



I-290

Phase I Study

West of US 45 (Mannheim Road) to Racine Avenue

# **Existing vs. Proposed Ramp Noise Sensitivity Analysis Austin Boulevard Interchange**

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*Technical Memorandum*

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## **Introduction**

An I-290 (Eisenhower Expressway) Environmental Impact Statement (EIS) is being prepared to identify transportation improvements needed between west of US 45 (Mannheim Road) and Racine Avenue in Cook County, IL.

Four build alternatives have been identified for further evaluation in the Draft EIS. Impacted noise receptors will be identified for the four build alternatives, along with the noise levels for the No Build Alternative, which will be documented in the Draft EIS. The traffic noise analysis will identify traffic noise impacts due to the proposed project and recommend abatement for the Preferred Alternative where it is found to be reasonable and feasible.

At Austin Boulevard, the proposed alternatives include a reconfiguration of the existing left side exit/entrance ramps to conventional, right side ramps to address design, safety, facility access consistency, and driver expectation issues.

To understand how the right side ramp configuration could affect the noise levels in the vicinity of the interchange, noise sensitivity tests were completed to compare the relative noise levels between the existing and proposed ramp configurations. This study was not intended to identify traffic noise impacts, because as stated above, traffic noise impacts will be identified as part of the traffic noise analysis for this project.

Two design alternatives for the Austin Boulevard (Oak Park/Chicago) and Central Avenue (Chicago) I-290 interchanges are under consideration. This noise sensitivity analysis compares the relative noise levels of the two proposed interchange design configurations at the Austin Boulevard and Central Avenue interchanges to those of the existing interchange configurations at those locations.

The existing Austin Boulevard interchange uses left side ramps to provide access to and from the Eisenhower Expressway, while the existing Central Avenue interchange uses conventional right side ramps to provide access. The proposed design alternatives for these interchanges include modifying the existing Austin Boulevard interchange ramps to become right side ramps to conform to current design standards, as well as to improve safety, improve facility access consistency, and meet driver expectation. Due to the close proximity of these two interchanges, the ramps between them will need to be overlapped, either as side-by-side or stacked with one ramp above the other.

## **Methods and Assumptions**

The existing I-290 interchange at Austin Boulevard (Oak Park/Chicago) has left side ramps that are proposed to be modified as part of the Eisenhower Expressway Reconstruction project. In the proposed build condition, the Austin interchange would become a modified Single Point Urban Interchange (SPUI). Interchange design concepts for Austin Boulevard are integrated with the concepts for Central Avenue due to the close proximity of the two interchanges. Central Avenue passes beneath the Eisenhower Expressway and is more than 20' lower in elevation than Austin Boulevard which crosses over I-290.

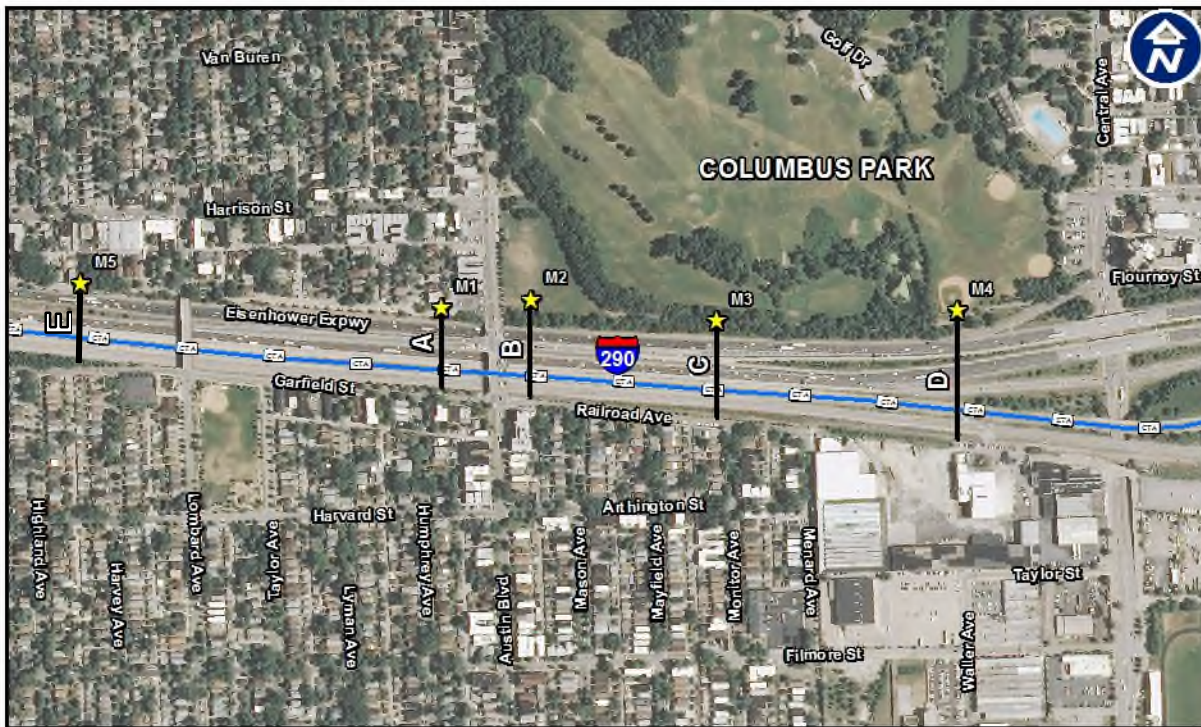
The following figures illustrate the existing roadway configurations for Austin to Central (Figure 1), as well as the two proposed Build conditions for the Austin-Central area (the proposed side-by-side ramps interchange concept (Figure 2), and the proposed stacked ramps interchange concept (Figure 3)).

Figures 1 through 3 also show the noise locations modeled for this evaluation, which include:

- M1: Residence at 932 S. Humphrey, Oak Park
- M2: Soccer field at Columbus Park, northeast quadrant of the Austin Boulevard interchange, Chicago
- M3: Trail within Columbus Park, parallel to and north of I-290. Chicago
- M4: Baseball field in Columbus Park, northwest quadrant of the Central Avenue interchange, Chicago
- M5: A receptor was added at a home at Lombard Avenue, on the north side of I-290 and approximately 450' east of Lombard Avenue, in order to assess the Austin Avenue ramps when they are nearer/at the mainline.

Callouts A through E on the Austin-Central figures refer to the locations of proposed roadway cross sections adjacent to the noise study locations with varying geometry between the proposed geometries; the referenced Austin-Central cross sections are shown in Figures 4-8.

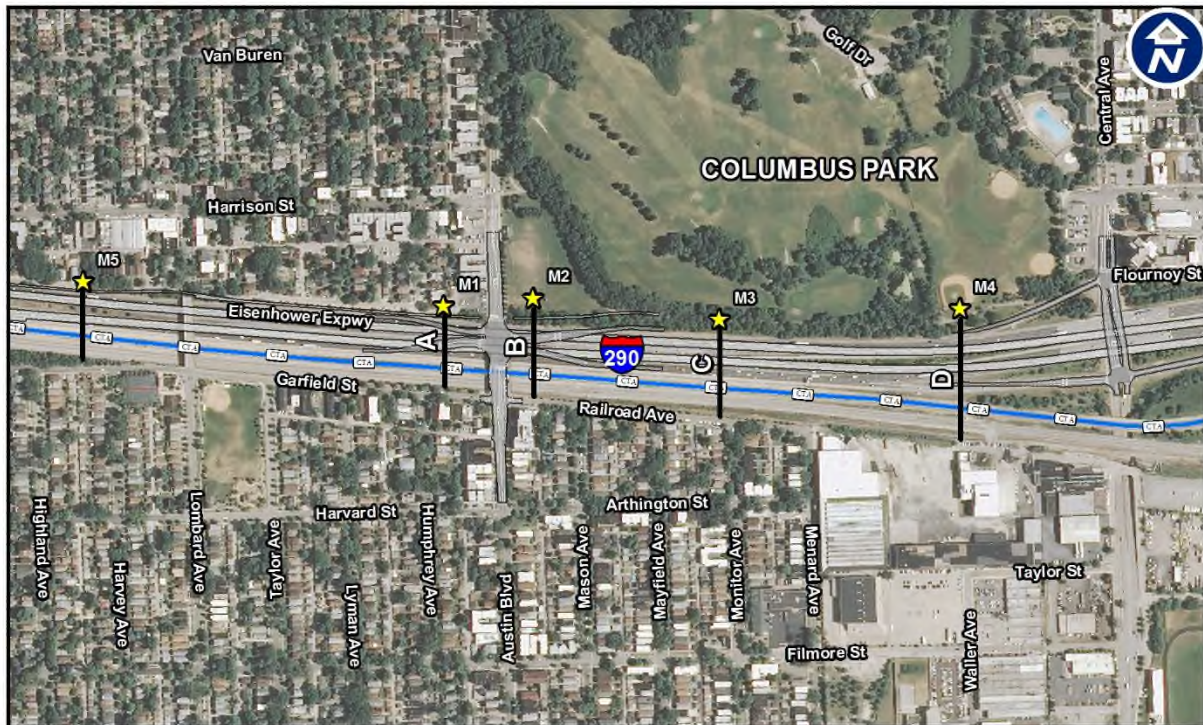
**Figure 1 – Existing Austin Boulevard and Central Avenue Roadway Geometry**



The existing roadway geometry in this area includes three mainline lanes (in each direction) west of the Austin interchange; a fourth mainline lane (in each direction) is added/dropped to the east of the Austin build interchange. The Austin Boulevard interchange includes left side

exit and entrance ramps from I-290 that converge at a single signalized intersection at Austin Boulevard. The Central Avenue interchange is a diamond interchange, with I-290 as an overpass over Central Avenue.

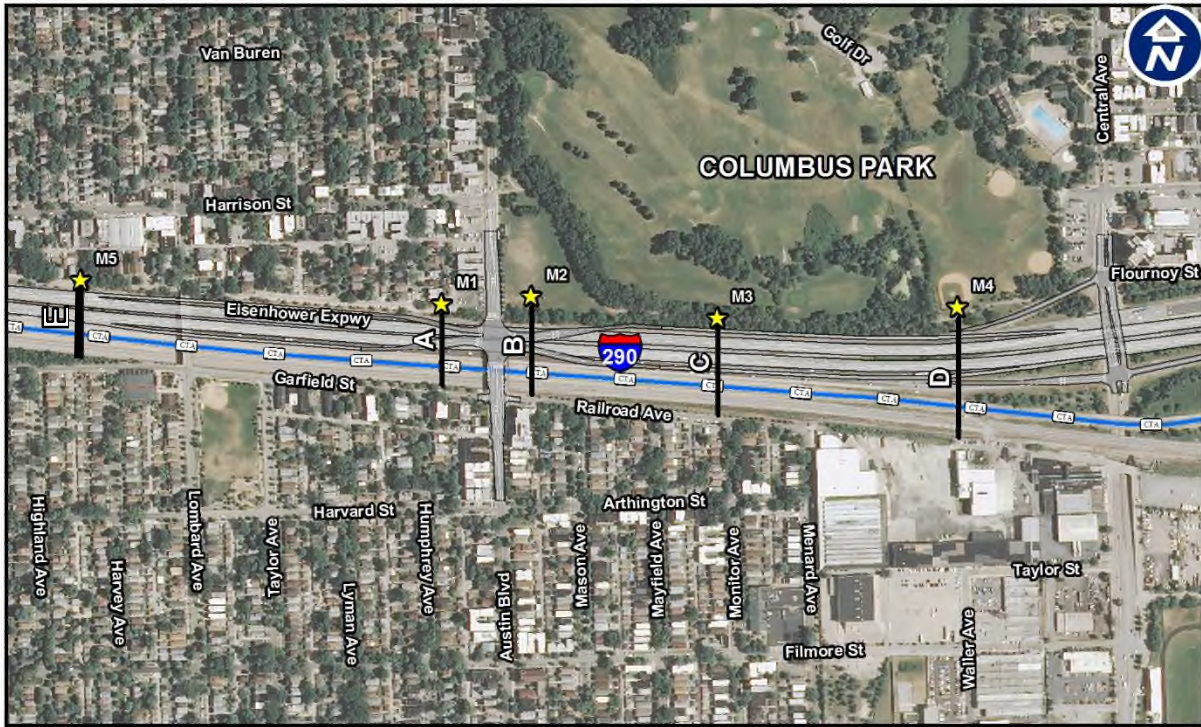
**Figure 2 – Proposed Austin-Central Side-by-Side Ramps Roadway Geometry**



As shown in Figure 2, the proposed condition for I-290 in the Austin-Central area includes four mainline lanes in each direction of travel, and the Austin interchange would be modified to include right side ramps to and from I-290. The two ramp configurations considered between Austin Boulevard and Central Avenue are side-by-side ramps and stacked ramps.

The proposed side-by-side ramps interchange concept would align the Austin Boulevard (westbound exit and eastbound entrance) and Central Avenue (westbound entrance and eastbound exit) interchange ramps next to each other for most of their length, then the Central Avenue ramps would cross under the Austin Boulevard ramps under Austin Boulevard. The Central Avenue ramps would be the outermost ramps in this section, and would have similar elevation to the I-290 mainline, once the ramps extend west of Central Avenue. The Austin Boulevard east interchange ramps would also be extended in length, and would connect with I-290 just west of Central Avenue. In each direction, the Austin Boulevard ramp would be located between the Central Avenue ramp and the I-290 mainline. The Austin Boulevard ramps are generally higher than the Central Avenue ramps, as the Austin Boulevard ramps need to maintain elevation to meet Austin Boulevard that crosses over I-290.

Figure 3 – Proposed Austin-Central Stacked Ramps Roadway Geometry



As shown in Figure 3, the proposed stacked ramps interchange concept would locate the Austin Boulevard (westbound exit and eastbound entrance) interchange ramps on structure over the ramps of Central Avenue (eastbound exit and westbound entrance). The ramps would be “stacked” for approximately 1,000 feet between Austin Boulevard and Central Avenue.

The series of cross-section figures on the following pages illustrate the varying mainline and ramp geometry and elevation at each of the locations evaluated. A mainline and ramp cross-section for both the stacked and side-by-side ramps is provided at each study location. The cross-section of the stacked and side-by-side ramps does not vary at the location of M5.

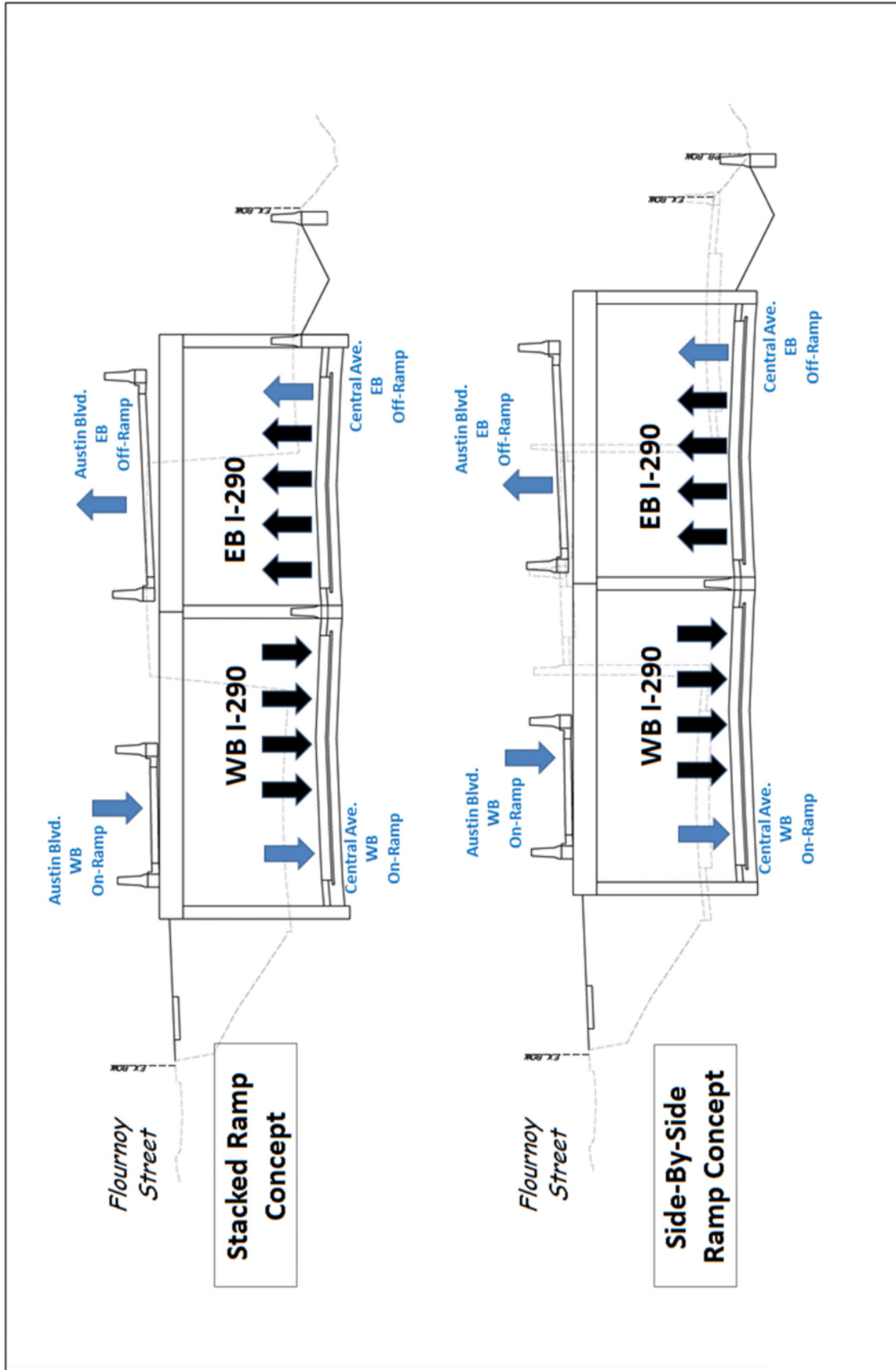


Figure 4 – I-290 Cross-section Near Noise Study Location M1

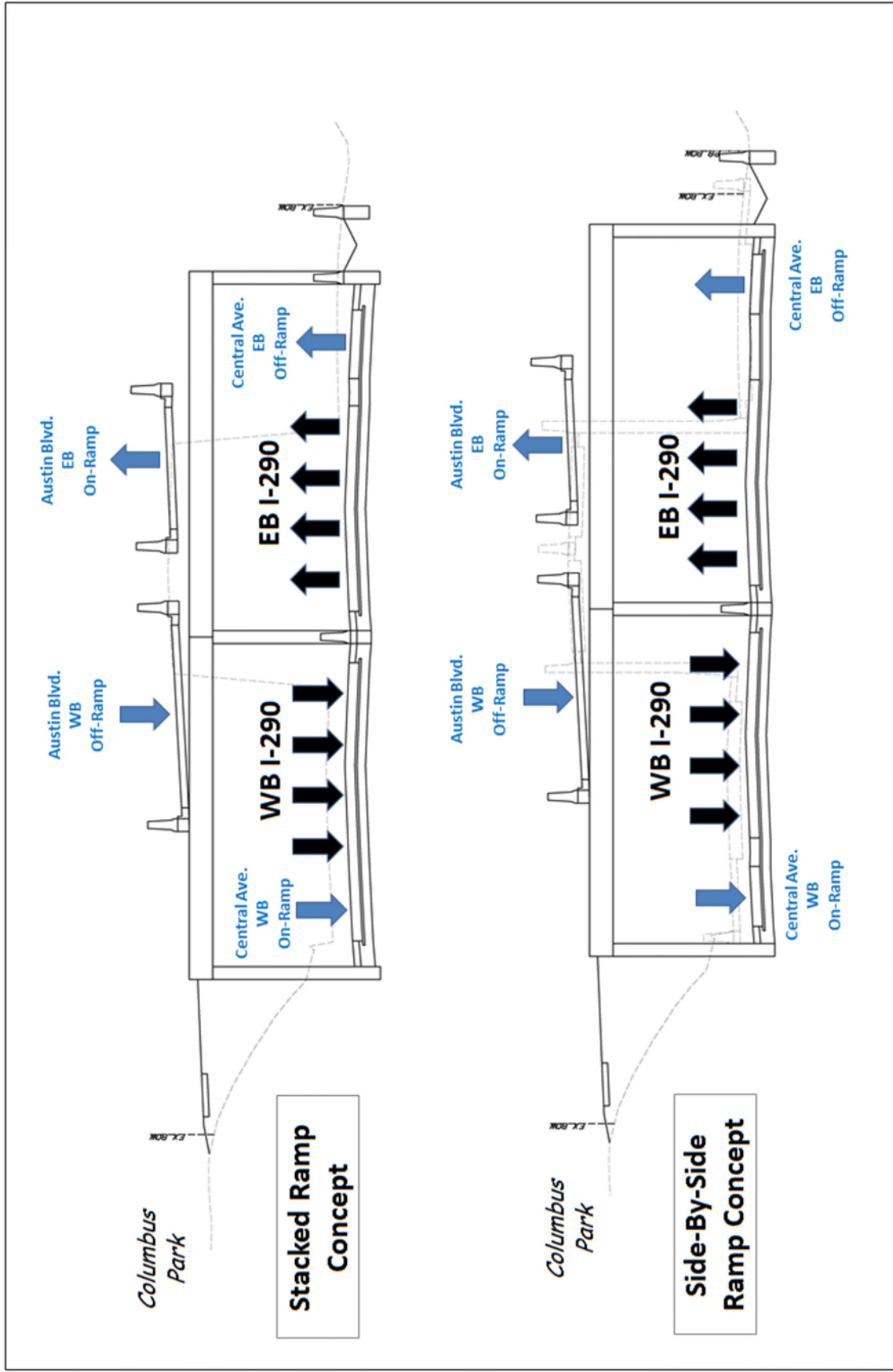


Figure 5 – I-290 Cross-section Near Noise Study Location M2

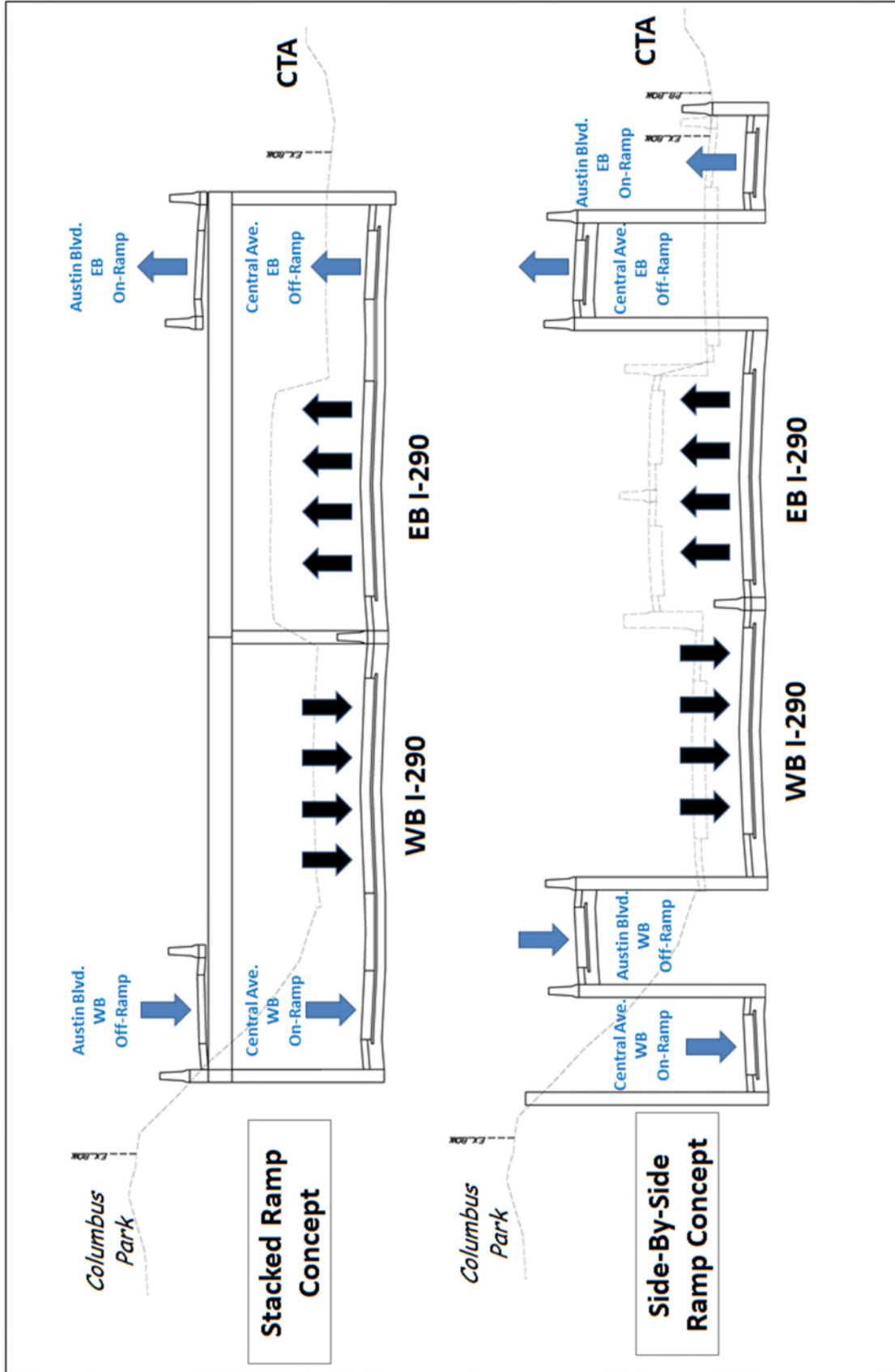


Figure 6 – I-290 Cross-section Near Noise Study Location M3



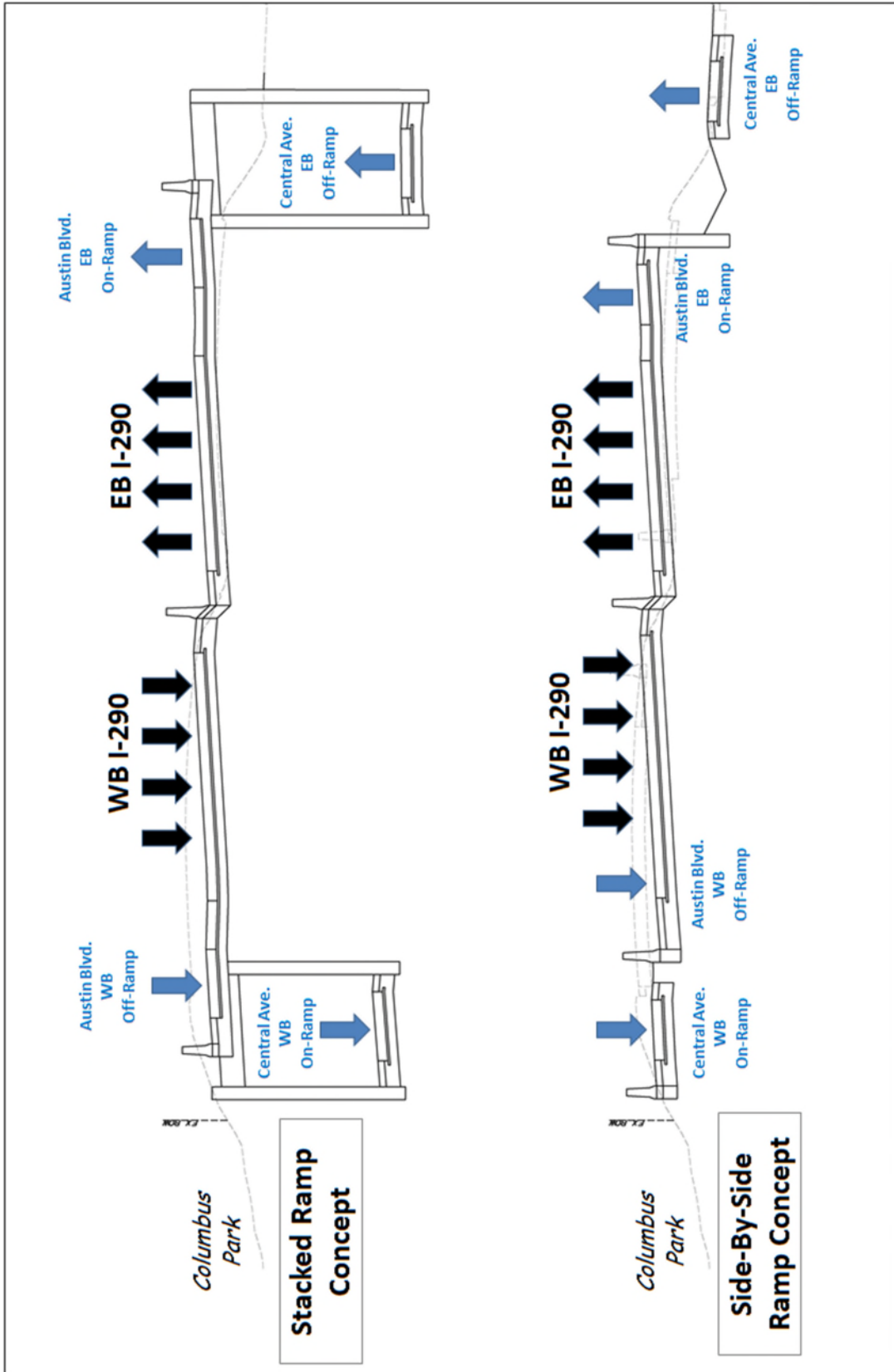


Figure 7 – I-290 Cross-section Near Noise Study Location M4

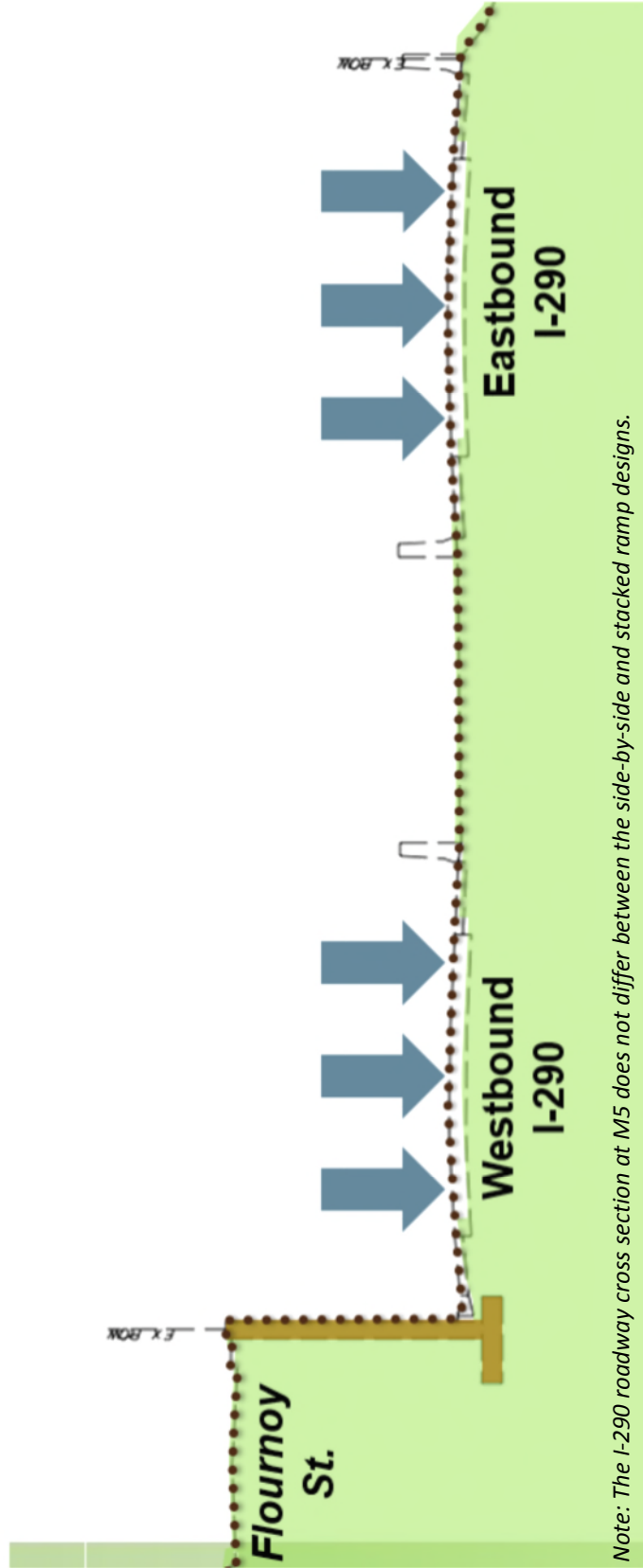


Figure 8 – I-290 Cross-section Near Noise Study Location M5

The noise sensitivity analysis was completed using FHWA's Traffic Noise Model (TNM) 2.5. Noise modeling scenarios were created for peak traffic volumes. The same traffic volumes were assumed for the various modeling scenarios to isolate roadway geometry as the only variable. Existing condition traffic volumes were used for all models, as the analysis measured relative changes. Traffic noise abatement was not considered in this analysis. Traffic noise levels will be reported and abatement will be studied in the traffic noise analysis for this project.

It should be noted the CTA and CSX rail lines extend along the southern edge of I-290. TNM does not predict rail noise and therefore this sensitivity analysis does not account for the rail facilities.

Three ramp configurations were evaluated to test the effect of moving the ramp geometry:

1. Existing Roadway Geometry
2. Stacked Ramps Interchange Concept
3. Side-by-Side Ramps Interchange Concept

The relative noise level changes due to the revised ramp geometry are reported both by the change in decibels and a description of how the human ear would perceive that level of noise change. Commonly accepted principles regarding perception of noise level changes, as cited in the Illinois DOT Traffic Noise Assessment Manual, include:

- ± 10 dB(A) a doubling or halving of perceived noise level
- ± 5 dB(A) readily perceptible
- ± 3 dB(A) barely perceptible
- ± 1 dB(A) less than a barely perceptible

It should be noted that the models present a conservative (higher) noise prediction than would likely occur in the real world, as TNM is not capable of modeling the horizontal, overhead noise shielding that would occur to some degree with any of the proposed interchange designs, as portions of the mainline would be covered by the proposed interchange ramp configurations.

### Overall Noise Sensitivity Test – Combined Mainline and Ramp Traffic

Table 1 summarizes the results of the noise sensitivity analysis comparing the stacked ramps and the side-by-side ramps option compared to the existing geometry. Results from the peak period are used for comparison.

**Table 1  
Mainline & Ramp Traffic  
Side-by-Side Ramps and Stacked Ramps Compared to Existing**

Modeled Location	Ramp & Mainline Traffic Peak Hour Traffic Volumes			
	Stacked Ramps		Side-by-Side Ramps	
	$\Delta$ dB(A) from Existing	Perceptibility	$\Delta$ dB(A) from Existing	Perceptibility
<b>M1</b>	-3	Barely	-3	Barely
<b>M2</b>	-1	Not perceptible	-1	Not perceptible
<b>M3</b>	-2	Not perceptible	-2	Not perceptible
<b>M4</b>	-2	Not perceptible	-3	Barely
<b>M5</b>	0	Not perceptible	0	Not perceptible

#### *Existing left-side ramp vs. right-side ramp (Table 1):*

The results indicate that compared to the existing interchange configuration, both proposed interchange configurations would result in overall noise differences ranging from a -1 to a -3 dB(A) reduction at the modeled locations adjacent to the Austin Boulevard interchange. This level of change is considered to be either not perceptible or barely perceptible. The majority of the noise reductions at these locations are due to shielding provided by the proposed retaining wall and the slight lowering of the mainline elevations, combined with the existing adjacent topography.

There is no difference in noise levels between the existing and proposed ramp conditions for the Lombard receptor, M5, (where the ramp is near the mainline). This is because mainline I-290 traffic is the primary traffic noise generator in this area, and traffic noise from the ramps (which have a much smaller traffic volume than the mainline) does not influence the overall noise levels.

#### *Additional noise benefits*

Additional reductions in noise levels may be achieved for both of the proposed interchange configurations, compared to the existing ramp configuration at Austin Boulevard, due to the bridge decking that extends over the I-290 mainline. However, the noise benefits of this decking cannot be captured in TNM due to the current limitations of the software (as discussed in the Methods and Assumptions section above).

## **Summary**

The proposed interchange configurations at Austin Boulevard and Central Avenue would result in slight noise reductions compared to existing noise levels at the study locations, due to the effects of the existing berm on the north side of I-290 and the proposed ramp and mainline locations that have similar noise reduction characteristics. All locations studied adjacent to Austin and Central Avenue result in not perceptible or barely perceptible overall noise changes (-1 to -3 dB(A)) between existing and proposed conditions. This documents that the primary noise contributor is the I-290 mainline traffic, and not ramp traffic.

Additionally, relative noise changes were studied for a receptor north of I-290 at Lombard Avenue. This location is near where the proposed westbound entrance ramp at Austin would merge with the mainline. There is no change in noise at Lombard when comparing the existing and proposed ramp conditions, as mainline I-290 traffic is the primary traffic noise generator in this location.