



Noise Impact Analysis Technical Report

Interstate Highway 20 at Center Point Road
From 0.55 mile west of East Bankhead
Highway to Lakeshore Drive
Parker County

CSJ: 0314-07-051, 0314-07-052,
0314-07-046

Date June 2016

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.

This analysis was accomplished in accordance with TxDOT's Guidelines for Analysis and Abatement of Roadway Traffic Noise (2011), which is approved by the Federal Highway Administration (FHWA). 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.

As shown in **Table 1**, the FHWA has established the following Noise Abatement Criteria (NAC) 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		
Activity Category	dB(A) Leq	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
C	67 (exterior)	Active sport areas, amphitheatres, 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

Table 1. FHWA Noise Abatement Criteria		
Activity Category	dB(A) Leq	Description of Land Use Activity Areas
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 sixty-six (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 ten (10) dB(A). For example: a noise impact would occur at a Category B residence if the existing level is fifty-four (54) dB(A) and the predicted level is sixty-five (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. The average daily traffic (ADT) volumes used to model Existing 2020 travel lanes range from a high of 63,600 vehicles

along IH-20 to a low of 100 vehicles along a westbound frontage road. The ADT volumes used to model Predicted 2040 travel lanes range from a high of 81,100 along IH-20 to a low of 200 along an eastbound frontage road.

Existing and predicted traffic noise levels were modeled at receiver locations (**Table 2** and **Figures 1A through 1G**) that represent the land use activity areas adjacent to the proposed roadway expansion project that might be impacted by traffic noise and potentially benefit from feasible and reasonable noise abatement.

Receiver	NAC Category	NAC Level	Existing 2020	Predicted 2040	Change (+/-)	Noise Impact
R1 - Residence	B	67	68	70	+2	Yes
R2 - Residence	B	67	65	67	+2	Yes
R3 - Residence	B	67	66	67	+1	Yes
R4 - Residence	B	67	62	64	+2	No
R5 - Residence	B	67	60	59	-1	No
R6 - Residence	B	67	61	61	0	No
R7 - Residence	B	67	62	65	+3	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 proposed interchange 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 (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 five (5) dB(A). The abatement measure must be able to reduce the noise level of at least one impacted, first row receiver by at least seven (7) dB(A).

Traffic management: control devices could be used to reduce the speed of the traffic; however, the minor benefit of one (1) 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 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:

R1 - This receiver represents a total of 11 residences. Many of the residences have driveways facing the roadway, and therefore, a continuous noise wall would restrict access to these residences. Gaps in a noise wall would satisfy access requirements but the resulting non-continuous wall segments would not be sufficient to achieve the minimum feasible reduction of 5 dB(A) for greater than 50% of impacted, first row receivers or reduce the noise level of at least one impacted, first row receivers by at least 7 dB(A).

R2 and R3 - These receivers are separate, individual residences. Noise walls at these residences would not be sufficient to achieve the minimum feasible reduction of 5 dB(A), much less the 7 dB(A) reduction needed for at least one impacted, first row receiver.

None of the above noise abatement measures would be both feasible and reasonable; therefore, no abatement measures are proposed for this project. Any subsequent project design changes may require a reevaluation of the traffic noise impacts.

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 (2040) noise impact contours (**Table 3**).

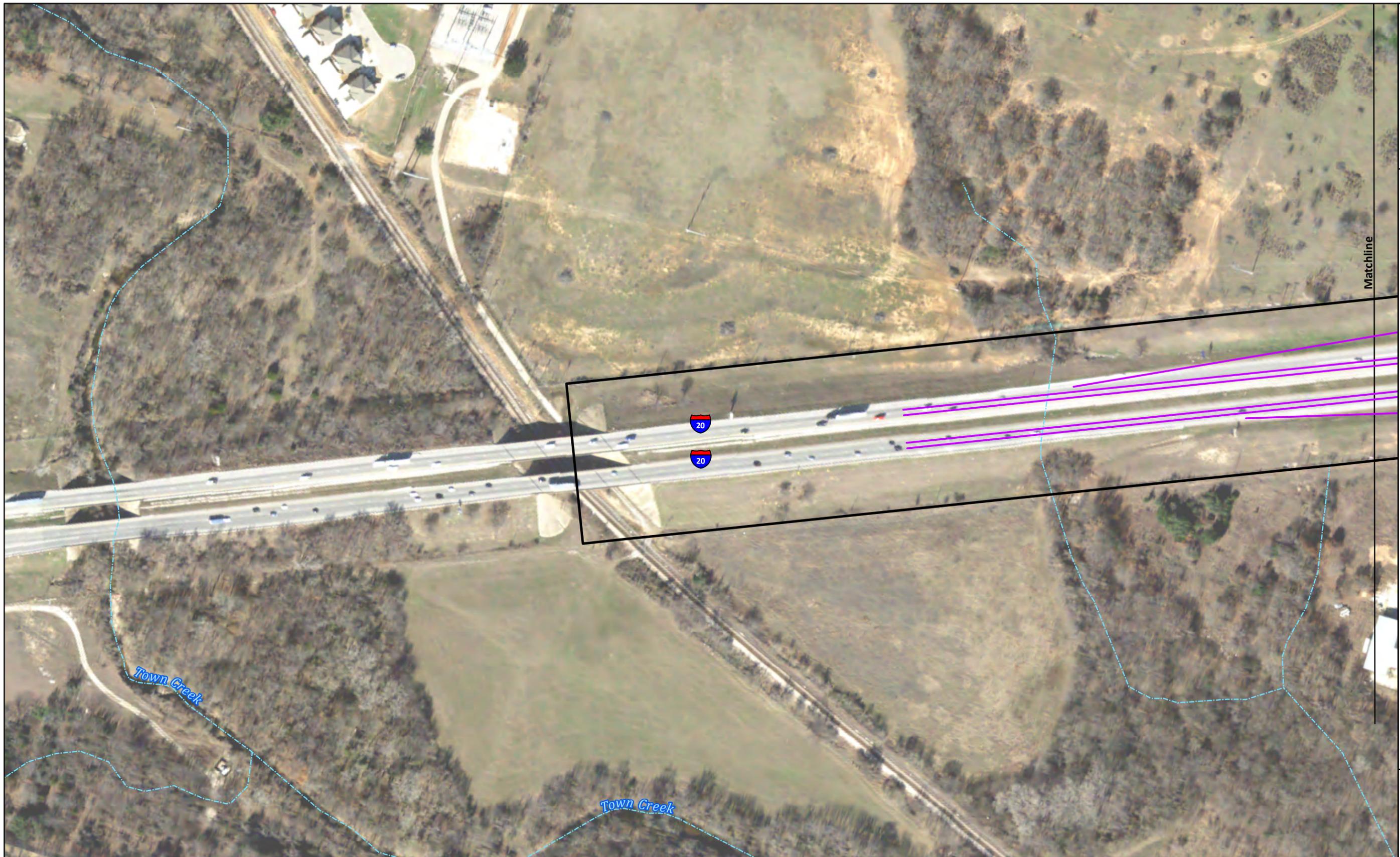
Table 3. Noise Impact Contours		
Land Use	Impact Contour	Distance from Right of Way
NAC category B&C	66 dB (A)	30 feet
NAC category E	71 dB (A)	160 feet

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 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.

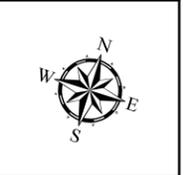
A copy of this traffic noise analysis will be available to local officials. On the date of approval of this document (Date of Public Knowledge), FHWA and TxDOT are no longer responsible for providing noise abatement for new development adjacent to the project.

Figures

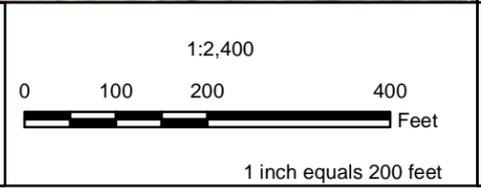
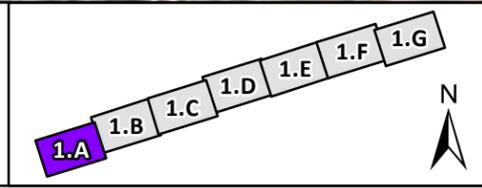


PROJECT NO.	PRK12278
DATE CREATED	6/8/2016
DATUM & COORDINATE SYSTEM	NAD83 State Plane (feet) Texas North Central
FILE NAME	Noise_Proposed_Design2040_20160608
PREPARED BY	SSJ

PARKER CO.
IH 20 AT CENTER POINT ROAD
 Proposed Design Year 2040

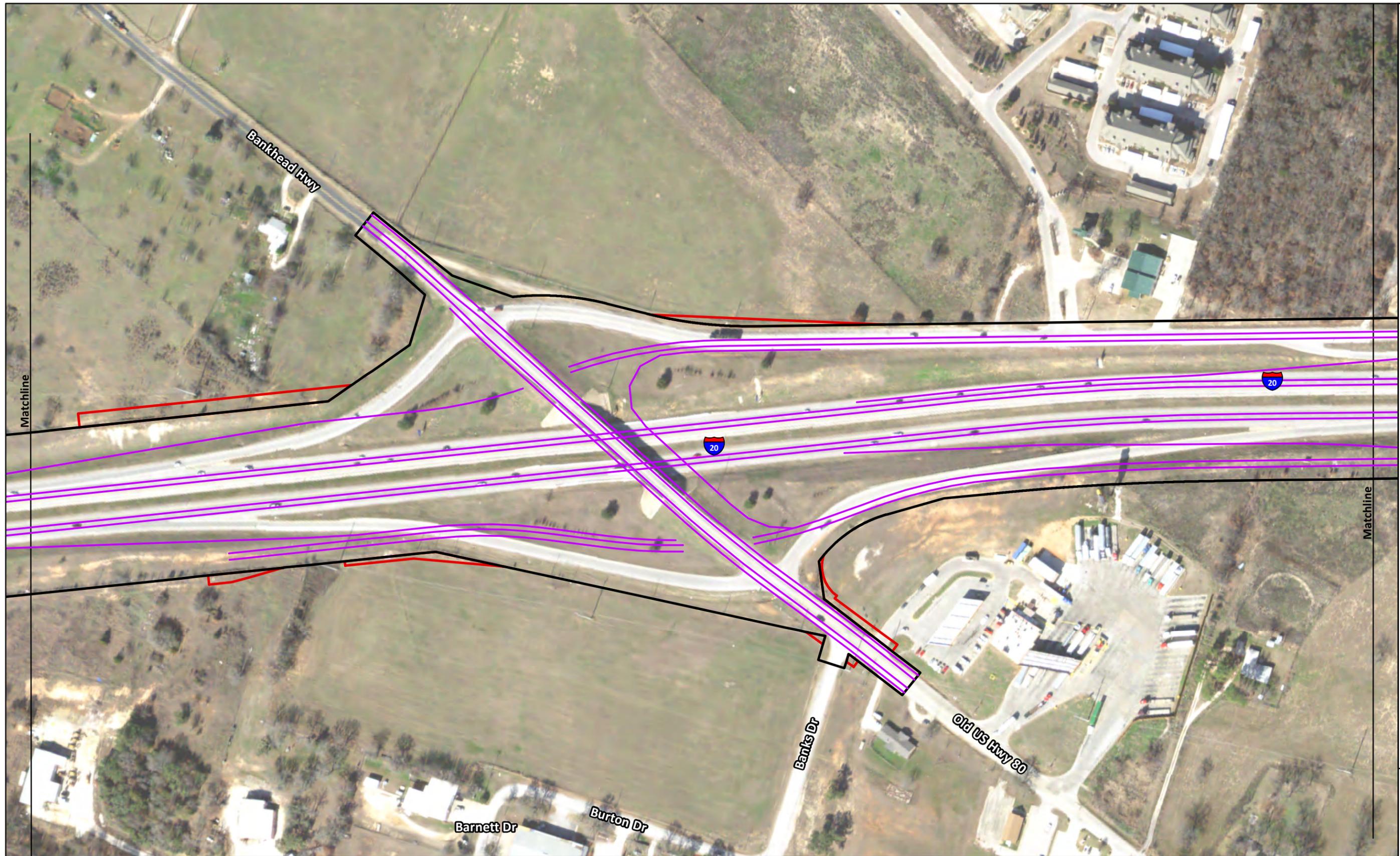


- Impacted Receiver
- Non-Impacted Receiver
- Proposed Travel Lanes
- Existing ROW
- Proposed ROW
- Existing Easement
- Proposed Permanent Easement
- Proposed Temporary Easement
- ~ Streams



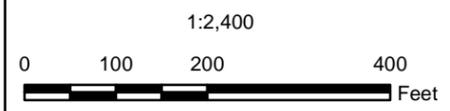
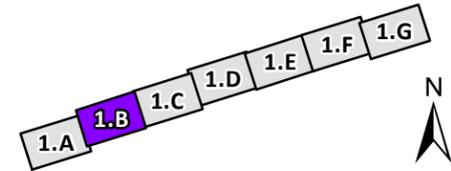
1.A
FIGURE

CSJ 0314-07-046, 051, 052



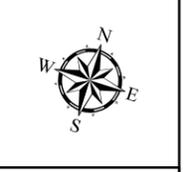
- Impacted Receiver
- Non-Impacted Receiver
- Proposed Travel Lanes
- Existing ROW
- Proposed ROW
- Existing Easement
- Proposed Permanent Easement
- Proposed Temporary Easement
- ~ Streams

CSJ 0314-07-046, 051, 052

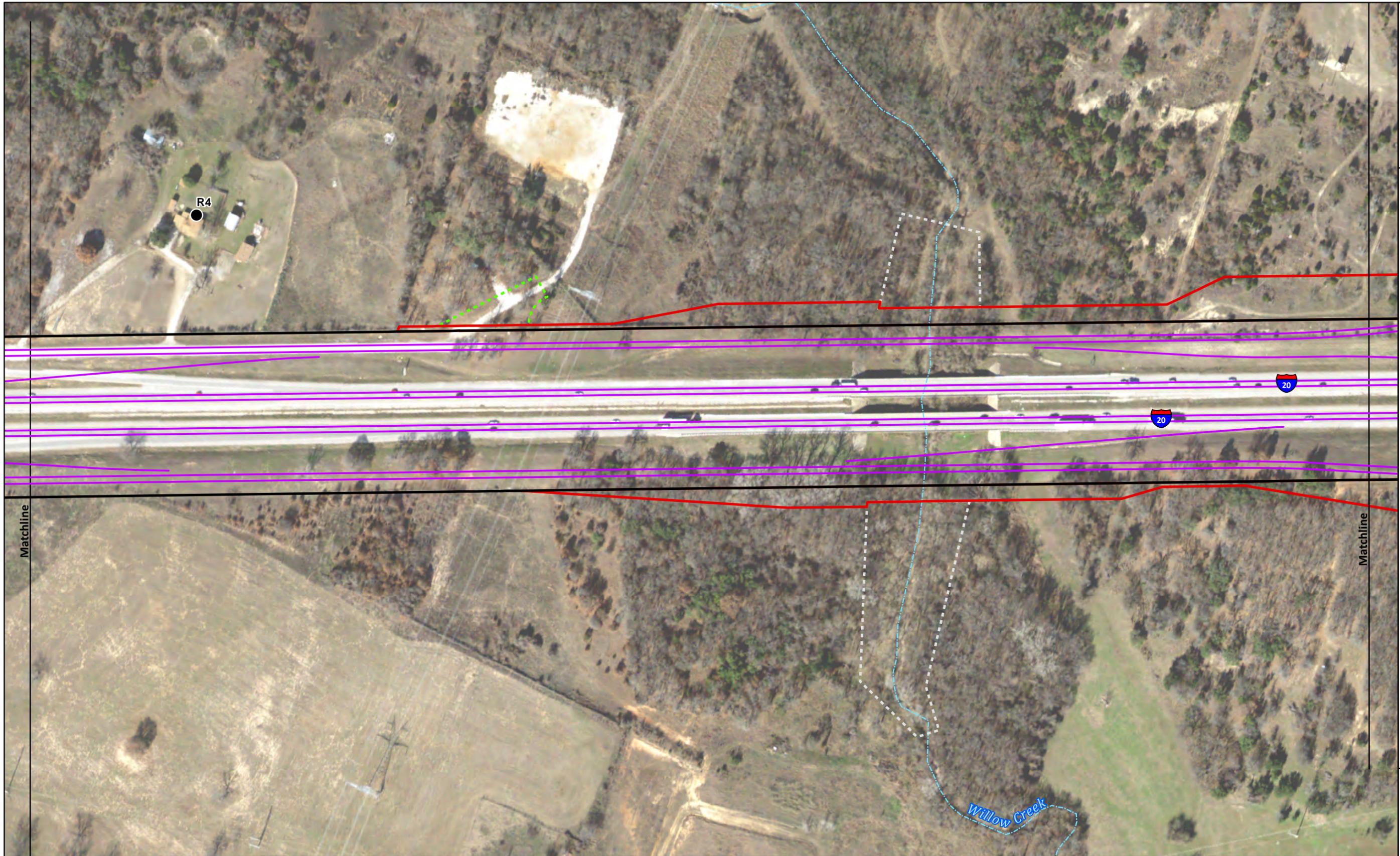


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IH 20 AT CENTER POINT ROAD
 Proposed Design Year 2040



1.B
FIGURE

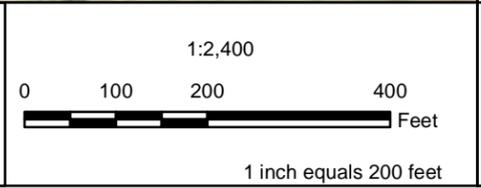
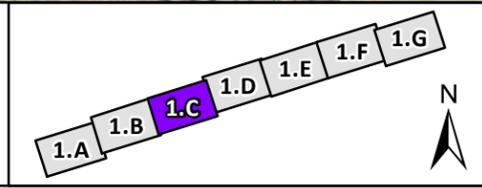


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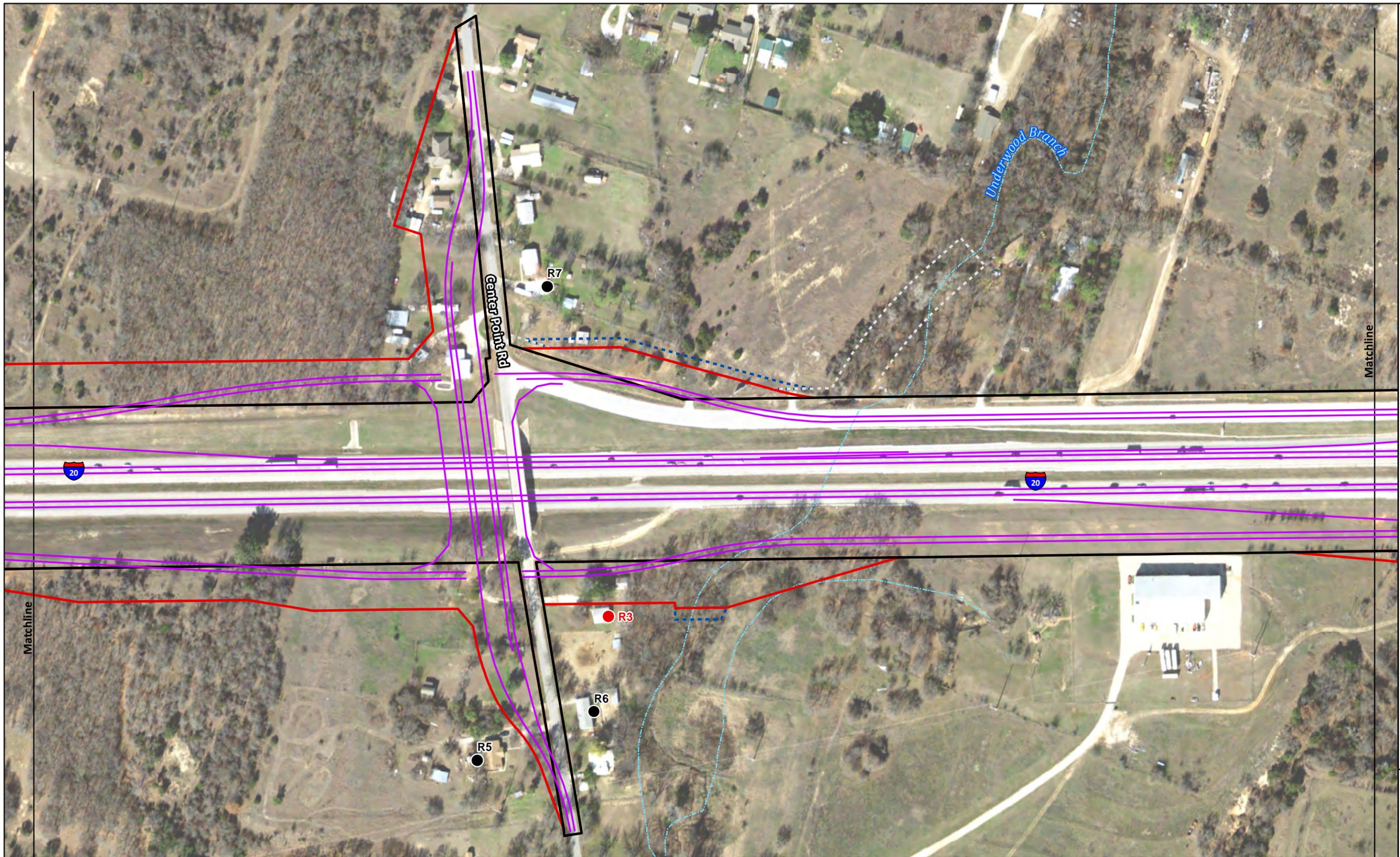
PARKER CO.
 IH 20 AT CENTER POINT ROAD
 Proposed Design Year 2040



- Impacted Receiver
- Non-Impacted Receiver
- Proposed Travel Lanes
- Existing ROW
- Proposed ROW
- Existing Easement
- Proposed Permanent Easement
- Proposed Temporary Easement
- ~ Streams

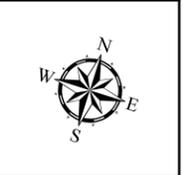


1.C
FIGURE

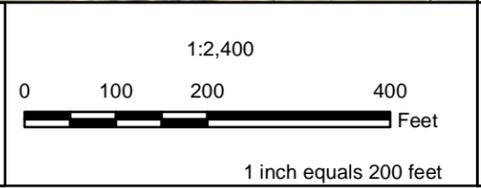
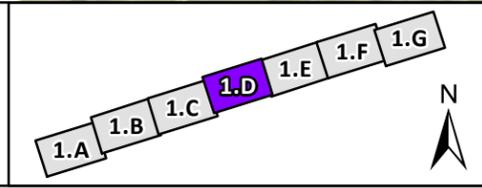


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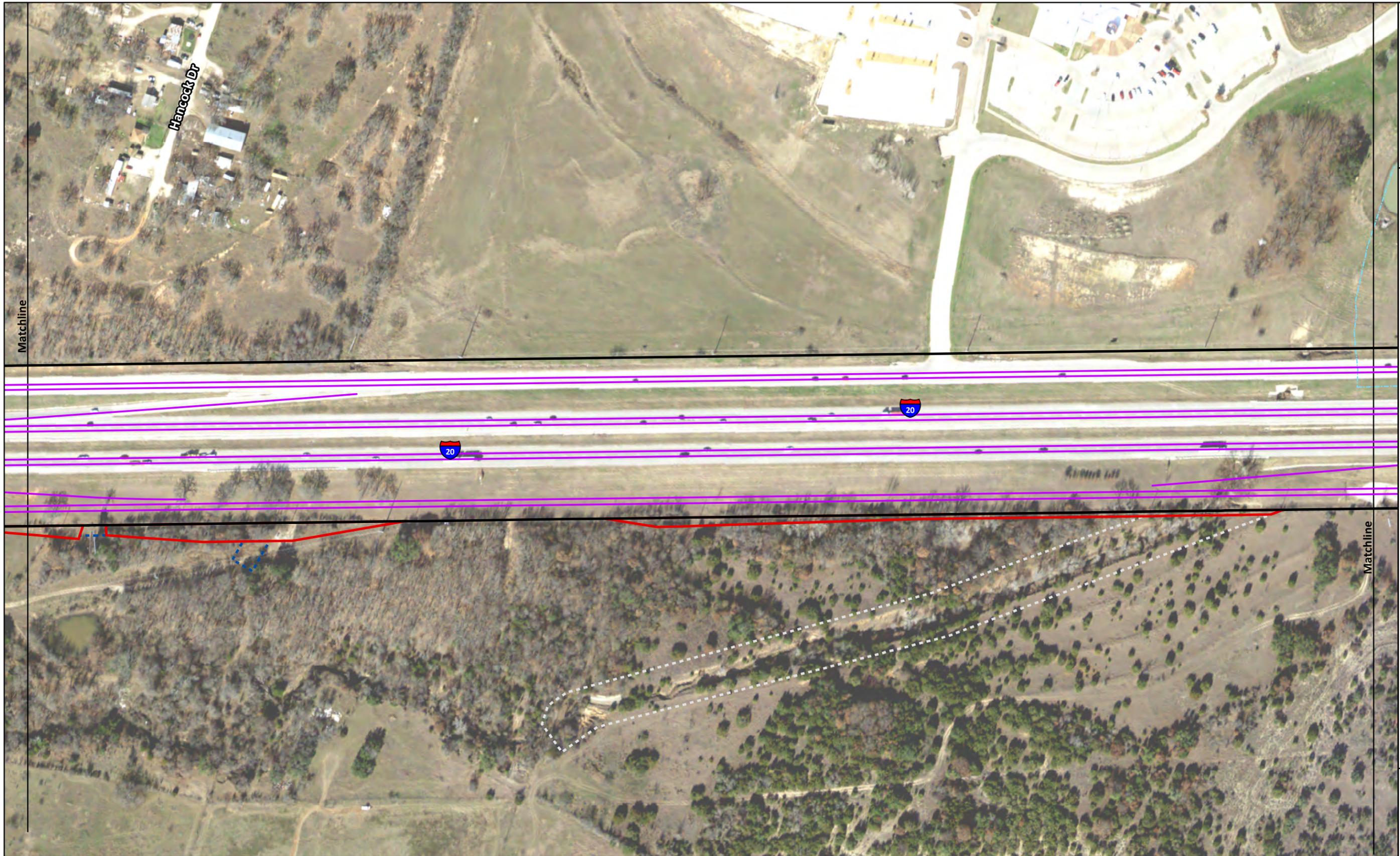
PARKER CO.
IH 20 AT CENTER POINT ROAD
 Proposed Design Year 2040



- Impacted Receiver
- Non-Impacted Receiver
- Proposed Travel Lanes
- Existing ROW
- Proposed ROW
- Existing Easement
- Proposed Permanent Easement
- Proposed Temporary Easement
- ~ Streams



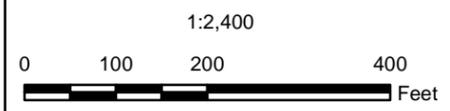
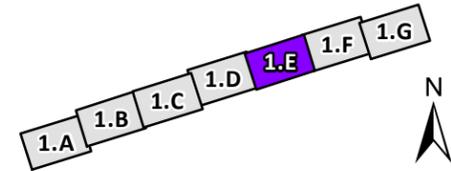
1.D
FIGURE



- Impacted Receiver
- Non-Impacted Receiver
- Proposed Travel Lanes

- ▭ Existing ROW
- ▭ Proposed ROW
- ▭ Existing Easement

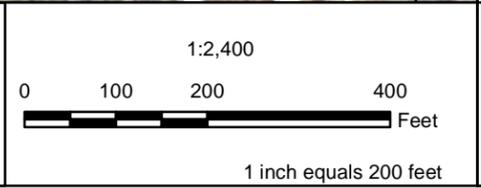
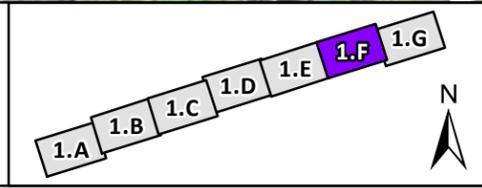
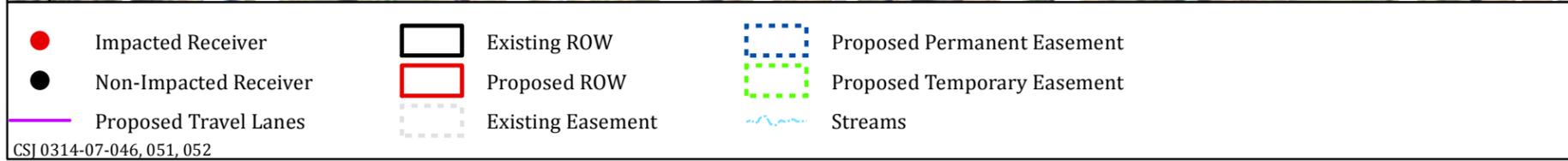
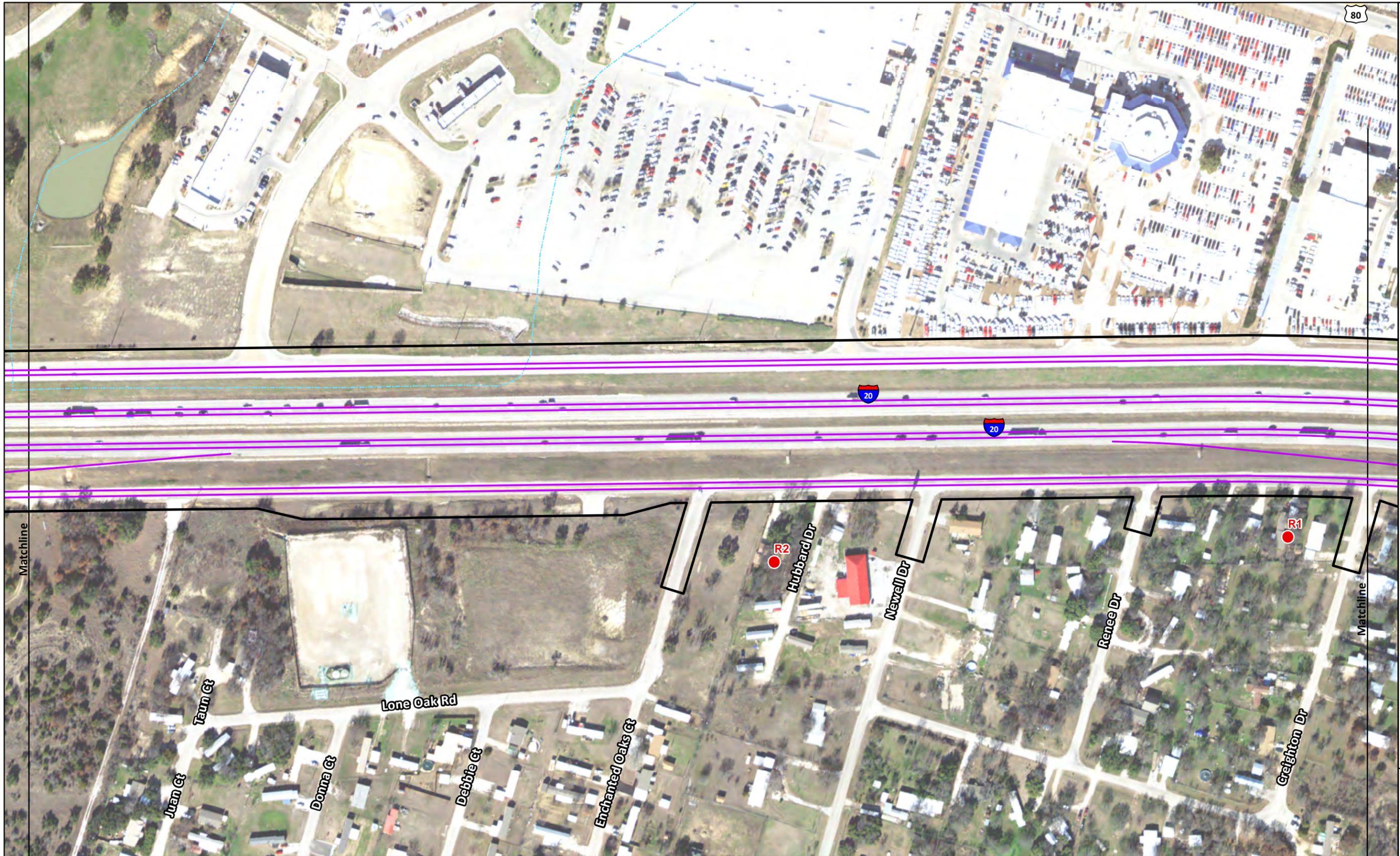
- ▭ Proposed Permanent Easement
- ▭ Proposed Temporary Easement
- ~ Streams



1.E
FIGURE

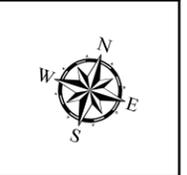
PROJECT NO.	PRK12278
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FILE NAME	Noise_Proposed_Design2040_20160608
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PARKER CO.
IH 20 AT CENTER POINT ROAD
Proposed Design Year 2040

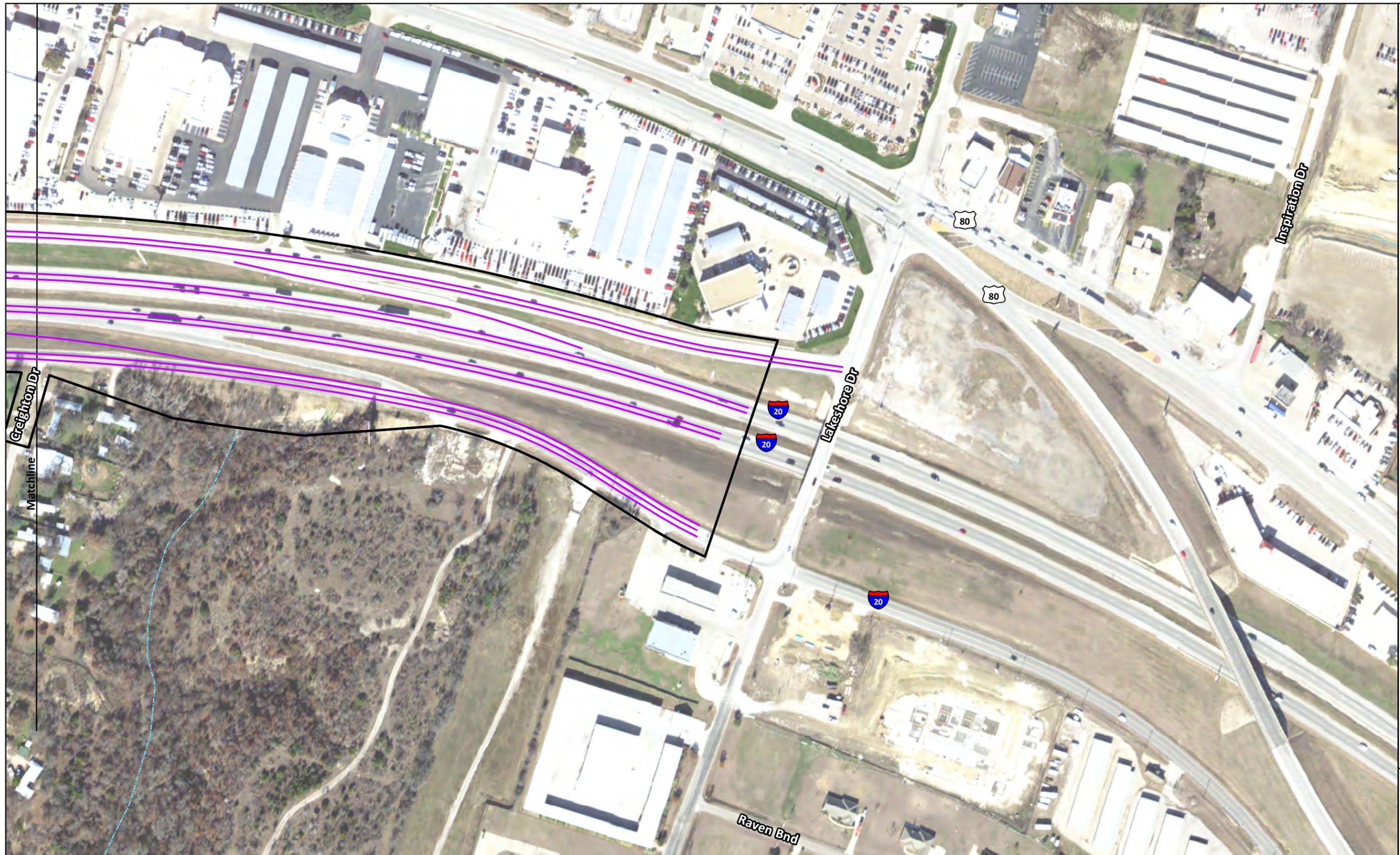


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PARKER CO.
IH 20 AT CENTER POINT ROAD
 Proposed Design Year 2040



1.F
FIGURE

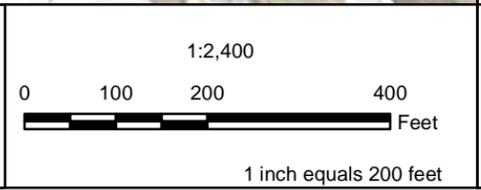
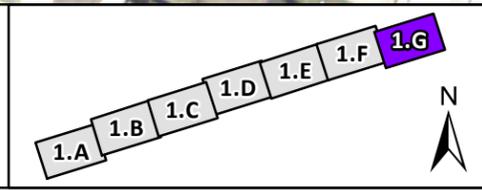


FN PROJECT NO. PRJ12278
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 FILE NAME Noise_Proposed_Design2040_20160608
 PREPARED BY SSJ

PARKER CO.
IH 20 AT CENTER POINT ROAD
 Proposed Design Year 2040



- Impacted Receiver
- Non-Impacted Receiver
- Proposed Travel Lanes
- Existing ROW
- Proposed ROW
- Existing Easement
- Proposed Permanent Easement
- Proposed Temporary Easement
- ~ Streams



1.G
FIGURE

Photographs



Photo 1. View to the south of receiver R1-Residence.



Photo 2. View to the south of receiver R2-Residence.



Photo 3. View to the east of receiver R3-Residence.



Photo 4. View to the north of receiver R4-Residence.



Photo 5. View to the west of receiver R5-Residence.

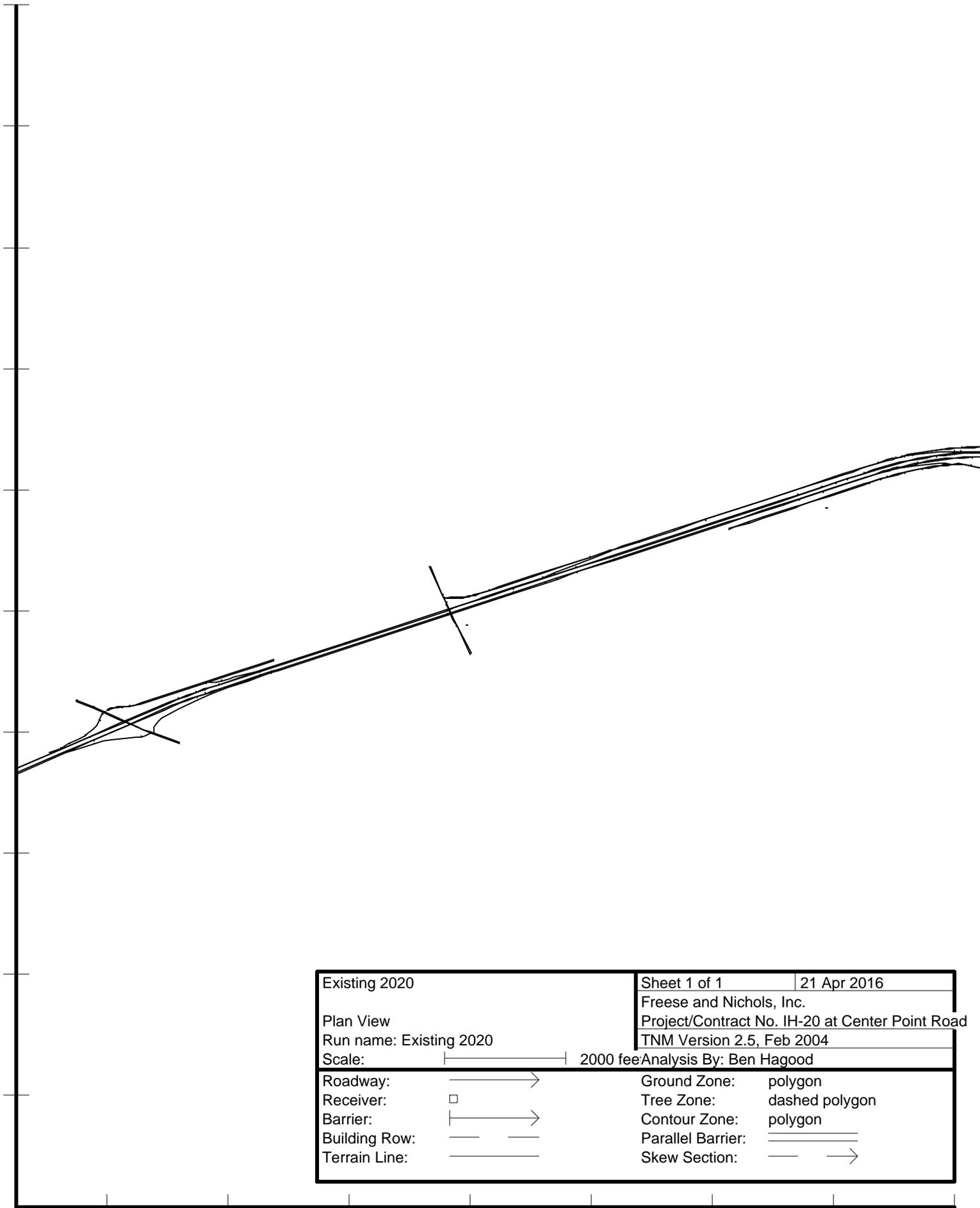


Photo 6. View to the east of receiver R6-Residence.



Photo 7. View to the east of receiver R7-Residence.

Noise Model Summary Data



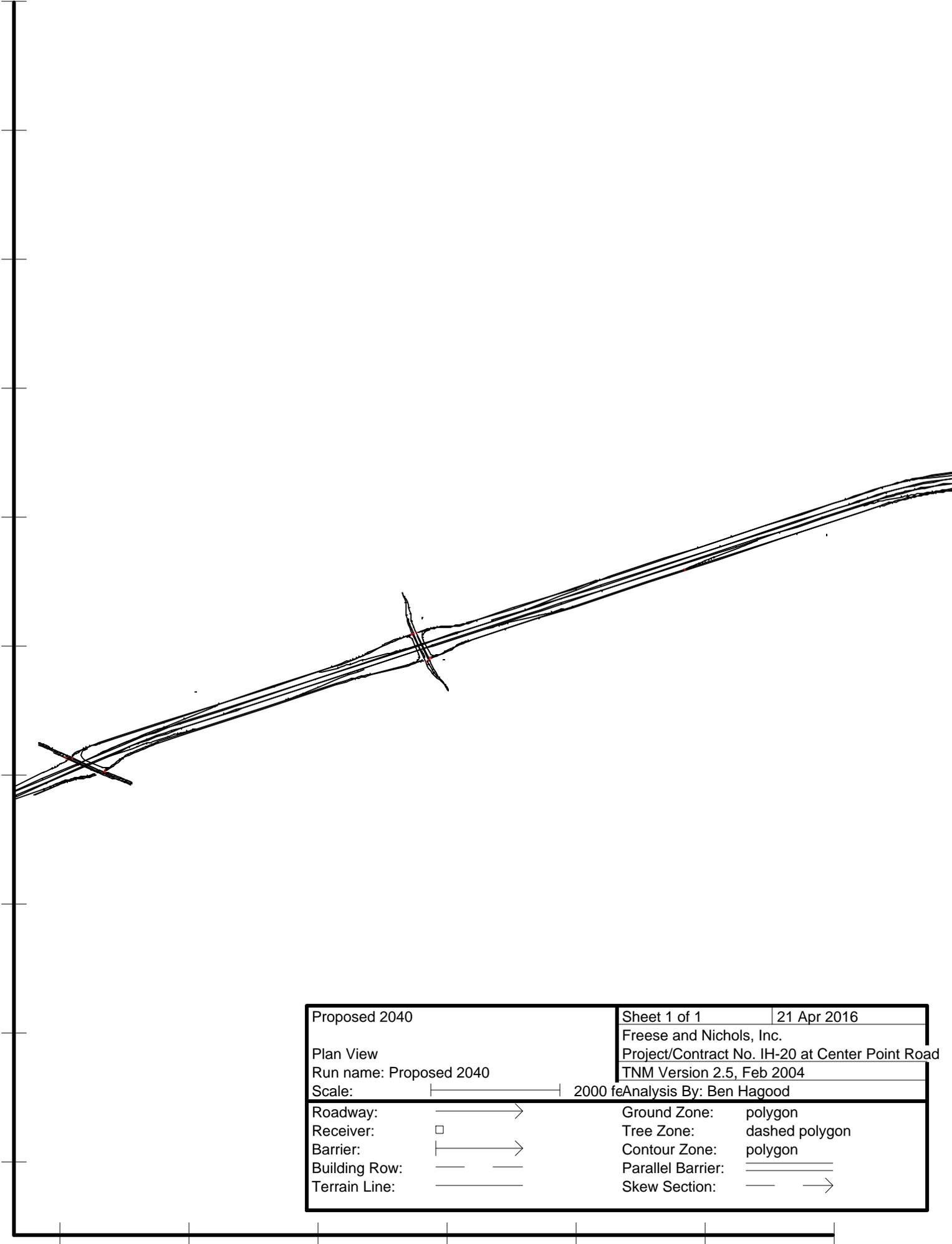
Existing 2020		Sheet 1 of 1	21 Apr 2016
Plan View		Freese and Nichols, Inc.	
Run name: Existing 2020		Project/Contract No. IH-20 at Center Point Road	
Scale: 		TNM Version 2.5, Feb 2004	
Analysis By: Ben Hagood			
Roadway:		Ground Zone:	polygon
Receiver:		Tree Zone:	dashed polygon
Barrier:		Contour Zone:	polygon
Building Row:		Parallel Barrier:	
Terrain Line:		Skew Section:	

2200000 2202000 2204000 2206000 2208000 2210000 2212000 2214000

RESULTS: SOUND LEVELS

IH-20 at Center Point Road

Freese and Nichols, Inc.								21 April 2016						
Ben Hagood								TNM 2.5						
								Calculated with TNM 2.5						
RESULTS: SOUND LEVELS														
PROJECT/CONTRACT:		IH-20 at Center Point Road												
RUN:		Existing 2020												
BARRIER DESIGN:		INPUT HEIGHTS						Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.						
ATMOSPHERICS:		68 deg F, 50% RH												
Receiver														
Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal		
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB		
Receiver1	1	1	0.0	68.5	66	68.5	11	Snd Lvl	68.5	0.0	7	-7.0		
Receiver2	3	1	0.0	65.4	66	65.4	11	----	65.4	0.0	7	-7.0		
Receiver3	4	1	0.0	66.1	66	66.1	11	Snd Lvl	66.1	0.0	7	-7.0		
Receiver4	5	1	0.0	62.8	66	62.8	11	----	62.8	0.0	7	-7.0		
Receiver5	6	1	0.0	60.1	66	60.1	11	----	60.1	0.0	7	-7.0		
Receiver6	7	1	0.0	61.7	66	61.7	11	----	61.7	0.0	7	-7.0		
Receiver7	8	1	0.0	62.0	66	62.0	11	----	62.0	0.0	7	-7.0		
Dwelling Units		# DUs	Noise Reduction											
			Min	Avg	Max									
			dB	dB	dB									
All Selected		7	0.0	0.0	0.0									
All Impacted		2	0.0	0.0	0.0									
All that meet NR Goal		0	0.0	0.0	0.0									



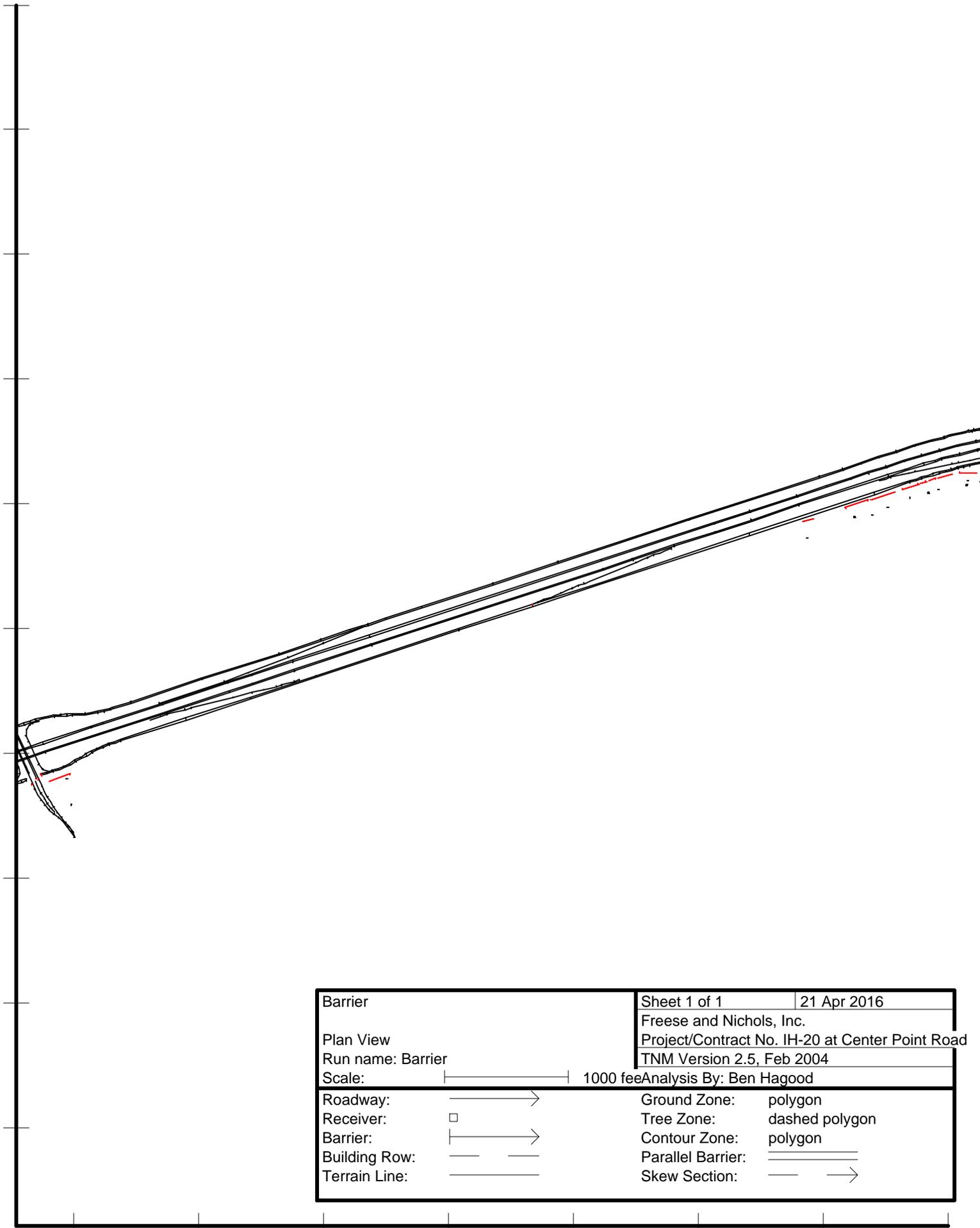
Proposed 2040		Sheet 1 of 1	21 Apr 2016
Plan View		Freese and Nichols, Inc.	
Run name: Proposed 2040		Project/Contract No. IH-20 at Center Point Road	
Scale: 		TNM Version 2.5, Feb 2004	
Analysis By: Ben Hagood			
Roadway:		Ground Zone:	polygon
Receiver:		Tree Zone:	dashed polygon
Barrier:		Contour Zone:	polygon
Building Row:		Parallel Barrier:	
Terrain Line:		Skew Section:	

00000 2202000 2204000 2206000 2208000 2210000 2212000

RESULTS: SOUND LEVELS

IH-20 at Center Point Road

Freese and Nichols, Inc.		8 June 2016										
Ben Hagood		TNM 2.5										
		Calculated with TNM 2.5										
RESULTS: SOUND LEVELS												
PROJECT/CONTRACT:		IH-20 at Center Point Road										
RUN:		Proposed 2040										
BARRIER DESIGN:		INPUT HEIGHTS										
ATMOSPHERICS:		68 deg F, 50% RH										
Receiver												
Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Receiver1	1	1	68.5	70.1	66	1.6	11	Snd Lvl	70.1	0.0	7	-7.0
Receiver2	3	1	65.4	67.5	66	2.1	11	Snd Lvl	67.5	0.0	7	-7.0
Receiver3	4	1	66.1	67.4	66	1.3	11	Snd Lvl	67.4	0.0	7	-7.0
Receiver4	5	1	62.8	64.8	66	2.0	11	----	64.8	0.0	7	-7.0
Receiver5	6	1	60.1	59.5	66	-0.6	11	----	59.5	0.0	7	-7.0
Receiver6	7	1	61.7	61.4	66	-0.3	11	----	61.4	0.0	7	-7.0
Receiver7	8	1	62.0	65.8	66	3.8	11	----	65.8	0.0	7	-7.0
Dwelling Units		# DUs	Noise Reduction									
			Min	Avg	Max							
			dB	dB	dB							
All Selected		7	0.0	0.0	0.0							
All Impacted		3	0.0	0.0	0.0							
All that meet NR Goal		0	0.0	0.0	0.0							



206000

2207000

2208000

2209000

2210000

2211000

2212000

2213000

Barrier		Sheet 1 of 1	21 Apr 2016
Plan View		Freese and Nichols, Inc.	
Run name: Barrier		Project/Contract No. IH-20 at Center Point Road	
Scale:		1000 feet	Analysis By: Ben Hagood
Roadway:		Ground Zone:	polygon
Receiver:		Tree Zone:	dashed polygon
Barrier:		Contour Zone:	polygon
Building Row:		Parallel Barrier:	
Terrain Line:		Skew Section:	

