	67.8	0.8		1.2	3.2	x	--	--	--		4
29+20	SFR on Bluestone Ct.	67	69.5	2.5	67.6	0.6		1.2	3.2	x	--	--	--		4
29+70	SFR on Brownstone Ct.	67	69.5	2.5	67.8	0.8	67.8 0.8	1.2	3.2	x	--	--	--	--	4
29+90	SFR on Brownstone Ct.	67	69.5	2.5	67.8	0.8	67.8 0.8	1.2	3.2	x	--	--	--	--	4

**TABLE C-2 SUMMARY OF PREDICTED PROJECT NOISE LEVELS - CELR AND BRT (YEAR 2035) W/PROPOSED BARRIERS FROM SEIR 2007 ANALYSIS AND QUIETER PAVEMEN**

Station Number	Location/Street (ID)	Noise Levels (dBA) - L <sub>dn</sub> or L <sub>eq</sub> <sup>2</sup>							Impact Criteria - Noise Increase over Existing		Impact Level						Comment
		Existing	No-Build (w/BRT)	Increase Over Existing	LRT w/ Ocala Option	Increase Over Existing	LRT no Ocala Option	Increase Over Existing			No-Build (BRT)		LRT (base)		LRT (no Ocala)		
									Moderate	Severe	Moderate	Severe	Moderate	Severe			
30+00	SFR on Brownstone Ct.	67	69.5	2.5	67.5	0.5	67.5	0.5	1.2	3.2	x	--	--	--	--	--	4
30+40	SFR on Pinkstone Ct.	67	69.5	2.5	67.6	0.6	67.6	0.6	1.2	3.2	x	--	--	--	--	--	4
30+70	SFR on Pinkstone Ct.	67	69.5	2.5	67.6	0.6	67.6	0.6	1.2	3.2	x	--	--	--	--	--	4
30+80	SFR on Pinkstone Ct.	67	69.5	2.5	67.6	0.6	67.6	0.6	1.2	3.2	x	--	--	--	--	--	4
31+30	SFR on Silverstone Ct.	67	69.5	2.5	67.4	0.4	67.4	0.4	1.2	3.2	x	--	--	--	--	--	4
31+50	SFR on Silverstone Ct.	67	69.5	2.5	67.4	0.4	67.4	0.4	1.2	3.2	x	--	--	--	--	--	4
31+70	SFR on Silverstone Ct.	67	69.5	2.5	67.2	0.2	67.2	0.2	1.2	3.2	x	--	--	--	--	--	4
10+00	SFR on Capitol/Wilbur (NA)	67	69.0	2.0	66.8	-0.2			1.2	3.2	x	--	--	--			
10+40	SFR on Capitol/Wilbur	67	69.0	2.0	67.3	0.3			1.2	3.2	x	--	--	--			
10+60	SFR on Capitol Ave.	67	69.0	2.0	67.2	0.2			1.2	3.2	x	--	--	--			
10+80	SFR on Capitol Ave.	67	69.0	2.0	67.2	0.2			1.2	3.2	x	--	--	--			
11+00	SFR on Capitol Ave.	67	69.0	2.0	67.4	0.4			1.2	3.2	x	--	--	--			
11+20	SFR on Capitol Ave.	67	69.0	2.0	67.7	0.7			1.2	3.2	x	--	--	--			
11+40	SFR on Capitol/Westboro	67	69.0	2.0	66.8	-0.2			1.2	3.2	x	--	--	--			1
11+80	SFR on Capitol/Westboro	67	69.0	2.0	66.8	-0.2			1.2	3.2	x	--	--	--			1
12+10	SFR on Capitol Ave.	67	69.0	2.0	66.7	-0.3			1.2	3.2	x	--	--	--			1
12+30	SFR on Capitol Ave.	67	69.0	2.0	67.3	0.3			1.2	3.2	x	--	--	--			1
12+50	SFR on Capitol Ave.	67	69.0	2.0	67.3	0.3			1.2	3.2	x	--	--	--			1
12+60	SFR on Capitol Ave.	67	69.0	2.0	67.3	0.3			1.2	3.2	x	--	--	--			1
12+80	SFR on Capitol/Highwood	67	69.0	2.0	67.4	0.4			1.2	3.2	x	--	--	--			1
13+40	SFR on Capitol/Highwood	67	69.0	2.0	67.5	0.5			1.2	3.2	x	--	--	--			1
13+60	SFR on Capitol Ave.	67	68.6	1.6	67.1	0.1			1.2	3.2	x	--	--	--			1
13+80	SFR on Capitol Ave.	67	68.6	1.6	67.1	0.1			1.2	3.2	x	--	--	--			1
13+90	SFR on Capitol Ave.	67	68.6	1.6	67.5	0.5			1.2	3.2	x	--	--	--			1
17+30	Church	71	73.3	2.3	72.3	1.3			2.6	5.6	--	--	--	--			
18+00	Church	71	73.3	2.3	72.2	1.2			2.6	5.6	--	--	--	--			
20+20	MFR 2719 Kollmar	73	75.3	2.3	73.2	0.2			0.6	2.4	x	--	--	--			1
20+80	SFR on S. Capitol/Sussex	73	75.3	2.3	73.0	0.0			0.6	2.4	x	--	--	--			1
21+20	SFR on S. Capitol/Sussex	73	75.3	2.3	73.0	0.0			0.6	2.4	x	--	--	--			1
21+50	SFR on S. Capitol/Tudor	73	75.3	2.3	73.1	0.1			0.6	2.4	x	--	--	--			1
21+90	SFR on S. Capitol/Tudor	73	75.3	2.3	73.1	0.1			0.6	2.4	x	--	--	--			1
22+20	SFR on S. Capitol/Capitol Ct	73	75.3	2.3	73.1	0.1	Same as LRT Alternative		0.6	2.4	x	--	--	--	Same as LRT Alternative		1
22+60	SFR on S. Capitol/Capitol Ct	73	75.3	2.3	73.3	0.3			0.6	2.4	x	--	--	--			
22+90	SFR on S. Capitol/Murtha	73	75.3	2.3	73.3	0.3			0.6	2.4	x	--	--	--			
23+40	SFR on S. Capitol/Murtha	73	75.3	2.3	73.3	0.3			0.6	2.4	x	--	--	--			
23+70	SFR on S. Capitol/Bristol	73	75.3	2.3	73.3	0.3			0.6	2.4	x	--	--	--			
24+20	SFR on S. Capitol/Bristol	73	75.3	2.3	73.3	0.3			0.6	2.4	x	--	--	--			
24+50	SFR on S. Capitol/Dublin	73	75.3	2.3	73.3	0.3			0.6	2.4	x	--	--	--			
24+90	SFR on S. Capitol/Dublin	73	75.3	2.3	73.3	0.3			0.6	2.4	x	--	--	--			
25+10	SFR on S. Capitol/Belfast	73	75.3	2.3	73.3	0.3			0.6	2.4	x	--	--	--			
25+60	SFR on S. Capitol/Belfast	73	75.3	2.3	73.3	0.3			0.6	2.4	x	--	--	--			
25+80	SFR on S. Capitol/Coventry	73	75.3	2.3	73.3	0.3			0.6	2.4	x	--	--	--			
26+40	SFR on S. Capitol/Coventry	73	75.3	2.3	73.2	0.2			0.6	2.4	x	--	--	--			
26+70	SFR on S. Capitol/Cornwall	73	75.3	2.3	73.2	0.2			0.6	2.4	x	--	--	--			
27+20	SFR on S. Capitol/Cornwall	73	75.3	2.3	73.3	0.3			0.6	2.4	x	--	--	--			
27+60	SFR on S. Capitol Ave.	73	75.3	2.3	73.2	0.2			0.6	2.4	x	--	--	--			
27+70	SFR on S. Capitol Ave.	73	75.3	2.3	73.2	0.2			0.6	2.4	x	--	--	--			
27+90	SFR on S. Capitol Ave.	73	75.3	2.3	73.2	0.2			0.6	2.4	x	--	--	--			
28+10	SFR on S. Capitol Ave.	73	75.3	2.3	73.2	0.2			0.6	2.4	x	--	--	--			
28+30	SFR on S. Capitol/Woodmoor	73	75.3	2.3	73.2	0.2			0.6	2.4	x	--	--	--			
28+60	SFR on S. Capitol/Woodmoor	73	75.3	2.3	73.2	0.2			0.6	2.4	x	--	--	--			
28+90	SFR on S. Capitol Ave.	73	75.3	2.3	73.2	0.2			0.6	2.4	x	--	--	--			
29+00	SFR on S. Capitol Ave.	73	75.3	2.3	73.2	0.2			0.6	2.4	x	--	--	--			
29+30	SFR on S. Capitol Ave.	73	75.3	2.3	73.2	0.2			0.6	2.4	x	--	--	--			
29+50	SFR on S. Capitol Ave.	73	75.3	2.3	73.2	0.2			0.6	2.4	x	--	--	--			
29+60	SFR on S. Capitol Ave.	73	75.3	2.3	73.2	0.2			0.6	2.4	x	--	--	--			
29+80	SFR on S. Capitol Ave.	73	75.3	2.3	73.1	0.1	73.2	0.2	0.6	2.4	x	--	--	--	--	--	

**TABLE C-2 SUMMARY OF PREDICTED PROJECT NOISE LEVELS - CELR AND BRT (YEAR 2035) W/PROPOSED BARRIERS FROM SEIR 2007 ANALYSIS AND QUIETER PAVEMEN**

Station Number	Location/Street (ID)	Noise Levels (dBA) - L <sub>dn</sub> or L <sub>eq</sub> <sup>2</sup>							Impact Criteria - Noise Increase over Existing		Impact Level						Comment
		Existing	No-Build (w/BRT)	Increase Over Existing	LRT w/ Ocala Option	Increase Over Existing	LRT no Ocala Option	Increase Over Existing			No-Build (BRT)		LRT (base)		LRT (no Ocala)		
									Moderate	Severe	Moderate	Severe	Moderate	Severe			
30+00	SFR on S. Capitol Ave.	73	75.3	2.3	73.1	0.1	73.2	0.2	0.6	2.4	x	--	--	--	--	--	
30+20	SFR on S. Capitol Ave.	73	75.3	2.3	73.1	0.1	73.2	0.2	0.6	2.4	x	--	--	--	--	--	
30+30	SFR on S. Capitol Ave.	73	75.3	2.3	73.1	0.1	73.2	0.2	0.6	2.4	x	--	--	--	--	--	
30+50	SFR on S. Capitol Ave.	73	75.3	2.3	73.1	0.1	73.2	0.2	0.6	2.4	x	--	--	--	--	--	
30+70	SFR on S. Capitol Ave.	73	75.3	2.3	73.1	0.1	73.1	0.1	0.6	2.4	x	--	--	--	--	--	
31+10	SFR on S. Capitol Ave.	73	75.3	2.3	73.0	0.0	73.1	0.1	0.6	2.4	x	--	--	--	--	--	
31+30	SFR Vermont Ct.	65	67.7	2.7	65.9	0.9	65.9	0.9	1.4	3.6	x	--	--	--	--	--	4
31+50	SFR Vermont Ct.	65	67.7	2.7	65.7	0.7	65.7	0.7	1.4	3.6	x	--	--	--	--	--	3,4
32+00	SFR Vermont Ct.	65	67.7	2.7	67.5	2.5	67.5	2.5	1.4	3.6	x	--	x	--	x	--	3,4
32+20	SFR on Home Gate Dr.	65	67.7	2.7	67.2	2.2	67.2	2.2	1.4	3.6	x	--	x	--	x	--	4
32+30	SFR on Home Gate Dr.	65	67.7	2.7	65.6	0.6	65.6	0.6	1.4	3.6	x	--	--	--	--	--	4
32+40	SFR on Home Gate Dr.	65	67.7	2.7	65.6	0.6	65.7	0.7	1.4	3.6	x	--	--	--	--	--	4
32+50	SFR on Home Gate Dr.	65	67.7	2.7	65.5	0.5	65.6	0.6	1.4	3.6	x	--	--	--	--	--	4
32+60	SFR on Home Gate Dr.	65	67.7	2.7	65.5	0.5	65.6	0.6	1.4	3.6	x	--	--	--	--	--	4
32+70	SFR on Home Gate Dr.	65	67.7	2.7	65.6	0.6	65.7	0.7	1.4	3.6	x	--	--	--	--	--	4
32+80	SFR on Home Gate Dr.	65	67.7	2.7	65.5	0.5	65.6	0.6	1.4	3.6	x	--	--	--	--	--	4
32+90	SFR on Home Gate Dr.	65	67.7	2.7	65.5	0.5	65.6	0.6	1.4	3.6	x	--	--	--	--	--	4
33+00	SFR on Home Gate Dr.	65	67.7	2.7	65.5	0.5	65.6	0.6	1.4	3.6	x	--	--	--	--	--	4
33+10	SFR on Home Gate Dr.	65	67.7	2.7	65.5	0.5	65.7	0.7	1.4	3.6	x	--	--	--	--	--	4
33+20	SFR on Home Gate Dr.	65	67.7	2.7	65.6	0.6	65.7	0.7	1.4	3.6	x	--	--	--	--	--	4
33+30	SFR on Home Gate Dr.	65	67.7	2.7	65.6	0.6	65.8	0.8	1.4	3.6	x	--	--	--	--	--	4
33+40	SFR on Home Gate Dr.	65	67.7	2.7	65.6	0.6	65.7	0.7	1.4	3.6	x	--	--	--	--	--	4
33+50	SFR on Home Gate Dr.	65	67.7	2.7	65.5	0.5	65.7	0.7	1.4	3.6	x	--	--	--	--	--	4
33+60	SFR on Home Gate Dr.	65	67.7	2.7	65.5	0.5	65.7	0.7	1.4	3.6	x	--	--	--	--	--	4
33+70	SFR on Home Gate Dr.	65	67.7	2.7	65.5	0.5	65.6	0.6	1.4	3.6	x	--	--	--	--	--	4
33+80	SFR on Home Gate Dr.	65	67.7	2.7	65.5	0.5	65.7	0.7	1.4	3.6	x	--	--	--	--	--	4
33+90	SFR on Home Gate Dr.	65	67.7	2.7	65.5	0.5	65.7	0.7	1.4	3.6	x	--	--	--	--	--	4
34+20	SFR on Supreme Dr	65	67.7	2.7	65.5	0.5	65.7	0.7	1.4	3.6	x	--	--	--	--	--	4
34+60	SFR on Supreme Dr	65	67.7	2.7	65.6	0.6	65.8	0.8	1.4	3.6	x	--	--	--	--	--	4
34+80	SFR on Supreme Dr	65	67.7	2.7	65.5	0.5	65.7	0.7	1.4	3.6	x	--	--	--	--	--	4
35+00	SFR on Supreme Dr	65	67.7	2.7	65.5	0.5	65.7	0.7	1.4	3.6	x	--	--	--	--	--	4
35+20	SFR on Supreme Dr	65	67.7	2.7	65.6	0.6	65.7	0.7	1.4	3.6	x	--	--	--	--	--	4
35+40	SFR on Supreme Dr	65	67.7	2.7	65.6	0.6	65.8	0.8	1.4	3.6	x	--	--	--	--	--	4
35+50	SFR on Supreme Dr	65	67.7	2.7	65.6	0.6	65.7	0.7	1.4	3.6	x	--	--	--	--	--	4
35+70	SFR on Supreme Dr	65	67.7	2.7	65.6	0.6	65.8	0.8	1.4	3.6	x	--	--	--	--	--	4
35+80	SFR on Supreme Dr	65	67.7	2.7	65.6	0.6	65.7	0.7	1.4	3.6	x	--	--	--	--	--	4

Notes:

- at= At-Grade, ae= Aerial or Embankment
- 1: With Proposed Sound Barriers (based on design approved for SEIR)
- 2: Noise Exposure Metric for non-residential areas is L<sub>eq</sub>, rather than L<sub>dn</sub>
- 3: Grade Crossing
- 4: Noise Reduction from Existing Sound Wall Included in Calculations
- 5: Residual Moderate Noise Impact
- 6: Window insulation program would eliminate impact

**TABLE C-3 SUMMARY OF PREDICTED VIBRATION LEVELS - 3-CAR TRAINS - CELR**

Station Number	Location Street (ID)	Near Track	Track type	FTA General Criteria	Groundborne Vibration Range	FTA DAC Exceed. wo/mit	GBV w/Mit. Range	FTA DAC Exceed. w/mit	Recommended Vibration Control	Comment	Groundborne Vibration Range	FTA DAC Exceed. wo/mit	GBV w/Mit. Range	FTA DAC Exceed. w/mit	Recommended Vibration Control	Comment					
<b>Original SEIR Analysis</b>											<b>Original SEIR Analysis (LRT Alternative)</b>						<b>No Ocala Station Option<sup>1</sup></b>				
10+80	SFR on Lombard Ave.	SB	at	72	74 - 78	--	-	--	--	2											
10+80	SFR on Lombard Ave.	SB	at	72	66 - 69	--	-	--	--												
11+20	SFR on Lombard Ave.	SB	ate	72	75 - 78	y	70 - 72	--	TDA	3											
11+40	SFR on Capitol Ave	SB	ate	72	78 - 81	y	74 - 76	--	TDA	3											
11+60	SFR on Capitol Ave	SB	ate	72	78 - 81	y	73 - 76	--	TDA	3											
13+90	SFR on Excalibur Dr.	SB	dff	72	63 - 64	--	-	--	--												
14+10	SFR on Excalibur Dr.	SB	dff	72	63 - 64	--	-	--	--												
14+30	SFR on Excalibur Dr.	SB	dff	72	63 - 63	--	-	--	--												
14+60	SFR on Capitol Ave	SB	dff	72	68 - 69	--	-	--	--												
14+75	SFR on Capitol Ave	SB	dff	72	67 - 68	--	-	--	--												
14+90	SFR on Capitol Ave	SB	dff	72	67 - 68	--	-	--	--												
15+60	SFR on Capitol Ave	SB	dff	72	67 - 68	--	-	--	--												
16+00	SFR on Capitol Ave	SB	dff	72	66 - 66	--	-	--	--												
16+20	SFR on Capitol Ave	SB	dff	72	66 - 67	--	-	--	--												
16+30	SFR on Capitol Ave	SB	dff	72	65 - 66	--	-	--	--												
16+50	SFR on Capitol Ave	SB	dff	72	66 - 66	--	-	--	--												
16+60	SFR on Capitol Ave	SB	dff	72	66 - 66	--	-	--	--												
16+80	SFR on Capitol Ave	SB	dff	72	65 - 66	--	-	--	--												
16+90	SFR on Capitol Ave	SB	dff	72	66 - 66	--	-	--	--												
17+10	SFR on Capitol Ave	SB	dff	72	65 - 66	--	-	--	--												
17+20	SFR on Capitol Ave	SB	dff	72	65 - 66	--	-	--	--												
17+40	SFR on Capitol Ave	SB	dff	72	66 - 66	--	-	--	--												
17+50	SFR on Capitol Ave	SB	dff	72	65 - 65	--	-	--	--												
17+70	SFR on Capitol Ave	SB	dff	72	66 - 67	--	-	--	--												
17+90	SFR on Capitol Ave	SB	dff	72	66 - 67	--	-	--	--												
18+00	SFR on Capitol Ave	SB	dff	72	67 - 67	--	-	--	--												
18+20	SFR on Capitol Ave	SB	dff	72	66 - 67	--	-	--	--												
18+40	SFR on Capitol Ave	SB	dff	72	66 - 67	--	-	--	--												
18+50	SFR on Capitol Ave	SB	dff	72	68 - 69	--	-	--	--												
18+70	Commercial (take)	SB	dff	72	69 - 70	--	-	--	--												
20+70	SFR on Logsdan Way (2)	SB	dff	72	70 - 70	--	-	--	--												
20+90	SFR on Logsdan Way	SB	dff	72	70 - 70	--	-	--	--												
21+00	SFR on Logsdan Way	SB	dff	72	69 - 70	--	-	--	--												
21+20	SFR on Logsdan Way	SB	ate	72	79 - 80	y	76 - 76	--	TDA	3											
21+30	SFR on Logsdan Way	SB	ate	72	79 - 80	y	75 - 76	--	TDA	3											
21+60	SFR on Logsdan Way	SB	ate	72	78 - 79	y	75 - 75	--	TDA	3											
21+70	SFR on Logsdan Way	SB	ate	72	79 - 80	y	76 - 76	--	TDA	3											
21+90	SFR on Logsdan Way	SB	ate	72	79 - 80	y	75 - 76	--	TDA	3											
22+00	SFR on Logsdan Way	SB	ate	72	77 - 78	--	-	--	--	2											
22+20	SFR on Logsdan Way	SB	ate	72	77 - 78	--	-	--	--	2											
22+10	SFR on Logsdan Way	SB	ate	72	78 - 79	y	75 - 76	--	TDA	3											
22+60	SFR on Logsdan Way	SB	at	72	77 - 78	--	-	--	--	2											
22+70	SFR on Logsdan Way	SB	at	72	80 - 81	y	77 - 77	y	TDA	3,4,6											
22+90	SFR on Logsdan Way	SB	at	72	79 - 80	y	76 - 76	y	TDA	3,4,6											
23+00	SFR on Logsdan Way	SB	at	72	74 - 75	--	-	--	--	2											
24+20	MFR on Foxdale Lp	SB	at	72	74 - 75	--	-	--	--	2											
24+90	MFR on Foxdale Lp	SB	at	72	74 - 75	--	-	--	--	2											
25+90	MFR on Foxdale Lp	SB	at	72	74 - 75	--	-	--	--	2											
27+10	SFR on Greenstone Ct.	SB	at	72	73 - 74	--	-	--	--	2											
27+20	SFR on Greenstone Ct.	SB	at	72	80 - 81	y	77 - 77	y	TDA	3,4,6											
27+40	SFR on Greenstone Ct.	SB	at	72	79 - 80	y	76 - 77	y	TDA	3,4,6											
27+60	SFR on Greenstone Ct.	SB	at	72	76 - 76	--	-	--	--	2											
28+00	SFR on Whitestone Ct.	SB	at	72	77 - 78	--	-	--	--	2											
28+20	SFR on Whitestone Ct.	SB	at	72	82 - 83	y	78 - 78	y	TDA	3,4,6											
28+40	SFR on Whitestone Ct.	SB	at	72	76 - 77	--	-	--	--	2											
28+90	SFR on Bluestone Ct.	SB	at	72	79 - 80	y	76 - 76	y	TDA	3,4,6											

**TABLE C-3 SUMMARY OF PREDICTED VIBRATION LEVELS - 3-CAR TRAINS - CELR**

Station Number	Location Street (ID)	Near Track	Track type	FTA General Criteria	Groundborne Vibration Range	FTA DAC Exceed. wo/mit	GBV w/Mit. Range	FTA DAC Exceed. w/mit	Recommended Vibration Control	Comment	Groundborne Vibration Range	FTA DAC Exceed. wo/mit	GBV w/Mit. Range	FTA DAC Exceed. w/mit	Recommended Vibration Control	Comment
29+10	SFR on Bluestone Ct.	SB	at	72	79 - 80	y	76 - 77	y	TDA	3,4,6						
29+20	SFR on Bluestone Ct.	SB	at	72	74 - 75	--	-	--	--	2						
29+70	SFR on Brownstone Ct.	SB	at	72	78 - 79	y	75 - 76	--	TDA	3	78 - 79	y	75 - 76	--	TDA	3
29+90	SFR on Brownstone Ct.	SB	at	72	82 - 83	y	78 - 79	y	TDA	3,4,6	82 - 83	y	78 - 79	y	TDA	3,4,6
30+00	SFR on Brownstone Ct.	SB	at	72	76 - 77	--	-	--	--	2	76 - 77	--	-	--	--	2
30+40	SFR on Pinkstone Ct.	SB	at	72	78 - 79	y	75 - 76	y	TDA	3,4,6	78 - 79	y	75 - 76	y	TDA	3,4,6
30+70	SFR on Pinkstone Ct.	SB	at	72	79 - 80	y	76 - 76	y	TDA	3,4,6	79 - 80	y	76 - 76	y	TDA	3,4,6
30+80	SFR on Pinkstone Ct.	SB	at	72	79 - 79	y	76 - 76	y	TDA	3,4,6	79 - 79	y	76 - 76	y	TDA	3,4,6
31+30	SFR on Silverstone Ct.	SB	at	72	75 - 76	--	-	--	--	2	75 - 76	--	-	--	--	2
31+50	SFR on Silverstone Ct.	SB	at	72	73 - 74	--	-	--	--	2	73 - 74	--	-	--	--	2
31+70	SFR on Silverstone Ct.	SB	at	72	69 - 70	--	-	--	--	2	68 - 69	--	-	--	--	2
10+00	SFR on Capitol/Wilbur (NA)	NB	at	72	59 - 59	--	-	--	--							
10+40	SFR on Capitol/Wilbur	NB	at	72	71 - 74	--	-	--	--	2						
10+60	SFR on Capitol Ave.	NB	at	72	69 - 72	--	-	--	--	2						
10+80	SFR on Capitol Ave.	NB	at	72	68 - 71	--	-	--	--							
11+00	SFR on Capitol Ave.	NB	ate	72	73 - 76	--	-	--	--	2						
11+20	SFR on Capitol Ave.	NB	ate	72	75 - 78	y	70 - 72	--	TDA	3						
11+40	SFR on Capitol/Westboro	NB	ate	72	76 - 80	y	71 - 74	--	TDA	3						
11+80	SFR on Capitol/Westboro	NB	ate	72	79 - 82	y	75 - 77	--	TDA	3						
12+10	SFR on Capitol Ave.	NB	ate	72	78 - 81	y	74 - 76	--	TDA	3						
12+30	SFR on Capitol Ave.	NB	dff	72	68 - 70	--	-	--	--							
12+50	SFR on Capitol Ave.	NB	dff	72	68 - 71	--	-	--	--							
12+60	SFR on Capitol Ave.	NB	dff	72	68 - 71	--	-	--	--							
12+80	SFR on Capitol/Highwood	NB	dff	72	70 - 74	--	-	--	--	2						
13+40	SFR on Capitol/Highwood	NB	dff	72	71 - 74	--	-	--	--	2						
13+60	SFR on Capitol Ave.	NB	dff	72	69 - 73	--	-	--	--	2						
13+80	SFR on Capitol Ave.	NB	dff	72	69 - 72	--	-	--	--							
13+90	SFR on Capitol Ave.	NB	dff	72	77 - 81	y	77 - 81	y	--	3,6						
16+60	Office	NB	dff	n/a	63 - 65	--	-	--	--	5						
17+30	Church	NB	dff	n/a	64 - 66	--	-	--	--	5						
18+00	Church	NB	dff	n/a	61 - 62	--	-	--	--	5						
20+20	MFR 2719 Kollmar	NB	dff	72	69 - 70	--	-	--	--							
20+80	SFR on S. Capitol/Sussex	NB	dff	72	68 - 68	--	-	--	--							
21+20	SFR on S. Capitol/Sussex	NB	ate	72	73 - 73	--	-	--	--	2						
21+50	SFR on S. Capitol/Tudor	NB	ate	72	73 - 73	--	-	--	--	2						
21+90	SFR on S. Capitol/Tudor	NB	ate	72	73 - 73	--	-	--	--	2						
22+20	SFR on S. Capitol/Capitol Ct	NB	ate	72	73 - 73	--	-	--	--	2						
22+60	SFR on S. Capitol/Capitol Ct	NB	at	72	74 - 74	--	-	--	--	2						
22+90	SFR on S. Capitol/murtha	NB	at	72	74 - 74	--	-	--	--	2						
23+40	SFR on S. Capitol/murtha	NB	at	72	74 - 74	--	-	--	--	2						
23+70	SFR on S. Capitol/Bristol	NB	at	72	74 - 74	--	-	--	--	2						
24+20	SFR on S. Capitol/Bristol	NB	at	72	74 - 74	--	-	--	--	2						
24+50	SFR on S. Capitol/Dublin	NB	at	72	74 - 74	--	-	--	--	2						
24+90	SFR on S. Capitol/Dublin	NB	at	72	74 - 74	--	-	--	--	2						
25+10	SFR on S. Capitol/Belfast	NB	at	72	74 - 74	--	-	--	--	2						
25+60	SFR on S. Capitol/Belfast	NB	at	72	74 - 75	--	-	--	--	2						
25+80	SFR on S. Capitol/Coventry	NB	at	72	74 - 75	--	-	--	--	2						
26+40	SFR on S. Capitol/Coventry	NB	at	72	74 - 74	--	-	--	--	2						
26+70	SFR on S. Capitol/Cornwall	NB	at	72	74 - 74	--	-	--	--	2						
27+20	SFR on S. Capitol/Cornwall	NB	at	72	75 - 76	--	-	--	--	2						
27+60	SFR on S. Capitol Ave.	NB	at	72	73 - 74	--	-	--	--	2						
27+70	SFR on S. Capitol Ave.	NB	at	72	73 - 73	--	-	--	--	2						
27+90	SFR on S. Capitol Ave.	NB	at	72	73 - 74	--	-	--	--	2						
28+10	SFR on S. Capitol Ave.	NB	at	72	73 - 73	--	-	--	--	2						
28+30	SFR on S. Capitol/Woodmoor	NB	at	72	74 - 74	--	-	--	--	2						
28+60	SFR on S. Capitol/Woodmoor	NB	at	72	73 - 74	--	-	--	--	2						
28+90	SFR on S. Capitol Ave.	NB	at	72	74 - 74	--	-	--	--	2						
29+00	SFR on S. Capitol Ave.	NB	at	72	73 - 74	--	-	--	--	2						

Same as LRT Alternative

**TABLE C-3 SUMMARY OF PREDICTED VIBRATION LEVELS - 3-CAR TRAINS - CELR**

Station Number	Location Street (ID)	Near Track	Track type	FTA General Criteria	Groundborne Vibration Range	FTA DAC Exceed. wo/ mit	GBV w/Mit. Range	FTA DAC Exceed. w/mit	Recommended Vibration Control	Comment	Groundborne Vibration Range	FTA DAC Exceed. wo/ mit	GBV w/Mit. Range	FTA DAC Exceed. w/mit	Recommended Vibration Control	Comment
29+30	SFR on S. Capitol Ave.	NB	at	72	74 - 74	--	-	--	--	2						
29+50	SFR on S. Capitol Ave.	NB	at	72	73 - 74	--	-	--	--	2						
29+60	SFR on S. Capitol Ave.	NB	at	72	74 - 74	--	-	--	--	2						
29+80	SFR on S. Capitol Ave.	NB	at	72	75 - 75	--	-	--	--	2	76 - 76	--	-	--	--	2
30+00	SFR on S. Capitol Ave.	NB	at	72	75 - 75	--	-	--	--	2	76 - 76	--	-	--	--	2
30+20	SFR on S. Capitol Ave.	NB	at	72	75 - 75	--	-	--	--	2	76 - 76	--	-	--	--	2
30+30	SFR on S. Capitol Ave.	NB	at	72	75 - 75	--	-	--	--	2	76 - 76	--	-	--	--	2
30+50	SFR on S. Capitol Ave.	NB	at	72	74 - 74	--	-	--	--	2	76 - 76	--	-	--	--	2
30+70	SFR on S. Capitol Ave.	NB	at	72	74 - 74	--	-	--	--	2	75 - 75	--	-	--	--	2
31+10	SFR on S. Capitol Ave.	NB	at	72	70 - 71	--	-	--	--		71 - 72	--	-	--	--	2
31+30	SFR Vermont Ct.	NB	at	72	76 - 77	--	-	--	--	2	76 - 77	--	-	--	--	2
31+50	SFR Vermont Ct.	NB	at	72	74 - 75	--	-	--	--	2	74 - 75	--	-	--	--	2
32+00	SFR Vermont Ct.	NB	at	72	70 - 71	--	-	--	--		70 - 71	--	-	--	--	
32+20	SFR on Home Gate Dr.	NB	at	72	73 - 74	--	-	--	--	2	71 - 72	--	-	--	--	
32+30	SFR on Home Gate Dr.	NB	at	72	73 - 74	--	-	--	--	2	73 - 74	--	-	--	--	2
32+40	SFR on Home Gate Dr.	NB	at	72	73 - 74	--	-	--	--	2	73 - 74	--	-	--	--	2
32+50	SFR on Home Gate Dr.	NB	at	72	69 - 70	--	-	--	--		70 - 71	--	-	--	--	
32+60	SFR on Home Gate Dr.	NB	at	72	70 - 71	--	-	--	--		71 - 72	--	-	--	--	
32+70	SFR on Home Gate Dr.	NB	at	72	72 - 73	--	-	--	--	2	73 - 74	--	-	--	--	2
32+80	SFR on Home Gate Dr.	NB	at	72	71 - 72	--	-	--	--		71 - 72	--	-	--	--	
32+90	SFR on Home Gate Dr.	NB	at	72	71 - 72	--	-	--	--		72 - 73	--	-	--	--	2
33+00	SFR on Home Gate Dr.	NB	at	72	71 - 72	--	-	--	--		72 - 73	--	-	--	--	2
33+10	SFR on Home Gate Dr.	NB	at	72	71 - 72	--	-	--	--		73 - 74	--	-	--	--	2
33+20	SFR on Home Gate Dr.	NB	at	72	71 - 72	--	-	--	--		74 - 75	--	-	--	--	2
33+30	SFR on Home Gate Dr.	NB	at	72	72 - 73	--	-	--	--	2	76 - 77	--	-	--	--	2
33+40	SFR on Home Gate Dr.	NB	at	72	72 - 73	--	-	--	--	2	73 - 74	--	-	--	--	2
33+50	SFR on Home Gate Dr.	NB	at	72	70 - 71	--	-	--	--		73 - 74	--	-	--	--	2
33+60	SFR on Home Gate Dr.	NB	at	72	68 - 69	--	-	--	--		73 - 74	--	-	--	--	2
33+70	SFR on Home Gate Dr.	NB	at	72	67 - 68	--	-	--	--		72 - 73	--	-	--	--	2
33+80	SFR on Home Gate Dr.	NB	at	72	67 - 68	--	-	--	--		73 - 74	--	-	--	--	2
33+90	SFR on Home Gate Dr.	NB	at	72	67 - 67	--	-	--	--		74 - 75	--	-	--	--	2
34+20	SFR on Supreme Dr	NB	at	72	66 - 66	--	-	--	--		73 - 74	--	-	--	--	2
34+60	SFR on Supreme Dr	NB	at	72	67 - 68	--	-	--	--		76 - 77	--	-	--	--	2
34+80	SFR on Supreme Dr	NB	at	72	66 - 66	--	-	--	--		72 - 73	--	-	--	--	2
35+00	SFR on Supreme Dr	NB	at	72	66 - 67	--	-	--	--		71 - 72	--	-	--	--	
35+20	SFR on Supreme Dr	NB	at	72	68 - 69	--	-	--	--		72 - 73	--	-	--	--	2
35+40	SFR on Supreme Dr	NB	at	72	69 - 70	--	-	--	--		73 - 74	--	-	--	--	2
35+50	SFR on Supreme Dr	NB	at	72	69 - 70	--	-	--	--		73 - 74	--	-	--	--	2
35+70	SFR on Supreme Dr	NB	at	72	70 - 71	--	-	--	--		73 - 74	--	-	--	--	2
35+80	SFR on Supreme Dr	NB	at	72	70 - 71	--	-	--	--		72 - 73	--	-	--	--	2

Notes:

- at= At-Grade, ate= Embankment, dff = Direct Fixation Fasteners, TDA = Tire Derived Aggregate
  - 1: No Ocala Station Option is generally closer to homes
  - 2: Vibration Exceeds FTA General Analysis Criteria but not FTA Detailed Analysis Criteria. No Vibration Control Required
  - 3: Vibration Control Indicated, Vibration Exceeds FTA Detailed Analysis Criteria
  - 4: Potential Residual Impact, Vibration Still Exceeds FTA Detailed Analysis Criteria
  - 5: No criteria for General Analysis, 84 VdB for detailed analysis
  - 6: Alternative control measures to be considered in Final Engineering (e.g., deeper TDA layer)
- All vibration reported in VdB re 1 microinch/sec

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