Traffic Noise Technical Report

Farm to Market Road (FM) 1560 from FM 471 to State Highway (SH) 16

Bexar County, Texas

CSJ's: 2230-01-020 & 2230-01-021

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 Project Description

The San Antonio District of the Texas Department of Transportation (TxDOT) proposes improvements to the Farm-to-Market Road (FM) 1560 corridor from FM 471 to State Highway (SH) 16 near the City of Helotes in Bexar County, Texas (Figure 1). The proposed project is approximately 5.2 miles (8.4 kilometers) long; the proposed project limits along FM 1560 extend from 600 feet south of FM 471 to approximately 500 feet south of SH 16.

The project is located within the city limits of Helotes and San Antonio within the Alamo Area Metropolitan Planning Organization region. The area is a mix of urbanized and undeveloped land uses and is surrounded by pockets of developed residential land, educational facilities, commercial land, places of worship, public and private utilities, and agricultural land. FM 1560 currently functions as a principal arterial that provides access to schools, places of work, recreational facilities, shopping areas, and medical facilities. Locally, FM 1560 serves as an important route for commuters.

1.1 Existing Facility

Within the project limits, FM 1560 consists of two 12-foot-wide travel lanes (one in each direction) with 6-foot-wide outside shoulders. The existing right-of-way is approximately 80 feet wide. The roadway has bridges over Culebra and Helotes Creeks and a tributary to Helotes Creek, but no overpasses. Roadways within the project limits include main lanes of FM 1560, and the roadway intersects (from south to north) FM 471 (Culebra Road), Galm/Schaenfield Road, Riggs Road, SH 16 (Bandera Road), Welch Terrace, Silver Pointe, Sawyer Valley, Tribute Oaks, Steubing Road, Ponce Pass, Doheny Road, Beverly Hills Drive, Braun Road, Paynes Gray, Waystone Place, Alta Loma, Saltillo Flat, Parigin Road, Antonio Drive, and Iron Horse Way. Numerous driveways also intersect the existing right-of-way. There is one area of sidewalk adjacent to a subdivision on either side of Silver Pointe, and south of FM 471 (Culebra Road). Drainage features include open ditches, culverts, and bridges; there are no retaining walls within the project limits.

1.2 Proposed Facility

Three alternatives were investigated during development of the build alternative: Alternative A Build Left, Alternative B Build Right, and Alternative C Best Fit; as indicated by the names of the build alternatives, all of the new right-of-way for Alternative A would have been taken from the left (west) side, all of the new right-of-way for Alternative B would have been taken from the right (east) side, and new right-of-way for Alternative C would have been taken from both sides to minimize impacts to adjacent properties to the most practical extent.

The proposed improvements include expanding the existing roadway from two to four lanes with a raised median or center turn lane from FM 471 SH 16, and constructing bike lanes and sidewalks along the entire length of the project. The majority of the project area would consist of an approximately 120-foot-wide right-of-way with four 12-foot-wide travel lanes (two in each direction) and a 14-foot-wide two-way left turn lane. Each side of the road would also contain a 5-foot-wide bike lane and a 6-foot-wide sidewalk.

2.0 Noise Analysis

2.1 Background and Methodology

This analysis was accomplished in accordance with TxDOT's Federal Highway Administration (FHWA)-approved *Guidelines for Analysis and Abatement of Roadway Traffic Noise* (2011). Traffic Noise Model version 2.5 (TNM 2.5) was utilized in this assessment. Traffic volume data used in this analysis and approved by TxDOT's Transportation Planning and Programming division can be found in **Appendix 2**.

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."

Dominant noise sources within the proposed project area include traffic on existing roads and various kinds of local activity.

The traffic noise analysis typically 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; and
- Consideration and evaluation of measures to reduce noise impacts.

FHWA has established the Noise Abatement Criteria (NAC) listed 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: Noise Abatement Criteria

Activity Category	FHWA (dB(A) Leq)	Description of Land Use Activity Areas
A	57 (exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose
B	67 (exterior)	Residential
C	67 (exterior)	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings
D	52 (interior)	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios

E	72 (exterior)	Hotels, motels, offices, restaurants/bars, and other developed lands, properties, or activities not included in A-D or F
F	--	Agricultural, 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

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

- Absolute criterion: the predicted noise level at a receiver approaches, equals or exceeds the NAC. "Approach" is defined as one dB(A) below the FHWA 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 FHWA traffic noise modeling software (version 2.5) was used to calculate existing and predicted (2044) traffic noise levels for all receivers. 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.

2.2 Consideration of Future Noise Impacts

Existing and predicted traffic noise levels were modeled at receiver locations (**Table 2** and **Figure 2**) that represent the land use activity areas adjacent to the proposed project that might be impacted by traffic noise and potentially benefit from feasible and reasonable noise abatement.

Table 2: Traffic Noise Levels dB(A) Leq

Receiver	NAC Category	NAC Level	Existing 2024	Predicted 2044	Change (+/-)	Noise Impact
R1	B (Residential)	67	63	64	+1	No
R2	B (Residential)	67	63	64	+1	No
R3	C (Soccer Fields)	67	59	63	+4	No
R4	B (Residential)	67	54	58	+4	No
R5	B (Residential)	67	63	65	+2	No
R6	B (Residential)	67	60	62	+2	No
R7	B (Residential)	67	60	61	+1	No
R8	B (Residential)	67	62	64	+2	No
R9	B (Residential)	67	67	70	+3	**Yes**
R10	B (Residential)	67	67	70	+3	**Yes**

Table 2: Traffic Noise Levels dB(A) Leq

Receiver	NAC Category	NAC Level	Existing 2024	Predicted 2044	Change (+/-)	Noise Impact
R11	B (Residential)	67	67	70	+3	**Yes**
R12	B (Residential)	67	65	69	+4	**Yes**
R13	B (Residential)	67	64	67	+3	**Yes**
R14	B (Residential)	67	67	70	+3	**Yes**
R15	B (Residential)	67	67	70	+3	**Yes**
R16	B (Residential)	67	67	70	+3	**Yes**
R17	B (Residential)	67	60	62	+2	No
R18	B (Residential)	67	61	62	+1	No
R19	B (Residential)	67	61	63	+2	No
R20	B (Residential)	67	59	62	+3	No
R21	B (Residential)	67	57	61	+4	No
R22	B (Residential)	67	52	55	+3	No
R23	B (Residential)	67	60	62	+2	No
R24	B (Residential)	67	55	58	+3	No
R25	C (Park)	67	54	58	+4	No
R26	B (Residential)	67	54	58	+4	No
R27	C (VFW Picnic Area)	67	60	64	+4	No
R28	B (Residential)	67	57	62	+5	No
R29	B (Residential)	67	59	63	+4	No
R30	B (Residential)	67	58	62	+4	No
R31	B (Residential)	67	58	62	+4	No
R32	B (Residential)	67	59	62	+3	No
R33	B (Residential)	67	62	64	+2	No
R34	C (School)	67	51	54	+3	No
R35	B (Residential)	67	62	65	+3	No
R36	B (Residential)	67	50	53	+3	No
R37	B (Residential)	67	49	52	+3	No
R38	B (Residential)	67	58	62	+4	No
R39	B (Residential)	67	58	62	+4	No
R40	D (College Building)	52	35	39	+4	No
R41	B (Residential)	67	60	61	+1	No
R42	B (Residential)	67	58	59	+1	No
R43	B (Residential)	67	60	63	+3	No
R44	D (Church)	52	34	37	+3	No
R45	B (Residential)	67	56	60	+4	No
R46	B (Residential)	67	52	56	+4	No
R47	B (Residential)	67	59	63	+4	No
R48	B (Residential)	67	65	67	+2	**Yes**
R49	B (Residential)	67	64	67	+3	**Yes**
R50	B (Residential)	67	55	59	+4	No
R51	B (Residential)	67	54	58	+4	No
R52	B (Residential)	67	54	59	+5	No

Table 2: Traffic Noise Levels dB(A) Leq						
Receiver	NAC Category	NAC Level	Existing 2024	Predicted 2044	Change (+/-)	Noise Impact
R53	B (Residential)	67	50	54	+4	No
R54	D (Masonic Lodge)	52	40	44	+4	No
R55	B (Residential)	67	58	61	+3	No
R56	B (Residential)	67	63	65	+2	No
R57	B (Residential)	67	63	64	+1	No
R58	B (Residential)	67	56	60	+4	No
R59	B (Residential)	67	64	66	+2	**Yes**
R60	B (Residential)	67	59	64	+5	No
R61	B (Residential)	67	58	61	+3	No
R62	B (Residential)	67	58	60	+2	No
R63	B (Residential)	67	60	63	+3	No
R64	B (Residential)	67	62	63	+1	No
R65	B (Residential)	67	61	63	+2	No
R66	C (Park)	67	61	62	+1	No
R67	B (Residential)	67	57	59	+2	No
R68	B (Residential)	67	57	58	+1	No
R69	B (Residential)	67	56	57	+1	No
R70	B (Residential)	67	55	56	+1	No
R71	D (Church)	52	35	37	+2	No

As indicated in **Table 2**, the proposed project would result in a traffic noise impact, and 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 walls.

Before any abatement measure can be proposed for incorporation into the 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 5 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 5 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 7 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 could displace existing businesses and residences, require additional right-of-way, and is typically not 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 walls - This is the most commonly used noise abatement measure. Noise walls were evaluated for each of the impacted receiver locations with the following results:

Noise barriers would be feasible and reasonable for the following impacted receivers and, therefore, are proposed for incorporation into the project (**Table 3**):

> **R9-R16**: These receivers represent 30 single-family homes in the Silver Oaks subdivision, all of which have predicted traffic noise impacts. Based on preliminary calculations, a noise barrier 2,006 feet in length and 10 feet high, with a gap to accommodate driveway access for Silver Pointe Drive, would reduce noise levels by at least 5dB(A) for 27 benefited receivers and meet the noise reduction design goal of 7dB(A) at 24 of those receivers. With a total cost of $361,084 or $13,373 for each benefited receiver, the barrier would also be cost reasonable.

Table 3: Noise Barrier Proposal (Preliminary)

Barrier	Receivers	Total # Benefited	Length (feet)	Height (feet)	Barrier Cost	Cost per Benefited Receiver
1	R9-R16	27	2,006	10	$361,084	$13,373

Noise barriers would not be feasible and reasonable for any of the following impacted receptors, and therefore, are not proposed for incorporation into the project:

> **R48, R49, R59**: These receivers are separate, isolated residences, which are not associated with a neighborhood or subdivision. Because a noise abatement measure must potentially benefit a minimum of two impacted receptors, noise abatement for these locations is not feasible.

To avoid noise impacts that may result from future development of properties adjacent to the project, local officials responsible for land use control programs must ensure, to the maximum extent possible, that no new activities are planned or constructed along or within the following predicted (2044) noise impact contours (**Table 4**).

Table 4: Land Use Contours for Undeveloped Land		
Land Use	**Impact Contour**	**Distance from Right-of-Way**
NAC Category B & C	66 dB(A)	95 feet
NAC Category E	71 dB(A)	25 feet

2.3 Construction Noise

Noise associated with the construction of the 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 not expected. Provisions will 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.

3.0 Local Officials Statement

A copy of this traffic noise analysis will be made available to local officials to ensure, to the maximum extent possible, future developments are planned, designed, and programmed in a manner that would avoid traffic noise impacts. On the date of approval of this document (Date of Public Knowledge), FHWA and TxDOT are no longer responsible for providing noise abatement for new development adjacent to the project.

Appendix 1

Figures

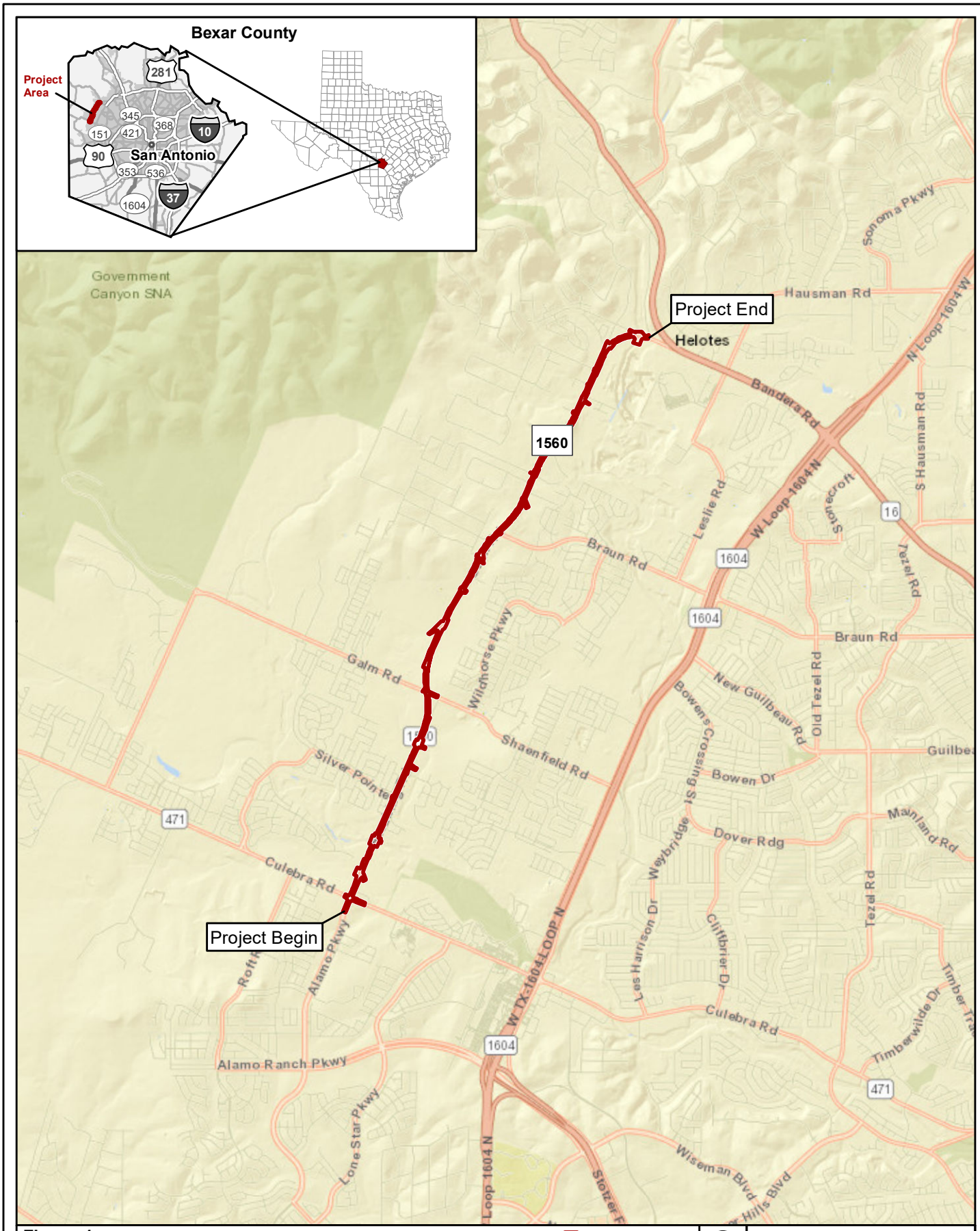

Figure 1.
Project Location (Road Base)

FM 1560 from FM 471 to SH 16

Project Location

Basemap Source: Esri (2020)

CSJ: 2230-01-020, 2230-01-021

0 1 Mile
0 1.5 Km

1 in = 1 mile
Scale: 1:63,360
Date: 3/13/2020

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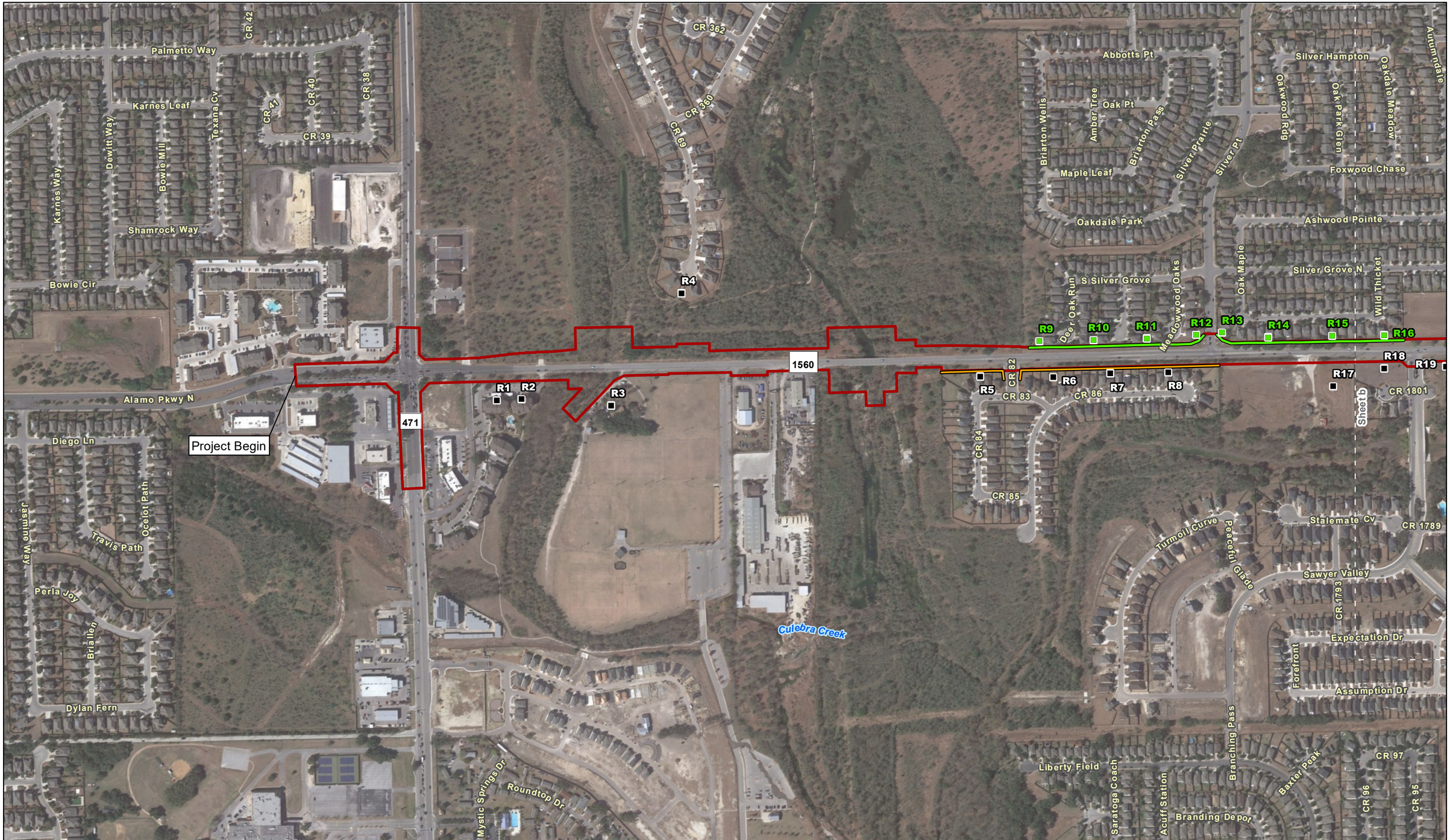

Figure 2a.
Location of Noise Receivers

FM 1560 from FM 471 to SH 16

Project Location
Sheet Limits
Benefited Receiver
Non-impacted Receiver
Existing Barrier
Proposed Barrier

Data Sources:
TxDOT (2020), StratMap (2019)
Aerial Source: Google (2018)

CSJ: 2230-01-020, 2230-01-021

0 500 Feet
0 150 Meters

1 in = 500 feet
Scale: 1:6,000
Date: 4/16/2020

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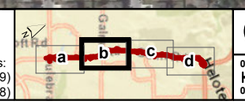
Figure 2b.
Location of Noise Receivers

FM 1560 from FM 471 to SH 16

Project Location
Sheet Limits
Benefited Receiver
Non-impacted Receiver
Proposed Barrier

Data Sources:
TxDOT (2020), StratMap (2019)
Aerial Source: Google (2018)



CSJ: 2230-01-020, 2230-01-021

0 500 Feet — 1 in = 500 feet
0 150 Meters — Scale: 1:6,000
Date: 4/16/2020

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Figure 2c.
Location of Noise Receivers

FM 1560 from FM 471 to SH 16

Project Location
Sheet Limits
Non-impacted Receiver
Impacted Receiver

Data Sources:
TxDOT (2020), StratMap (2019)
Aerial Source: Google (2018)

CSJ: 2230-01-020, 2230-01-021

0 500 Feet | 1 in = 500 feet
0 150 Meters | Scale: 1:6,000
Date: 4/16/2020

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Figure 2d.
Location of Noise Receivers

FM 1560 from FM 471 to SH 16

Project Location
Sheet Limits
Non-impacted Receiver
Impacted Receiver
Existing Barrier

Data Sources:
TxDOT (2020), StratMap (2019)
Aerial Source: Google (2018)

CSJ: 2230-01-020, 2230-01-021

0 500 Feet
0 150 Meters

1 in = 500 feet
Scale: 1:6,000
Date: 4/16/2020

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Appendix 2

Traffic Analysis for Highway Design and Anticipated Average Daily Traffic and Turning Movement Schematics

Texas Department of Transportation

MEMO

June 25, 2018

To: Mario R. Jorge, P.E., District Engineer
Attention: Jonathan A. Bean, 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: 2230-01-020, 021
FM 1560:
From FM 471
To SH 16
Bexar County

Attached are diagrams depicting 2024, 2044 and 2054 average daily traffic volumes and turning movements on FM 1560 from FM 471 to SH 16. Also attached are tabulations showing traffic analysis for highway design for the 2024 to 2044 twenty year period and 2024 to 2054 thirty year period for the described limits of the route. Also included is a tabulation showing data for use in air and noise analysis.

Please refer to your original request dated May 11, 2017.

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

Attachments

CC: Richard De La Cruz, P.E.,
Transportation Engineer, San Antonio District
Design Division

TRAFFIC ANALYSIS FOR HIGHWAY DESIGN

San Antonio District

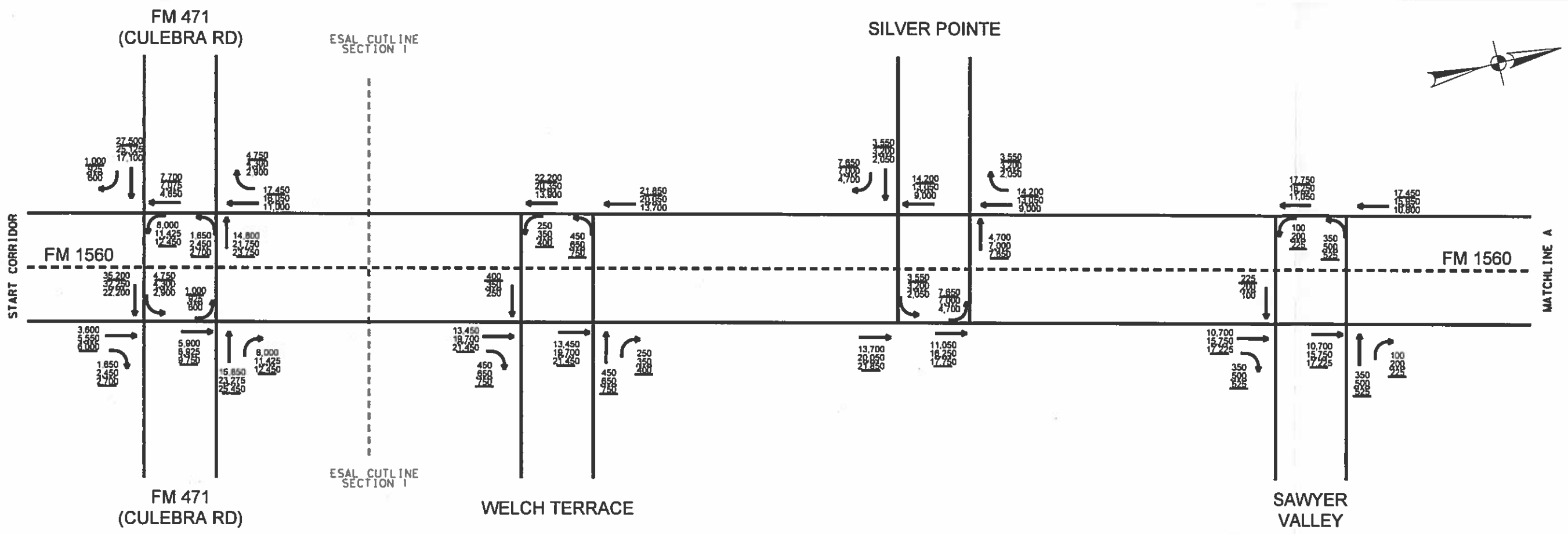
May 24, 2018

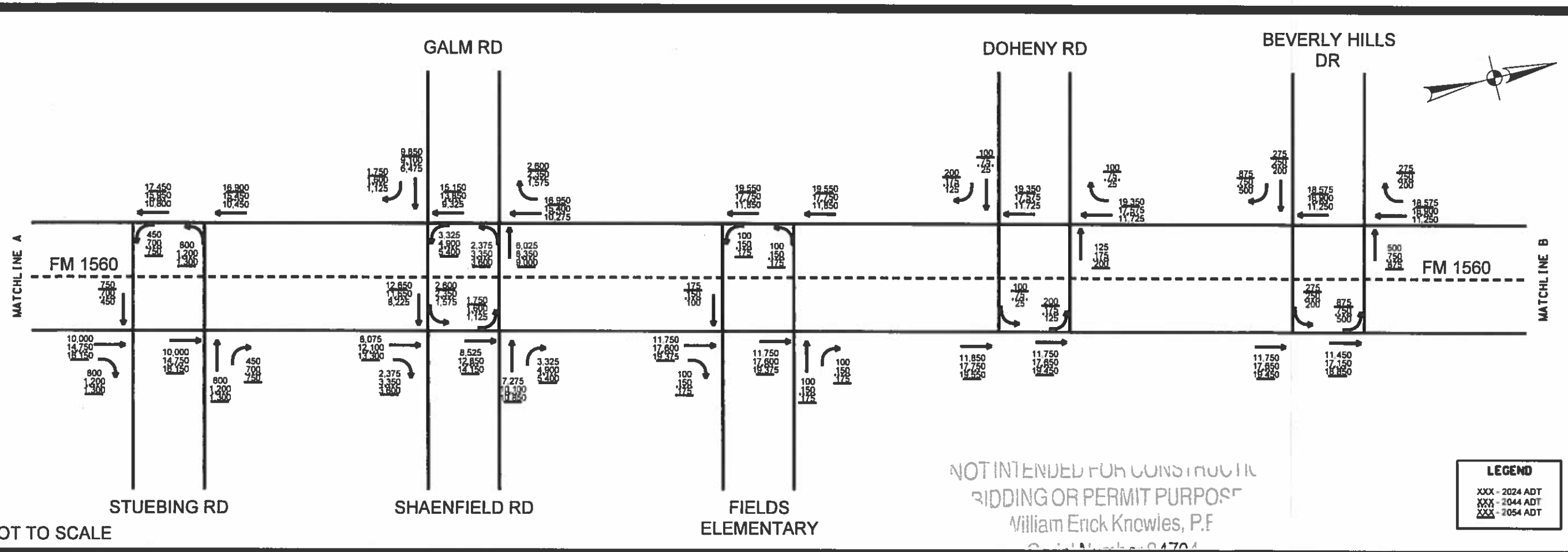
Description of Location	Average Daily Traffic 2024	Average Daily Traffic 2044	Base Year Dir Dist %	Base Year K Factor	Base Year Percent Trucks ADT	Base Year Percent Trucks DHV	ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 20 Year Period (2024 to 2044) Flexible Pavement	SN	Rigid Pavement	SLAB
FM 1560 From FM 471 To SH 16 Bexar County	27,800	40,700	52 - 48	12.6	4.4	3.3	11,500	30	3,473,000	3	4,155,000	8"

Data for Use in Air & Noise Analysis

Vehicle Class	Base Year % of ADT	Base Year % of DHV
Light Duty	95.6	96.7
Medium Duty	2.9	2.2
Heavy Duty	1.5	1.1

Description of Location	Average Daily Traffic 2024	Average Daily Traffic 2054	Base Year Dir Dist %	Base Year K Factor	Base Year Percent Trucks ADT	Base Year Percent Trucks DHV	ATHWLD	Percent Tandem Axles in ATHWLD	Total Number of Equivalent 18k Single Axle Load Applications One Direction Expected for a 30 Year Period (2024 to 2054) Flexible Pavement	SN	Rigid Pavement	SLAB
FM 1560 From FM 471 To SH 16 Bexar County	27,800	44,400	52 - 48	12.6	4.4	3.3	11,500	30	5,491,000	3	6,570,000	8"





LEGEND

XXX - 2024 ADT
XXX - 2044 ADT
XXX - 2054 ADT

REVISIONS:

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #100288-00

FM 1560 FROM FM 471 TO SH 16
CSJ: NA
ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES
BEXAR COUNTY, TX
NO-BUILD CONDITIONS

JOB NO. 11201-02
DATE 5/24/2018
DESIGNER
CHECKED DNM DRAWN JCH
SHEET 1 OF 3

Plotted on: 5/24/2018

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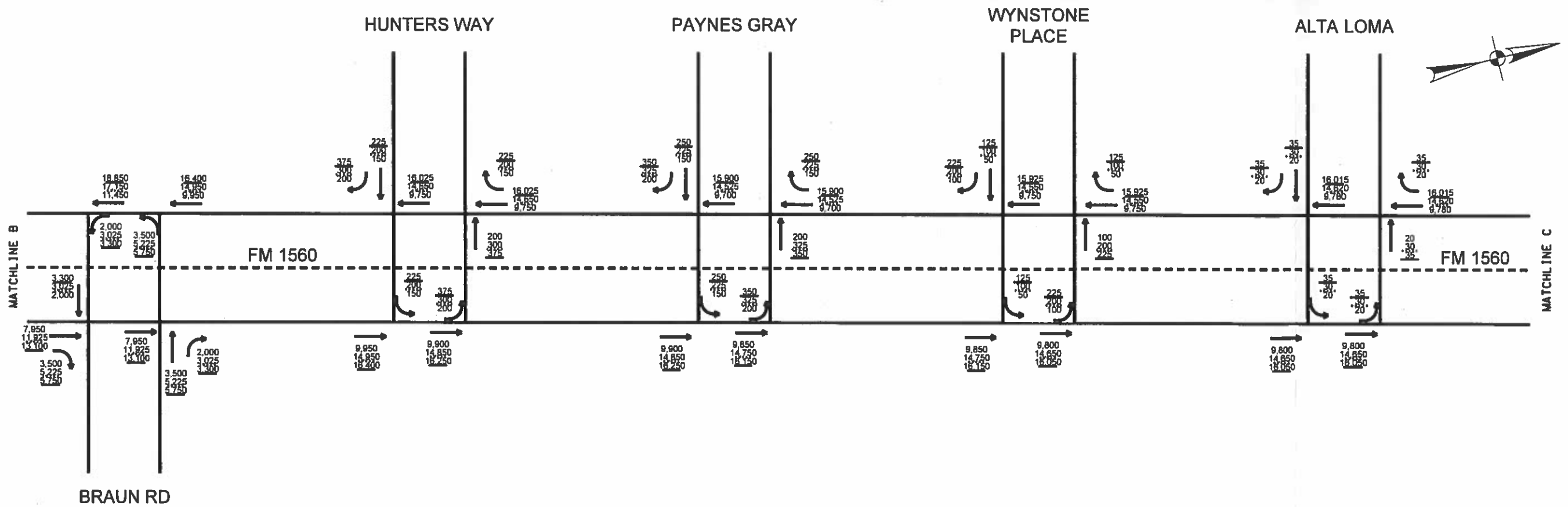

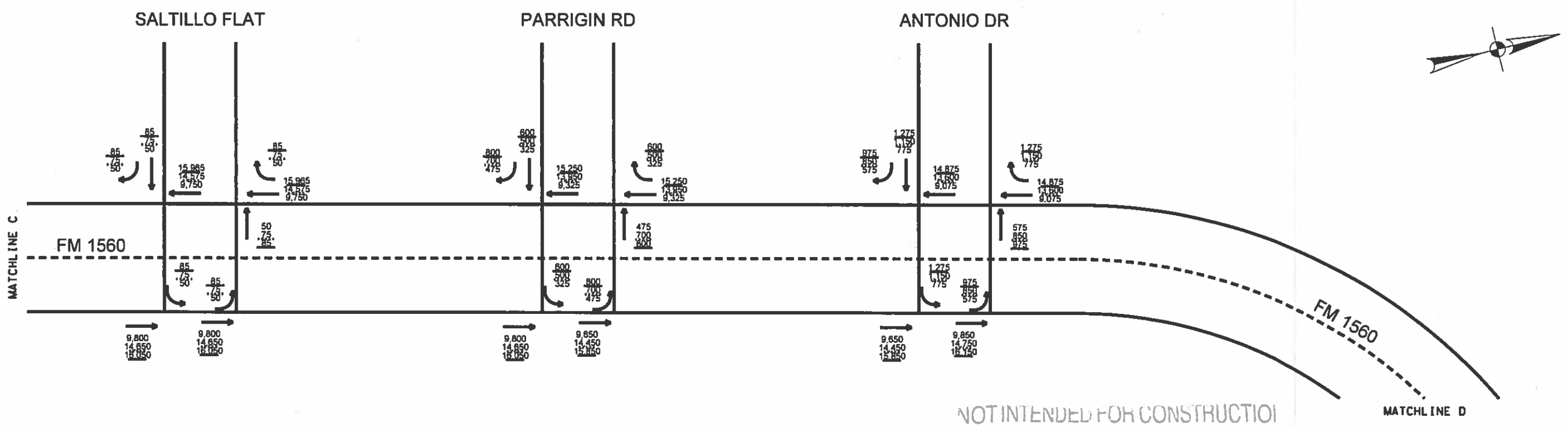

NOT TO SCALE

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

LEGEND

XXX - 2024 ADT
XXX - 2044 ADT
XXX - 2054 ADT

REVISIONS:

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2306 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #100288

FM 1560 FROM FM 471 TO SH 16
CSJ: NA
ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES
BEXAR COUNTY, TX
NO-BUILD CONDITIONS

JOB NO. 11201-02
DATE 5/24/2018
DESIGNER
CHECKED DNM DRAWN JCH
SHEET 2 OF 3

Plotted on: 5/24/2018

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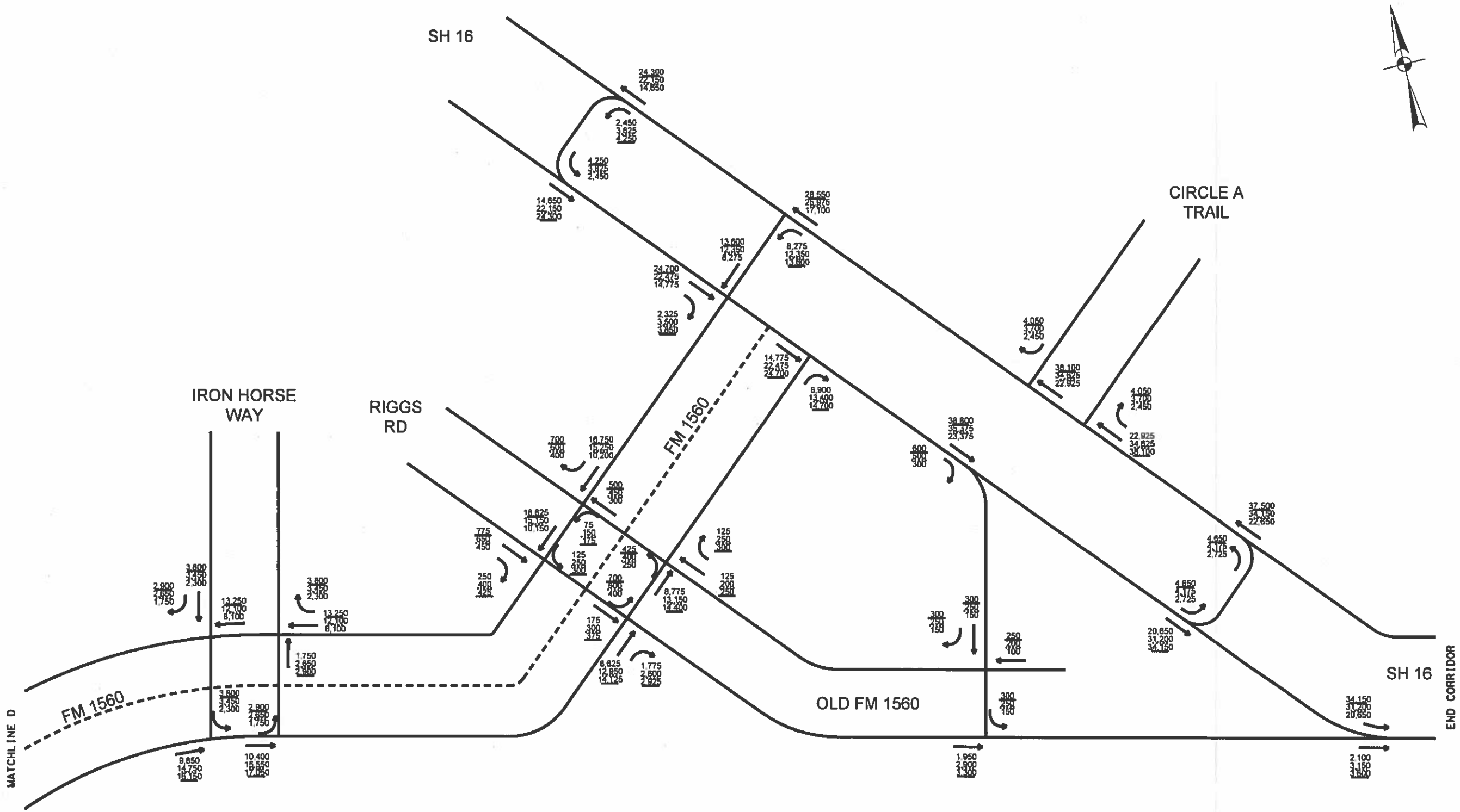

NOT TO SCALE

LEGEND

XXX - 2024 ADT
XXX - 2044 ADT
XXX - 2054 ADT

REVISIONS:

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2804 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #100288

FM 1560 FROM FM 471 TO SH 16
CSJ: NA
ANTICIPATED AVERAGE DAILY TRAFFIC VOLUMES
BEXAR COUNTY, TX
NO-BUILD CONDITIONS

JOB NO. 11201-02
DATE 5/24/2018
DESIGNER
CHECKED DNM DRAWN JCH
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