Noise Technical Report

SH 46 from Bulverde Road to FM 3159

CSJs: 0215-07-027, 0215-01-044, 0215-01-051 & 0215-07-049
Date: April 2018

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 16, 2014, and executed by FHWA and TxDOT.

The Texas Department of Transportation (TxDOT) proposes to widen State Highway (SH) 46 in Comal County, Texas, from two to six lanes with a raised median, beginning at Bulverde Road and continuing east to Farm-to-Market (FM) 3159, a distance of approximately 7 miles. SH 46 is classified as an urban/suburban arterial. The project would be constructed in phases. Phase I is from Farhills Drive to FM 3159. Phase II is from Bulverde Road to Farhills Drive.

The existing SH 46 facility within the overall project limits is a two-lane, undivided roadway. Lane widths are approximately 12 feet with shoulders of varying widths. Existing right-of-way (ROW) is approximately 100 feet. The posted speed limit varies from 35 miles per hour (mph) to 65 mph.

The proposed SH 46 project would widen the roadway from its existing two-lane highway to two different configurations. The curbed with storm drain configuration, constructed in the more developed areas, would consist of six 11-foot travel lanes with a 16-foot raised median. The roadway would have 5-foot bike lanes and 6-foot sidewalks to accommodate cyclists and pedestrians. Drainage would be via underground storm sewer. Typical ROW width of the curbed with storm drain configuration would be 130 feet. The other configuration, a curbed with grass-lined open-ditch configuration, would be constructed in less developed areas and would consist of six 11-foot travel lanes with a 16-foot raised median. The roadway would have 5-foot bike lanes and 6-foot sidewalks to accommodate cyclists and pedestrians. Drainage would be via grass-lined open ditches. Typical ROW width for the curbed with grass-lined open-ditch configuration would be 170 feet. Additional ROW would be required for both roadway configurations. A grade-separated intersection would be constructed at SH 46 and FM 3159. The project would transition back to the existing two-lane configuration east of FM 3159.

Phase I of the proposed SH 46 project would extend between logical termini at Farhills Drive on the western end and FM 3159 on the eastern end with transitions to tie in to the existing pavement widths. Phase II would extend between logical termini at Bulverde on the western end and Farhills Drive on the eastern end with transitions to tie in to the existing pavement widths. Each phase of the project has independent utility.

According to project design engineers, the proposed project's future posted speed limit will be 45 mph. Future noise levels were modeled using 45 mph as the speed limit. The only area within the construction limits of the proposed project where 45 mph was not modeled as the speed limit is the area near Bill Brown Elementary. According to project design engineers, the proposed project's future posted speed limit in this area will be 35 mph. Future noise levels for this area were modeled using 35 mph as the speed limit.

This analysis was accomplished in accordance with TxDOT's (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 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.
- Consideration and evaluation of measures to reduce noise impacts.

The FHWA has established the following Noise Abatement Criteria (NAC) (**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)L_{eq}	Description of Land Use Activity Areas
A	57 (exterior)	Lands on which serenity and quiet are of extra-ordinary 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

Activity Category	FHWA dB(A)L_{eq}	Description of Land Use Activity Areas
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 would occur 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 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 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.

Existing and predicted traffic noise levels were modeled at receiver locations (**Table 2 and Exhibit A**) 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 2016	Predicted 2039	Change (+/-)	Noise Impact
R1 – Residence	B	67	58	58	0	No
R2 – Residence	B	67	58	61	3	No
R3 – Church	C	67	57	59	2	No
R4 – Residence	B	67	58	61	3	No
R5 – Residence	B	67	60	60	0	No
R6 – Residence	B	67	57	58	1	No
R7 – Residence	B	67	58	58	0	No
R8 – Residence	B	67	58	58	0	No
R9 – Residence	B	67	57	60	3	No
R10 – Restaurant	E	72	66	68	2	No
R11 – School	C	67	58	62	4	No
R12 – Residence	B	67	59	59	0	No
R13 – Residence	B	67	54	57	3	No
R14 – Residence	B	67	56	59	3	No
R15 – Residence	B	67	55	58	3	No
R16 – Residence	B	67	55	58	3	No
R17 – Restaurant	E	72	66	69	3	No
R18 – Residence	B	67	53	56	3	No
R19 – Residence	B	67	53	56	3	No
R20 – Residence	B	67	54	56	2	No
R21 – School	C	67	55	59	4	No
R22 – Restaurant	E	72	62	65	3	No
R23 – Residence	B	67	58	60	2	No
R24 – Residence	B	67	60	63	3	No

Receiver	NAC Category	NAC Level	Existing 2016	Predicted 2039	Change (+/-)	Noise Impact
R25 – Residence	B	67	60	63	3	No
R26 – Residence	B	67	55	59	4	No
R27 – Medical Facility (interior)	D	52	44	47	3	No
R28 – Residence	B	67	62	62	0	No
R29 – Residence	B	67	59	60	1	No
R30 – Residence	B	67	57	59	2	No
R31 – Residence	B	67	58	60	2	No
R32 – Residence	B	67	58	62	4	No
R33 – Residence	B	67	57	61	4	No
R34 – Residence	B	67	60	63	3	No
R35 – Residence	B	67	60	60	0	No
R36 – Residence	B	67	59	59	0	No
R37 – Residence	B	67	59	59	0	No
R38 – Residence	B	67	58	59	1	No
R39 – Residence	B	67	62	64	2	No
R40 – Residence	B	67	58	61	3	No
R41 – Residence	B	67	54	58	4	No
R42 – Residence	B	67	64	65	1	No
R43 – Residence	B	67	61	65	4	No
R44 – Residence	B	67	62	65	3	No
R45 – Residence	B	67	64	66	2	Yes
R46 – Residence	B	67	64	66	2	Yes
R47 – Residence	B	67	65	68	3	Yes
R48 – Church	C	67	62	61	-1	No
R49 – Church	C	67	62	61	-1	No
R50 – Residence	B	67	54	58	4	No
R51 – Residence	B	67	67	66	-1	Yes
R52 – Residence	B	67	68	67	-1	Yes
R53 – Residence	B	67	56	59	3	No
R54 – Restaurant	E	72	71	70	-1	No
R55 – Residence	B	67	56	59	3	No

Receiver	NAC Category	NAC Level	Existing 2016	Predicted 2039	Change (+/-)	Noise Impact
R56 – Residence	B	67	61	63	2	No
R57 – Residence	B	67	53	54	1	No
R58 – Residence	B	67	56	58	2	No
R59 – Residence	B	67	51	53	2	No

As shown in **Table 2**, Receivers R48, R49, R51, R52 and R54 have a decrease in dB(A) between the existing 2016 and the proposed 2039 noise levels. The noise reduction for R48, R49, R51, R52 and R54 is caused by speed reductions between existing and the proposed conditions. The existing posted speed limit for SH 46 is 50 mph between approximately 600 feet east of Towry Ln and the driveway for Spring Branch Middle School, while the design speed for the proposed project is 45 mph. The existing posted speed limit for SH 46 is 55 mph between Sun Valley Dr and approximately 400 feet east of Creekwood Pass, while the design speed for the proposed project is 45 mph. Refer to **Exhibit A** for a project layout.

As indicated in **Table 2**, the proposed project would result in traffic noise impacts 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 barriers.

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 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 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 proposed alignment would displace existing businesses, other residences and structures 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 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:

R45, R46 and R47 - These receivers are separate individual residences. Noise walls were considered for this group of receivers. Noise walls were modeled along the ROW at this location. A noise wall 1,332 feet in length and 10 feet in height would reduce noise levels by the minimum feasible reduction of at least 5 dB(A) for five benefitted receivers and at least one of these receivers would have the noise reduction design goal of greater than 7 dB(A). However, based on preliminary calculations, a noise barrier 1,332 feet in length and 10 feet in height would cost $239,760 or $47,952 for each benefitted. This noise barrier would exceed the cost-effectiveness criterion of $25,000 for each benefitted receiver.

R51 and R52 - These receivers are separate individual residences. Noise walls were considered for each of these receivers. These receivers represent a total of three residences with driveways connecting to SH 46. A continuous noise barrier would restrict access to these residences. Gaps in a noise barrier would satisfy access requirements but the resulting non-continuous barrier segments would not be sufficient to achieve the minimum, feasible reduction of 5 dB(A) or the noise reduction design goal of 7 dB(A).

None of the above noise abatement measures would be both feasible and reasonable; therefore, no abatement measures are proposed for this project. 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, no new activities are planned or constructed along or within the following predicted (2039) noise impact contours.

Table 3: 2039 Noise Impact Contours

Land Use	Impact Contour	Distance to Nearest Proposed Travel Lane
North of SH 46 between beginning of the proposed project and Bulverde Rd		
NAC Category B & C	66 dB(A)	100 feet
NAC Category E	71 dB(A)	38 feet
North of SH 46 between Bulverde Rd and Farhills Dr		
NAC Category B & C	66 dB(A)	95 feet
NAC Category E	71 dB(A)	15 feet

Land Use	Impact Contour	Distance to Nearest Proposed Travel Lane
North of SH 46 between Farhills Dr and Windmill Ranch Rd		
NAC Category B & C	66 dB(A)	60 feet
NAC Category E	71 dB(A)	0 feet
North of SH 46 between US 281 and Berry Oaks		
NAC Category B & C	66 dB(A)	192 feet
NAC Category E	71 dB(A)	57 feet
North of SH 46 between Berry Oaks and Bentwood Dr		
NAC Category B & C	66 dB(A)	148 feet
NAC Category E	71 dB(A)	55 feet
North of SH 46 between Bentwood Dr and begin of frontage roads near FM 3159		
NAC Category B & C	66 dB(A)	140 feet
NAC Category E	71 dB(A)	55 feet
North of SH 46 between begin of frontage roads near FM 3159 and FM 3159		
NAC Category B & C	66 dB(A)	120 feet
NAC Category E	71 dB(A)	35 feet
North of SH 46 between FM 3159 and end of frontage roads near FM 3159		
NAC Category B & C	66 dB(A)	65 feet
NAC Category E	71 dB(A)	10 feet
North of SH 46 between end of frontage roads near FM 3159 and end of the proposed project		
NAC Category B & C	66 dB(A)	147 feet
NAC Category E	71 dB(A)	49 feet
South of SH 46 between beginning of the proposed project and Farhills Dr		
NAC Category B & C	66 dB(A)	95 feet
NAC Category E	71 dB(A)	25 feet
South of SH 46 between Farhills Dr and Spring Branch Middle School		
NAC Category B & C	66 dB(A)	150 feet
NAC Category E	71 dB(A)	50 feet

Land Use	Impact Contour	Distance to Nearest Proposed Travel Lane
South of SH 46 between US 281 and Berry Oaks		
NAC Category B & C	66 dB(A)	220 feet
NAC Category E	71 dB(A)	59 feet
South of SH 46 between Berry Oaks and Canterbury Rd		
NAC Category B & C	66 dB(A)	155 feet
NAC Category E	71 dB(A)	55 feet
South of SH 46 between Canterbury Rd and begin of FM 3159 frontage roads		
NAC Category B & C	66 dB(A)	120 feet
NAC Category E	71 dB(A)	35 feet
South of SH 46 between begin of frontage roads near FM 3159 and FM 3159		
NAC Category B & C	66 dB(A)	70 feet
NAC Category E	71 dB(A)	10 feet
South of SH 46 between FM 3159 and end of frontage roads near FM 3159		
NAC Category B & C	66 dB(A)	65 feet
NAC Category E	71 dB(A)	20 feet
South of SH 46 between end of frontage roads near FM 3159 and end of the proposed project		
NAC Category B & C	66 dB(A)	131 feet
NAC Category E	71 dB(A)	41 feet

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 is 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.

A copy of this traffic noise analysis will be available to local officials. 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.

This report was written on behalf of the Texas Department of Transportation by

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EXHIBITS

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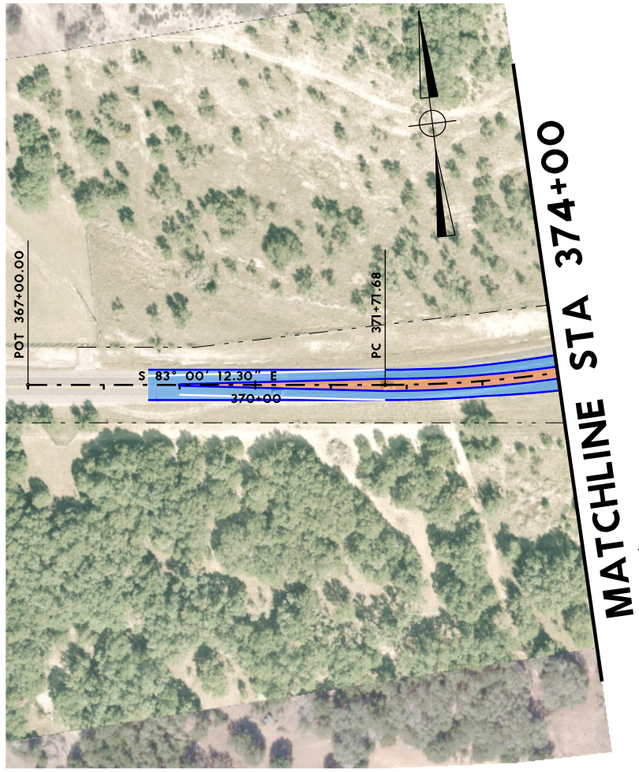

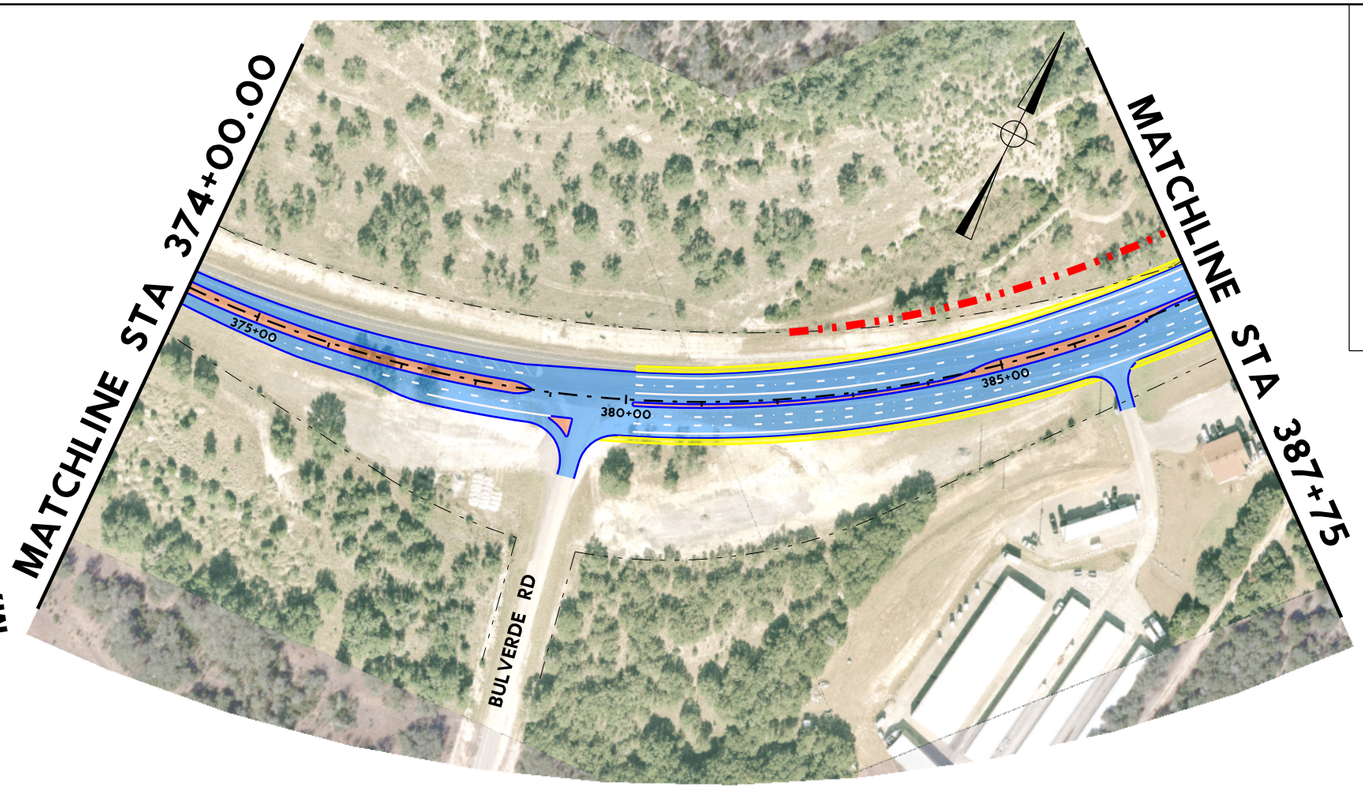

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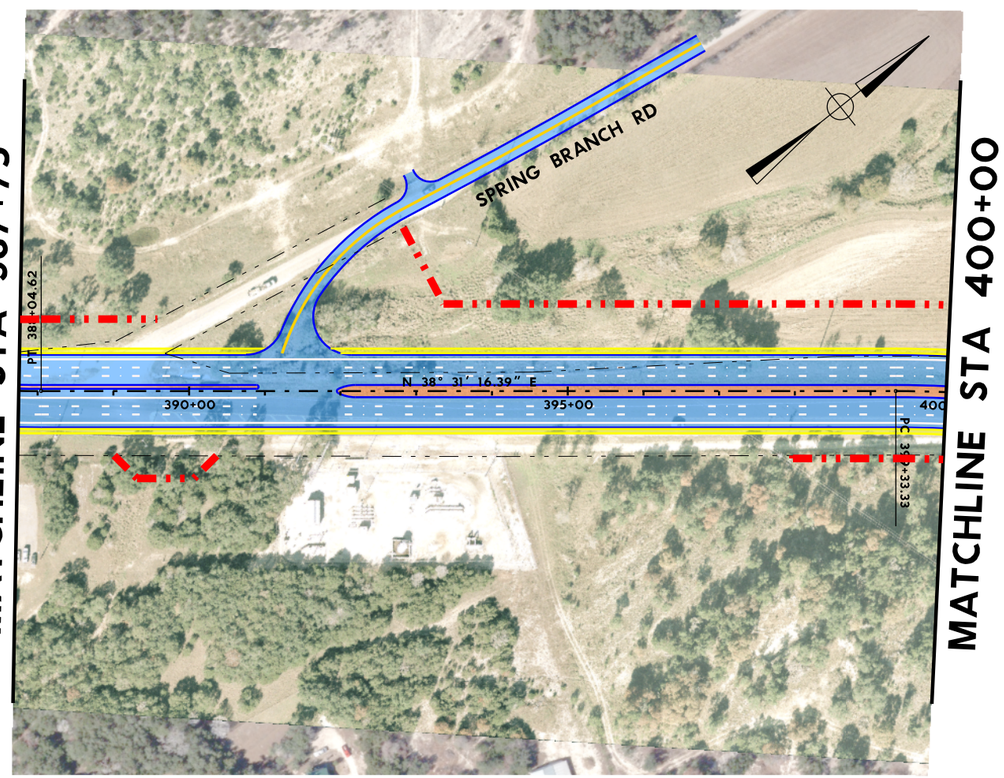

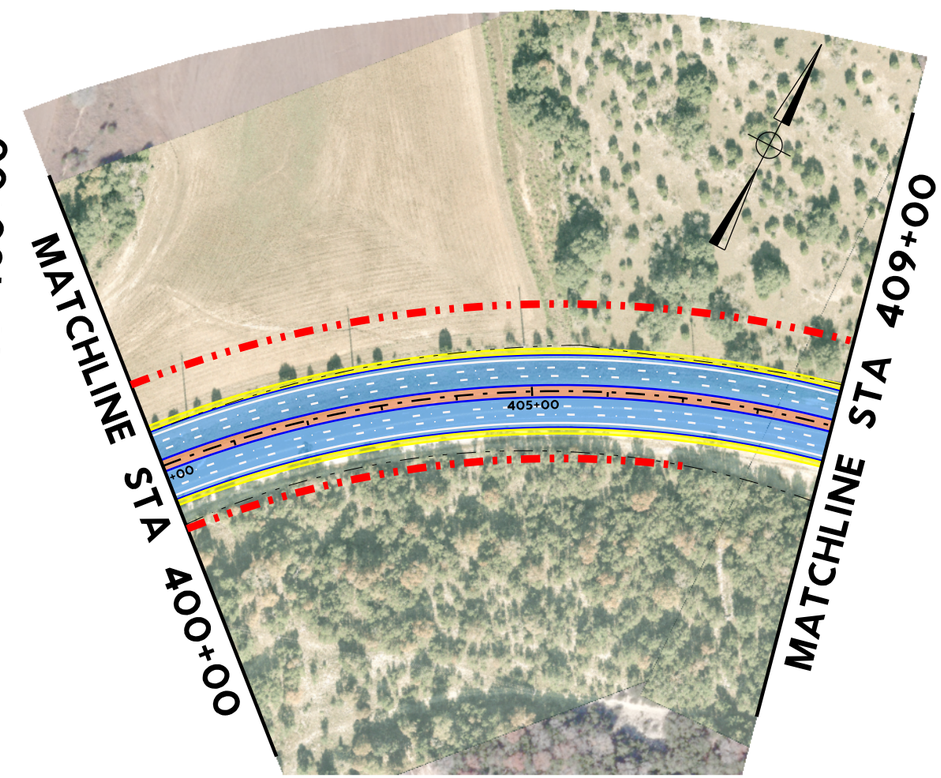

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NOISE RECEIVERS

SH46
FROM BULVERDE ROAD TO FM 3159
COMAL COUNTY

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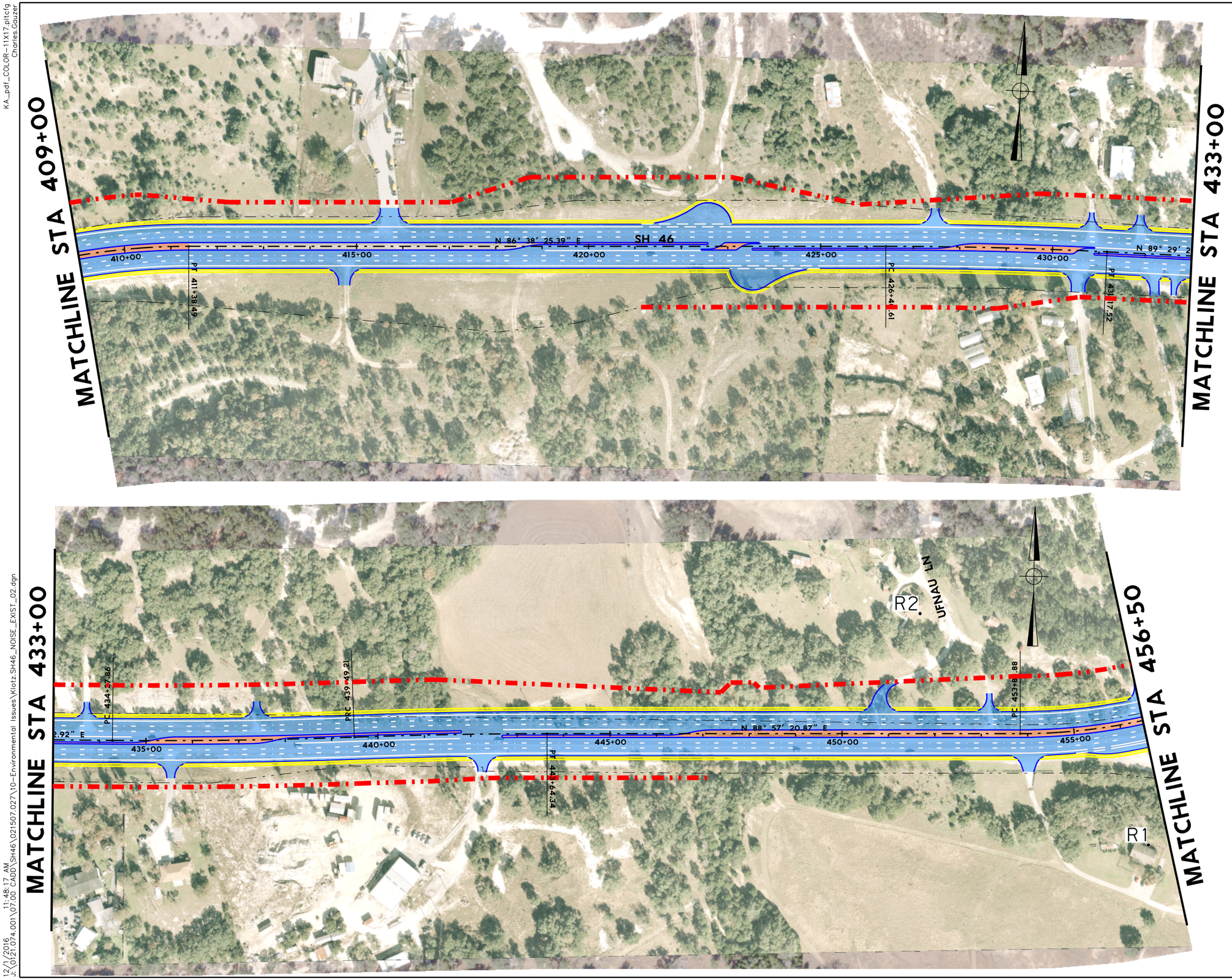

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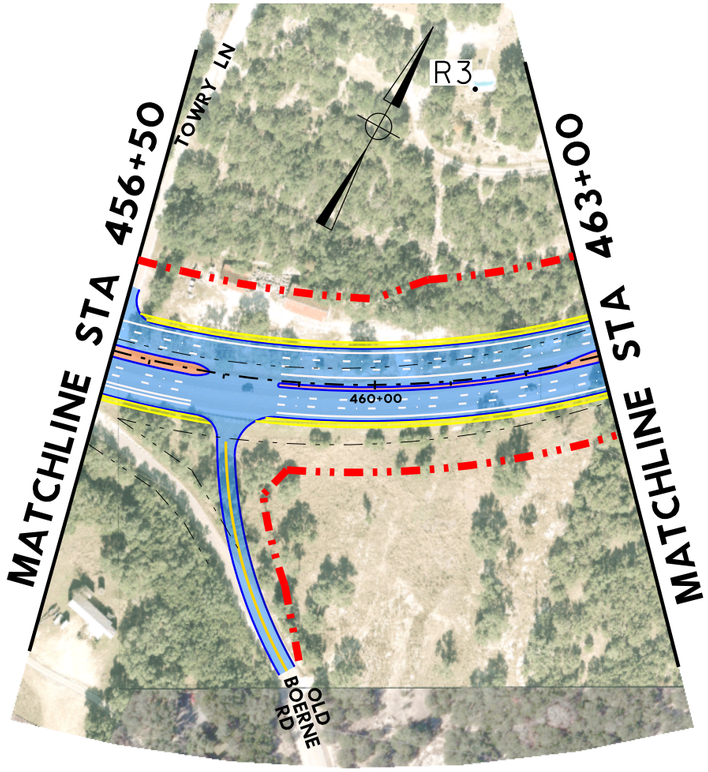

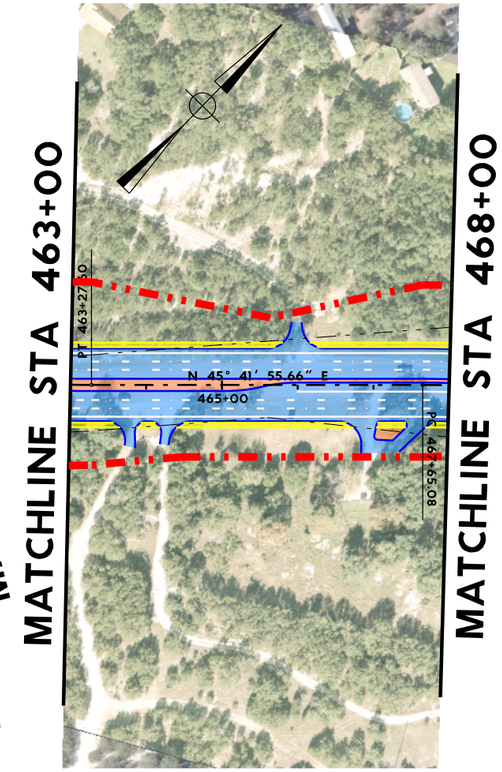

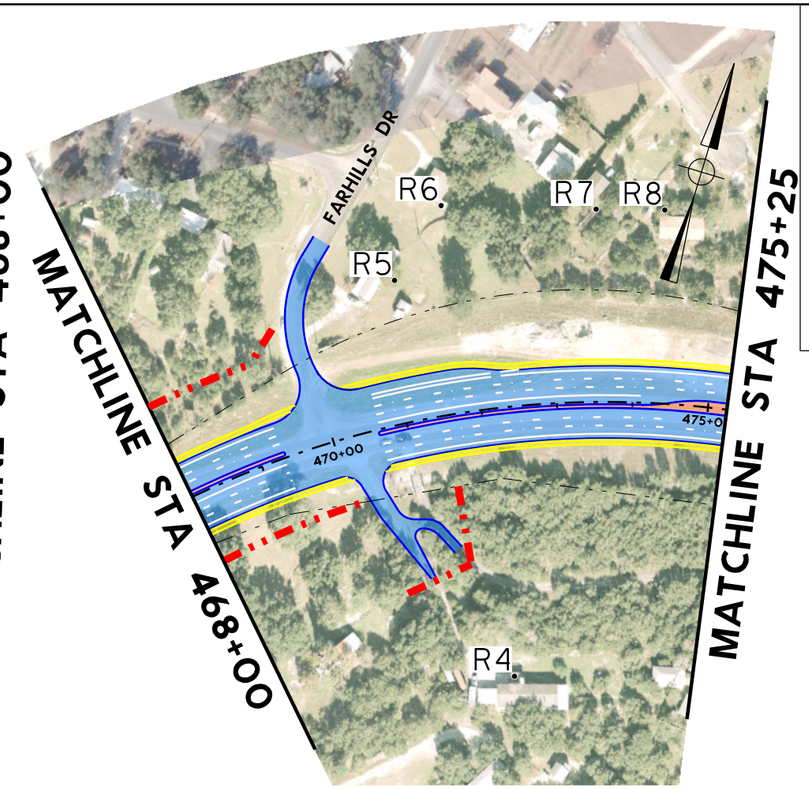

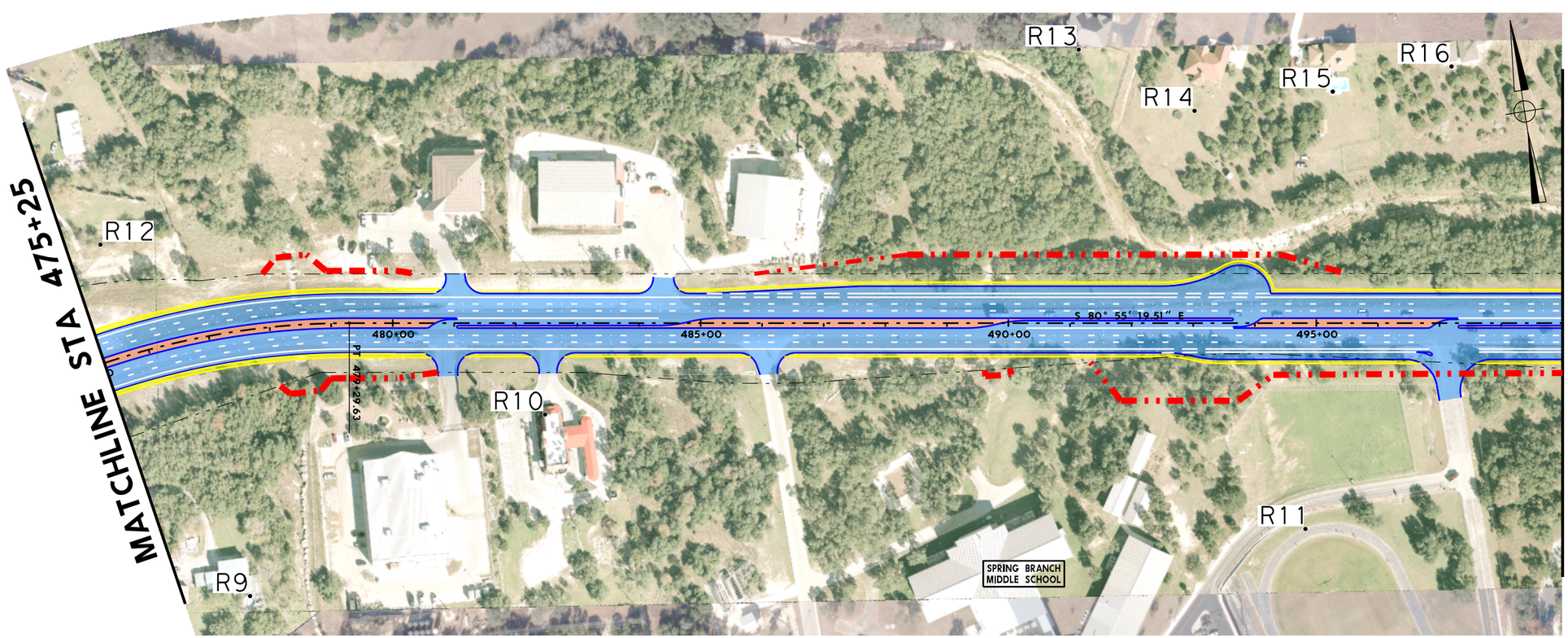

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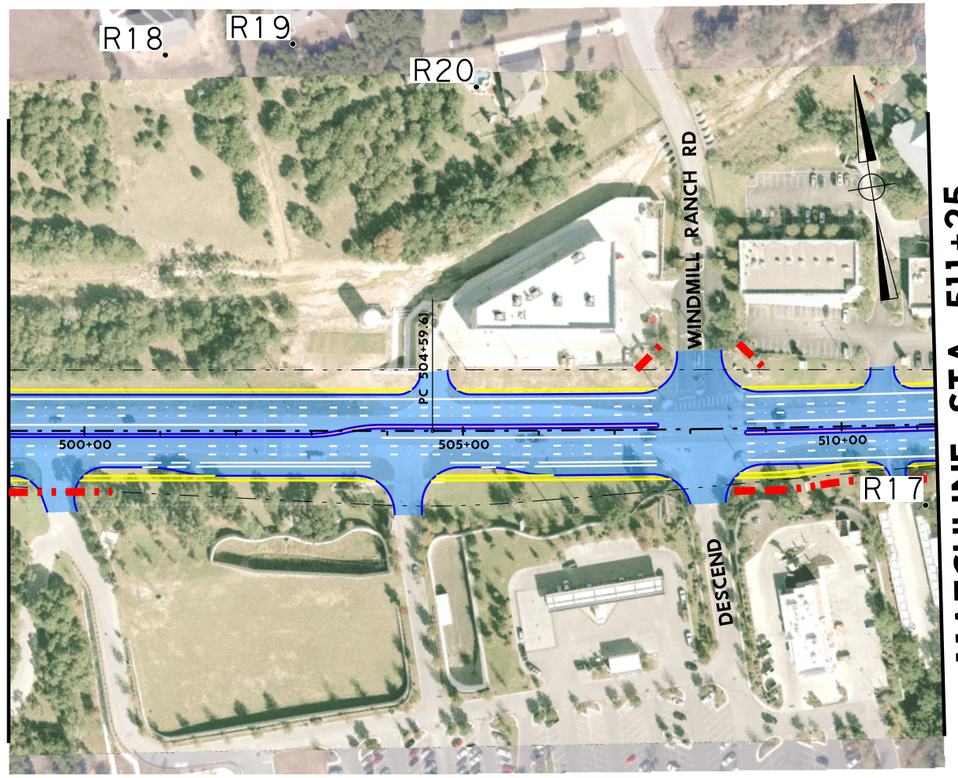

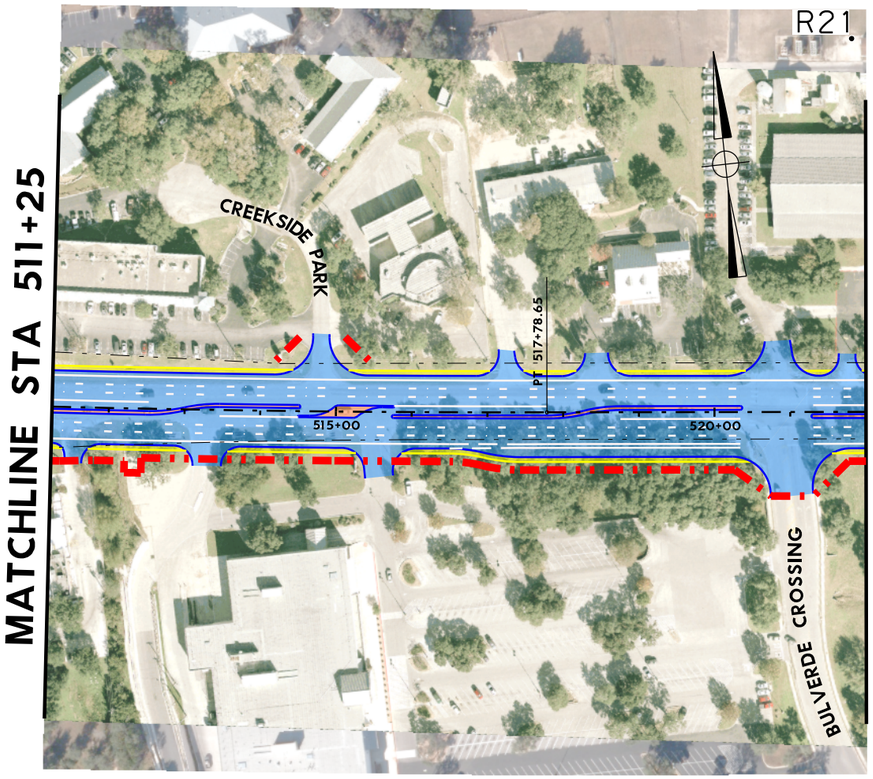

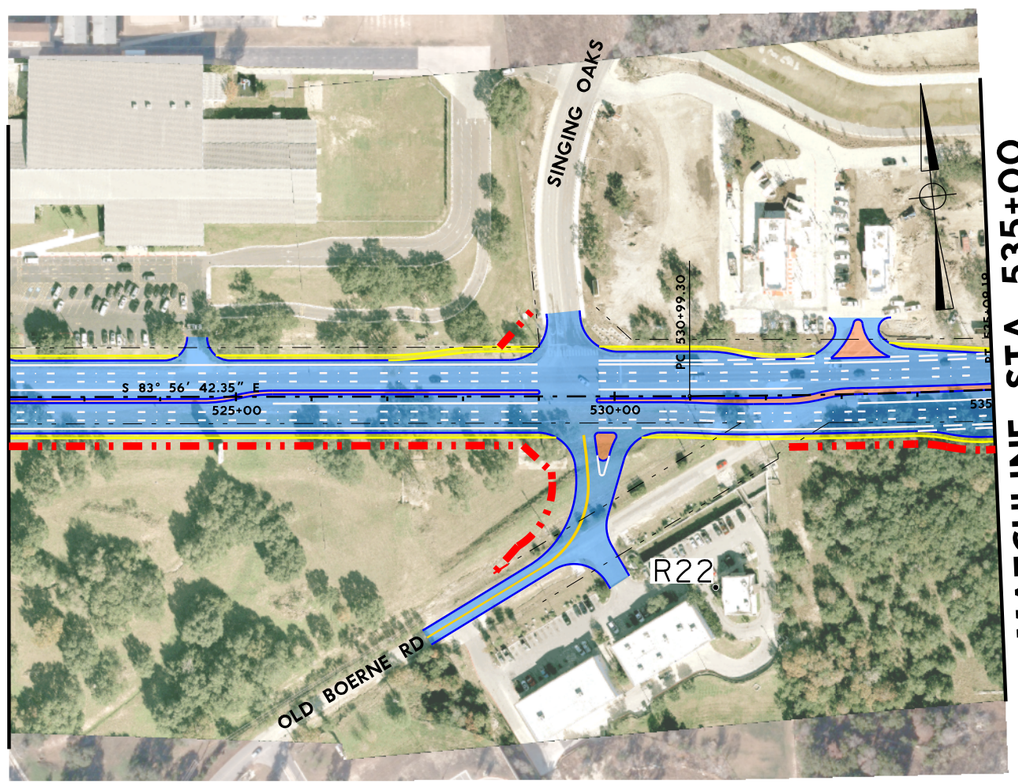

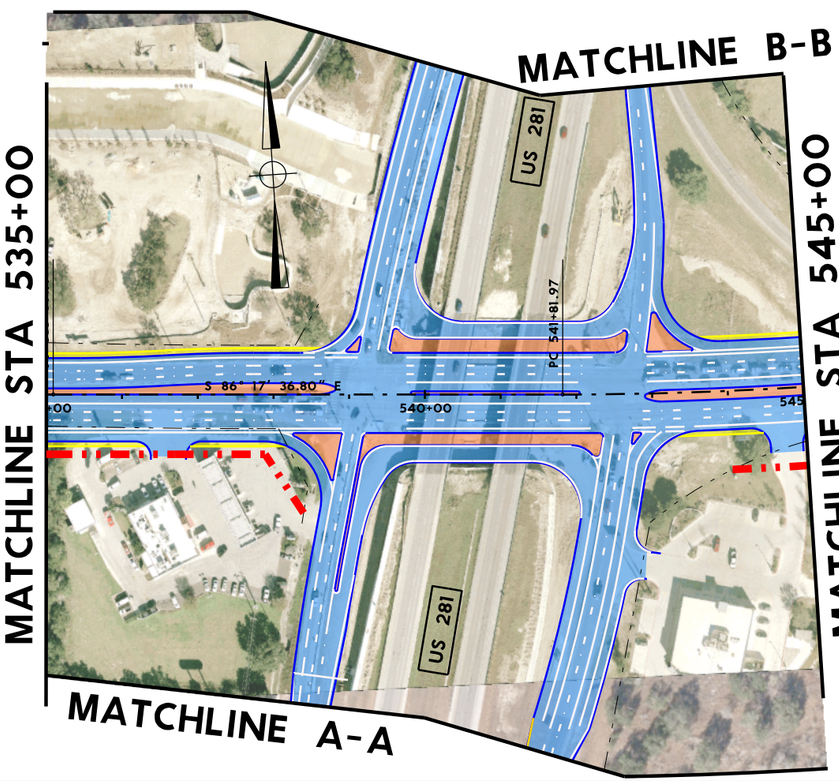

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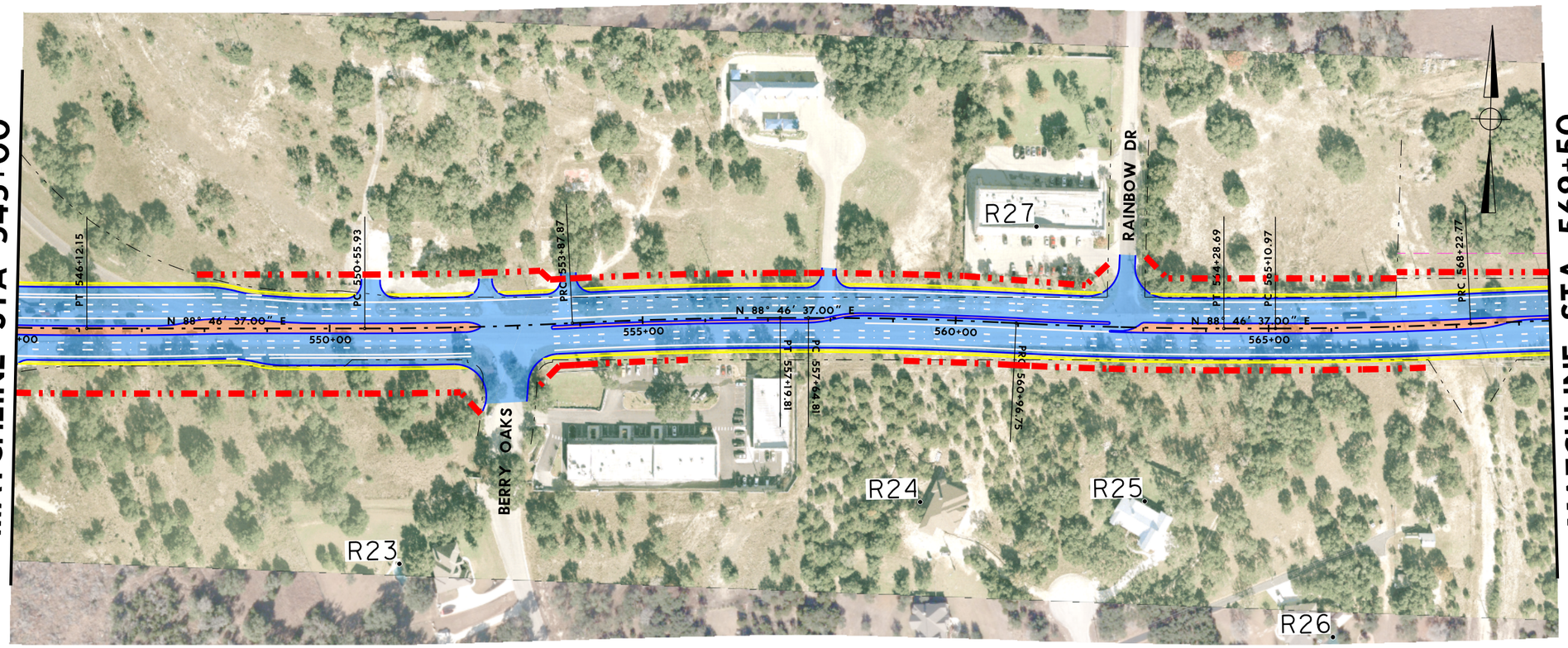

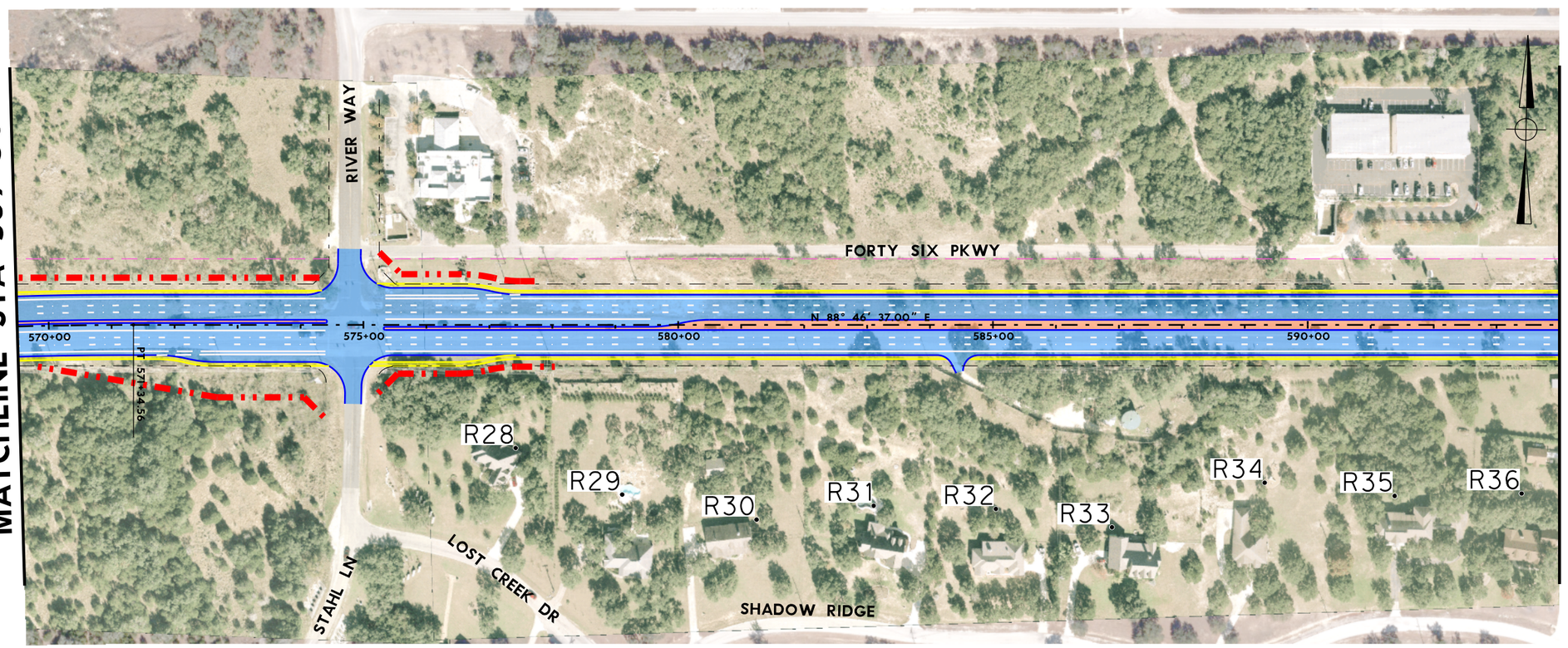

LEGEND

- PROPOSED EDGE OF PAVEMENT
- EXISTING PARCEL LINE
- EXISTING ROW
- EXISTING EASEMENT
- PROPOSED ROW
- PAVEMENT
- BRIDGE
- SIDEWALK
- MEDIAN
- R#• NON IMPACTED NOISE RECIEVERS
- R#• IMPACTED NOISE RECIEVERS

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NOISE RECEIVERS

SH46
FROM BULVERDE ROAD TO FM 3159
COMAL COUNTY

RPS Klotz Proj. No: 0121.077.001	Exhibit A
Scale: 1"=200'	
Date: OCTOBER 2016	

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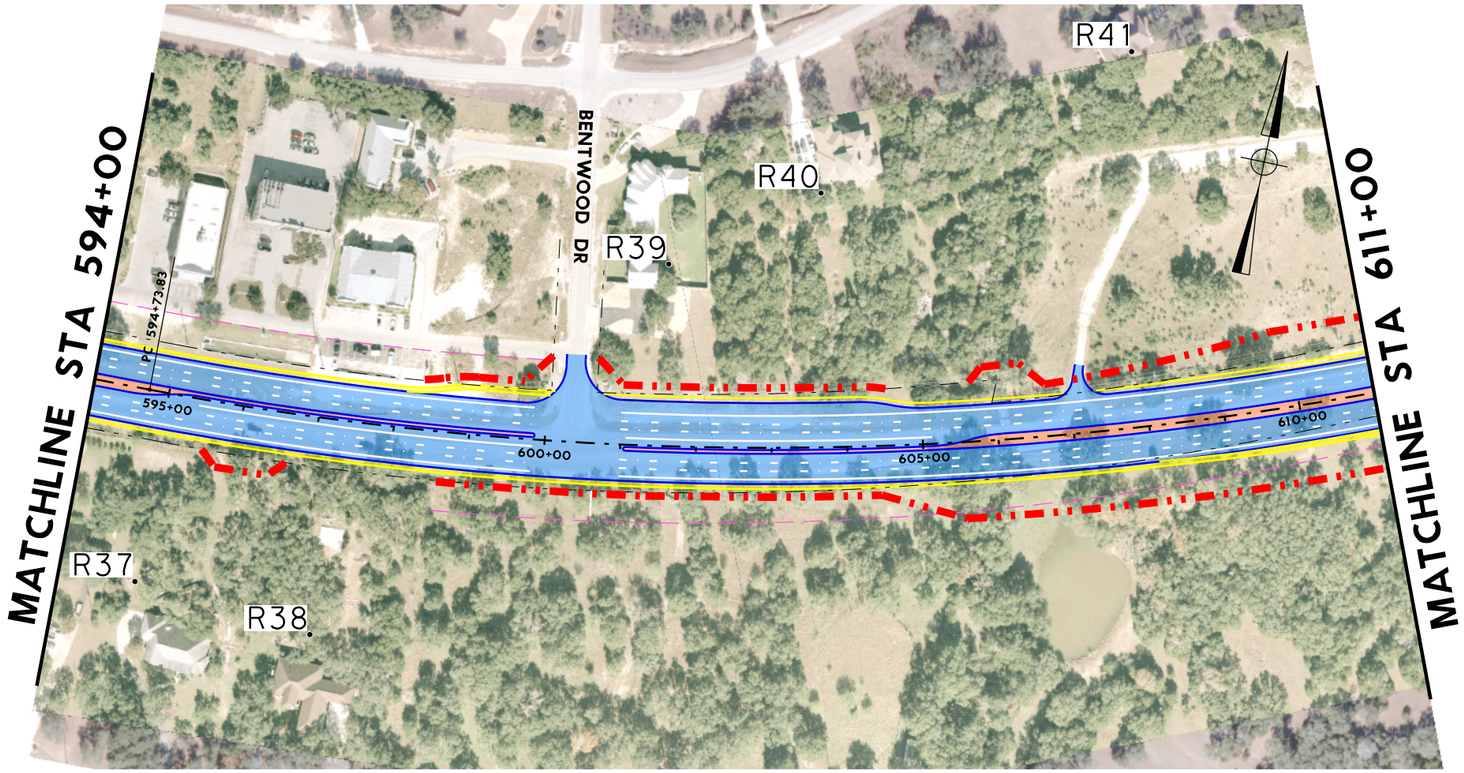

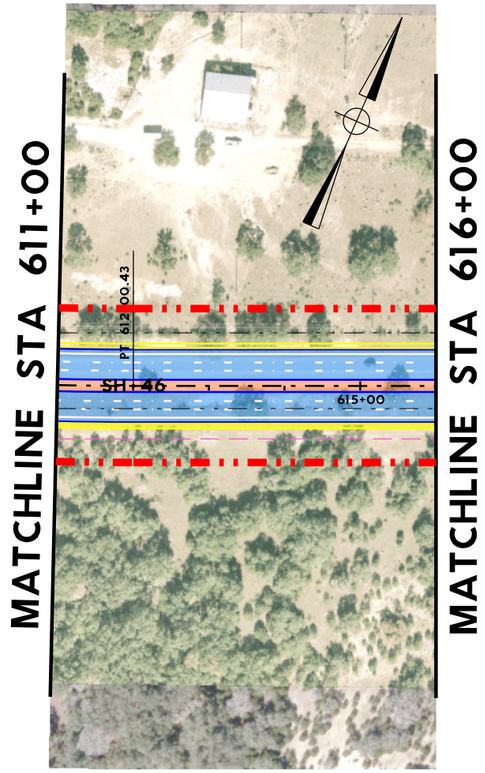

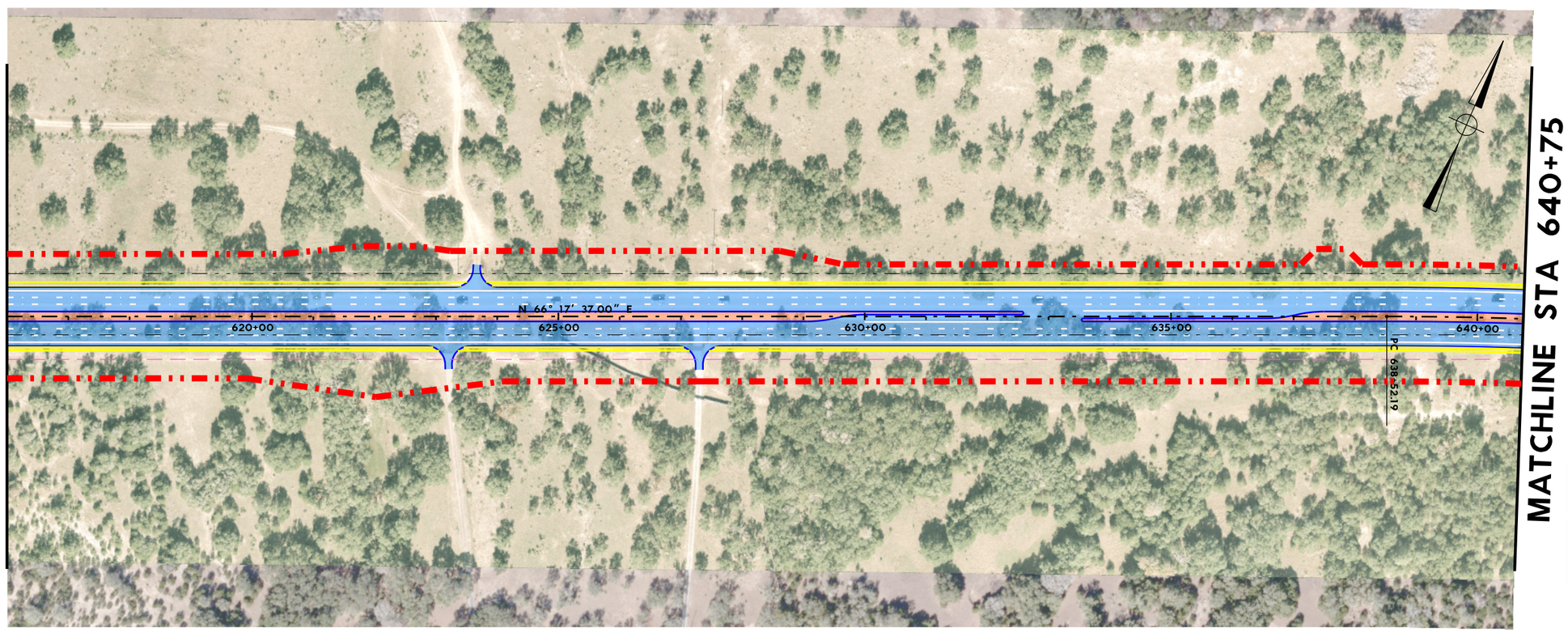

LEGEND

- PROPOSED EDGE OF PAVEMENT
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- EXISTING ROW
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NOISE RECEIVERS

SH46
FROM BULVERDE ROAD TO FM 3159
COMAL COUNTY

RPS Klotz Proj. No: 0121.077.001	Exhibit
Scale: 1"=200'	A
Date: OCTOBER 2016	

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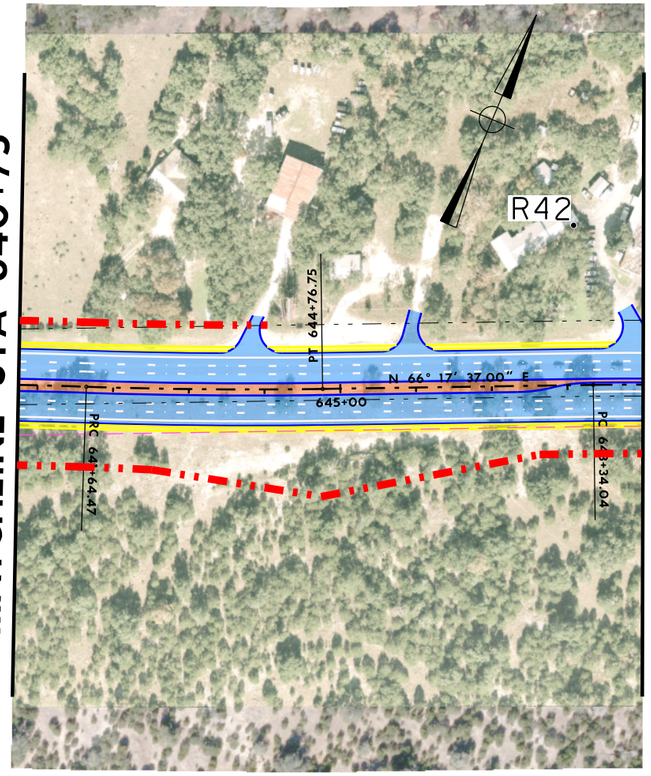

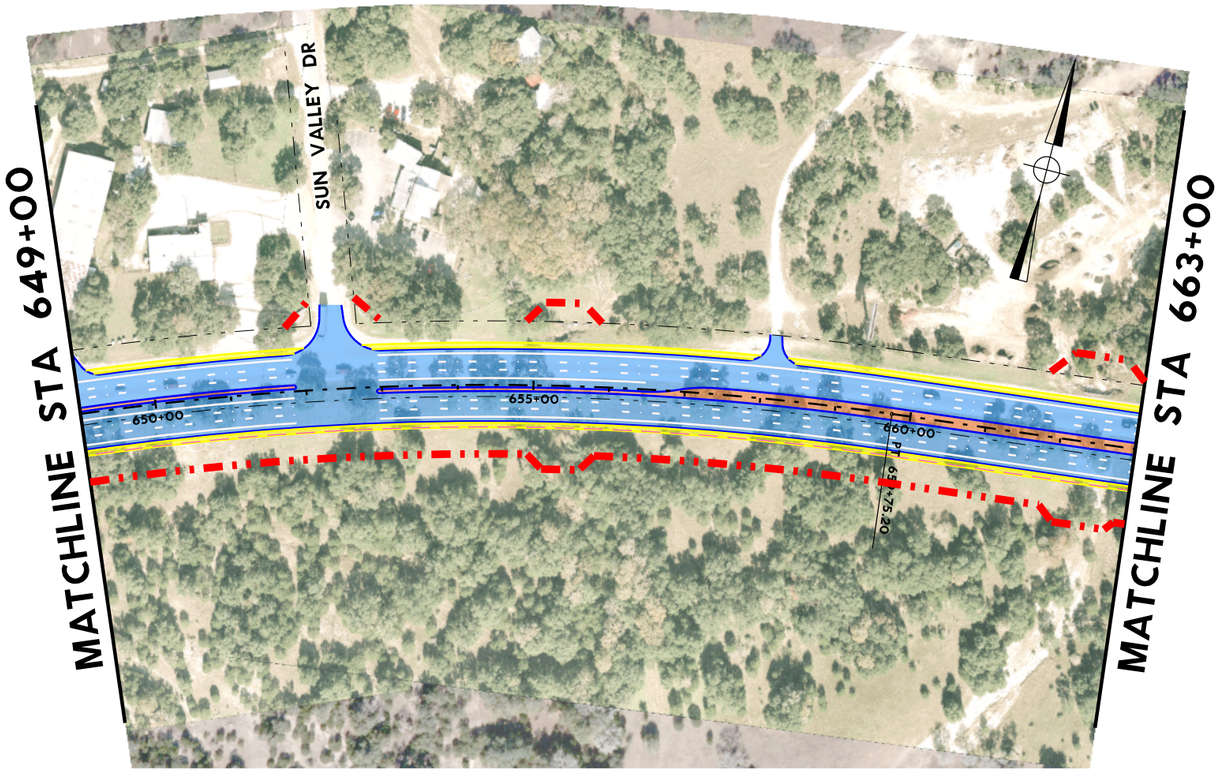

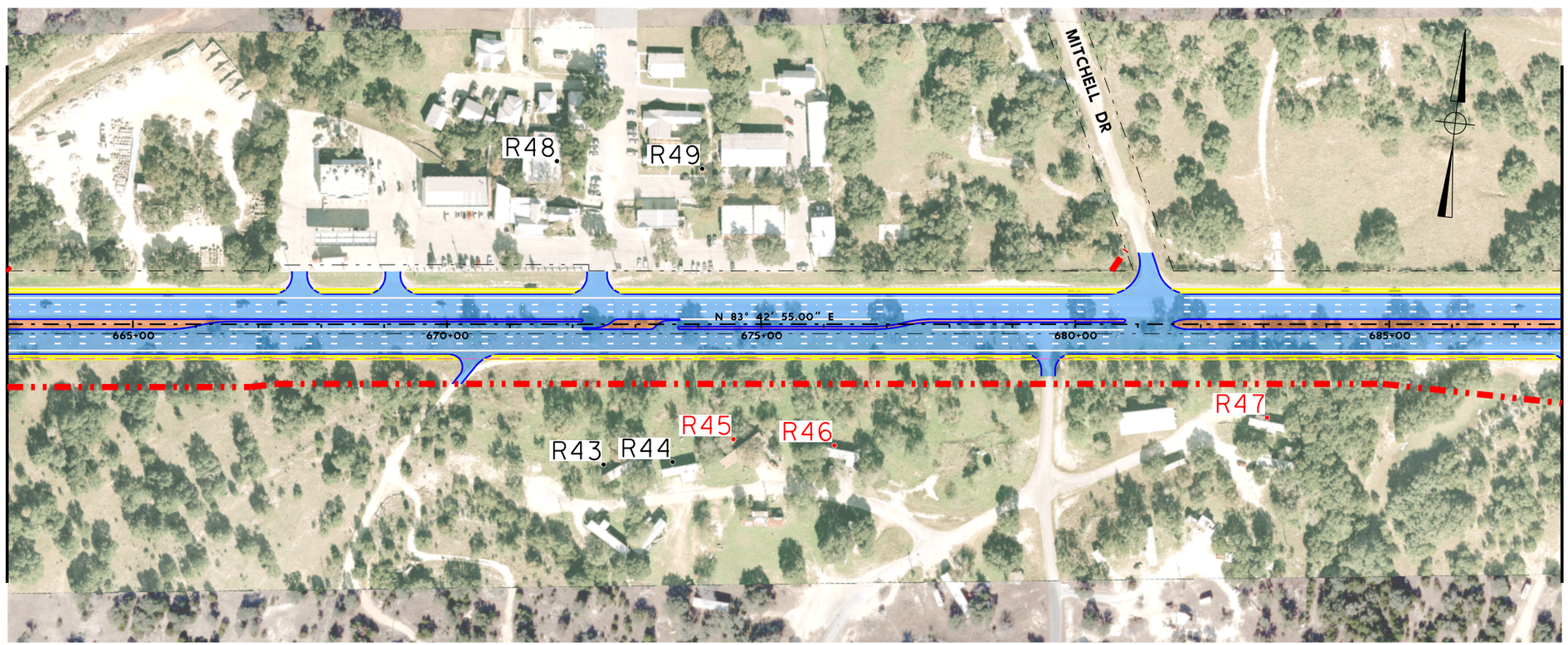

LEGEND

- PROPOSED EDGE OF PAVEMENT
- EXISTING PARCEL LINE
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NOISE RECEIVERS

SH46
FROM BULVERDE ROAD TO FM 3159
COMAL COUNTY

RPS Klotz Proj. No: 0121.077.001	Exhibit
Scale: 1"=200'	A
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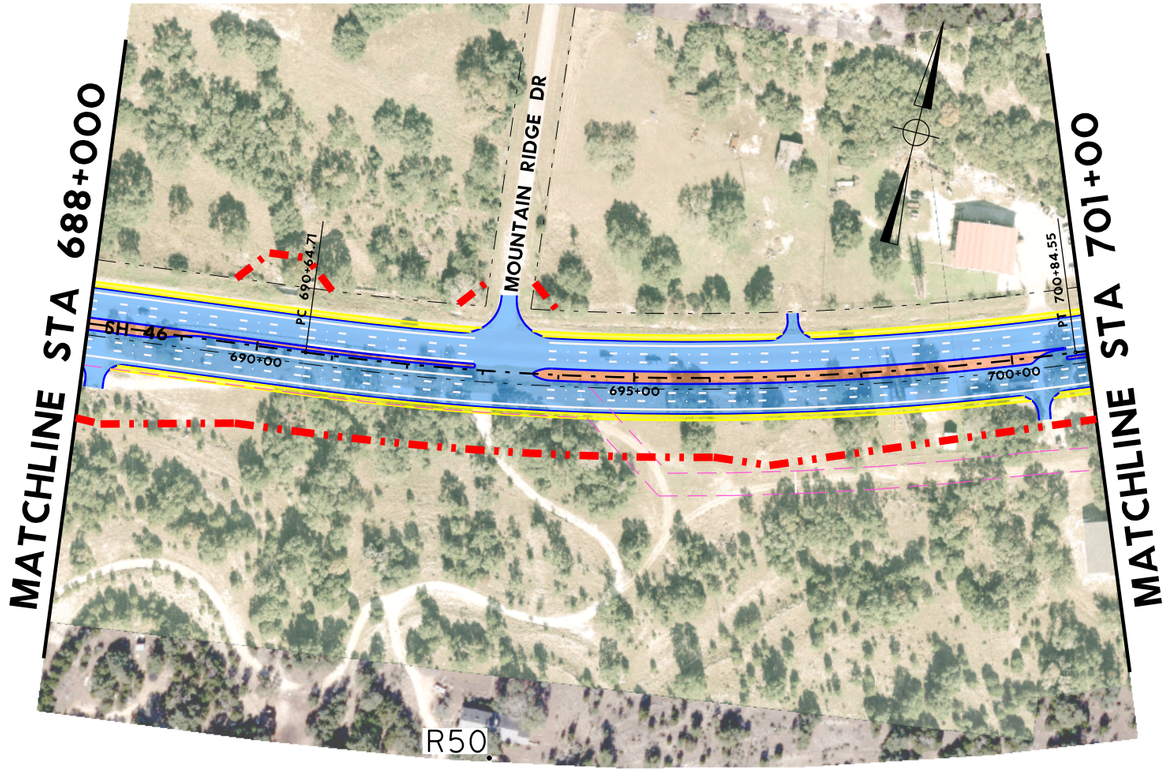

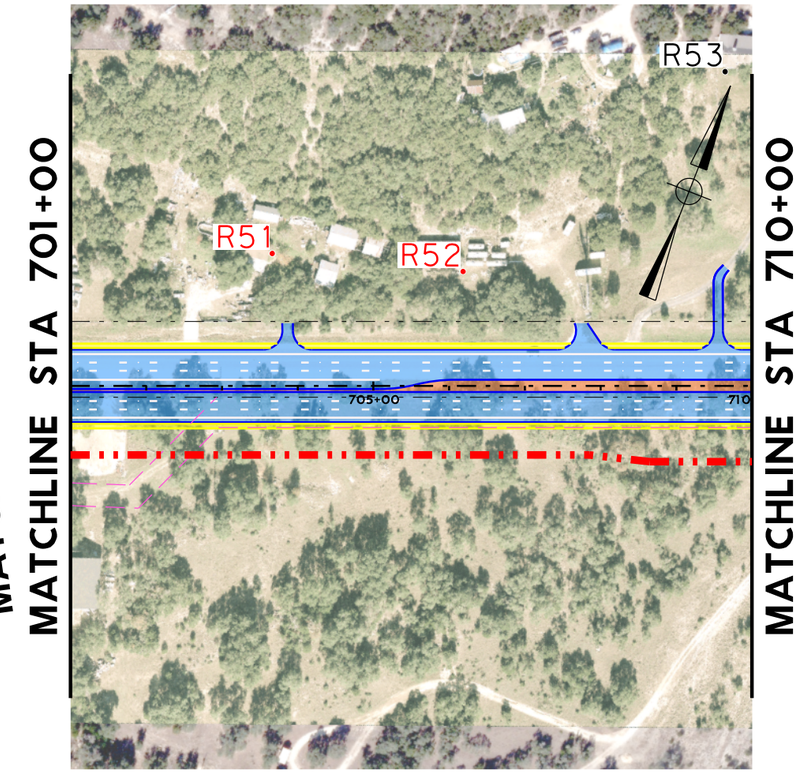

LEGEND

- PROPOSED EDGE OF PAVEMENT
- EXISTING PARCEL LINE
- EXISTING ROW
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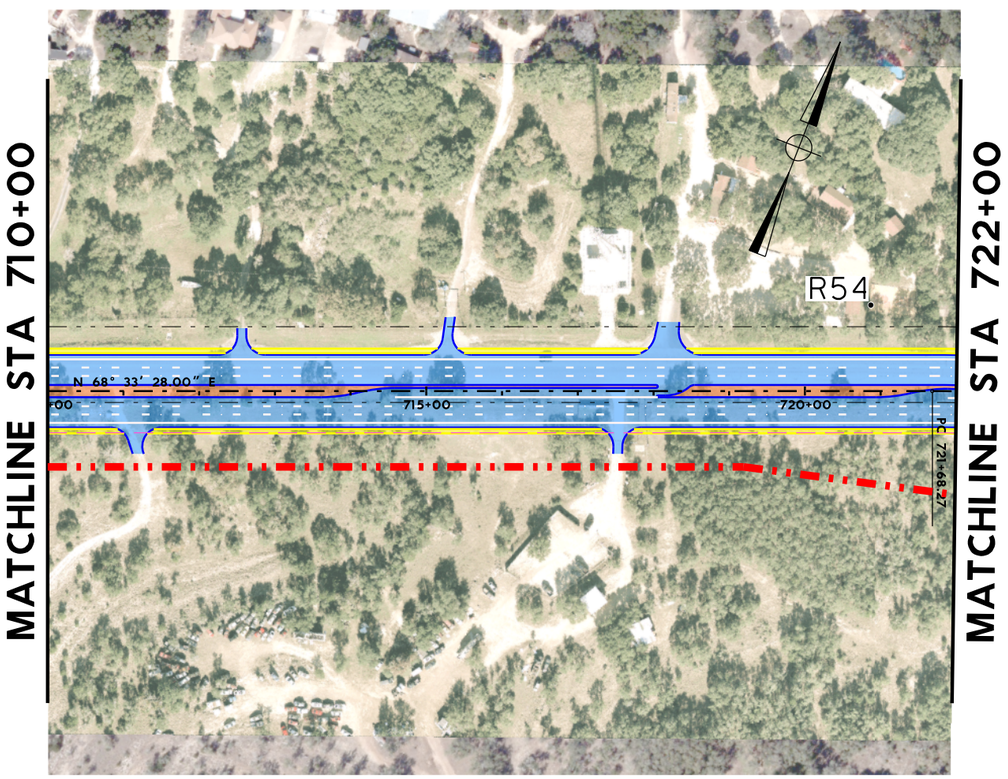

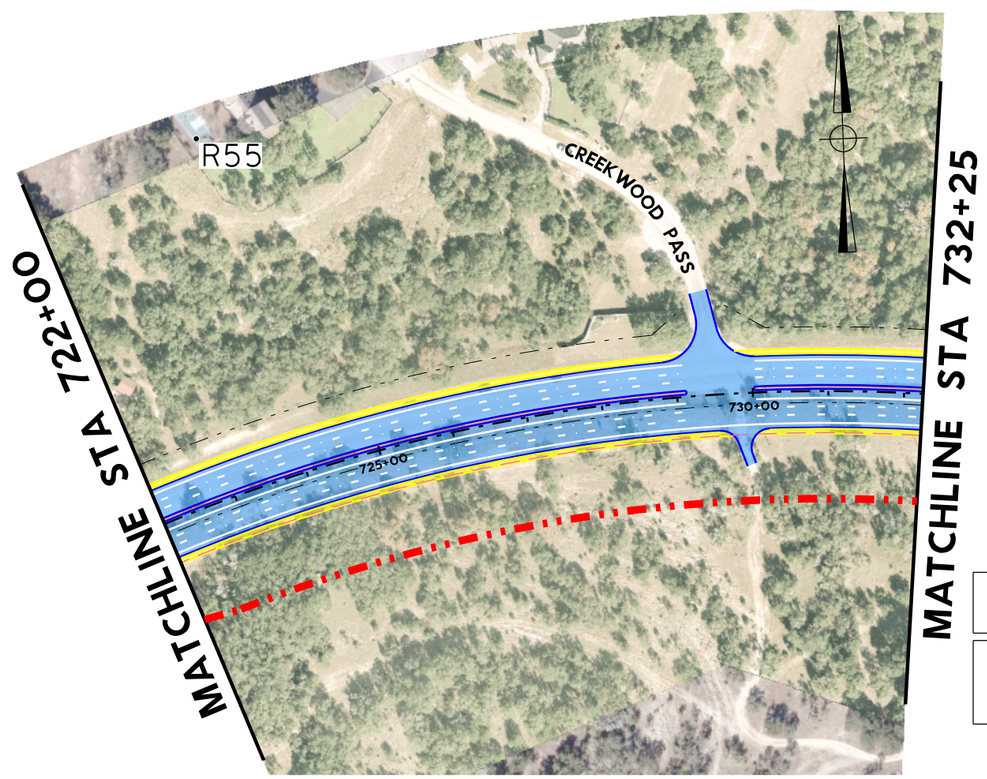

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NOISE RECEIVERS

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COMAL COUNTY

RPS Klotz Proj. No: 0121.077.001	Exhibit
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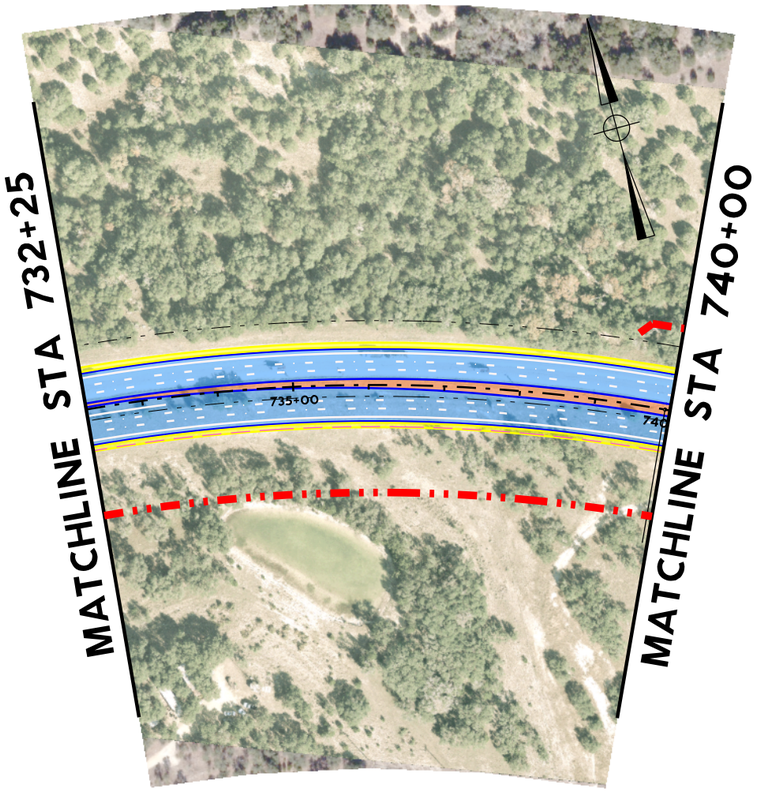

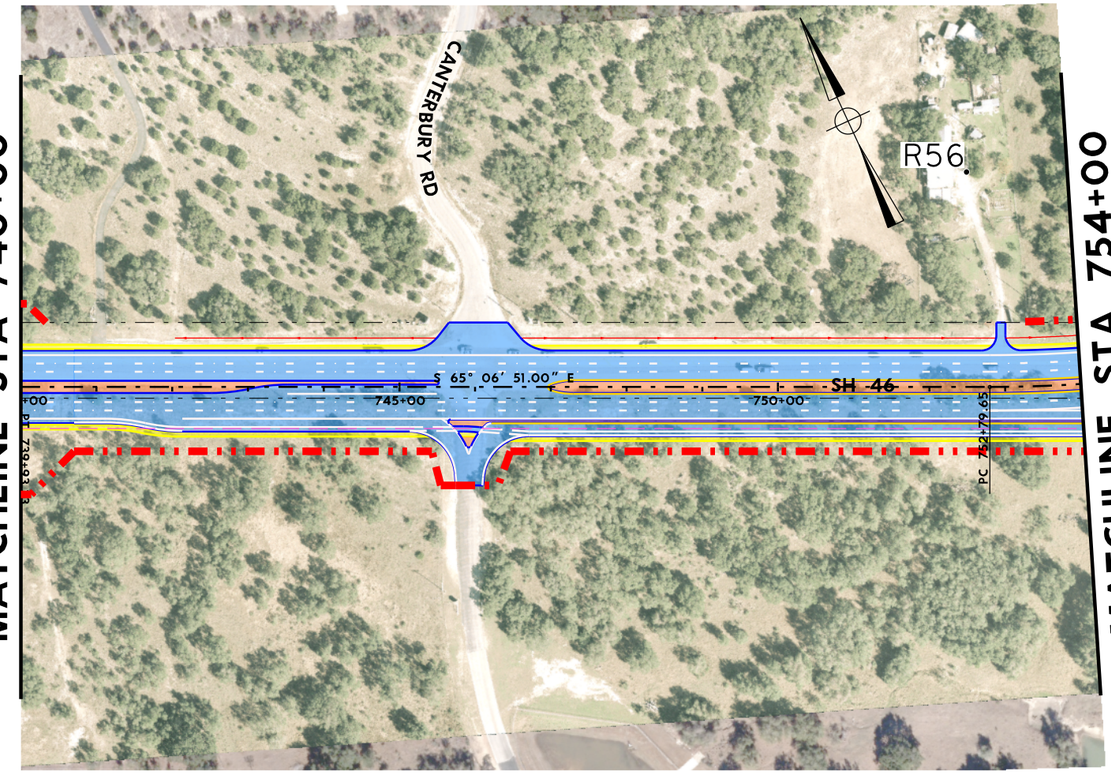

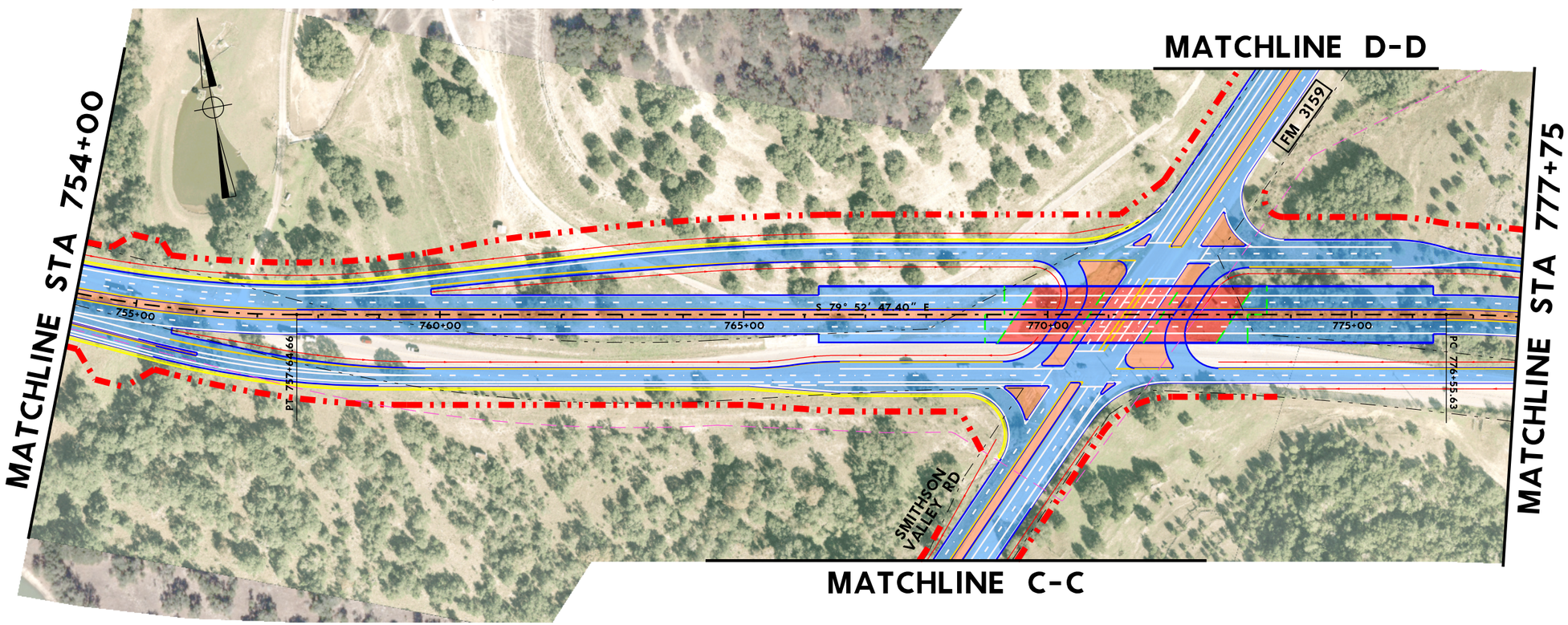

LEGEND

- PROPOSED EDGE OF PAVEMENT
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FROM BULVERDE ROAD TO FM 3159
COMAL COUNTY

RPS Klotz Proj. No: 0121.077.001	Exhibit
Scale: 1"=200'	A
Date: OCTOBER 2016	

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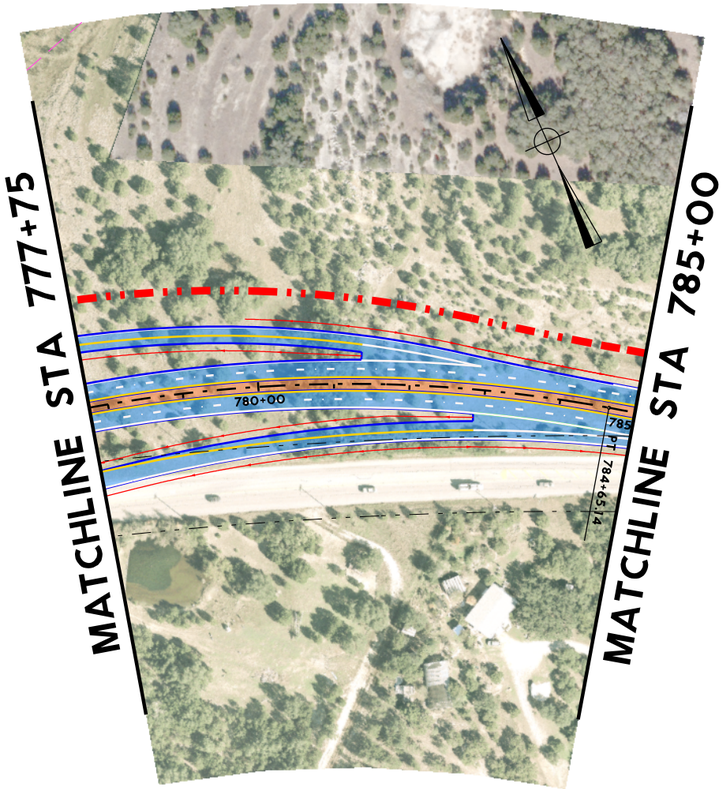

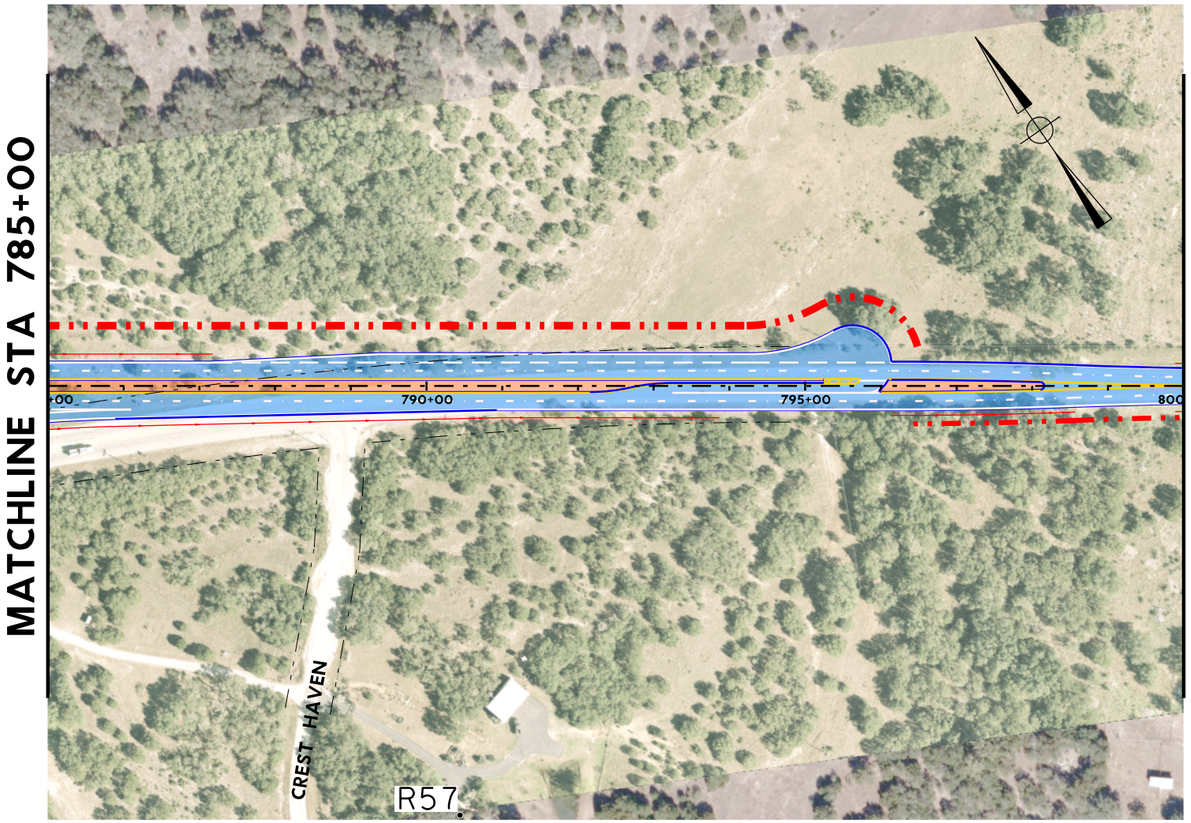

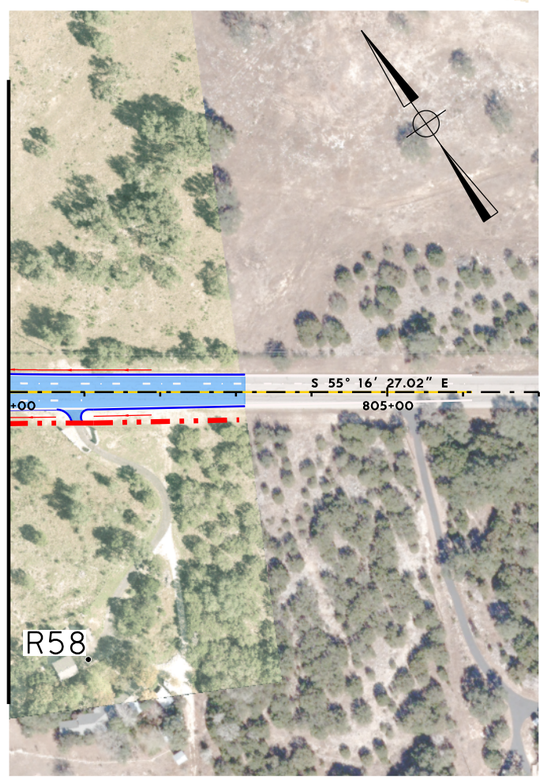

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FROM BULVERDE ROAD TO FM 3159
COMAL COUNTY

RPS Klotz Proj. No: 0121.077.001	Exhibit A
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Date: OCTOBER 2016	

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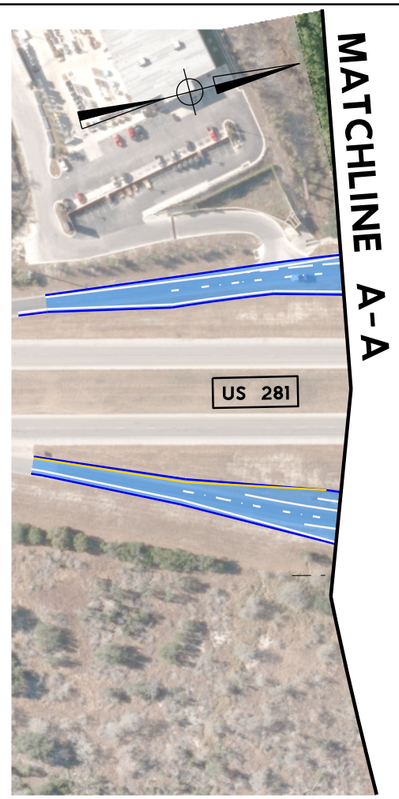

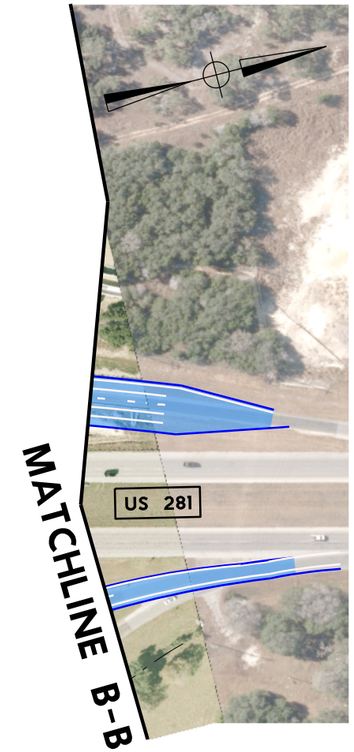

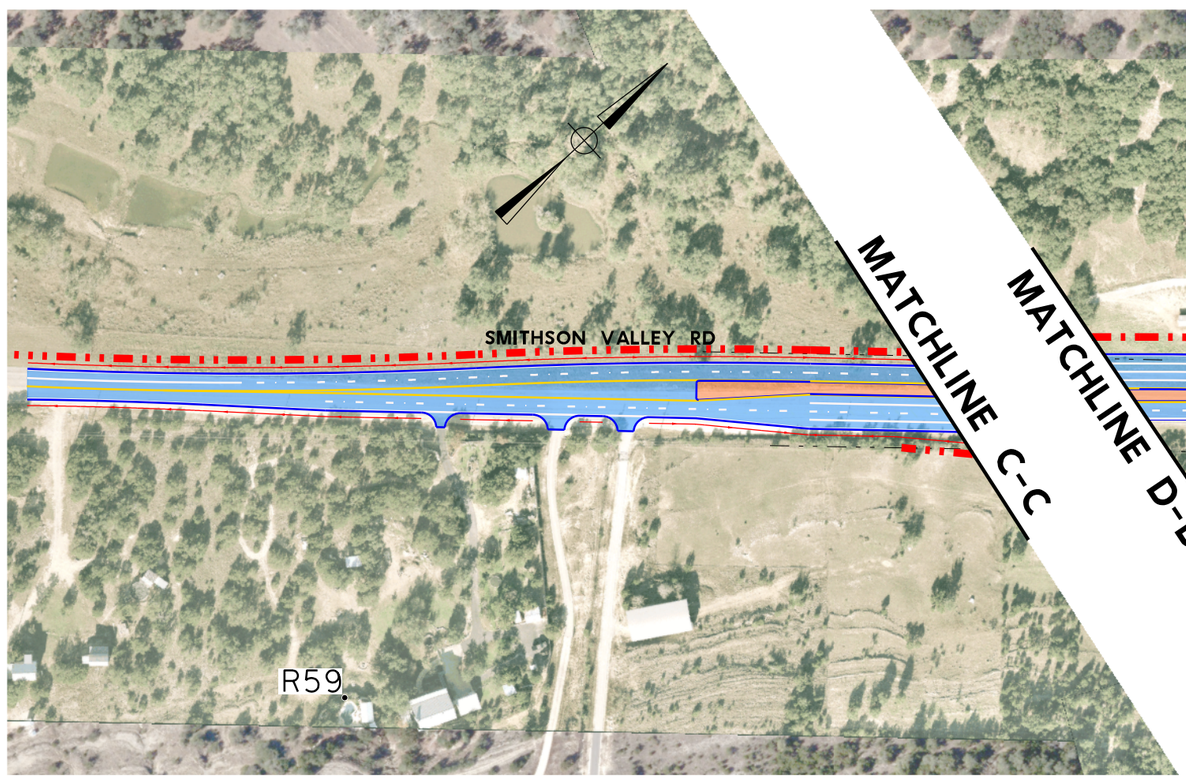

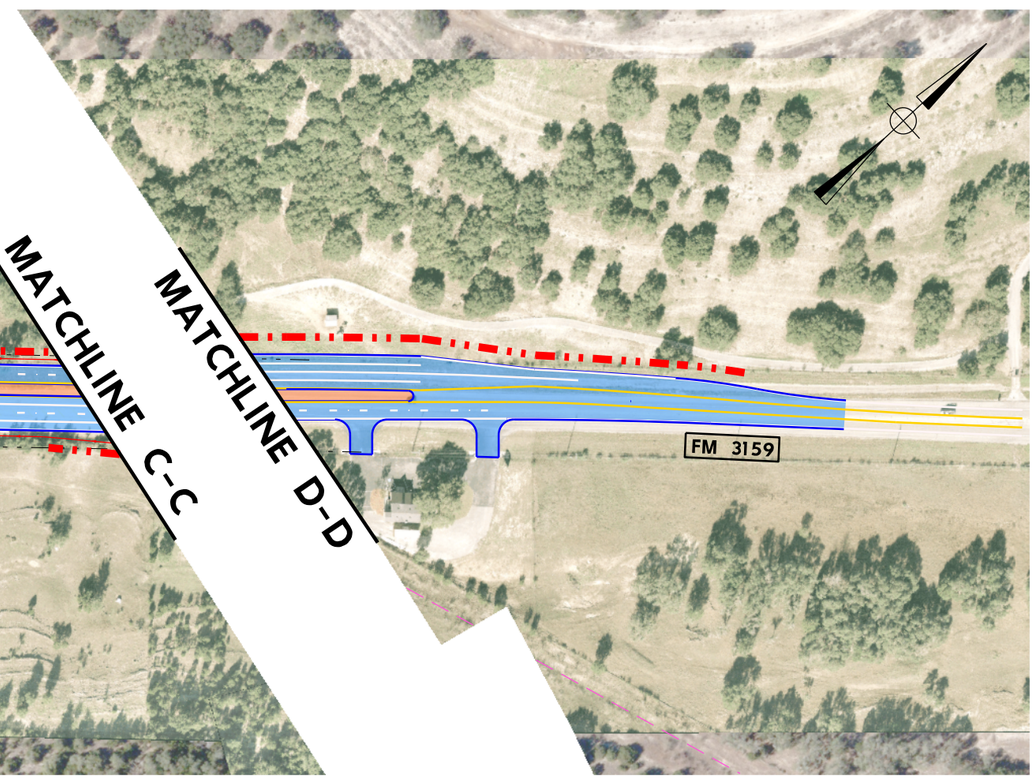

LEGEND

- PROPOSED EDGE OF PAVEMENT
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FROM BULVERDE ROAD TO FM 3159
COMAL COUNTY

RPS Klotz Proj. No: 0121.077.001	Exhibit
Scale: 1"=200'	A
Date: OCTOBER 2016	

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