



Traffic Noise Technical Report

SL 360 at Courtyard Drive and RM 2222

From Lake Austin to North of RM 2222

CSJ: 0113-13-168

Travis County, Texas

April 2020

The environmental review, consultation, and other actions required by applicable Federal environmental laws for this project are being, or have been, carried-out by TxDOT pursuant to 23 U.S.C. 327 and a Memorandum of Understanding dated December 9, 2019, and executed by FHWA and TxDOT.

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1.0 INTRODUCTION

The Texas Department of Transportation (TxDOT) is proposing improvements to State Loop (SL) 360 from Lake Austin to north of Ranch-to-Market (RM) 2222 in Travis County, Texas. The proposed project would replace the at-grade intersection of SL 360 at Courtyard Drive with an underpass and add a diverging diamond intersection at the SL 360/RM 2222 intersection. The project length is approximately 1 mile.

2.0 TRAFFIC NOISE ANALYSIS

This analysis was accomplished in accordance with TxDOT's (Federal Highway Administration [FHWA] approved) *Guidelines for Analysis and Abatement of Roadway Traffic Noise* (2011).

Sound from highway traffic is generated primarily from a vehicle's tires, engine and exhaust. It is commonly measured in decibels and is expressed as "dB."

Sound occurs over a wide range of frequencies. However, not all frequencies are detectable by the human ear; therefore, an adjustment is made to the high and low frequencies to approximate the way an average person hears traffic sounds. This adjustment is called A-weighting and is expressed as "dB(A)."

Also, because traffic sound levels are never constant due to the changing number, type and speed of vehicles, a single value is used to represent the average or equivalent sound level and is expressed as "Leq."

The traffic noise analysis process includes the following elements:

- Identification of land use activity areas that might be impacted by traffic noise.
- Determination of existing noise levels.
- Prediction of future noise levels.
- Identification of possible noise impacts.
- Consideration and evaluation of measures to reduce noise impacts.

The FHWA has established the following Noise Abatement Criteria (NAC), shown in **Table 1**, for various land use activity areas that are used as one of two means to determine when a traffic noise impact would occur.

Table 1: FHWA Noise Abatement Criteria (NAC)

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

Source: Guidelines for Analysis and Abatement of Roadway Traffic Noise (TxDOT 2011)

A noise impact occurs when either the absolute or relative criterion is met:

Absolute criterion - the predicted noise level at the receiver approaches, equals, or exceeds the NAC. “Approach” is defined as one dB(A) below the NAC. For example, a noise impact would occur at a Category B residence if the noise level is predicted to be 66 dB(A) or above.

Relative criterion - the predicted noise level substantially exceeds the existing noise level at a receiver even though the predicted noise level does not approach, equal, or exceed the NAC. “Substantially exceeds” is defined as more than 10 dB(A). For example: a noise impact would occur at a Category B residence if the existing level is 54 dB(A) and the predicted level is 65 dB(A).

When a traffic noise impact occurs, noise abatement measures must be considered. A noise abatement measure is any positive action taken to reduce the impact of traffic noise on an activity area.

The TNM 2.5 traffic noise modeling software was used to calculate existing and predicted traffic noise levels. The model primarily considers the number, type, and speed of vehicles; highway alignment and grade; cuts, fills, and natural berms; surrounding terrain features; and the locations of activity areas likely to be impacted by the associated traffic noise.

Table 2 and **Appendix B** shows the traffic data utilized in the SL 360 at Courtyard Drive and RM 2222 traffic noise models, as provided by TxDOT’s Transportation Planning and Programming Division (TPP). The line diagram shown in the original traffic memo provided by TPP showed that the proposed project would provide access to/from Courtyard Drive and SL 360 south of the intersection. The proposed project would not provide access to/from Courtyard Drive and SL 360; therefore, an adjustment was made to the line diagram to reflect predicted traffic under the proposed roadway configuration. The adjusted line diagram is shown in **Appendix B**.

Table 2: Traffic Noise Analysis Parameters

Roadway	Speed Limit	Design Hour Volume (K-Factor)*	Average Annual Daily Traffic**		Vehicle Distribution (%)		
			2020	2040	Light Duty	Medium Duty	Heavy Duty
SL 360 (from Courtyard Drive to RM 2222)	55 mph	8.3	52,150	71,800	97.3	1.1	1.6
<p><u>Notes:</u> *Design Hour Volume (K-Factor) is defined as the proportion of annual average daily traffic occurring in an hour, which is used for designing and analyzing highway traffic flow and for weighting average annual daily traffic. **Average annual daily traffic is the total volume of vehicle traffic of a highway or road for a year divided by 365 days, which is a used to measure how busy the road is.</p>							

Existing and predicted traffic noise levels were modeled at receiver locations (see **Table 3** and **Appendix A**) that represent the land use activity areas adjacent to the project area that might be impacted by traffic noise and might potentially benefit from feasible and reasonable noise abatement.

Table 3: Traffic Noise Levels [dB(A) Leq]

Receiver ID	Land Use	NAC Category	NAC Level	Predicted Traffic Noise Level [dB(A) Leq]			Noise Impact
				Existing (2020)	Predicted (2040)	Change (+/-)	
R1	Residential	B	67	65	67	+2	Y
R2	Residential	B	67	56	65	+9	N
R3	Residential	B	67	62	63	+1	N
R4	Restaurant	E	72	54	55	+1	N

3.0 NOISE ABATEMENT MEASURES

As indicated in **Table 3**, the proposed project would result in a traffic noise impact; therefore, the following noise abatement measures were considered: traffic management, alteration of horizontal and/or vertical alignments, acquisition of undeveloped property to act as a buffer zone, and the construction of noise barriers.

Before any abatement measure can be proposed for incorporation into the proposed project, it must be both feasible and reasonable. In order to be “feasible,” the abatement measure must be able to reduce the noise level at greater than 50% of impacted, first row receivers by at least five dB(A); and to be “reasonable,” it must not exceed the cost-effectiveness criterion of \$25,000 for each receiver that would benefit by a reduction of at least five dB(A) and the abatement measure must be able to reduce the noise level for at least one impacted, first row receiver by at least seven dB(A).

Traffic management - Control devices could be used to reduce the speed of the traffic; however, the minor benefit of one dB(A) per five mph reduction in speed does not outweigh the associated increase in congestion and air pollution. Other measures such as time or use restrictions for certain vehicles are prohibited on state highways.

Alteration of horizontal and/or vertical alignments - Any alteration of the existing alignment would displace existing businesses and residences, require additional right-of-way (ROW) and not be cost effective/reasonable.

Buffer zone - The acquisition of undeveloped property to act as a buffer zone is designed to avoid rather than abate traffic noise impacts and, therefore, is not feasible.

Noise barriers - This is the most commonly used noise abatement measure. Noise barriers were evaluated for each of the impacted receiver locations.

Noise barriers would not be feasible and reasonable for the impacted receivers, and therefore, are not proposed for incorporation into the project:

R1: This receiver represents a single-family residential neighborhood along the east side of SL 360, on Scout Island Circle just north of Courtyard Drive. For the barrier analysis, 33 additional receivers were modeled at first, second, third, and fourth-row residences in the neighborhood. A contiguous barrier modeled on the ROW line totaling 1,757 feet in length and 8 feet in height would reduce noise levels by at least five dB(A) at greater than 50% of impacted, first row receivers and also achieve the noise reduction design goal of seven dB(A) at one or more receivers. However, the cost of the barrier

would exceed the reasonable, cost-effectiveness criterion of \$25,000 per benefitted receiver. Therefore, a barrier at this location is not proposed for incorporation into the project.

4.0 NOISE PLANNING

To avoid noise impacts that may result from future development of properties adjacent to the proposed project, local officials responsible for land use control programs must ensure, to the maximum extent possible, no new activities are planned or constructed along or within the following predicted (2040) noise impact contours (see **Table 4**).

Table 4: Traffic Noise Contours [dB(A) Leq]

Location	Distance from ROW	
	NAC Category B & C 66 dB(A)	NAC Category E 71 dB(A)
East side of SL 360, South of RM 2222	340 ft	ROW
West side of SL 360, South of West Courtyard Drive	ROW	ROW

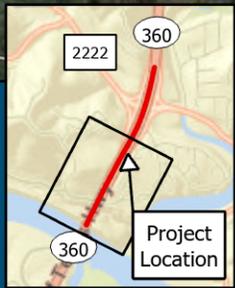
5.0 CONCLUSION

Based on this modeled noise analysis, there are projected noise impacts within the corridor. A barrier analysis was conducted for the impacted representative receiver and results indicated that a barrier would be feasible, but not reasonable; therefore, no noise abatement measures are proposed for incorporation into the proposed project.

Noise associated with the construction of the proposed project is difficult to predict. Heavy machinery, the major source of noise in construction, is constantly moving in unpredictable patterns. However, construction normally occurs during daylight hours when occasional loud noises are more tolerable. None of the receivers are expected to be exposed to construction noise for a long duration; therefore, any extended disruption of normal activities is expected. Provisions would be included in the plans and specifications that require the contractor to make every reasonable effort to minimize construction noise through abatement measures such as work-hour controls and proper maintenance of muffler systems.

APPENDIX A

REPRESENTATIVE NOISE RECEIVERS EXHIBIT



Representative Noise Receivers

State Loop 360

From Lake Austin
 To North of RM 2222
 Travis County, TX
 CSJ: 0113-13-168

 Project Area

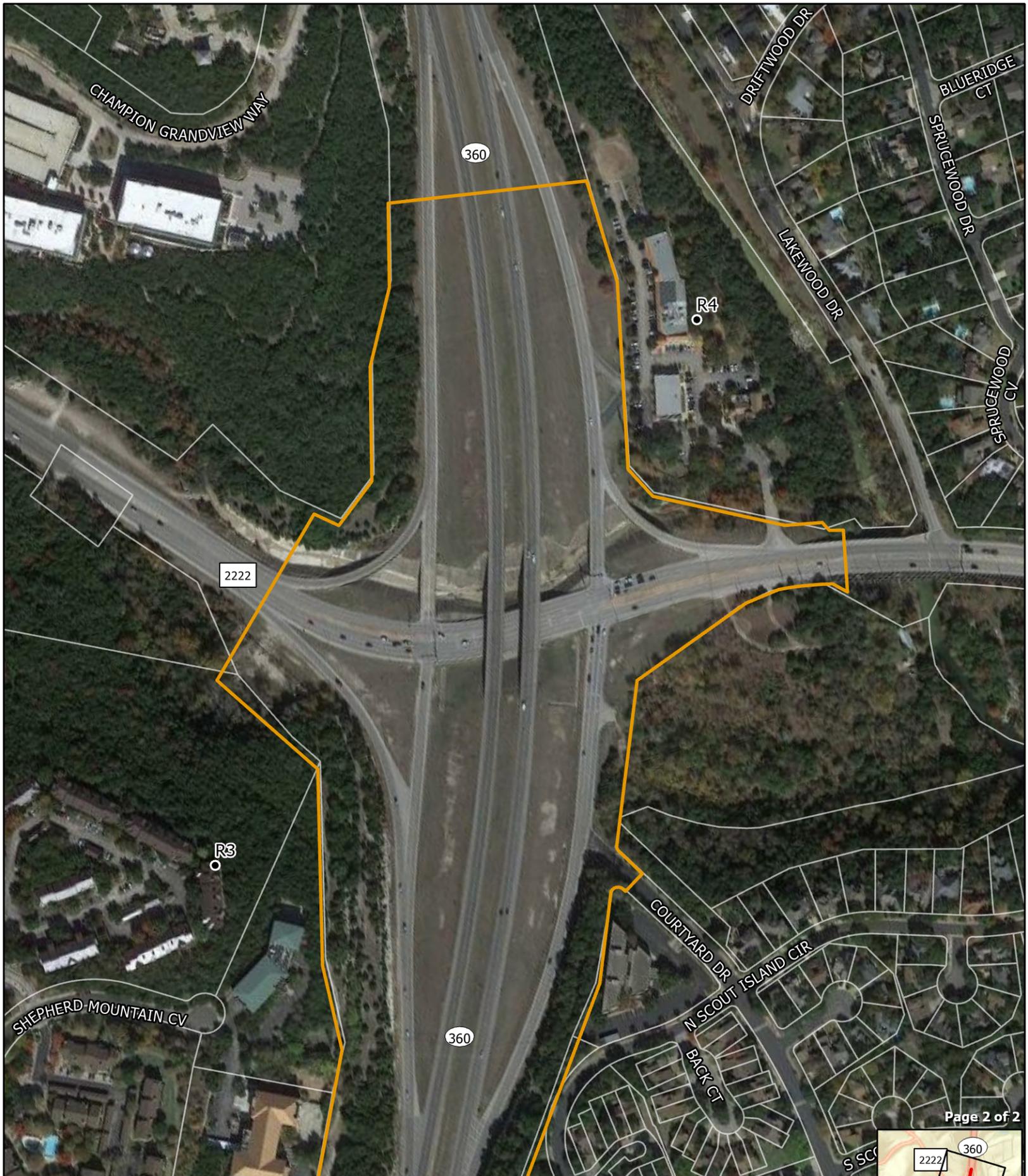
 Parcel Boundary

Representative Receivers

 Impacted

 Non-Impacted





Representative Noise Receivers

State Loop 360

From Lake Austin
 To North of RM 2222
 Travis County, TX
 CSJ: 0113-13-168

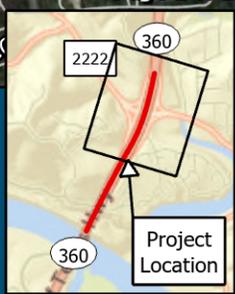
Project Area

Parcel Boundary

Representative Receivers

Impacted

Non-Impacted



APPENDIX B

TRAFFIC DATA MEMO



MEMO

October 22, 2018

To: Terry G. McCoy, P.E., District Engineer
Attention: Marisabel Ramthun, P.E., Director of TPD

Through: William E. Knowles, P.E.
Traffic Analysis Section Director, TPP

From: Lee Theobald
Planner, TPP

Subject: Traffic Data
CSJ: 0113-13-168
SL 360:
From Courtyard Dr.
To RM 2222
Travis County

Attached are diagrams depicting 2020, 2040 and 2050 average daily traffic volumes and turning movements on SL 360 from Courtyard Dr. to RM 2222. Also attached are tabulations showing traffic analysis for highway design for the 2020 to 2040 twenty year period and 2020 to 2050 thirty year period for the described limits of the route for existing and proposed conditions. Also included is a tabulation showing data for use in air and noise analysis.

Please refer to your original request dated April 2, 2018.

If you have any questions or need additional information, please contact Lee Theobald at (512) 486-5143.

Attachments

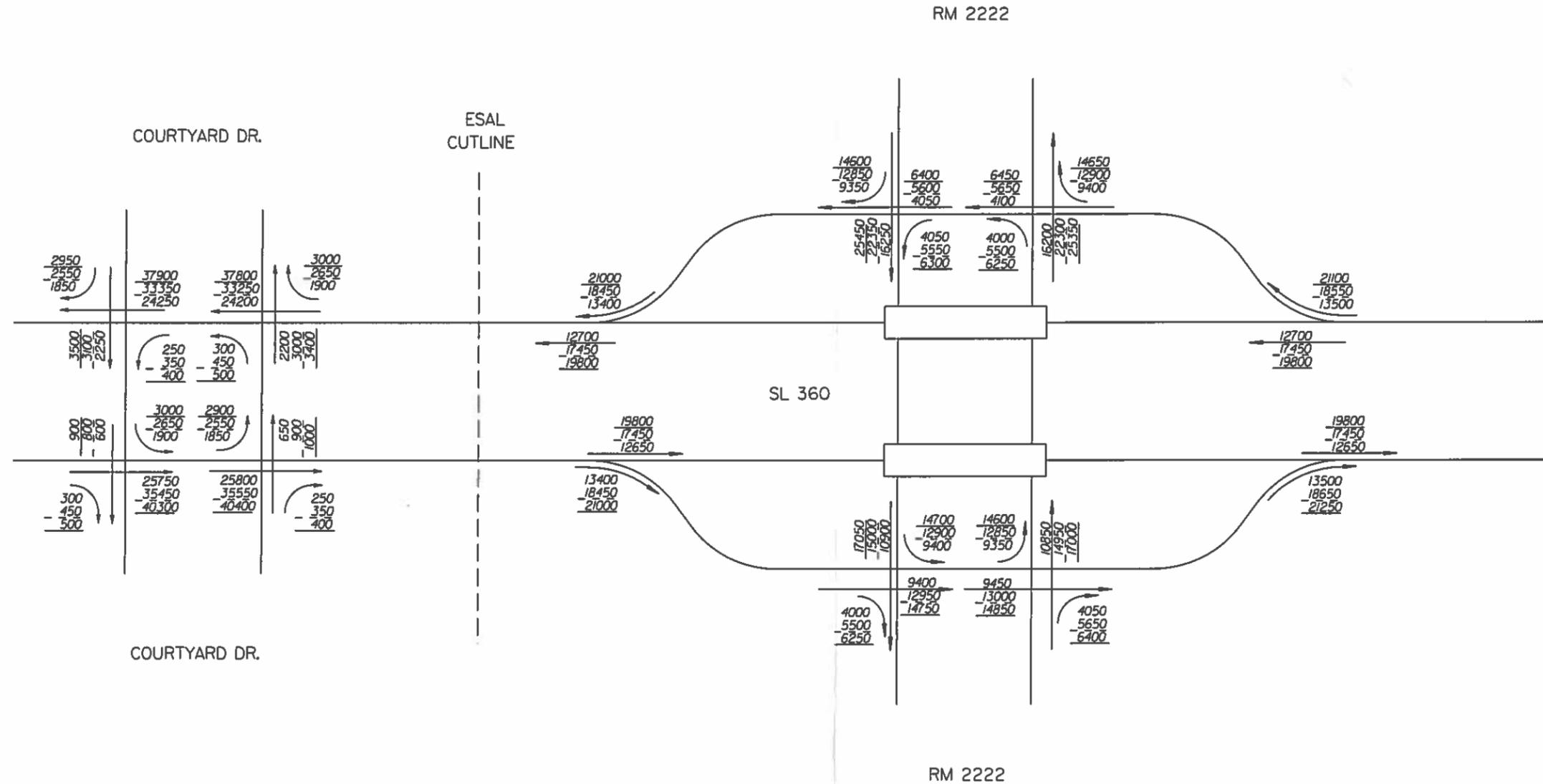
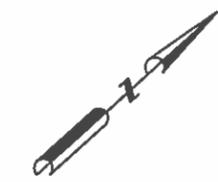
CC: Carmen Ramos
Planner, Austin District
Design Division

OUR VALUES: People • Accountability • Trust • Honesty

OUR MISSION: Through collaboration and leadership, we deliver a safe, reliable, and integrated transportation system that enables the movement of people and goods.

An Equal Opportunity Employer

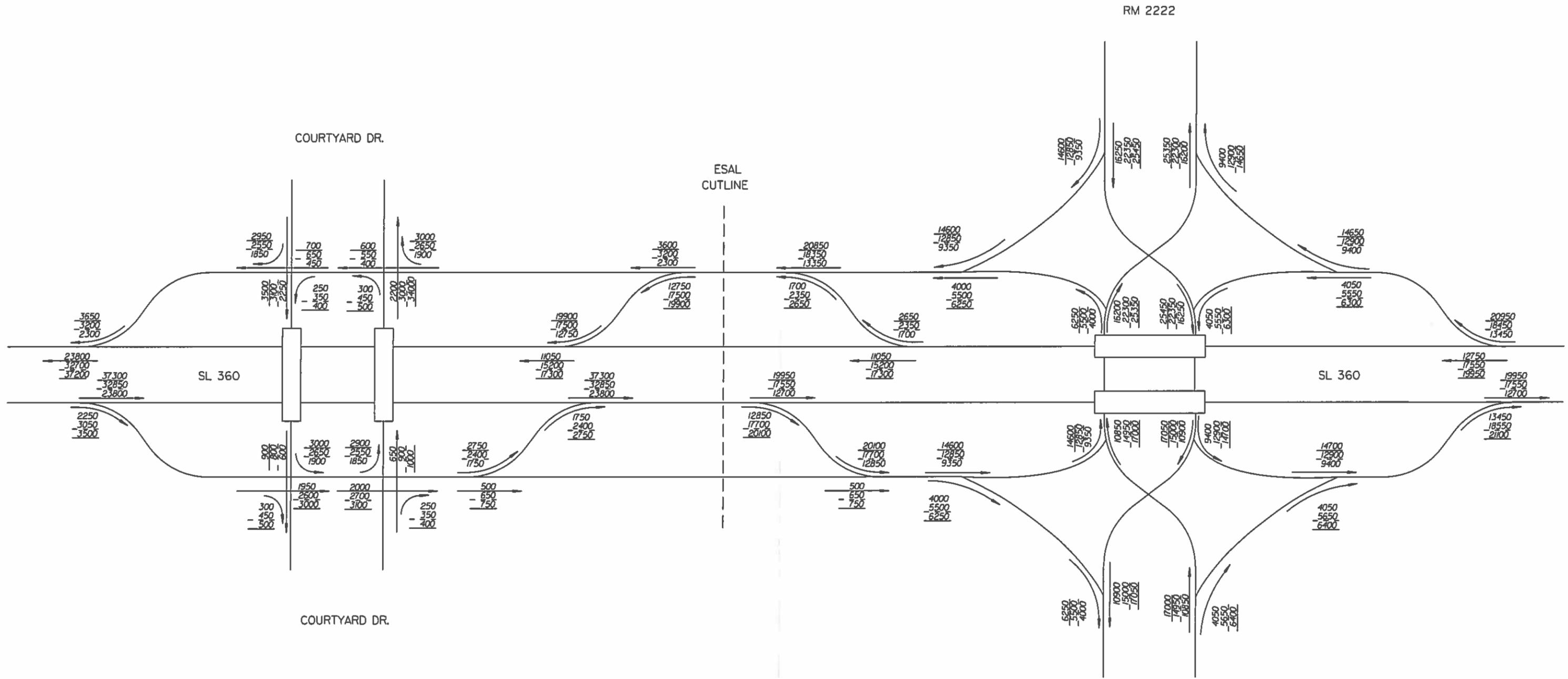
EXISTING CONDITION



LEGEND
 1000 - 2020 ADT
 1000 - 2040 ADT
 1000 - 2050 ADT

NOT INTENDED FOR CONSTRUCTION
 BIDDING OR PERMIT PURPOSES
 William Erick Knowles, P.E.
 Serial Number 84704

PROPOSED CONDITION



LEGEND
 1000 - 2020 ADT
 1000 - 2040 ADT
 1000 - 2050 ADT

2020, 2040 AND 2050 ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES AND TURNING MOVEMENTS AT SPECIFIED POINTS ALONG SL 360 FROM COURTYARD DR. TO RM 222
 TRANSPORTATION PLANNING AND PROGRAMMING DIVISION
 OCTOBER 17, 2018

NOT INTENDED FOR CONSTRUCTION
 BIDDING OR PERMIT PURPOSES
 William Erick Knowles, P.E.
 Serial Number 84704

TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

Austin District

October 16, 2018

									Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2020 to 2040)			
Description of Location	Average Daily Traffic		Base Year				ATHWLD	Percent Tandem Axles in ATHWLD	Flexible Pavement	S N	Rigid Pavement	SLAB
	2020	2040	Dir Dist %	K Factor	Percent Trucks							
					ADT	DHV						
<u>SL 360</u> (Existing and Proposed Conditions) From Courtyard Dr. To RM 2222 Travis County	52,150	71,800	62 - 38	8.3	4.1	2.7	12,000	40	7,299,000	3	9,551,000	8"
Data for Use in Air & Noise Analysis												
Vehicle Class	Base Year											
	% of ADT		% of DHV									
Light Duty	95.9		97.3									
Medium Duty	1.7		1.1									
Heavy Duty	2.4		1.6									
									Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 30 Year Period (2020 to 2050)			
Description of Location	Average Daily Traffic		Base Year				ATHWLD	Percent Tandem Axles in ATHWLD	Flexible Pavement	S N	Rigid Pavement	SLAB
	2020	2050	Dir Dist %	K Factor	Percent Trucks							
					ADT	DHV						
<u>SL 360</u> (Existing and Proposed Conditions) From Courtyard Dr. To RM 2222 Travis County	52,150	81,600	62 - 38	8.3	4.1	2.7	12,000	40	11,814,000	3	15,459,000	8"

NOT INTENDED FOR CONSTRUCTION,
 BIDDING OR PERMIT PURPOSES
 William Erick Knowles, P.E.
 Serial Number 84704

SL 360 FROM COURTYARD DR TO RM 2222

2040 MODIFIED TP&P AVERAGE DAILY TRAFFIC (ADT)

