TENNESSEE
DEPARTMENT OF TRANSPORTATION

TRAFFIC FORECAST STUDY

PELLISSIPPI PARKWAY EXTENSION
From: SR-33 to SR-73/US-321,
Blount County

PREPARED BY SAIN ASSOCIATES, INC.
for the
Strategic Transportation Investments Division

Recommended by:	Signature	DATE
TRANSPORTATION DIRECTOR STRATEGIC TRANSPORTATION INVESTMENTS DIVISION		12-23-13

This document is covered by 23 USC § 409 and its production pursuant to fulfilling public planning requirements does not waive the provisions of § 409.

INTRODUCTION

This report documents traffic volume forecasts for a proposed extension of Pellissippi Parkway / I-140 from State Route 33 to US Highway 321 in Blount County, Tennessee. These forecasts represent an update to previous forecasts produced in 2007 and updated in 2011. The purpose of the current update is to incorporate changes from the new Knoxville Regional Travel Demand Model (adopted in June 2013 for horizon year 2034). The traffic forecasts provide estimates of future traffic volumes for horizon years 2020 and 2040 without and with the proposed Pellissippi Parkway Extension. The traffic volume estimates for conditions with the proposed Pellissippi Parkway Extension are based upon the preferred alignment as documented in TDOT's Environmental Impact Statement (EIS).

The area included in this updated study was modified from previous versions to eliminate intersections that have been shown to not be influenced by the Pellissippi Parkway Extension. The modified study area is shown on Figure 1.

The process used to develop the updated traffic forecasts in this study was approved by the TDOT's Strategic Transportation Investments Division. In general, the process included four major steps: field data collection, data tabulation, validation or adjustment of segment volumes from the regional travel demand model, and estimation of future traffic volumes for horizon years 2020 and 2040 at specific intersections and segments impacted by the proposed Pellissippi Parkway extension.

Figure 1 – Study Area

DATA COLLECTION

Sain Associates retained the assistance of Quality Counts, a firm that specializes in traffic data collection, to gather traffic volume counts at intersections and interchanges in the study area. The field data collection efforts were conducted on Tuesday, October 29, 2013 and Tuesday, November 5, 2013 between the hours of 6:00-9:00 a.m., 11:00 a.m.-1:00 p.m., and 3:00-6:00 p.m. Area schools were in session during the days that surveys were taken. Following is a summary of items collected in the field:

Location	Date Counted	Type of Count	Comment
I-140 @ US 129 interchange	10/29/13	Mechanical tube counts on all ramps and on US 129	None
US 120 @ SR 35 interchange	10/29/13	Mechanical tube counts on all ramps	None
SR 33 @ I-140 ramps	10/29/13	Manual turning movement count	Construction was underway on SR 33 but did not hinder flow of traffic during survey hours
SR 33 @ Horn Street / Wildwood Road	10/29/13	Manual turning movement count	None
SR 35 @ SR 33	10/29/13	Manual turning movement count	None
SR 35 / S Washington @ Sevierville Road	11/5/13	Manual turning movement count	Traffic flow was hindered by a construction detour. This count was discarded and a count provided by the City of Maryville from 5/18/11 was substituted for the forecasts.
SR 35 / S Washington @ High Street/SR 35 / US 411	10/29/13	Manual turning movement count	Traffic flow was hindered by a construction detour. This count was discarded and a count provided by the City of Maryville from 5/18/11 was substituted for the forecasts.
S Washington @ US 321	10/29/13	Manual turning movement count	None

The intersection traffic counts collected in the field were supplemented with data from TDOT's segment volume database.

REGIONAL TRAVEL DEMAND MODEL

This update to previously prepared traffic forecasts for Pellissippi Parkway Extension was necessitated by changes in the Knoxville Regional Travel Demand Model that were implemented by the Knoxville Transportation Planning Organization's (TPO). The updated travel demand model for horizon year 2034 was adopted in June 2013. The updated model includes new socio economic forecasts for Blount County that have a direct influence on traffic projections in the area roadway network. The new travel demand model was used as a primary source for developing the traffic forecast volumes for Pellissippi Parkway Extension.

During the initial stages of developing new traffic forecasts for Pellissippi Parkway Extension, The Knoxville TPO voted to remove a project to improve James White Parkway from the long range transportation plan. With the assistance of the Knoxville TPO staff, the travel demand model was tested to see if removal of James White Parkway would have an impact on traffic volumes in the Pellissippi Parkway Extension study area. The test runs showed that removal of James White Parkway does not alter traffic forecasts in the Pellissippi Parkway Extension study area.

TRAFFIC FORECASTS

The traffic forecasting process utilized existing traffic count data and future volumes projected by the Knoxville regional travel demand model. It was first necessary to determine whether the travel demand model was sufficiently calibrated so that its projections could be relied upon for the Pellissippi Parkway Extension. The verification and forecasting process involved four major steps:

1. Examine segment volumes from the model's year 2010 assignment and compare them to actual ground counts.
2. Identify segments where adjustments are needed to increase or decrease the model volumes to better match actual ground counts.
3. Develop growth rates from the model's segment volumes for 2034 and apply them to existing segment volumes to derive future segment volumes for 2020 and 2040.
4. Apply growth rates to existing intersection turning movement volumes to forecast them to future years 2020 and 2040, matching as closely as possible to the adjacent segment volumes derived from step 3.

Segment Volume Calibration

Step one of the verification process involved comparing actual traffic counts to volumes in the base year model assignments. Traffic counts from TDOTs Advanced Traffic Data Analysis and Management (ADAM) system was used for the verification process. In general, the comparison revealed that the model volumes were well calibrated to actual count data. The only area of concern identified is in the eastern edge of the study area where the model over assigned traffic volumes on Peppermint Road, Hitch Road, and Helton Road.

Where adjustments to the model were needed to account for volume differences, historic count data from appropriate ADAM stations was used to develop a growth rate that could be used to forecast 2020 and 2040 volumes without the Pellissippi Parkway Extension. Finally, differences between the "No Pellissippi Parkway Extension" and "With Pellissippi Parkway Extension" model assignments were then applied to the adjusted 2020 and 2040 volumes to estimate volumes with the Pellissippi Parkway Extension.

In most instances, the model volumes were deemed appropriate based upon the calibration analysis, and they were used as reported with only an adjustment to shift the 2034 model output to the horizon years 2020 and 2040.

Traffic Volume Forecasts

Future traffic volume forecasting for the project involved consideration of other roadway network improvements and land developments planned for the Alcoa/Maryville area. The Relocated Alcoa Highway (RAH) project is included in the Knoxville Transportation Improvement Plan (TIP). It is planned to be constructed east of US 129/SR 155 with the southern termini connecting with US 129/SR 115 north of SR 335 and the northern termini connecting with US 129/SR 115 north of Pellissippi Parkway. The RAH project is included in the Knoxville travel demand model, so it was also included in the traffic forecasts for 2020 and 2040.

In previous traffic forecasts, a Southern Loop (SL) project was included to connect with US 321/SR 73 east of Maryville and extend in a general southwest direction to US 129/US 411/SR 33. The Southern Loop is not in the current Knoxville TIP and is therefore not coded into the Knoxville travel demand model. It is not included in this current traffic forecast update.

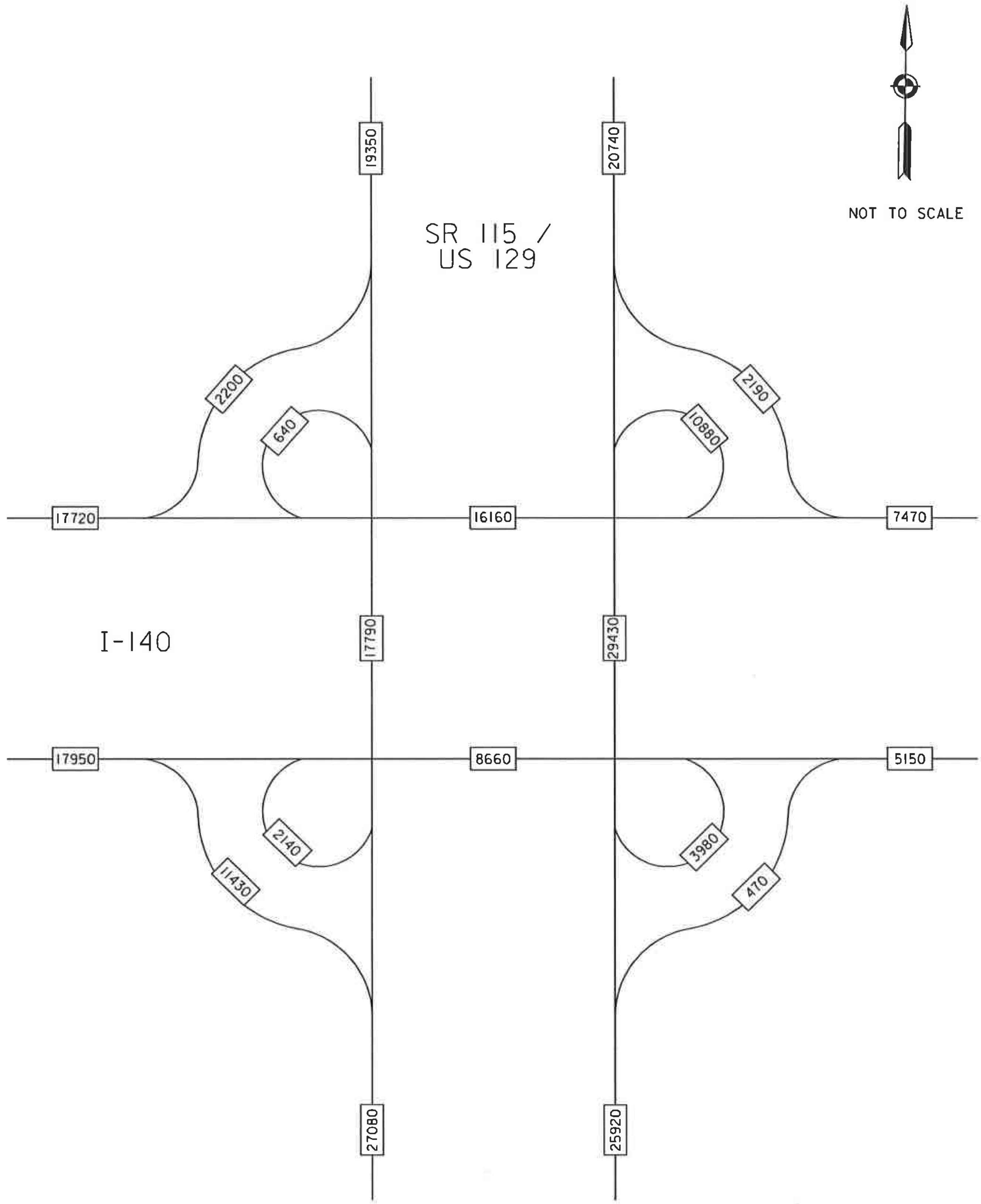
Construction of a large research and development park is being planned for a parcel of land east of SR 33 in the vicinity of the proposed Pellissippi Parkway Extension. Current plans for the development propose that the park's access would be provided via SR 33, south of its interchange with Pellissippi Parkway. Increases in population and employment that will result from the R&D Park are incorporated into the Knoxville travel demand model for the traffic analysis zone that contains the development parcel. By incorporating the additional population and employment, traffic impacts of the R&D Park were included in the model's traffic forecasts.

The traffic forecasts prepared for the Pellissippi Parkway Extension study are included in the appendix to this report. Traffic volumes for existing conditions are included along with forecasts for future years 2020 and 2040. Following is a list of each item included in the appendix.

- Existing turning movement volumes for the following intersections:
  - SR 115 / US 129 @ I-140 / Pellissippi Parkway
  - SR 115 / US 129 @ SR 35
  - SR 33 @ I-140 / Pellissippi Parkway
  - SR 33 @ Horn Street/Wildwood Road
  - SR 33 / E. Broadway Avenue @ SR 35 / S. Washington Street
  - SR 35 / S. Washington Street @ Sevierville Road

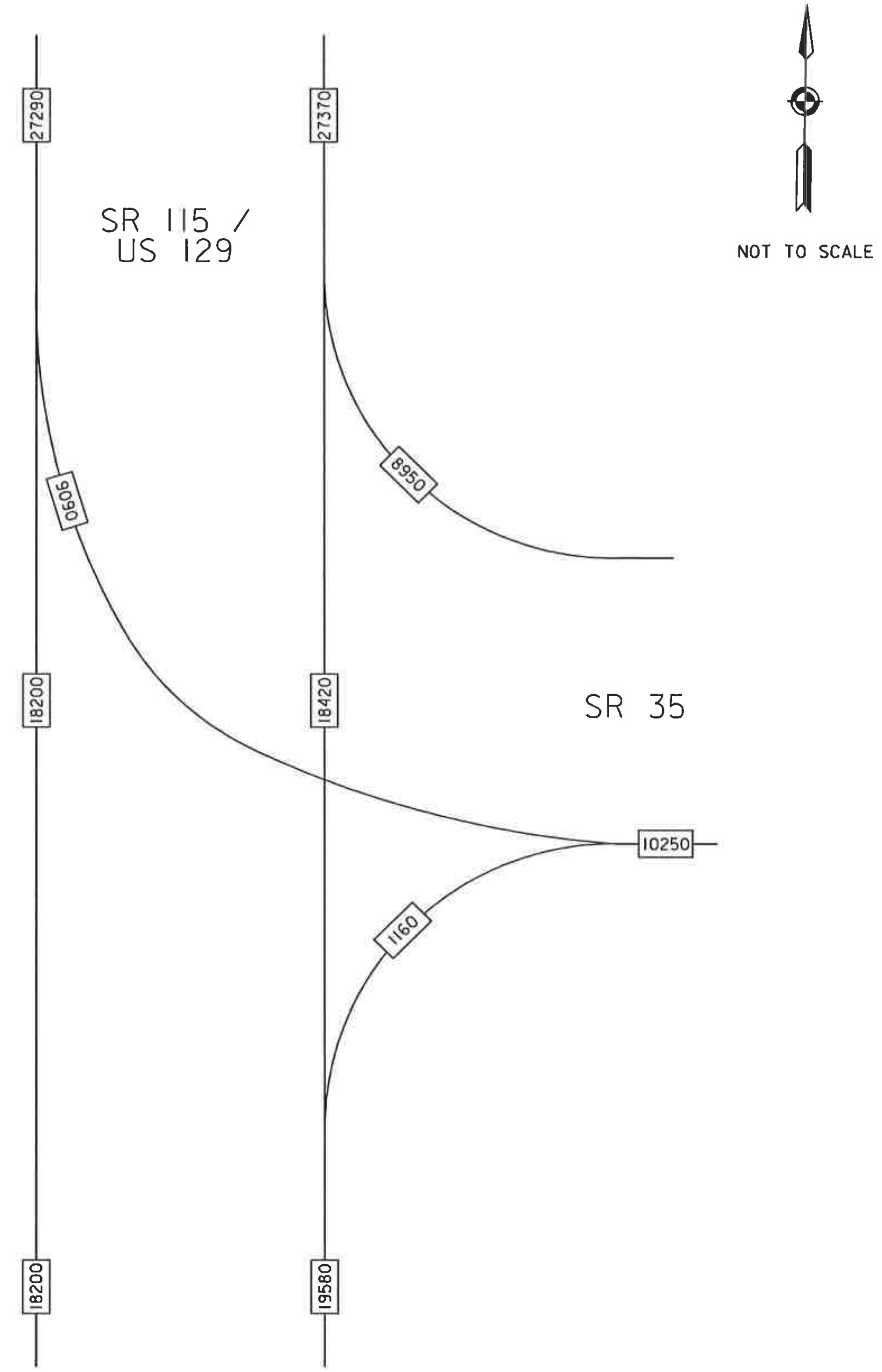
- S. Washington Street / SR 35 @ High Street / SR 35
- S. Washington Street @ SR 73 / US 321
- SR 33 @ Sam Houston School Road
- Wildwood Road @ Peppermint Road
- Wildwood Road @ Sam Houston School Road
- SR 35 / US 411 / Sevierville Road @ Peppermint Road
- SR 35 / US 411 / Sevierville Road @ Hitch Road
- Davis Ford Road @ Helton Road
- David Ford Road @ Hitch Road
- SR 73 / US 321 @ Helton Road / Tuckaleechee Pike

- Schematic Diagram of Average Annual Daily Traffic (AADT) Volumes and Truck Percentages for existing conditions (2010, 2012, or 2013) and future years 2020 and 2040 for the scenario without Pellissippi Parkway Extension ("No Build")
- Intersection Volumes (2020 and 2040) for the "No Build" scenario at the same intersections listed for existing conditions
- Schematic Diagram of Average Annual Daily Traffic (AADT) Volumes and Truck Percentages for the years 2020 and 2040 for the scenario with Pellissippi Parkway Extension ("Build")
- Intersection Volumes (2020 and 2040) for the "Build" scenario at the same intersections listed for existing conditions plus these intersections:
  - Pellissippi Parkway Extension @ SR 35 / US 411 / Sevierville Road
  - Pellissippi Parkway Extension @ SR 73 / US 321.

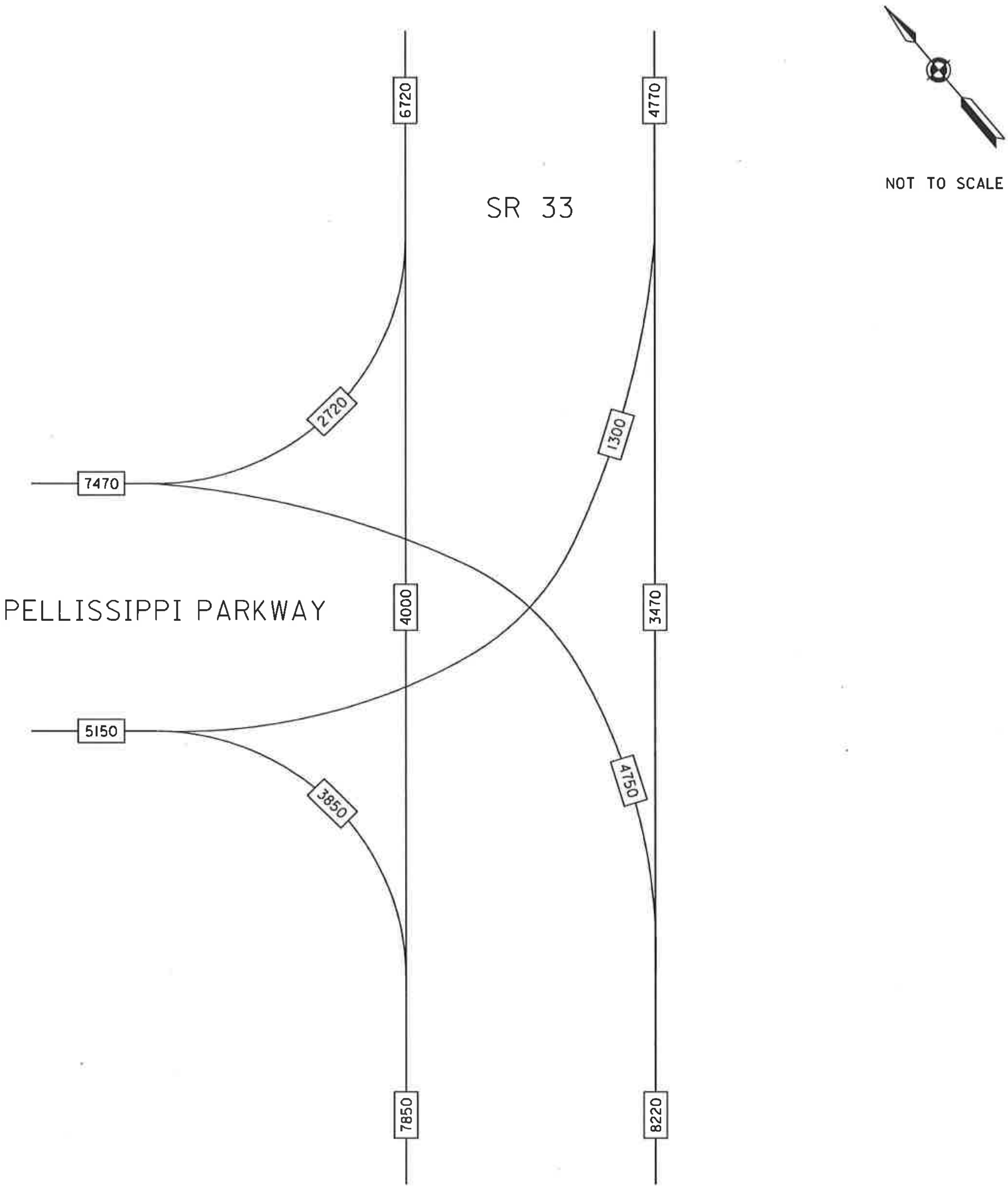


2013 AADT

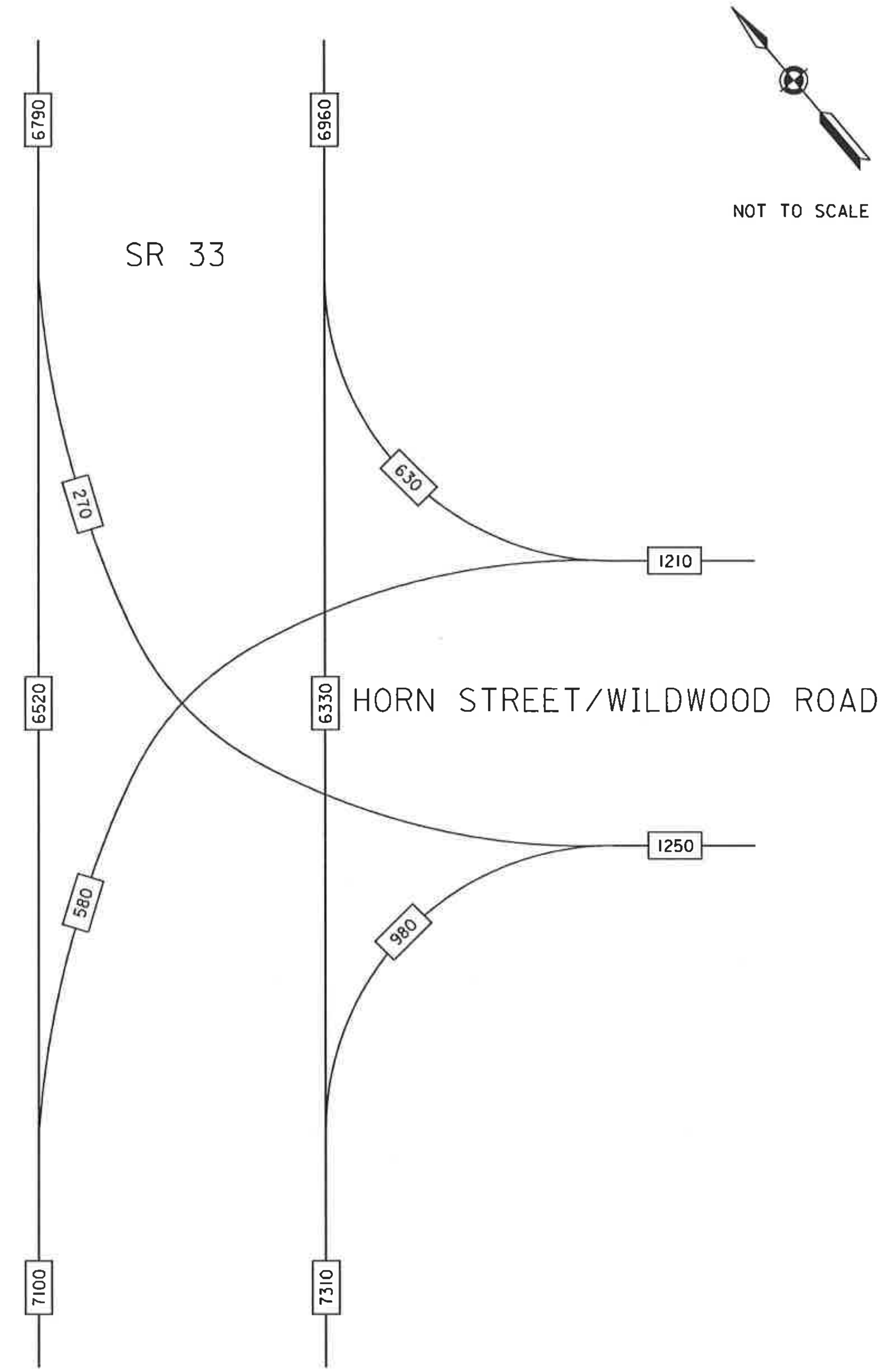
SR 115/US 129 @
I-140 / Pellissippi Parkway



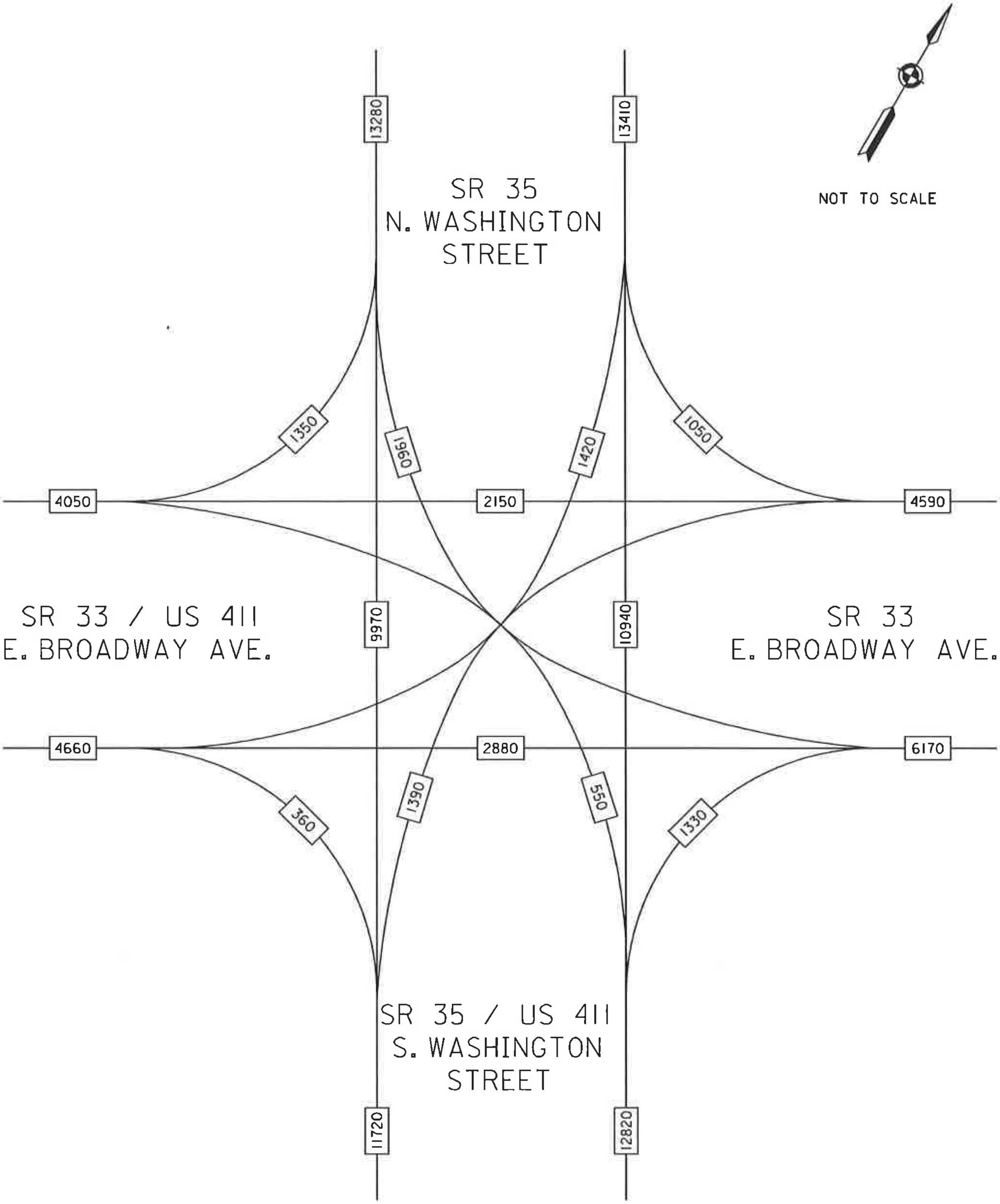
2013 AADT	SR 115/US 129 @ SR 35



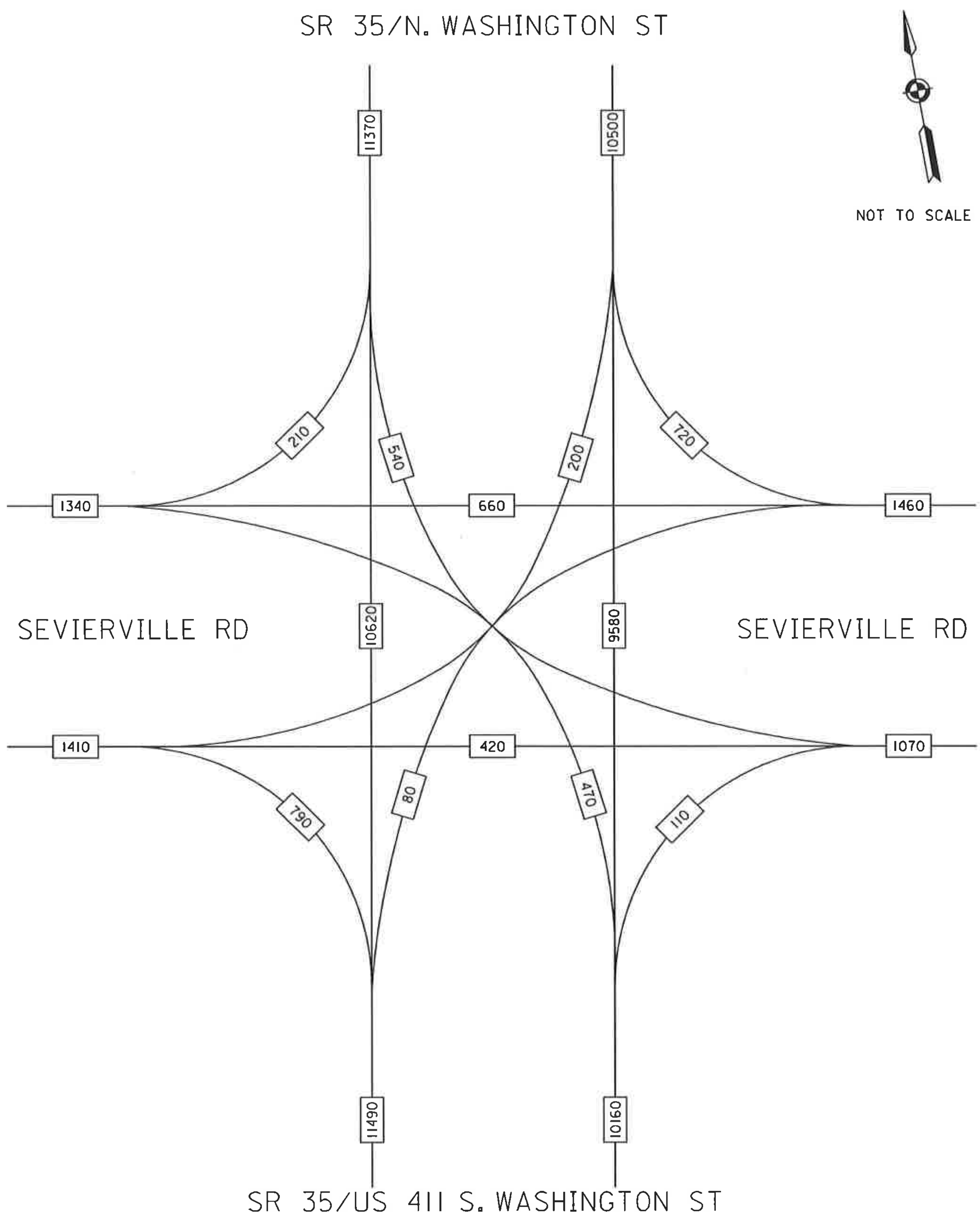
2013 AADT	SR 33 @ PELLISSIPPI PARKWAY



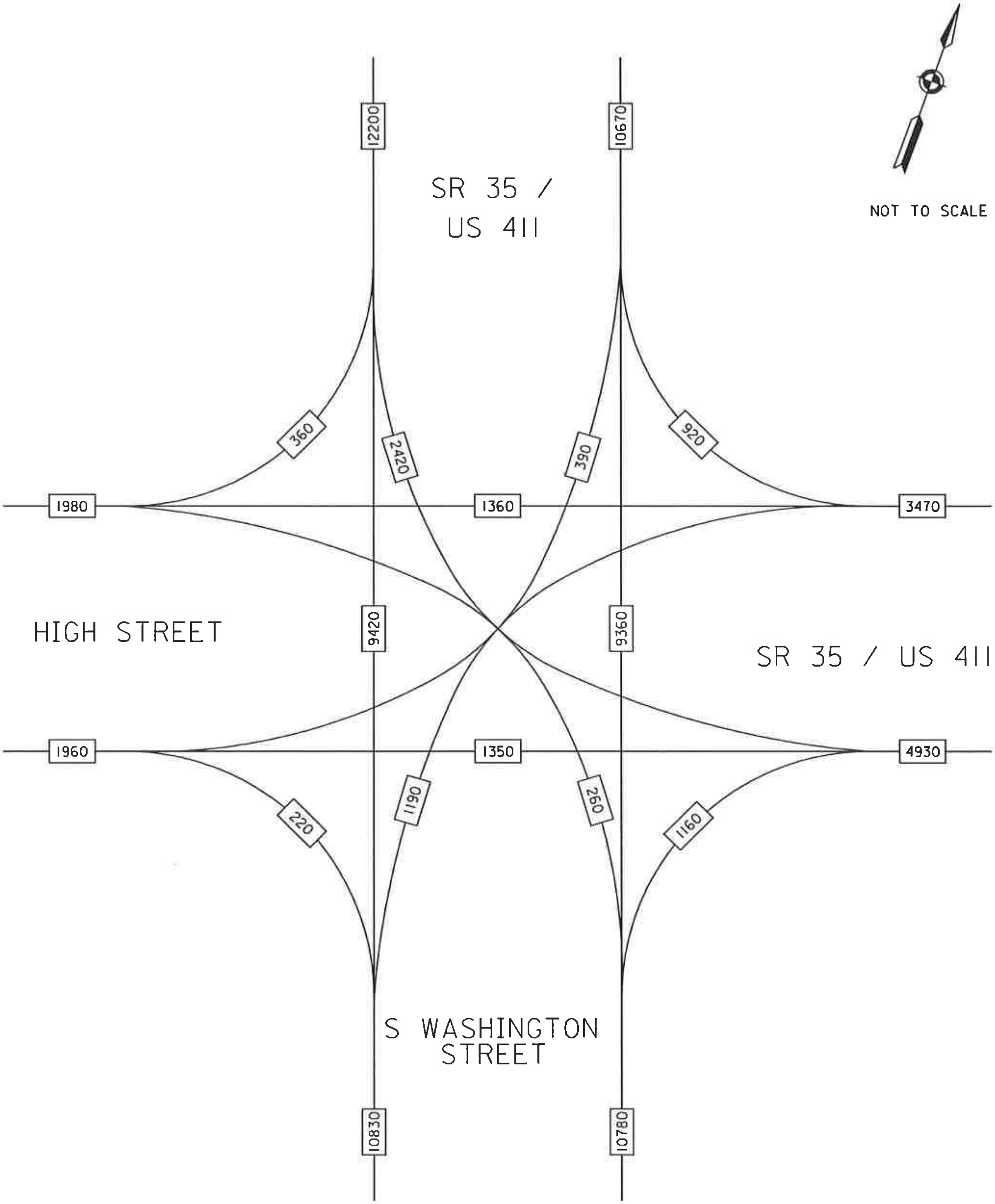
2013 AADT	SR 33 @ HORN STREET/ WILDWOOD ROAD



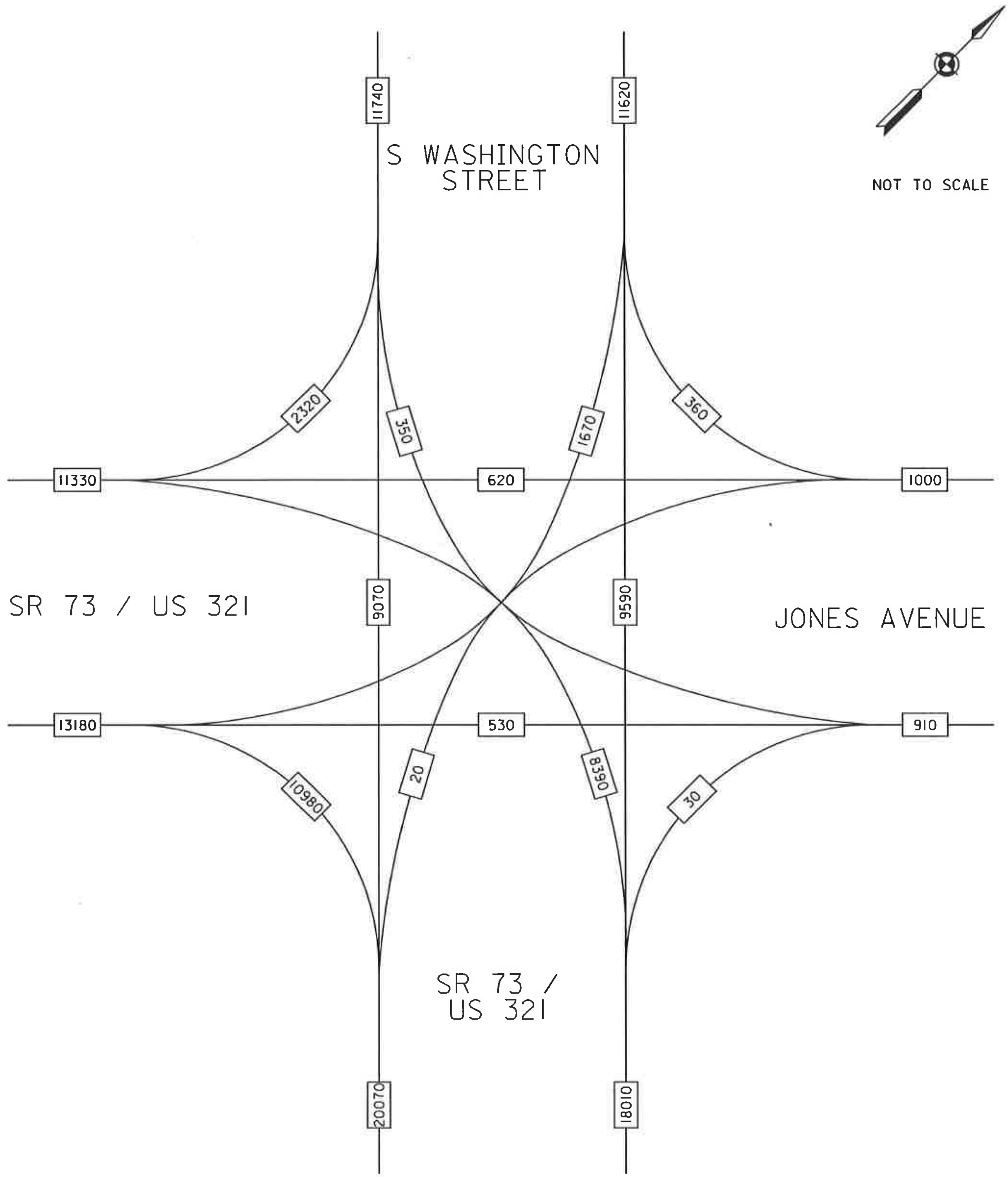
2013 AADT	SR 33 @ SR 35



2011 AADT	SEVIERVILLE RD @ SR 35/US 411 WASHINGTON ST

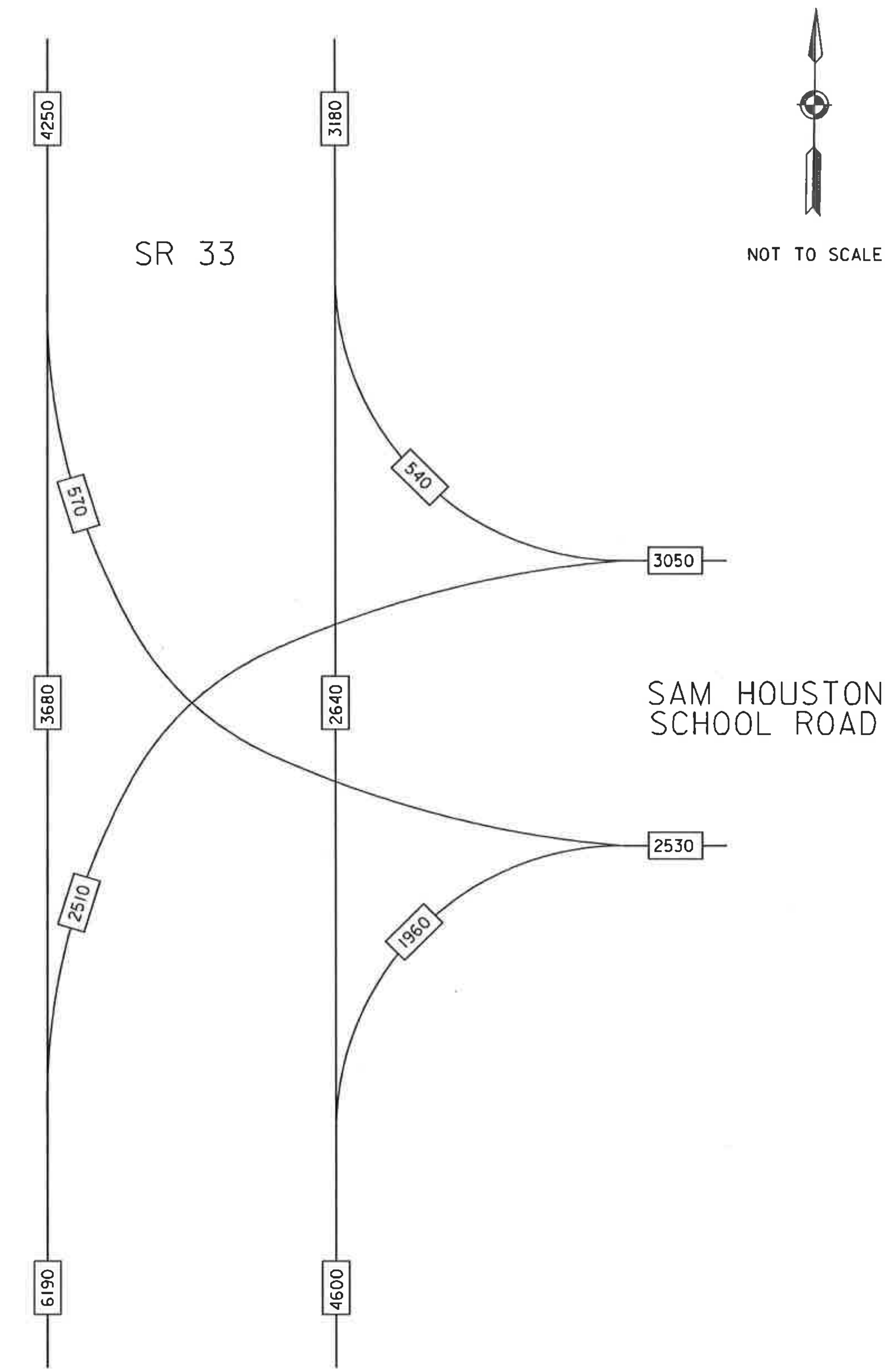


2011 AADT	S WASHINGTON ST / SR 35 @ HIGH ST / SR 35

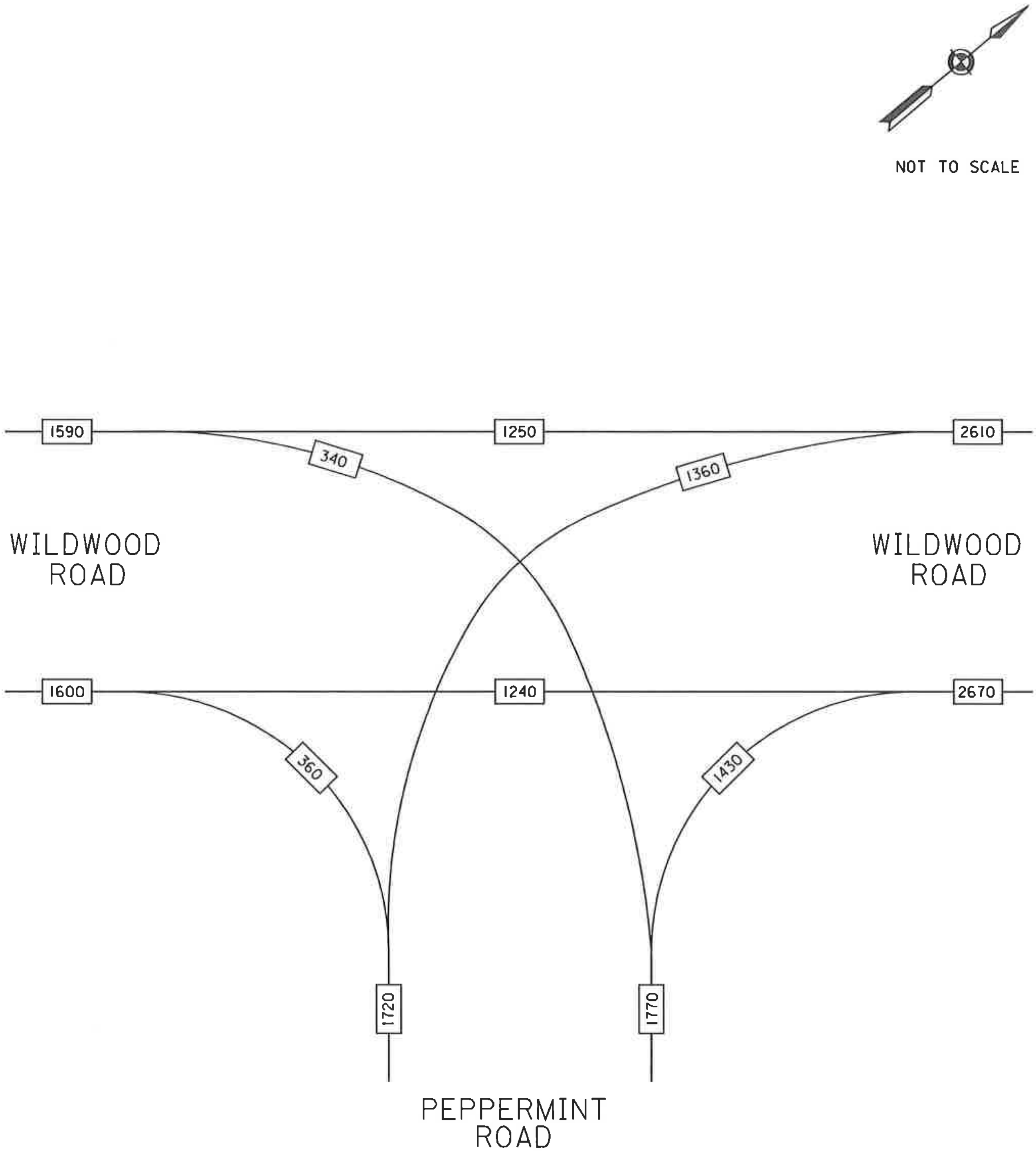


2013 AADT

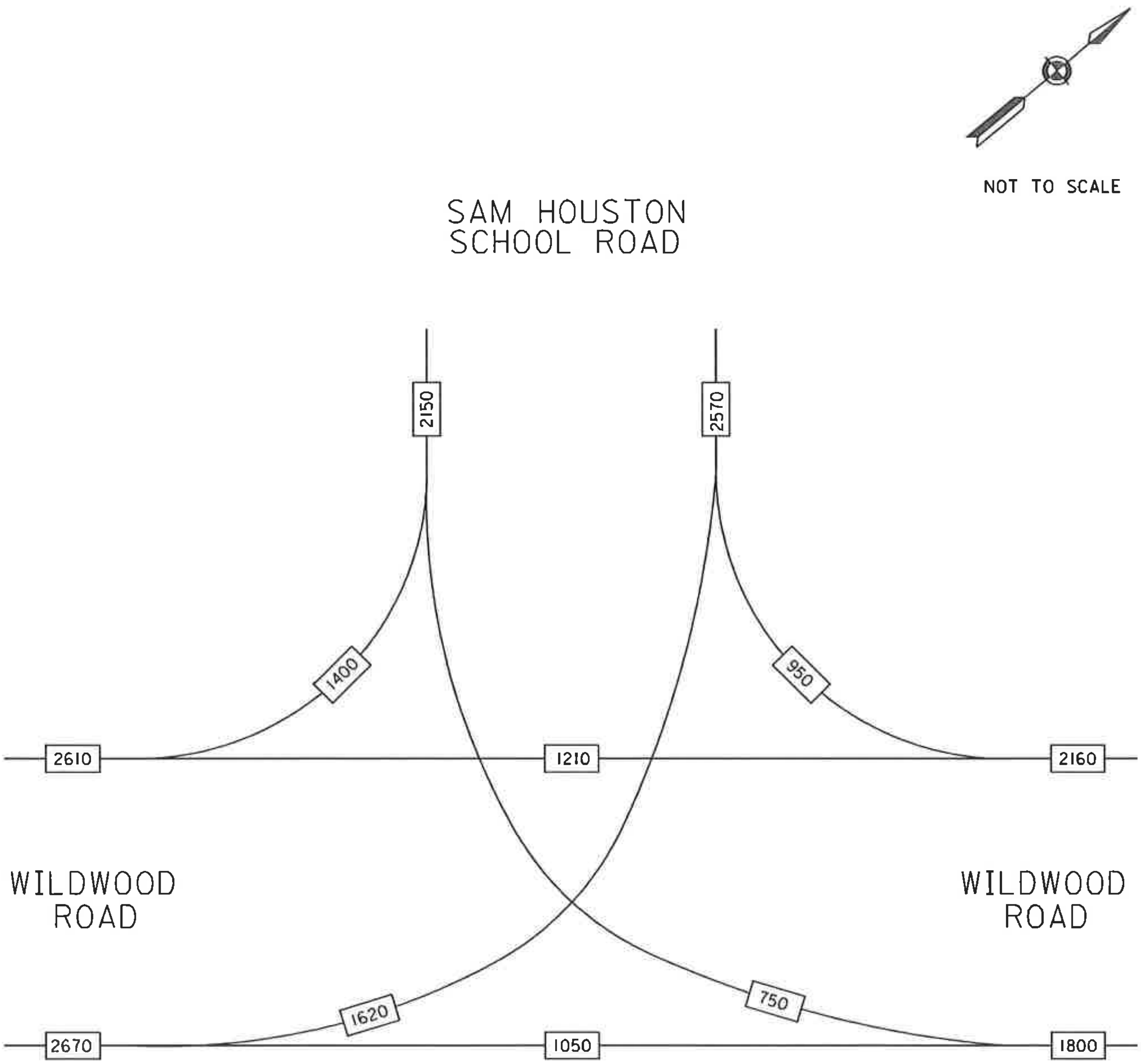
S Washington St @ SR 73 / US 321



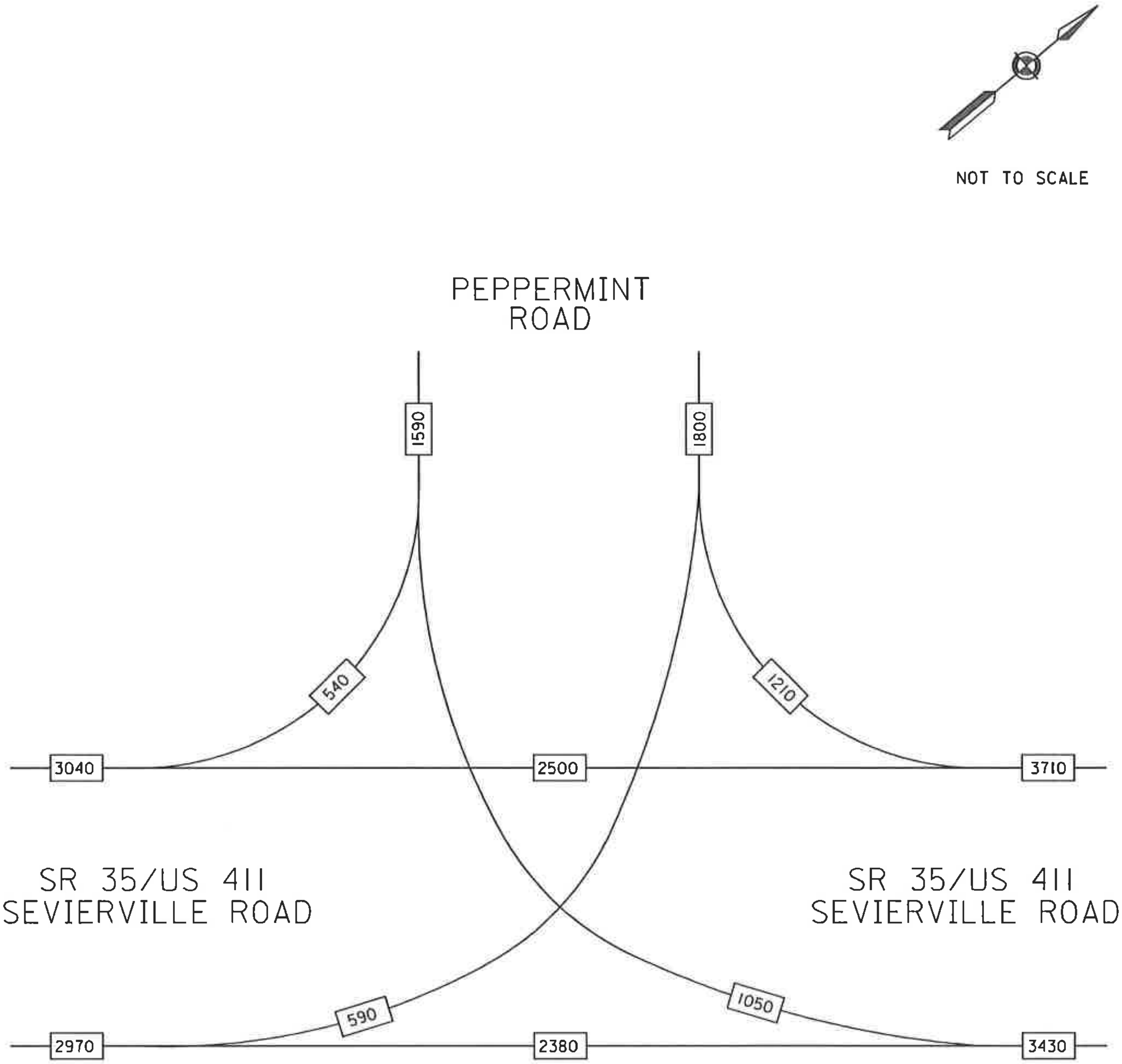
2010 AADT	SR 33 @ SAM HOUSTON SCHOOL ROAD



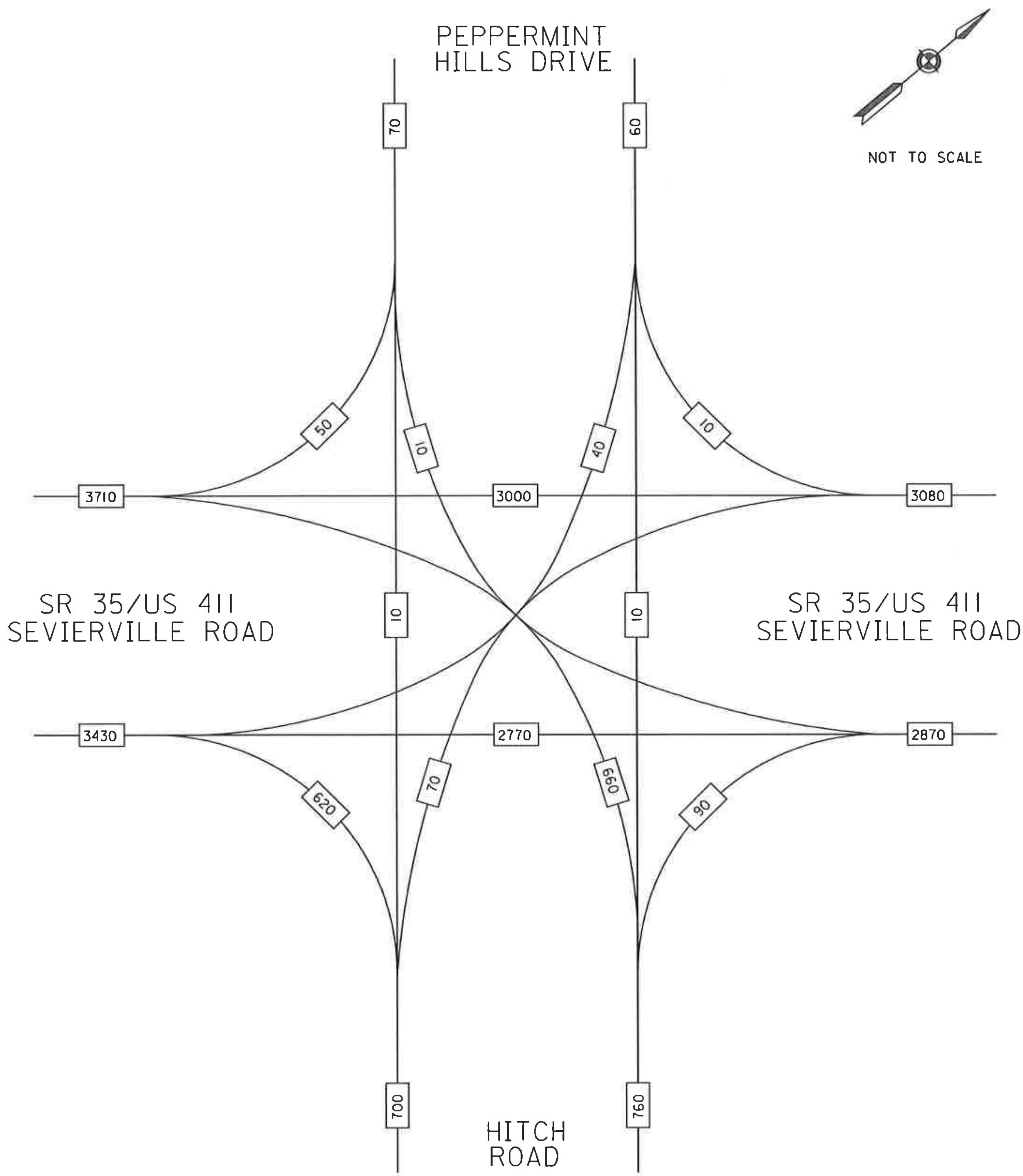
2010 AADT	PEPPERMINT ROAD @ WILDWOOD ROAD



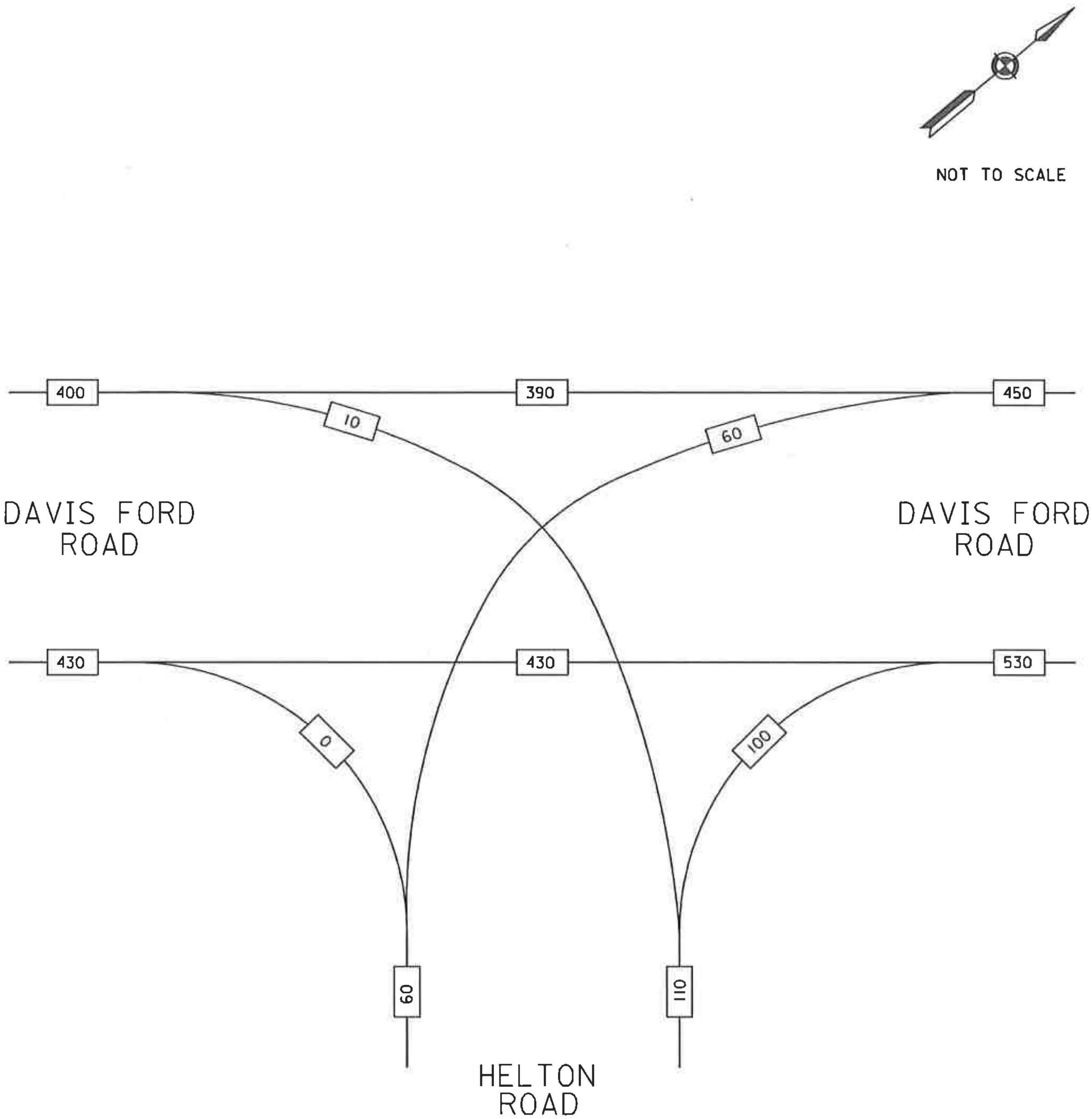
2010 AADT	SAM HOUSTON SCHOOL ROAD @ WILDWOOD ROAD



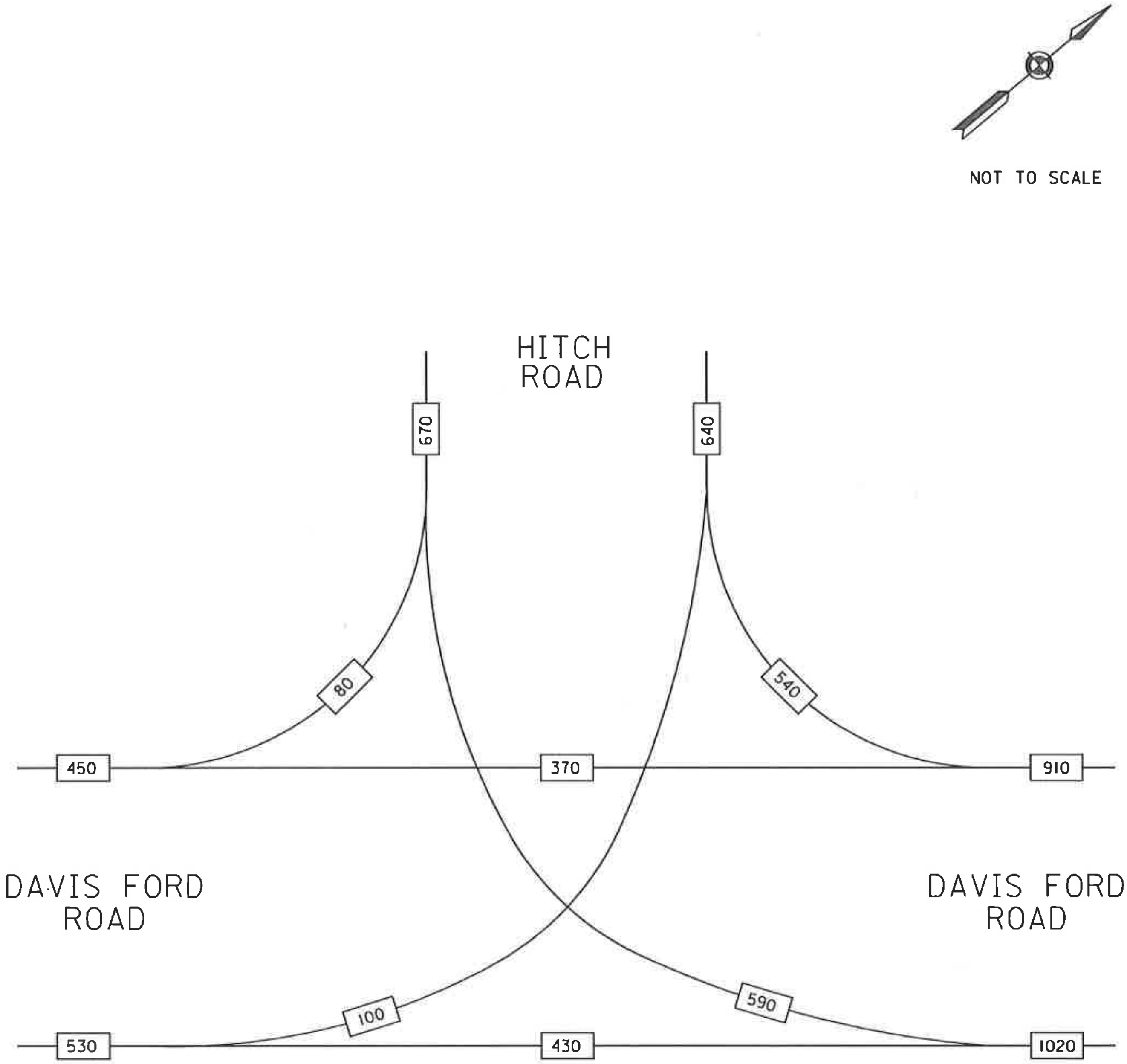
2010 AADT	SR 35/US 411/SEVIERVILLE ROAD @ PEPPERMINT ROAD



2010 AADT	SR 35/US 411/SEVIERVILLE ROAD @ HITCH ROAD/PEPPERMINT HILLS DR

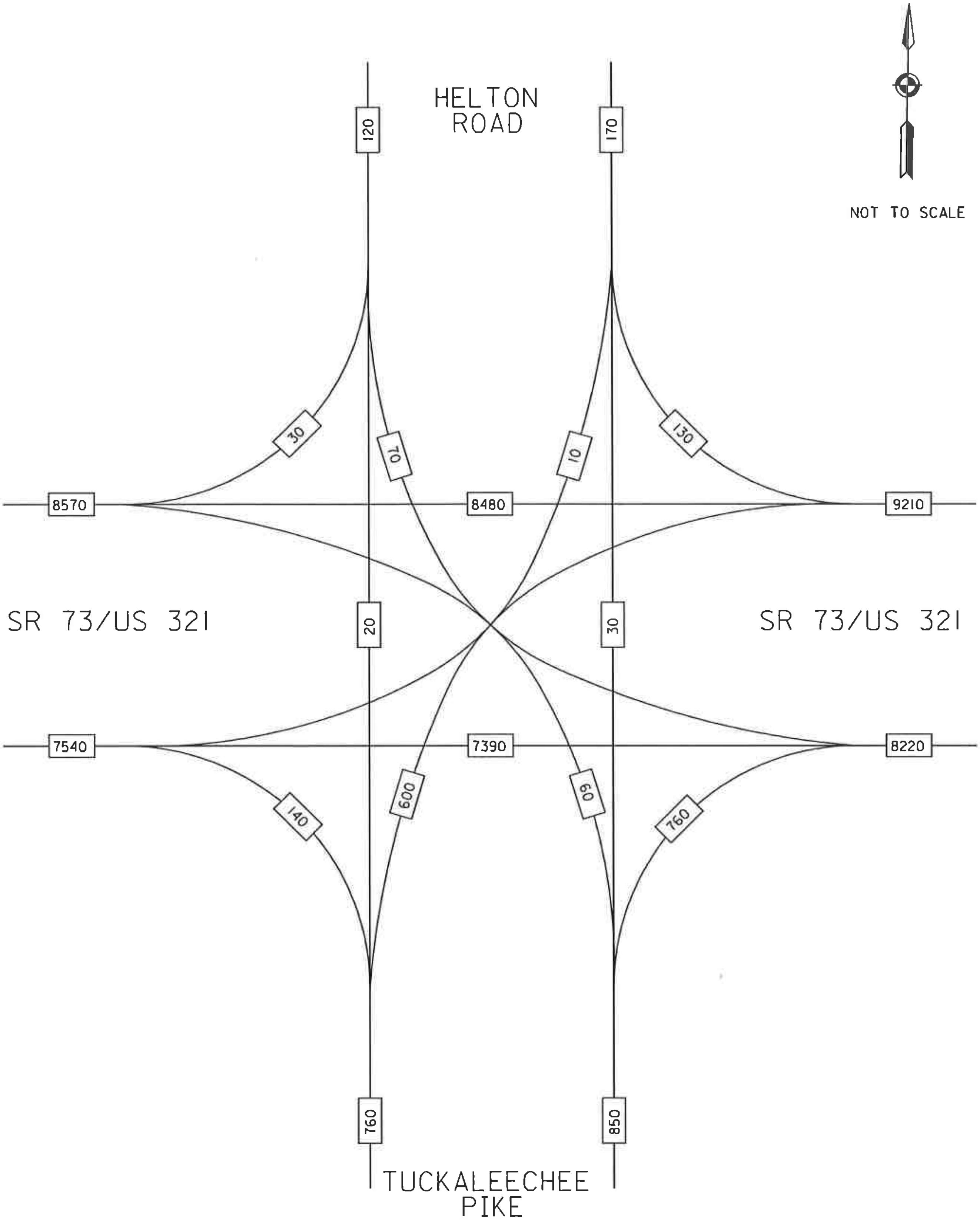


2010 AADT	DAVIS FORD ROAD @ HELTON ROAD

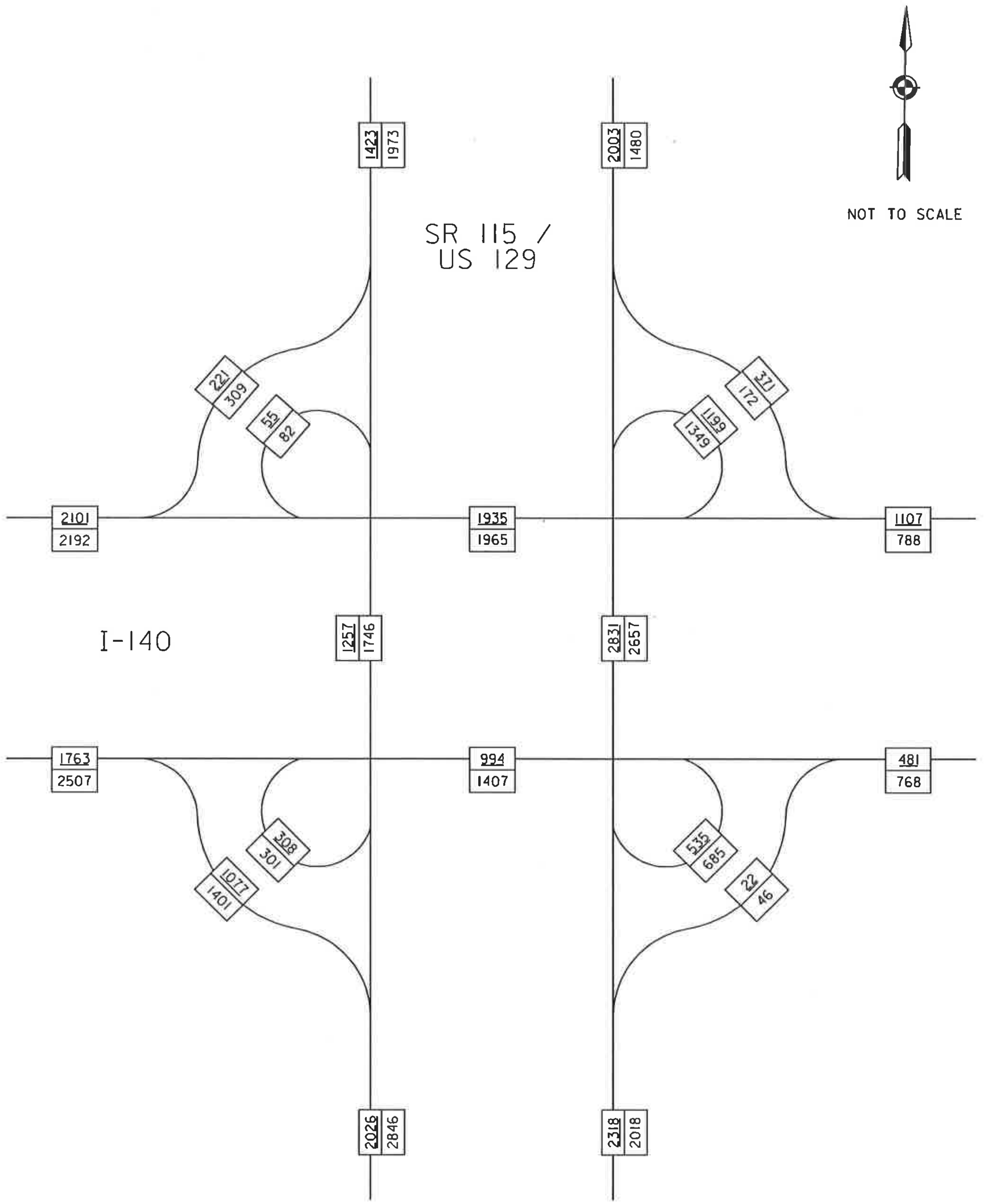


2010 AADT

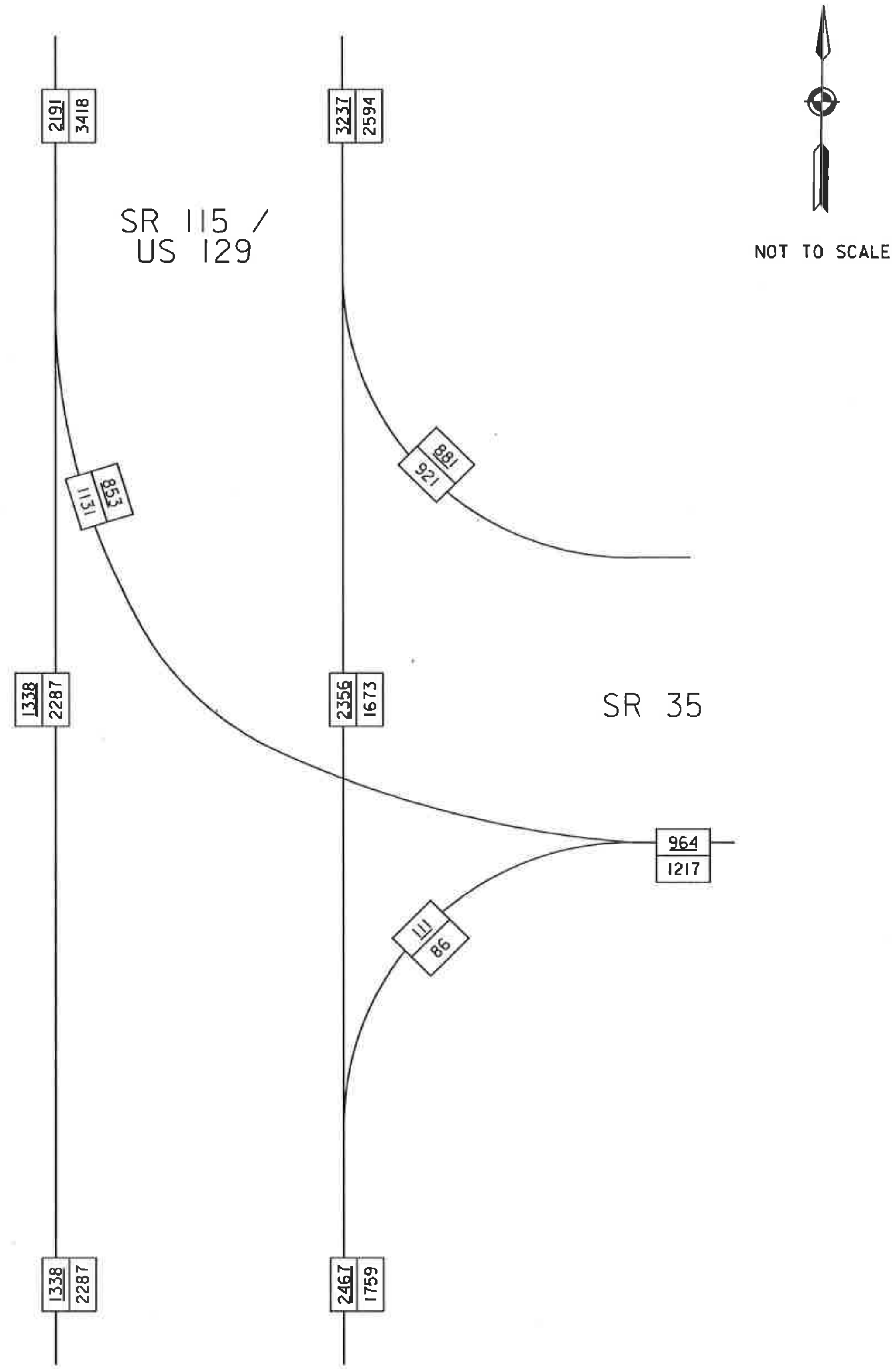
DAVIS FORD ROAD @ HITCH ROAD



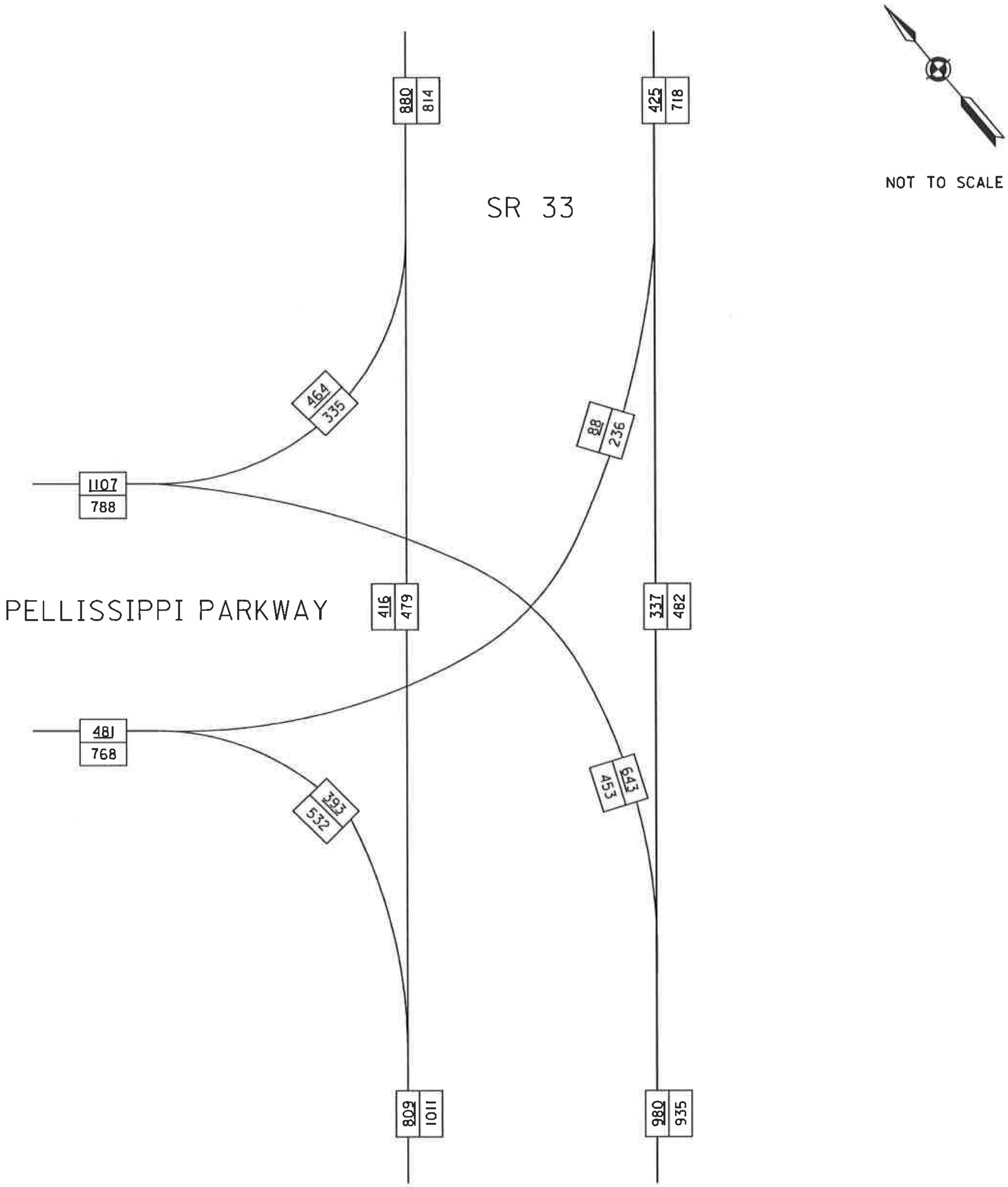
2010 AADT	SR 73/US 321 @ HELTON ROAD/TUCKALEECHEE PIKE



2013 DHV AM/PM	SR 115/US 129 @ I-140 / PELLISSIPPI PARKWAY

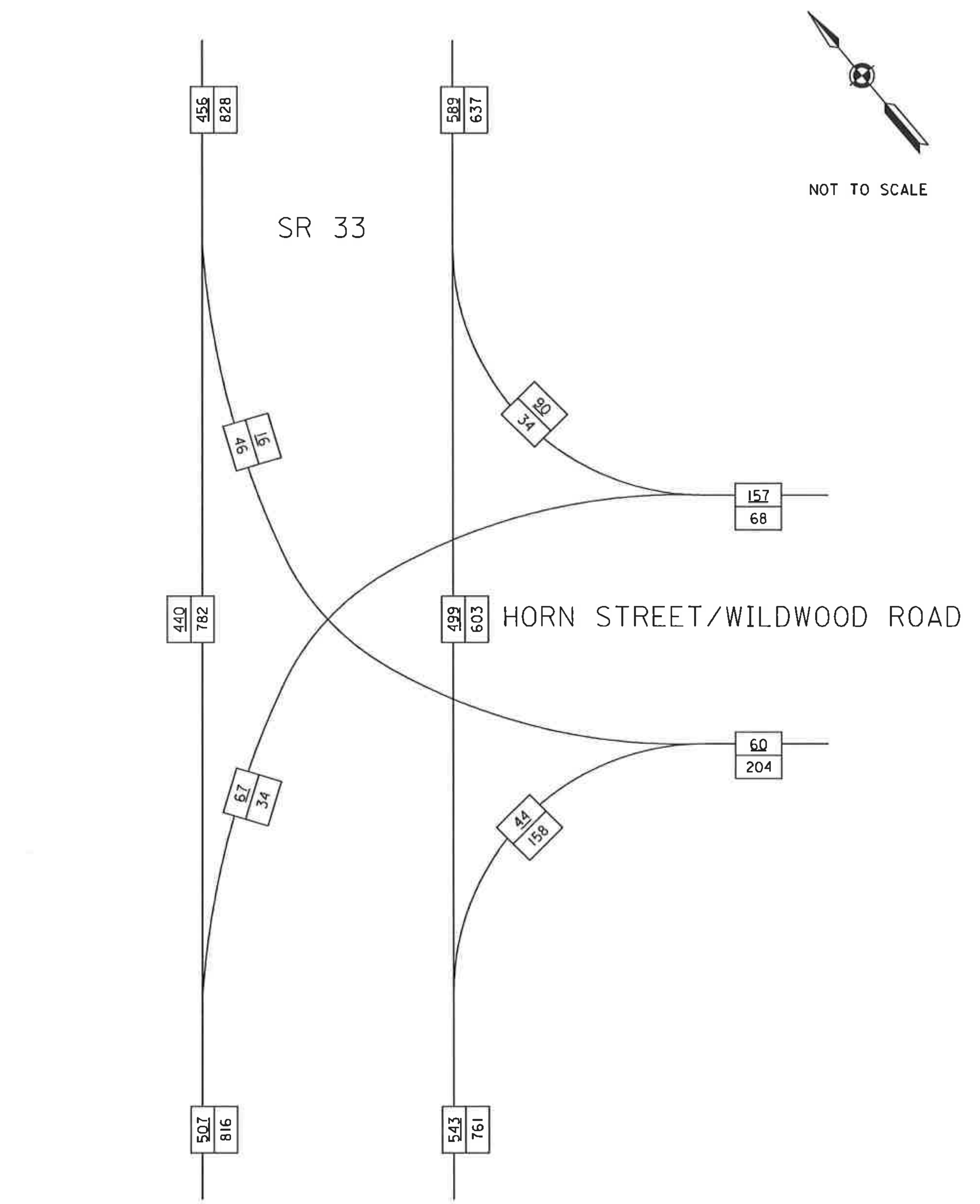


2013 DHV AM/PM	SR 115/US 129 @ SR 35

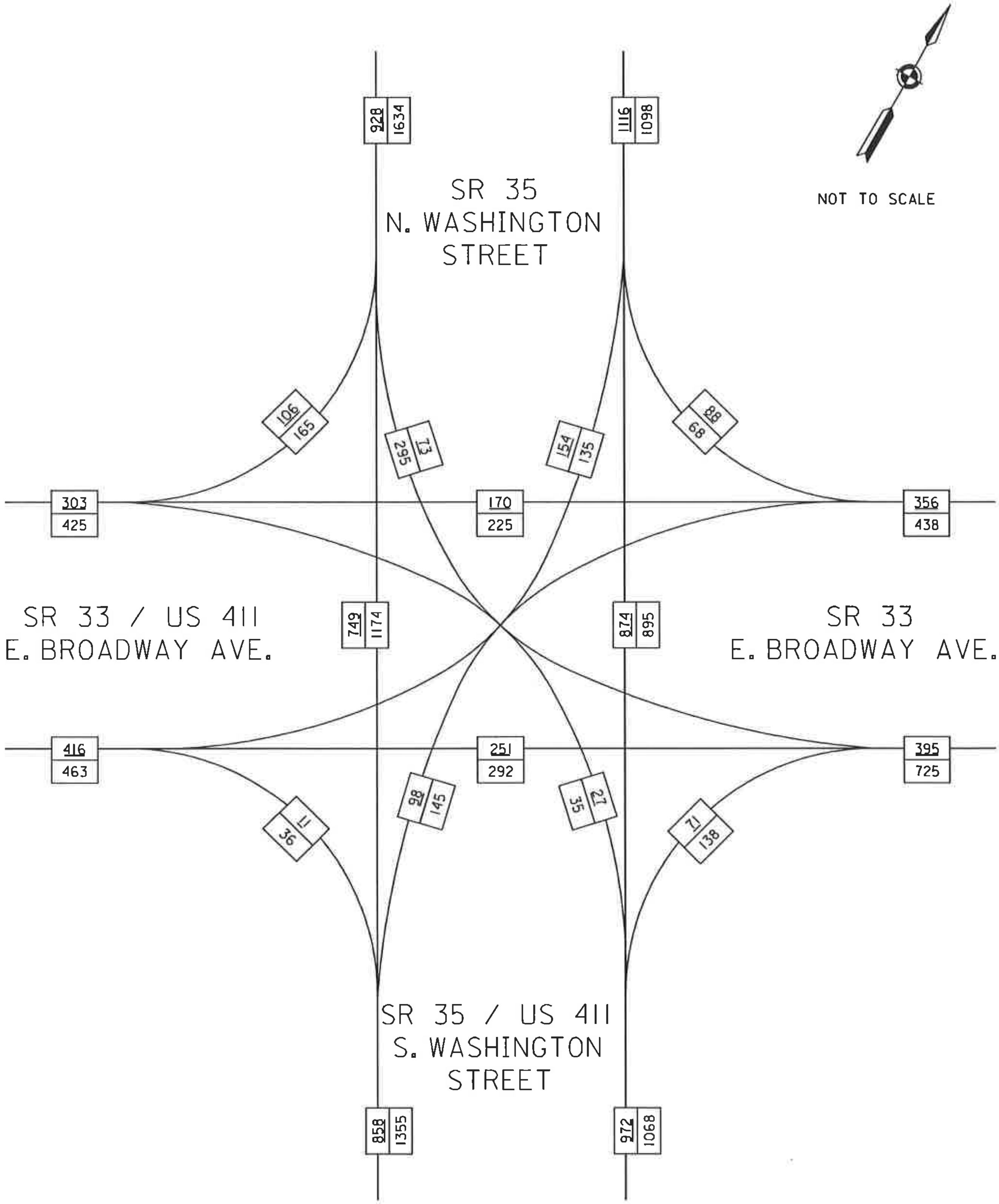


2013 DHV
AM/PM

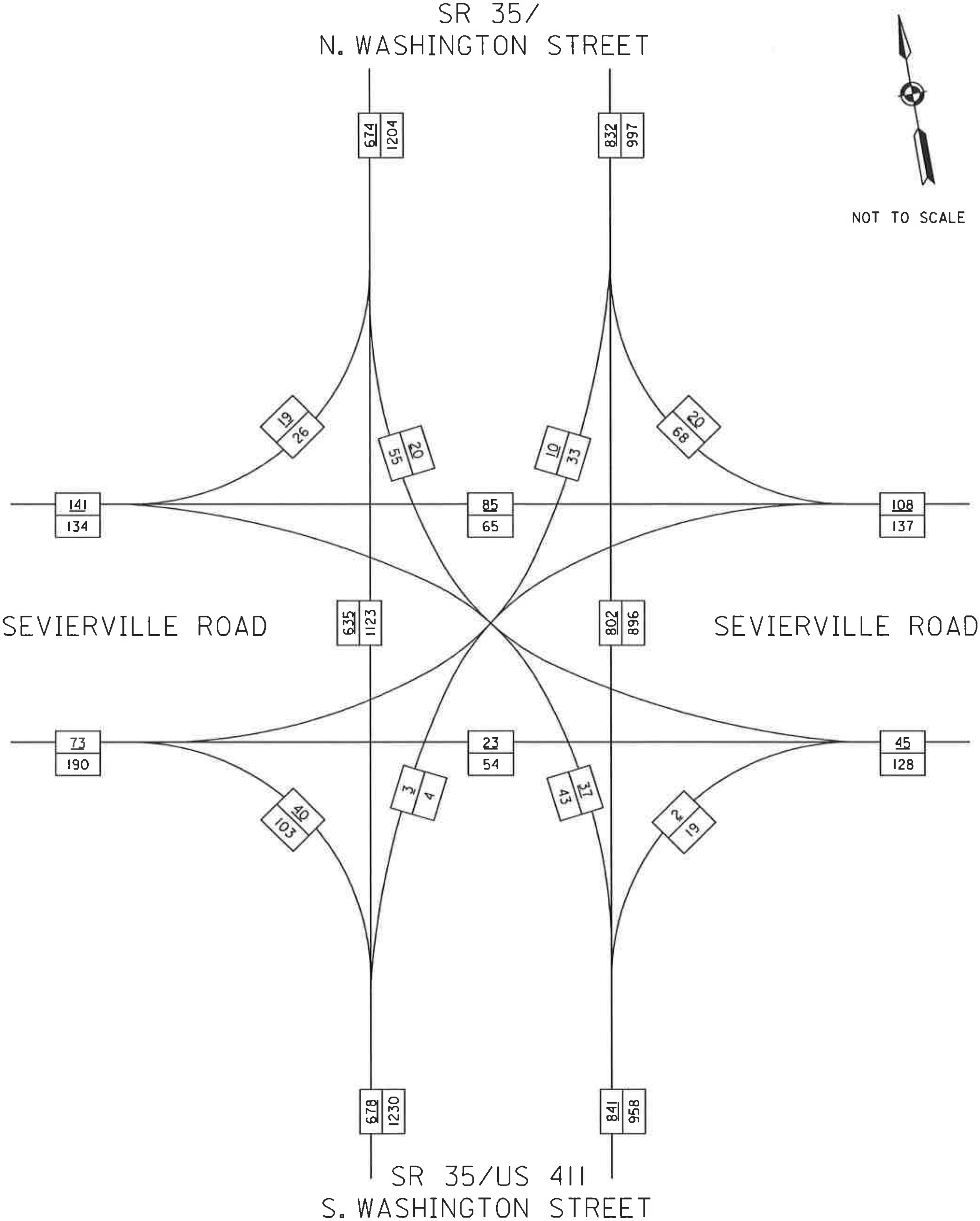
SR 33 @ PELLISSIPPI PARKWAY



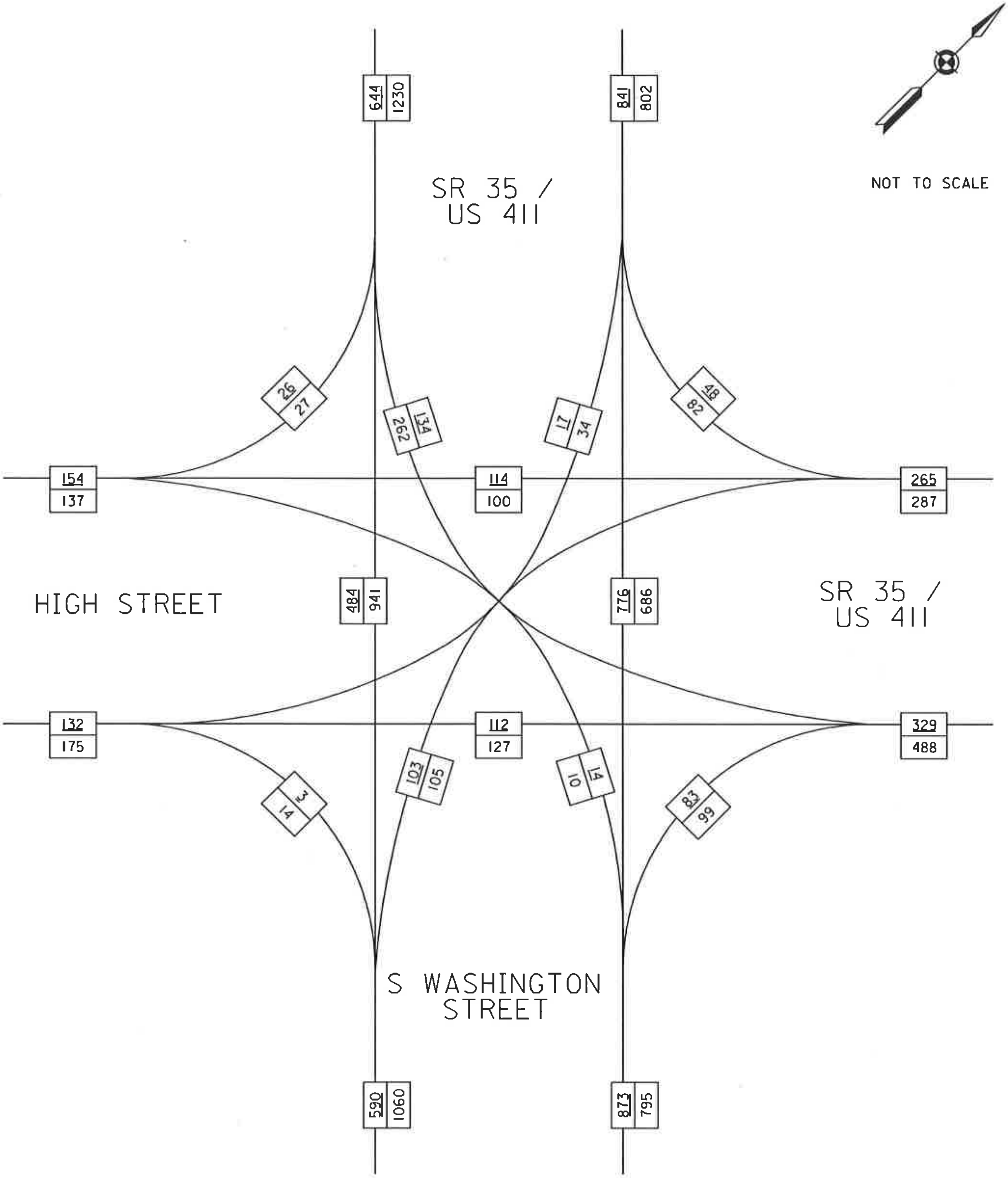
2013 DHV AM/PM	SR 33 @ HORN STREET/ WILDWOOD ROAD



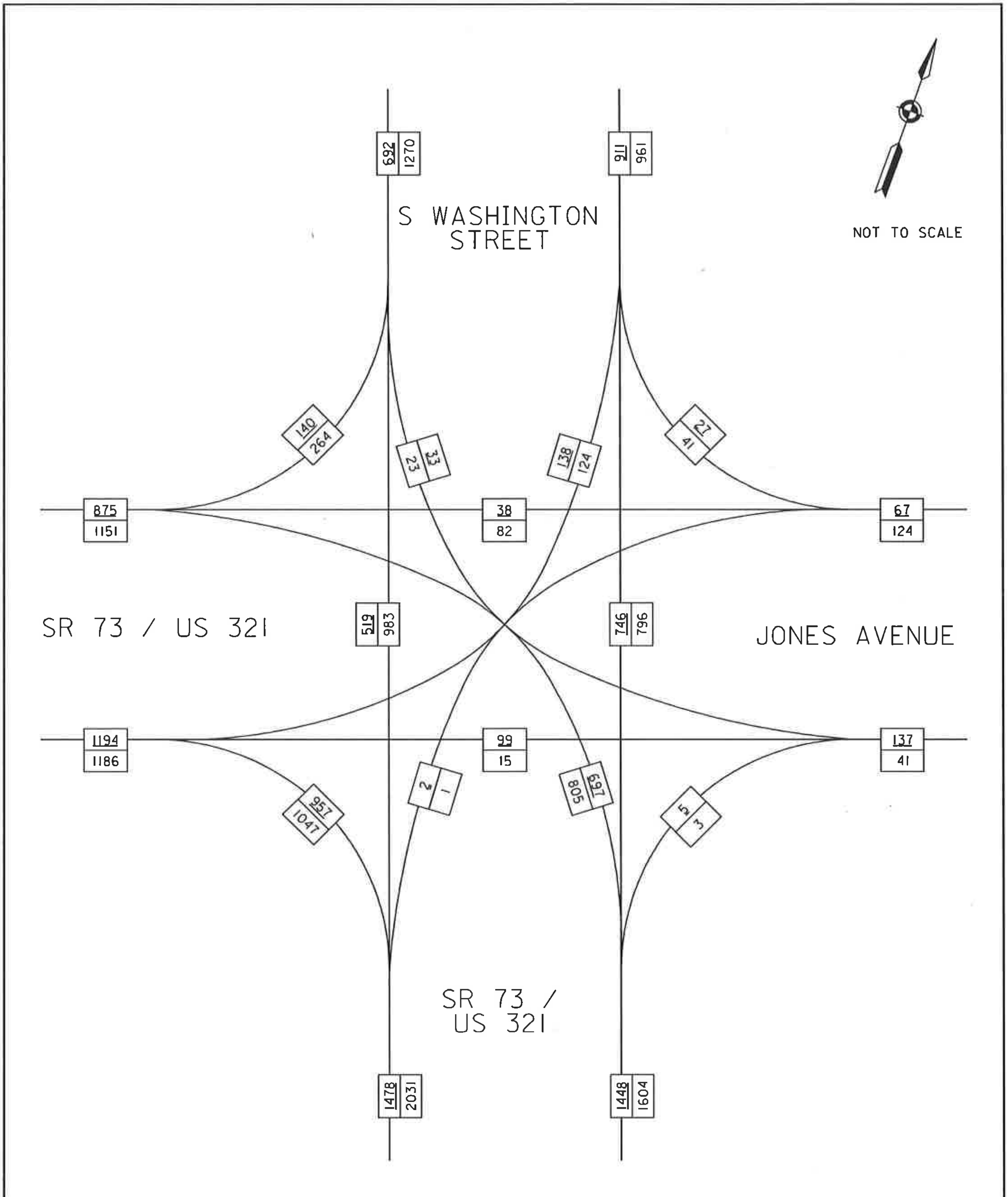
2013 DHV AM/PM	SR 33 @ SR 35



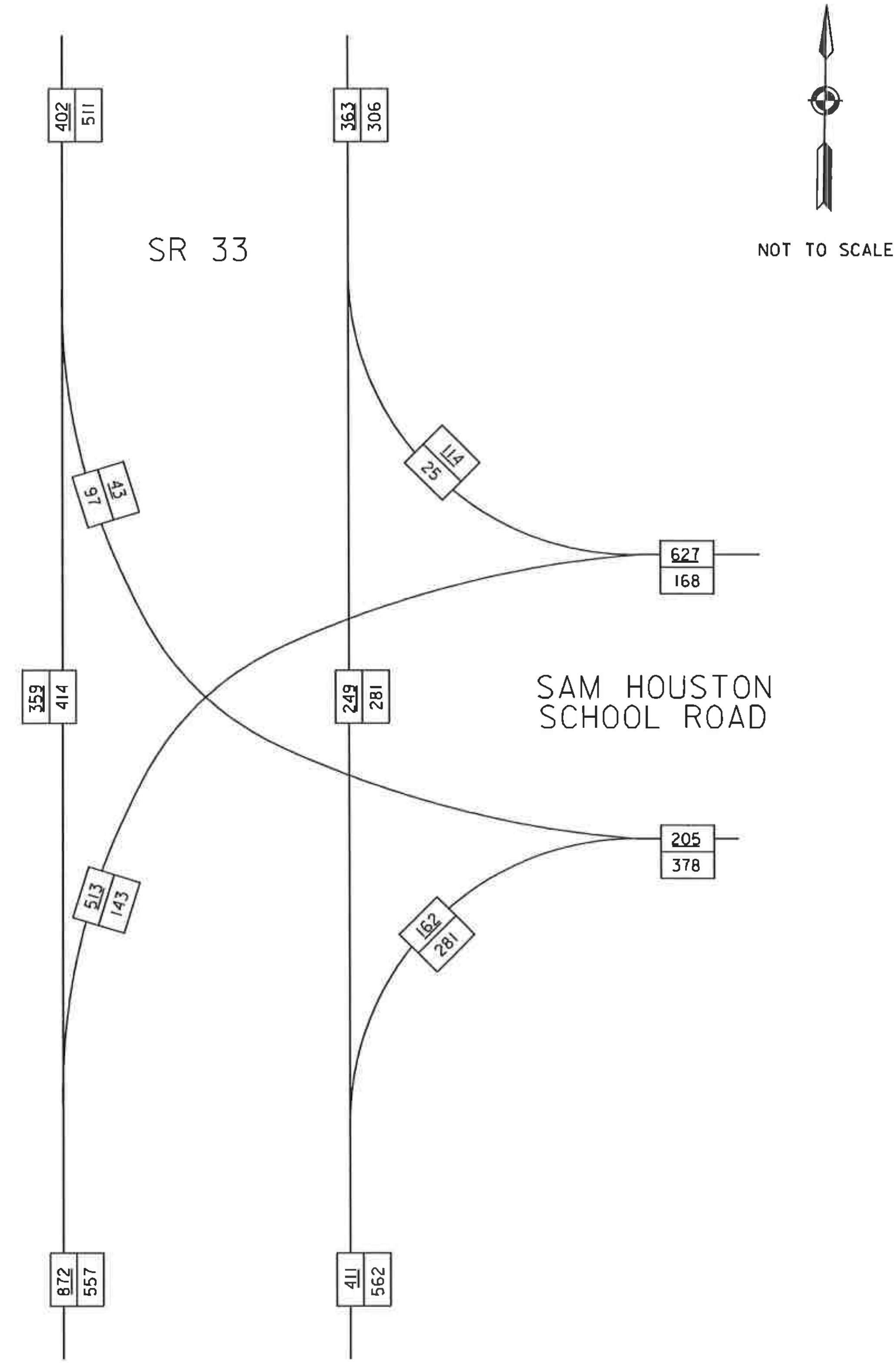
2011 DHV AM/PM	SEVIERVILLE ROAD @ SR 35/WASHINGTON STREET



2011 DHV AM/PM	S WASHINGTON ST / SR 35 @ HIGH ST / SR 35

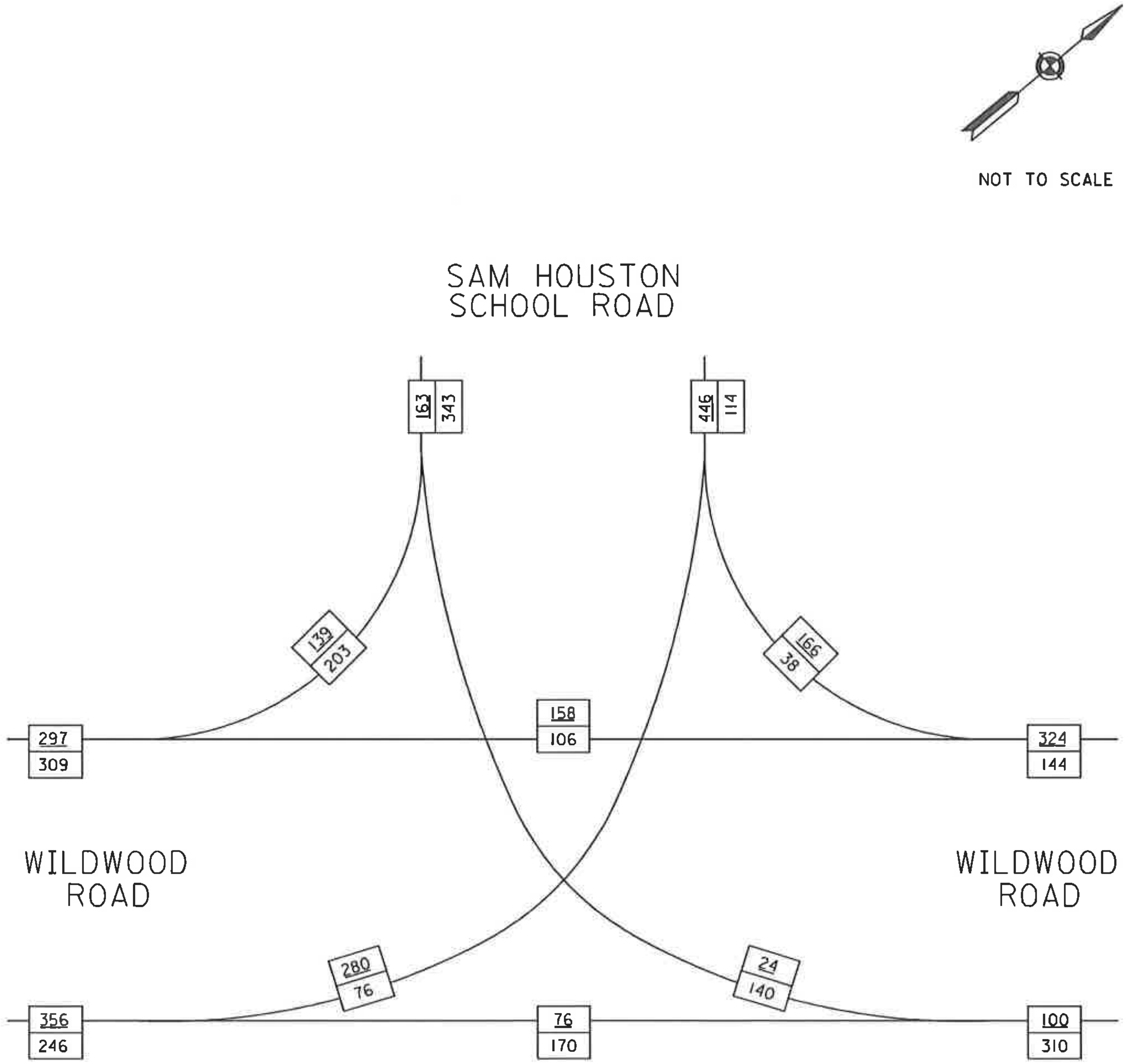


2013 DHV AM/PM	S WASHINGTON ST @ SR 73/ US 321

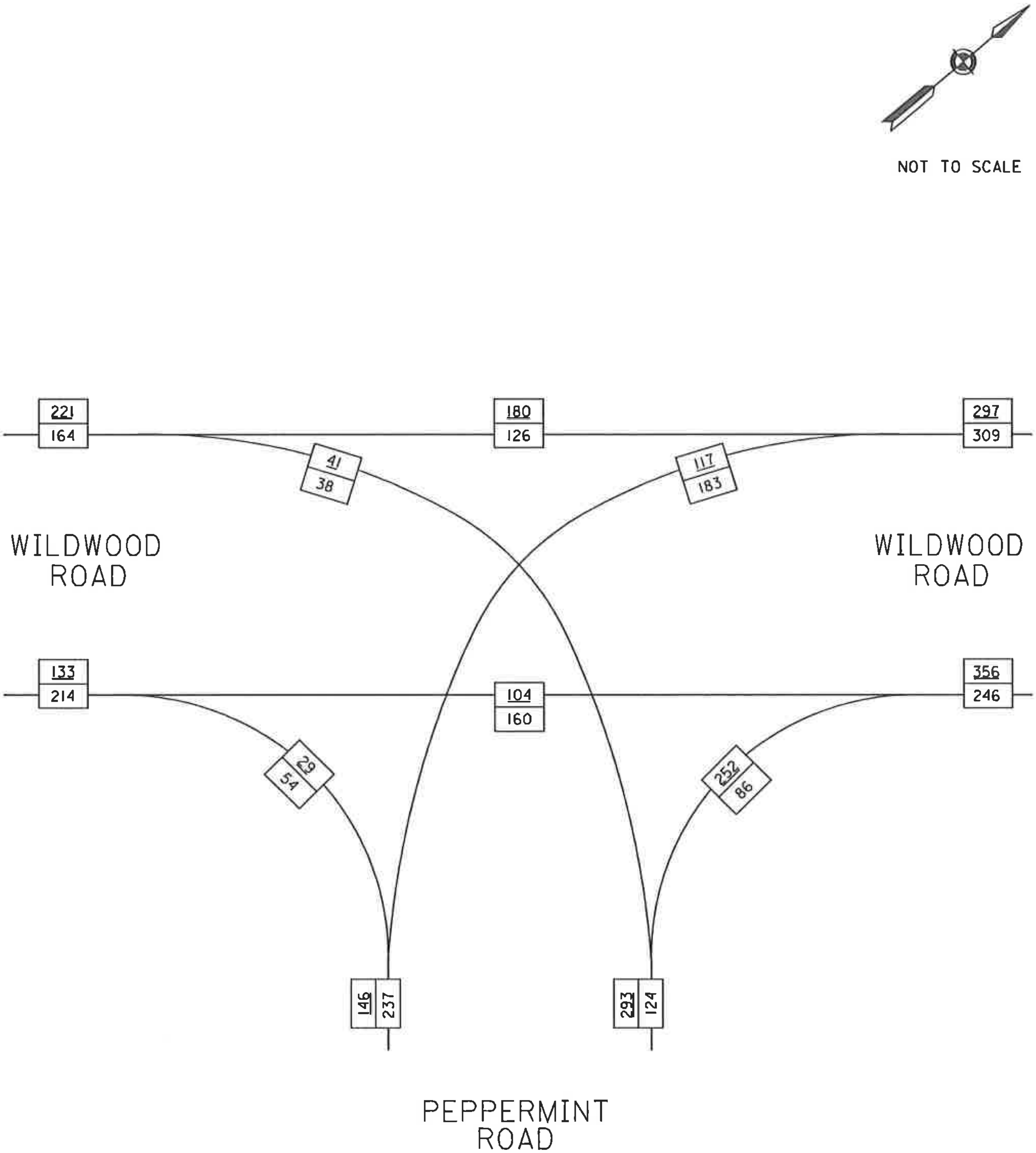


2010 DHV
AM/PM

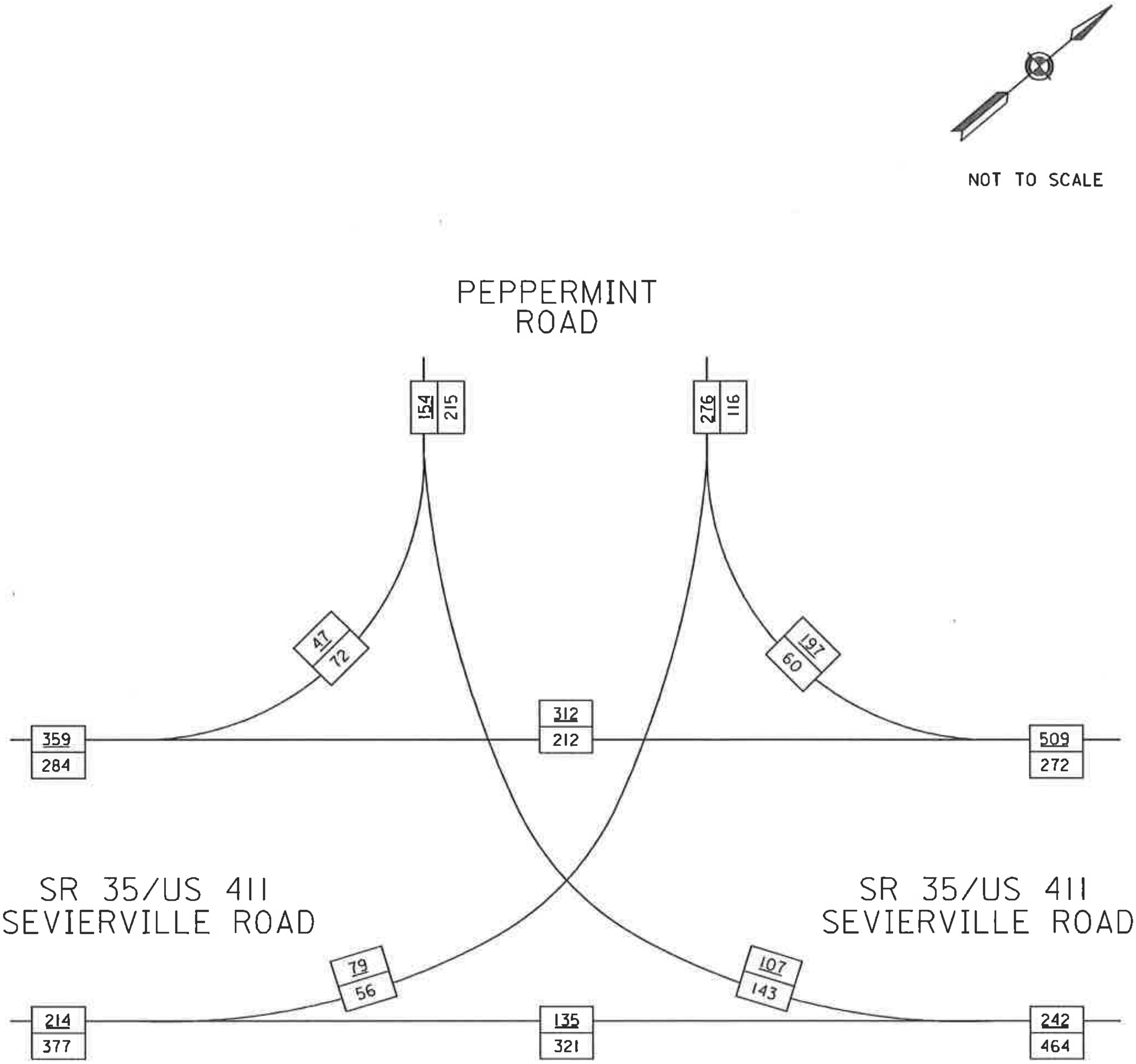
SR 33 @
SAM HOUSTON SCHOOL ROAD



2010 DHV AM/PM	SAM HOUSTON SCHOOL ROAD @ WILDWOOD ROAD

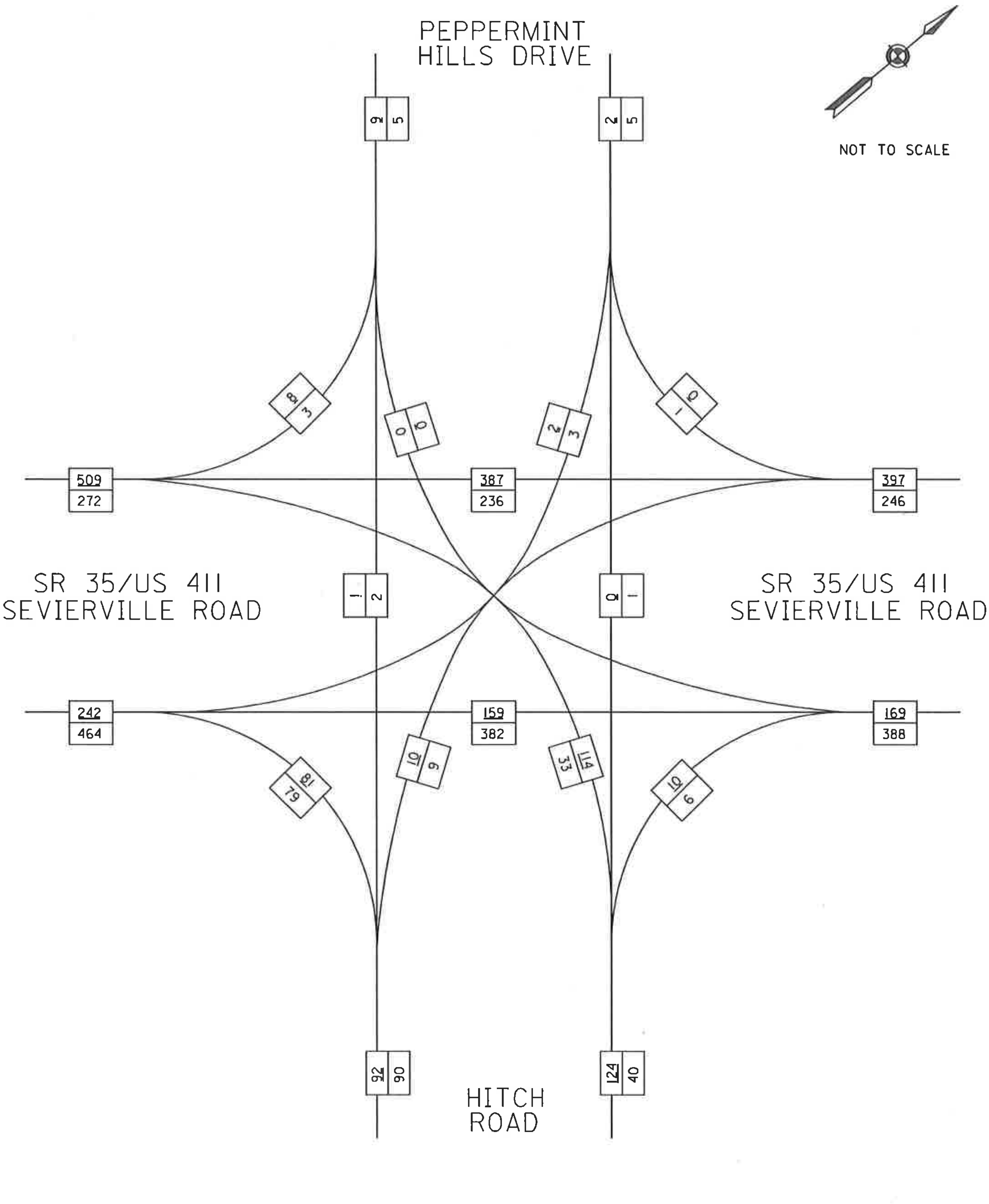


2010 DHV AM/PM	PEPPERMINT ROAD @ WILDWOOD ROAD

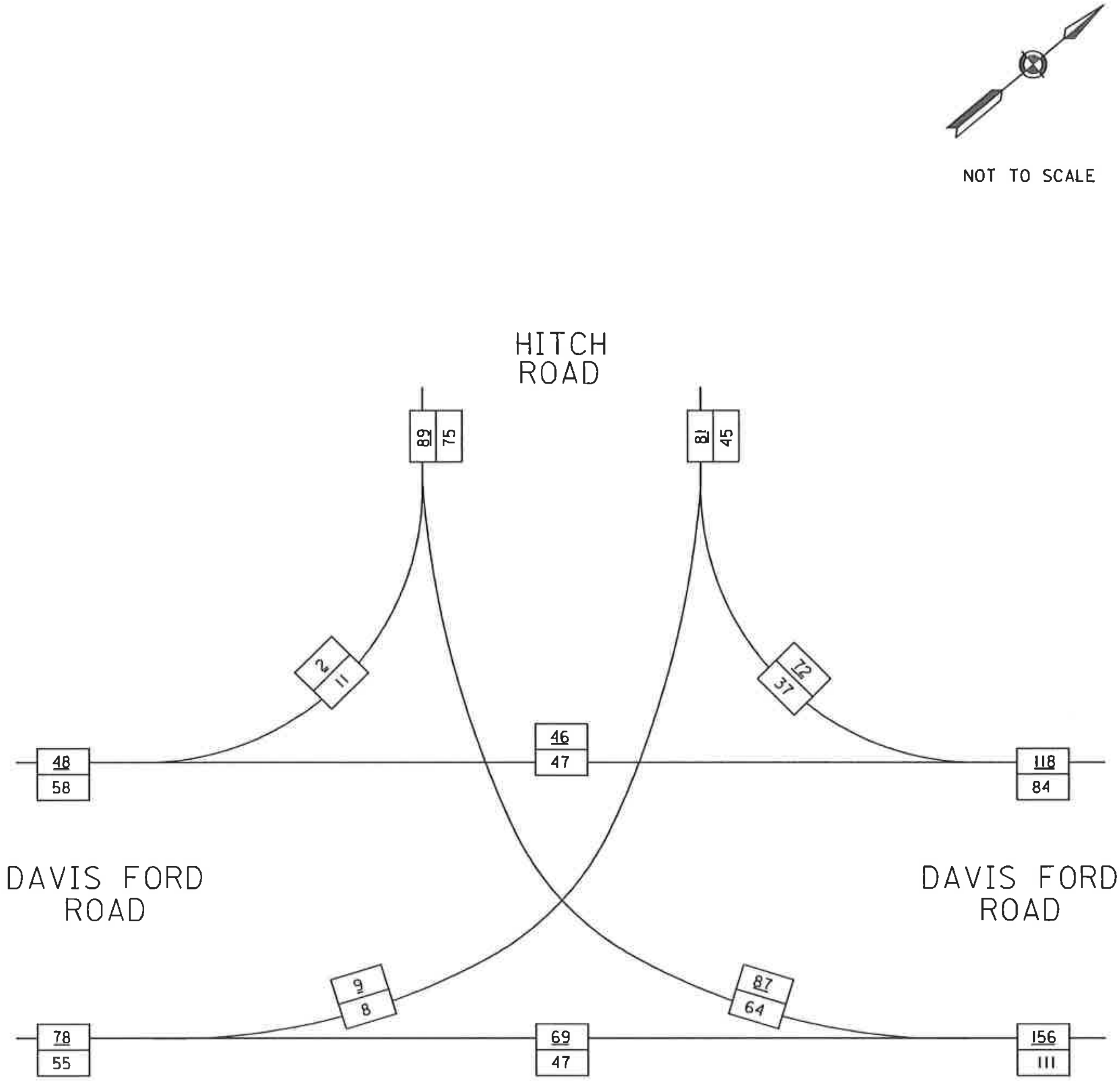


2010 DHV
AM/PM

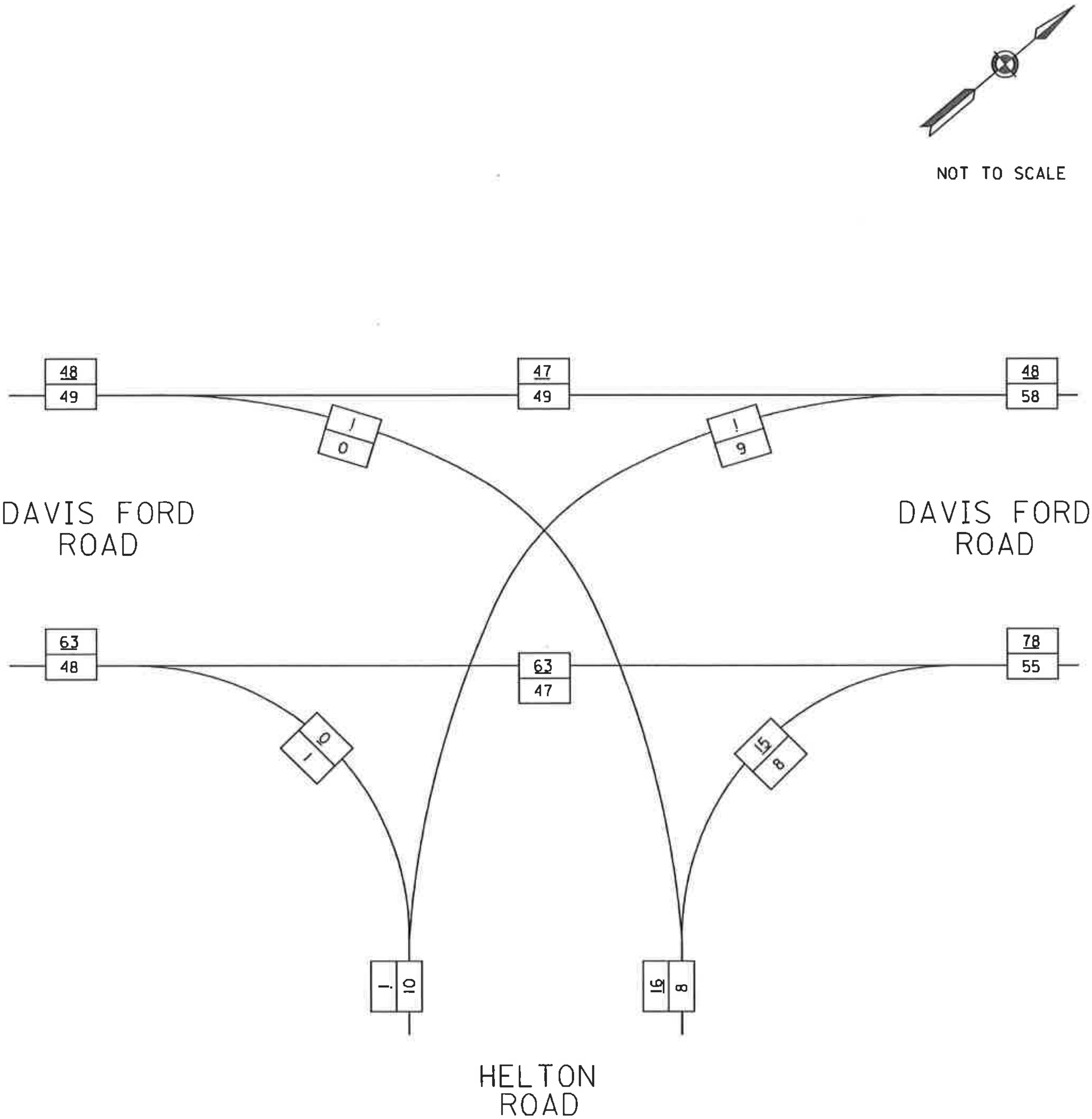
SR 35/US 411/SEVIERVILLE ROAD @ PEPPERMINT ROAD



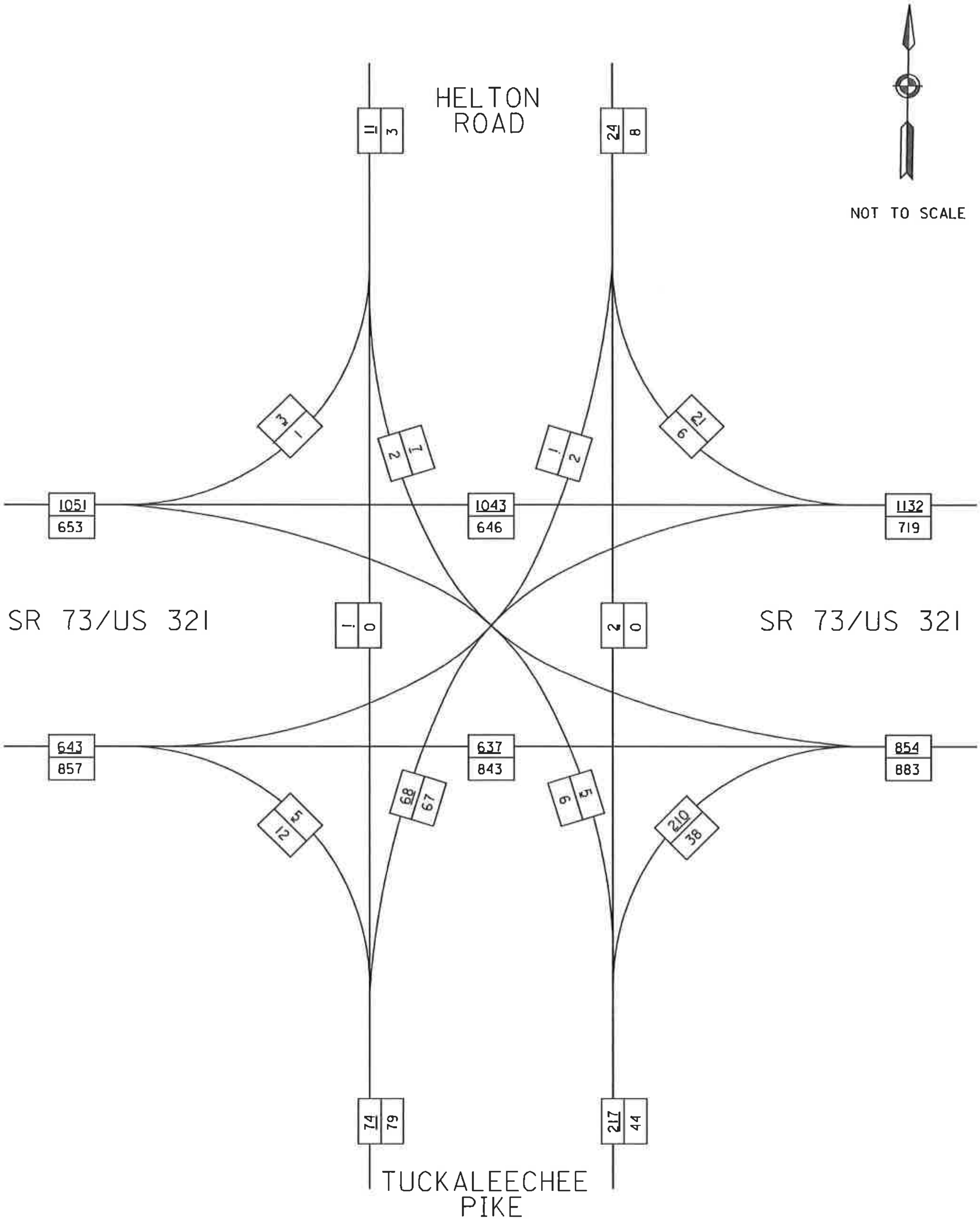
2010 DHV AM/PM	SR 35/US 411/SEVIERVILLE ROAD @ HITCH ROAD/PEPPERMINT HILLS DR



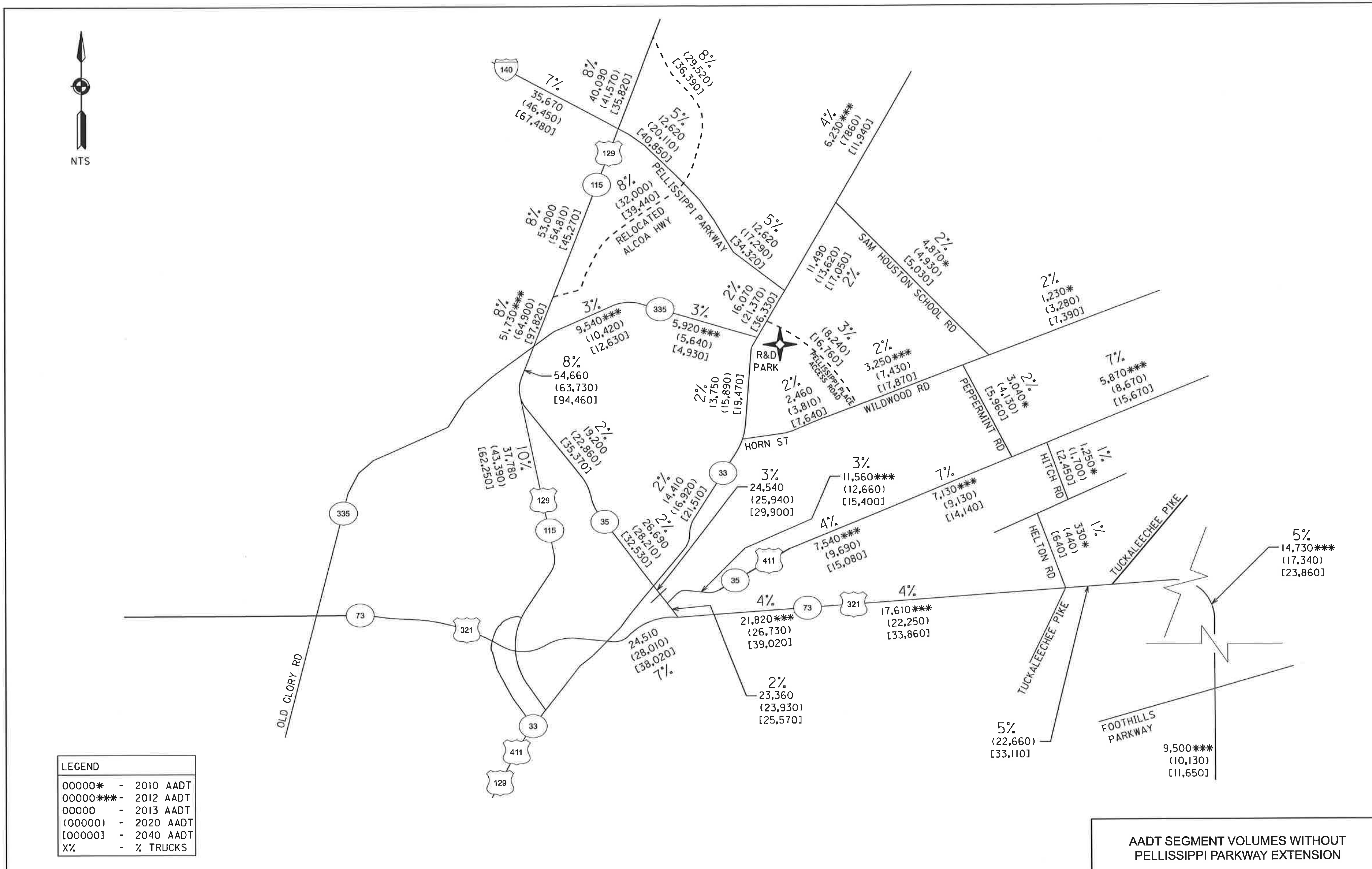
2010 DHV AM/PM	DAVIS FORD ROAD @ HITCH ROAD



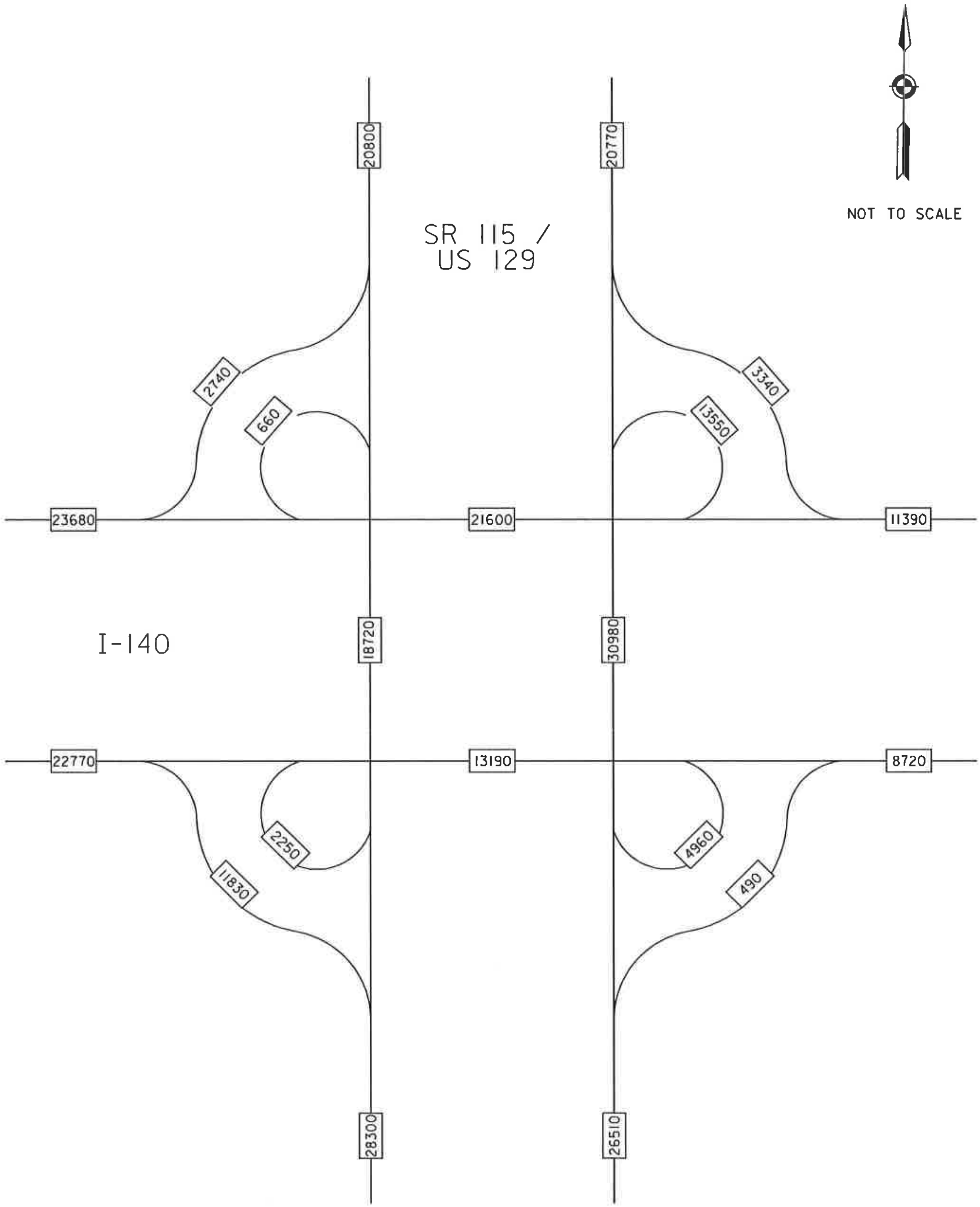
2010 DHV AM/PM	DAVIS FORD ROAD @ HELTON ROAD



2010 DHV AM/PM	SR 73/US 321 @ HELTON ROAD/TUCKALEECHEE PIKE

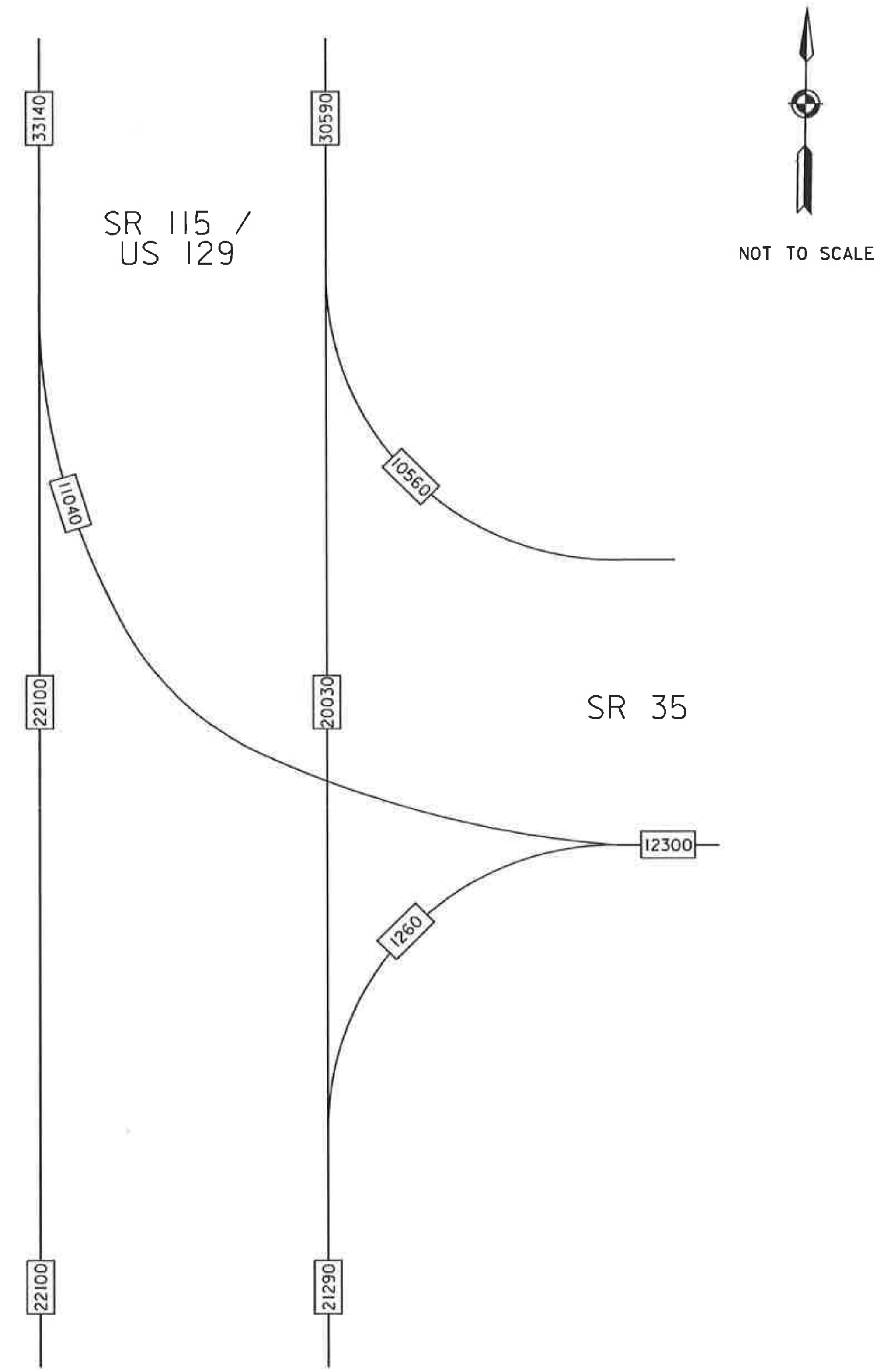


AADT SEGMENT VOLUMES WITHOUT
PELLISSIPPI PARKWAY EXTENSION

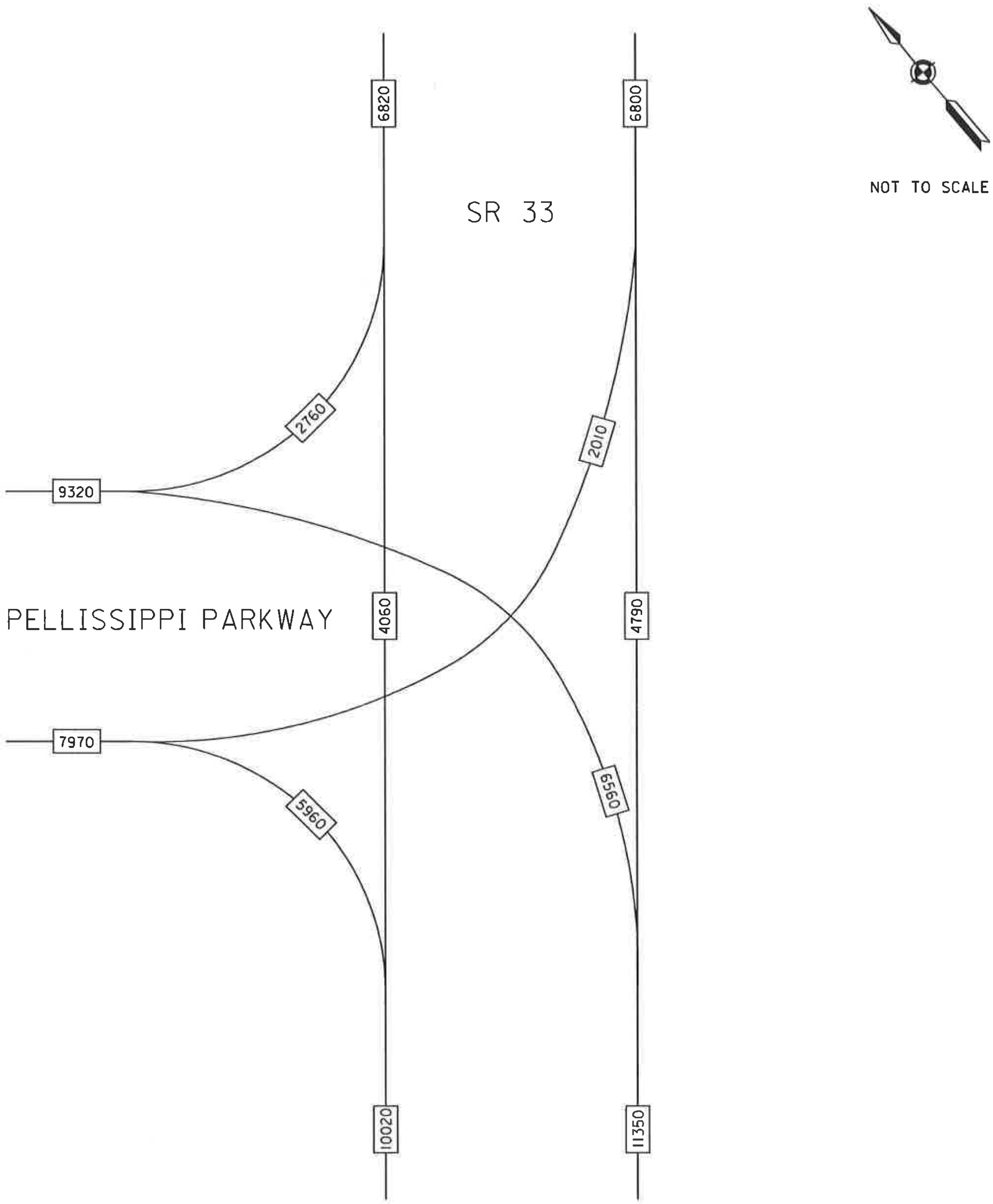


2020 AADT NO PPE

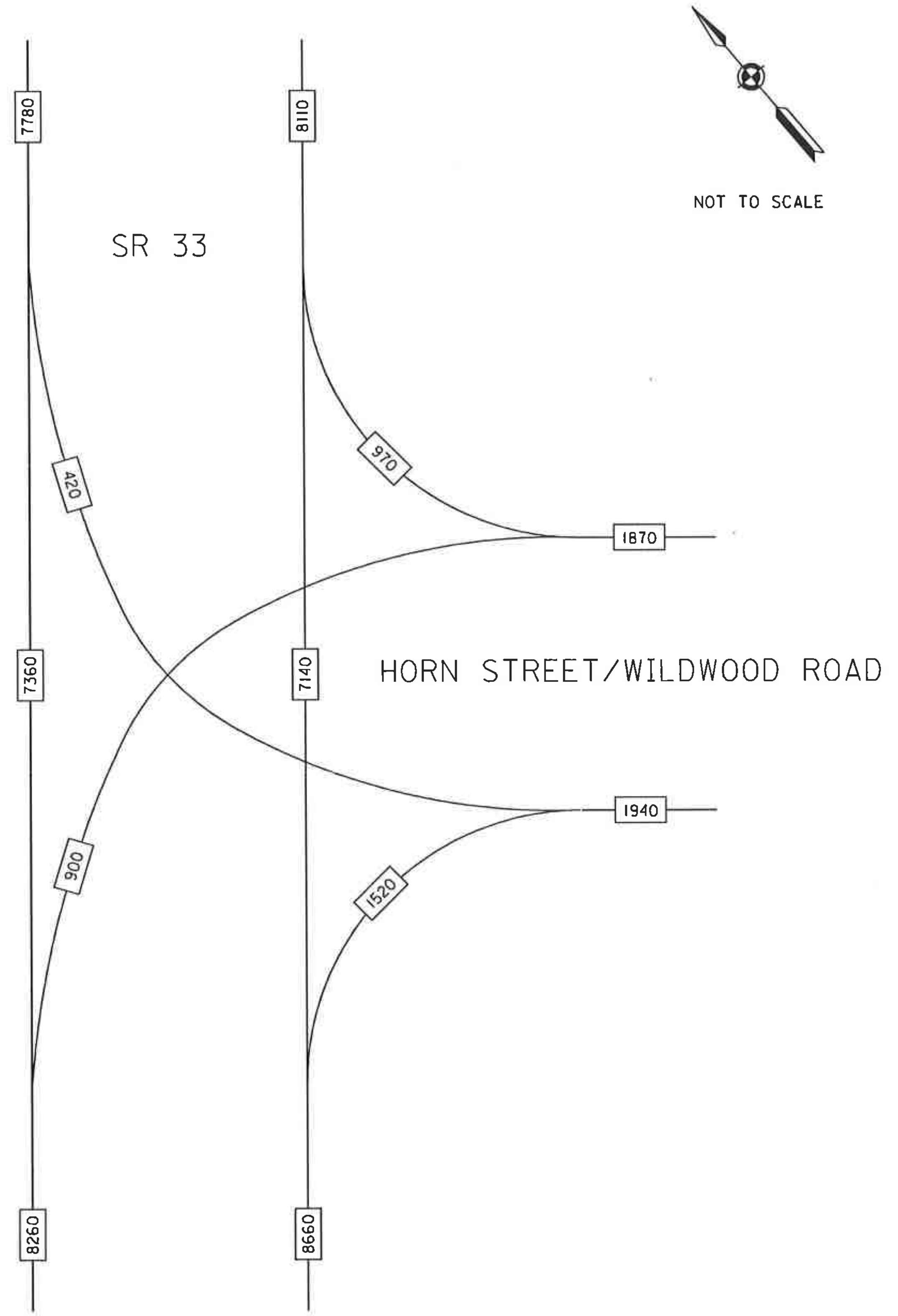
SR 115/US 129 @
I-140 / PELLISSIPPI PARKWAY



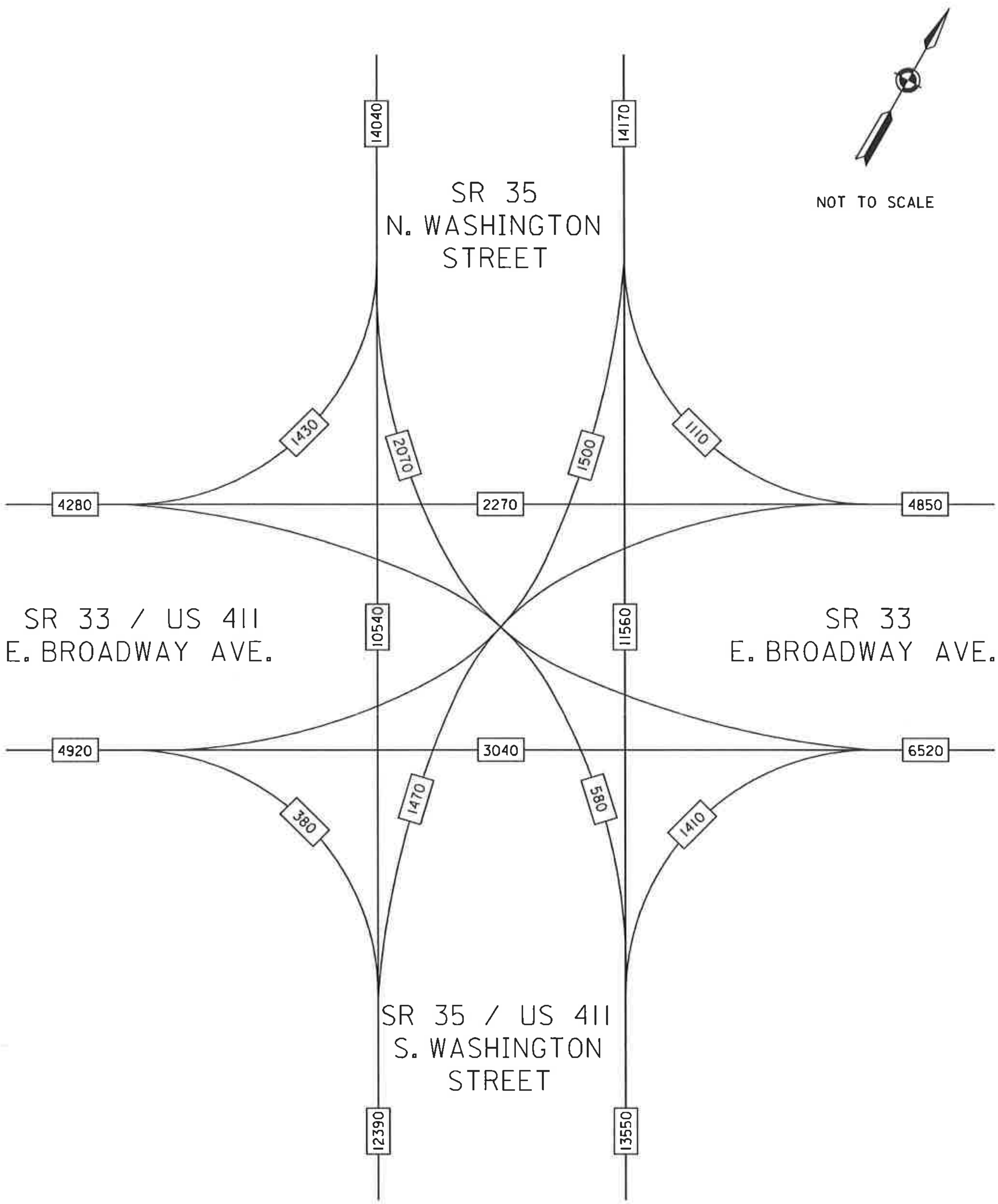
2020 AADT NO PPE	SR 115/US 129 @ SR 35



2020 AADT NO PPE	SR 33 @ PELLISSIPPI PARKWAY

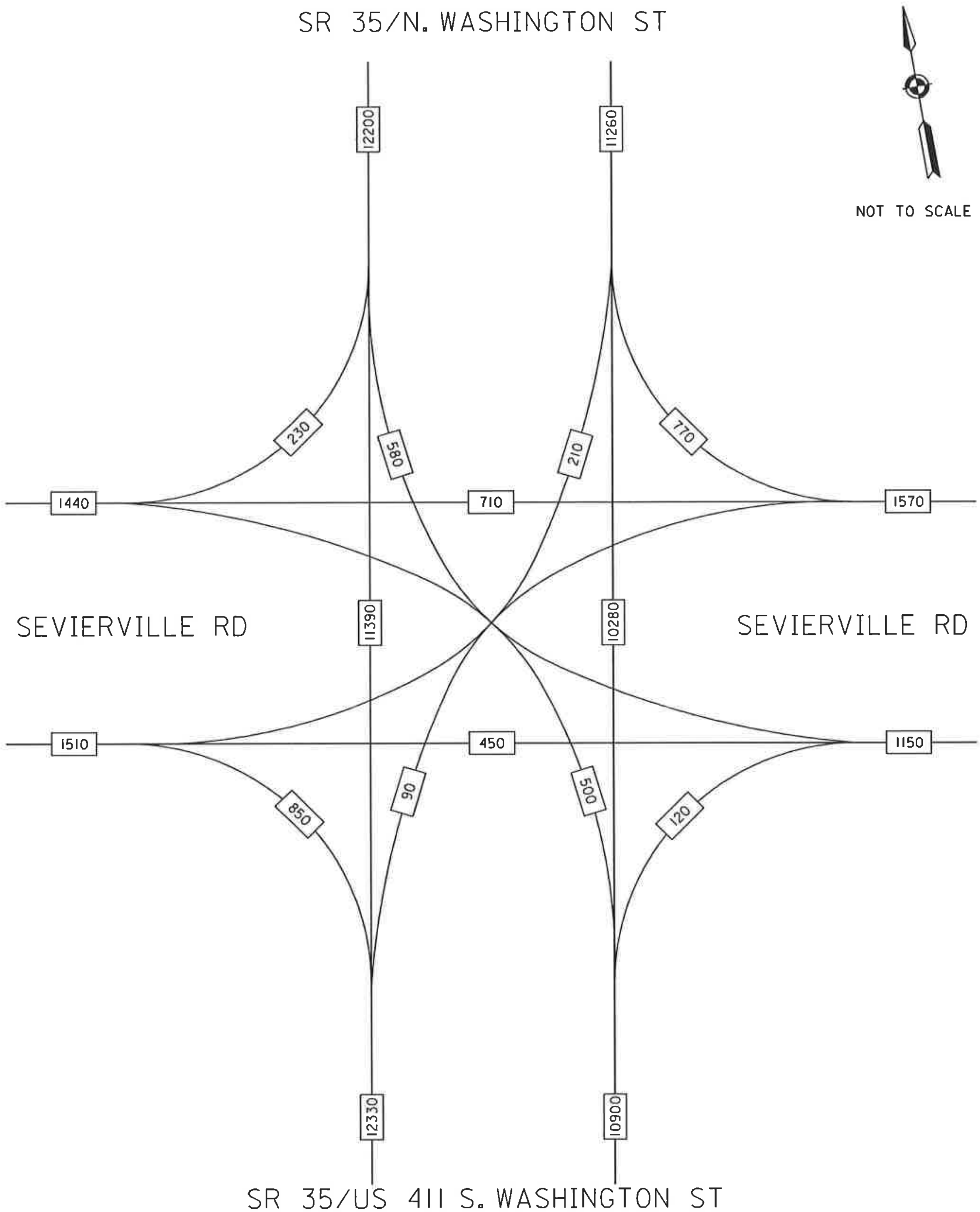


2020 AADT NO PPE	SR 33 @ HORN STREET/ WILDWOOD ROAD

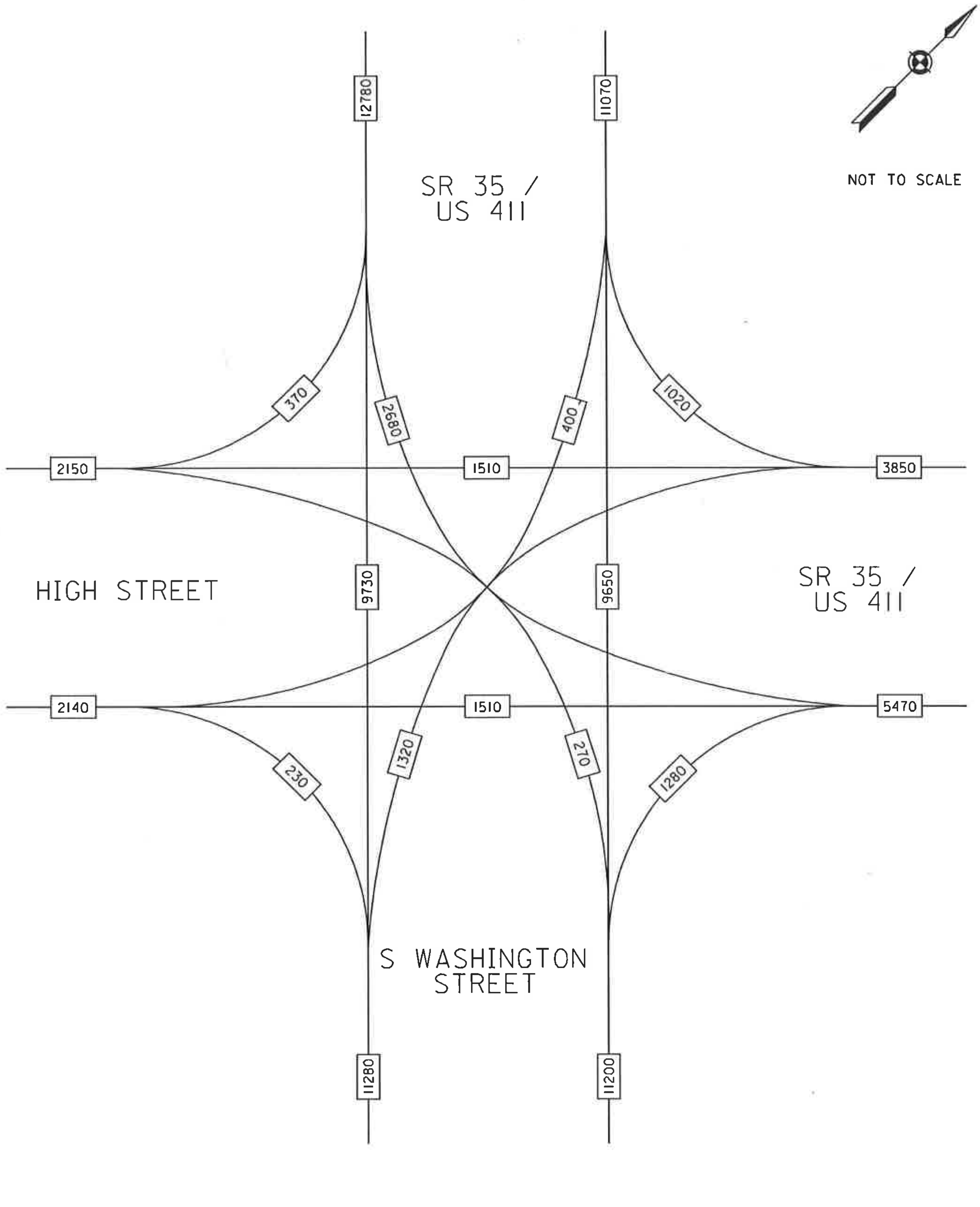


2020 AADT NO PPE

SR 33 @ SR 35

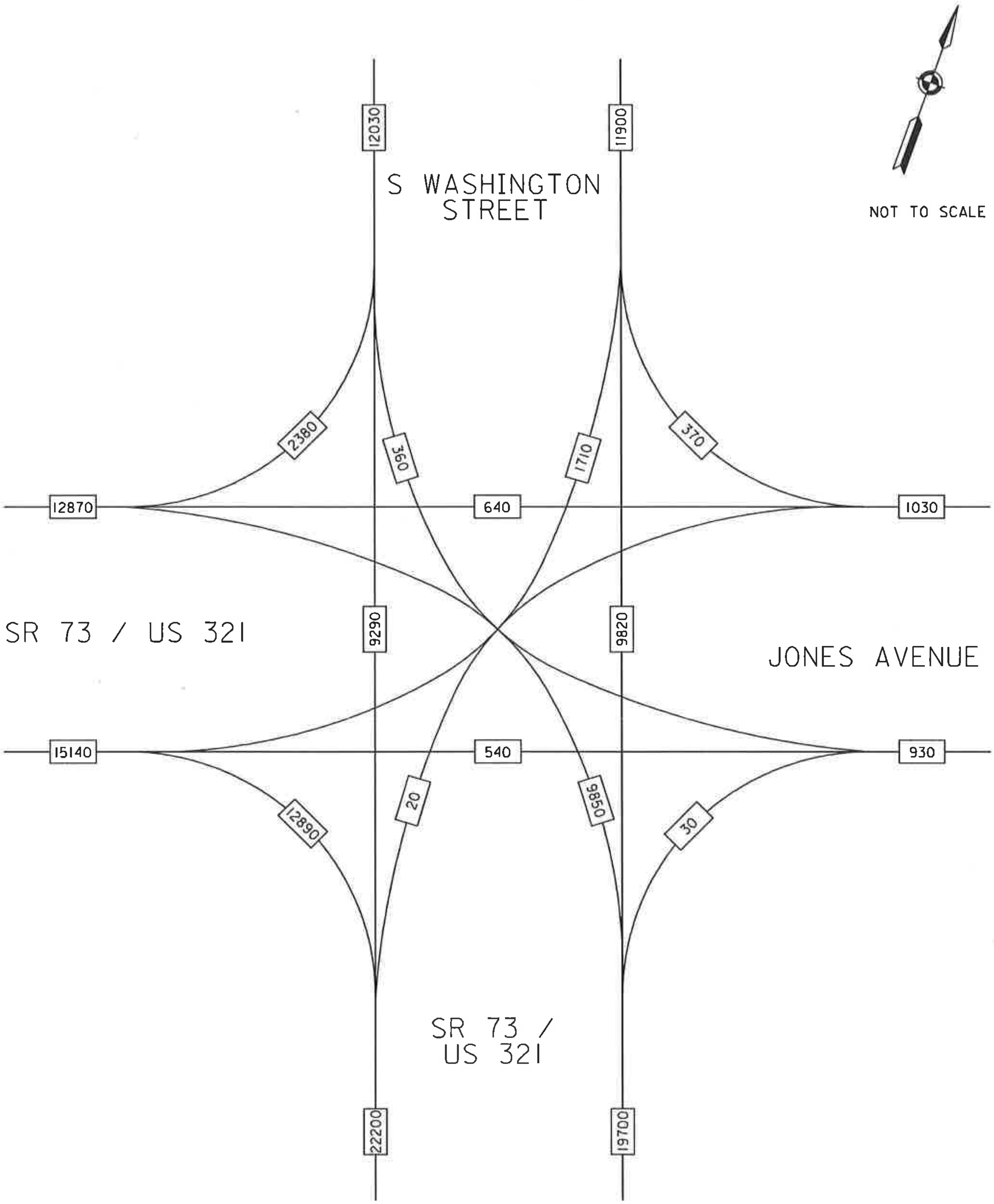


2020 AADT NO PPE	SEVIERVILLE RD @ SR 35/US 411 WASHINGTON ST



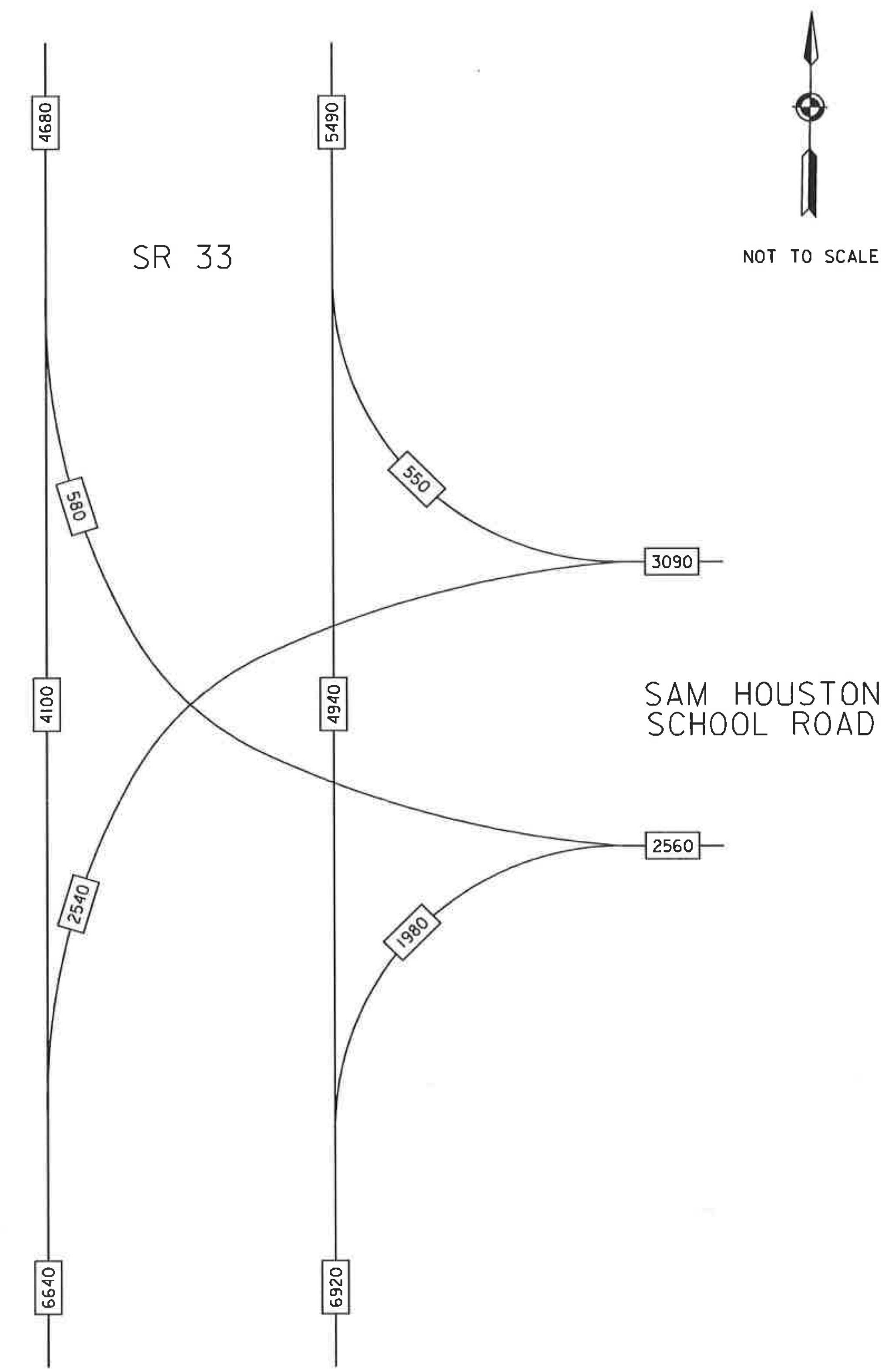
2020 AADT NO PPE

S WASHINGTON ST / SR 35
@ HIGH ST / SR 35



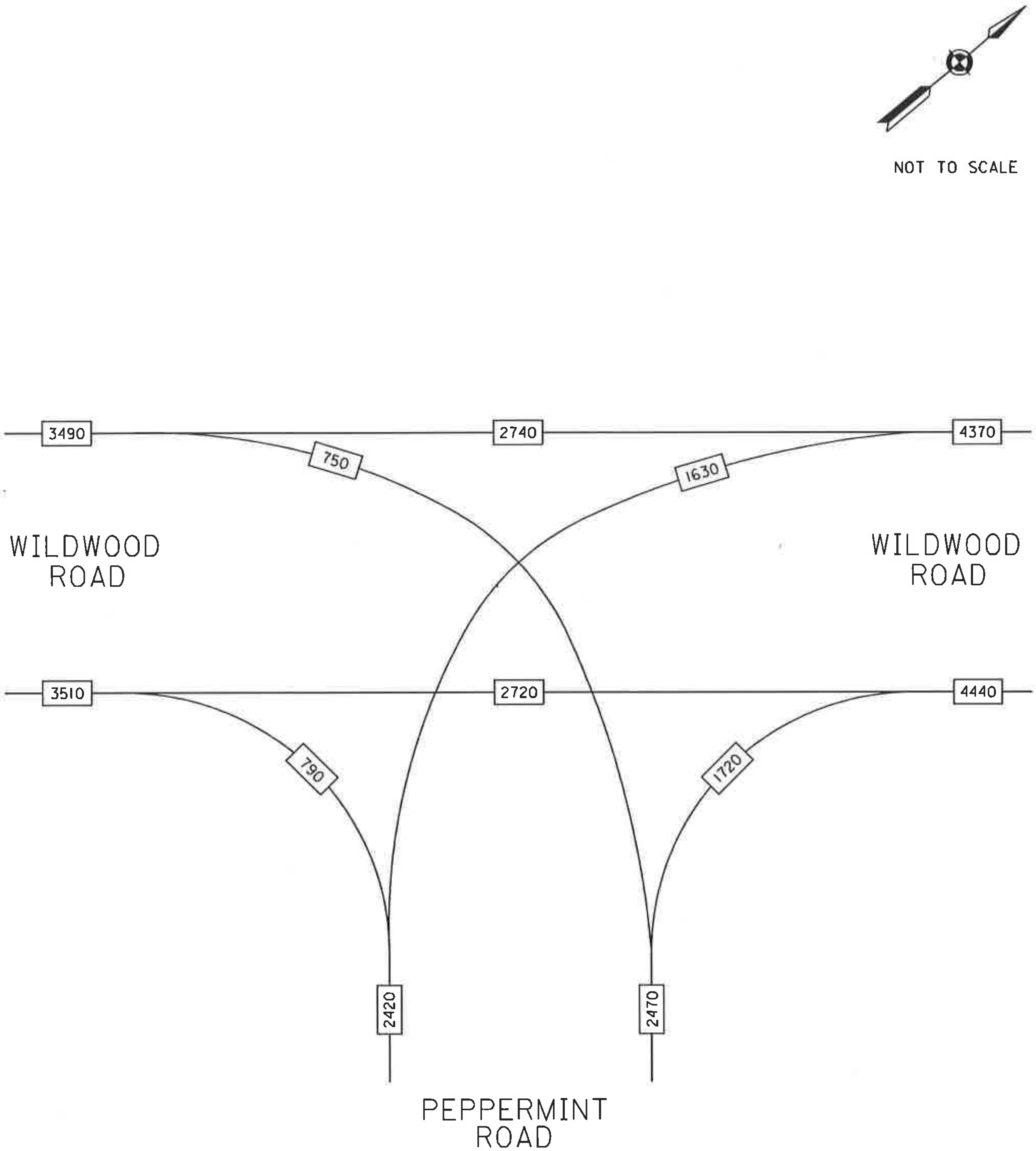
2020 AADT NO PPE

S WASHINGTON ST
@ SR 73/ US 321

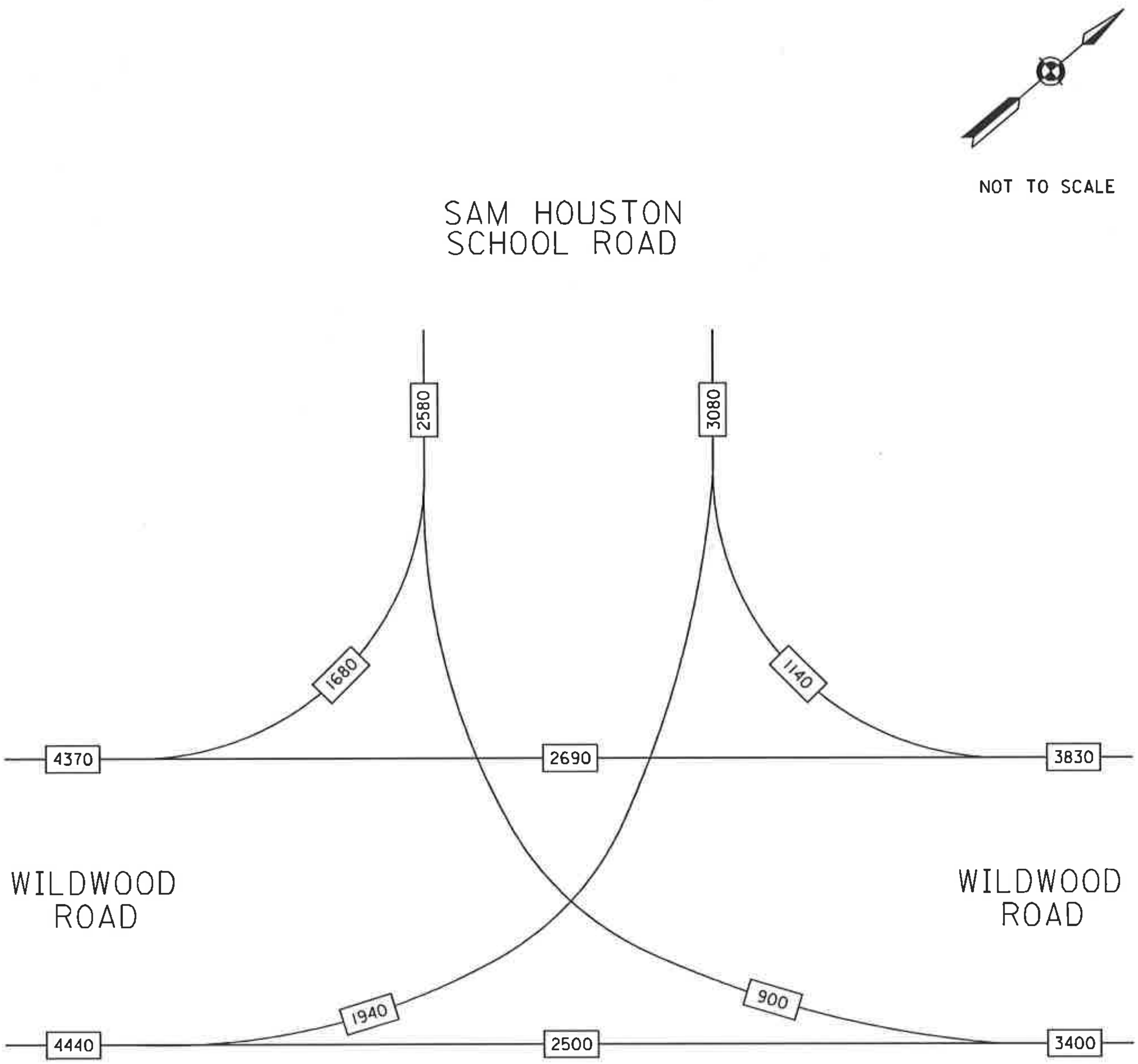


2020 AADT NO PPE

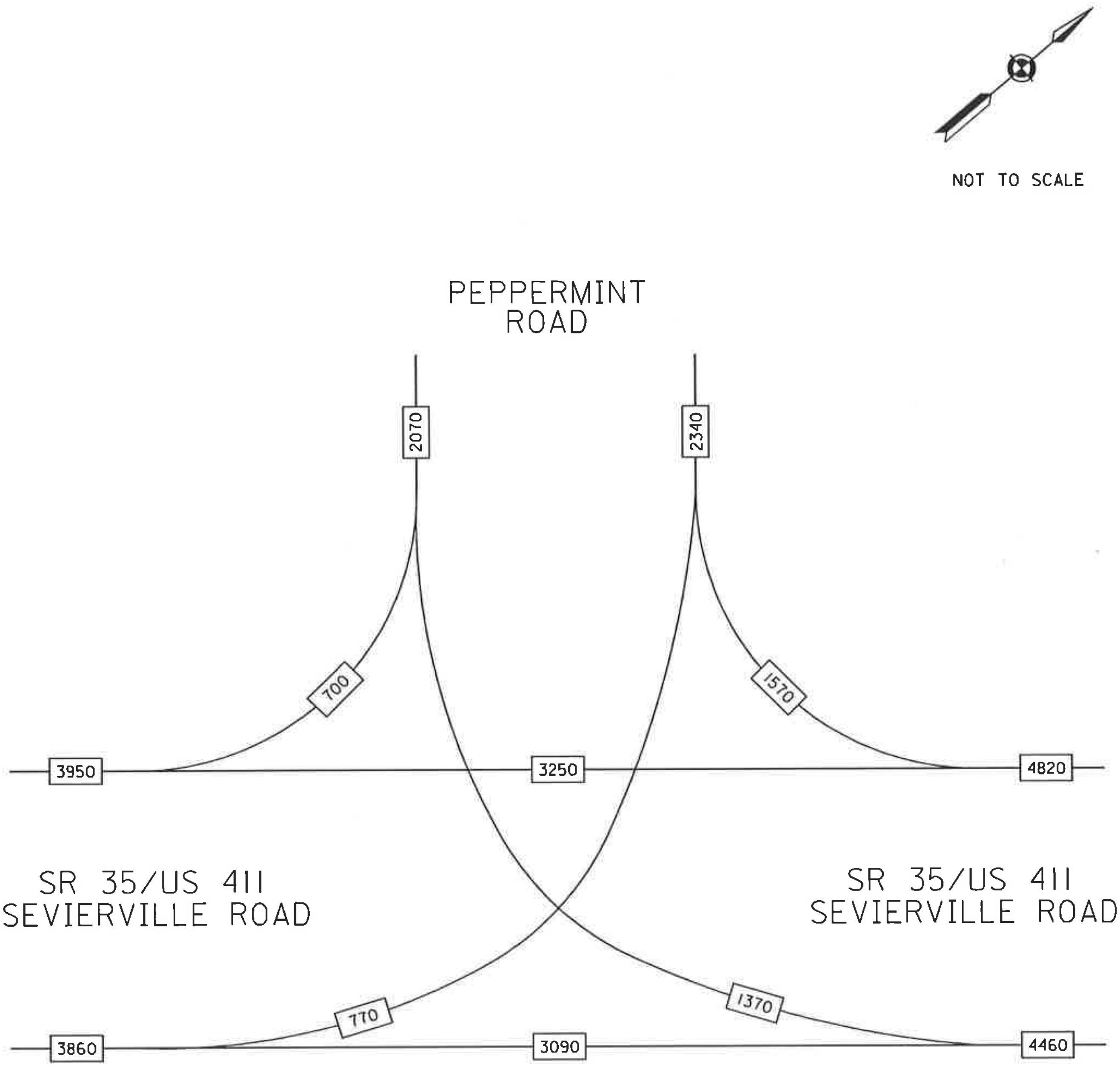
SR 33 @
SAM HOUSTON SCHOOL ROAD



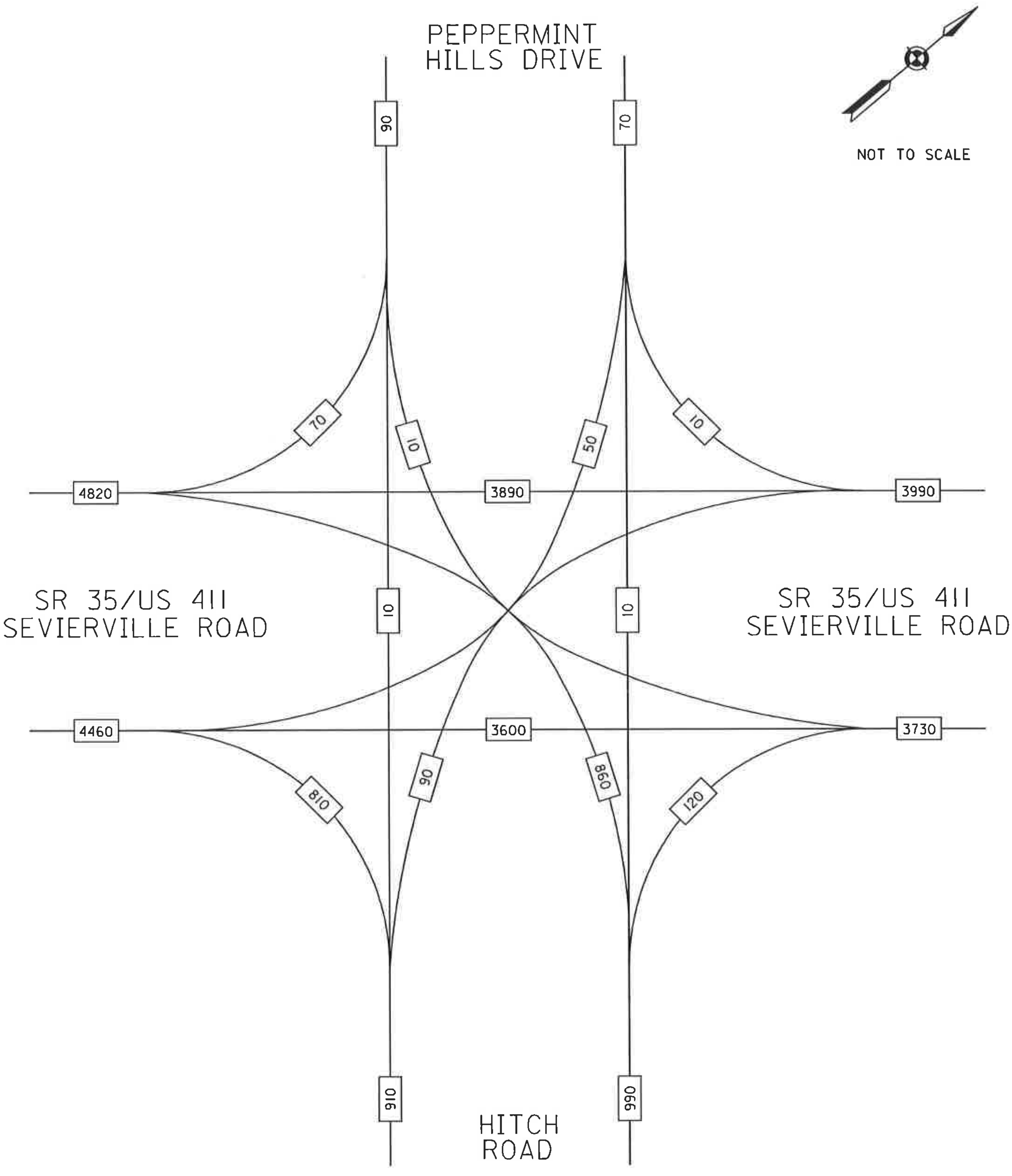
2020 AADT NO PPE	PEPPERMINT ROAD @ WILDWOOD ROAD



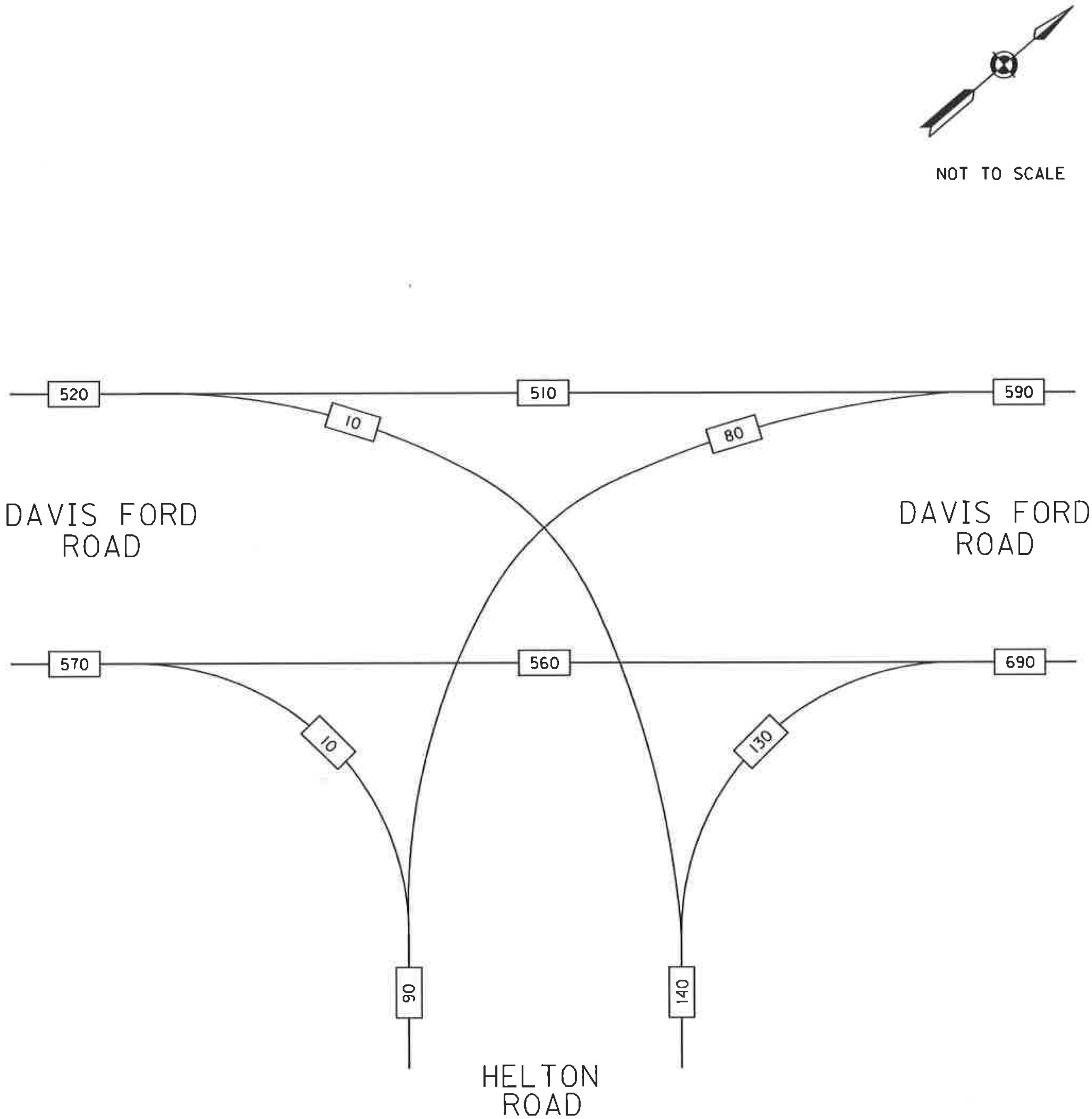
2020 AADT NO PPE	SAM HOUSTON SCHOOL ROAD @ WILDWOOD ROAD



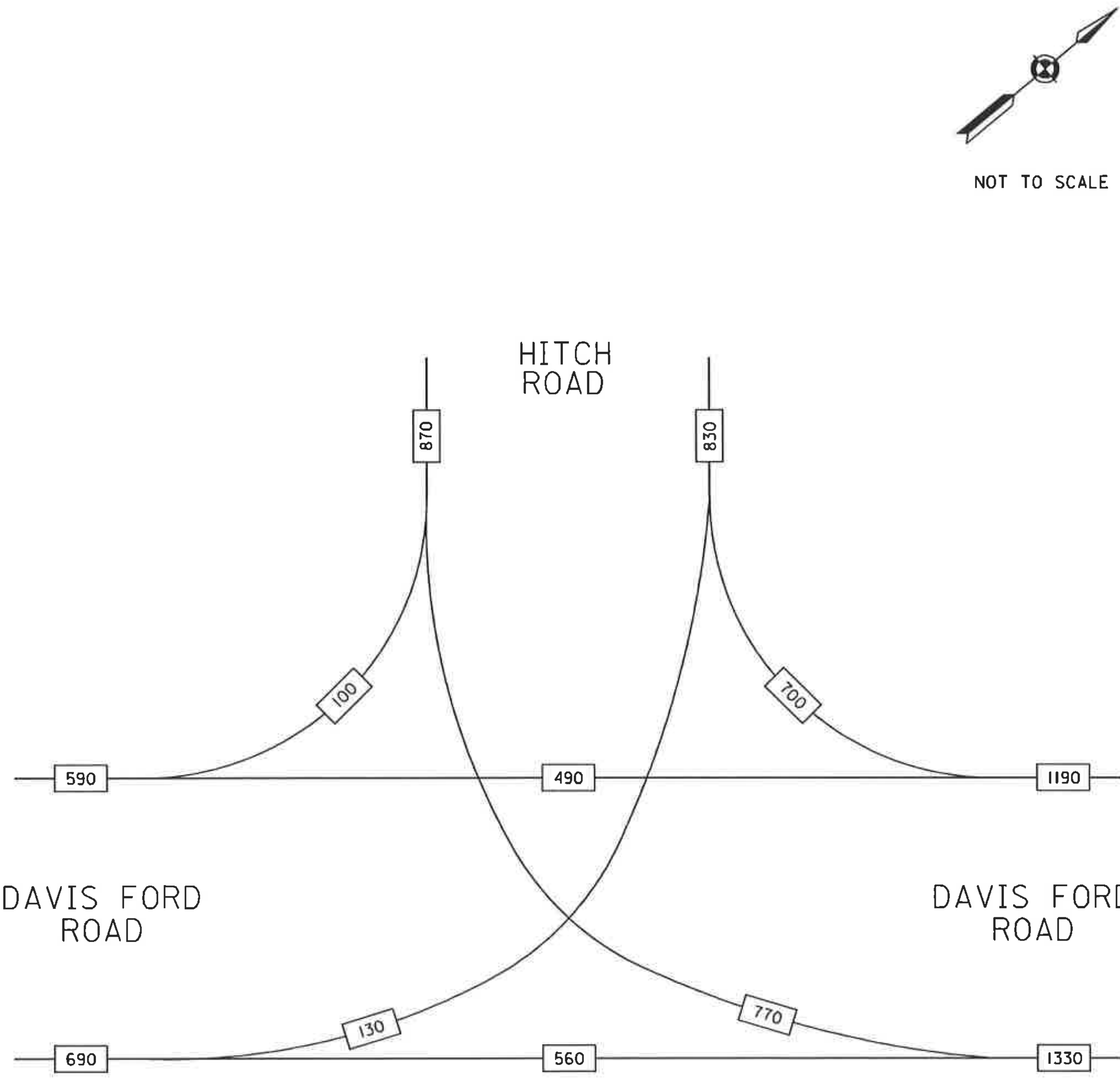
2020 AADT NO PPE	SR 35/US 411/SEVIERVILLE ROAD @ PEPPERMINT ROAD



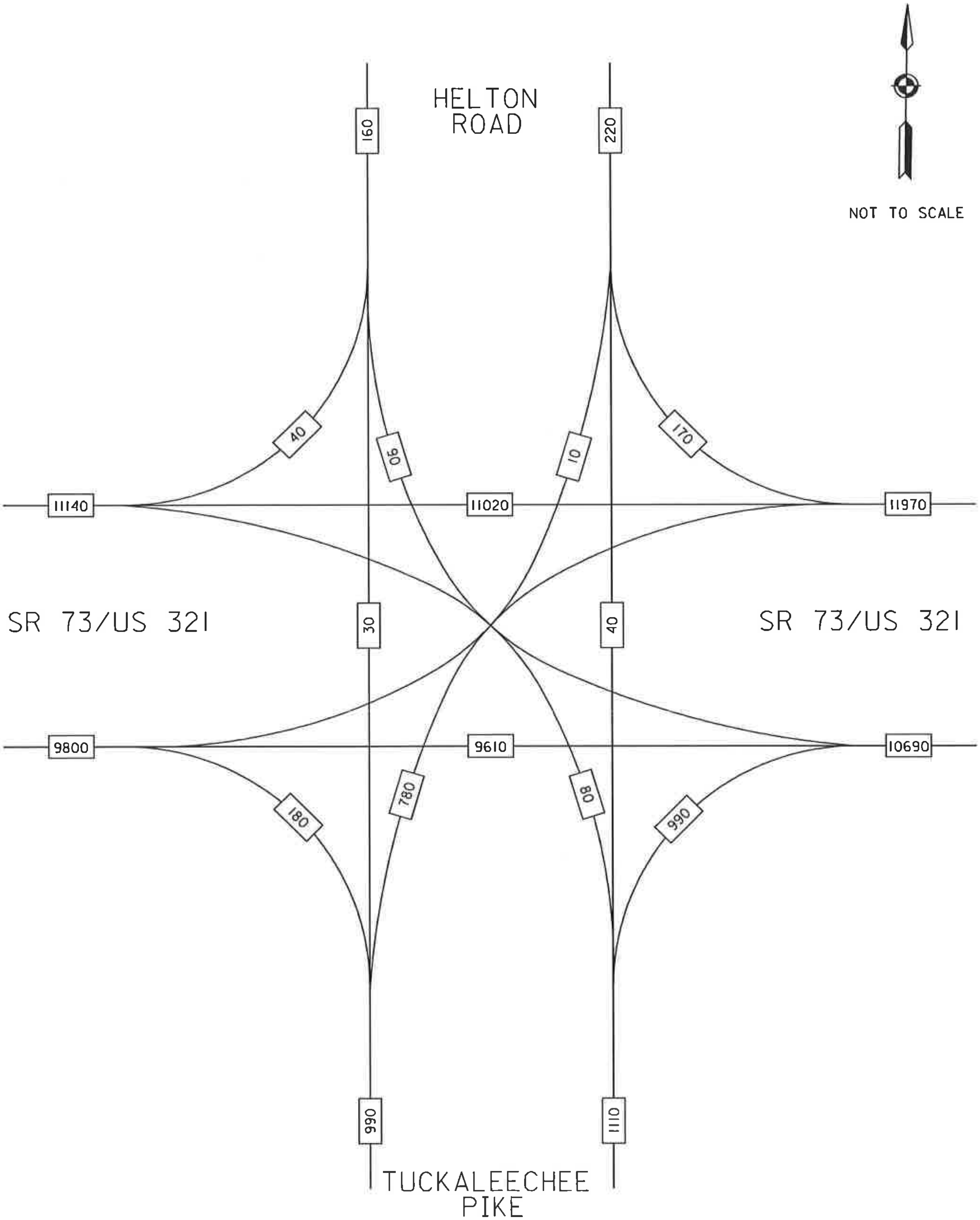
2020 AADT NO PPE	SR 35/US 411/SEVIERVILLE ROAD @ HITCH ROAD/PEPPERMINT HILLS DR



2020 AADT NO PPE	DAVIS FORD ROAD @ HELTON ROAD

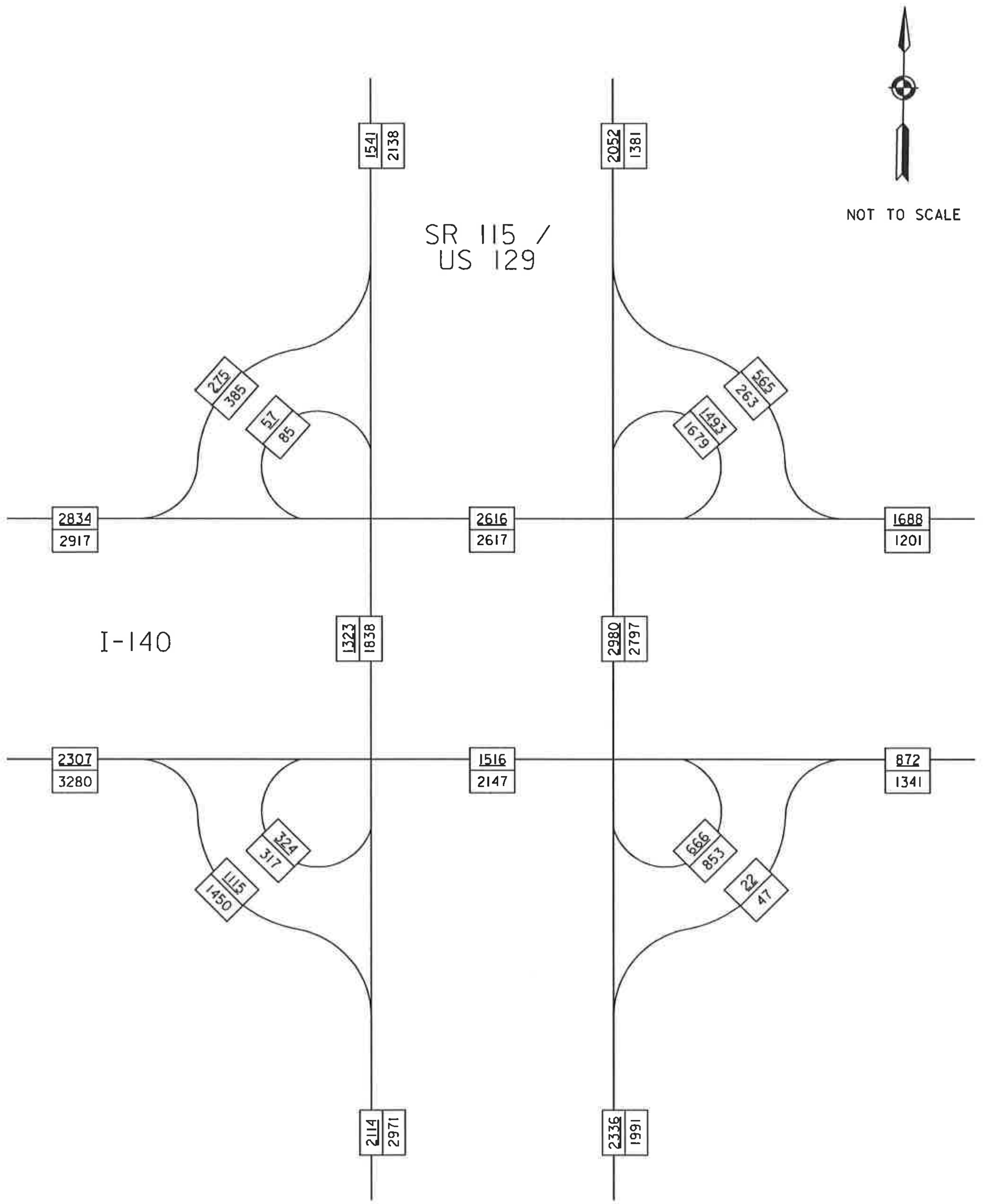


2020 AADT NO PPE	DAVIS FORD ROAD @ HITCH ROAD



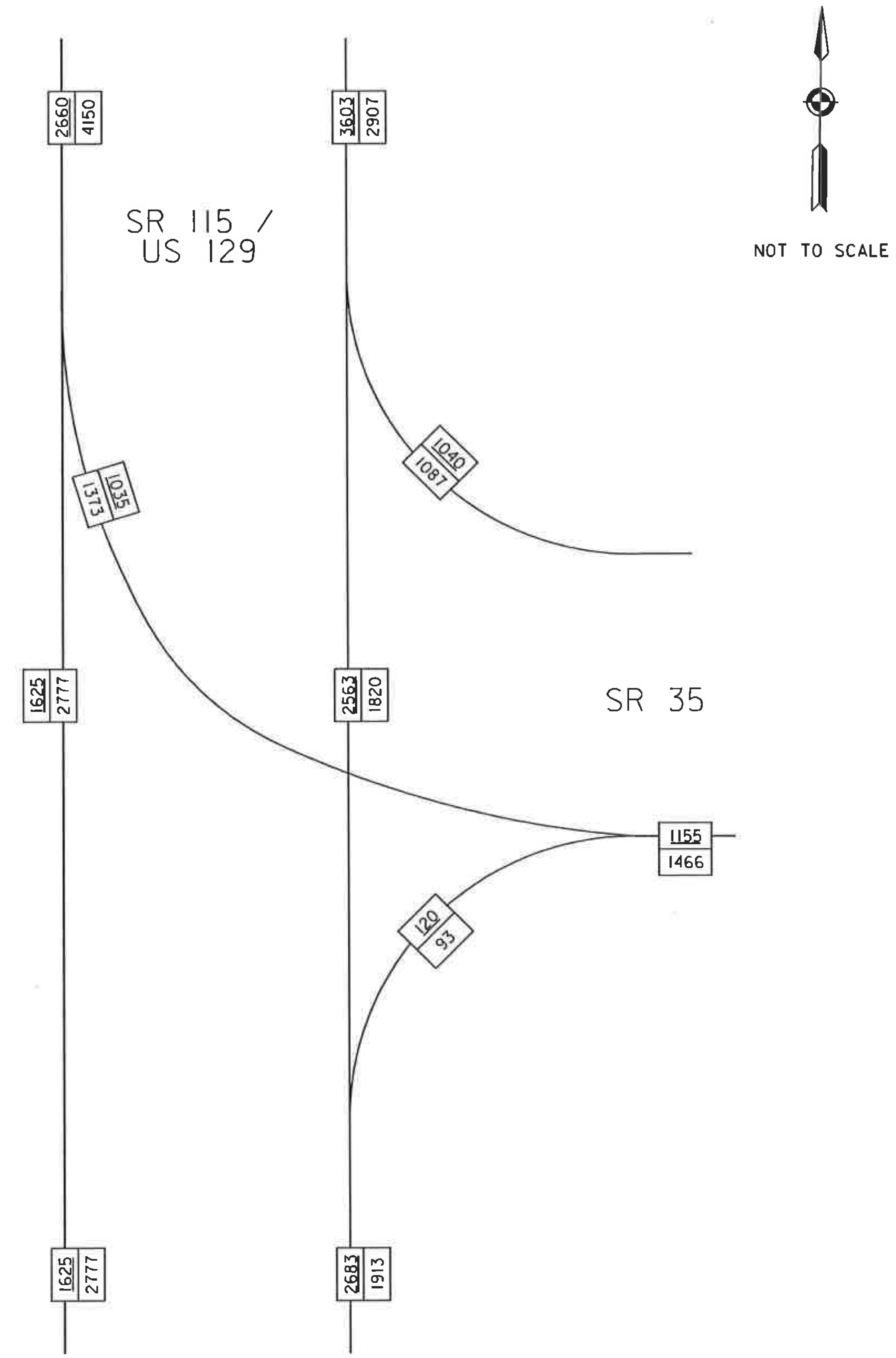
2020 AADT NO PPE

SR 73/US 321 @
HELTON ROAD/TUCKALEECHEE PIKE

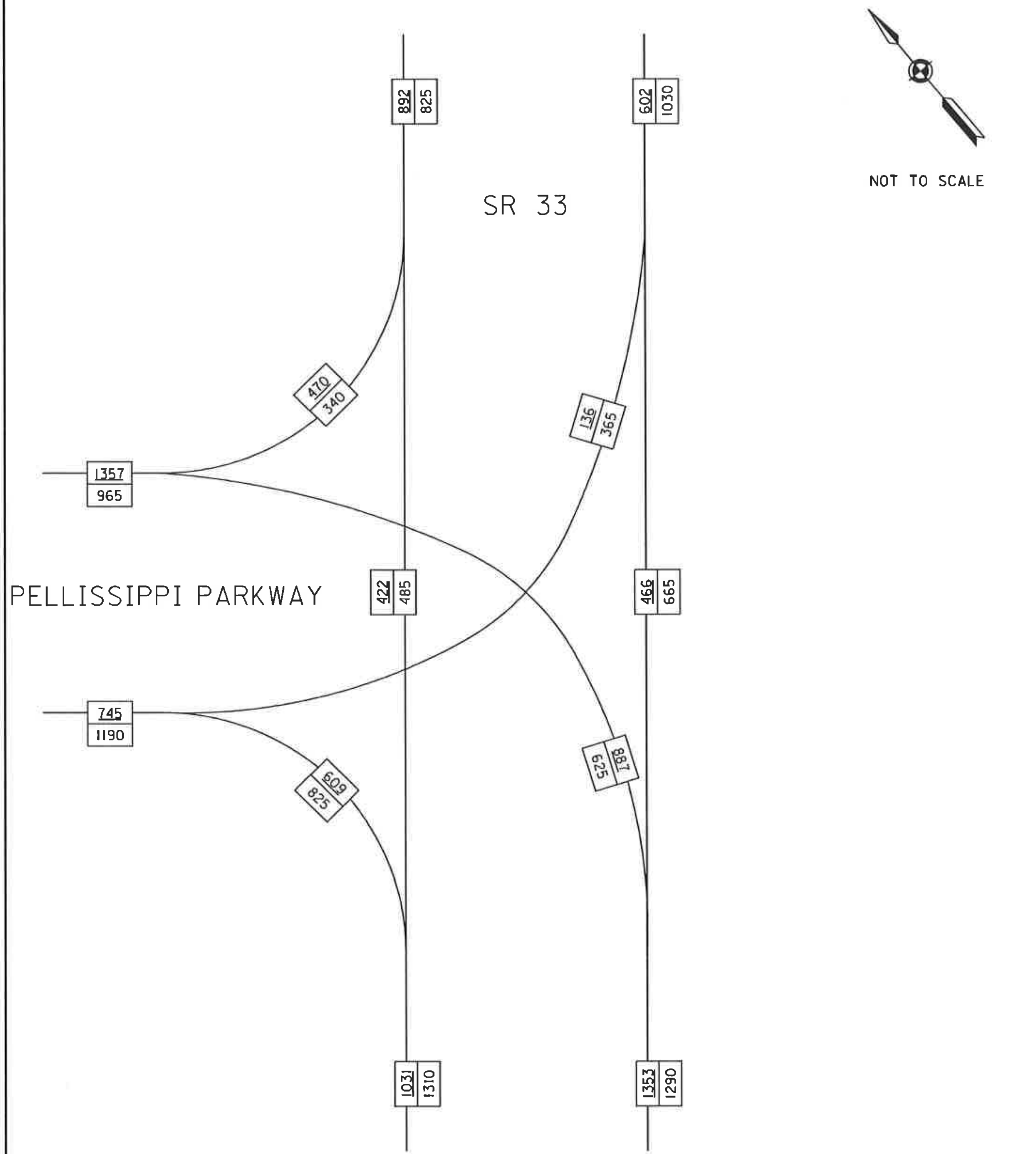


2020 DHV NO PPE
AM / PM

SR 115/US 129 @
I-140 / PELLISSIPPI PARKWAY

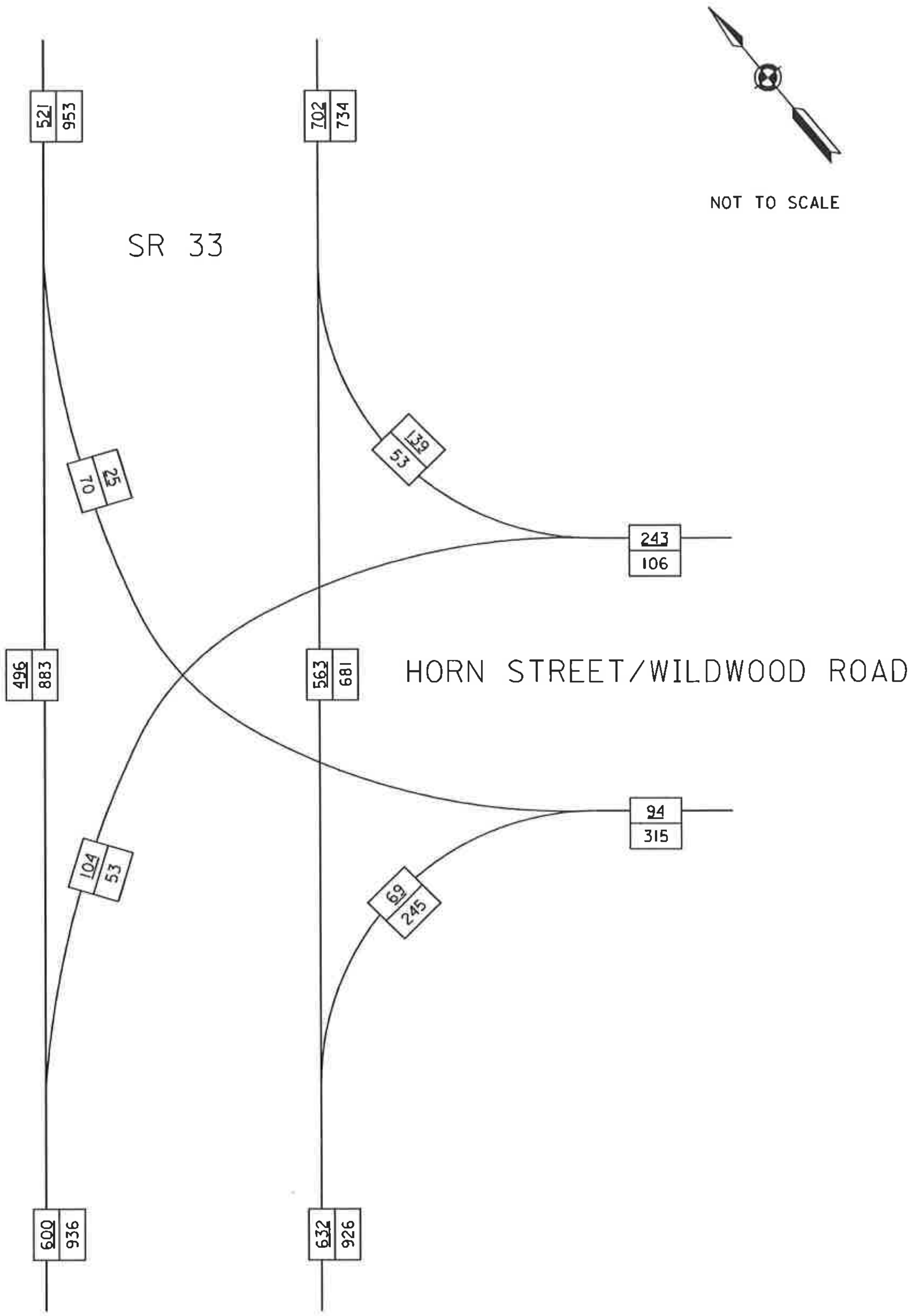


2020 DHV NO PPE AM / PM	SR 115/US 129 @ SR 35



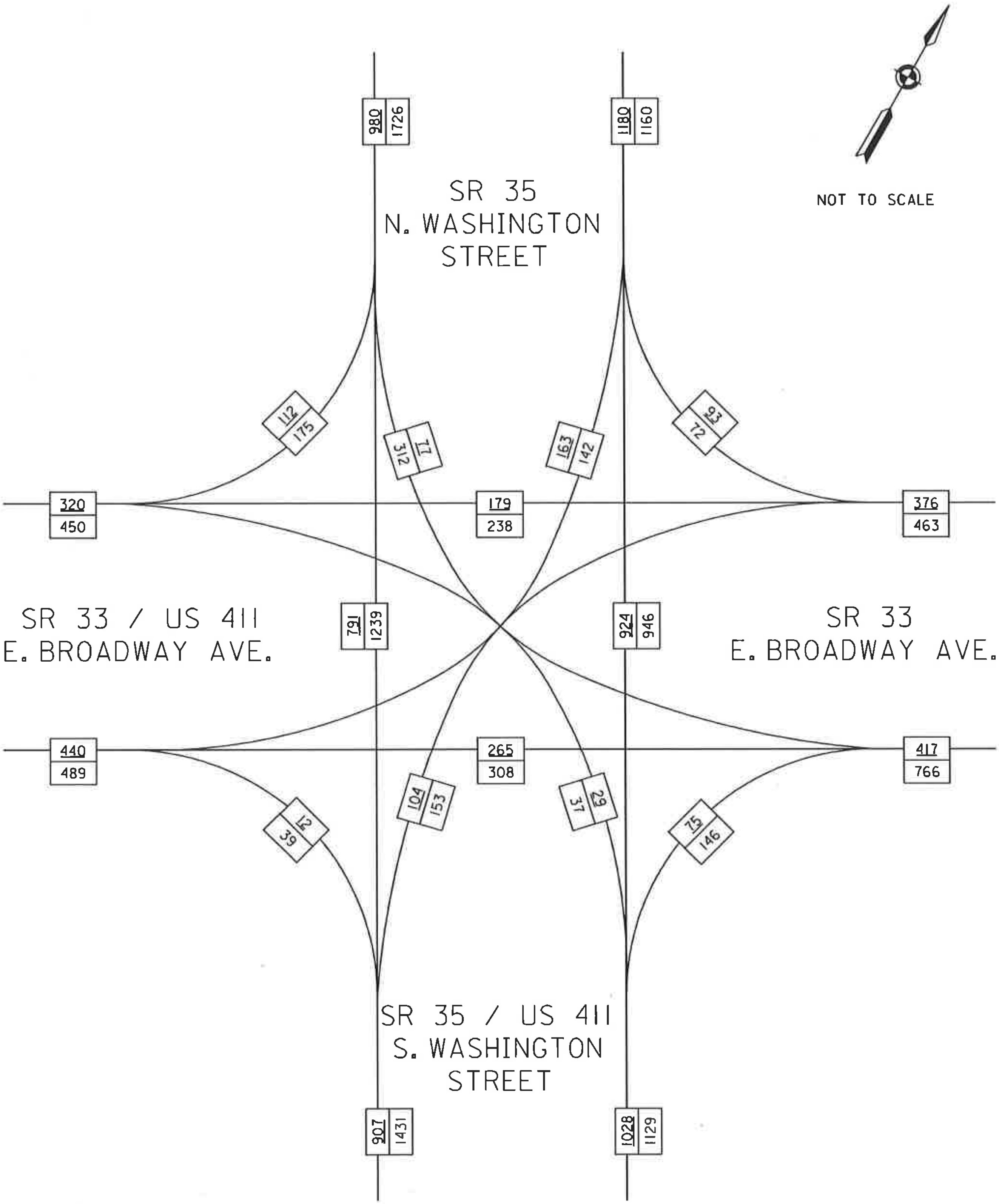
2020 DHV NO PPE
AM / PM

SR 33 @ PELLISSIPPI PARKWAY



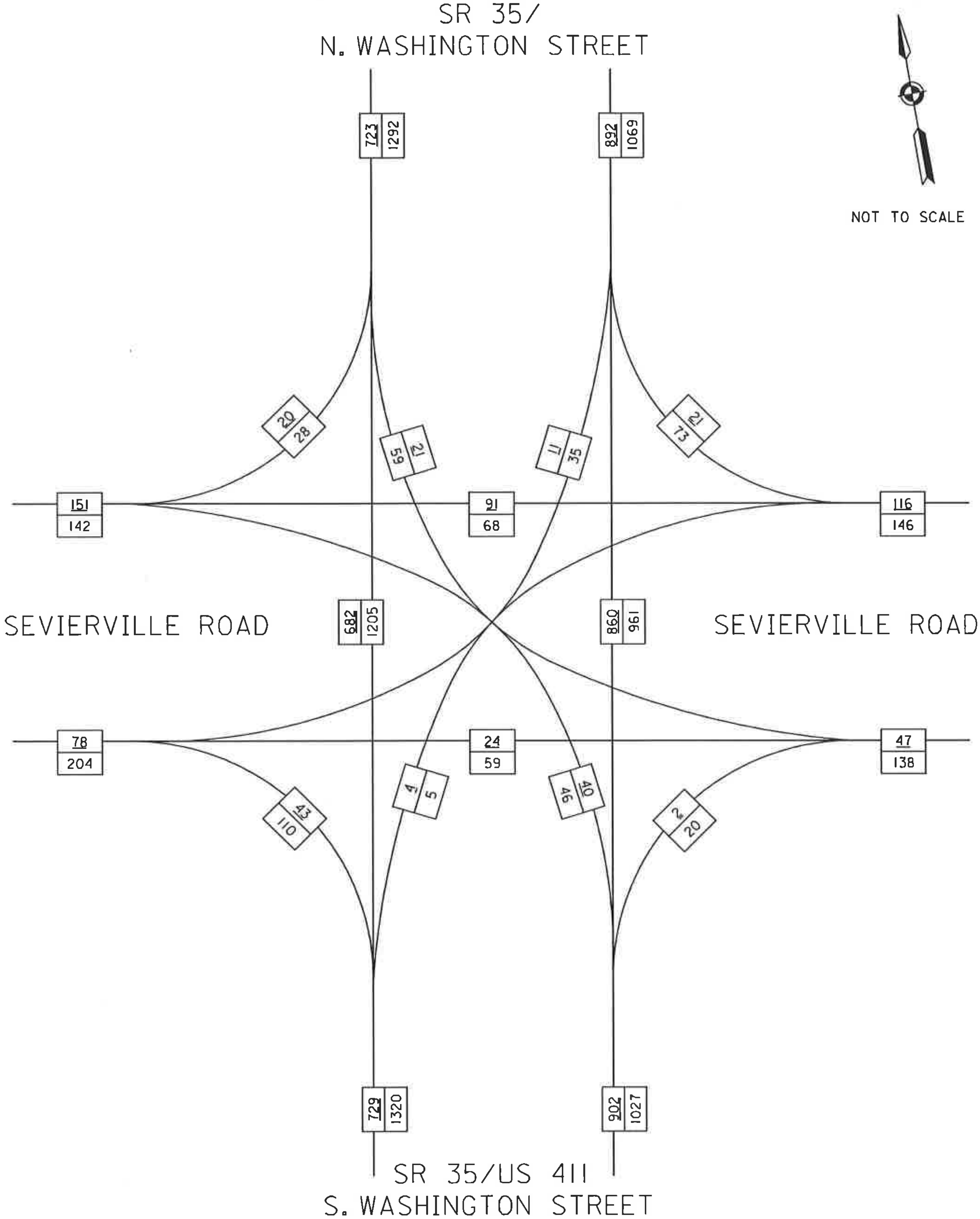
2020 DHV NO PPE
AM / PM

SR 33 @ HORN STREET/
WILDWOOD ROAD

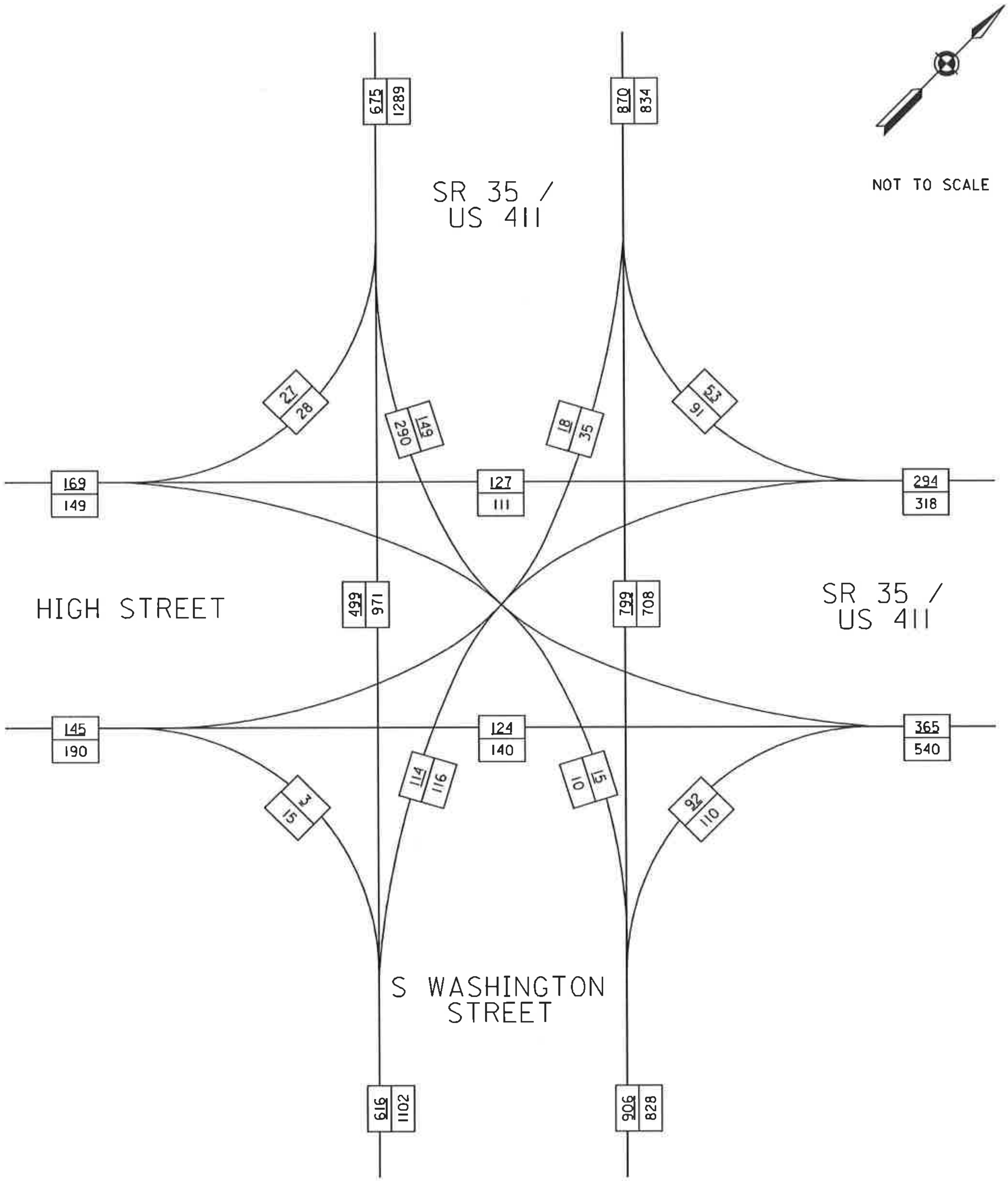


2020 DHV NO PPE
AM / PM

SR 33 @ SR 35

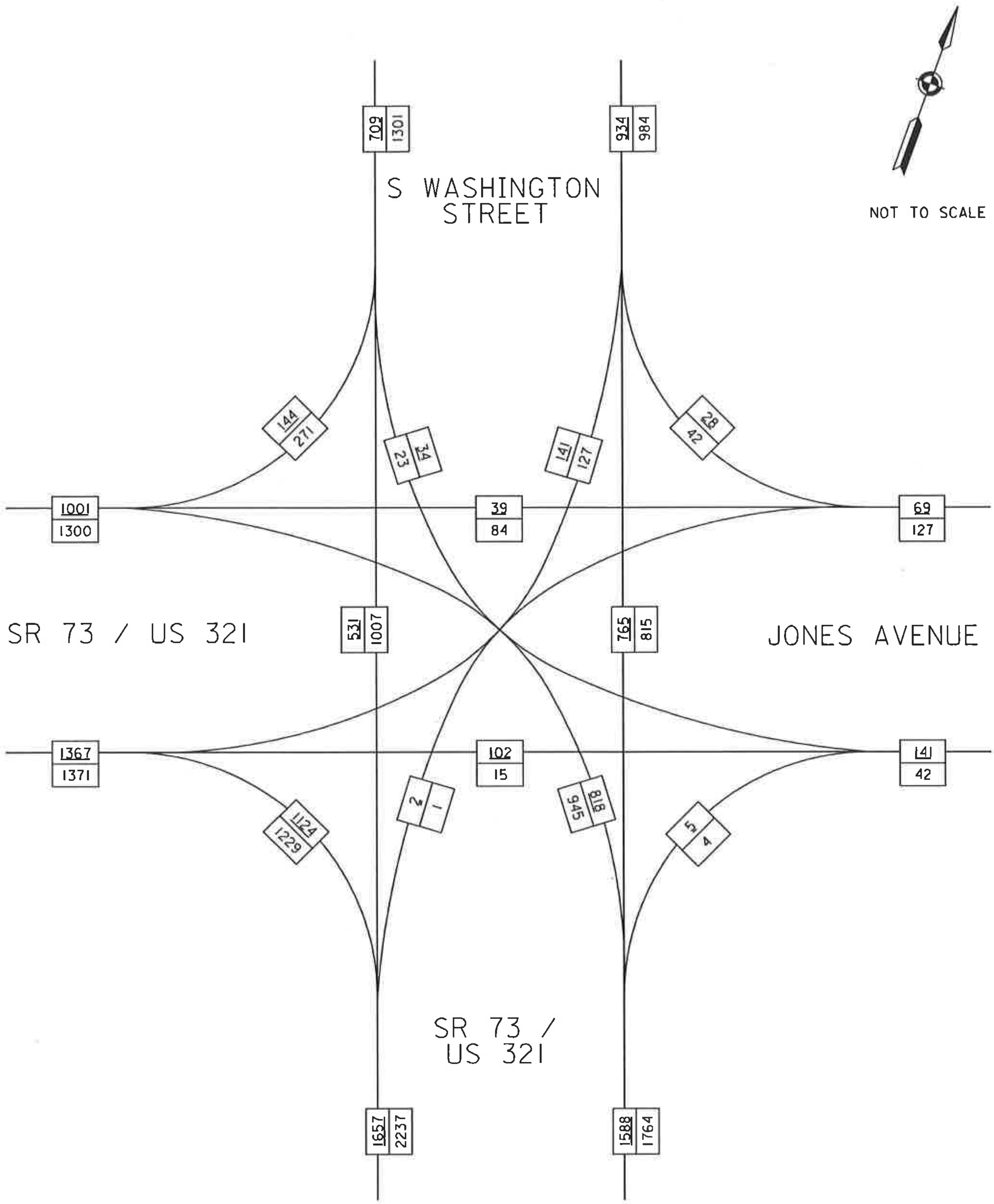


2020 DHV NO PPE AM / PM	SEVIERVILLE ROAD @ SR 35/WASHINGTON STREET



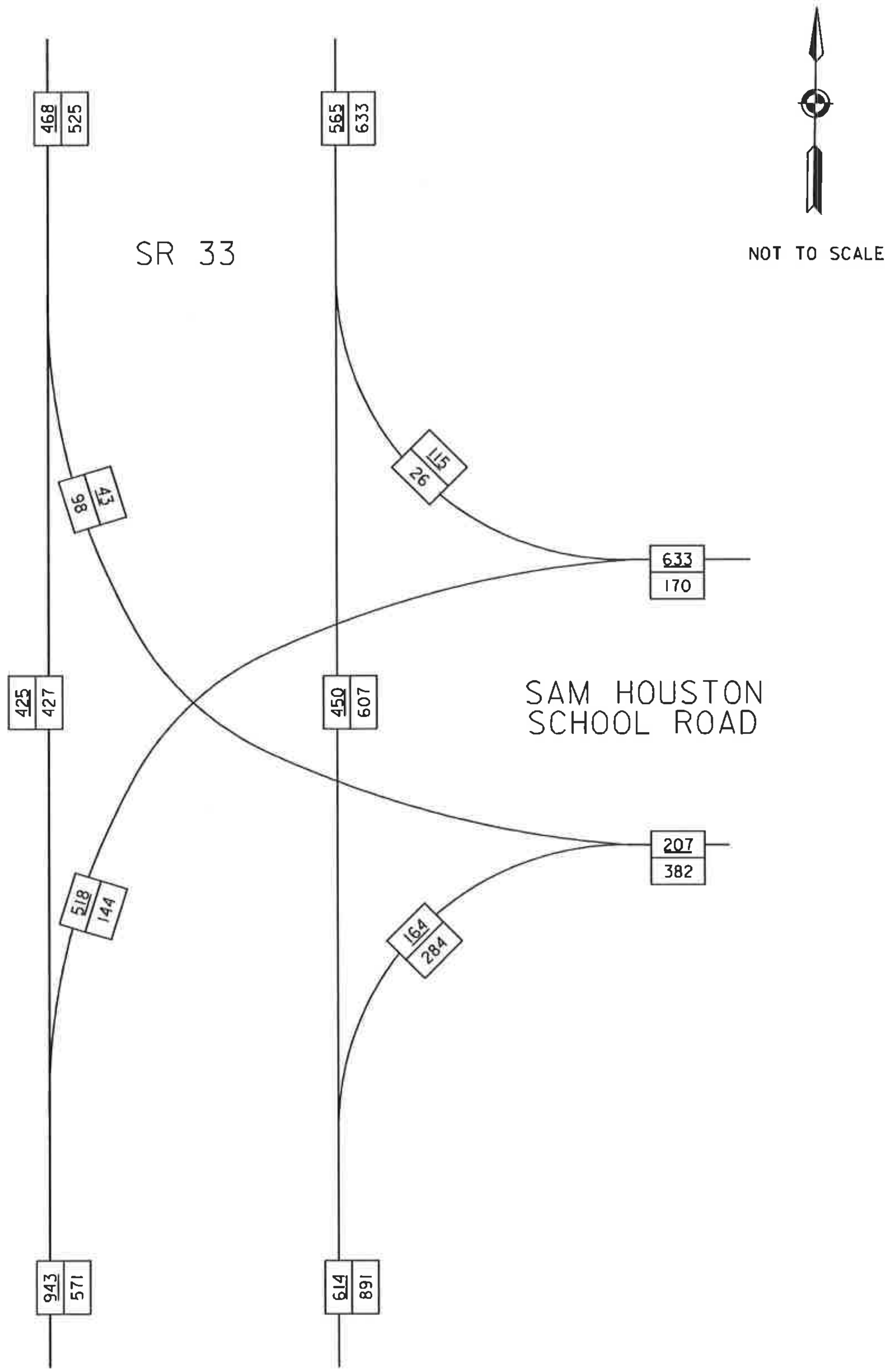
2020 DHV NO PPE
AM / PM

S WASHINGTON ST / SR 35
@ HIGH ST / SR 35



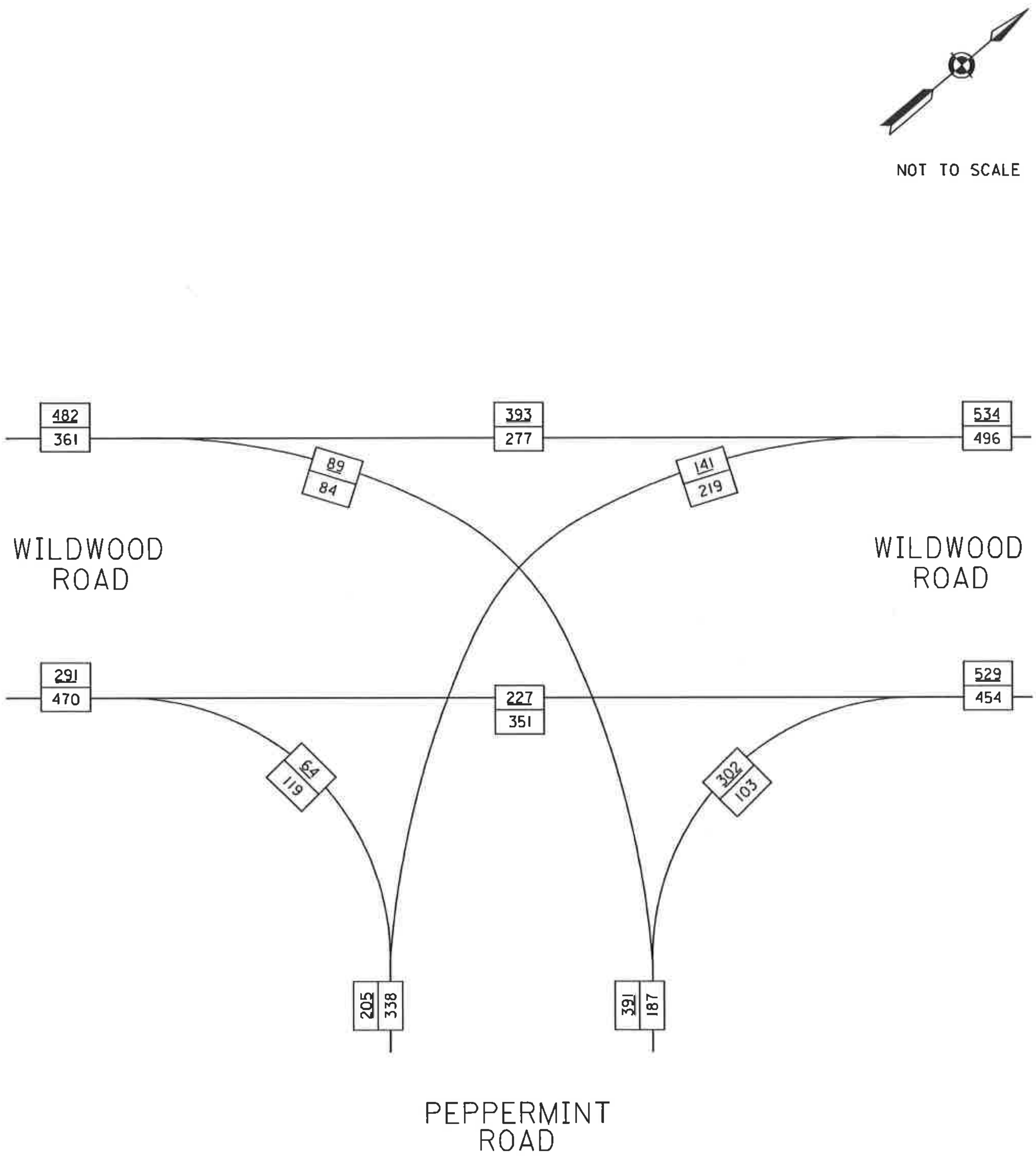
2020 DHV NO PPE
AM / PM

S WASHINGTON ST
@ SR 73/ US 321



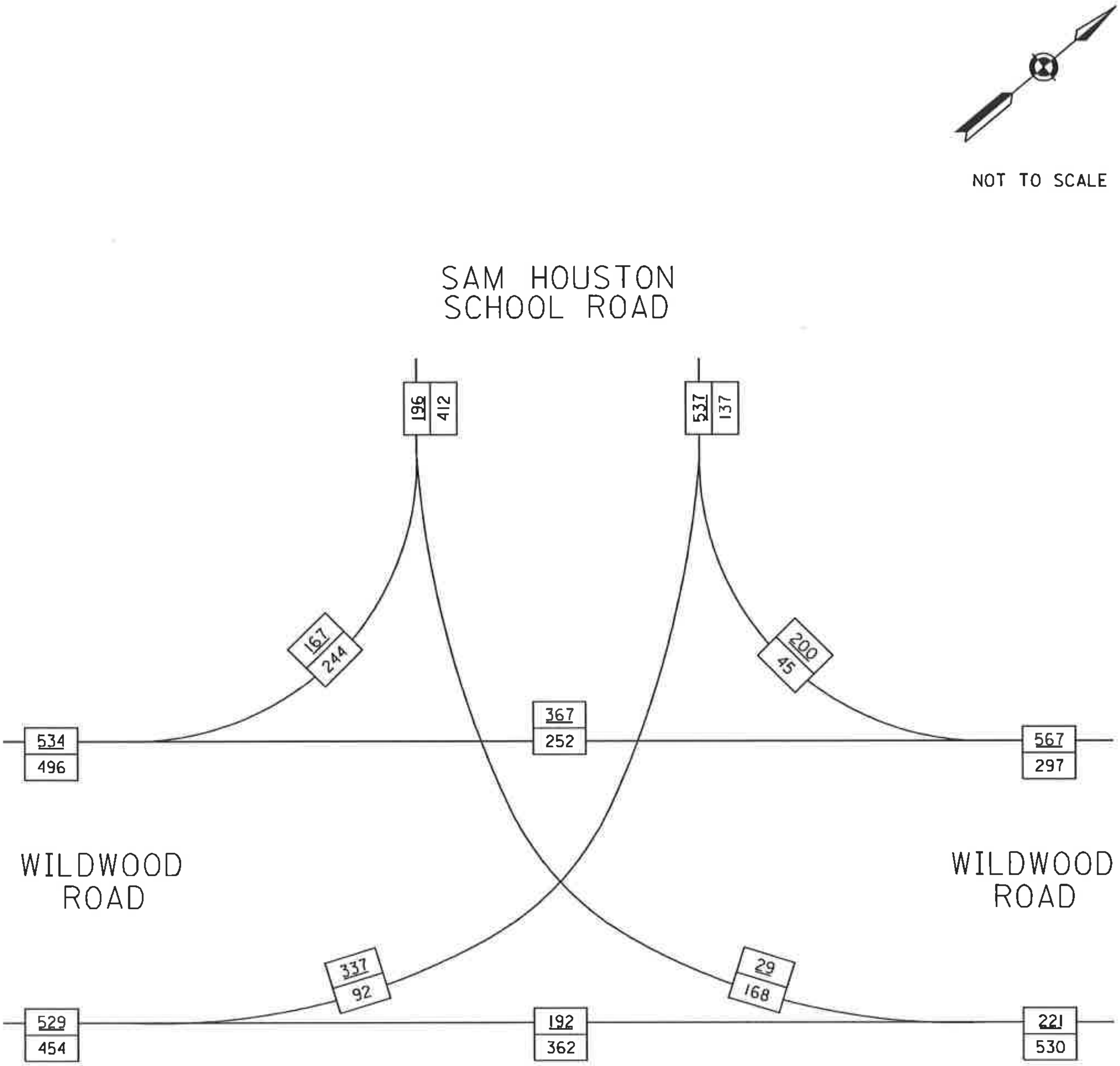
2020 DHV NO PPE
AM/PM

SR 33 @
SAM HOUSTON SCHOOL ROAD



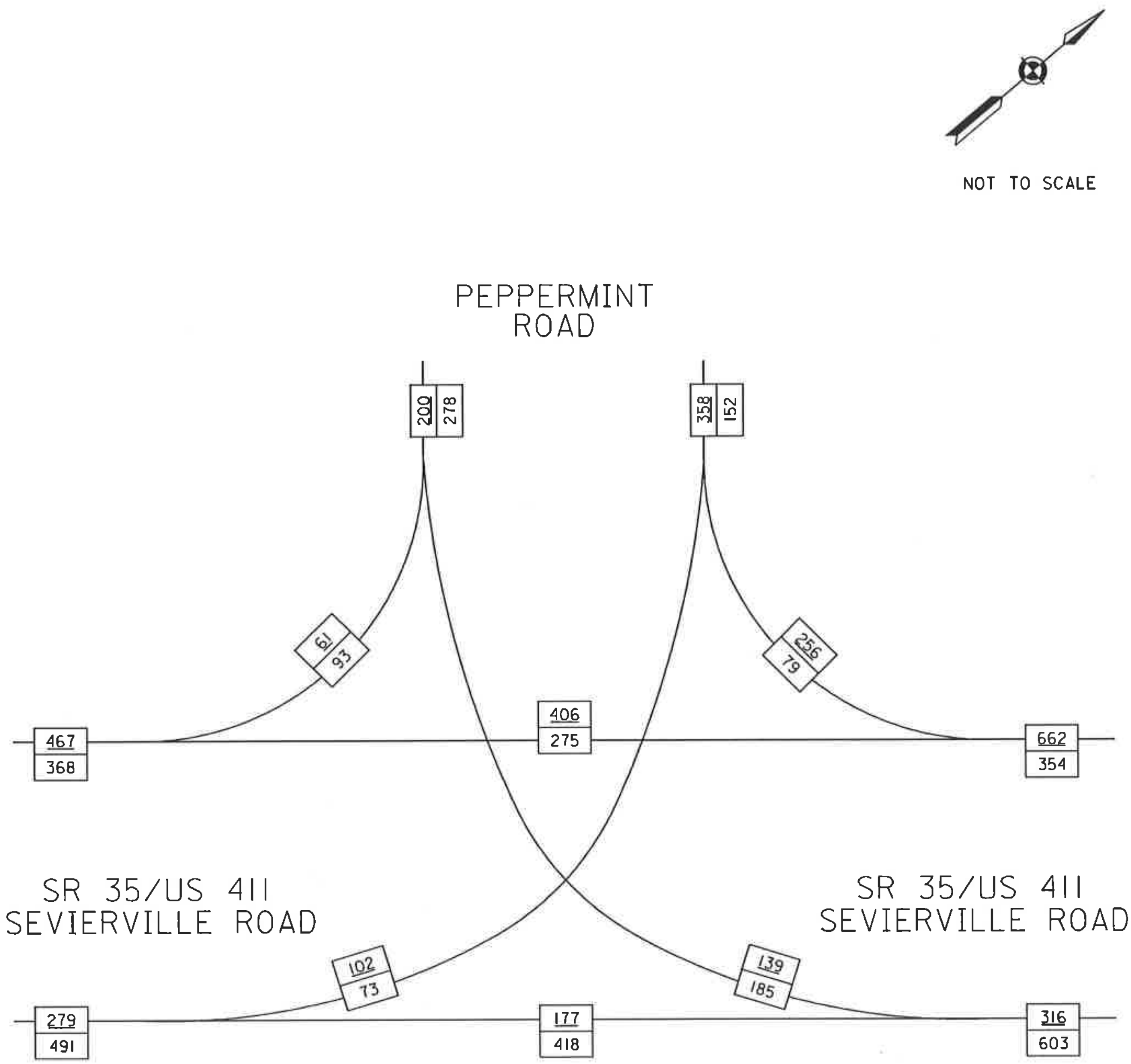
2020 DHV NO PPE
AM/PM

PEPPERMINT ROAD @
WILDWOOD ROAD



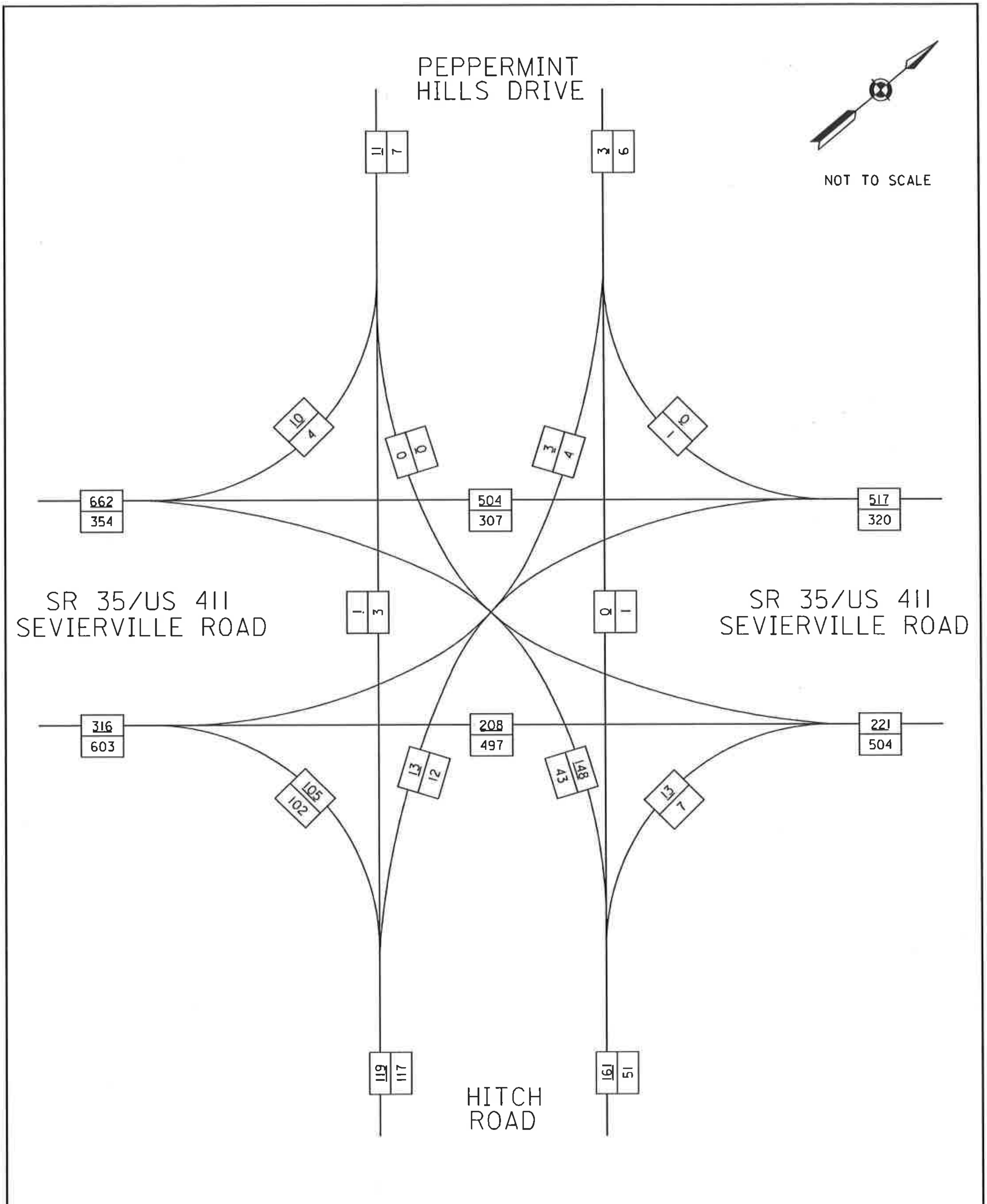
2020 DHV NO PPE
AM/PM

SAM HOUSTON SCHOOL ROAD @ WILDWOOD ROAD

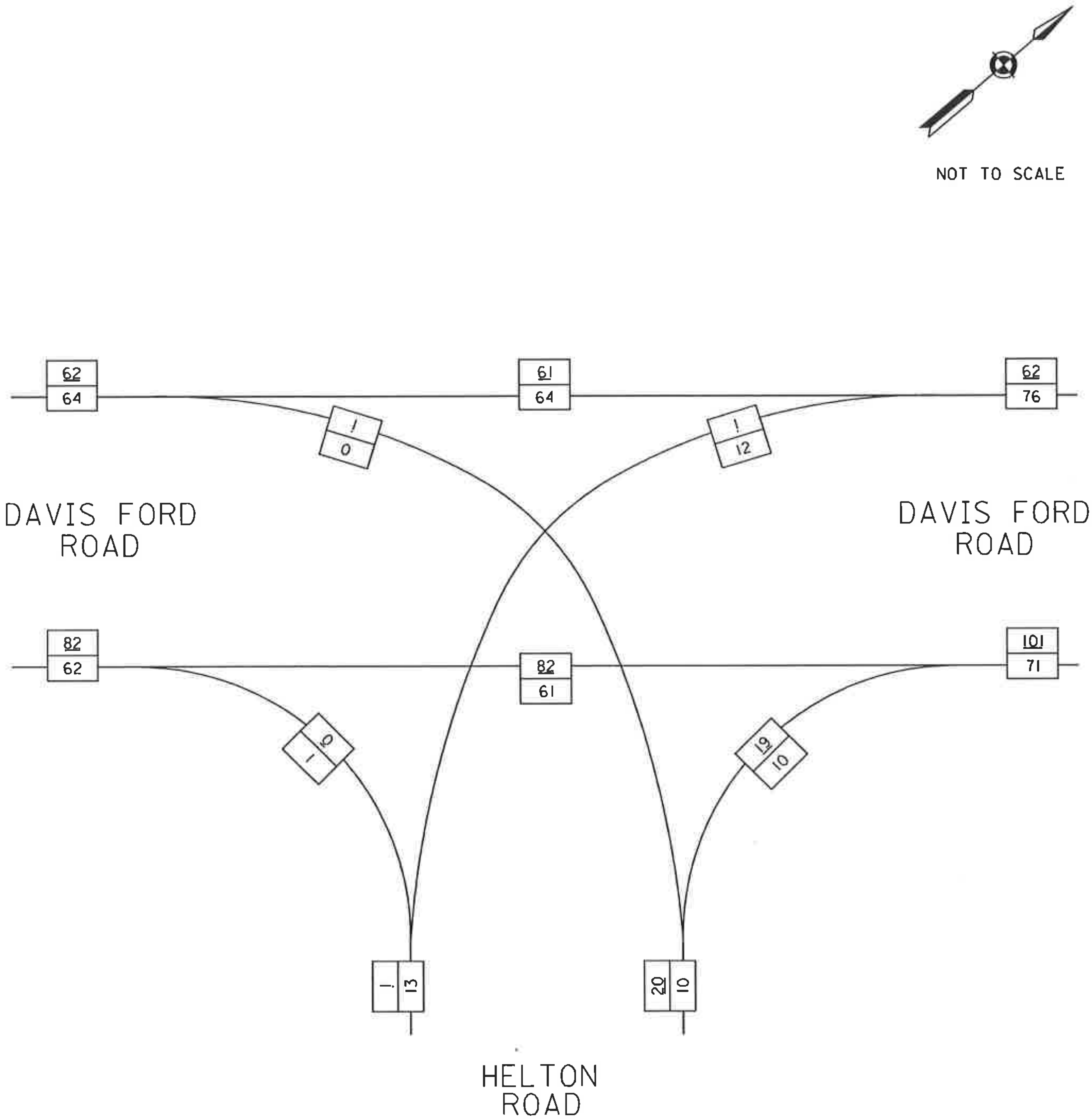


2020 DHV NO PPE
AM/PM

SR 35/US 411/SEVIERVILLE ROAD @ PEPPERMINT ROAD

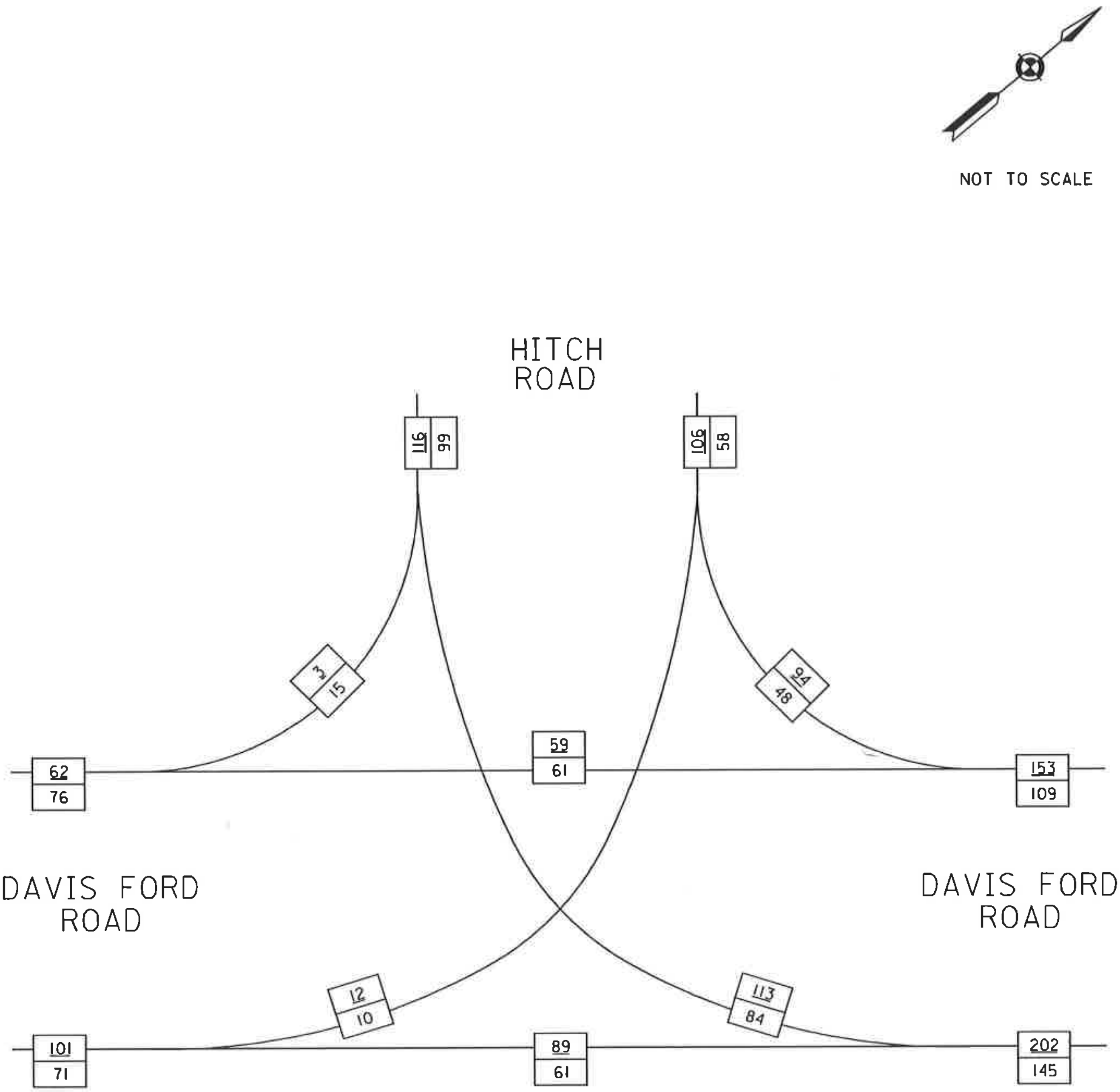


2020 DHV NO PPE AM/PM	SR 35/US 411/SEVIERVILLE ROAD @ HITCH ROAD/PEPPERMINT HILLS DR



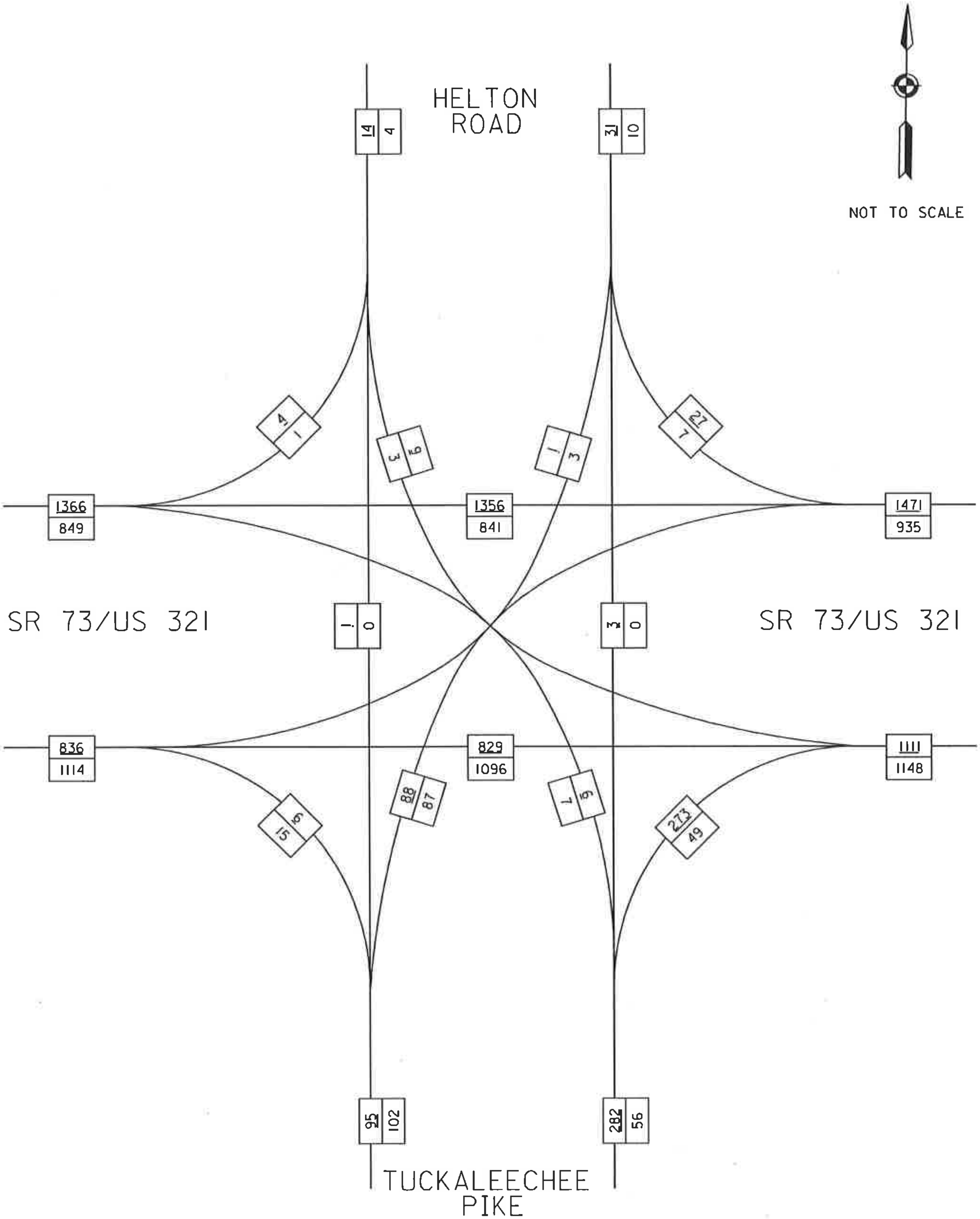
2020 DHV NO PPE
AM/PM

DAVIS FORD ROAD @ HELTON ROAD

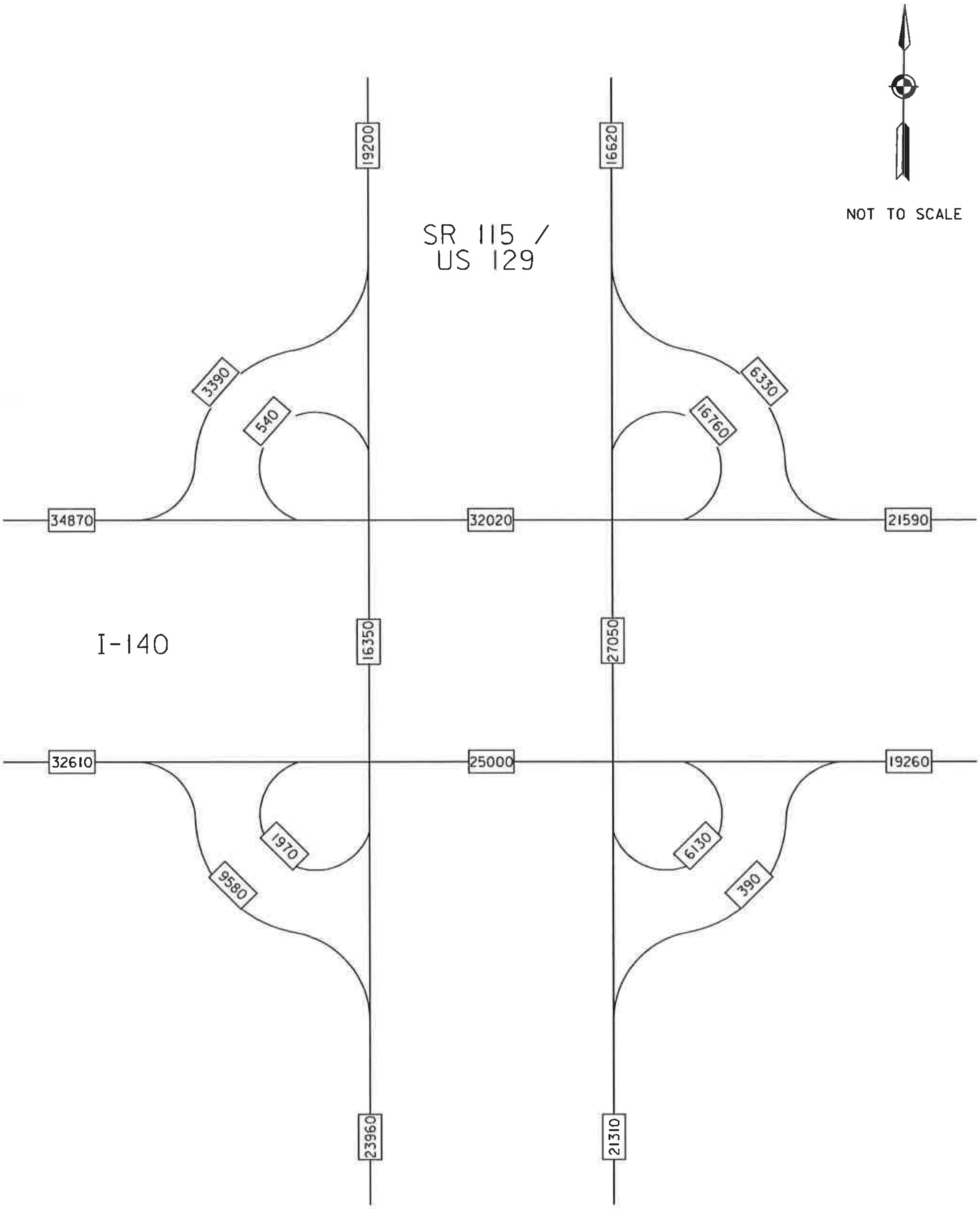


2020 DHV NO PPE
<u>AM</u>/PM

DAVIS FORD ROAD @ HITCH ROAD

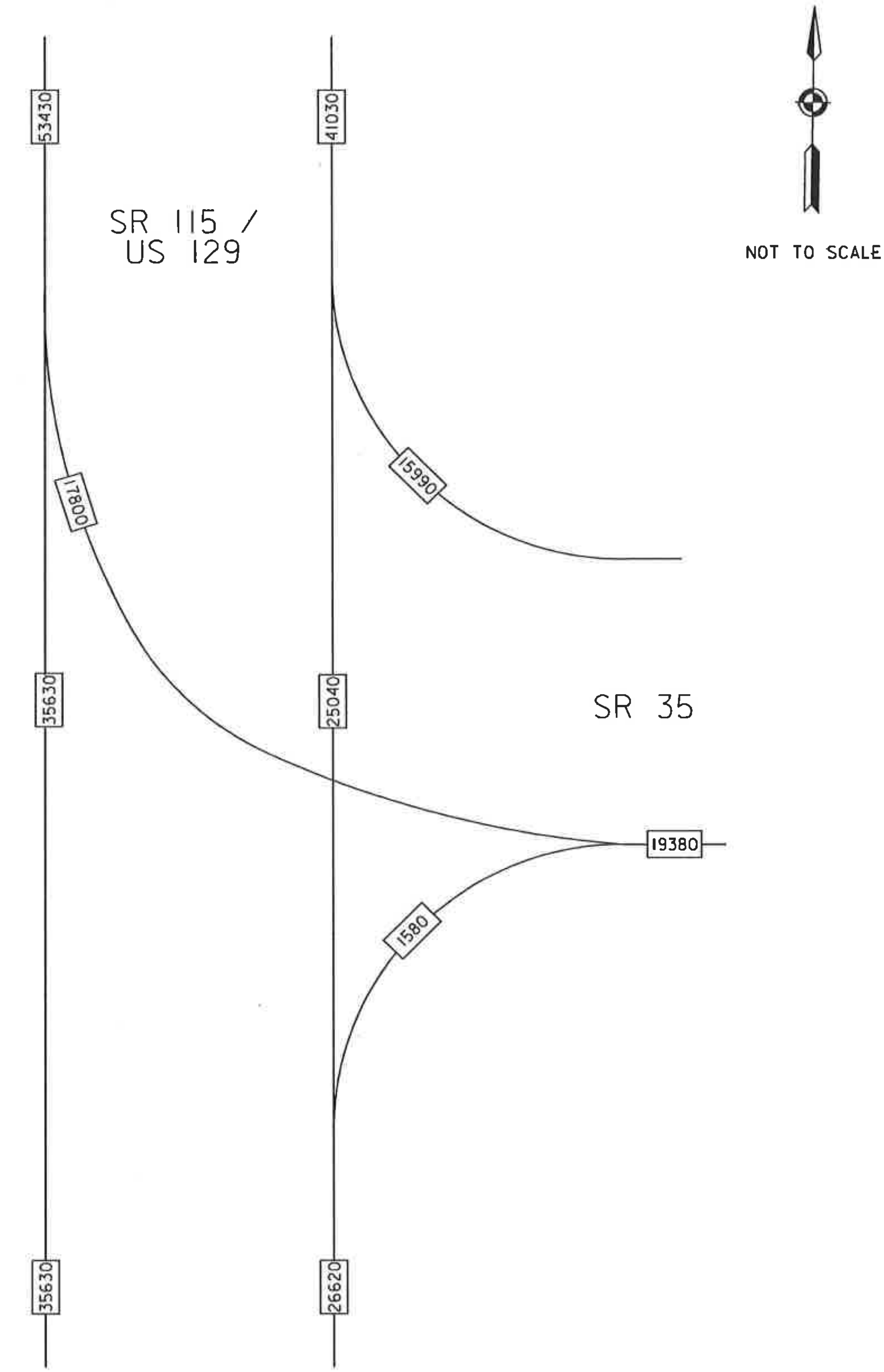


2020 DHV NO PPE AM/PM	SR 73/US 321 @ HELTON ROAD/TUCKALEECHEE PIKE



2040 AADT NO PPE

SR 115/US 129 @
I-140 / PELLISSIPPI PARKWAY



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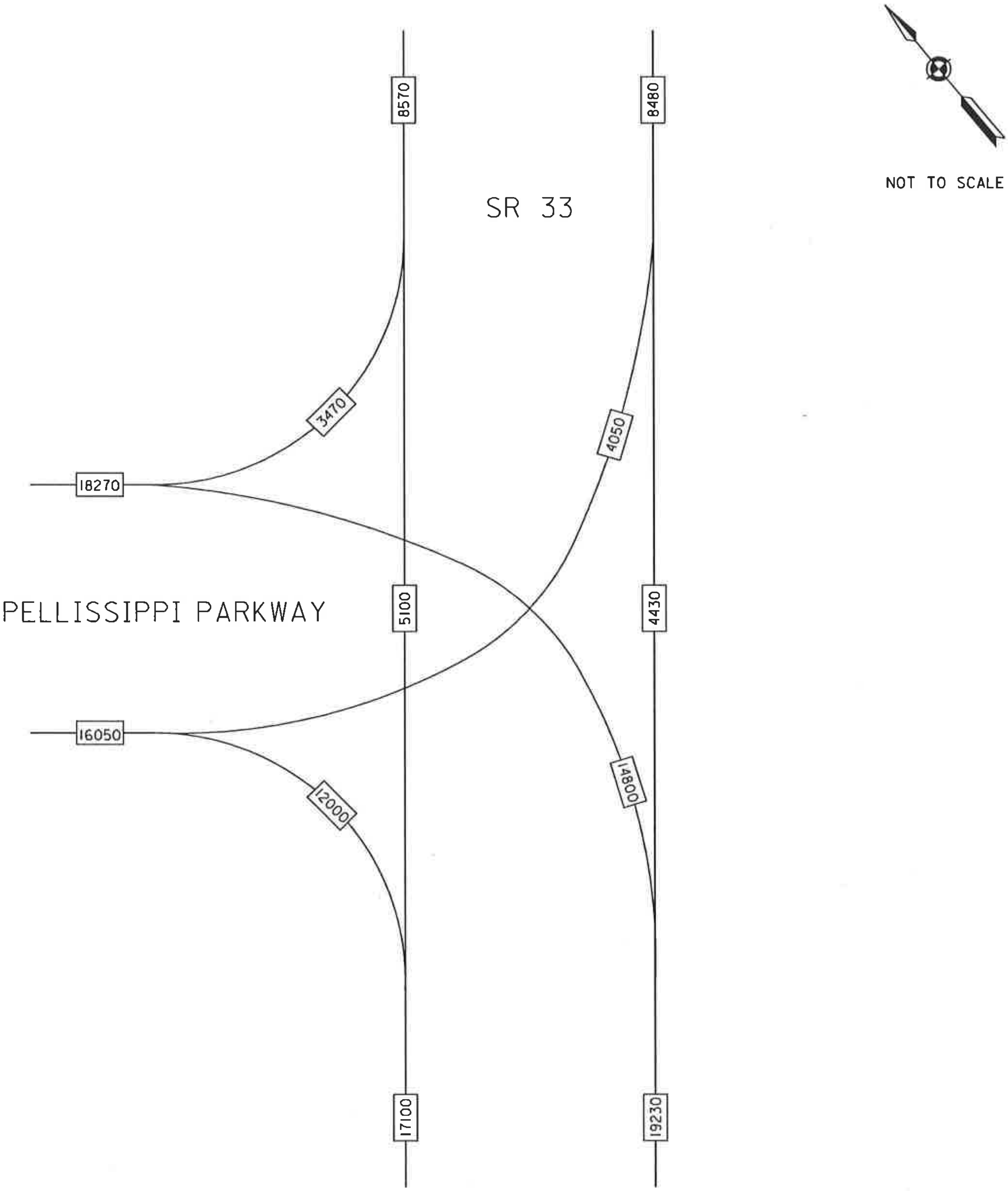
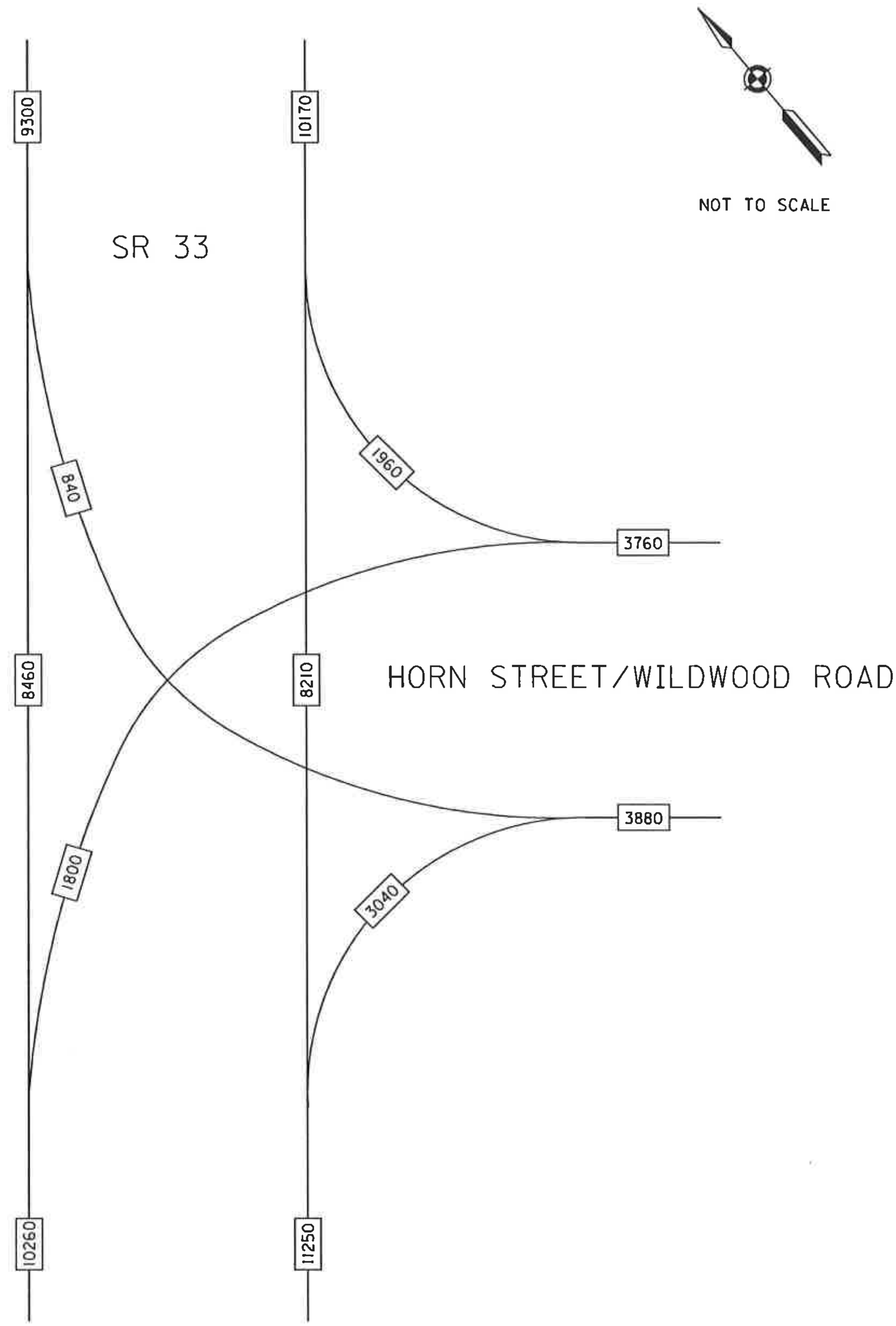
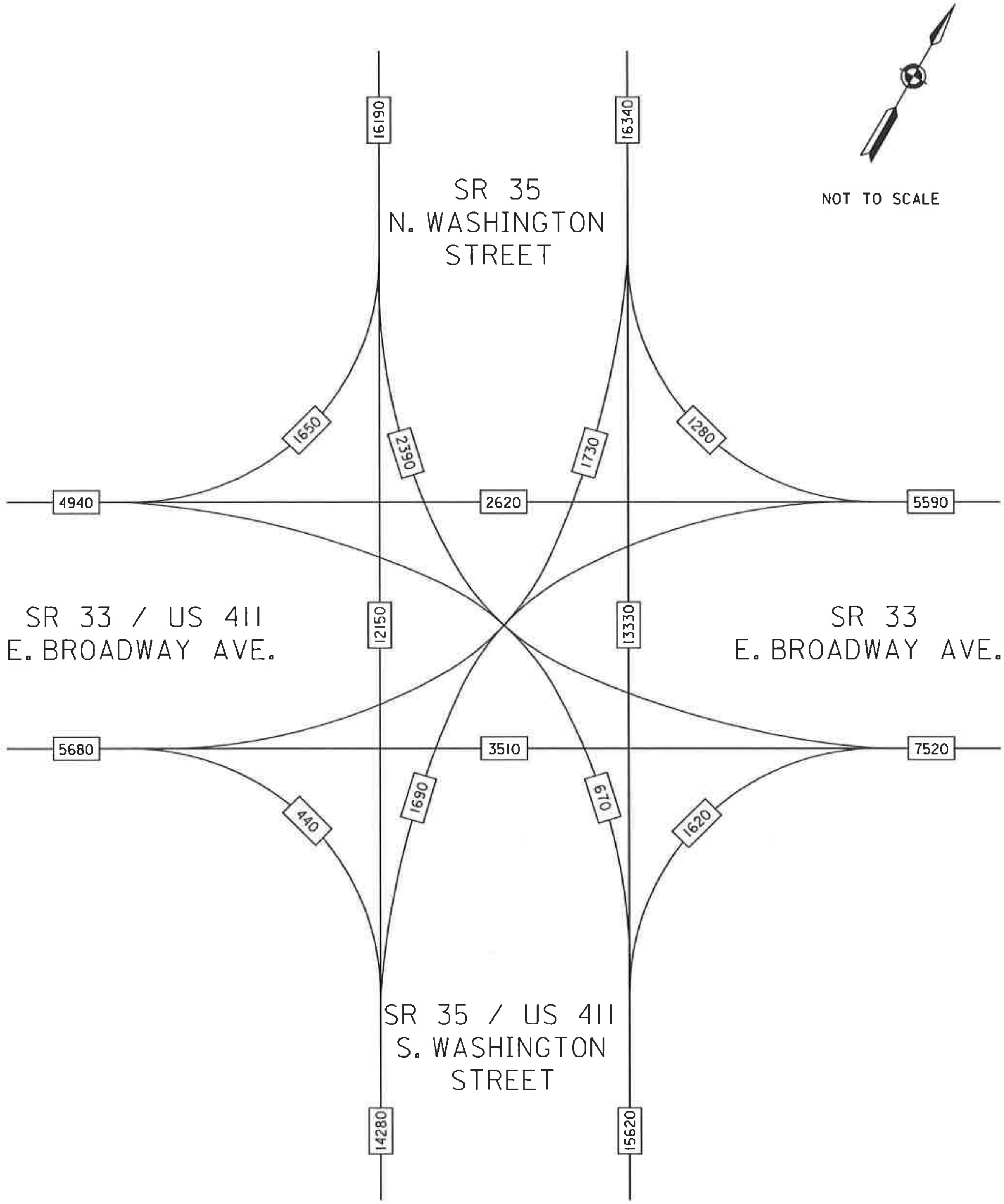


2040 AADT NO PPE

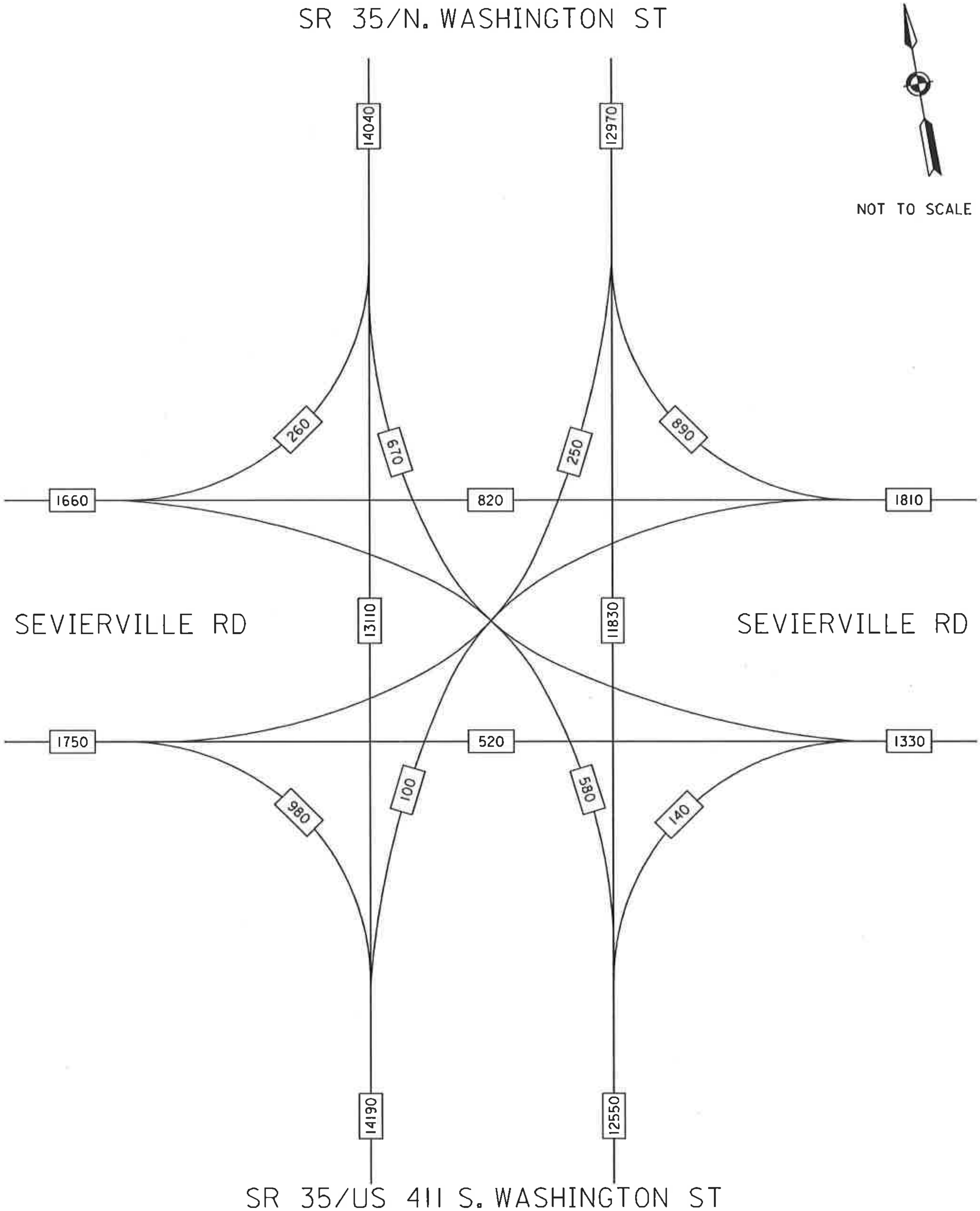
SR 33 @ PELLISSIPPI PARKWAY



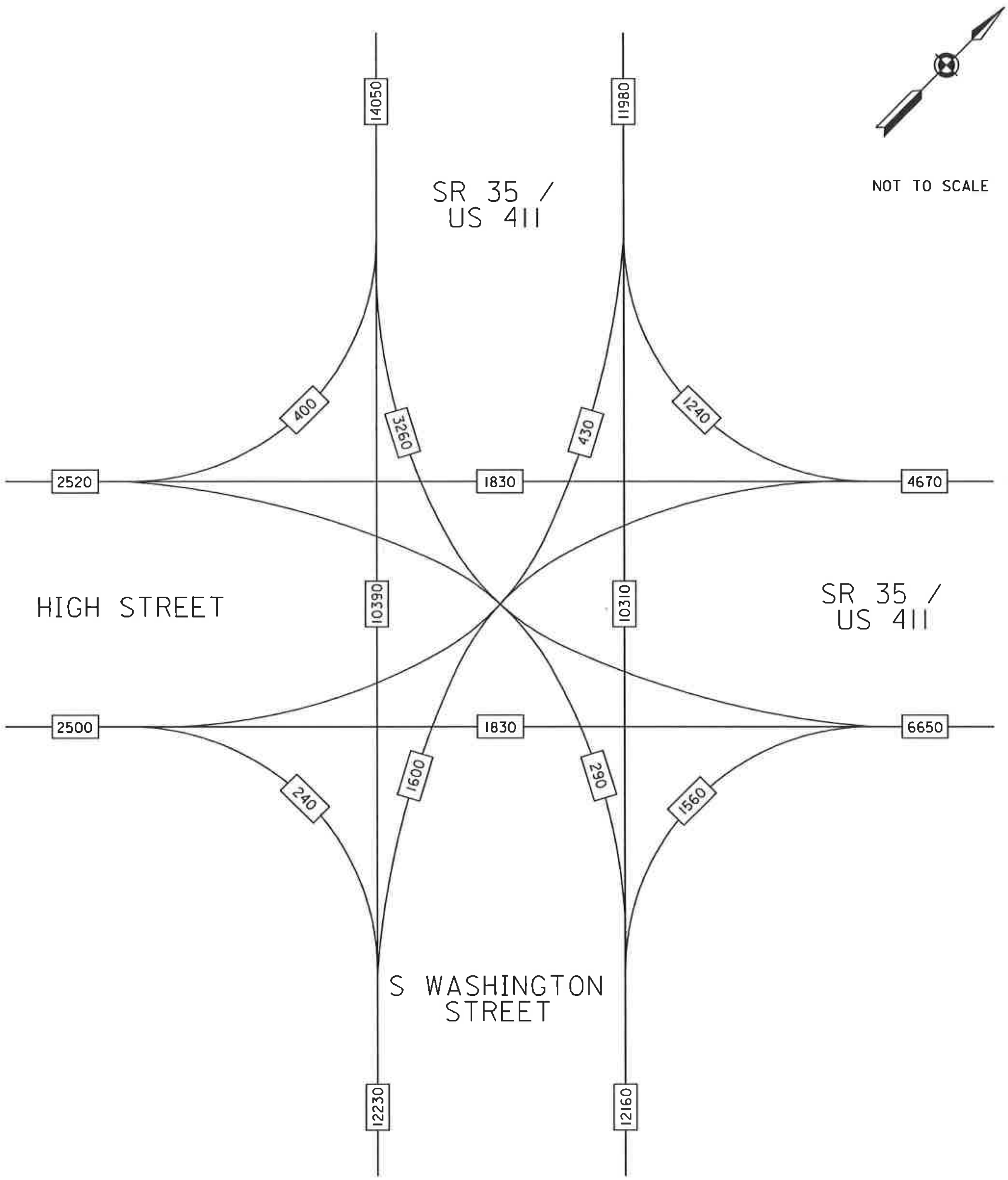
2040 AADT NO PPE	SR 33 @ HORN STREET/ WILDWOOD ROAD



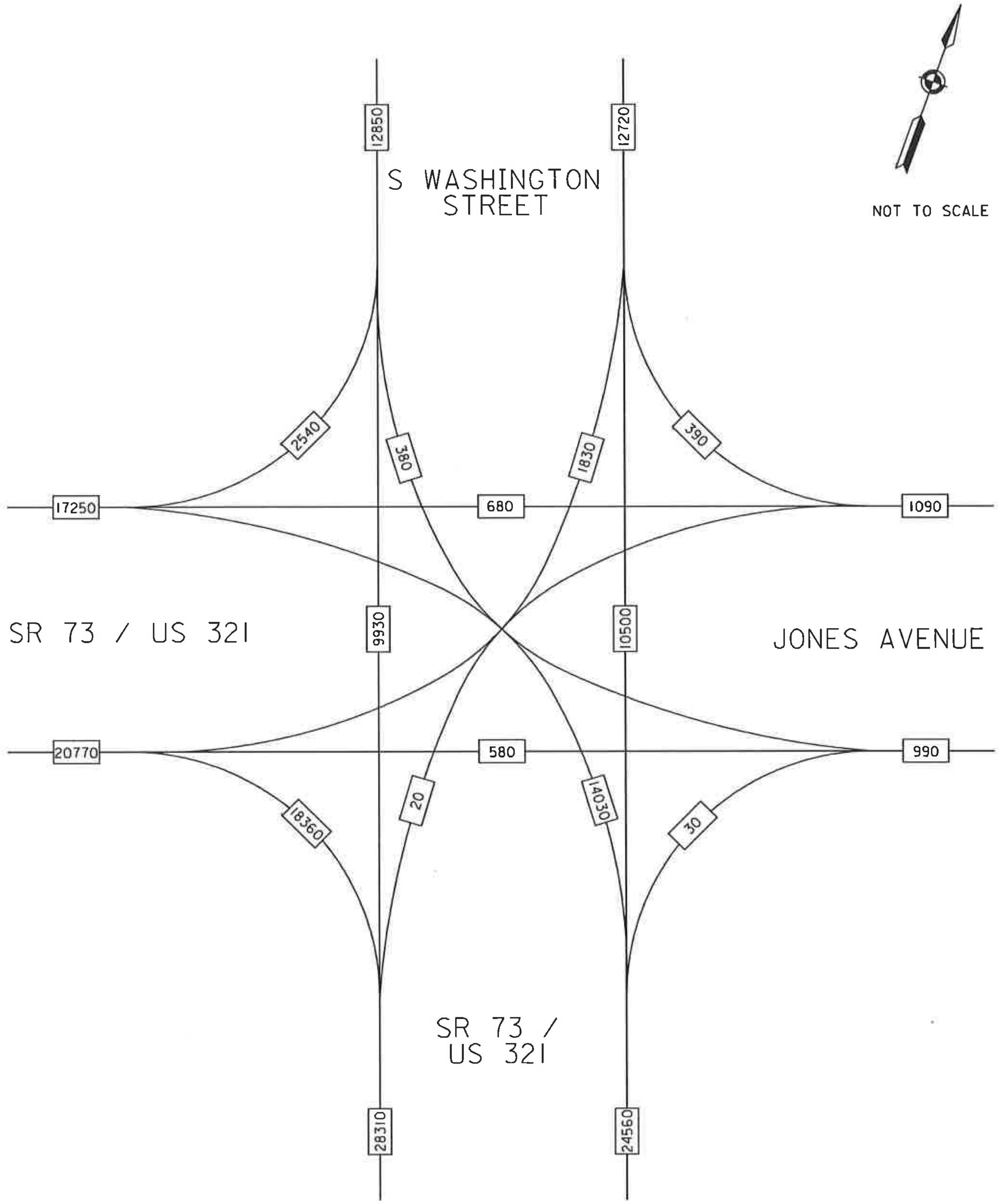
2040 AADT NO PPE	SR 33 @ SR 35



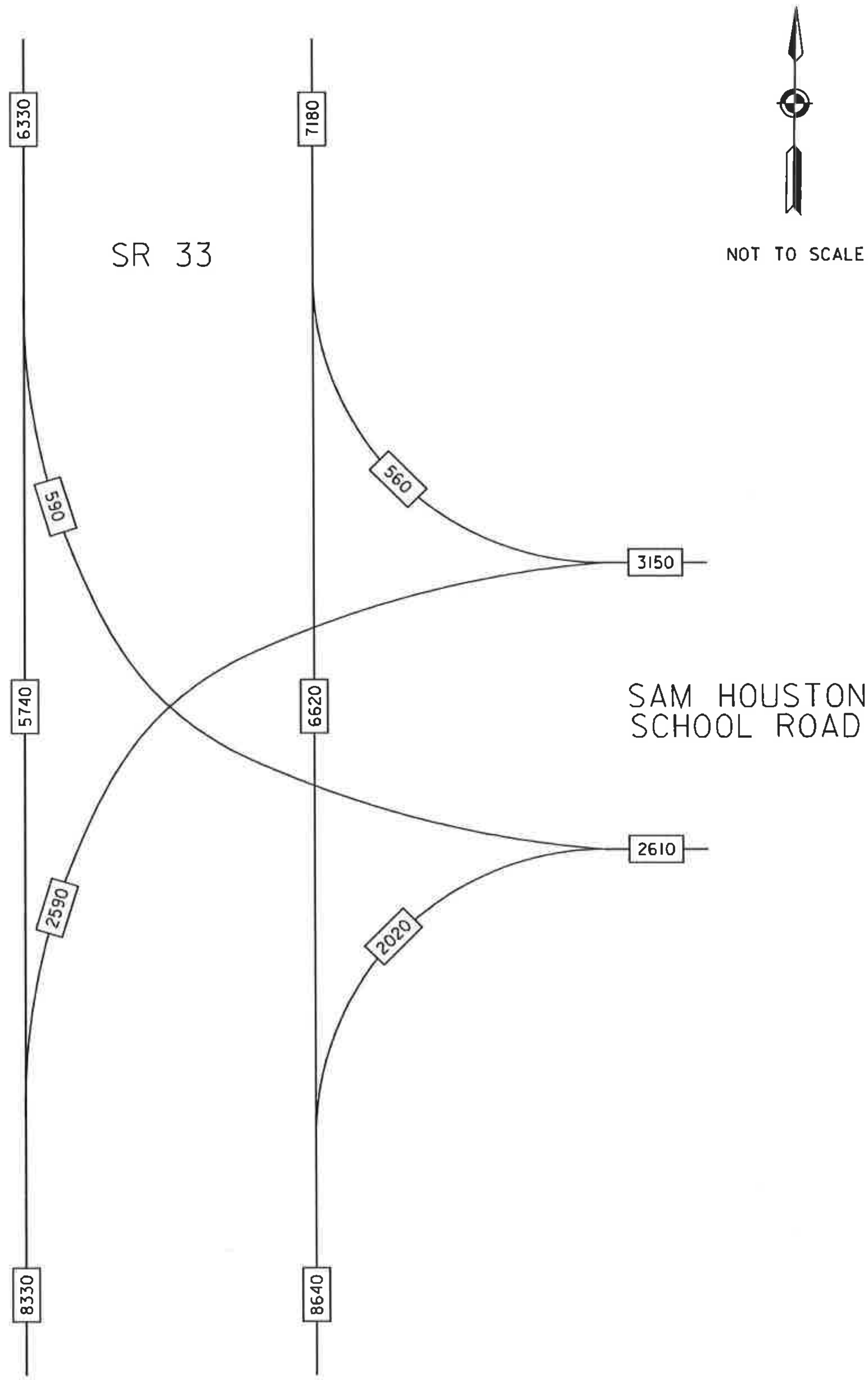
2040 AADT NO PPE	SEVIERVILLE RD @ SR 35/US 411 WASHINGTON ST



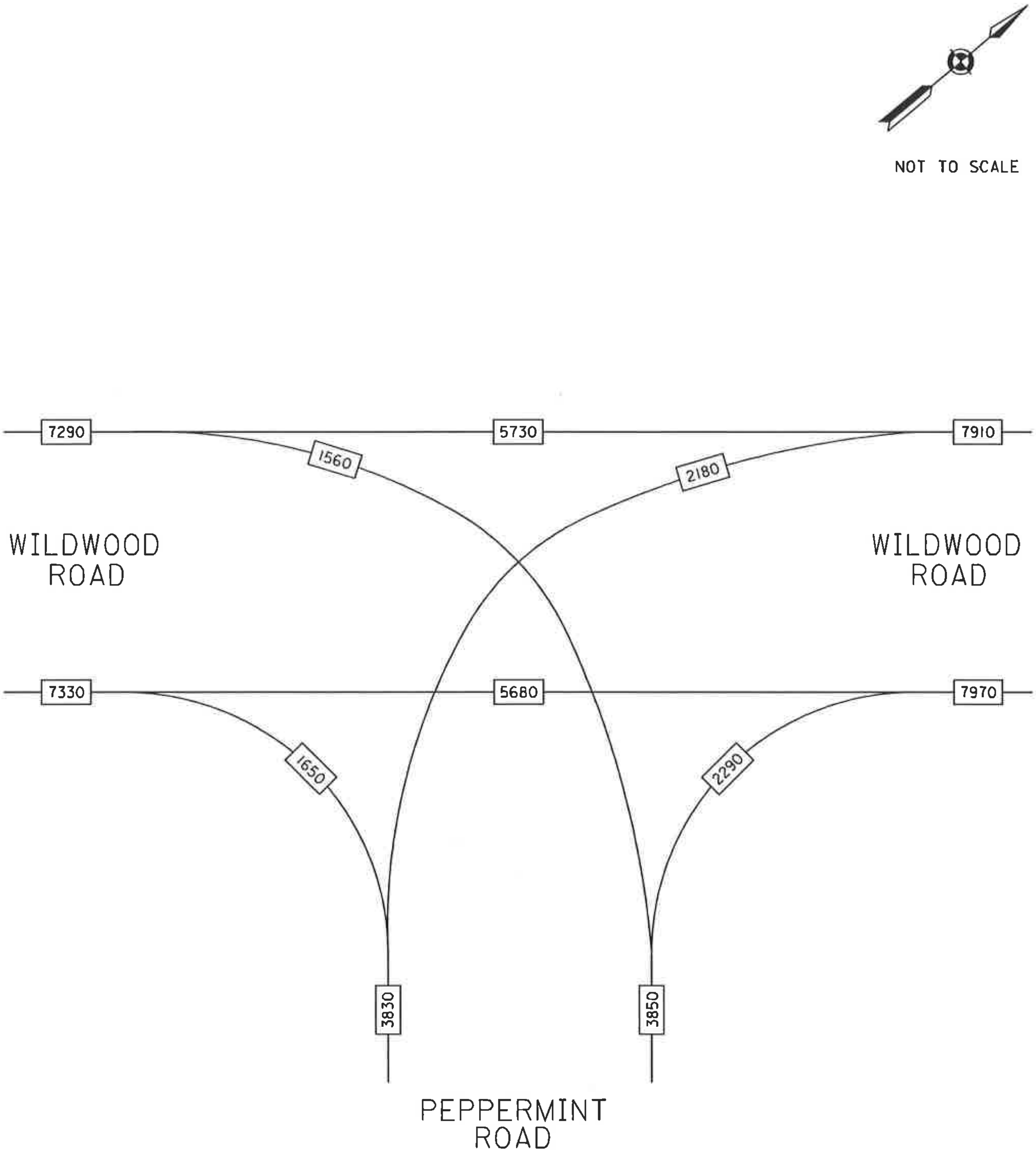
2040 AADT NO PPE	S WASHINGTON ST / SR 35 @ HIGH ST / SR 35



2040 AADT NO PPE	S WASHINGTON ST @ SR 73/ US 321

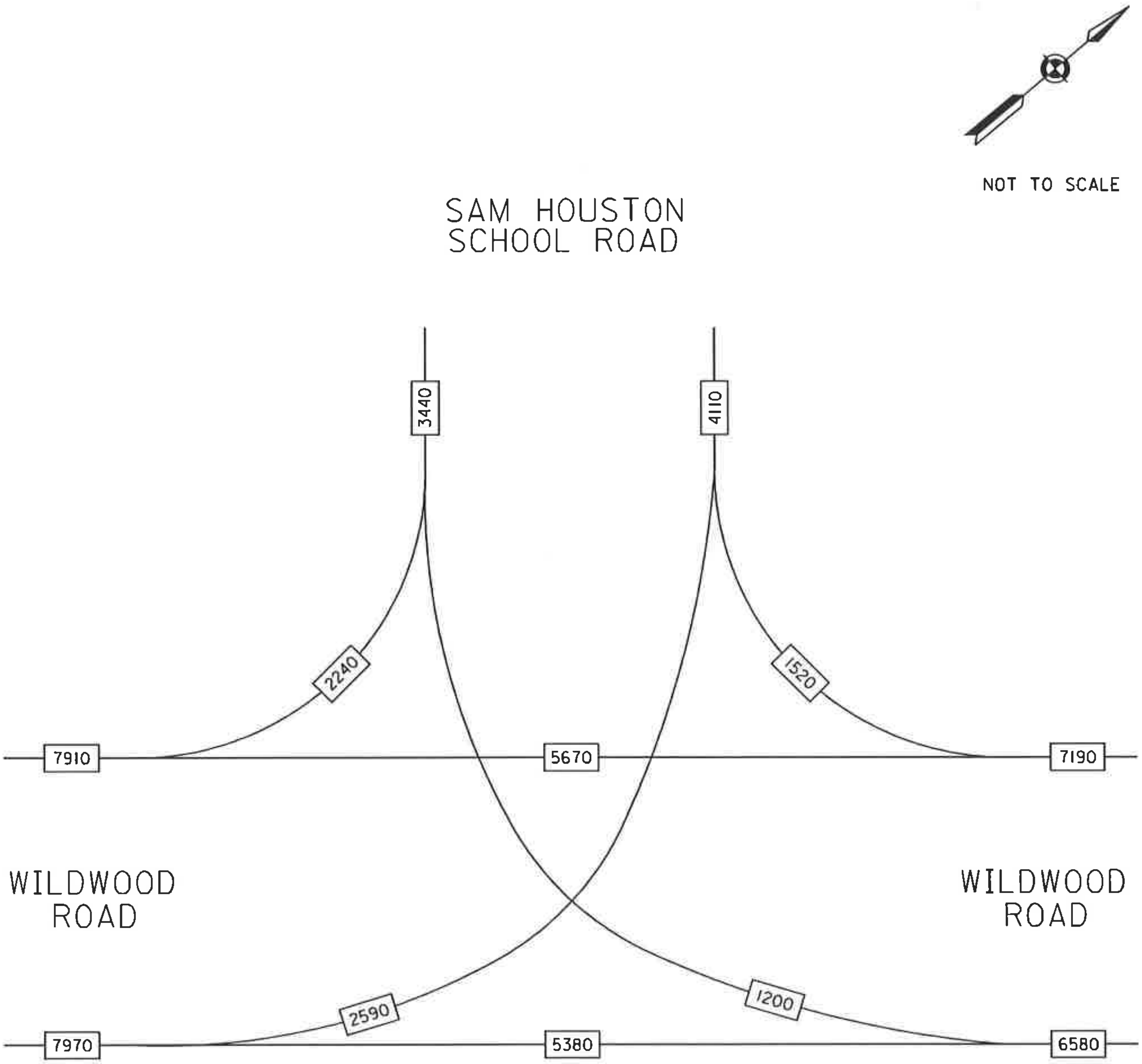


2040 AADT NO PPE	SR 33 @ SAM HOUSTON SCHOOL ROAD



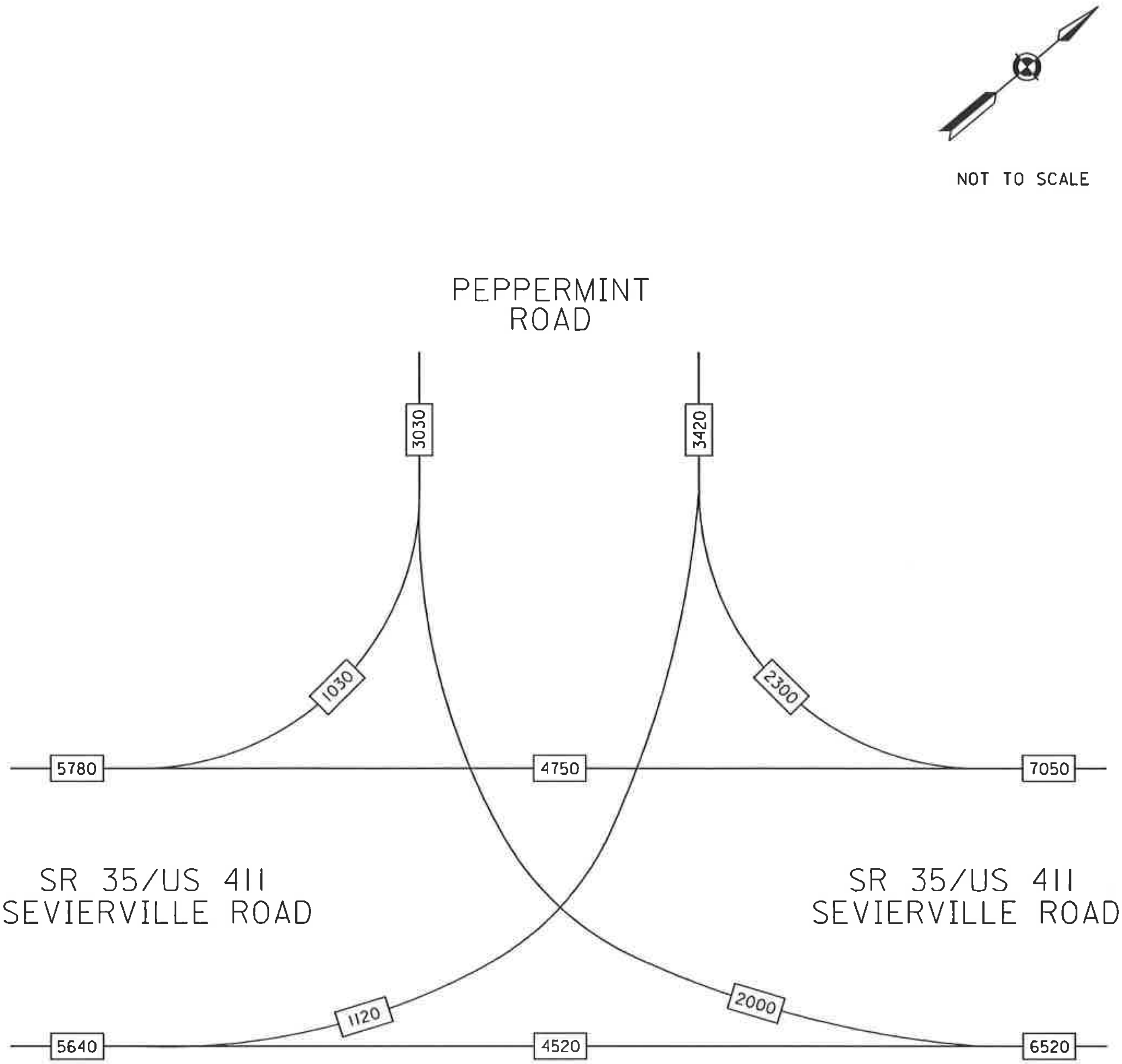
2040 AADT NO PPE

PEPPERMINT ROAD @ WILDWOOD ROAD

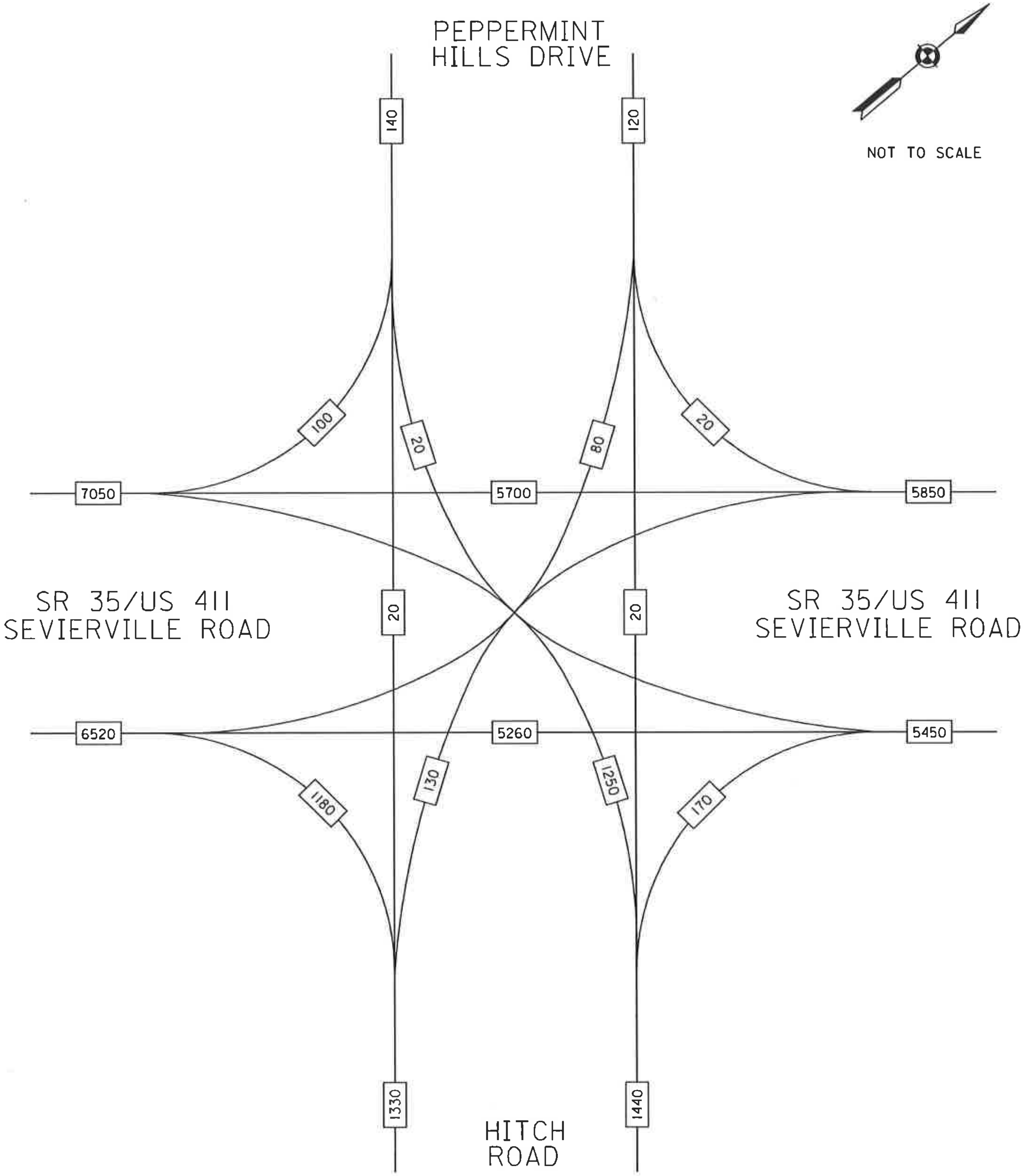


2040 AADT NO PPE

SAM HOUSTON SCHOOL ROAD @
WILDWOOD ROAD

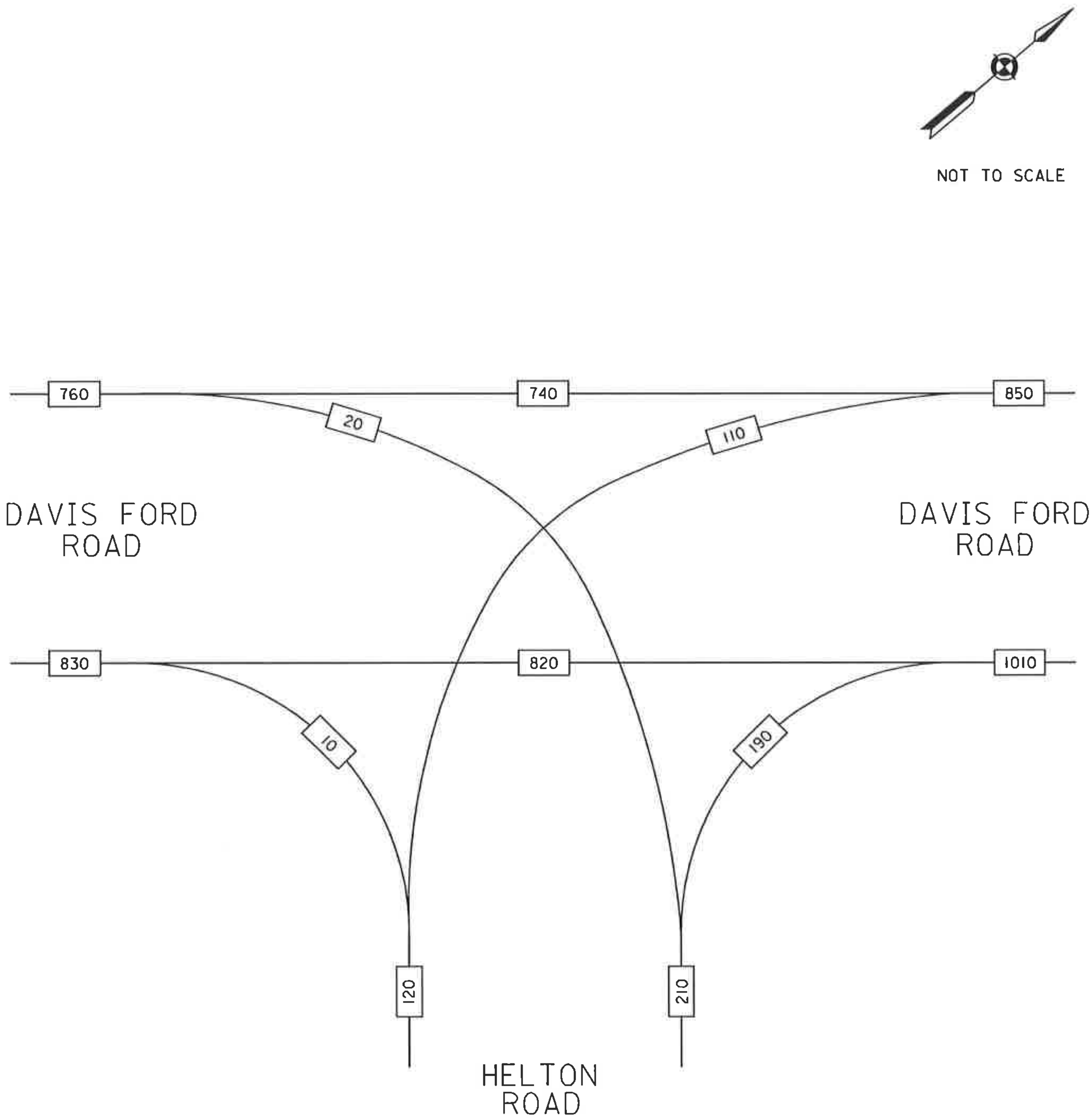


2040 AADT NO PPE	SR 35/US 411/SEVIERVILLE ROAD @ PEPPERMINT ROAD



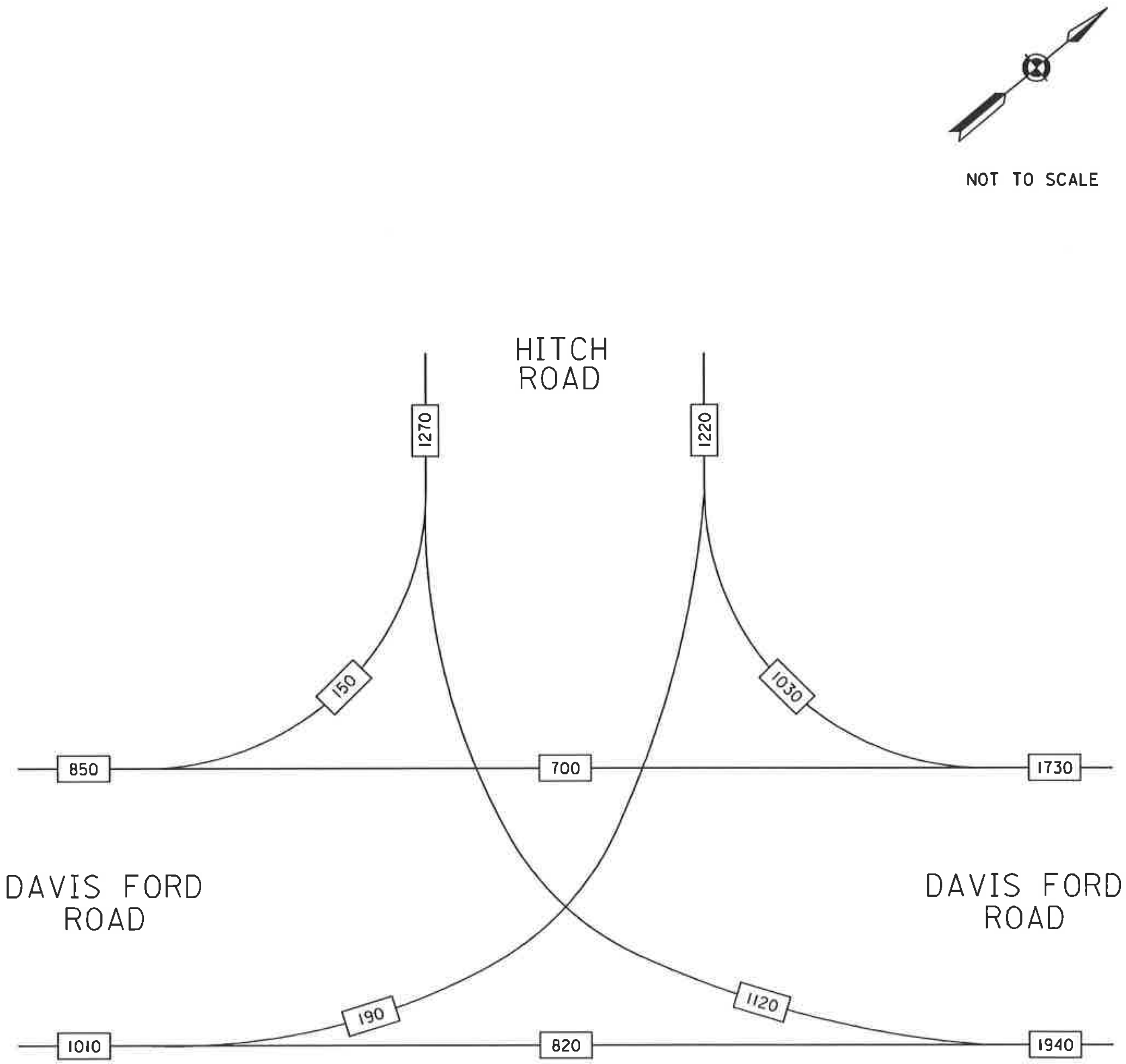
2040 AADT NO PPE

SR 35/US 411/SEVIERVILLE ROAD @
HITCH ROAD/PEPPERMINT HILLS DR



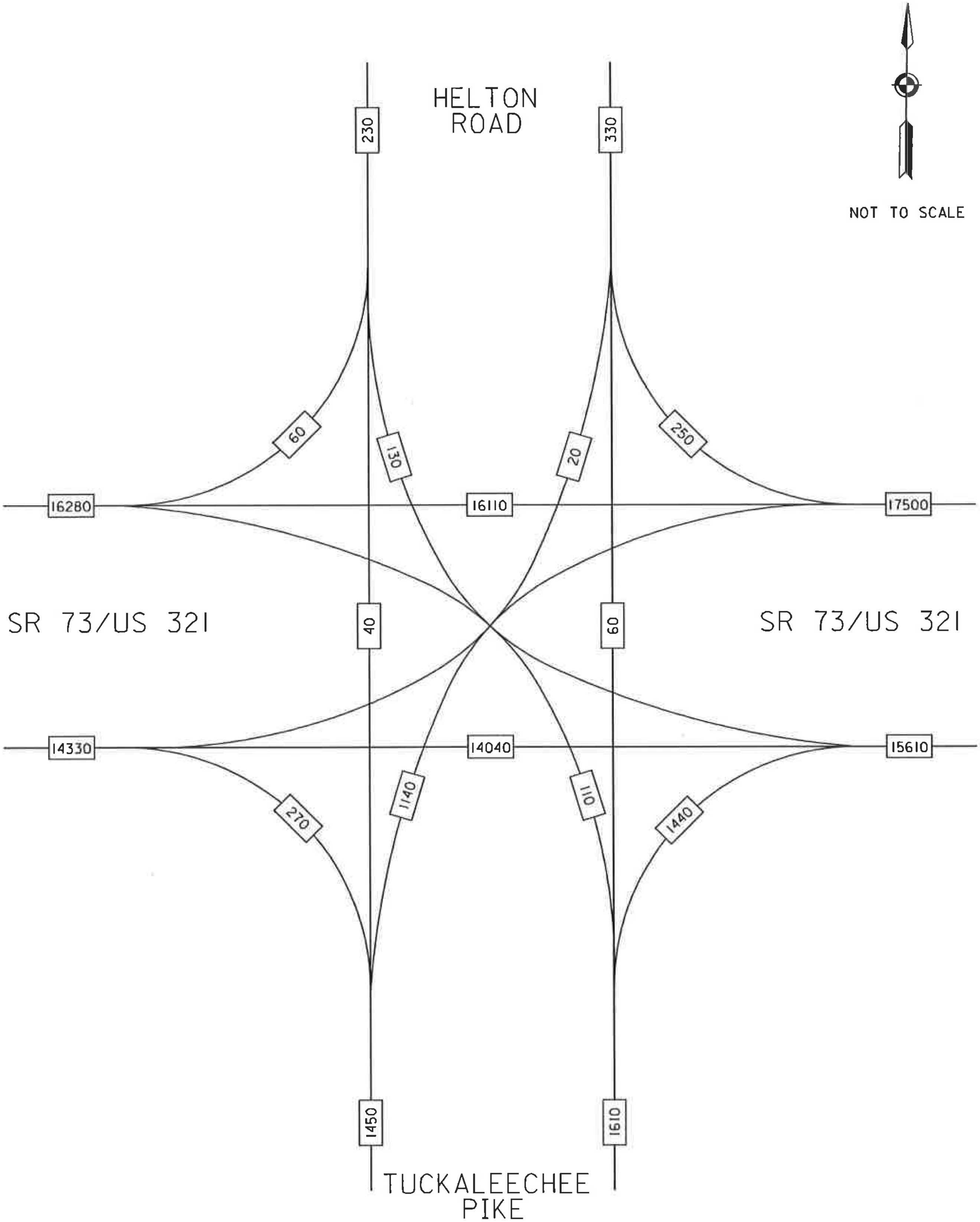
2040 AADT NO PPE

DAVIS FORD ROAD @
HELTON ROAD

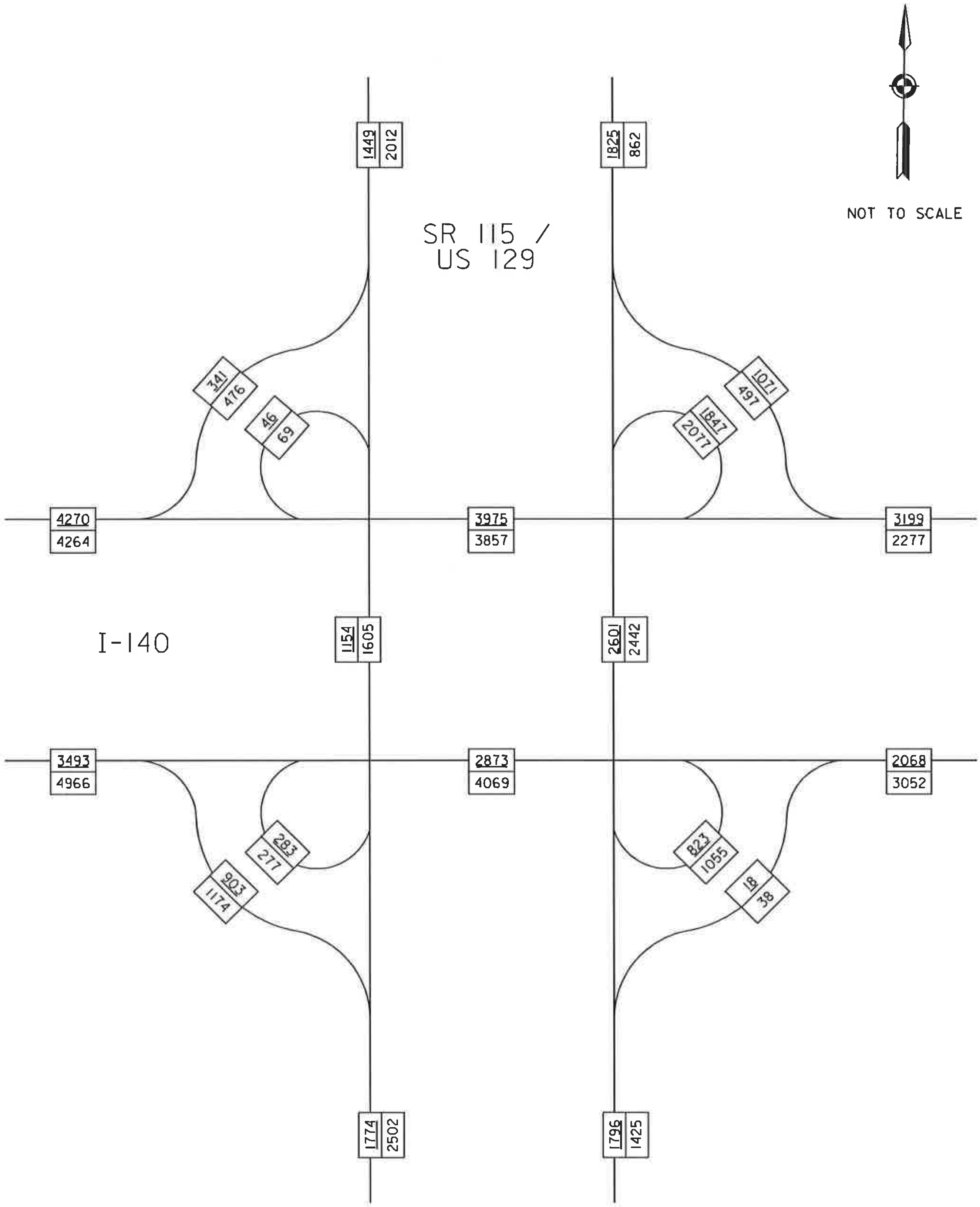


2040 AADT NO PPE

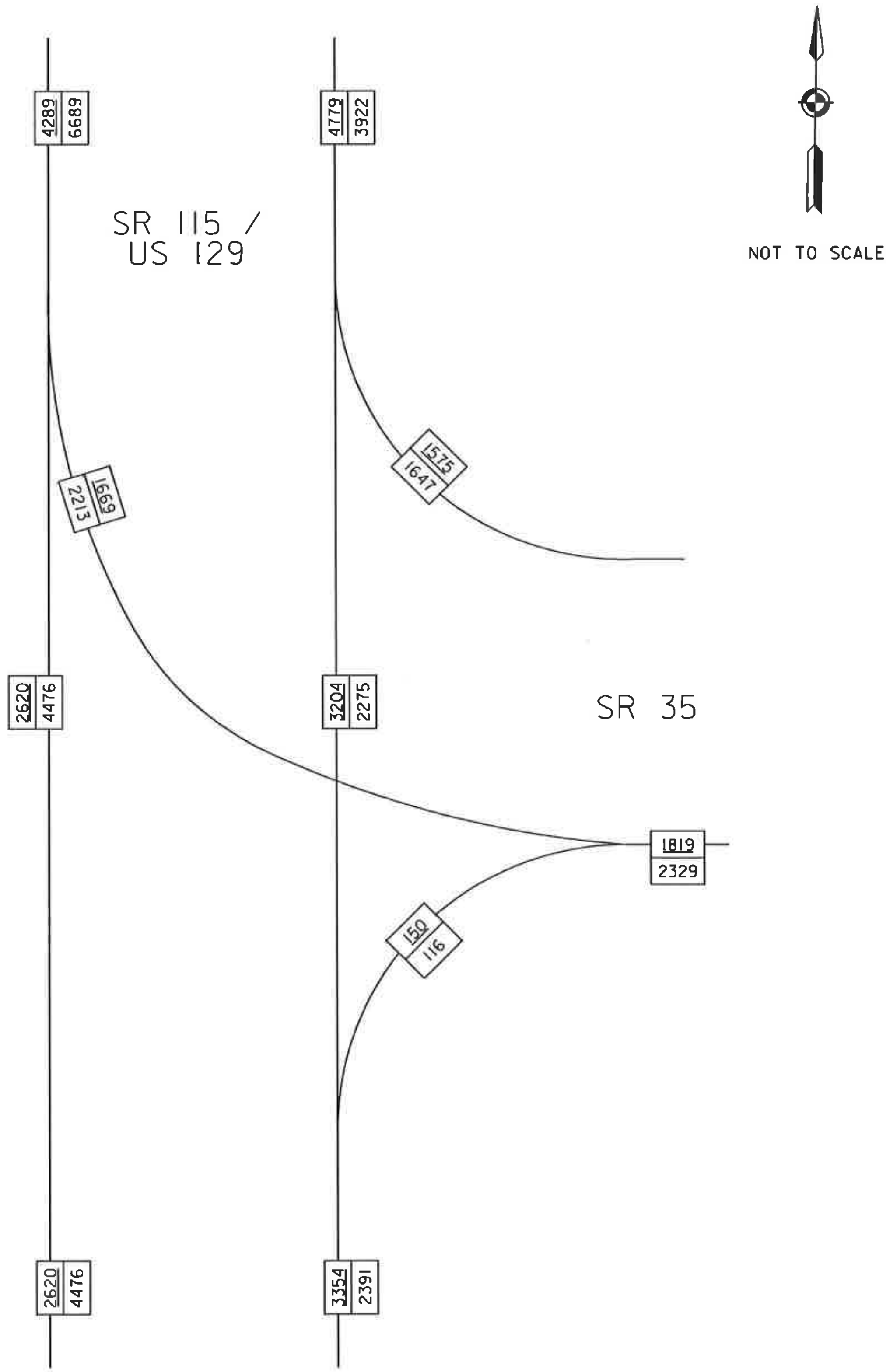
DAVIS FORD ROAD @ HITCH ROAD



2040 AADT NO PPE	SR 73/US 321 @ HELTON ROAD/TUCKALEECHEE PIKE

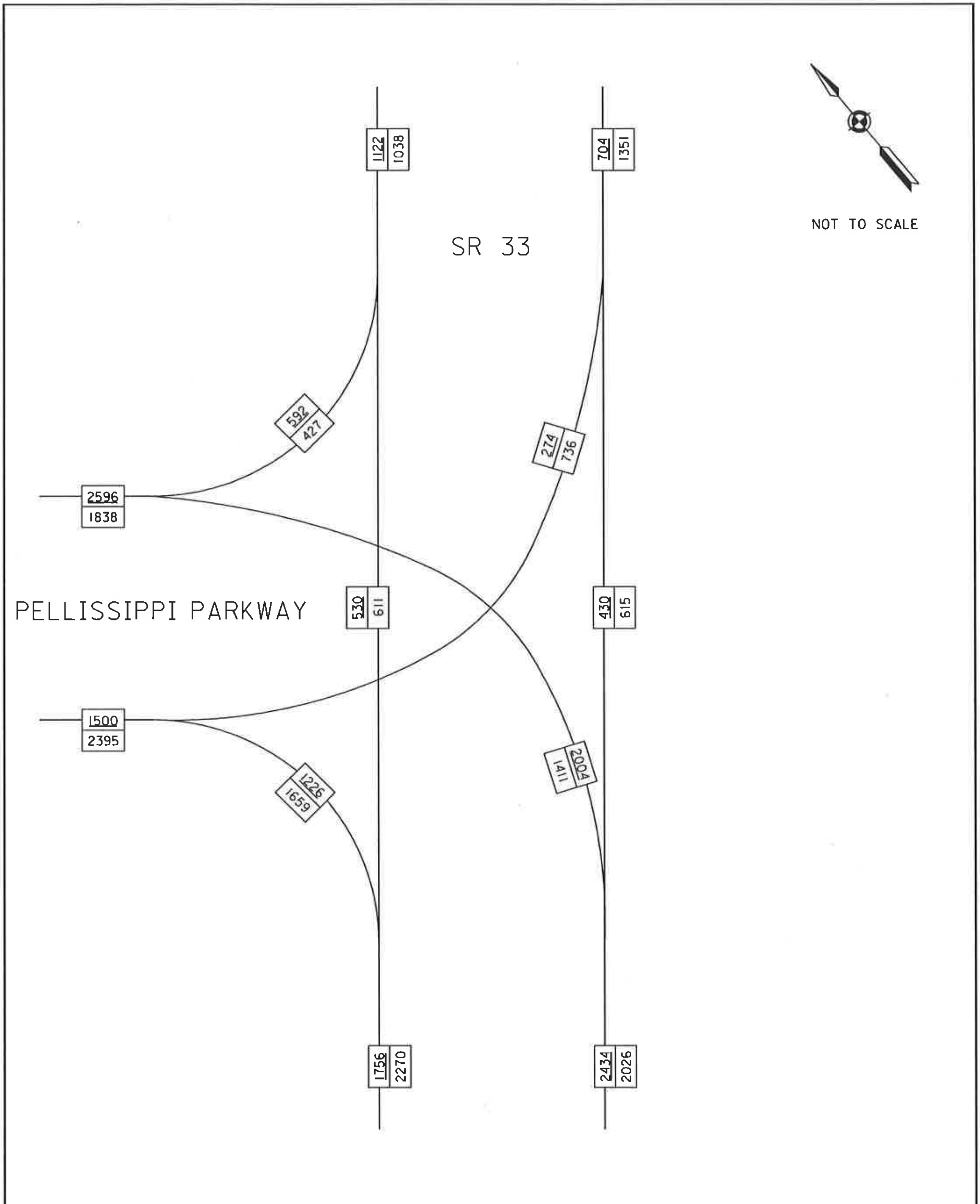


2040 DHV NO PPE <u>AM</u> / PM	SR 115/US 129 @ I-140 / PELLISSIPPI PARKWAY



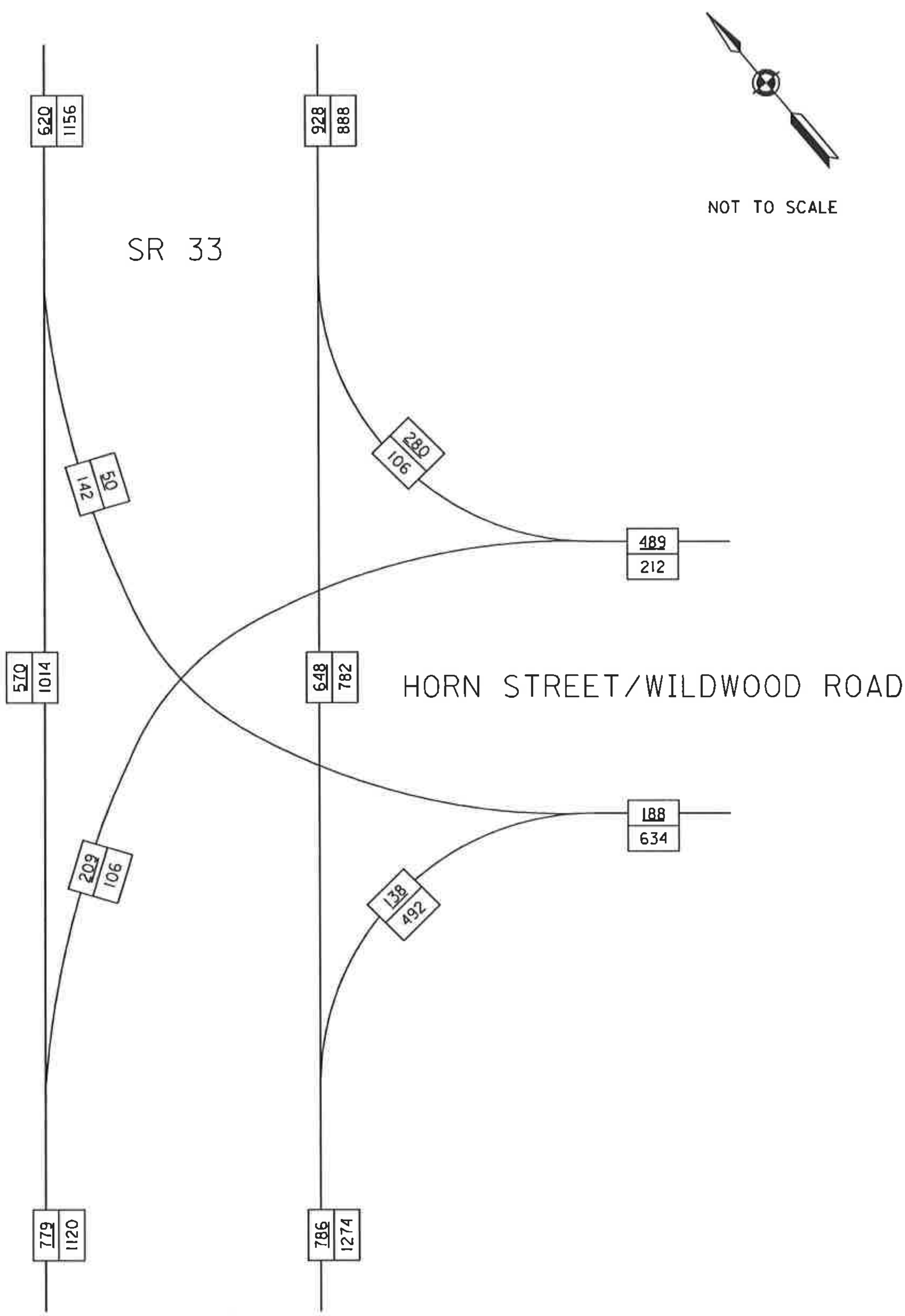
2040 DHV NO PPE
AM / PM

SR 115/US 129 @ SR 35

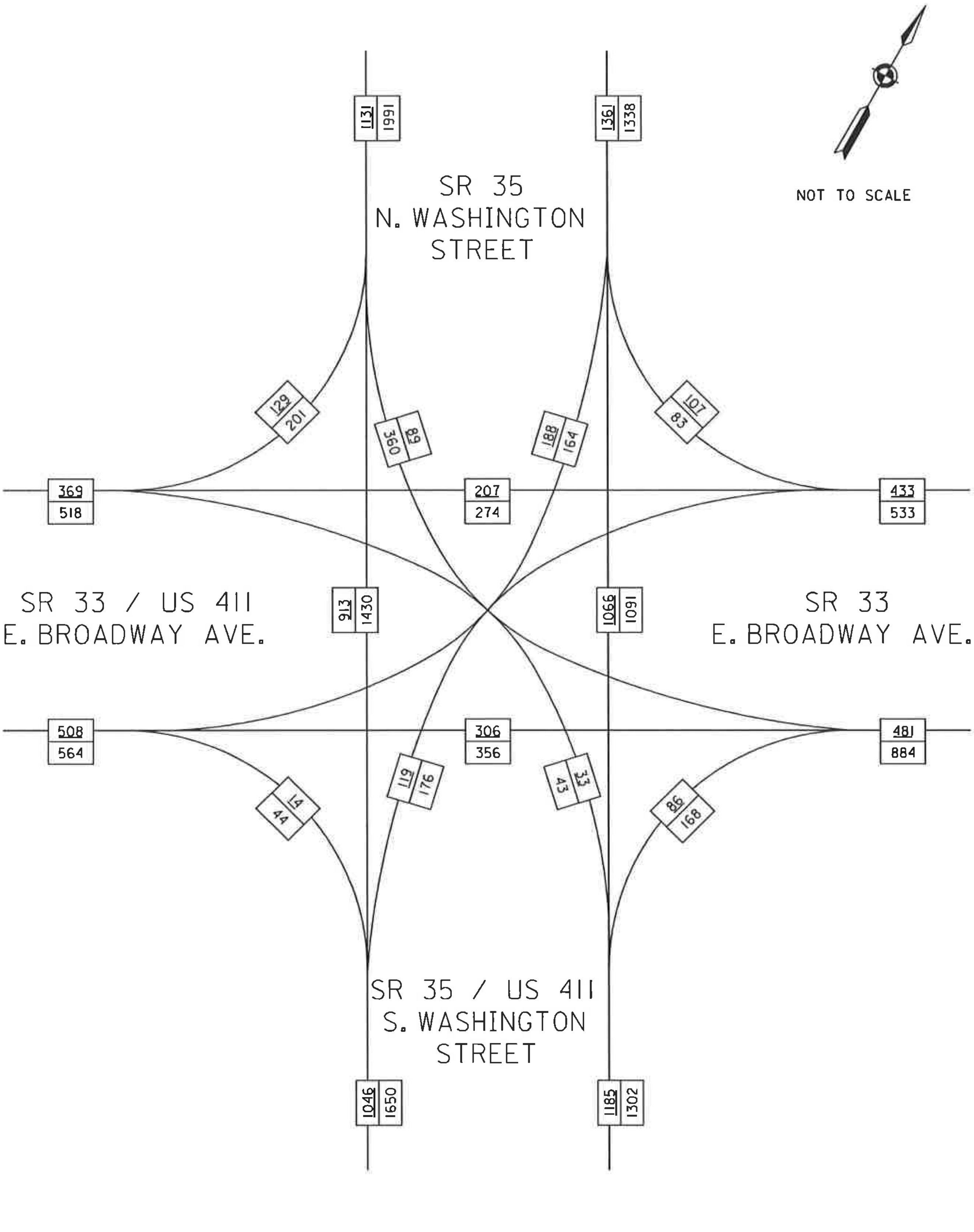


2040 DHV NO PPE
AM / PM

SR 33 @ PELLISSIPPI PARKWAY

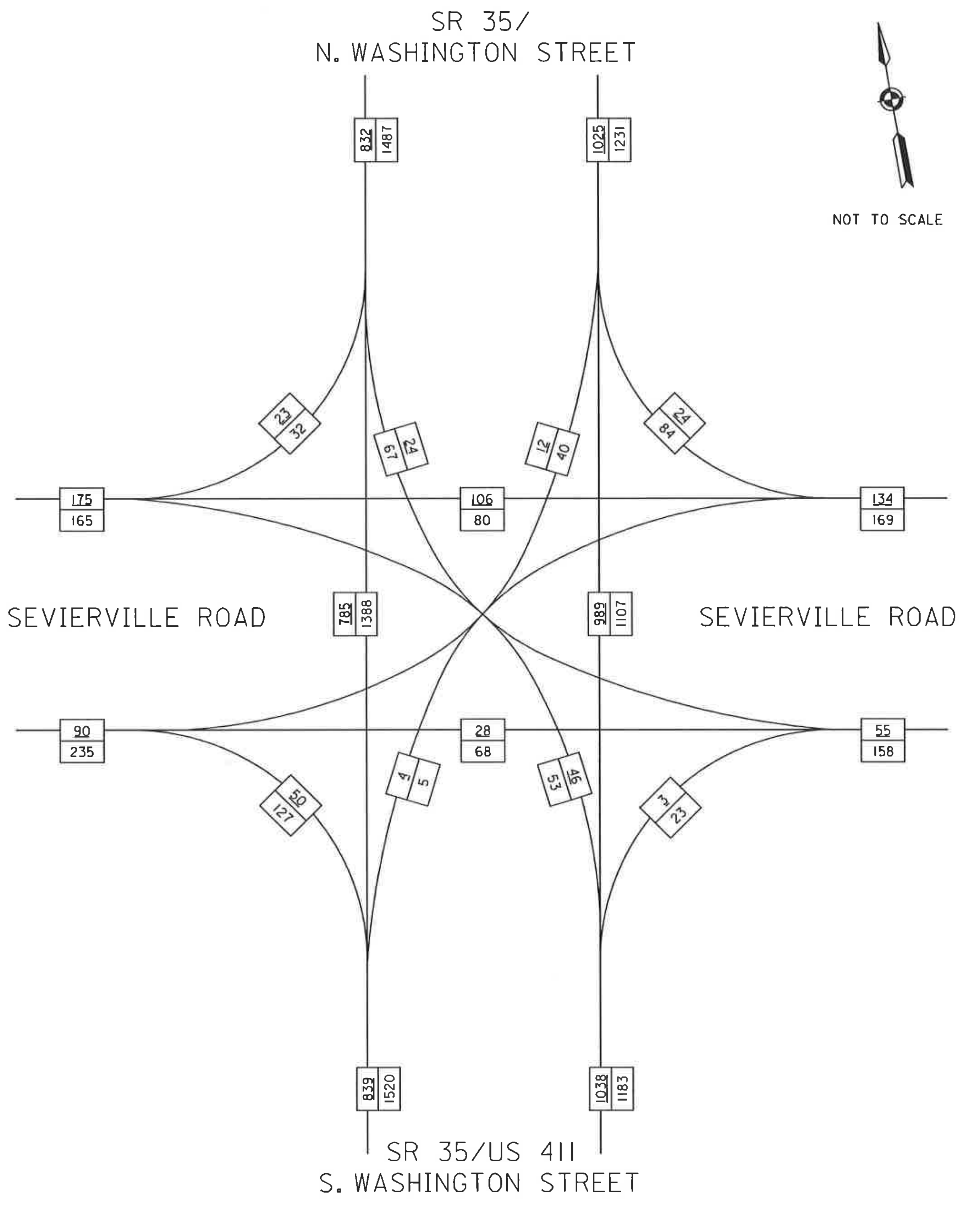


2040 DHV NO PPE AM / PM	SR 33 @ HORN STREET/ WILDWOOD ROAD

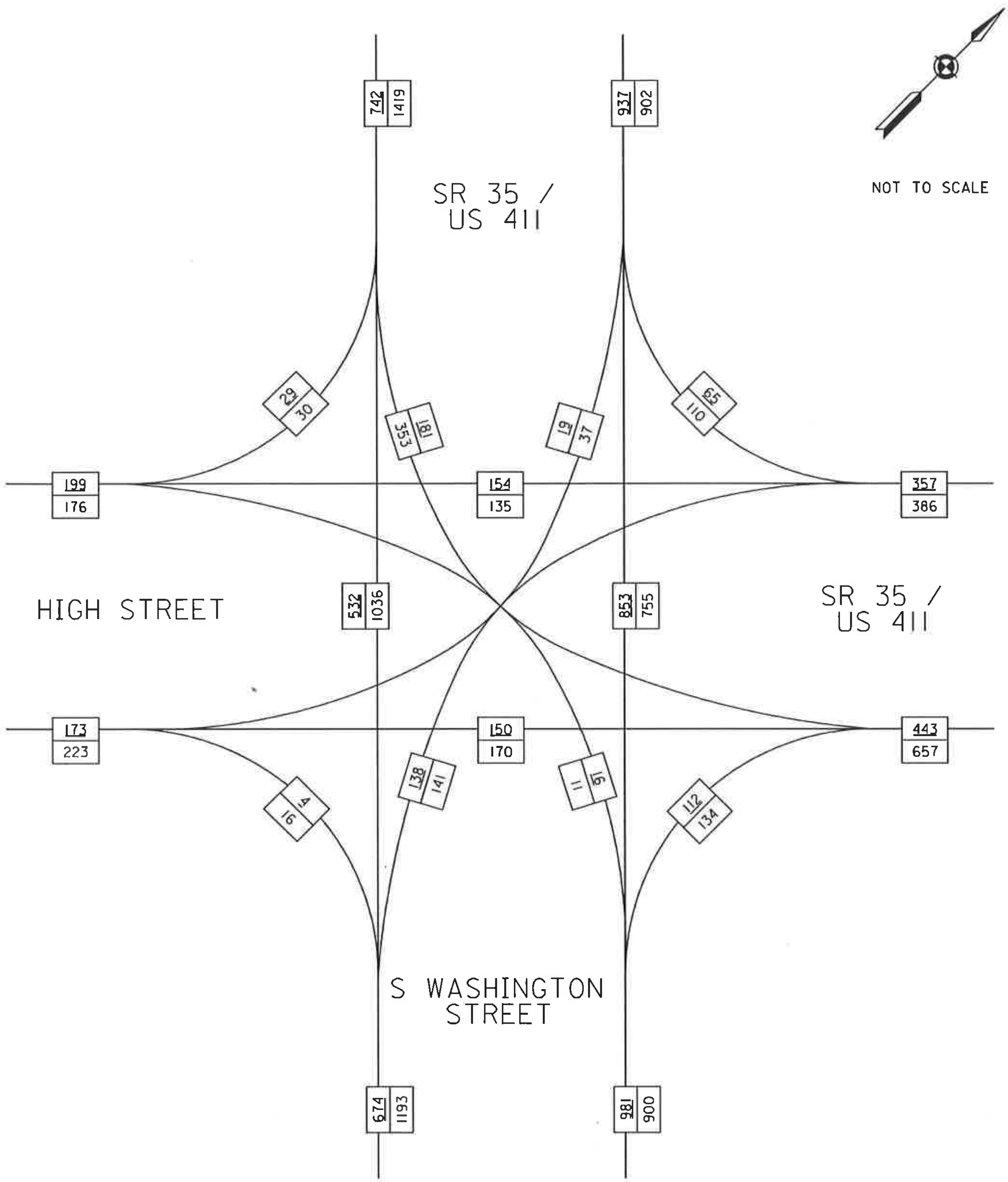


2040 DHV NO PPE
AM / PM

SR 33 @ SR 35

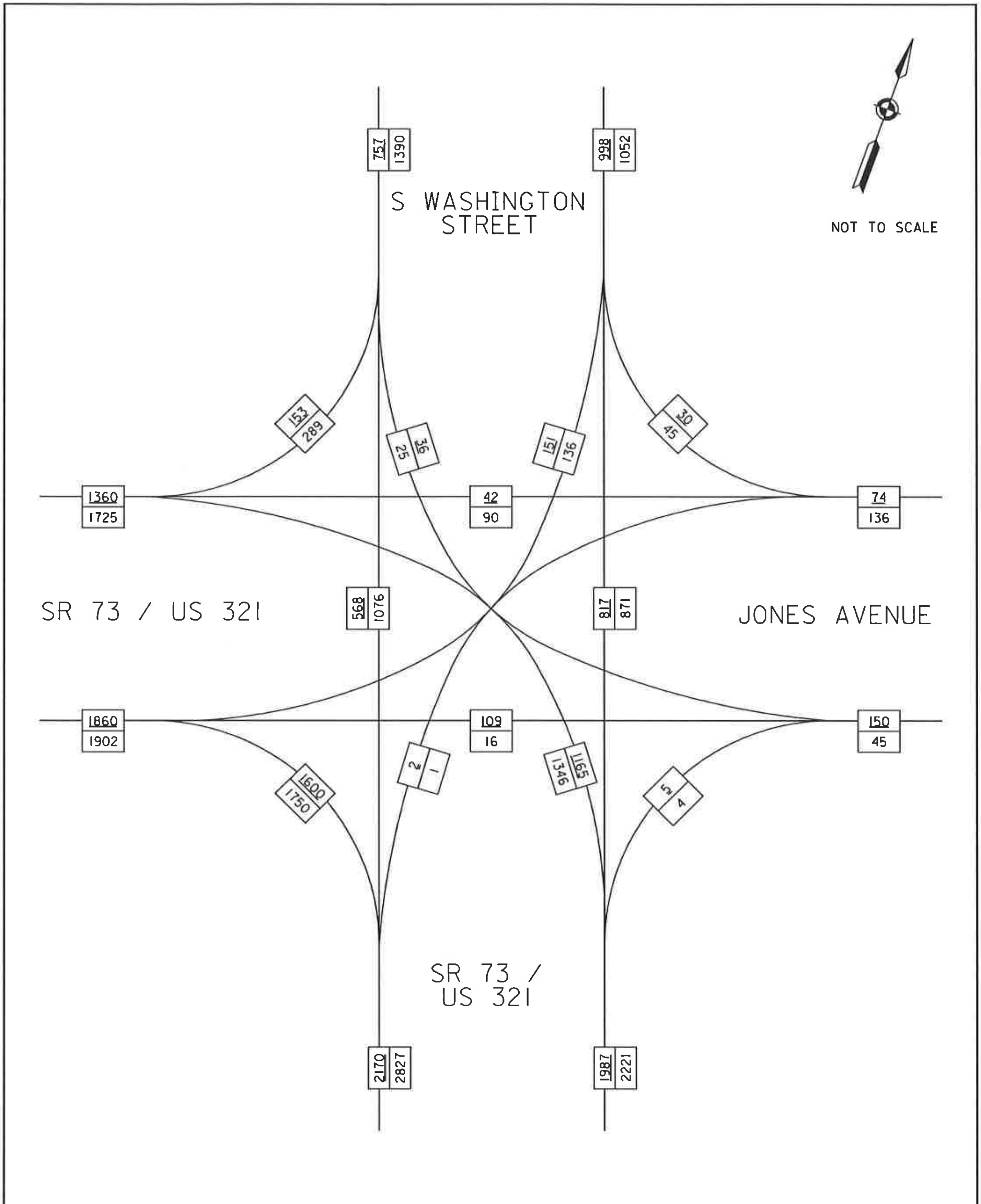


2040 DHV NO PPE AM / PM	SEVIERVILLE ROAD @ SR 35/WASHINGTON STREET

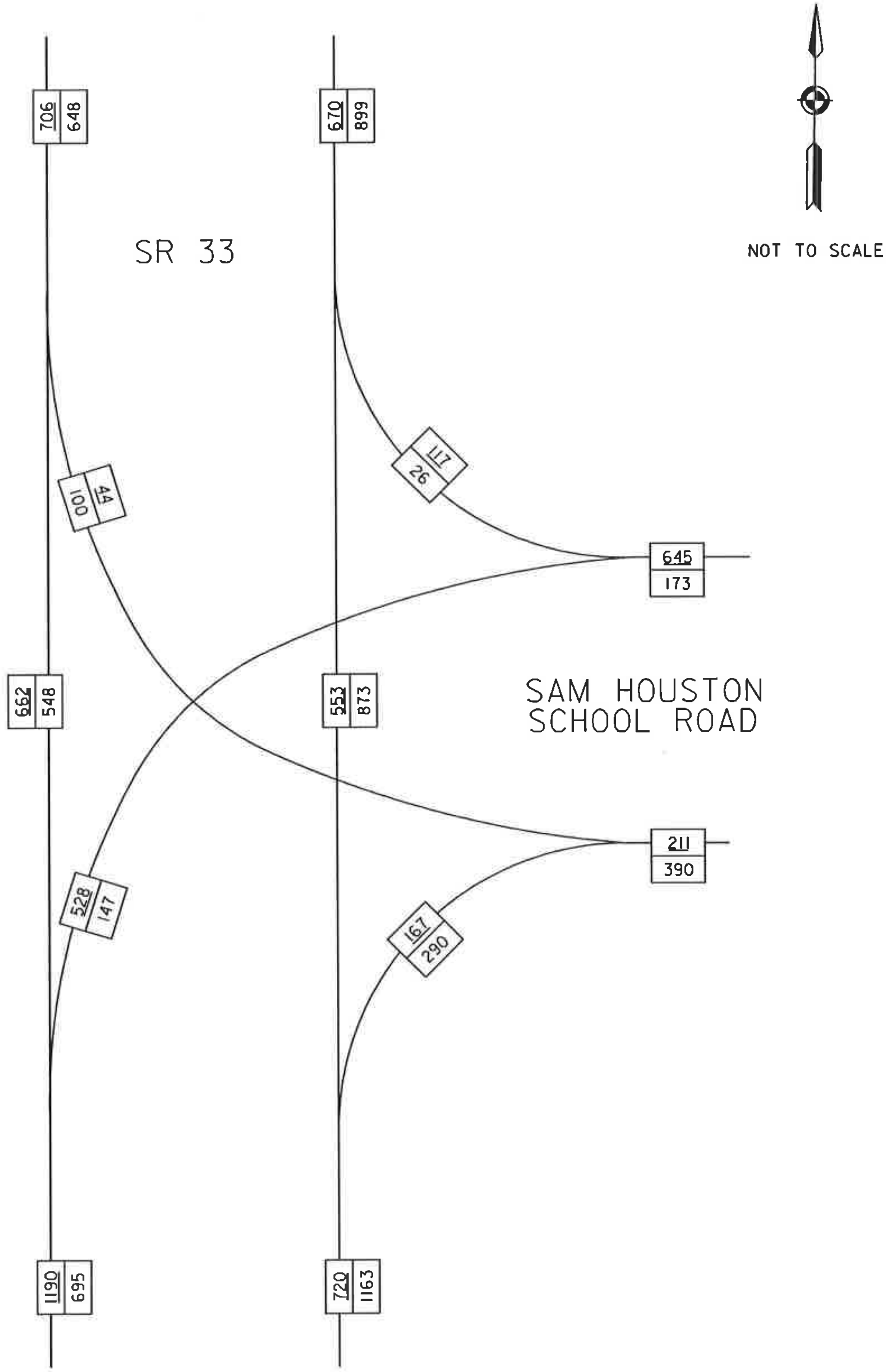


2040 DHV NO PPE
AM / PM

S WASHINGTON ST / SR 35 @ HIGH ST / SR 35

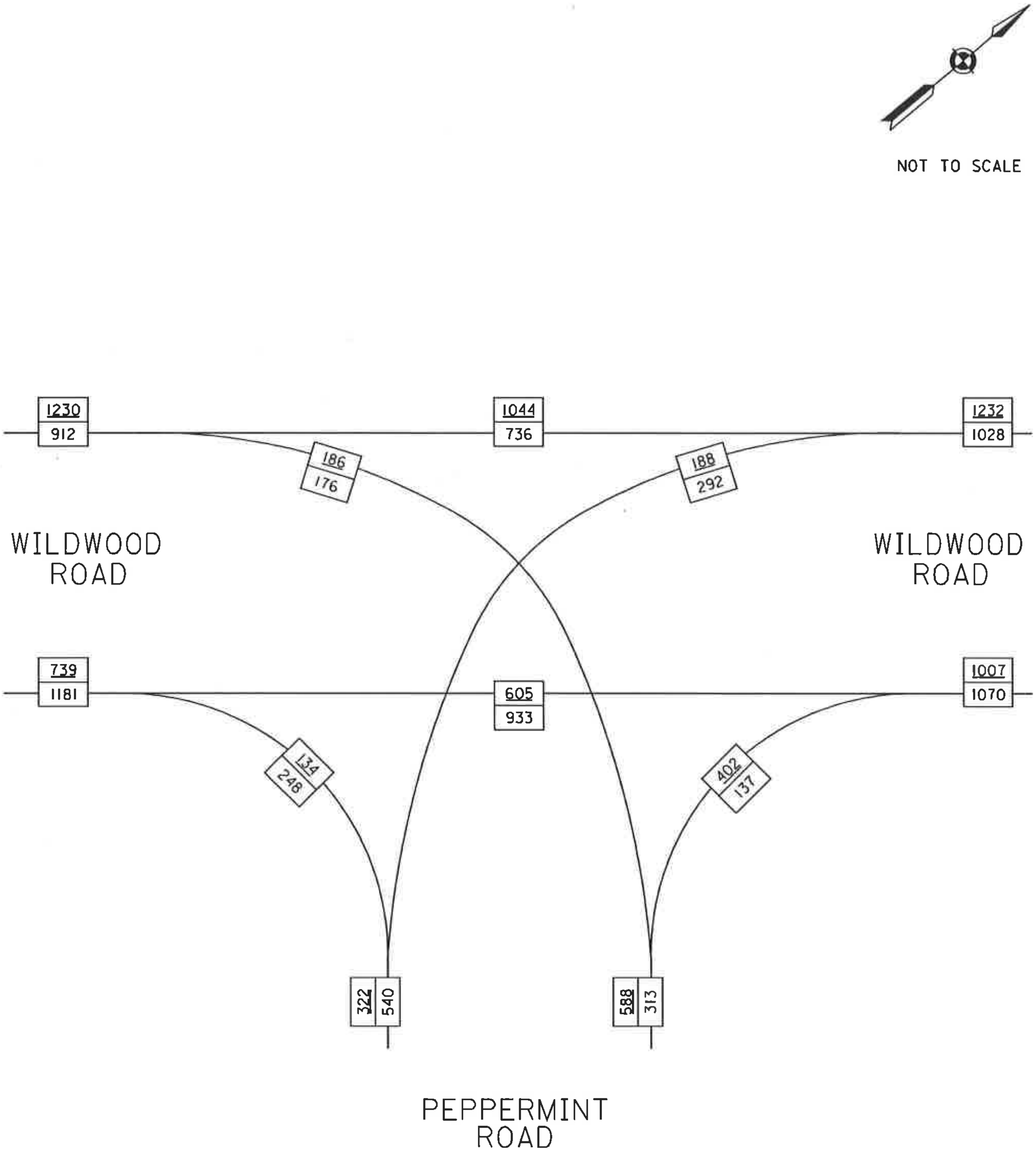


2040 DHV NO PPE AM / PM	S WASHINGTON ST @ SR 73/ US 321



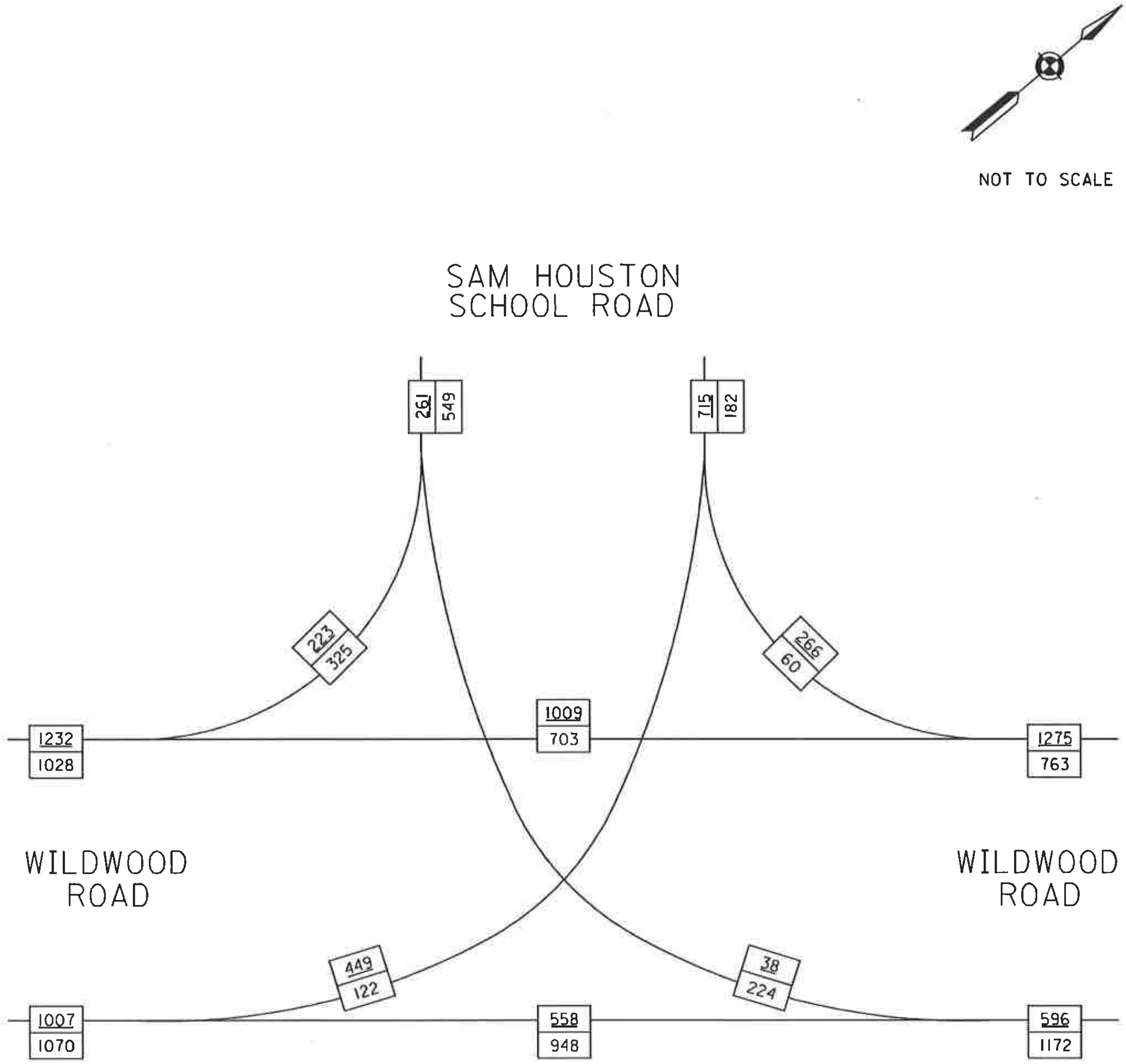
2040 DHV NO PPE
AM/PM

SR 33 @
SAM HOUSTON SCHOOL ROAD

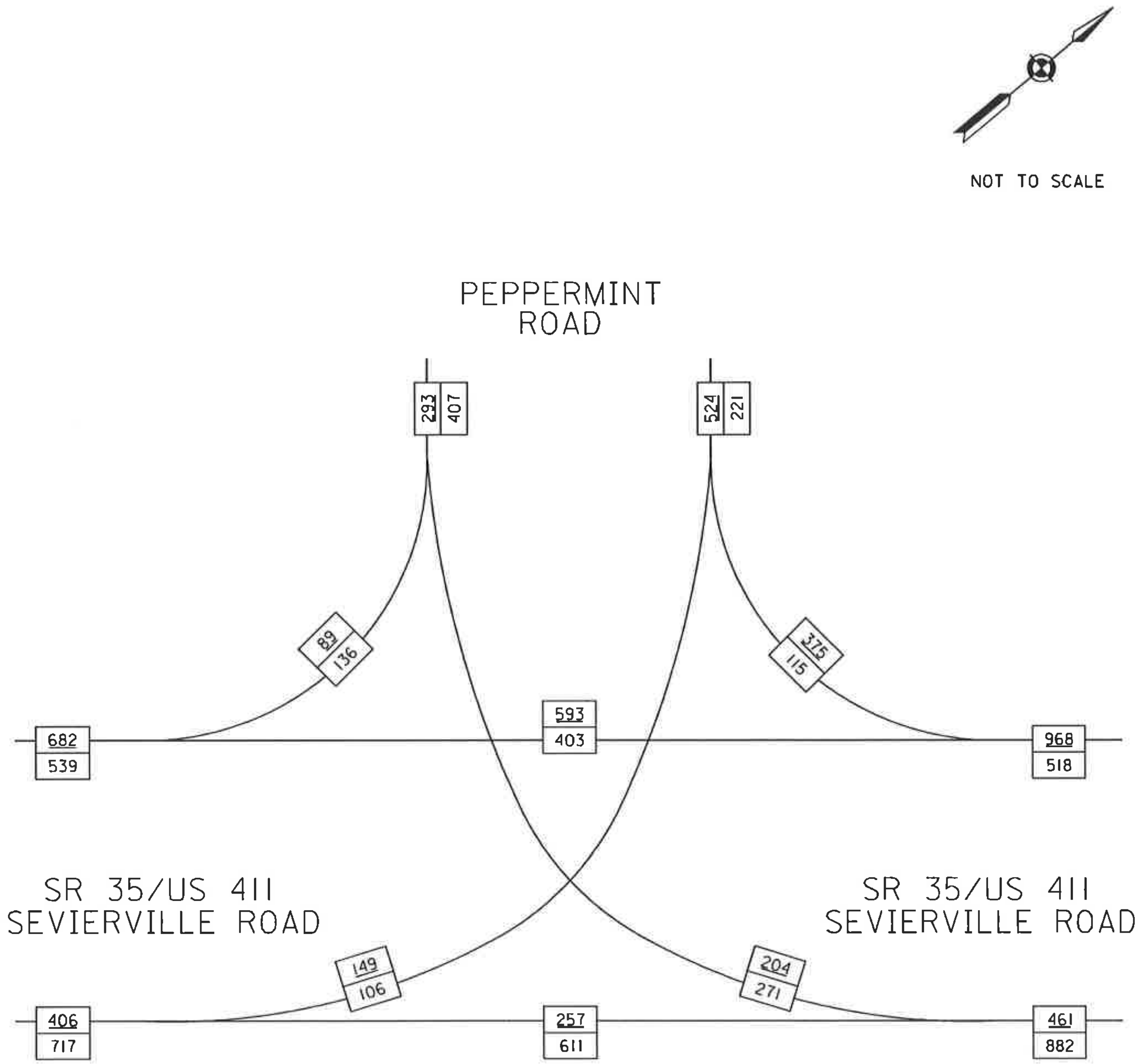


2040 DHV NO PPE
AM/PM

PEPPERMINT ROAD @ WILDWOOD ROAD

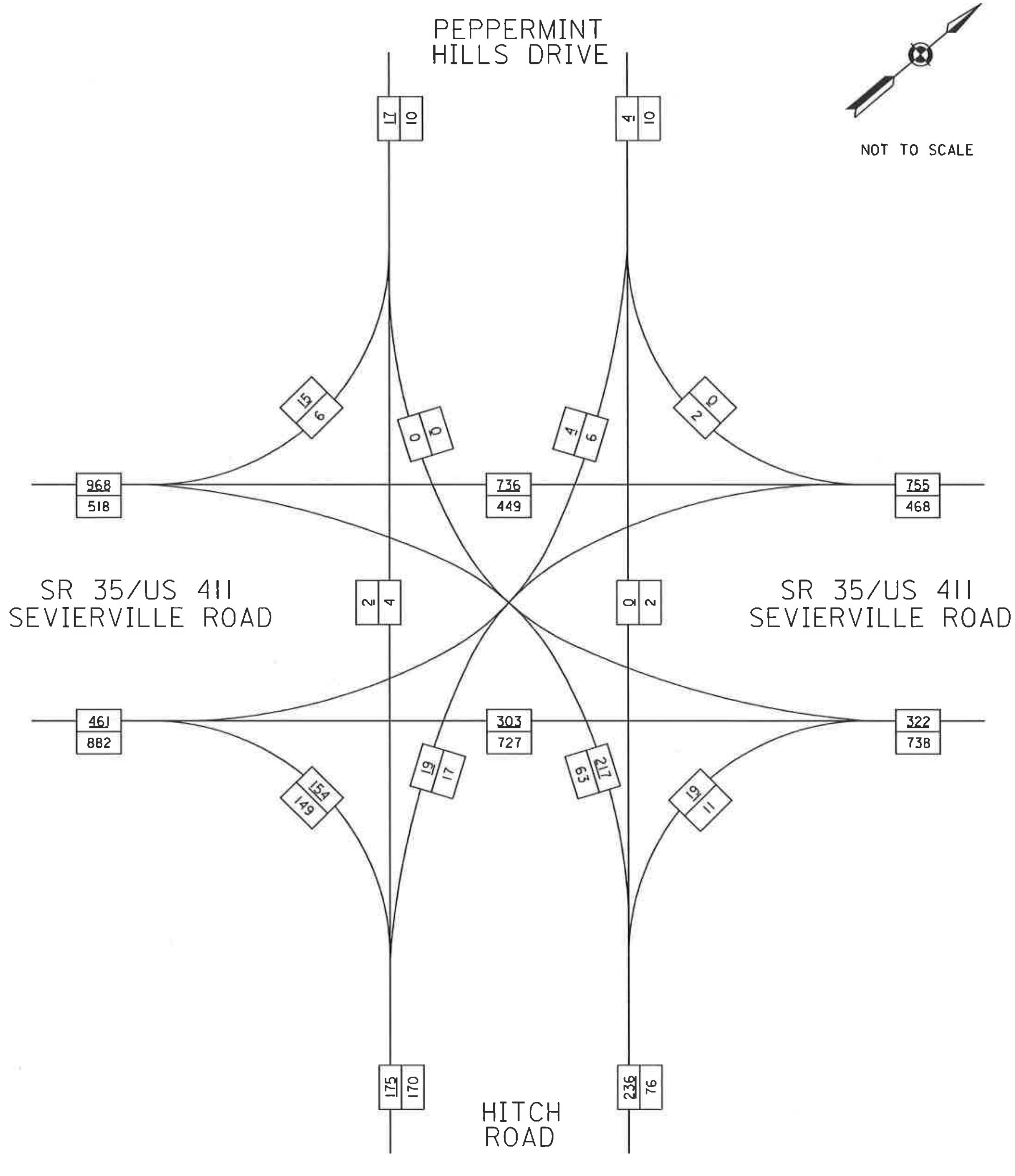


2040 DHV NO PPE AM/PM	SAM HOUSTON SCHOOL ROAD @ WILDWOOD ROAD



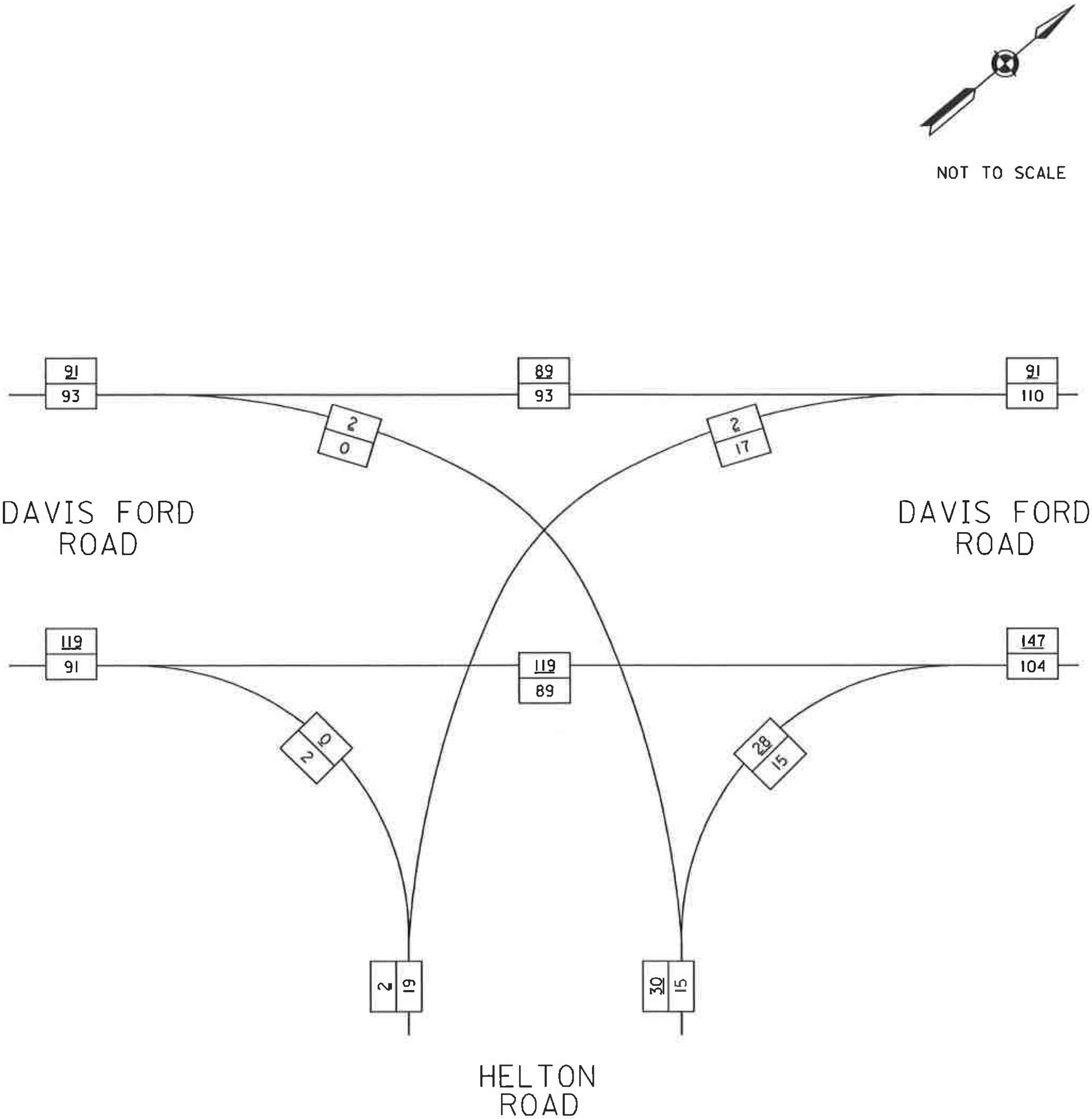
2040 DHV NO PPE
AM/PM

SR 35/US 411/SEVIERVILLE ROAD @ PEPPERMINT ROAD



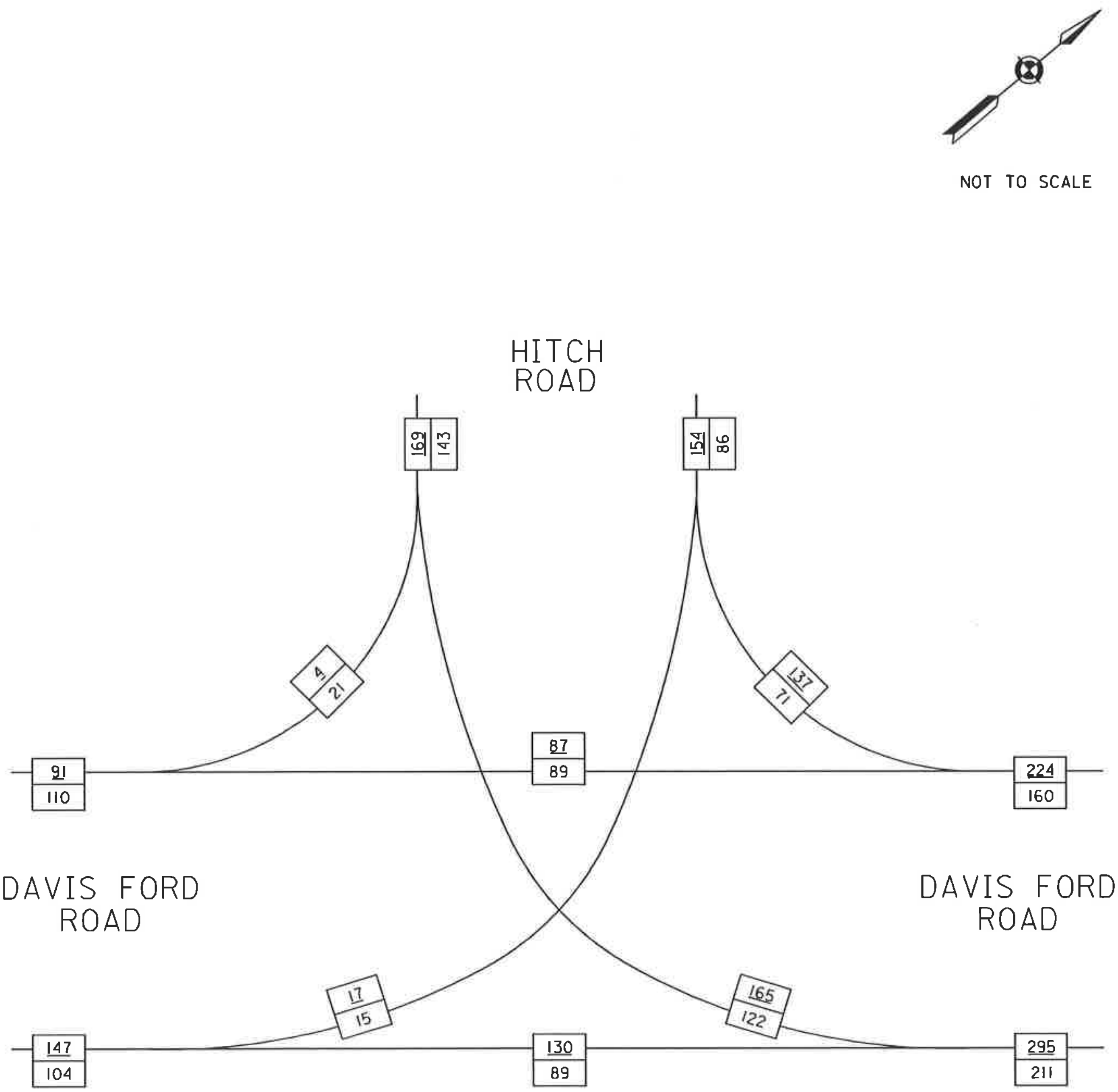
2040 DHV NO PPE
AM/PM

SR 35/US 411/SEVIERVILLE ROAD @
HITCH ROAD/PEPPERMINT HILLS DR



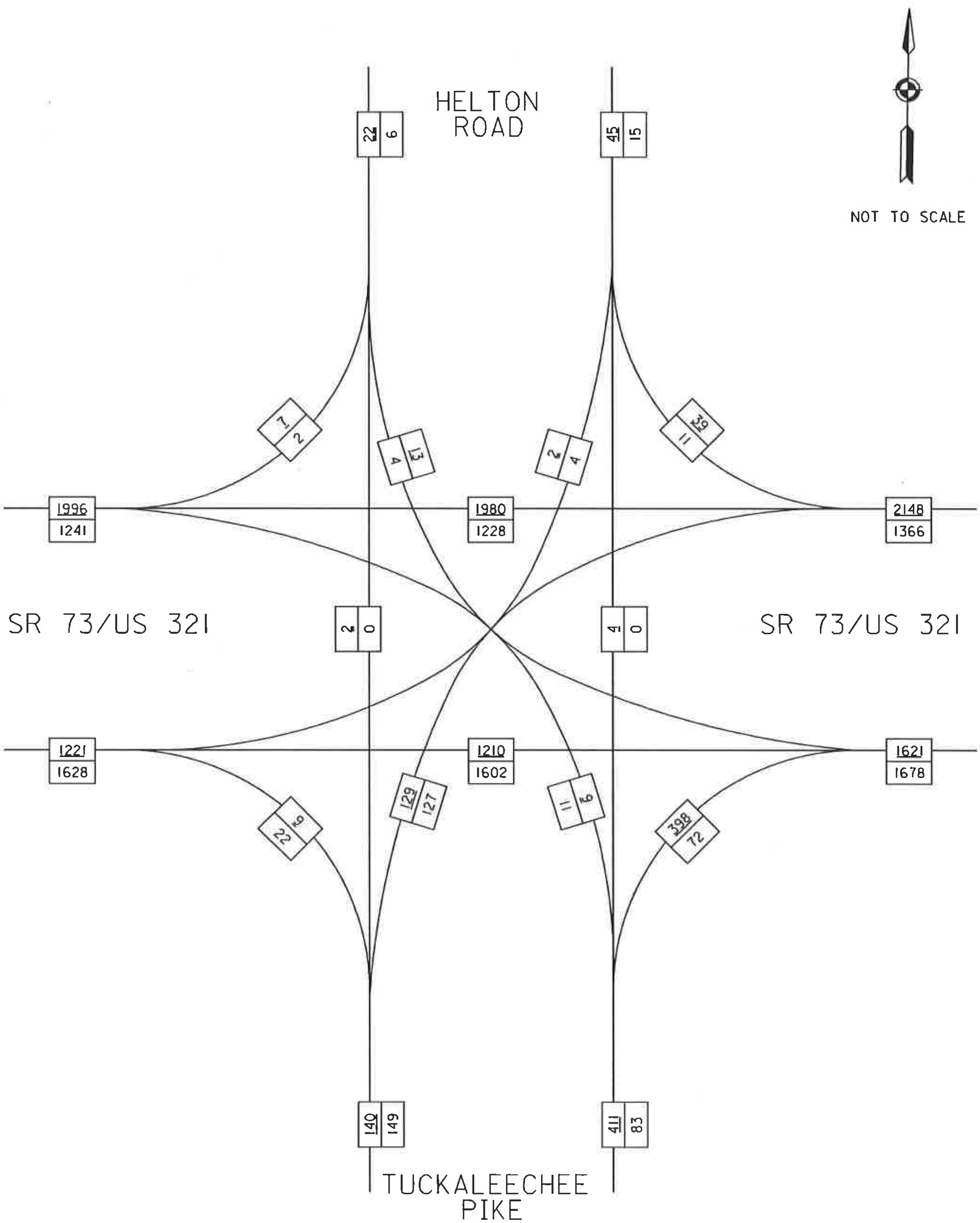
2040 DHV NO PPE
AM/PM

DAVIS FORD ROAD @
HELTON ROAD

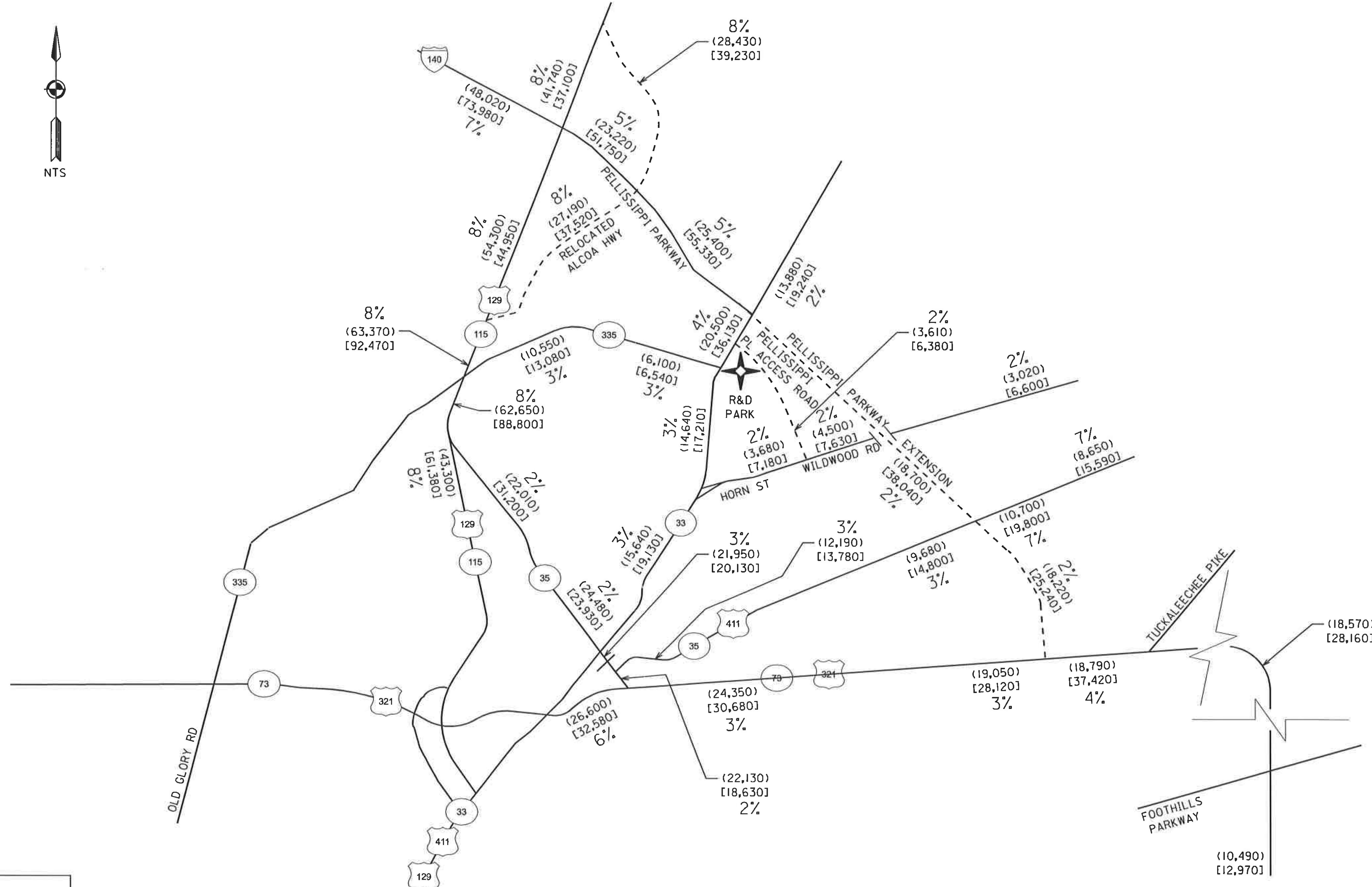


2040 DHV NO PPE
AM/PM

DAVIS FORD ROAD @ HITCH ROAD

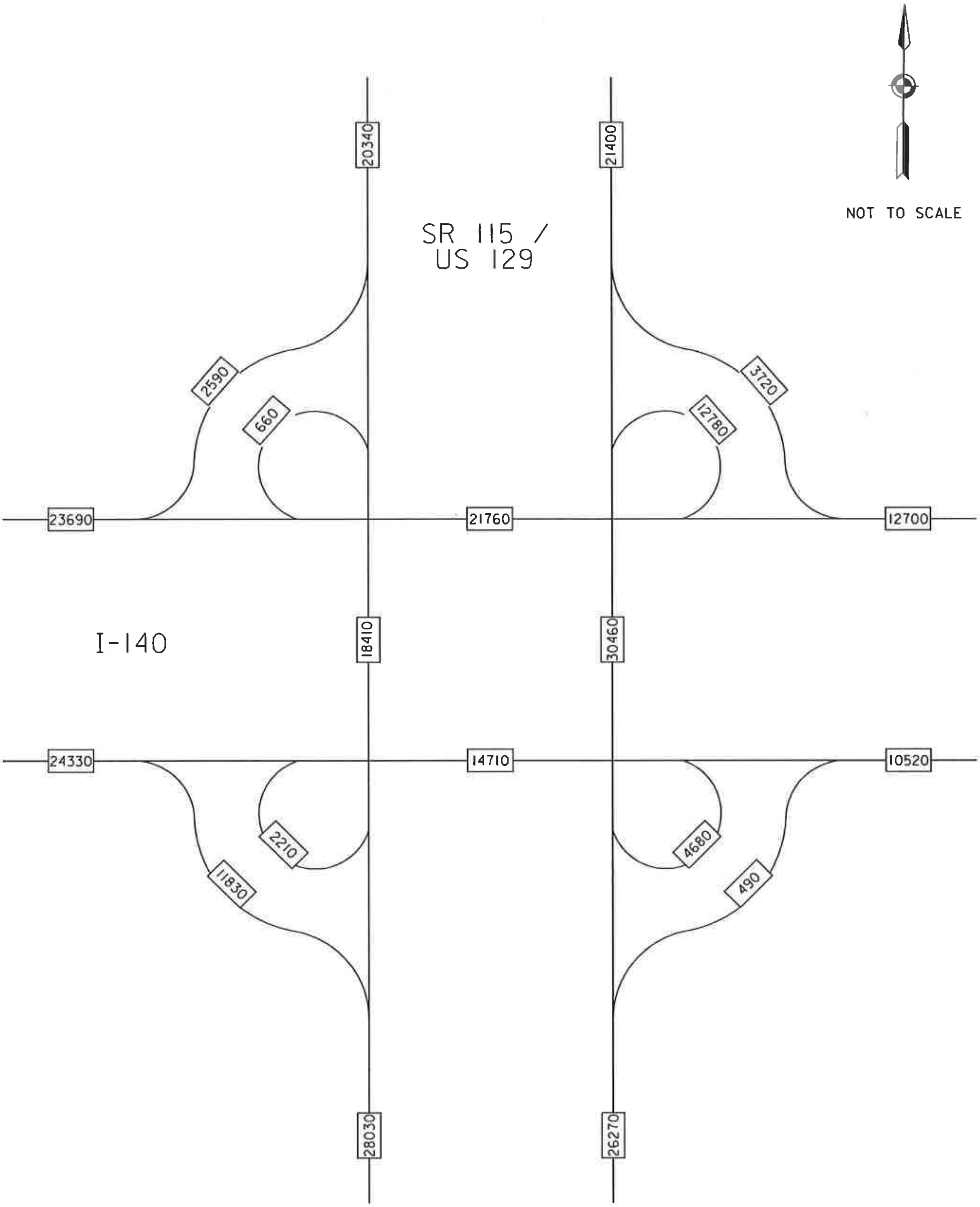


2040 DHV NO PPE AM/PM	SR 73/US 321 @ HELTON ROAD/TUCKALEECHEE PIKE



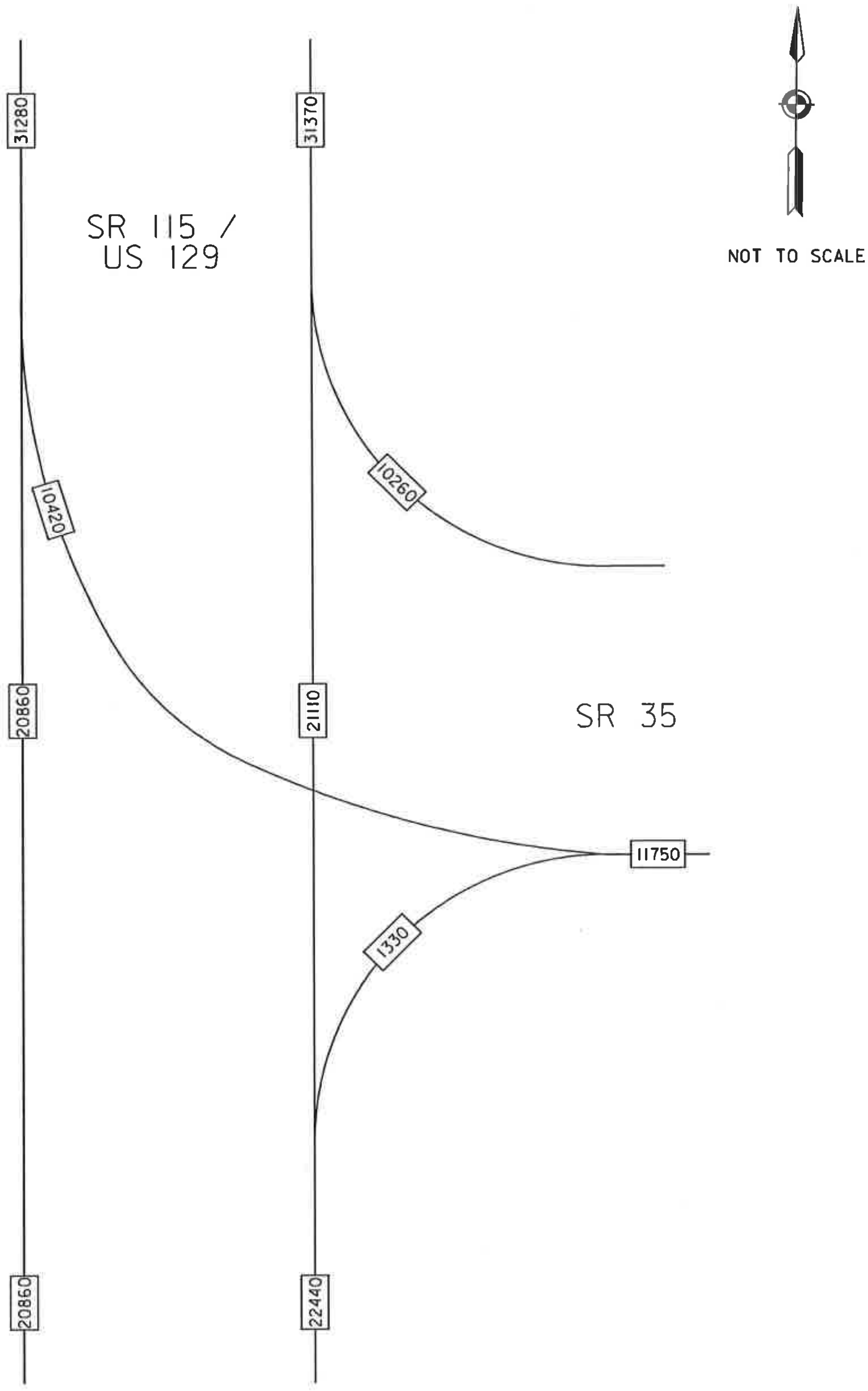
LEGEND	
(00000)	- 2020 AADT
[00000]	- 2040 AADT
X%	- % TRUCKS

AADT SEGMENT VOLUMES WITH
PELLISSIPPI PARKWAY EXTENSION



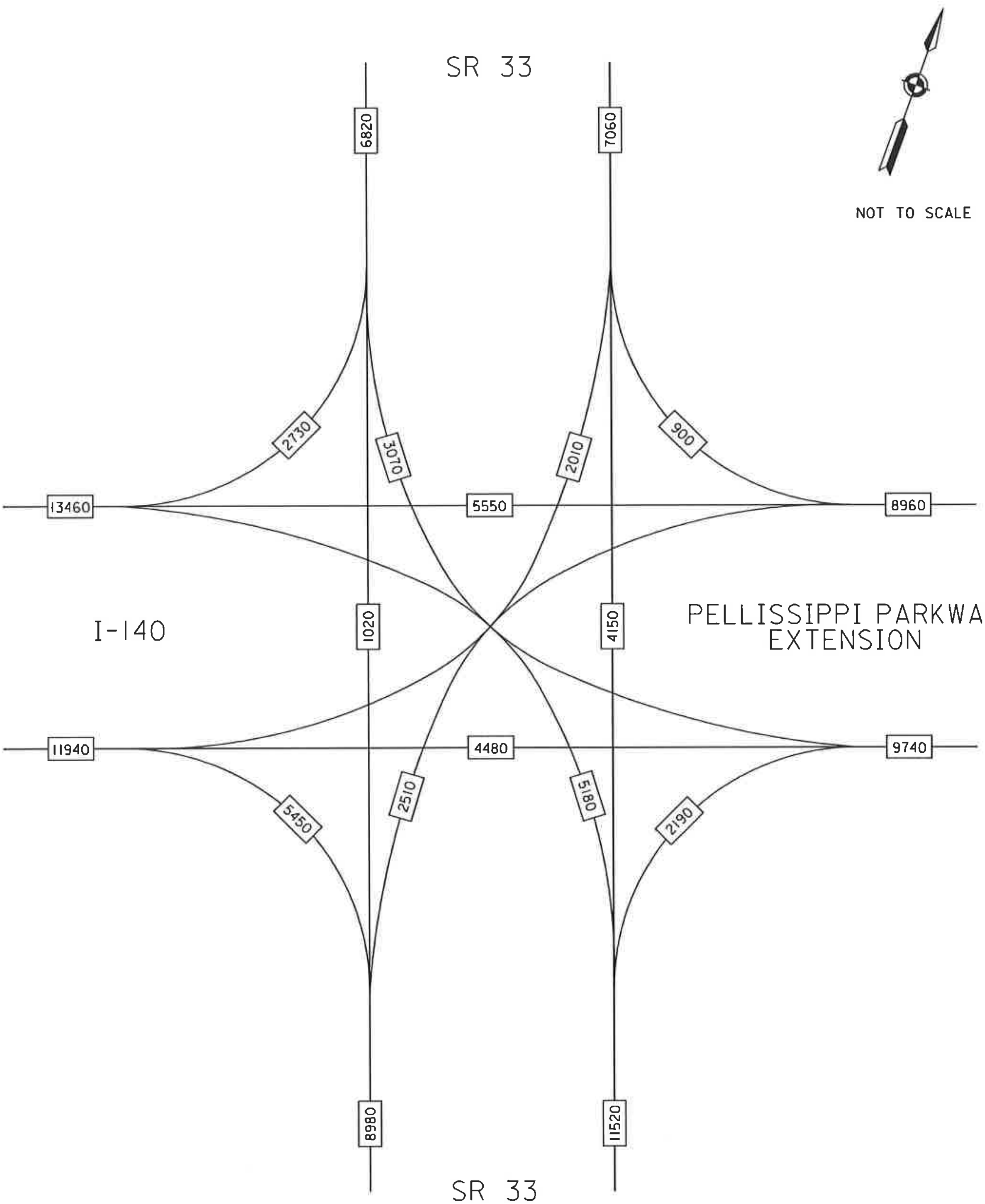
2020 AADT WITH PPE

SR 115/US 129 @
I-140 / PELLISSIPPI PARKWAY



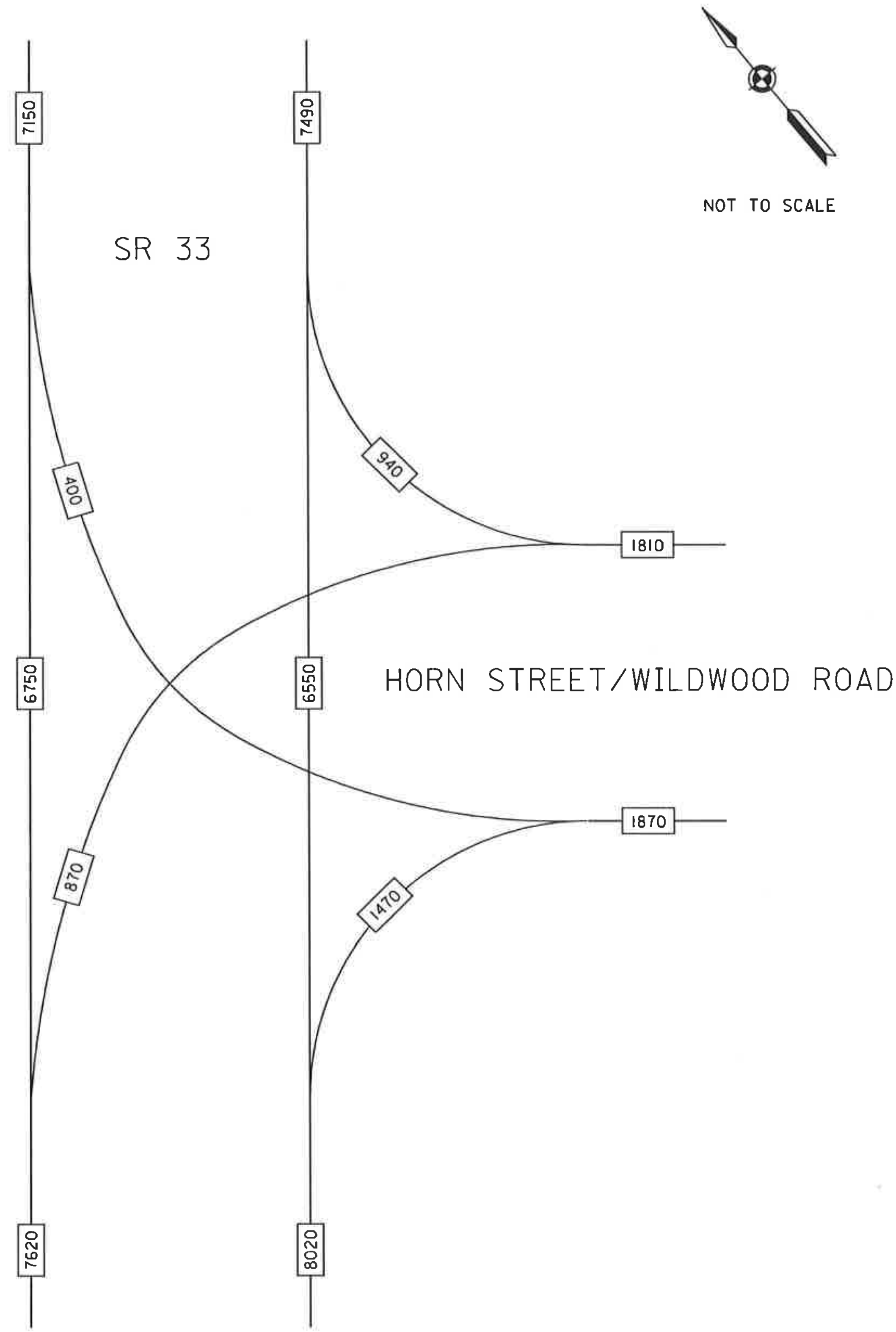
2020 AADT WITH PPE

SR 115/US 129 @ SR 35

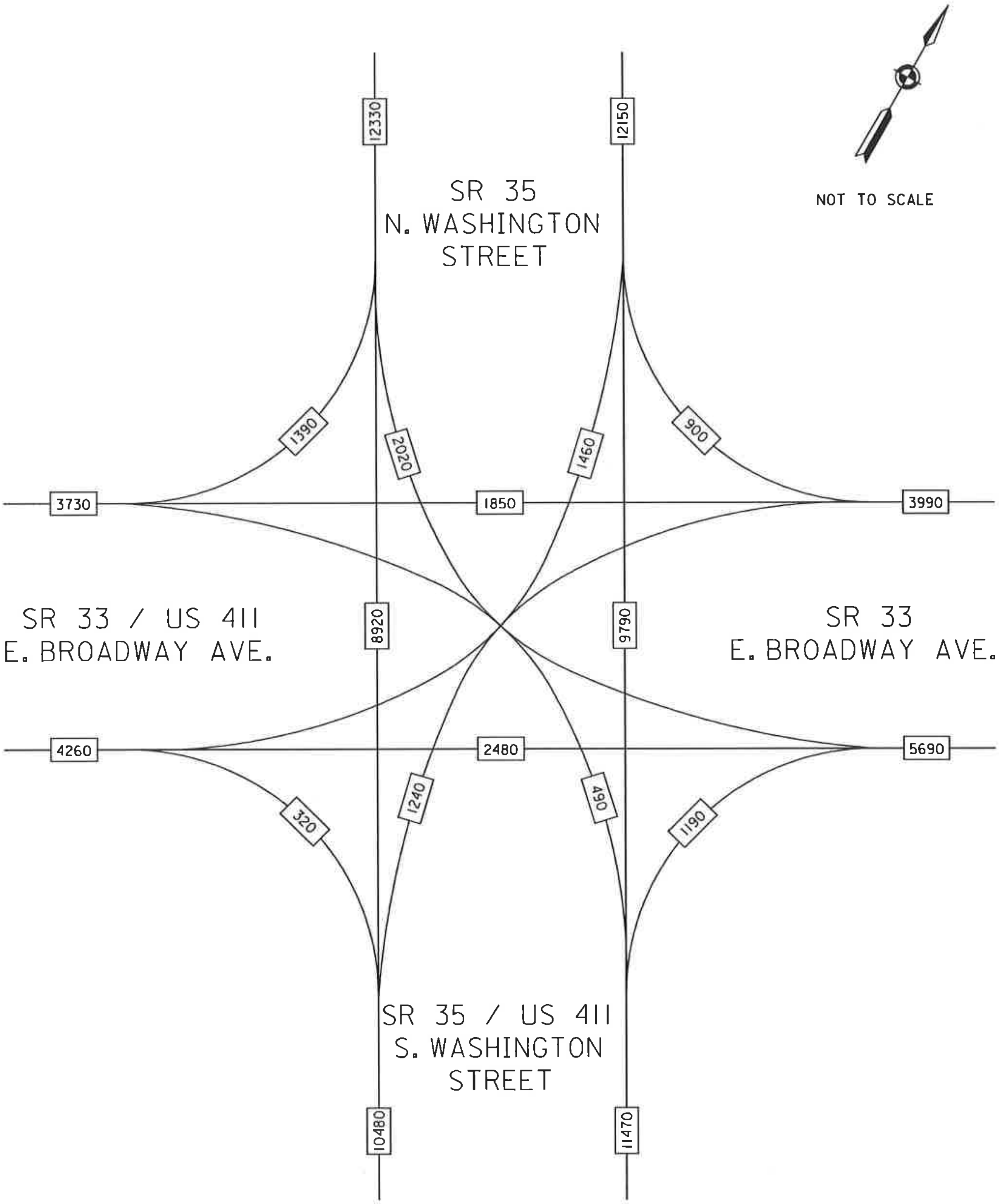


2020 AADT WITH PPE

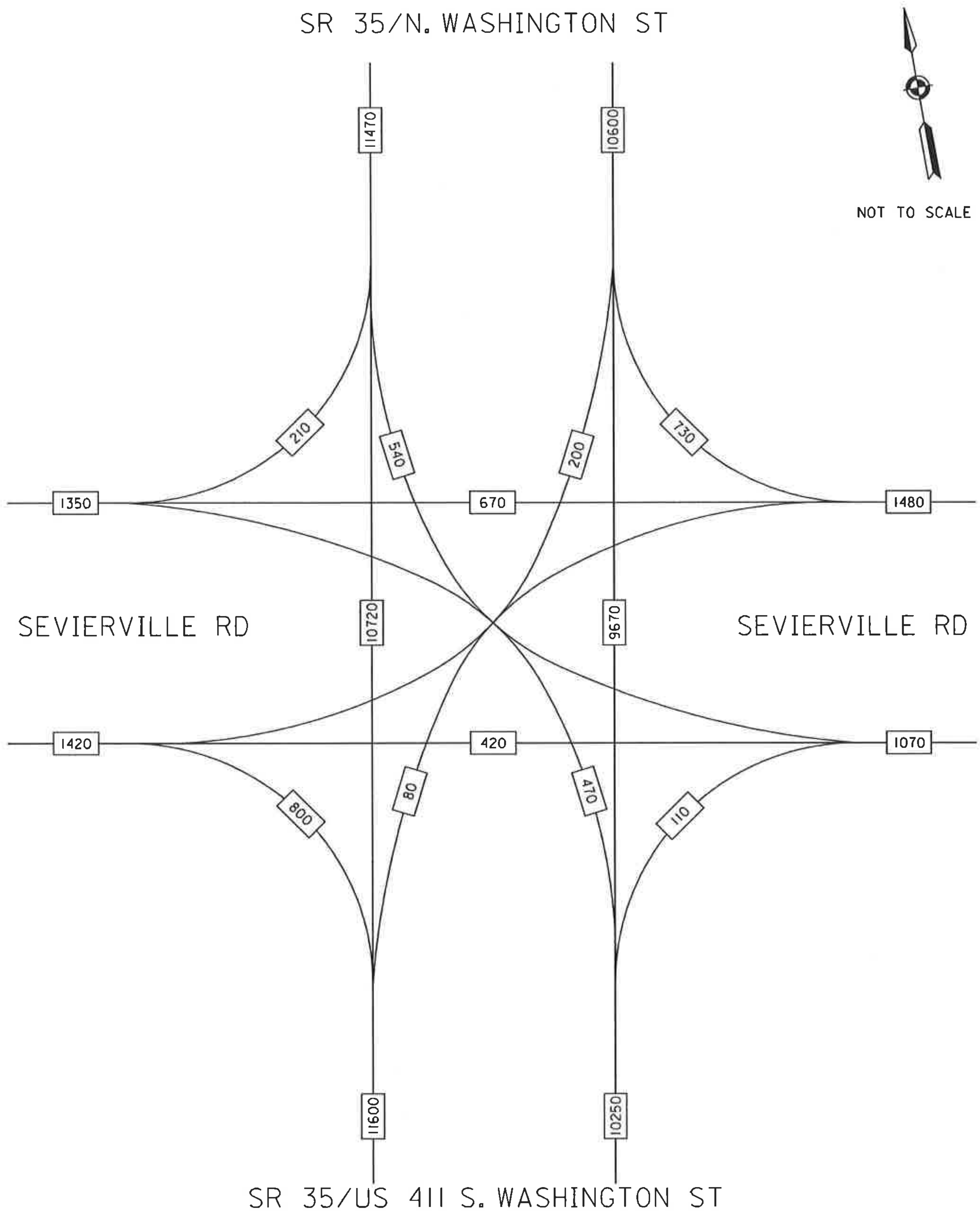
SR 33 @
I-140 / PELLISSIPPI PKWY EXTENSION



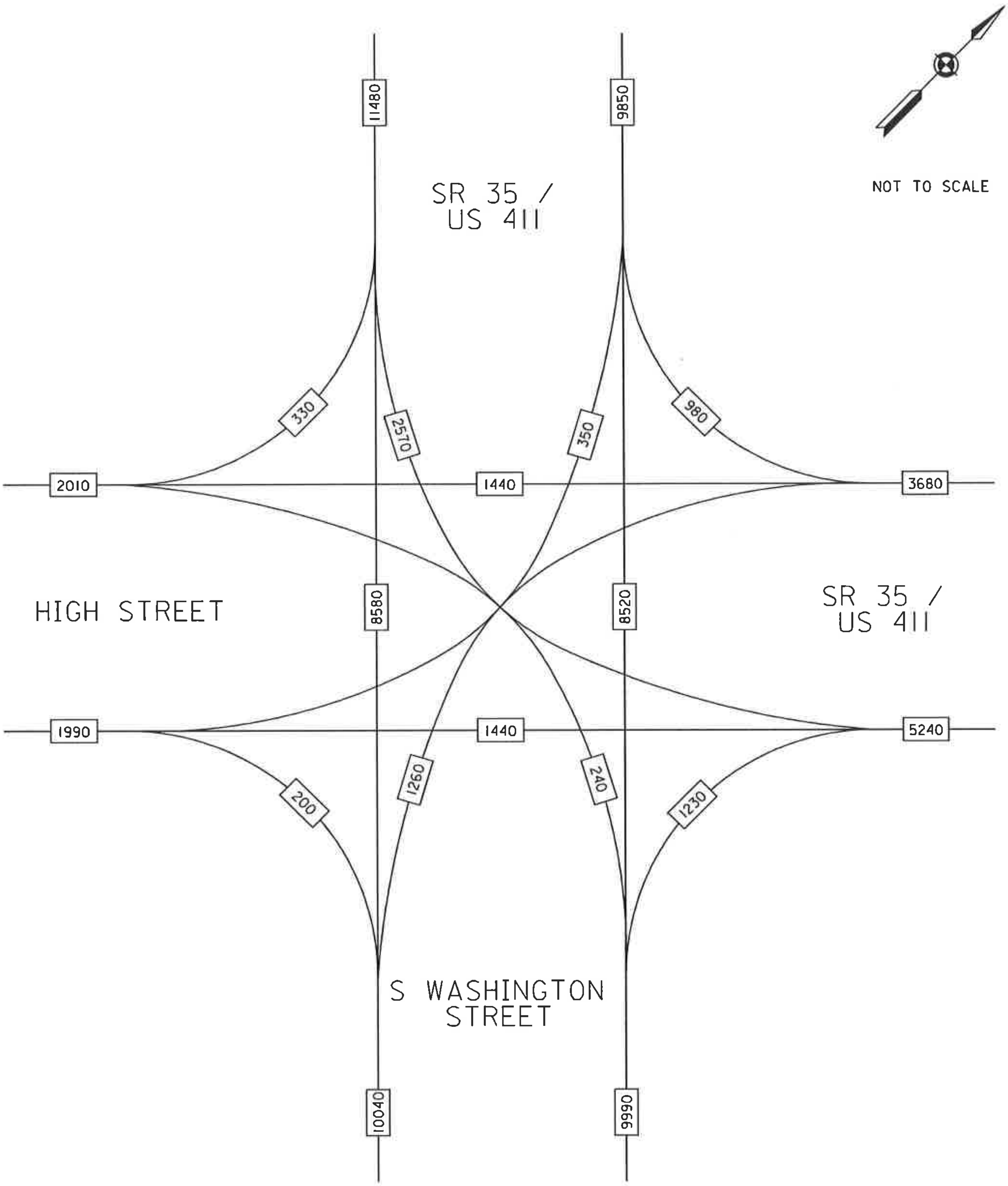
2020 AADT WITH PPE	SR 33 @ HORN STREET/ WILDWOOD ROAD



2020 AADT WITH PPE	SR 33 @ SR 35

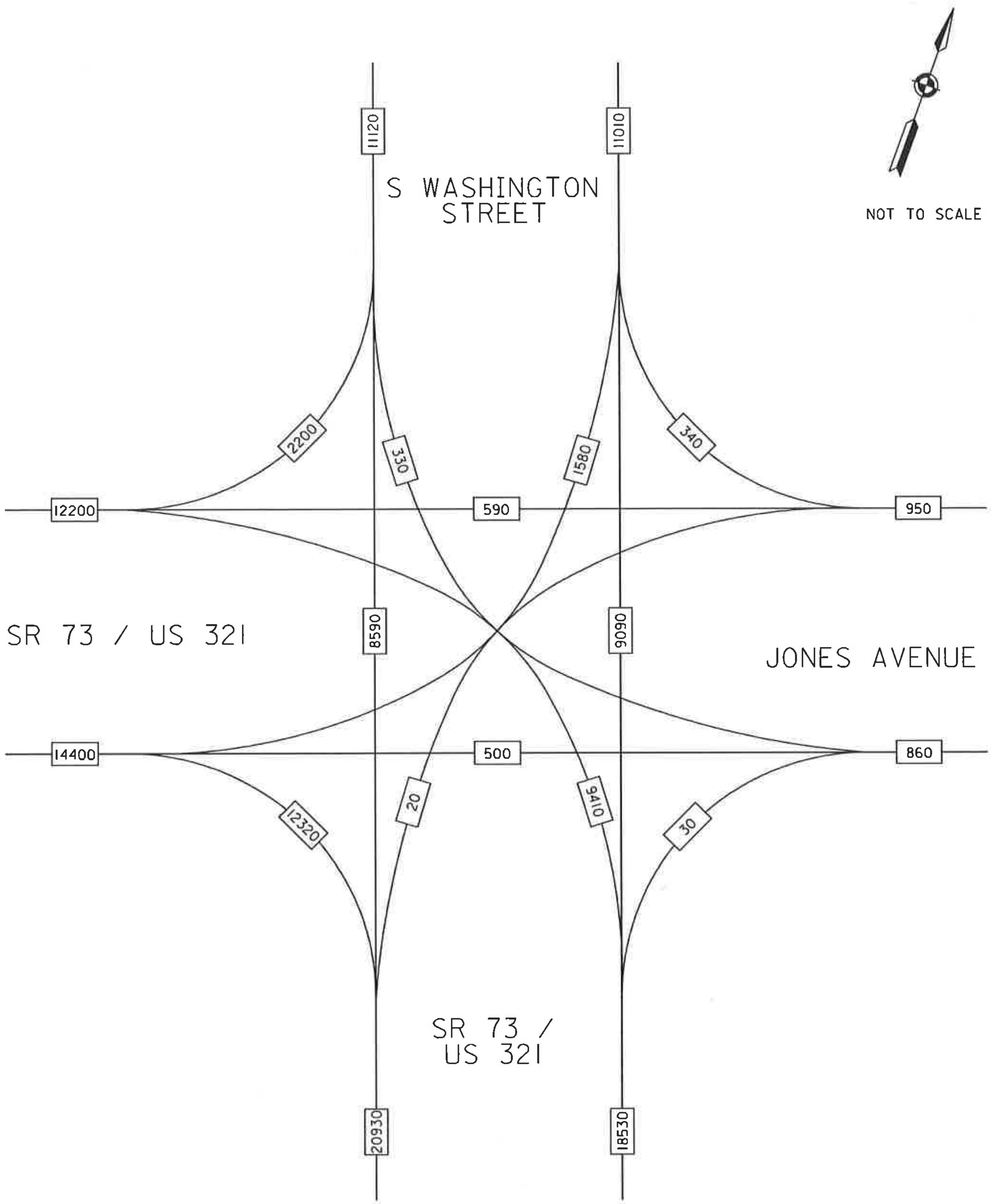


2020 AADT WITH PPE	SEVIERVILLE RD @ SR 35/US 411 WASHINGTON ST

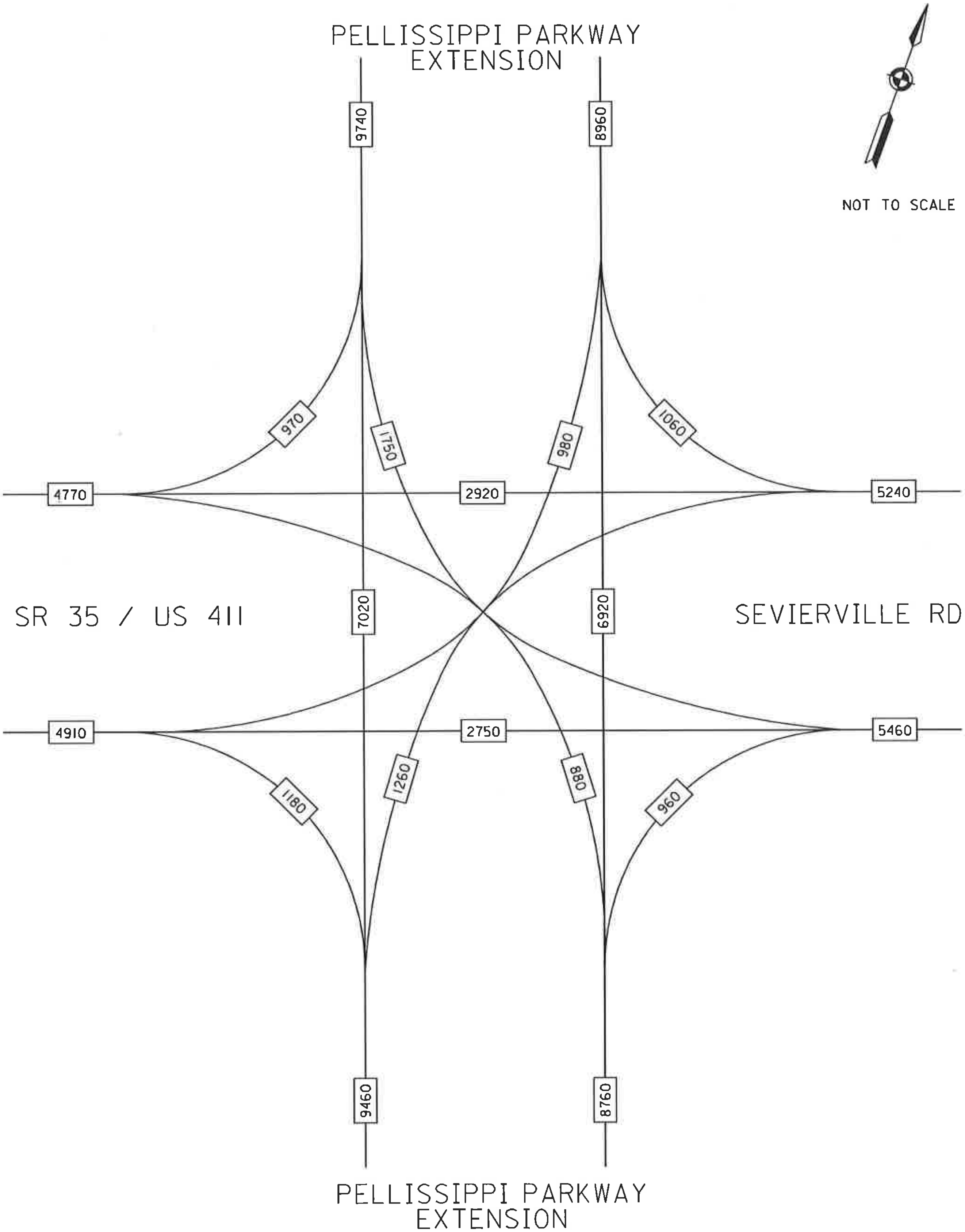


2020 AADT WITH PPE

S WASHINGTON ST / SR 35
@ HIGH ST / SR 35

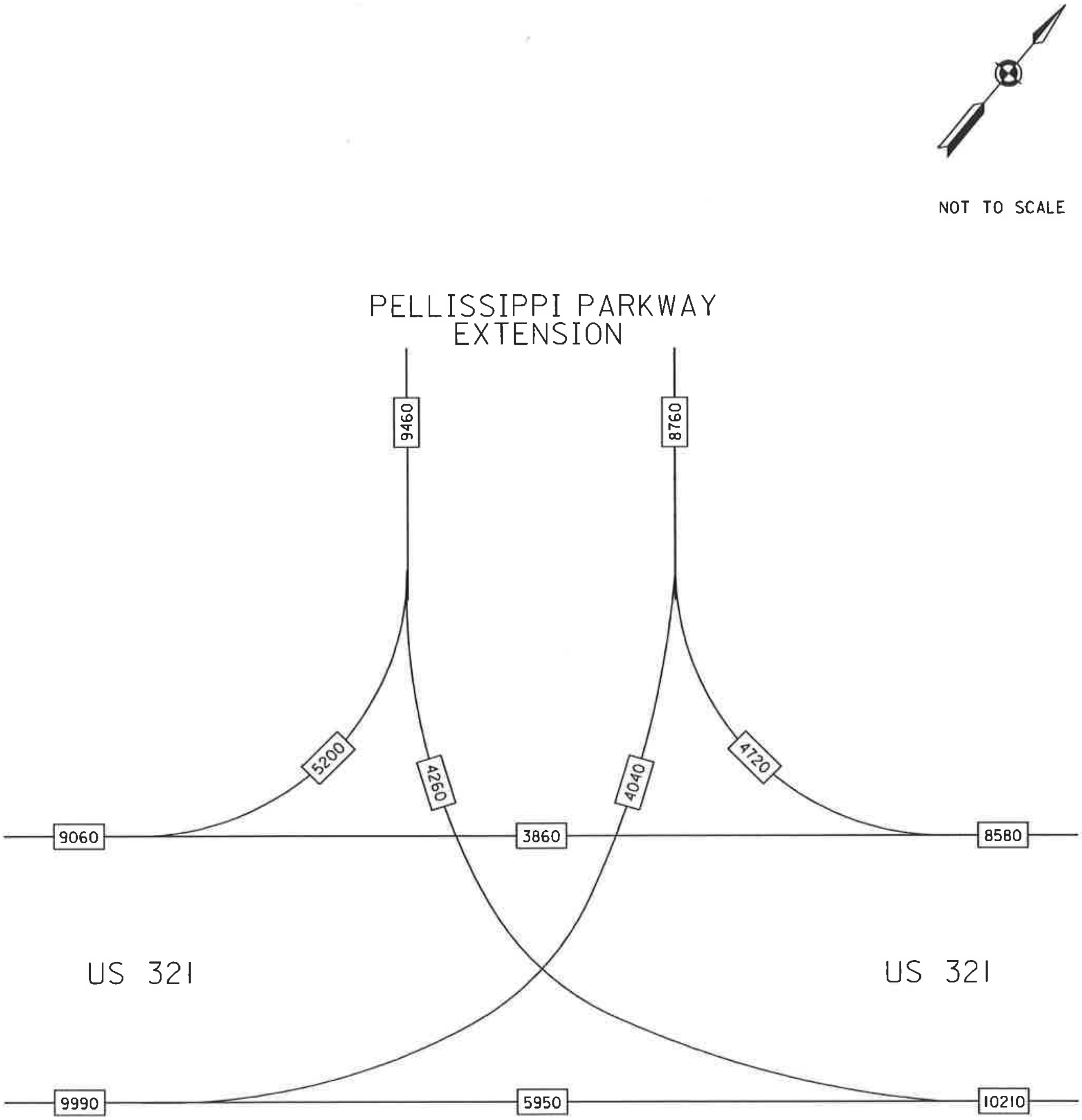


2020 AADT WITH PPE	S WASHINGTON ST @ SR 73/ US 321

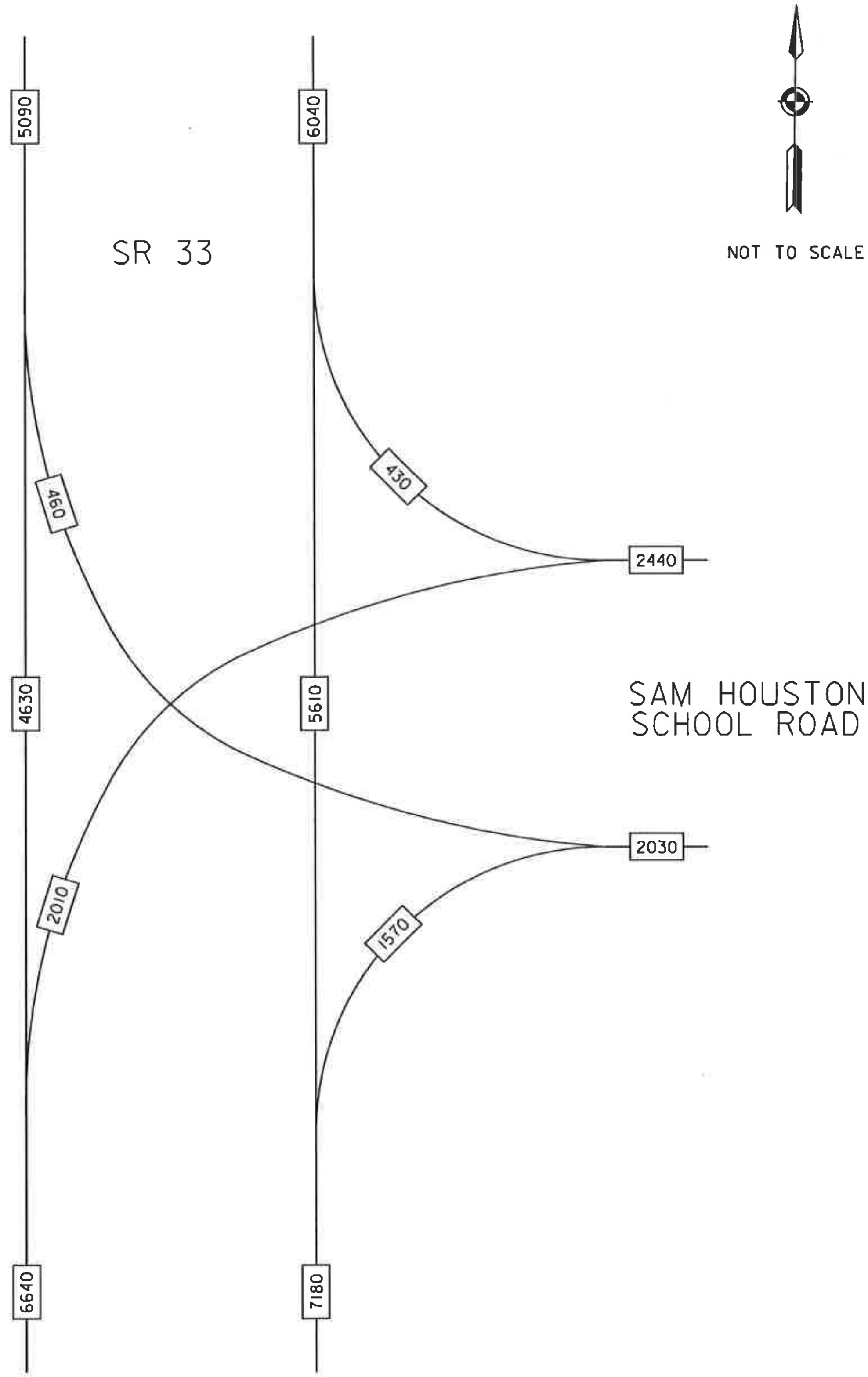


2020 AADT WITH PPE

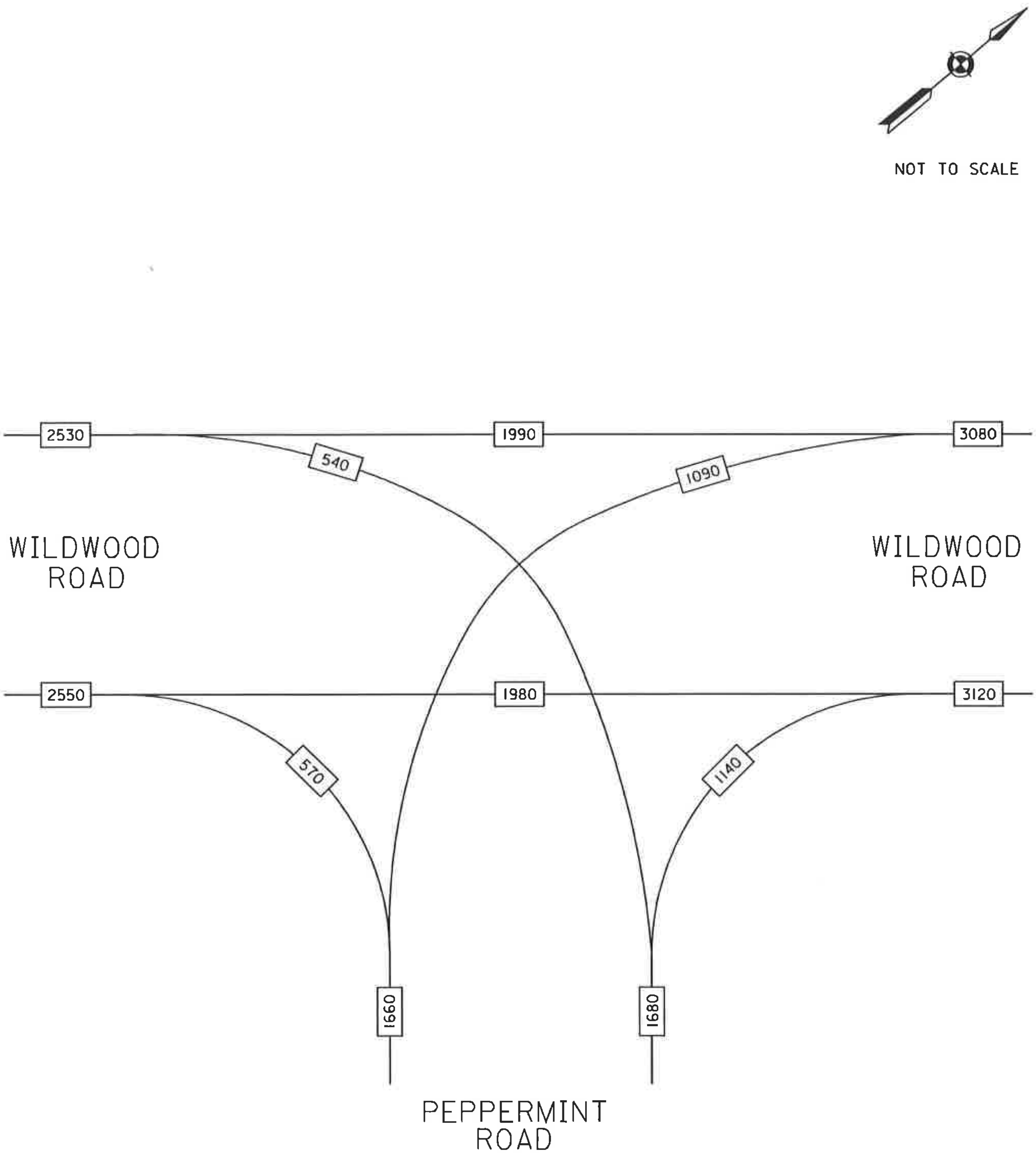
PELLISSIPPI PKWY EXTENSION @ SR 35 / US 411 / SEVIERVILLE RD



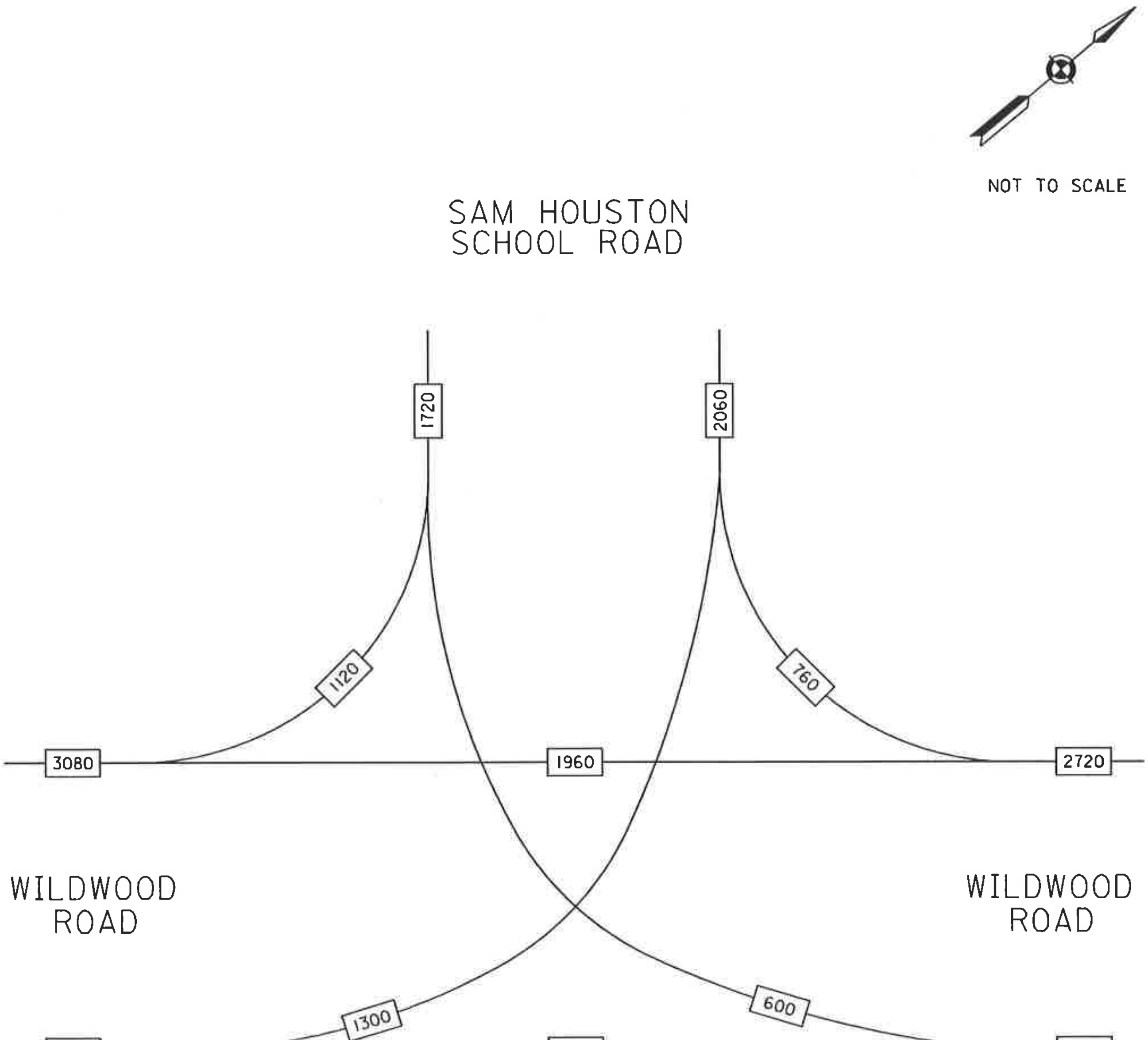
2020 AADT WITH PPE	PELLISSIPPI PKWY EXTENSION @ US 321



2020 AADT WITH PPE	SR 33 @ SAM HOUSTON SCHOOL ROAD

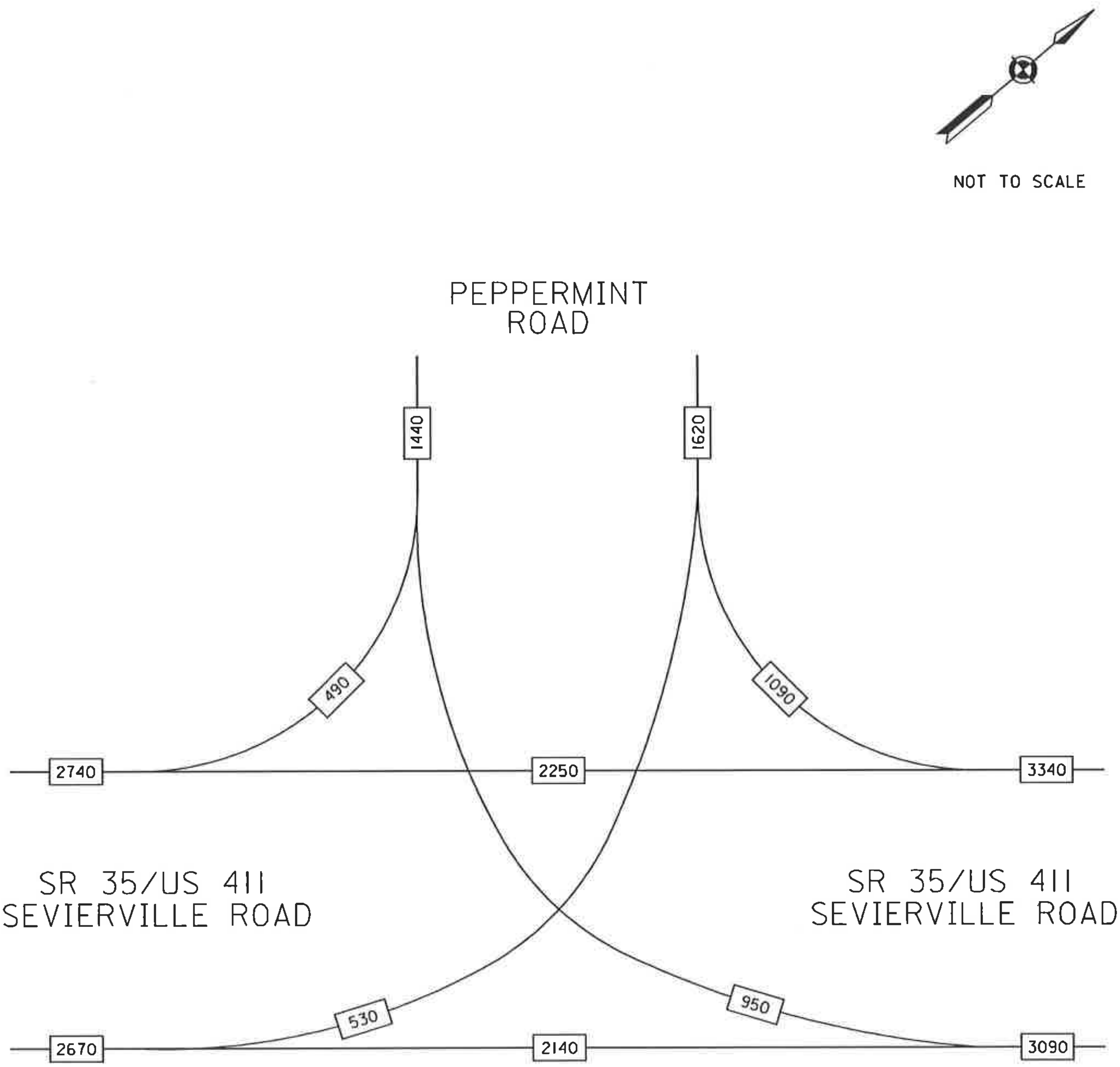


2020 AADT WITH PPE	PEPPERMINT ROAD @ WILDWOOD ROAD



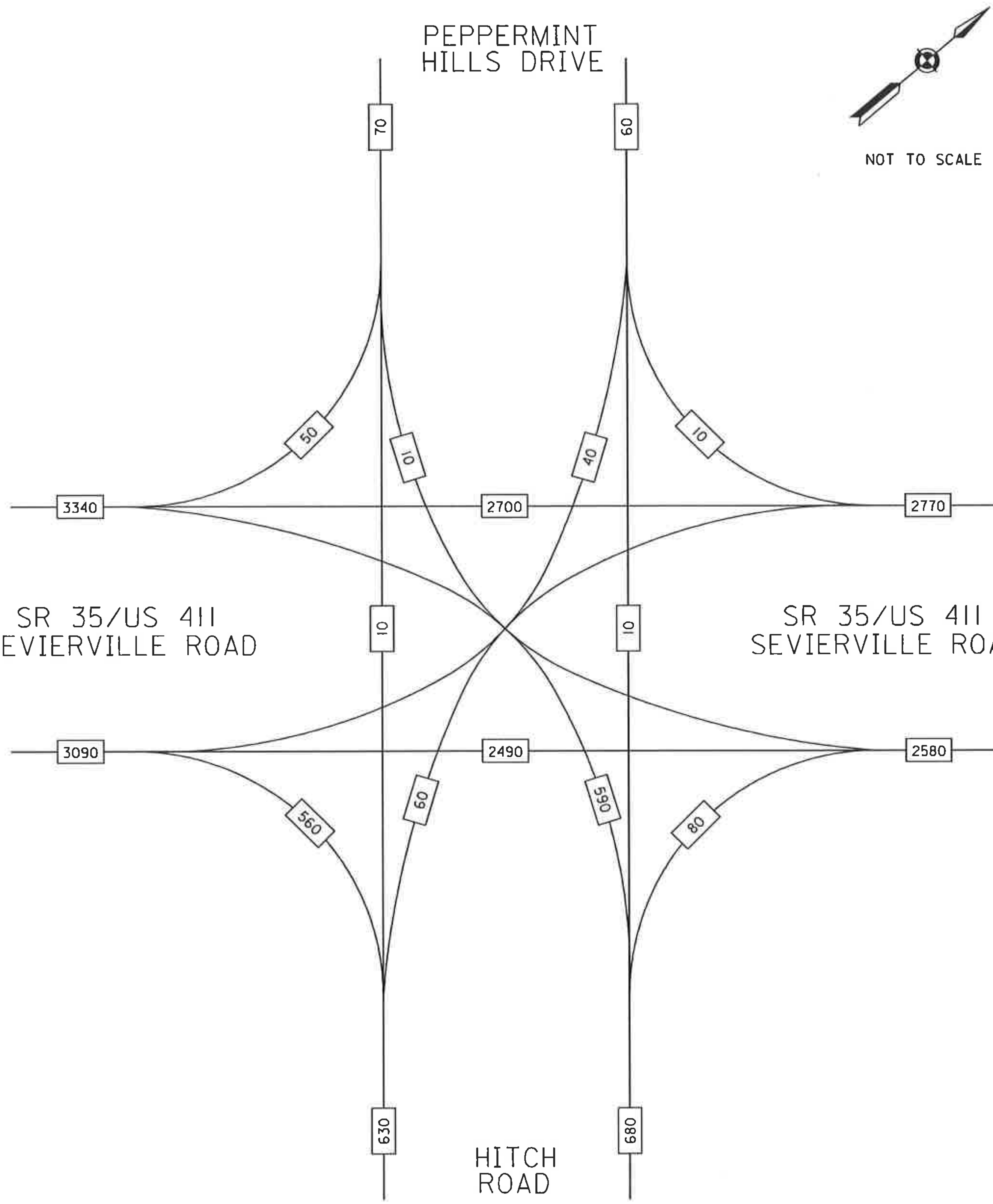
2020 AADT WITH PPE

SAM HOUSTON SCHOOL ROAD @
WILDWOOD ROAD



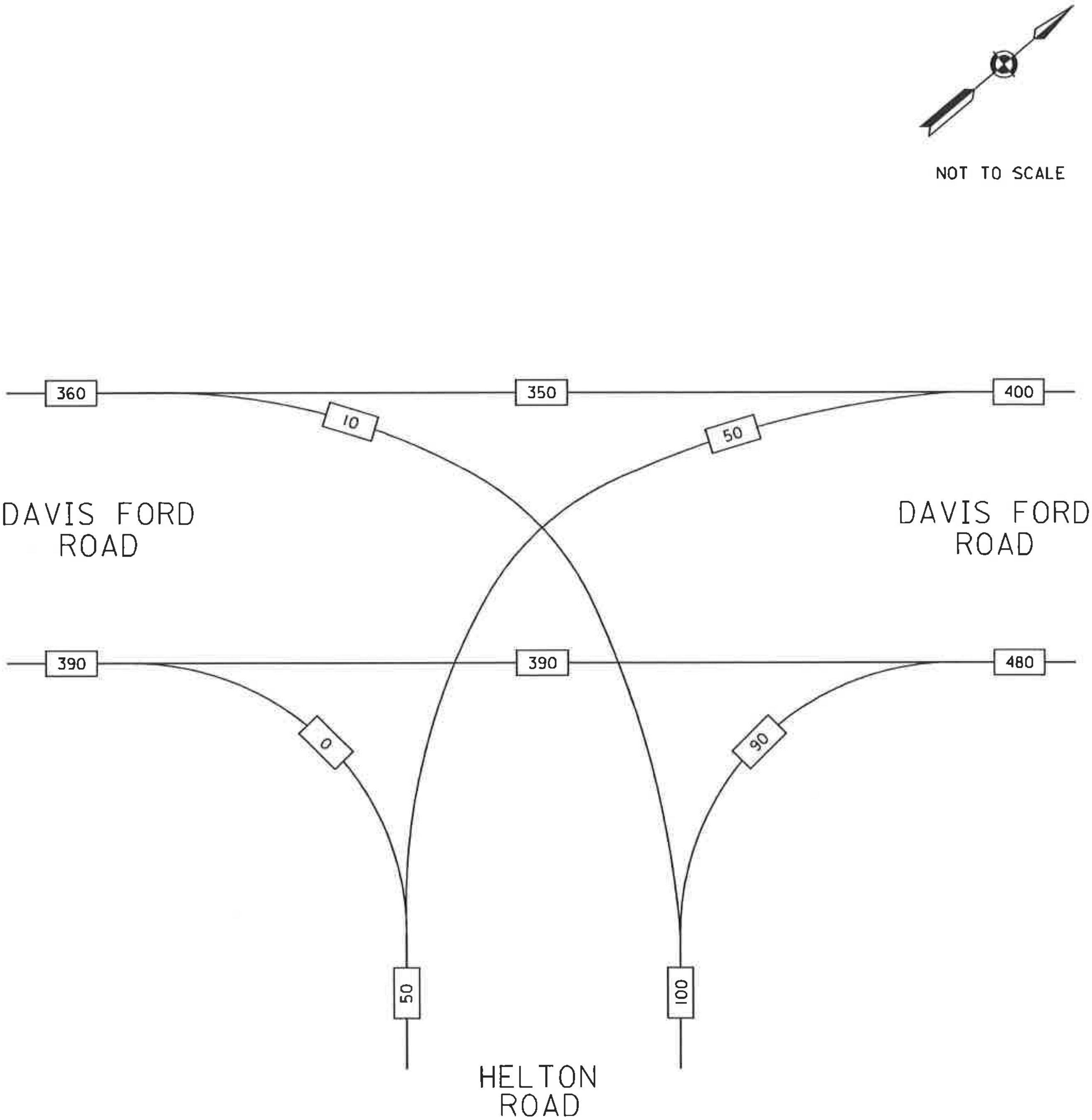
2020 AADT WITH PPE

SR 35/US 411/SEVIERVILLE ROAD @ PEPPERMINT ROAD

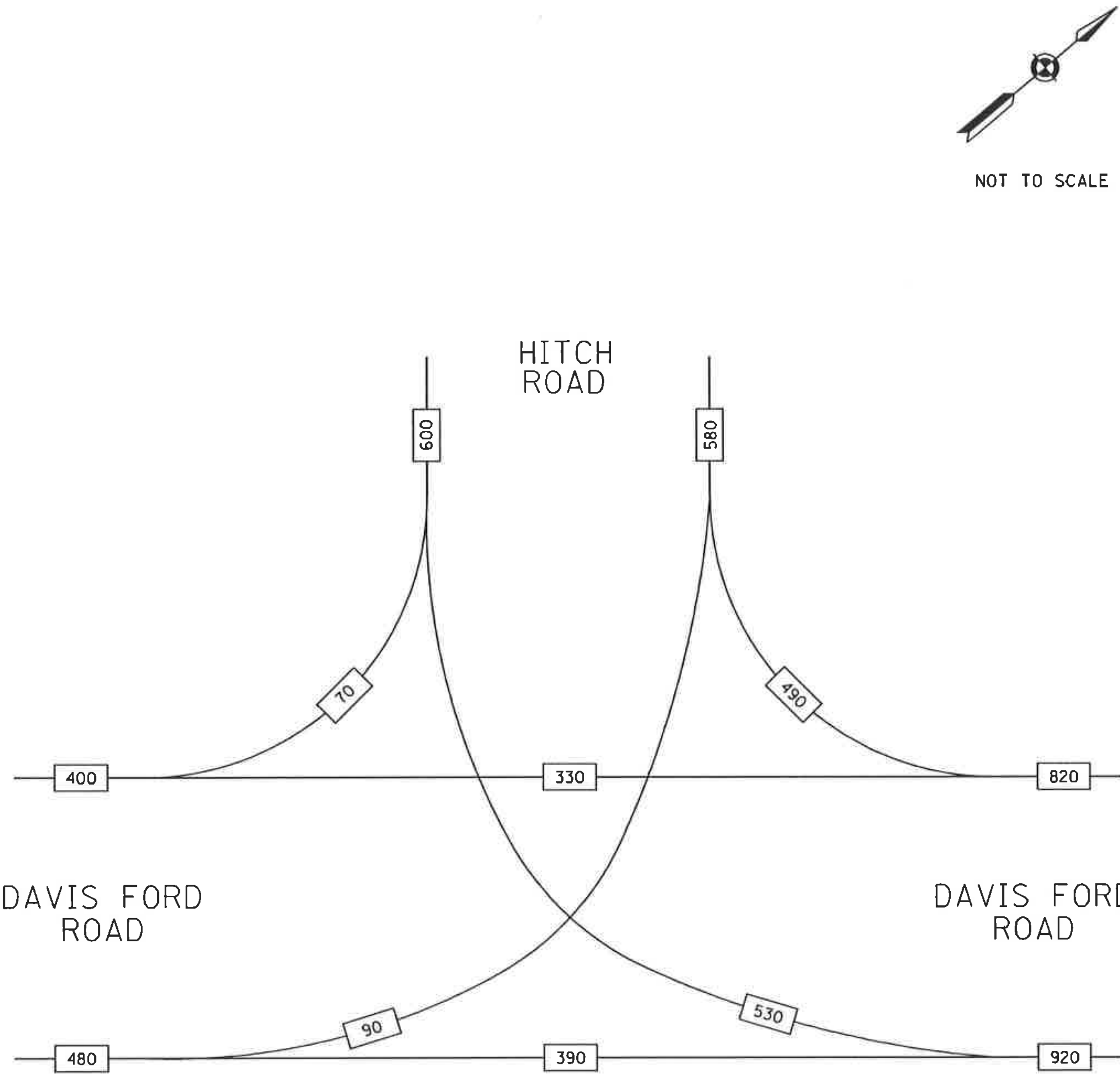


2020 AADT WITH PPE

SR 35/US 411/SEVIERVILLE ROAD @
HITCH ROAD/PEPPERMINT HILLS DR

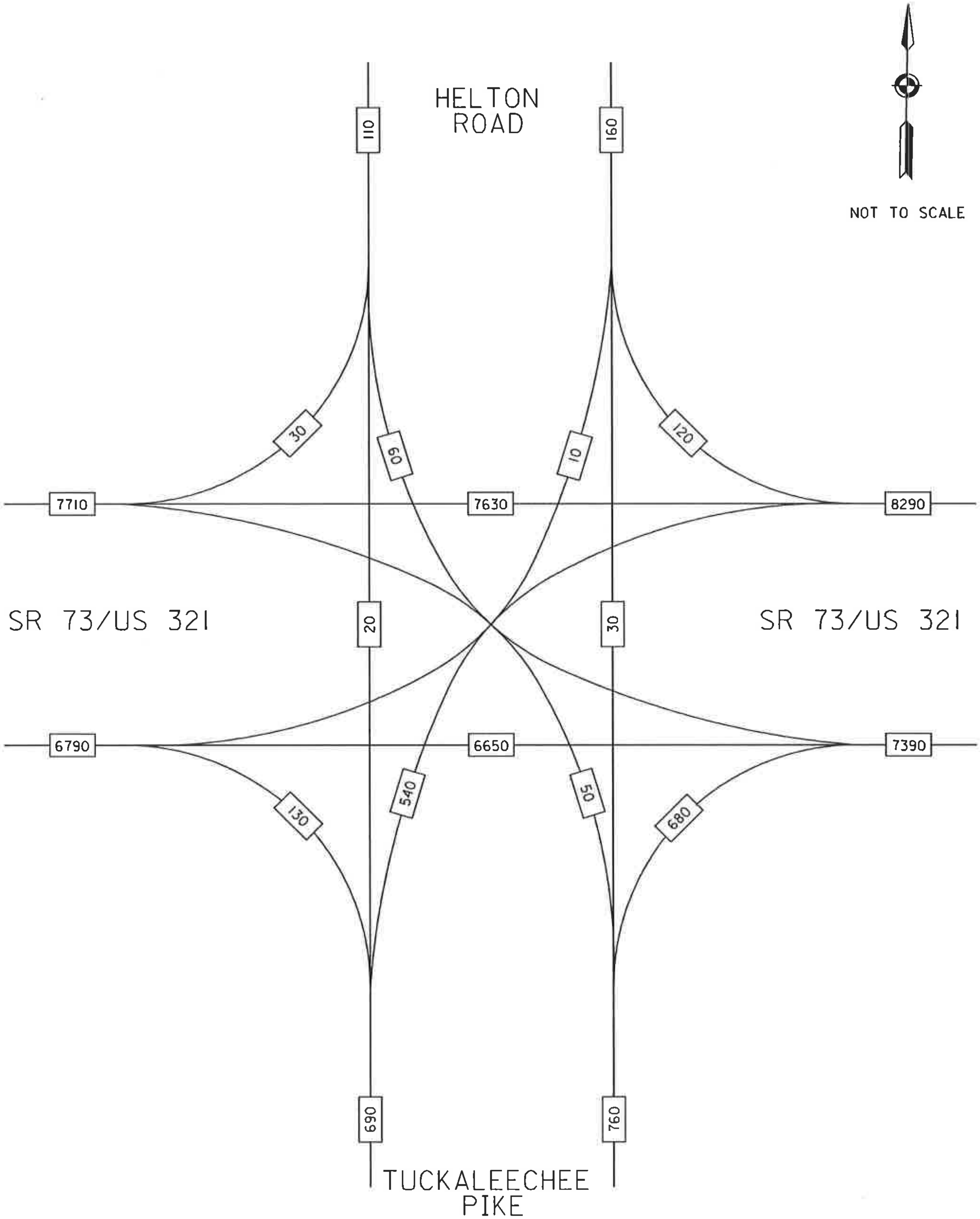


2020 AADT WITH PPE	DAVIS FORD ROAD @ HELTON ROAD

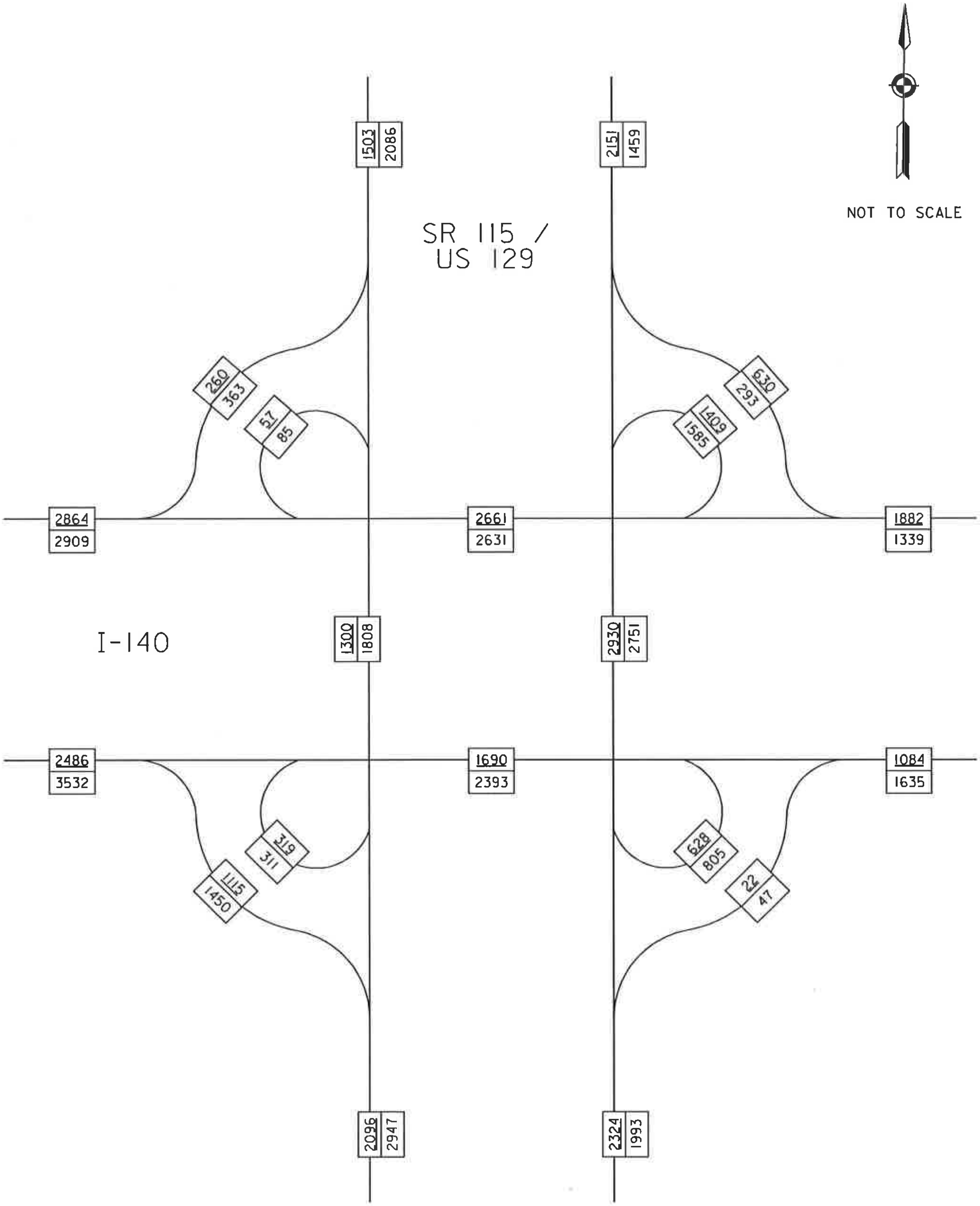


2020 AADT WITH PPE

DAVIS FORD ROAD @
HITCH ROAD

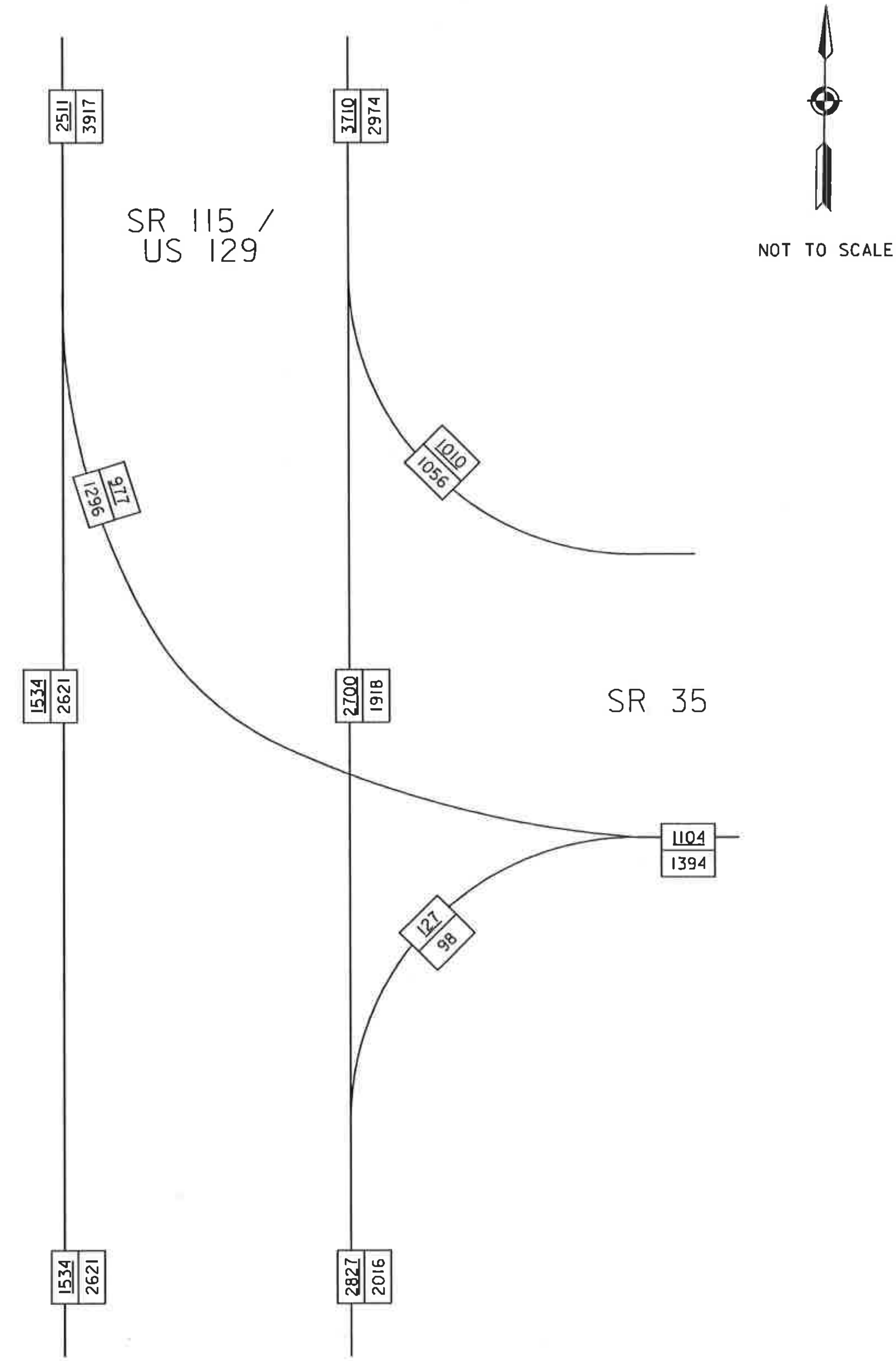


2020 AADT WITH PPE	SR 73/US 321 @ HELTON ROAD/TUCKALEECHEE PIKE



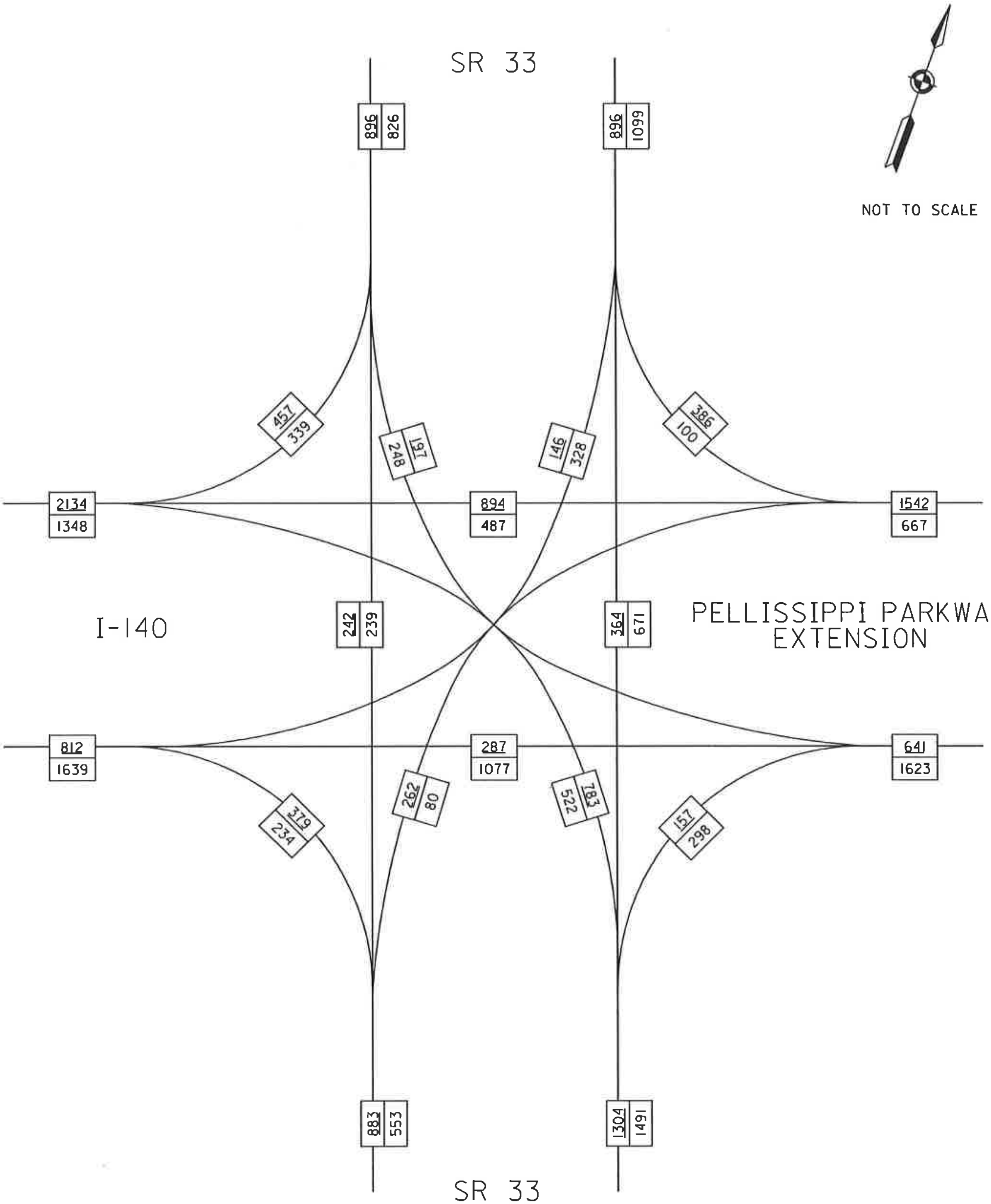
2020 DHV WITH PPE
AM / PM

SR 115/US 129 @
I-140 / PELLISSIPPI PARKWAY



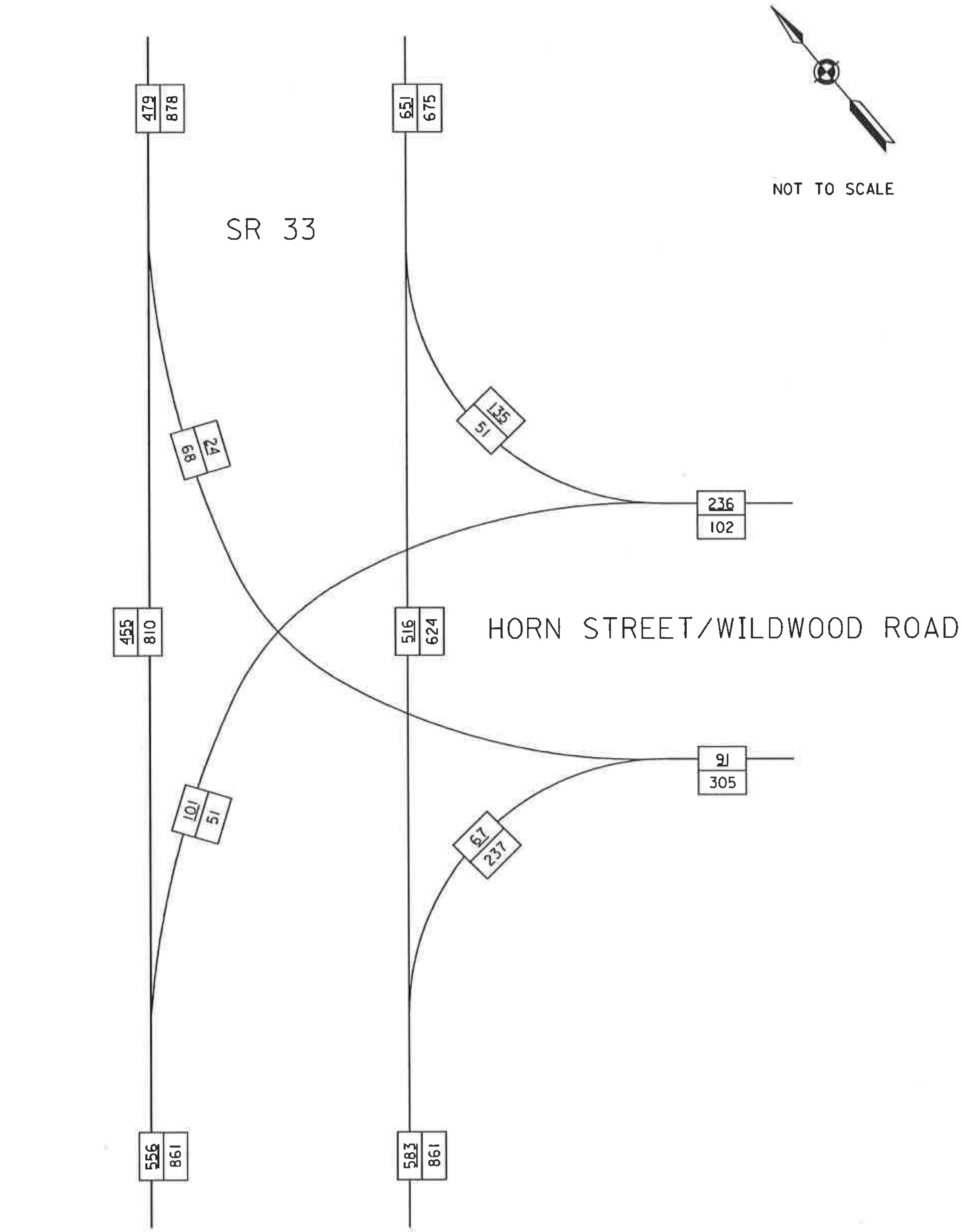
2020 DHV WITH PPE
AM / PM

SR 115/US 129 @ SR 35



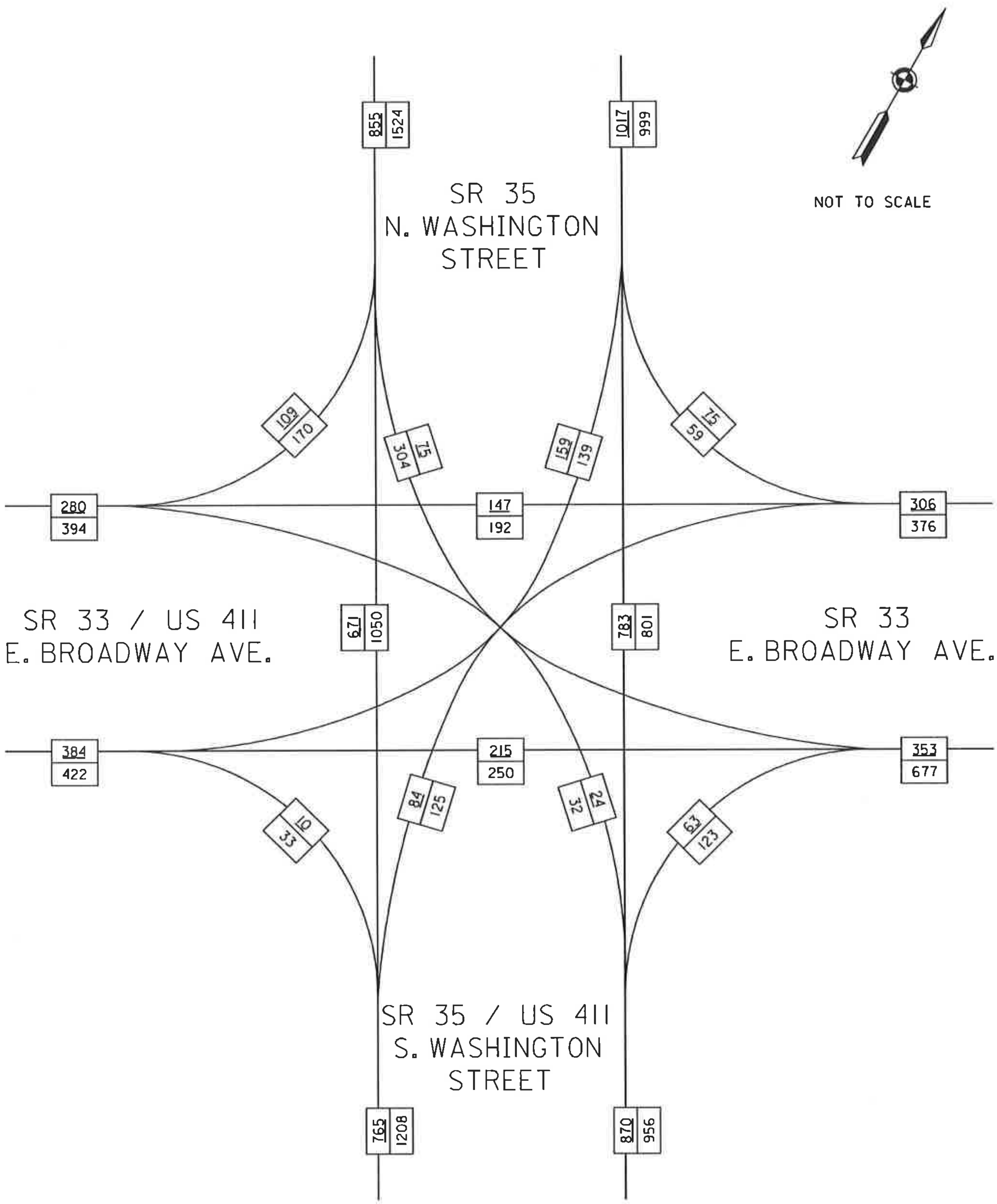
2020 DHV WITH PPE
AM / PM

SR 33 @
I-140 / PELLISSIPPI PKWY EXTENSION

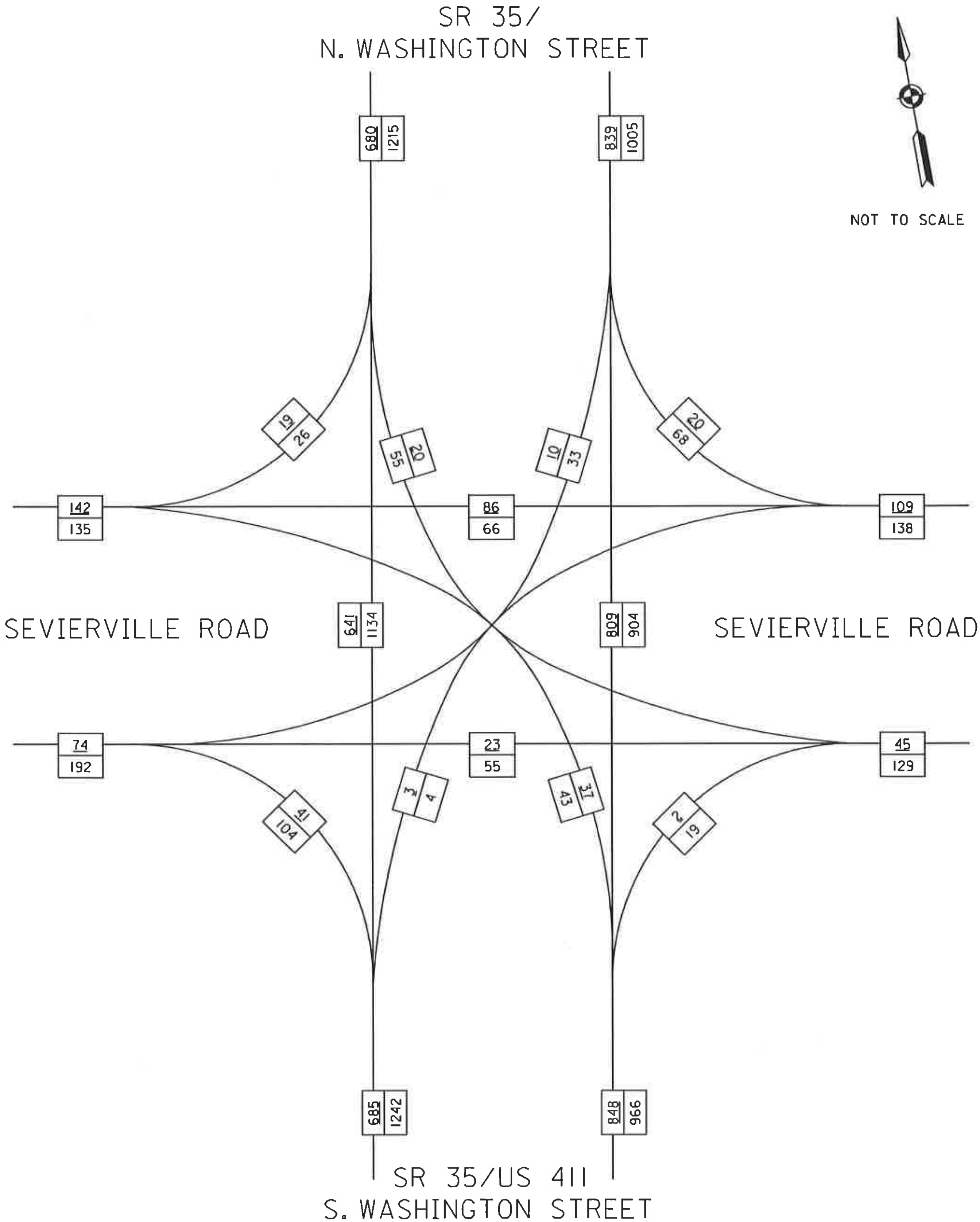


2020 DHV WITH PPE
AM / PM

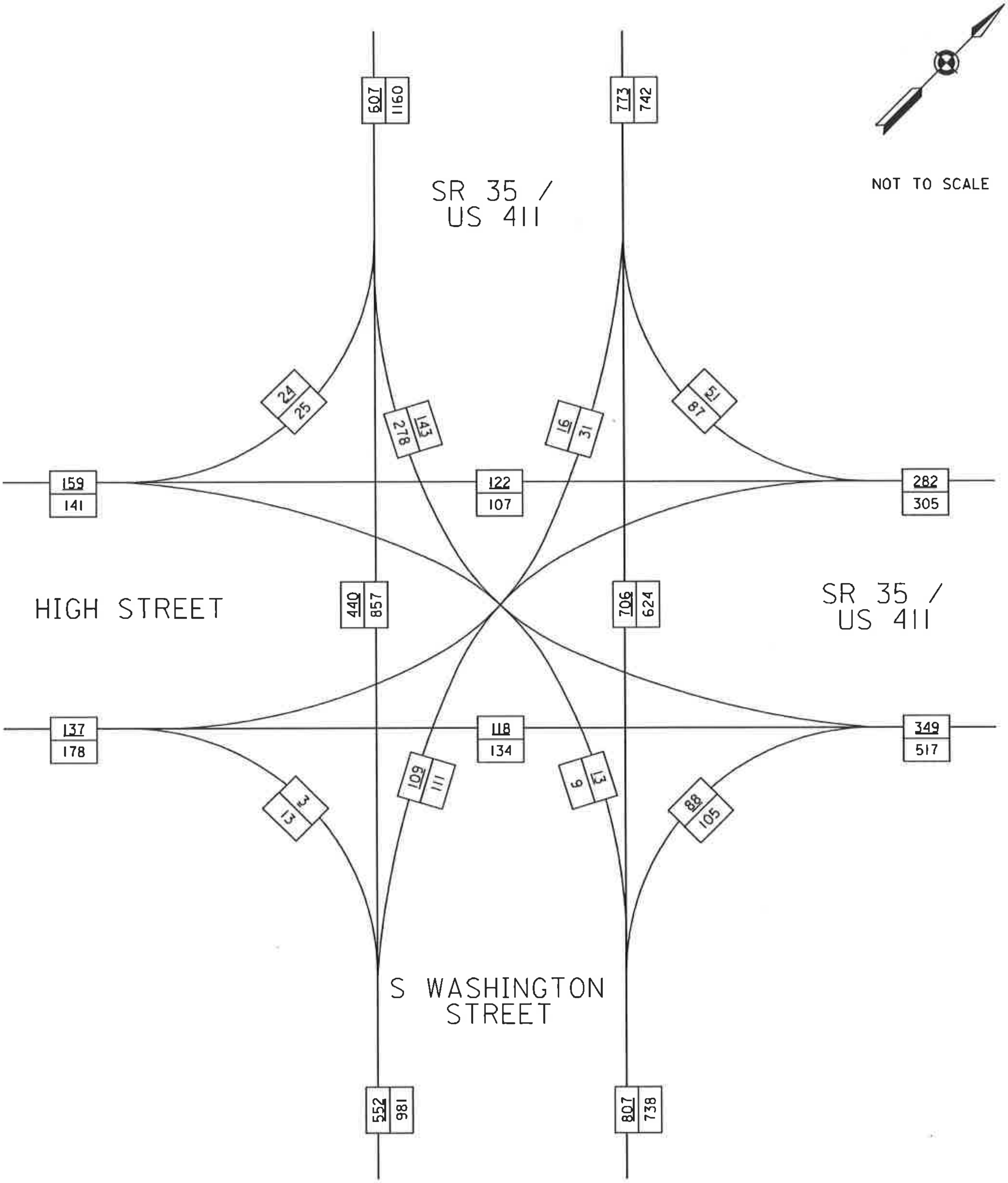
SR 33 @ HORN STREET/
WILDWOOD ROAD



2020 DHV WITH PPE AM / PM	SR 33 @ SR 35

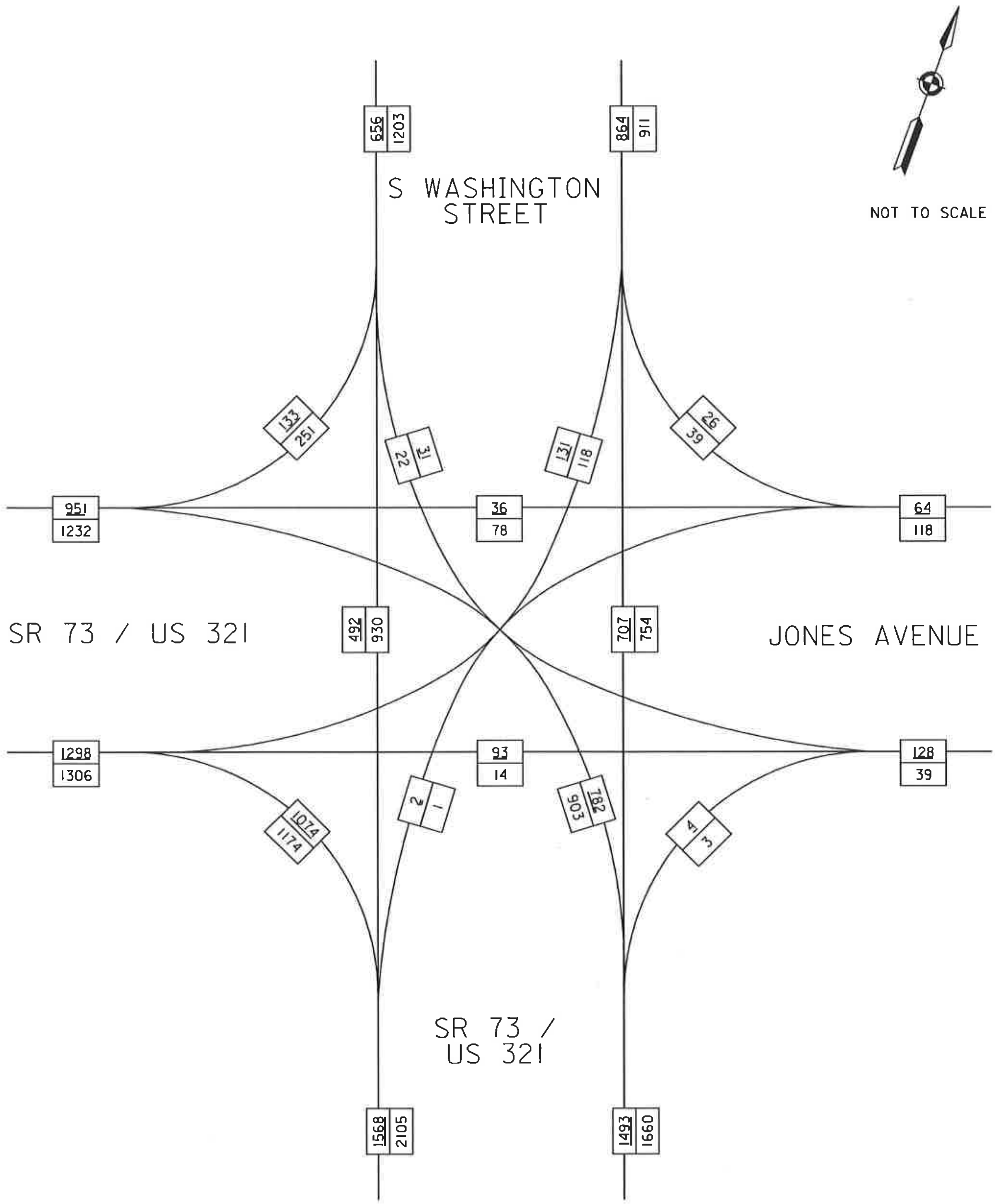


2020 DHV WITH PPE AM / PM	SEVIERVILLE ROAD @ SR 35/WASHINGTON STREET



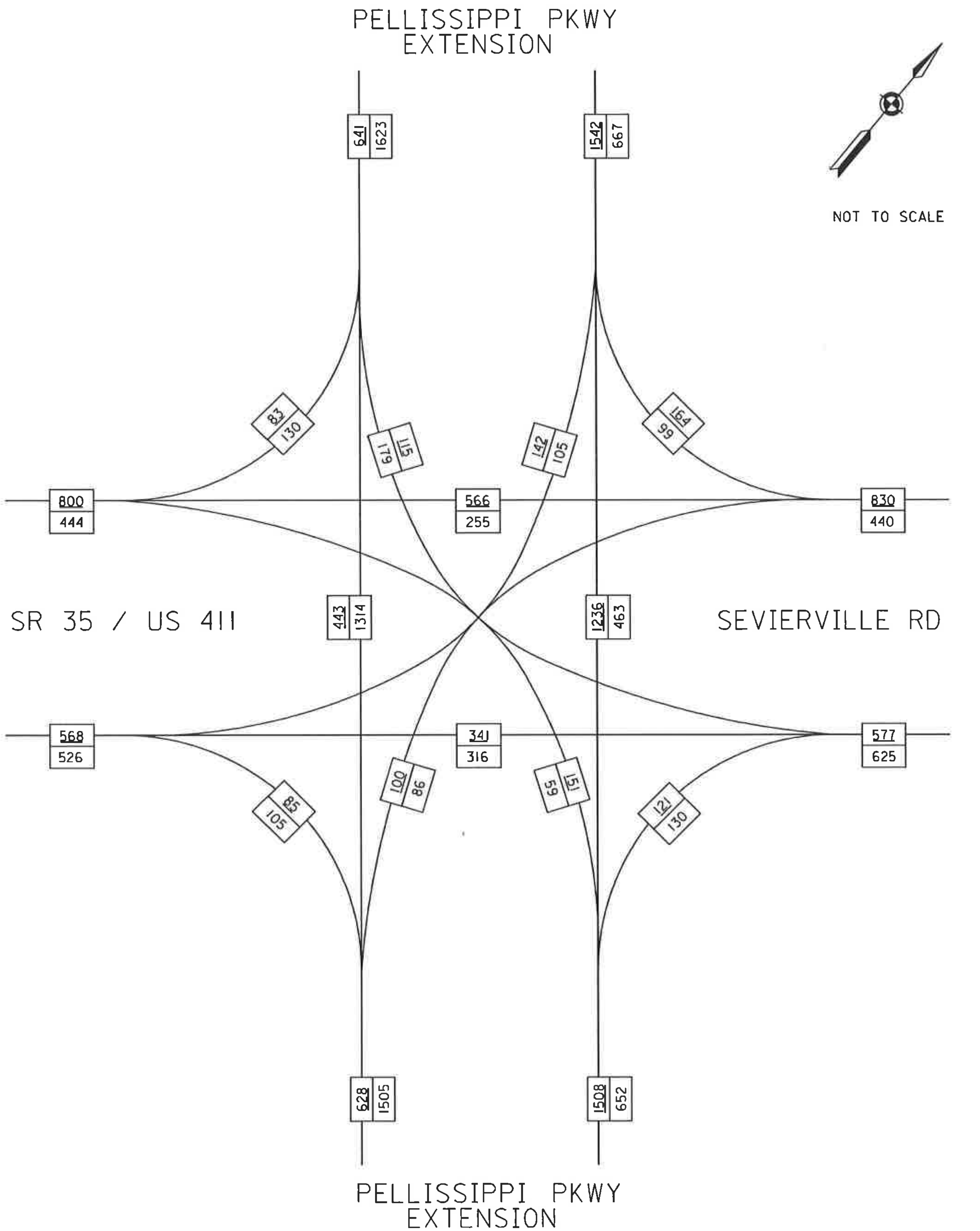
2020 DHV WITH PPE
AM / PM

S WASHINGTON ST / SR 35
@ HIGH ST / SR 35

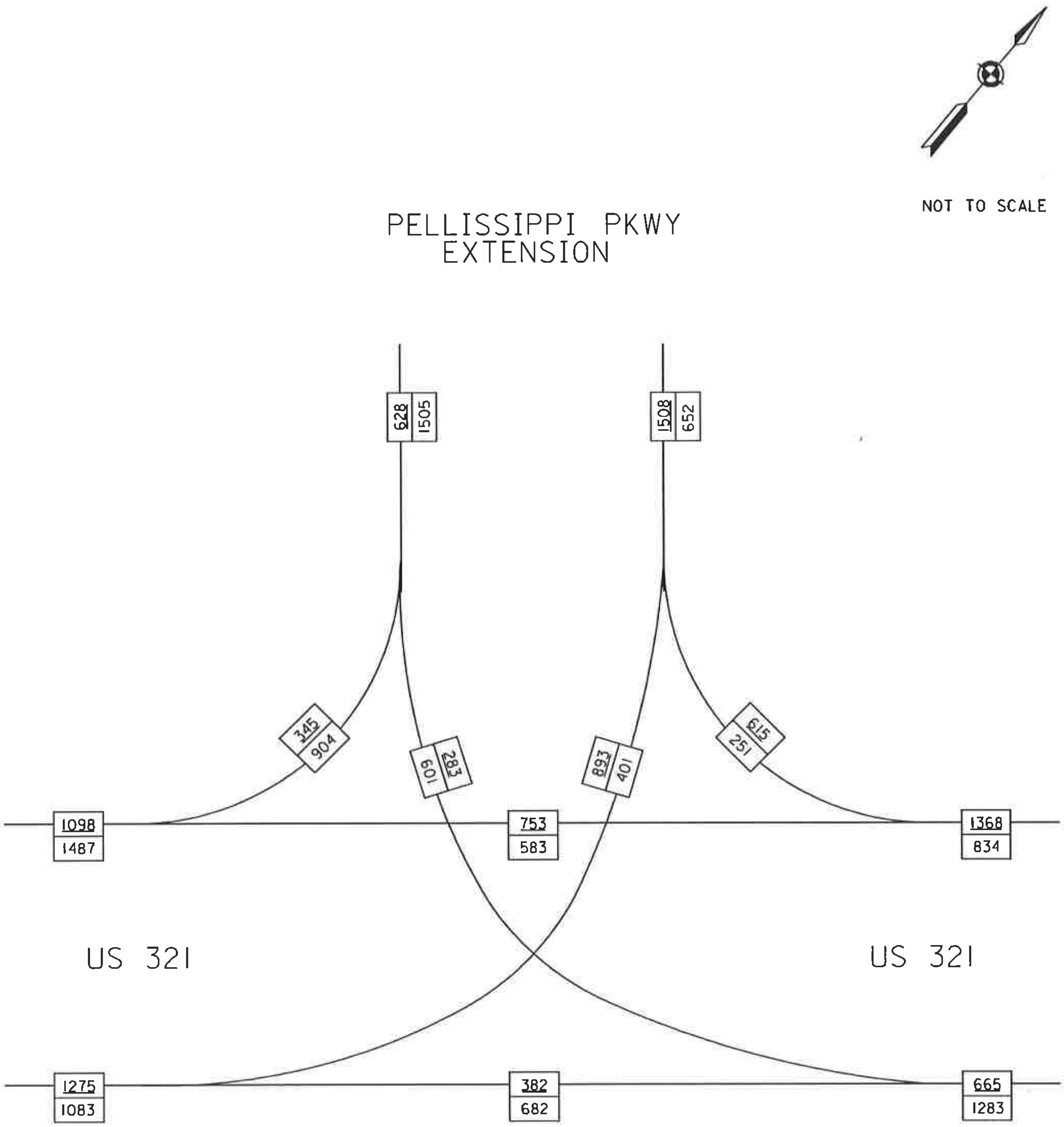


2020 DHV WITH PPE
AM / PM

S WASHINGTON ST
@ SR 73/ US 321

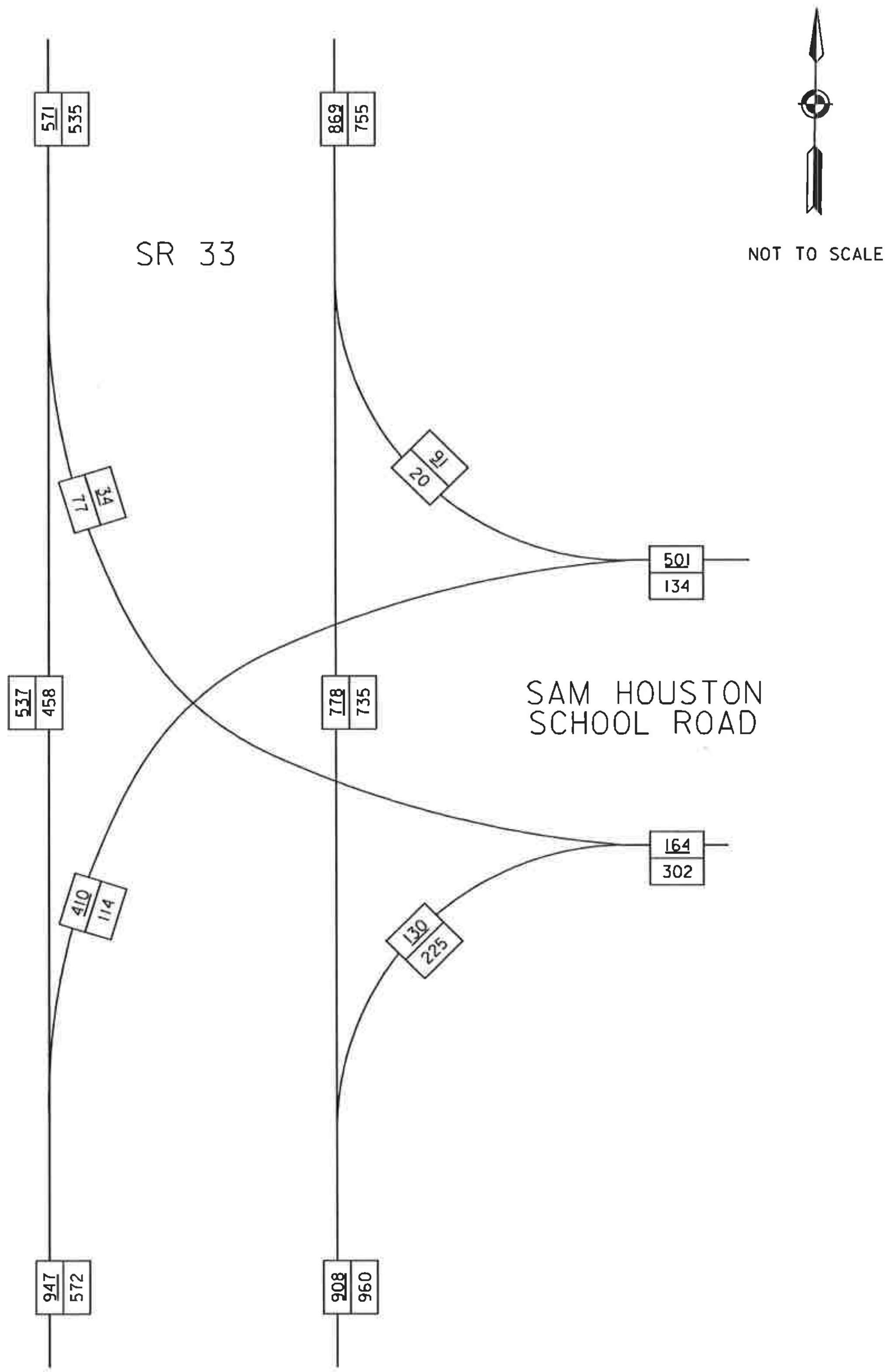


2020 DHV WITH PPE AM / PM	PELLISSIPPI PKWY EXTENSION @ SR 35 / US 411 / SEVIERVILLE RD



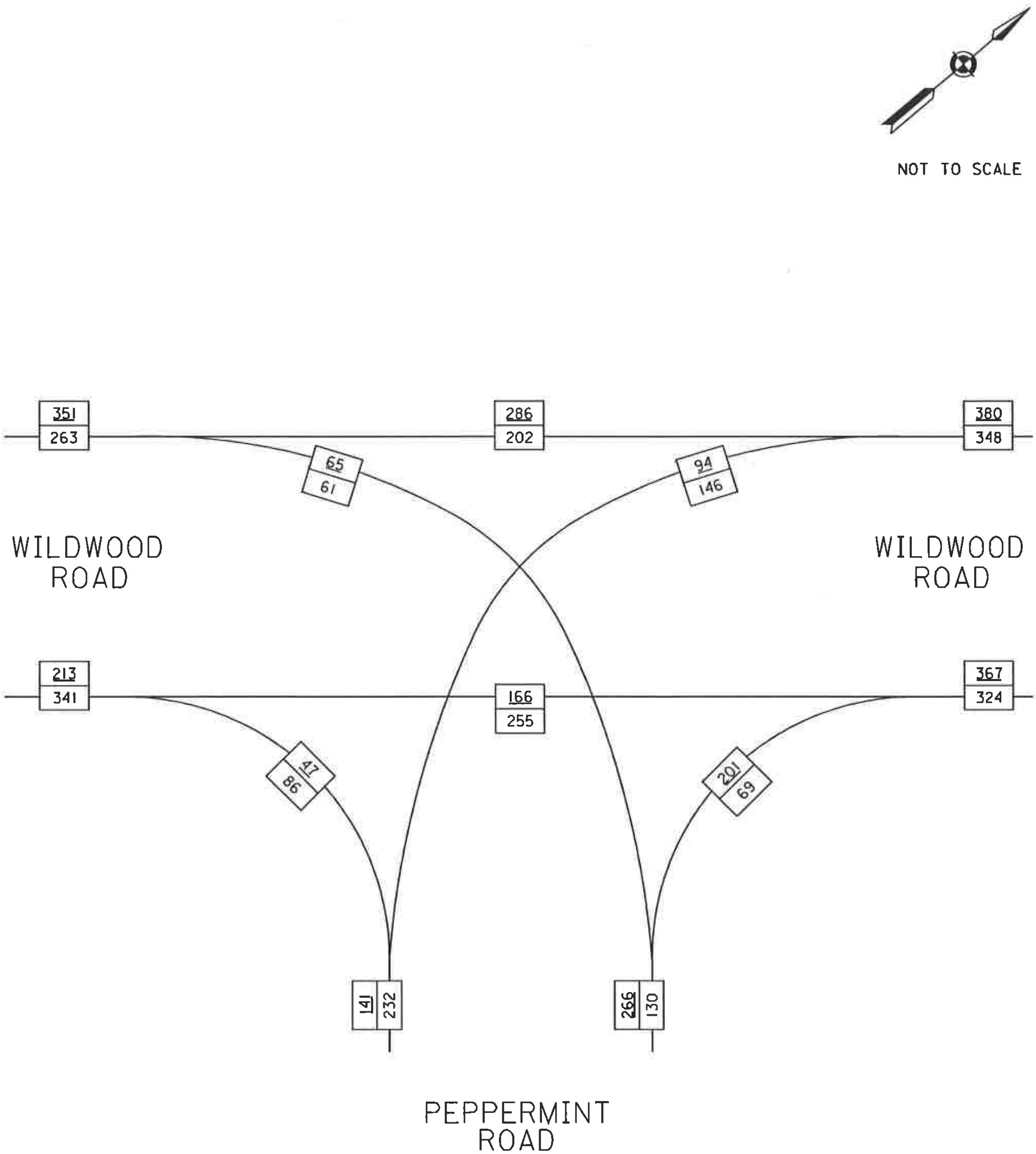
2020 DHV WITH PPE
AM / PM

PELLISSIPPI PKWY EXTENSION @ US 321



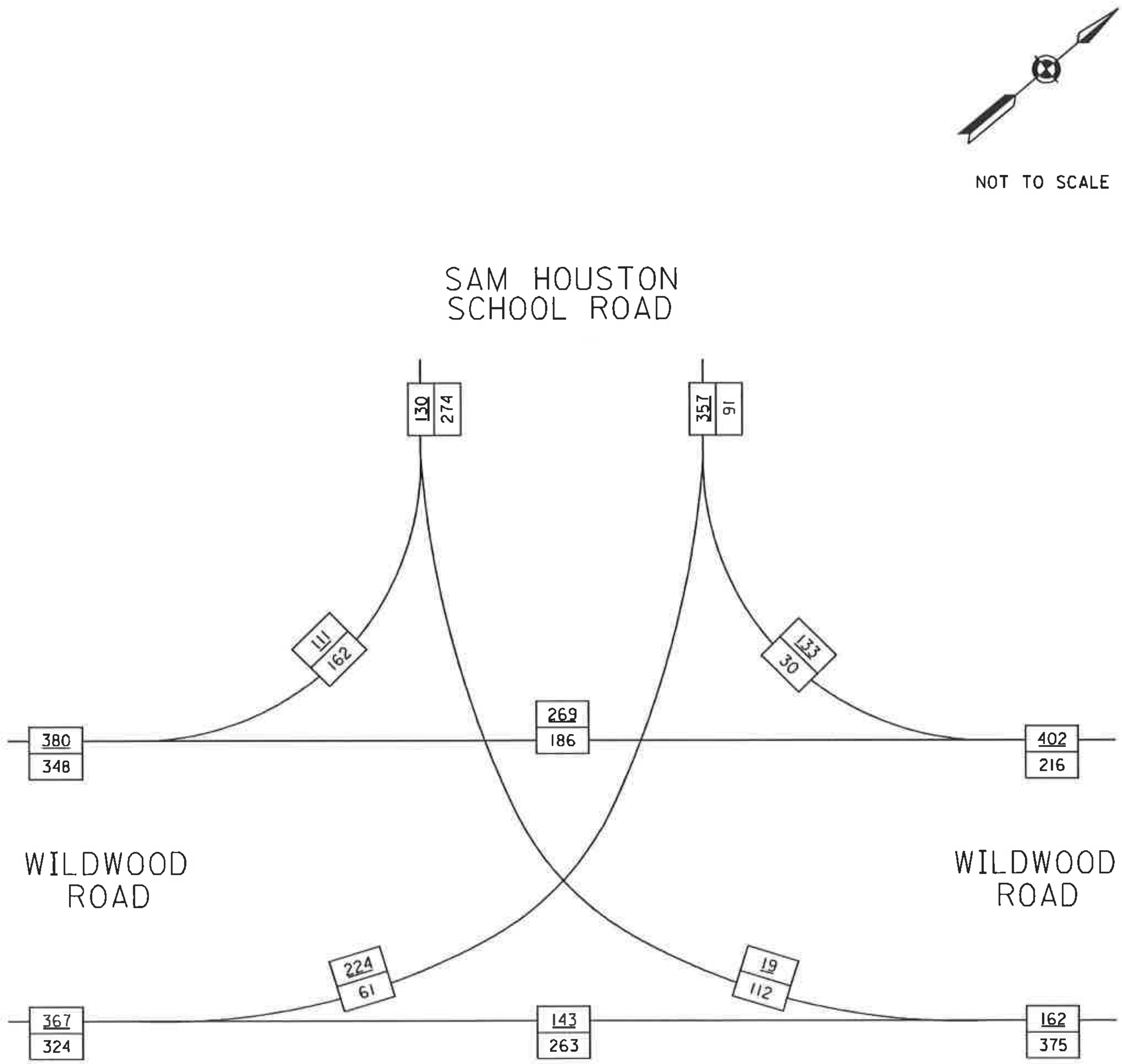
2020 DHV WITH PPE
AM / PM

SR 33 @
SAM HOUSTON SCHOOL ROAD



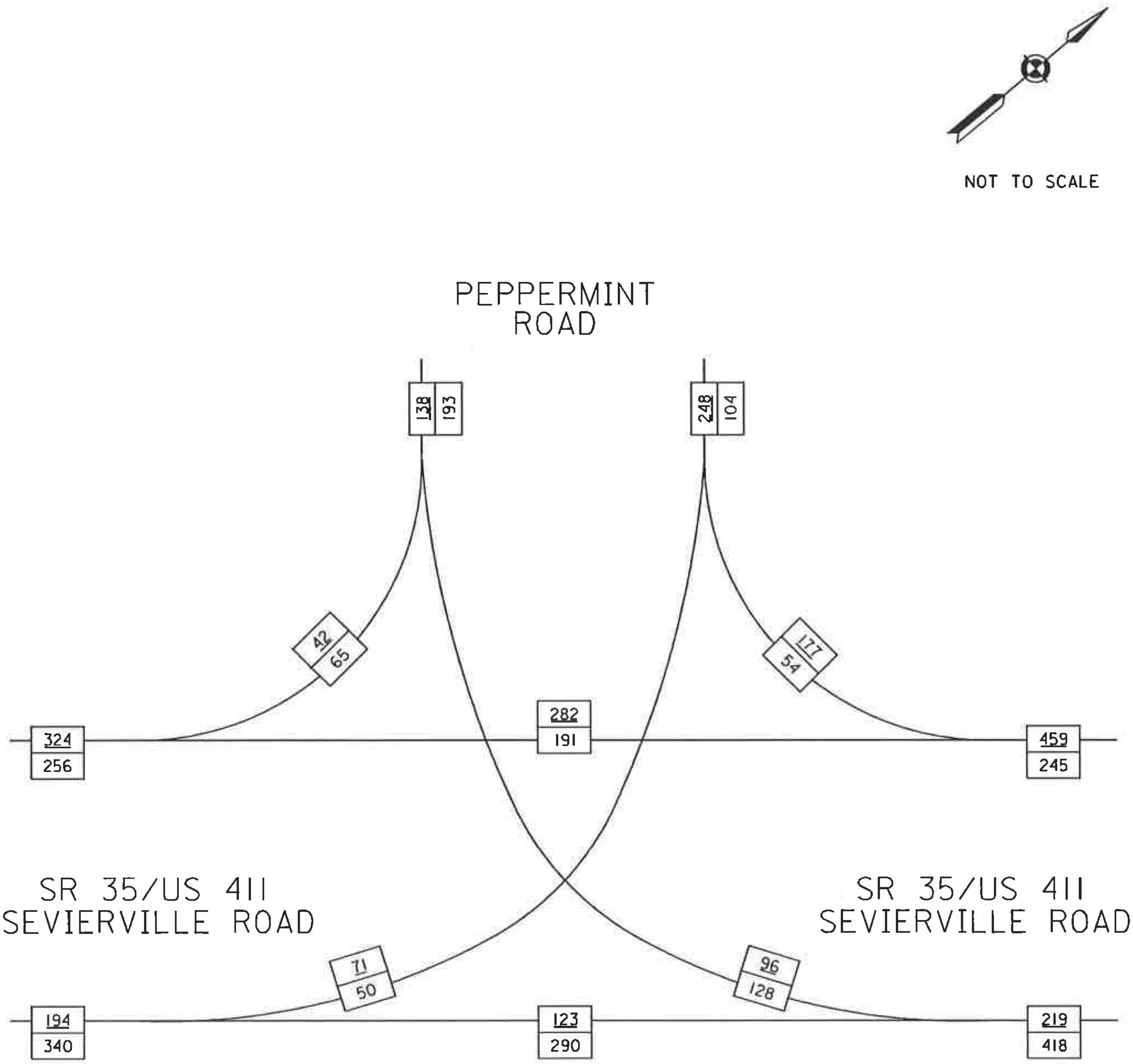
2020 DHV WITH PPE
AM / PM

PEPPERMINT ROAD @
WILDWOOD ROAD



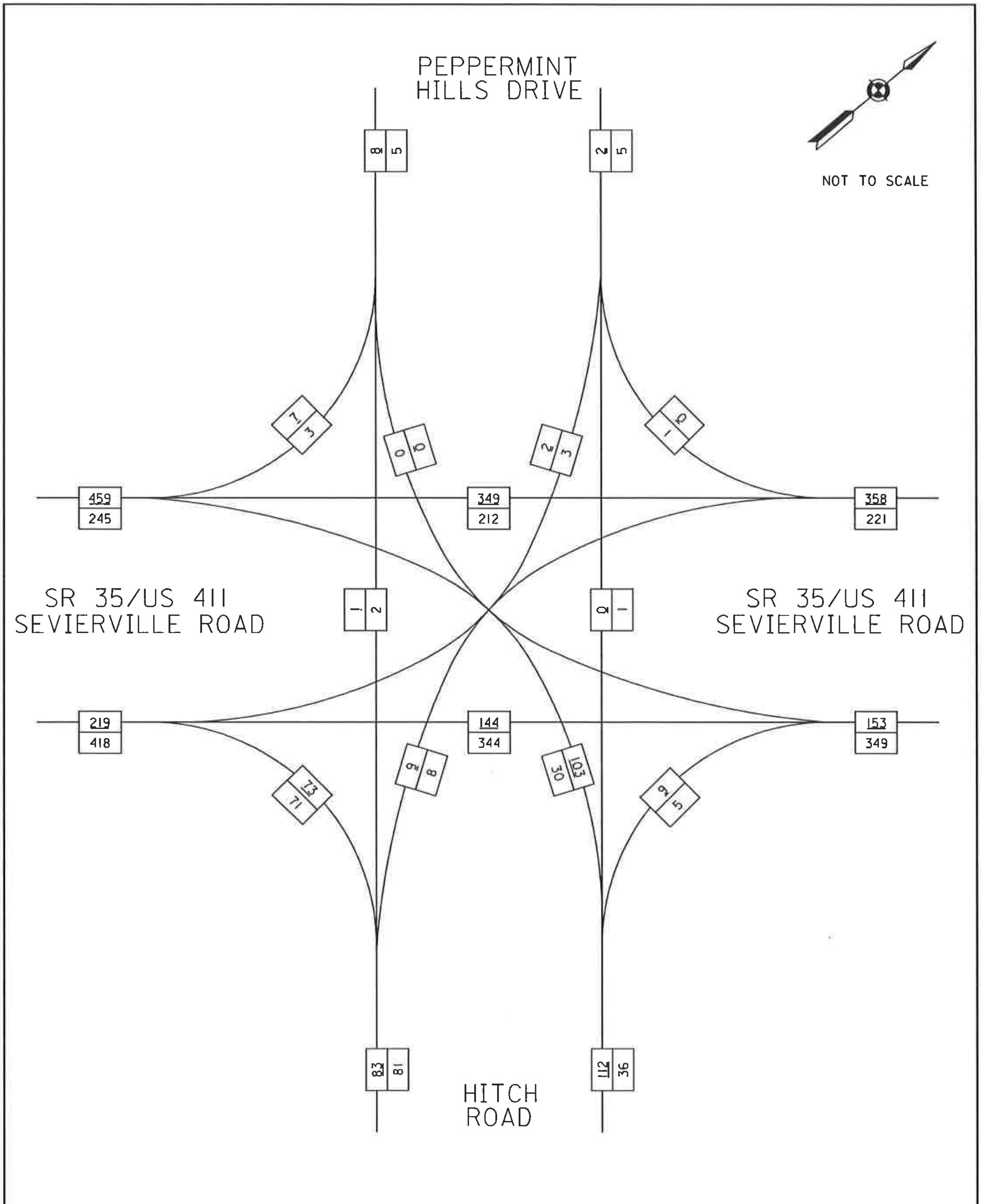
2020 DHV WITH PPE
AM / PM

SAM HOUSTON SCHOOL ROAD @ WILDWOOD ROAD

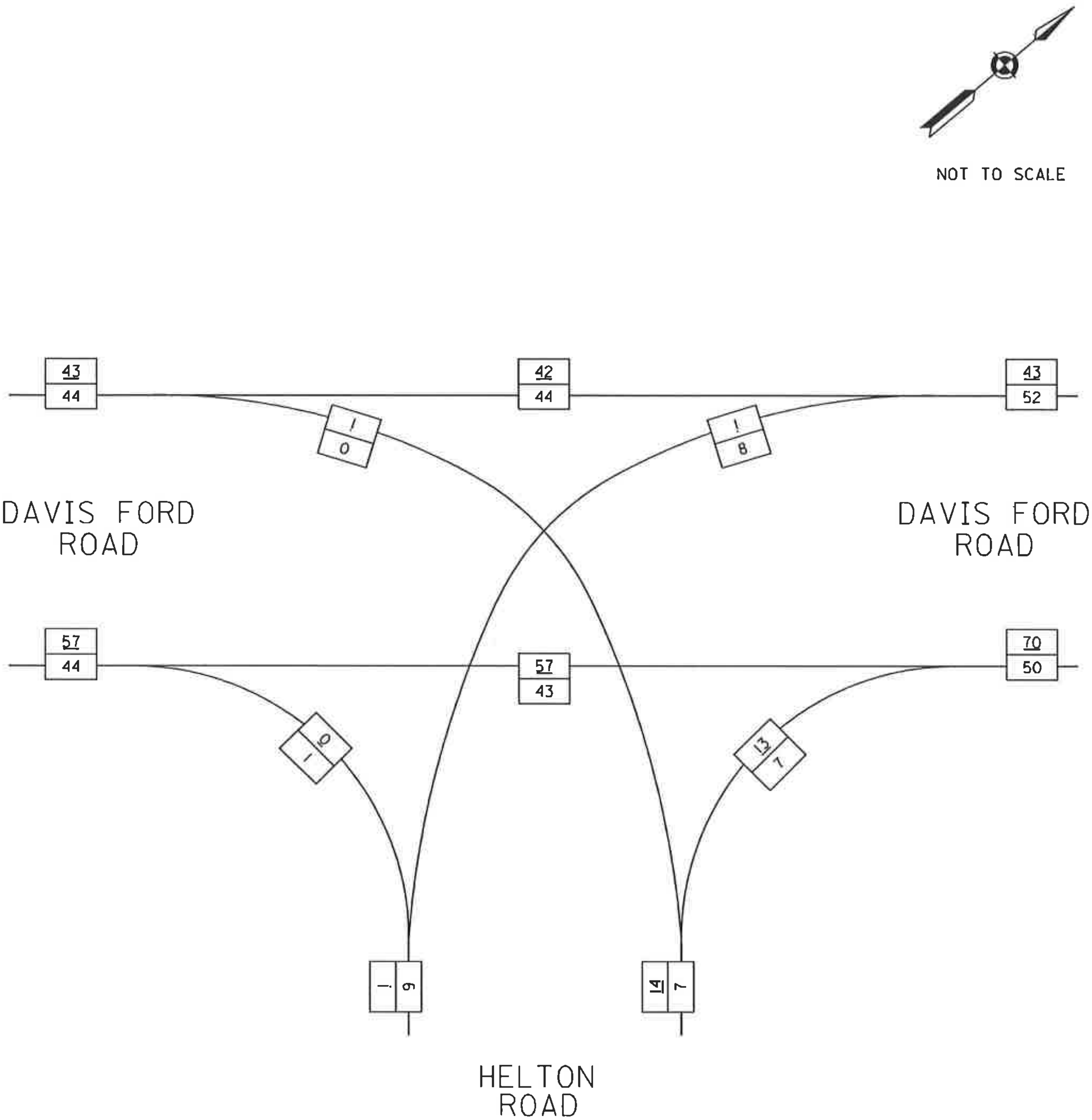


2020 DHV WITH PPE
AM / PM

SR 35/US 411/SEVIERVILLE ROAD @ PEPPERMINT ROAD

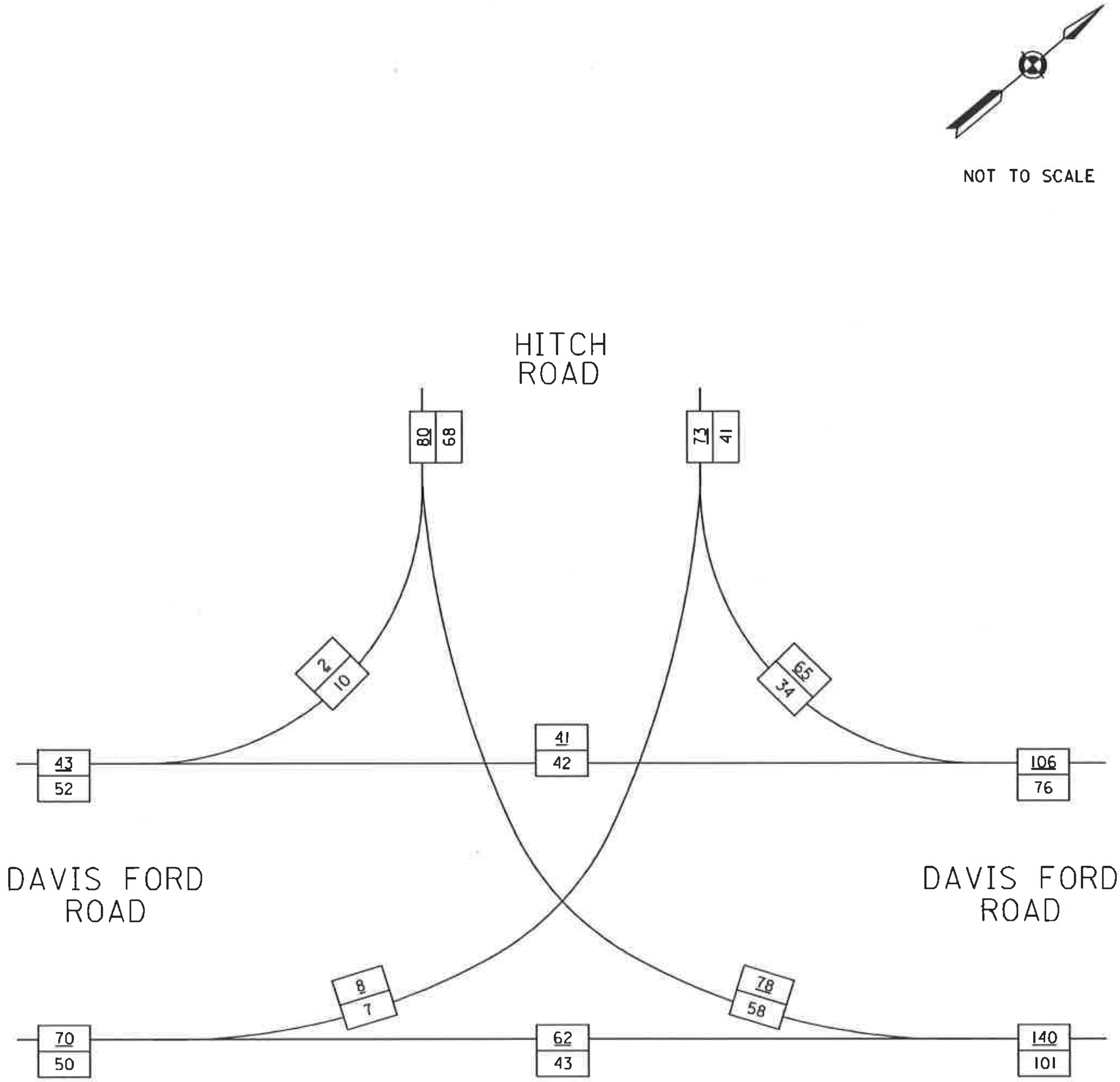


2020 DHV WITH PPE AM / PM	SR 35/US 411/SEVIERVILLE ROAD @ HITCH ROAD/PEPPERMINT HILLS DR



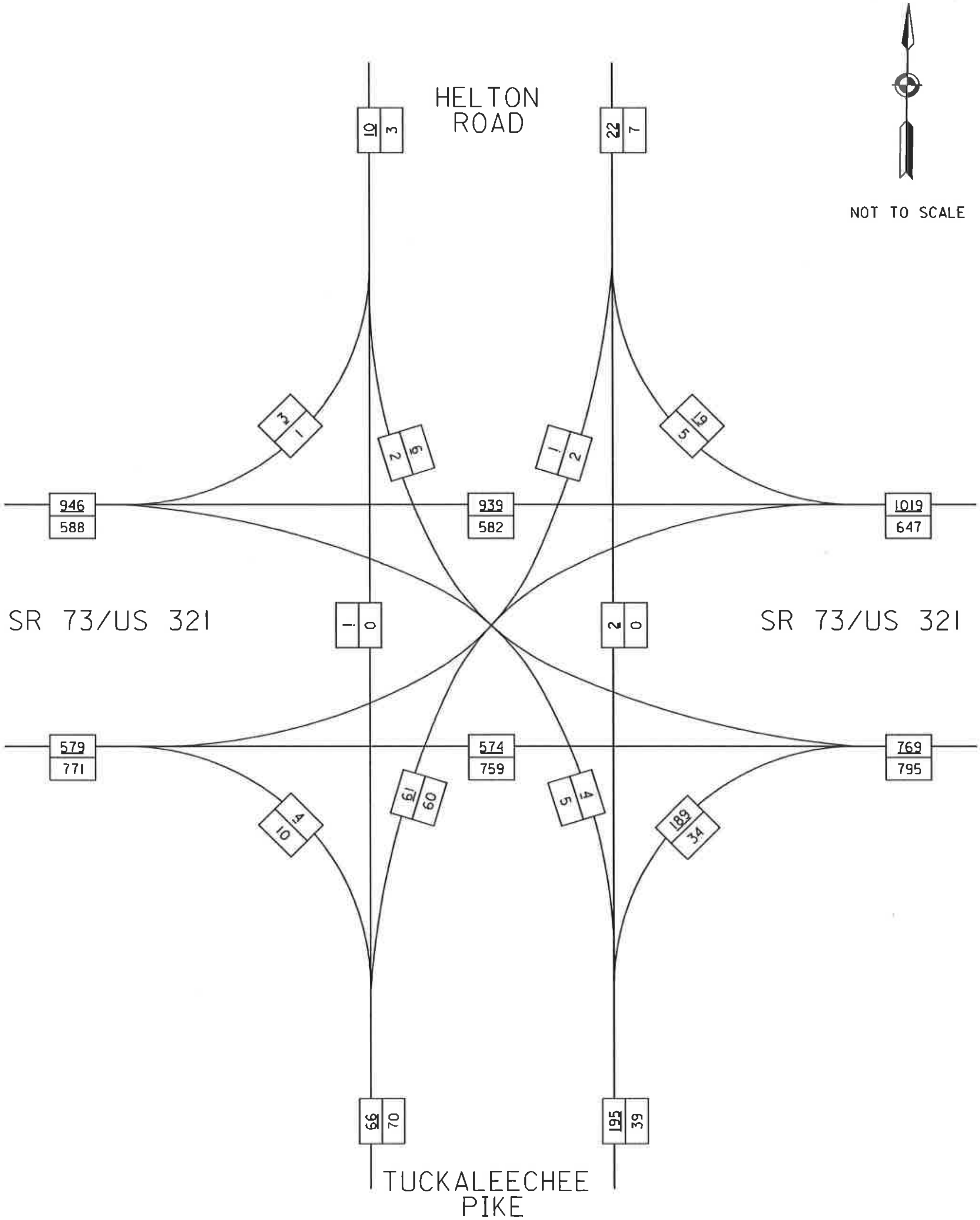
2020 DHV WITH PPE
AM / PM

DAVIS FORD ROAD @ HELTON ROAD



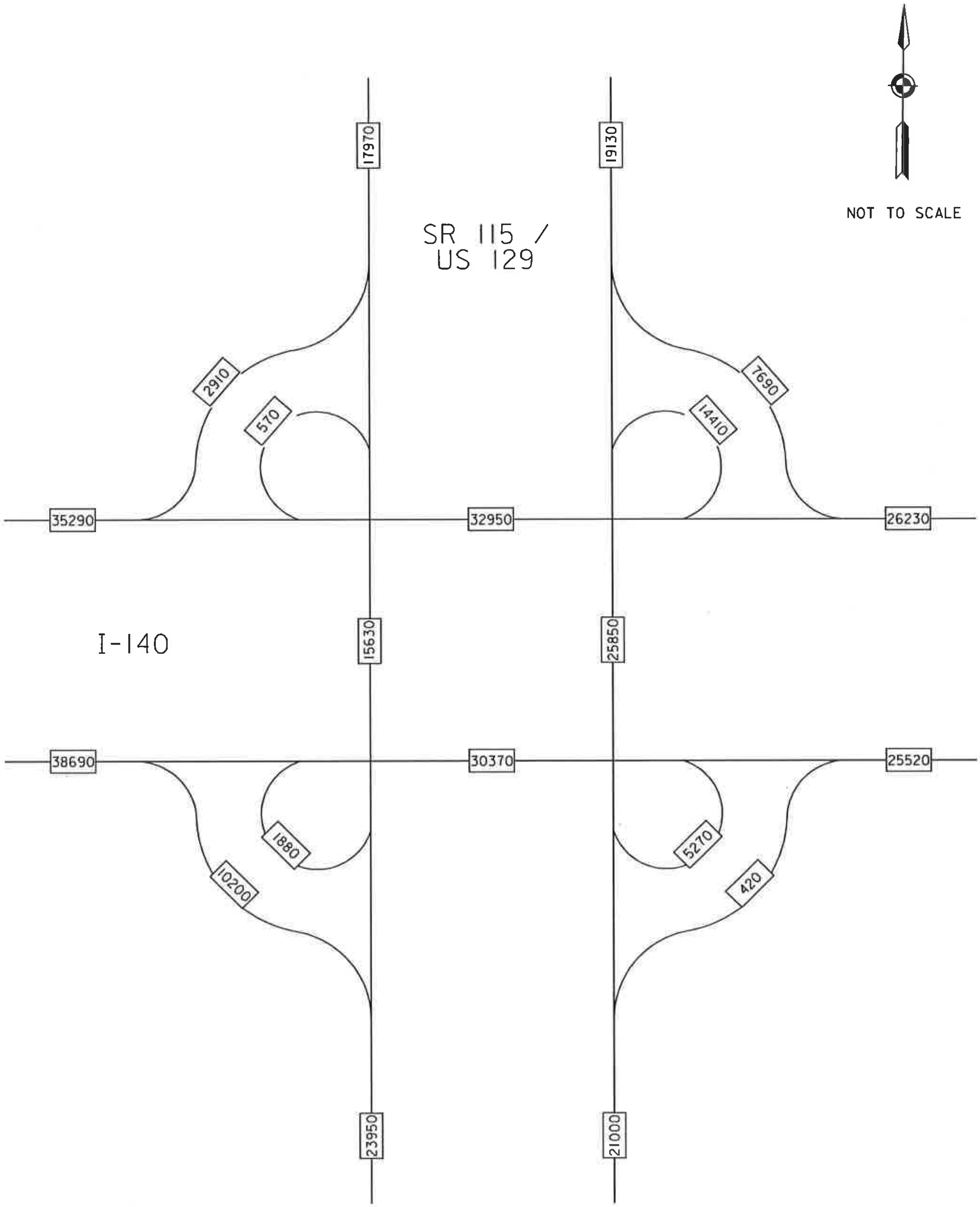
2020 DHV WITH PPE
AM / PM

DAVIS FORD ROAD @ HITCH ROAD

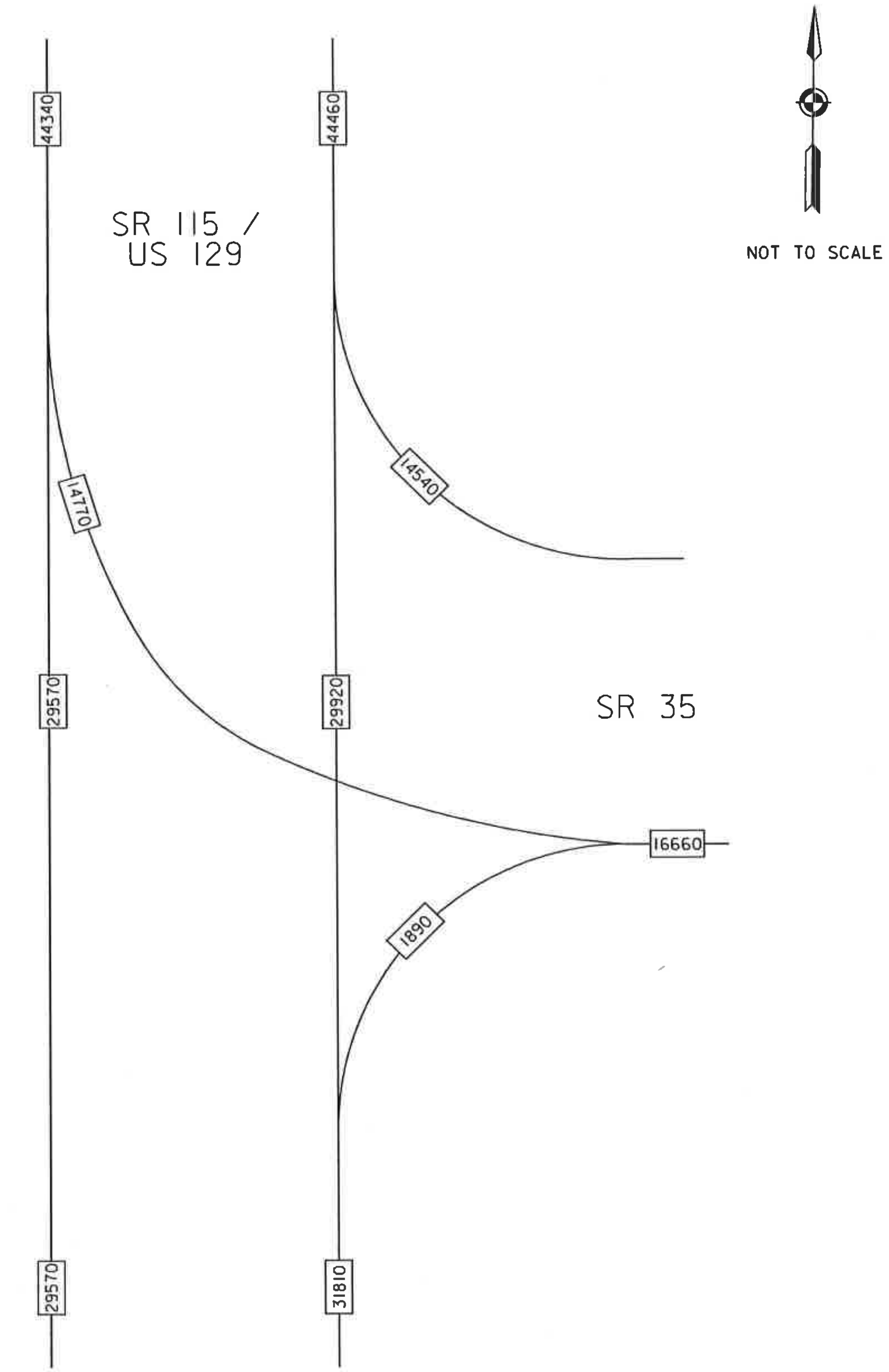


2020 DHV WITH PPE
AM / PM

SR 73/US 321 @
HELTON ROAD/TUCKALEECHEE PIKE

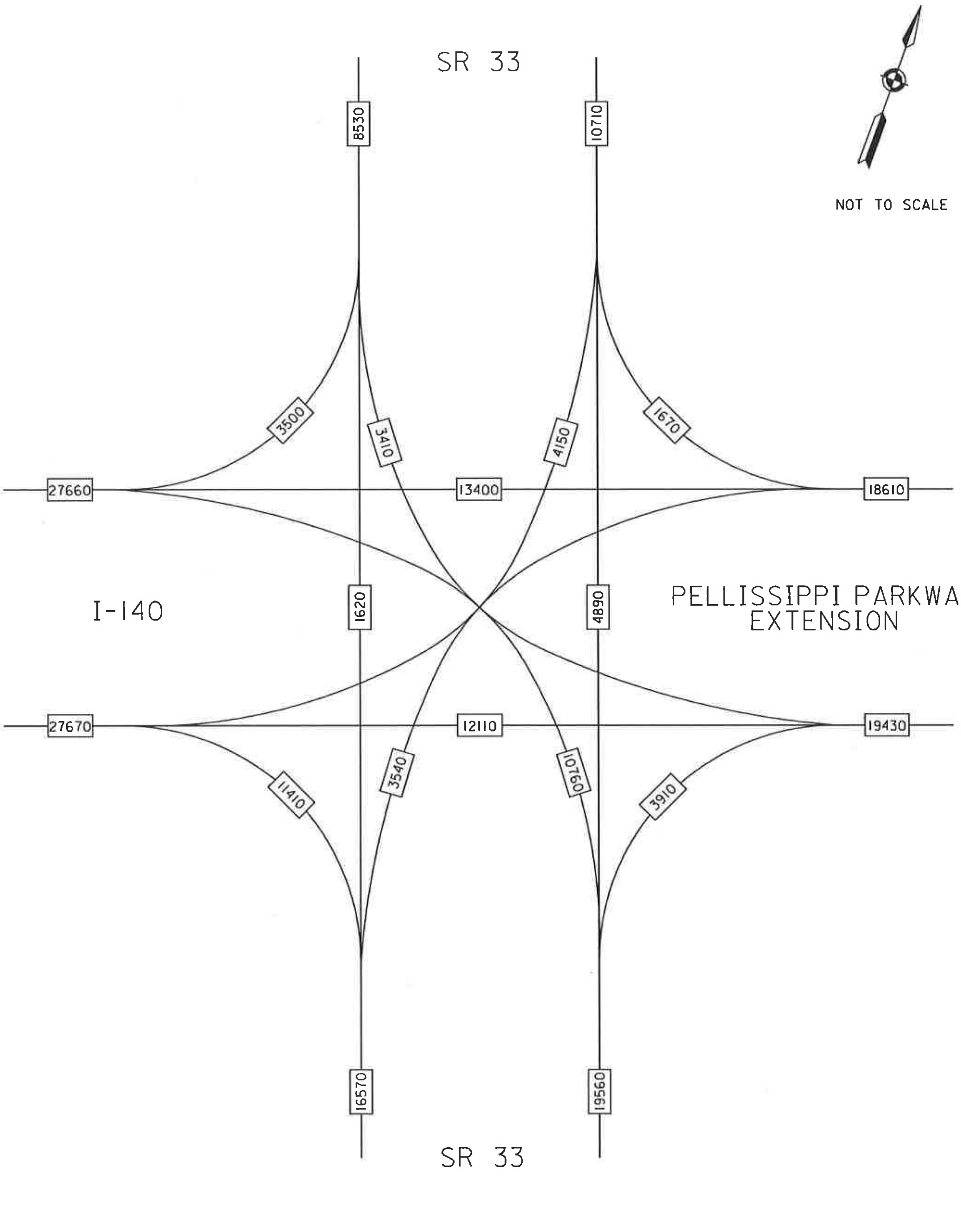


2040 AADT WITH PPE	SR 115/US 129 @ I-140 / PELLISSIPPI PARKWAY



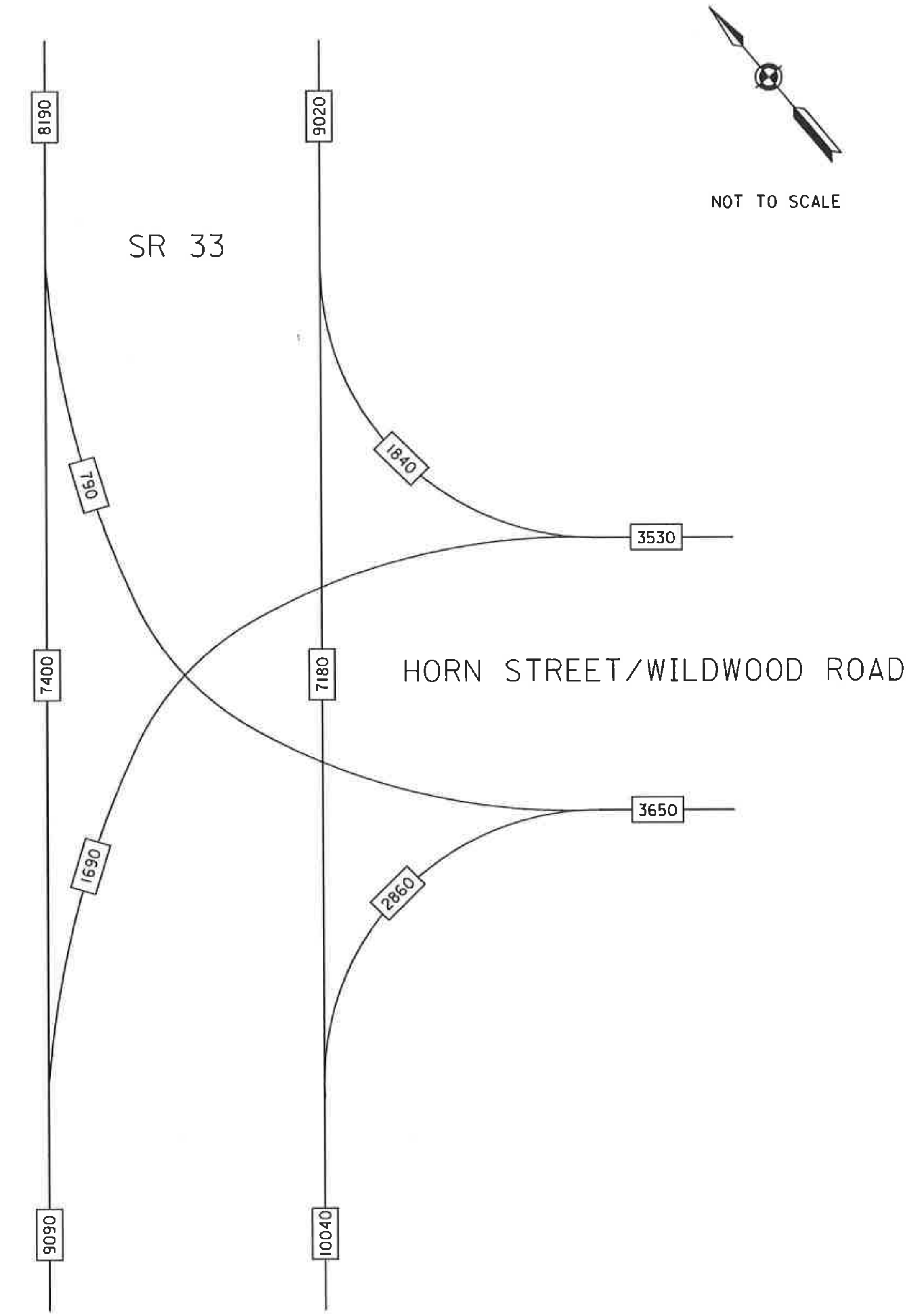
2040 AADT WITH PPE

SR 115/US 129 @ SR 35

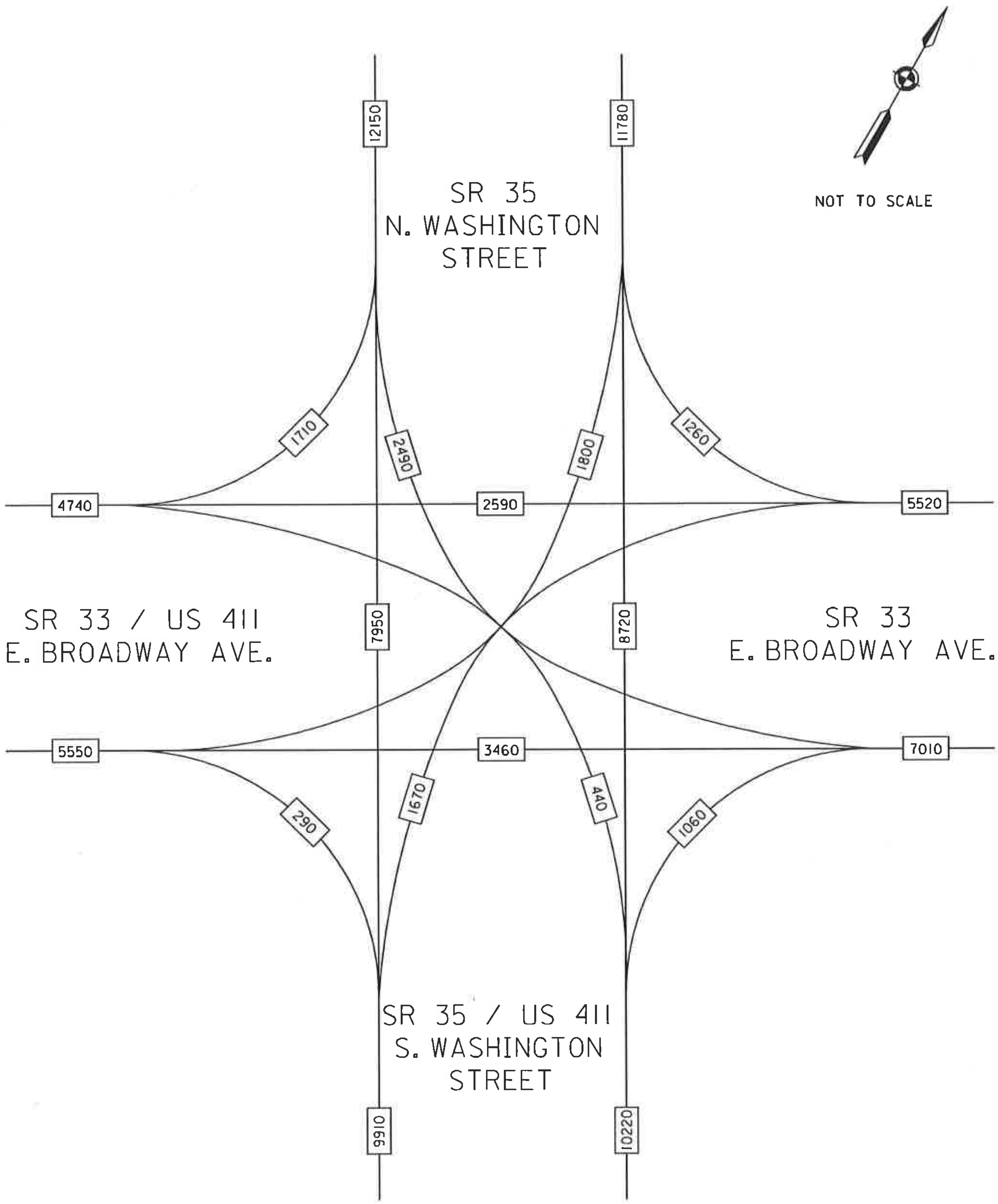


2040 AADT WITH PPE

SR 33 @
I-140 / PELLISSIPPI PKWY EXTENSION

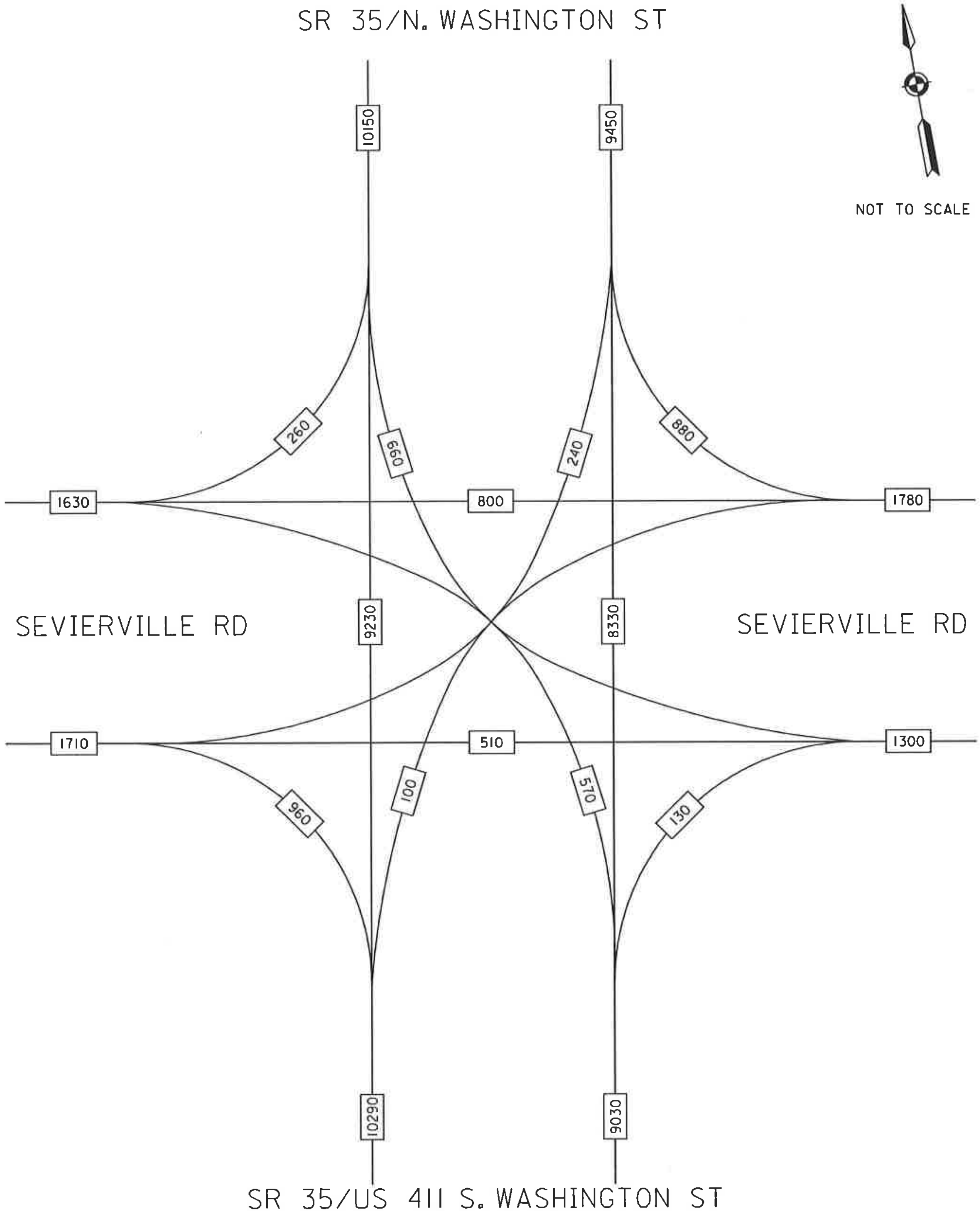


2040 AADT WITH PPE	SR 33 @ HORN STREET/ WILDWOOD ROAD



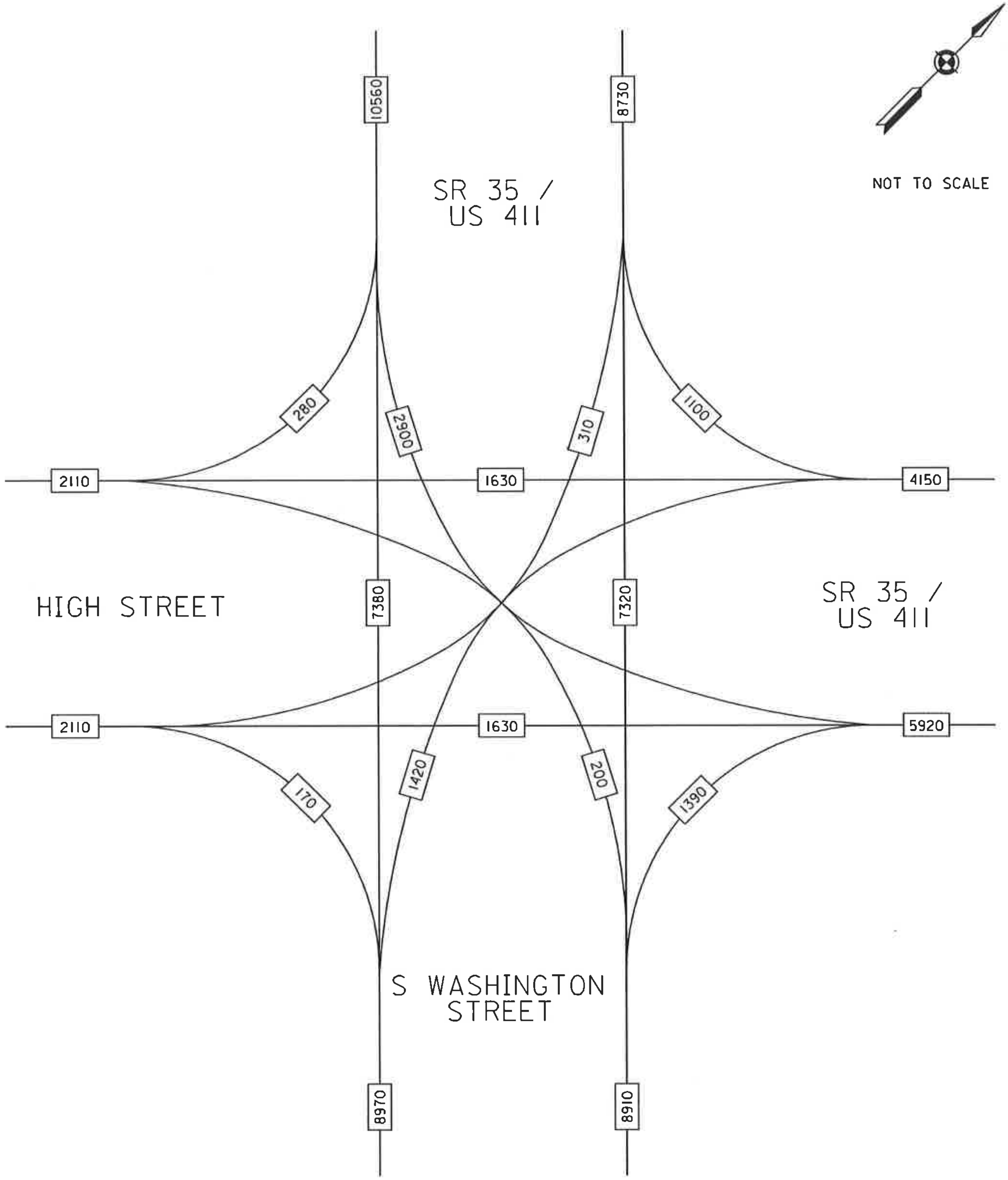
2040 AADT WITH PPE

SR 33 @ SR 35

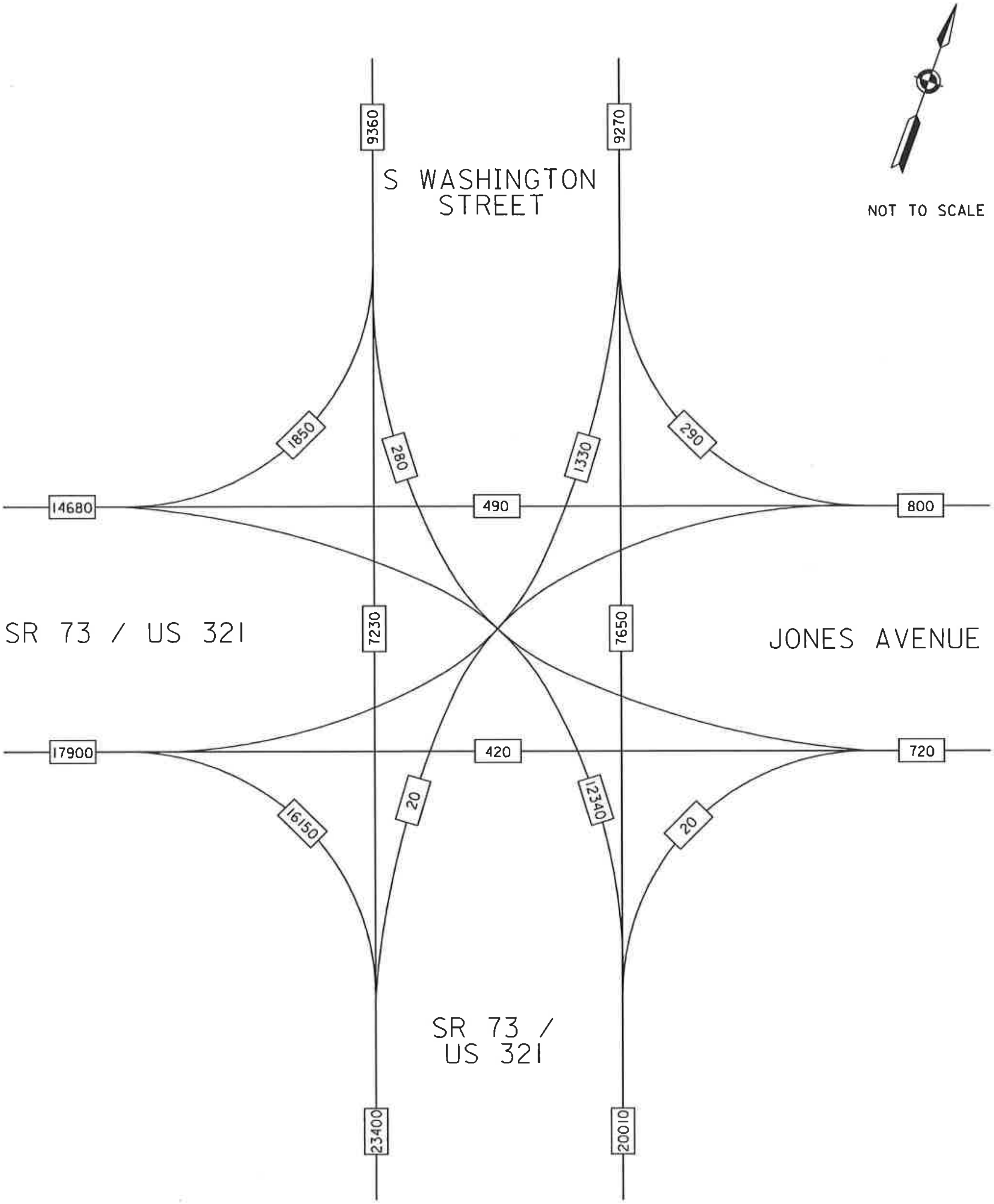


2040 AADT WITH PPE

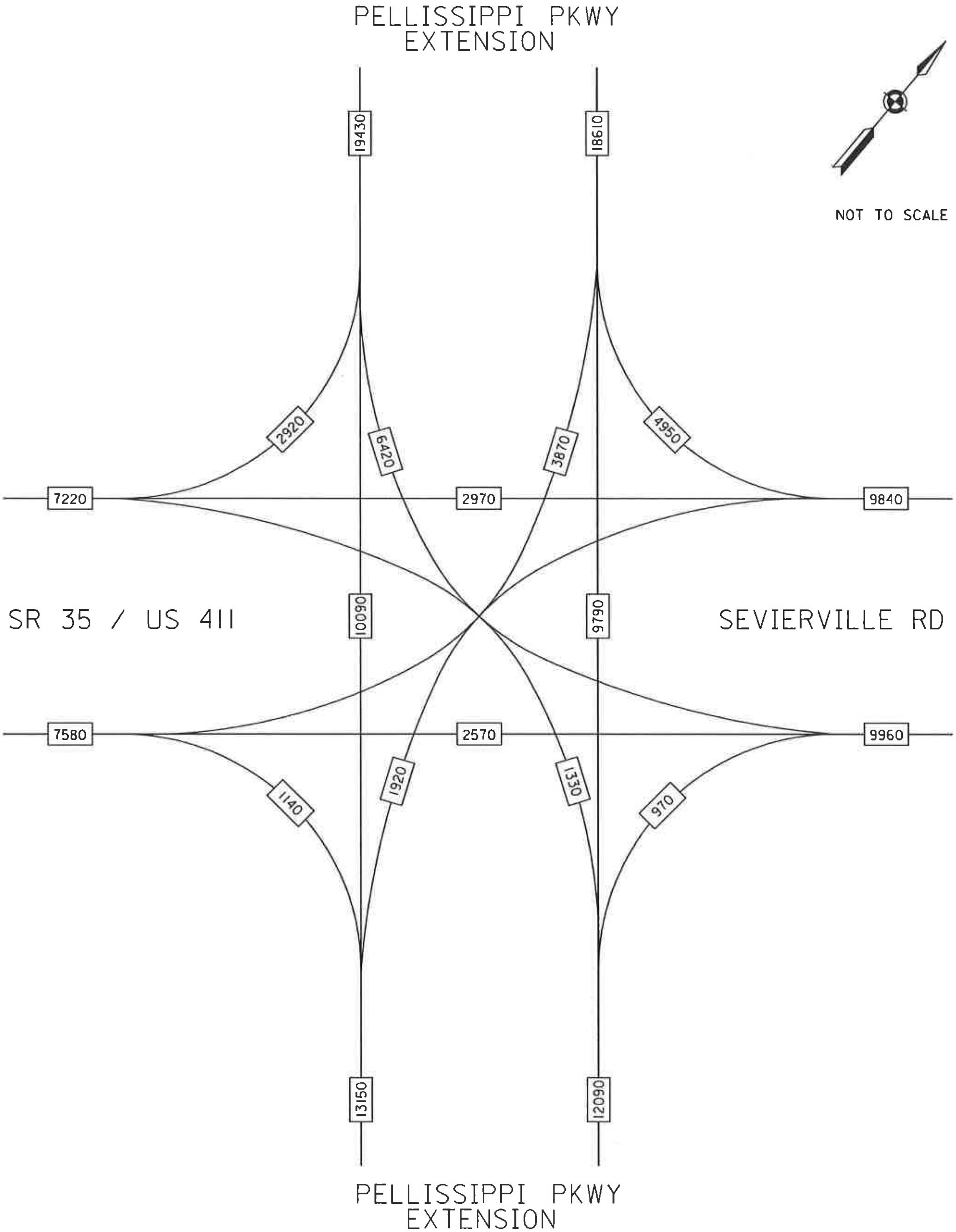
SEVIERVILLE RD @
SR 35/US 411 WASHINGTON ST



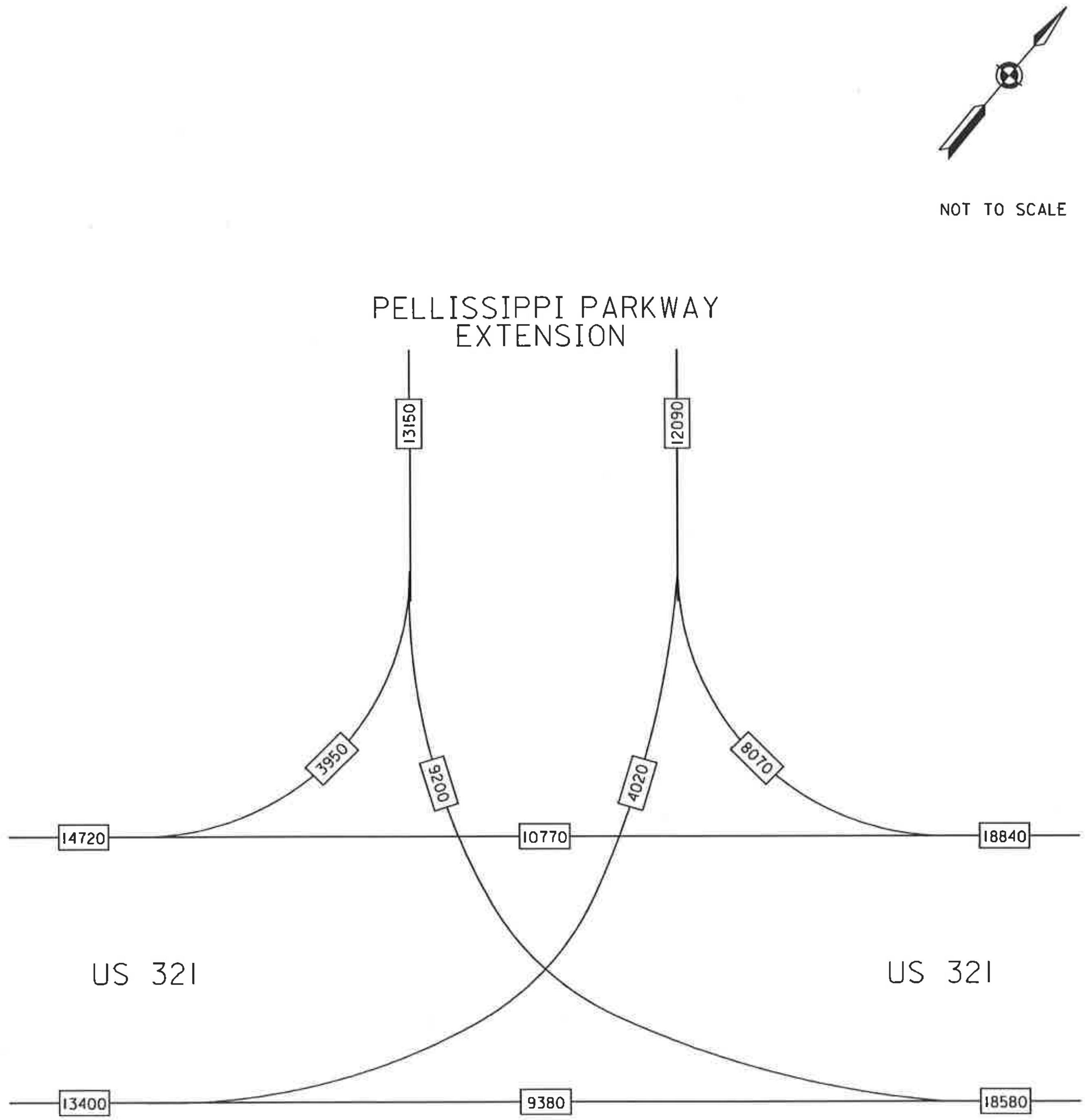
2040 AADT WITH PPE	S WASHINGTON ST / SR 35 @ HIGH ST / SR 35



2040 AADT WITH PPE	S WASHINGTON ST @ SR 73/ US 321

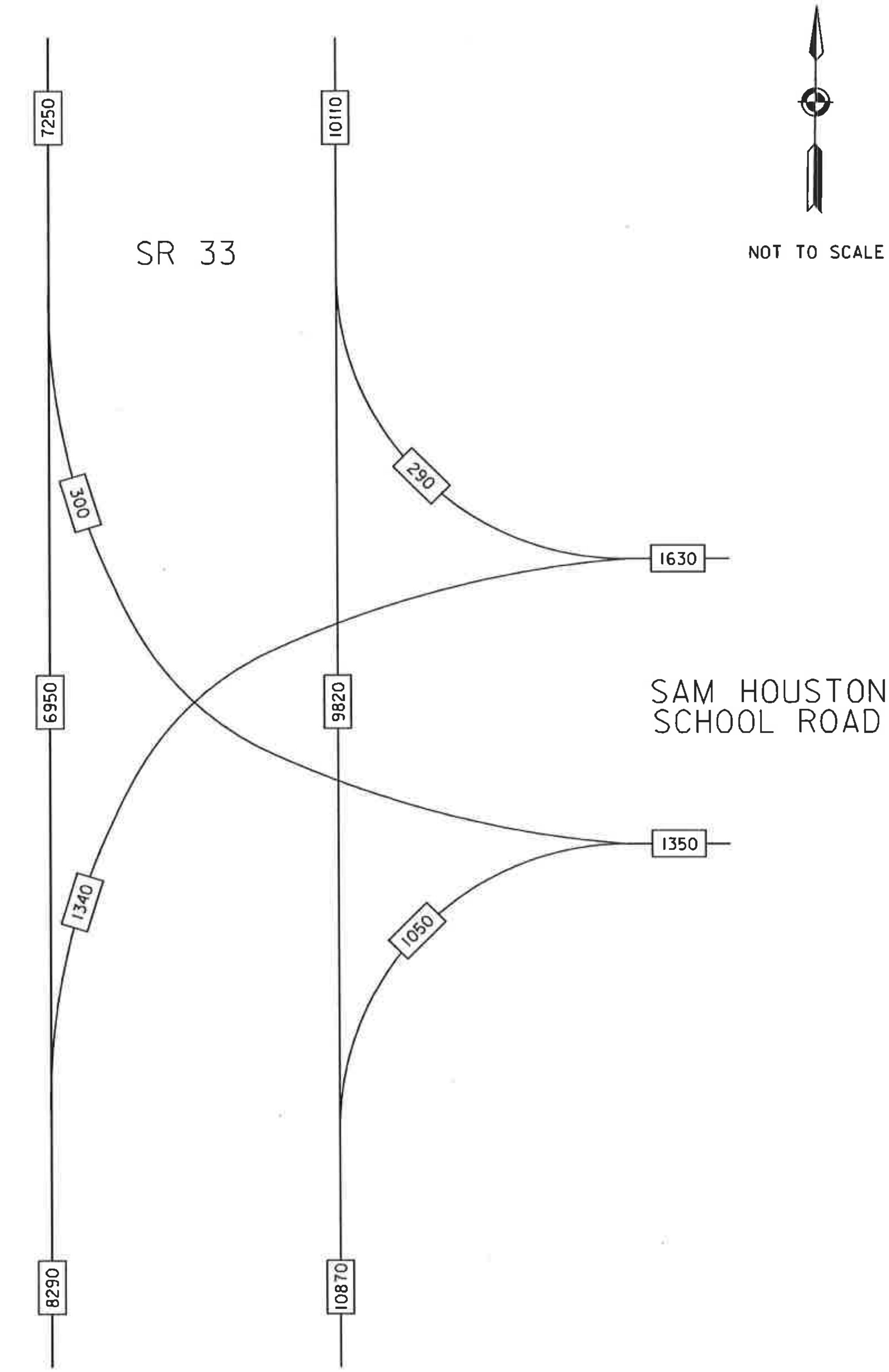


2040 AADT WITH PPE	PELLISSIPPI PKWY EXTENSION @ SR 35 / US 411 / SEVIERVILLE RD

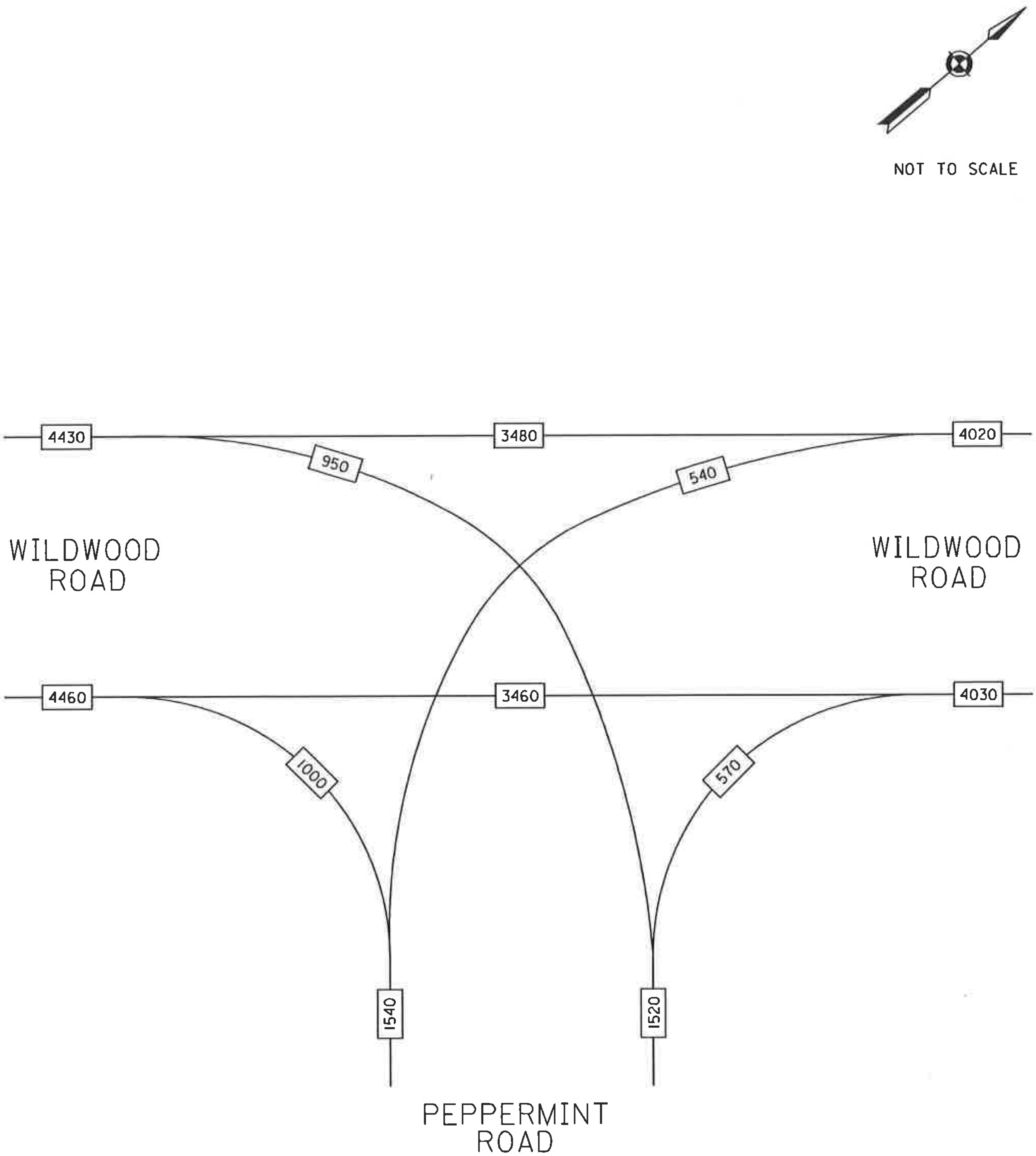


2040 AADT WITH PPE

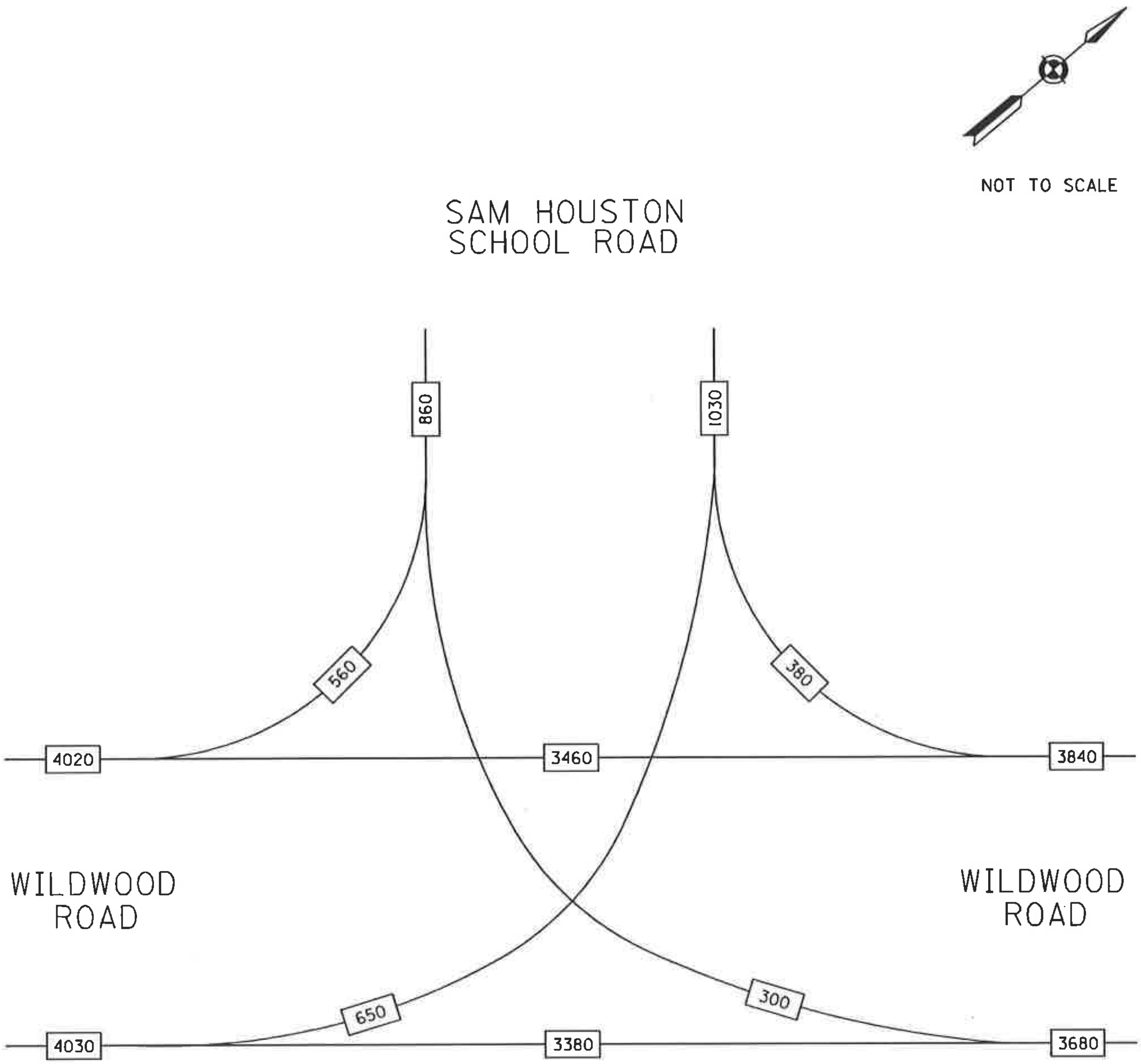
PELLISSIPPI PKWY EXTENSION @ US 321



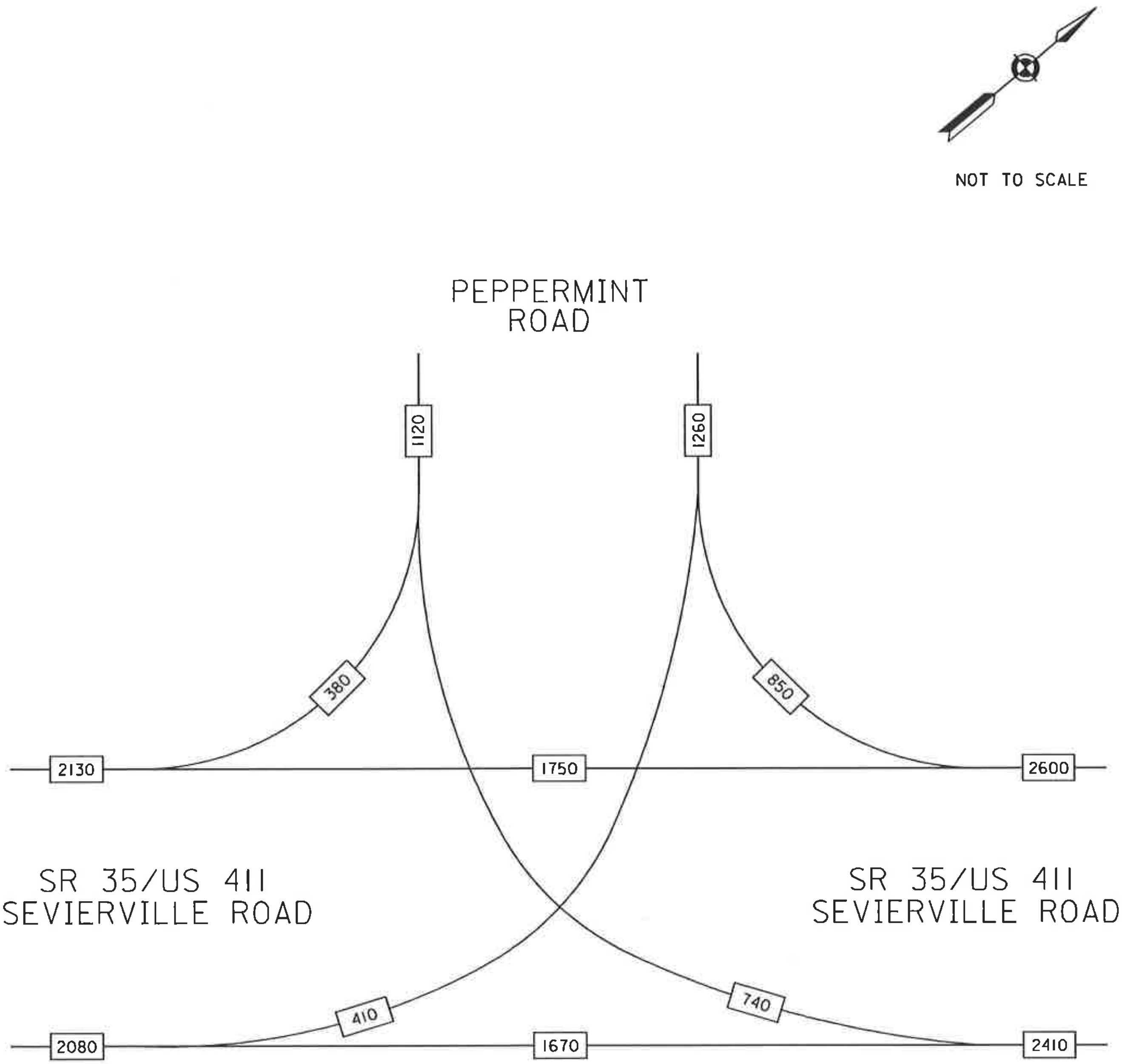
2040 AADT WITH PPE	SR 33 @ SAM HOUSTON SCHOOL ROAD



2040 AADT WITH PPE	PEPPERMINT ROAD @ WILDWOOD ROAD



2040 AADT WITH PPE	SAM HOUSTON SCHOOL ROAD @ WILDWOOD ROAD



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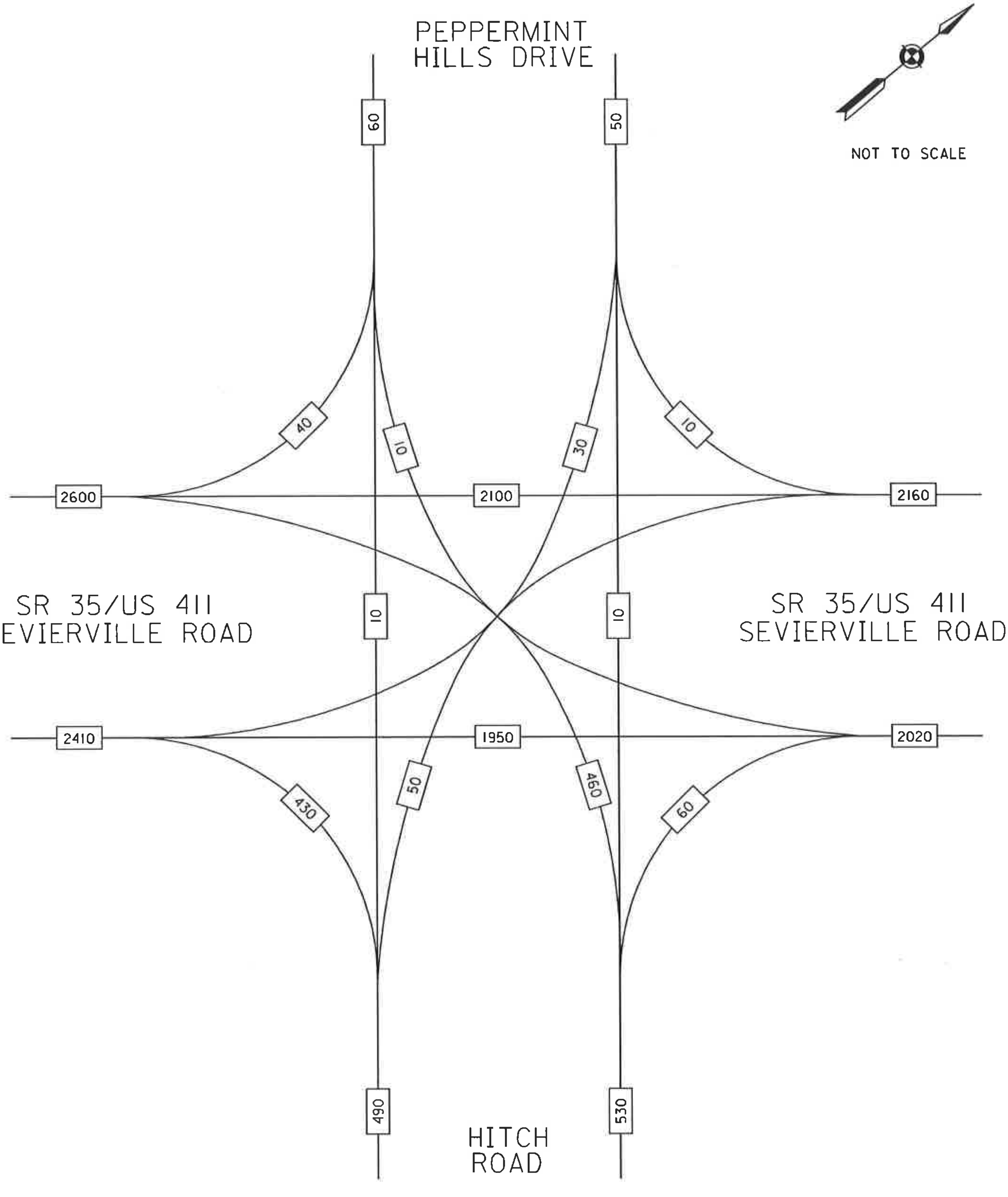
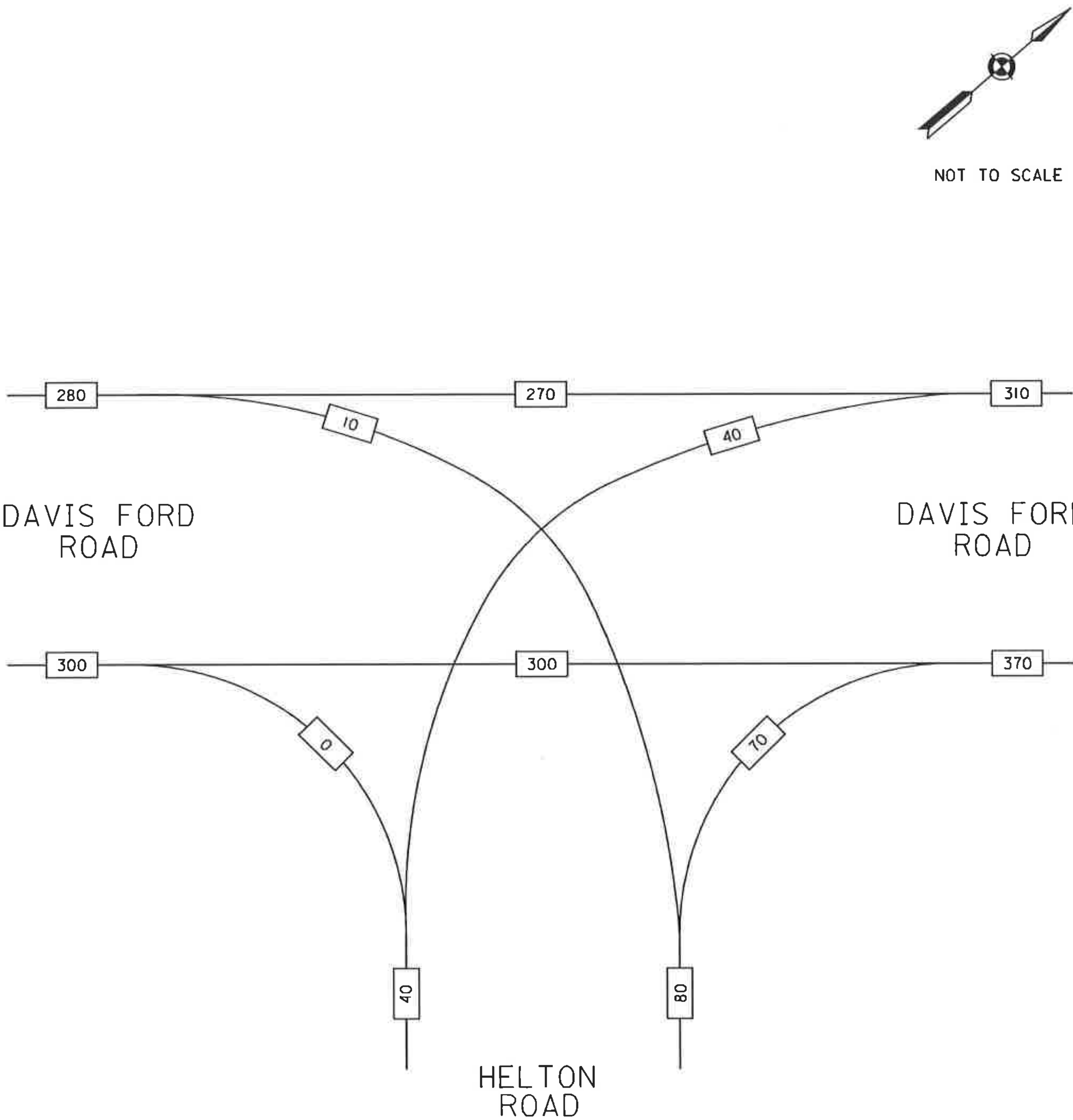
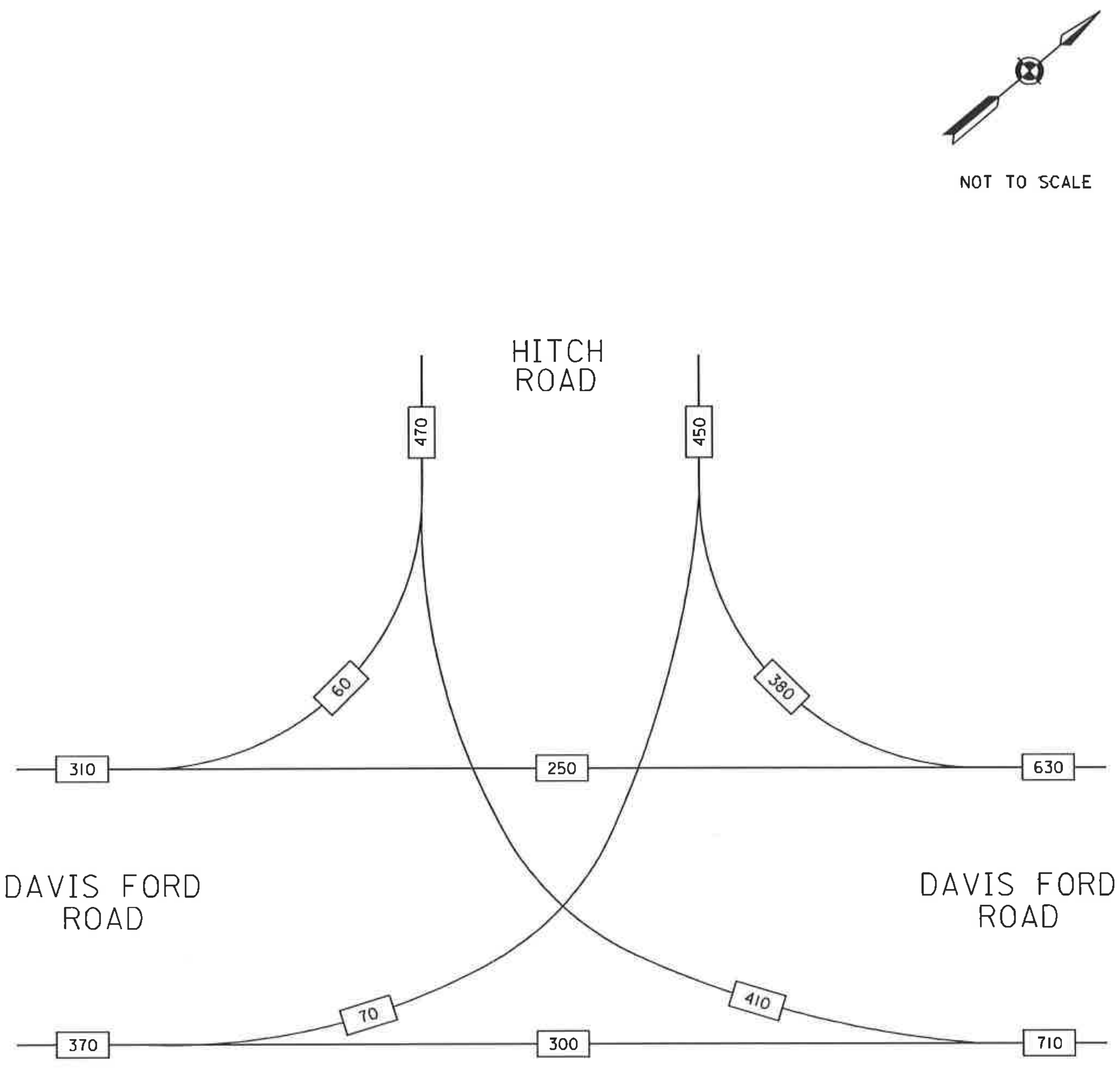


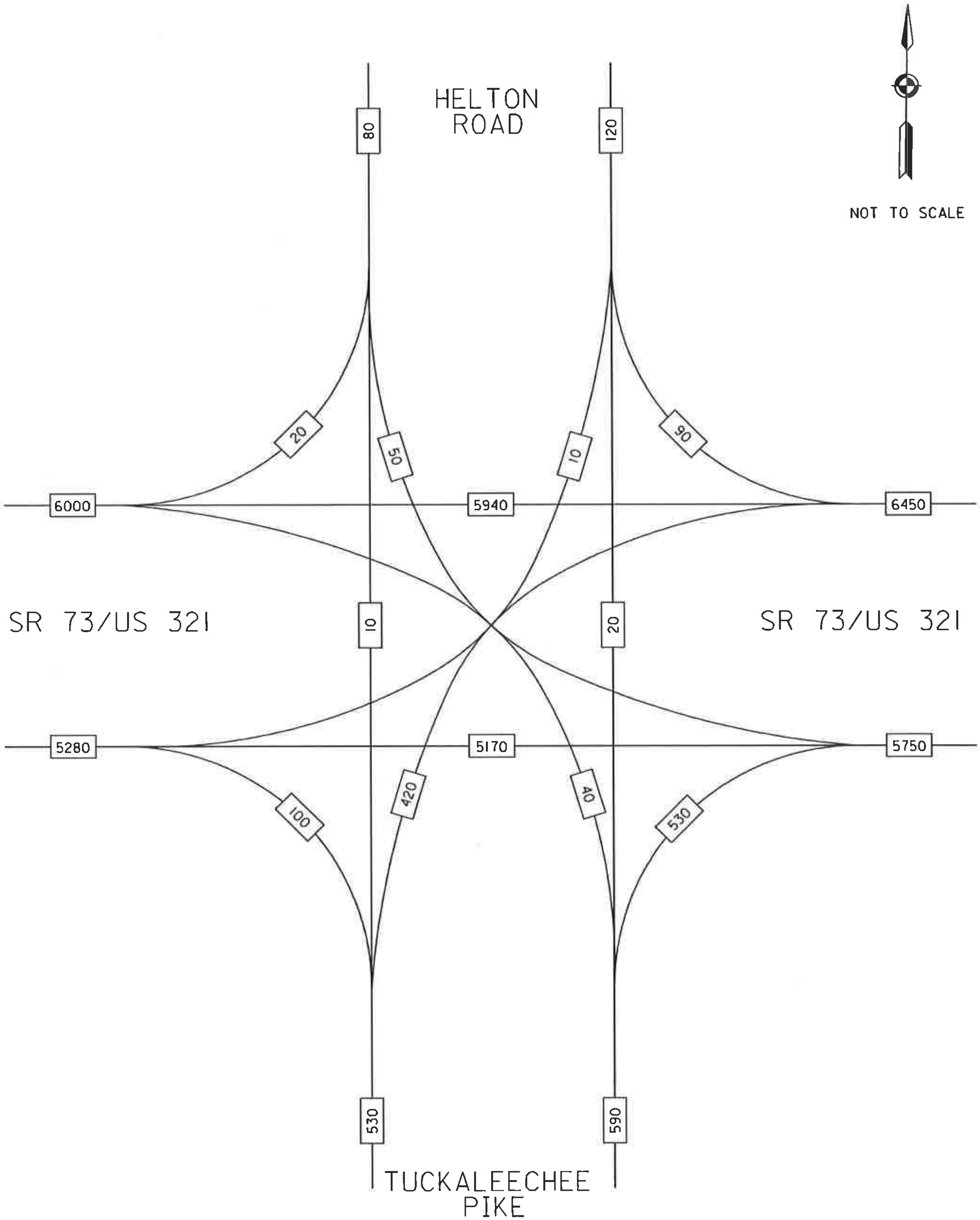
2040 AADT WITH PPE	SR 35/US 411/SEVIERVILLE ROAD @ HITCH ROAD/PEPPERMINT HILLS DR



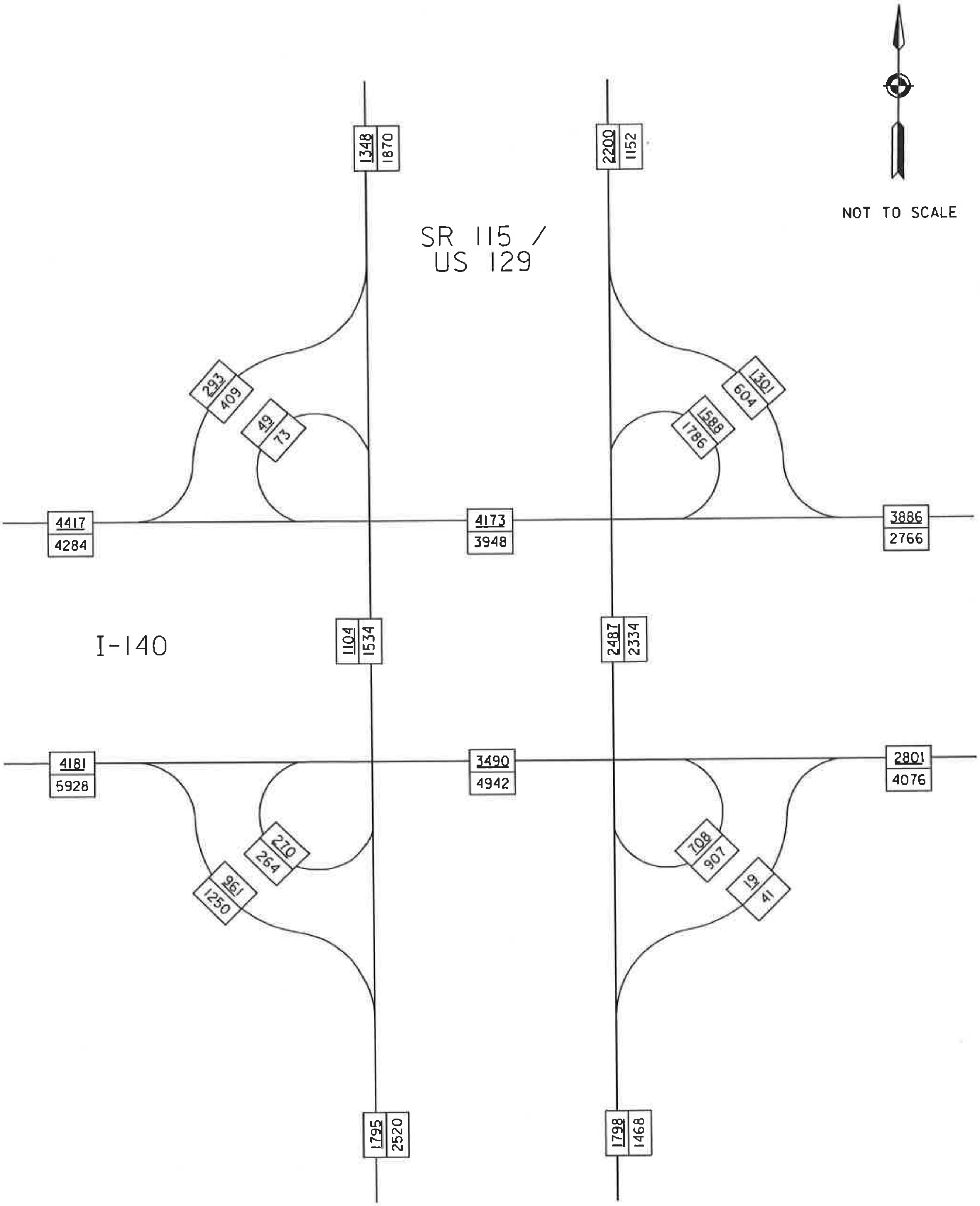
2040 AADT WITH PPE	DAVIS FORD ROAD @ HELTON ROAD



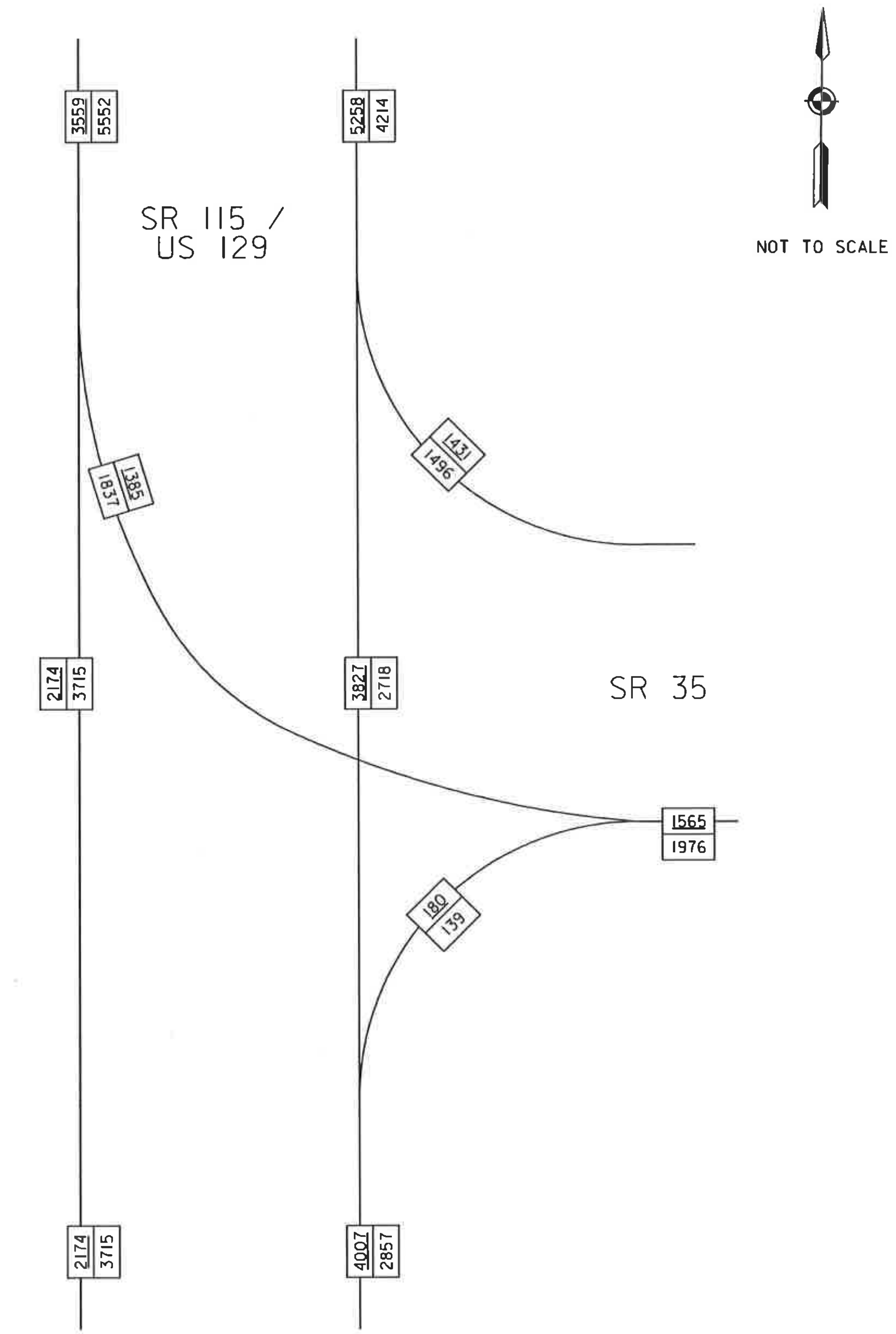
2040 AADT WITH PPE	DAVIS FORD ROAD @ HITCH ROAD



2040 AADT WITH PPE	SR 73/US 321 @ HELTON ROAD/TUCKALEECHEE PIKE

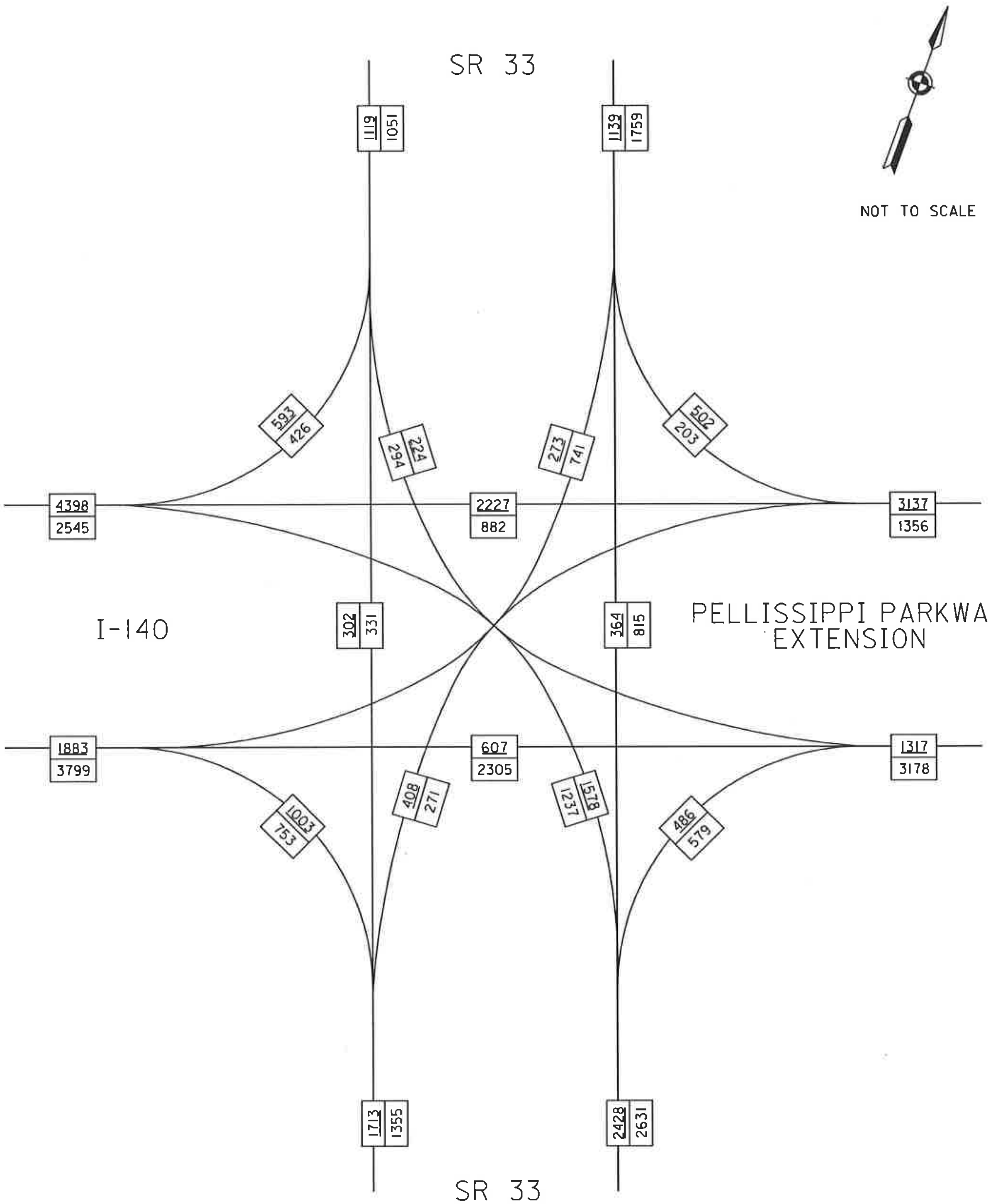


2040 DHV WITH PPE AM / PM	SR 115/US 129 @ I-140 / PELLISSIPPI PARKWAY

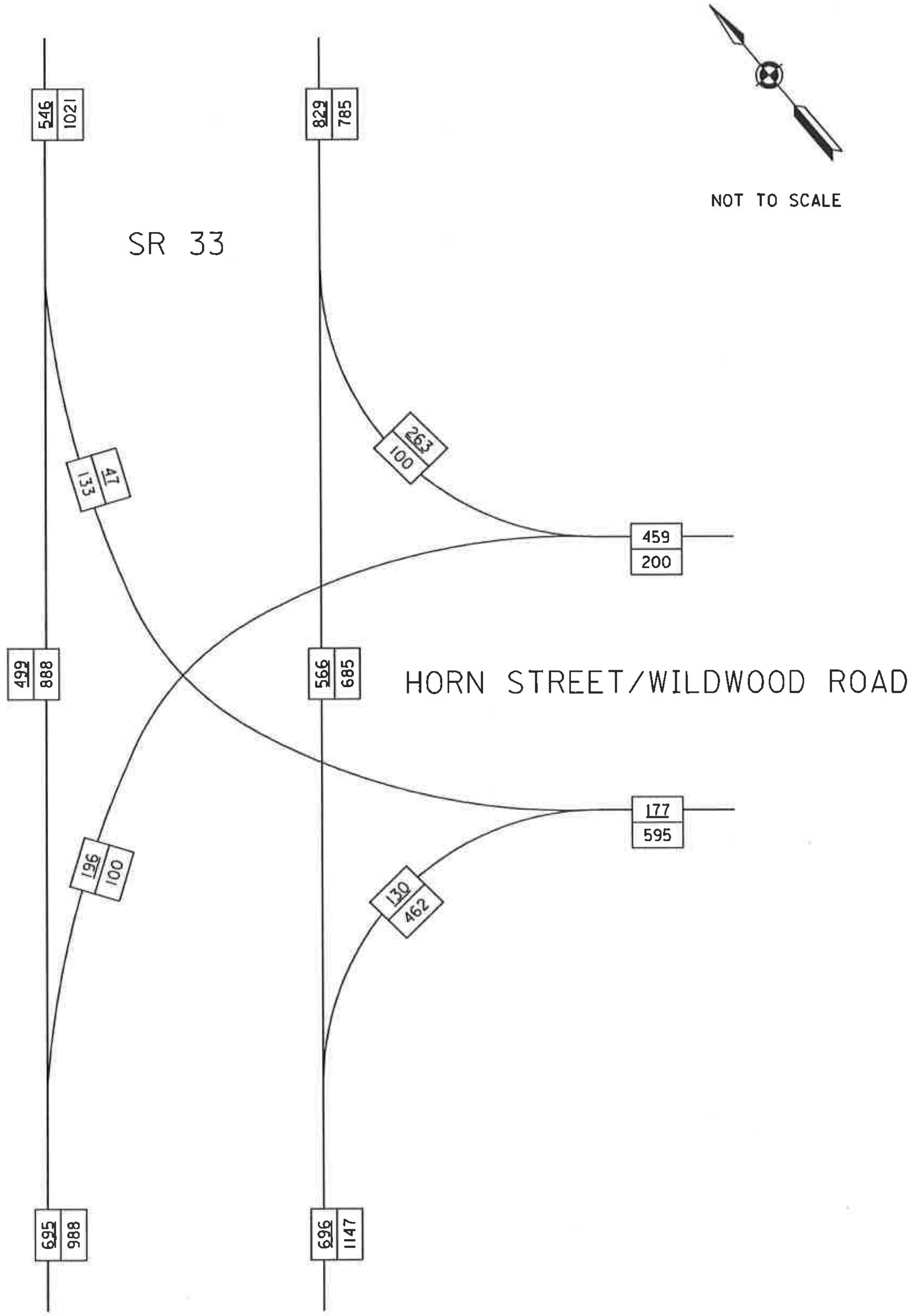


2040 DHV WITH PPE
AM / PM

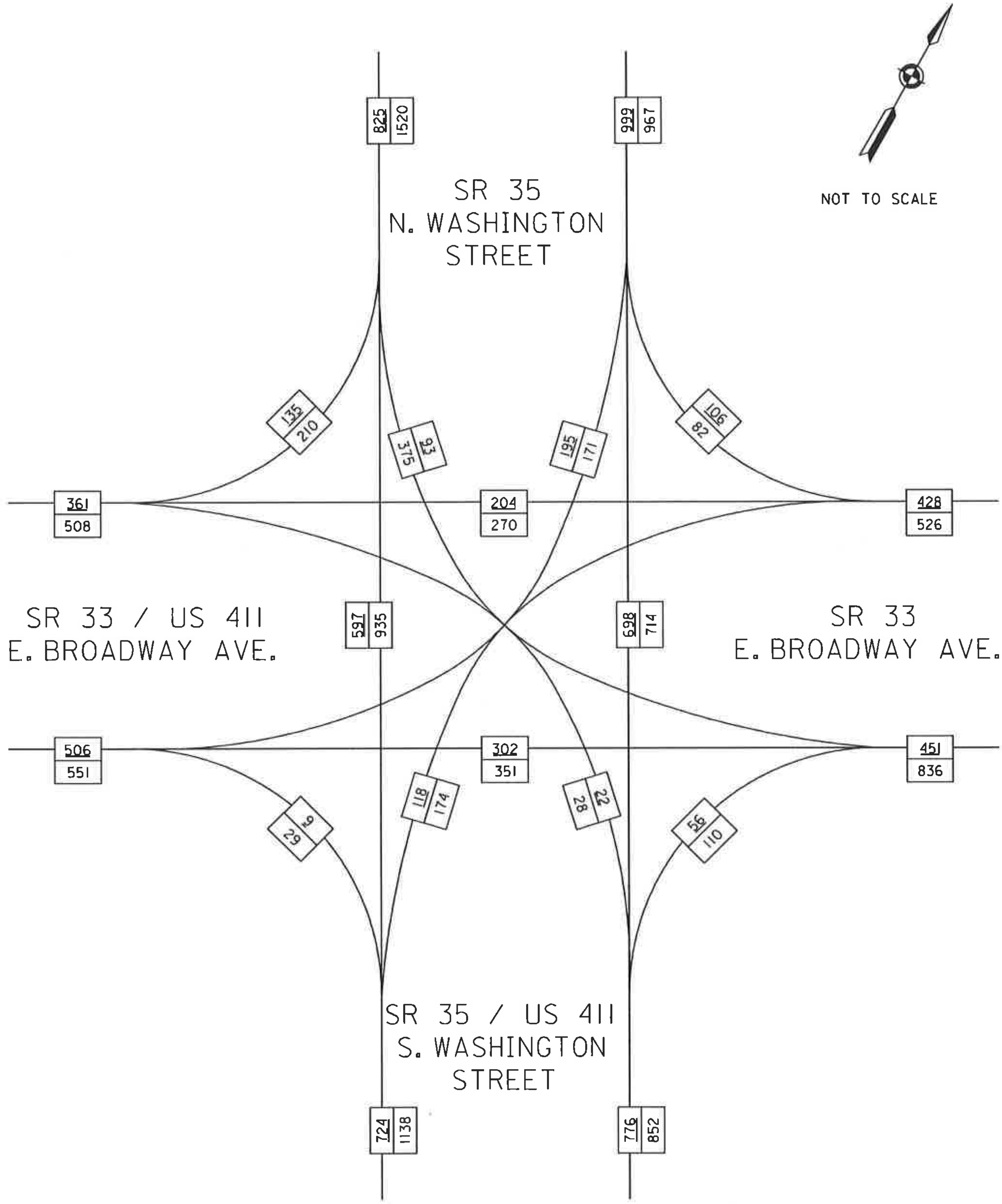
SR 115/US 129 @ SR 35



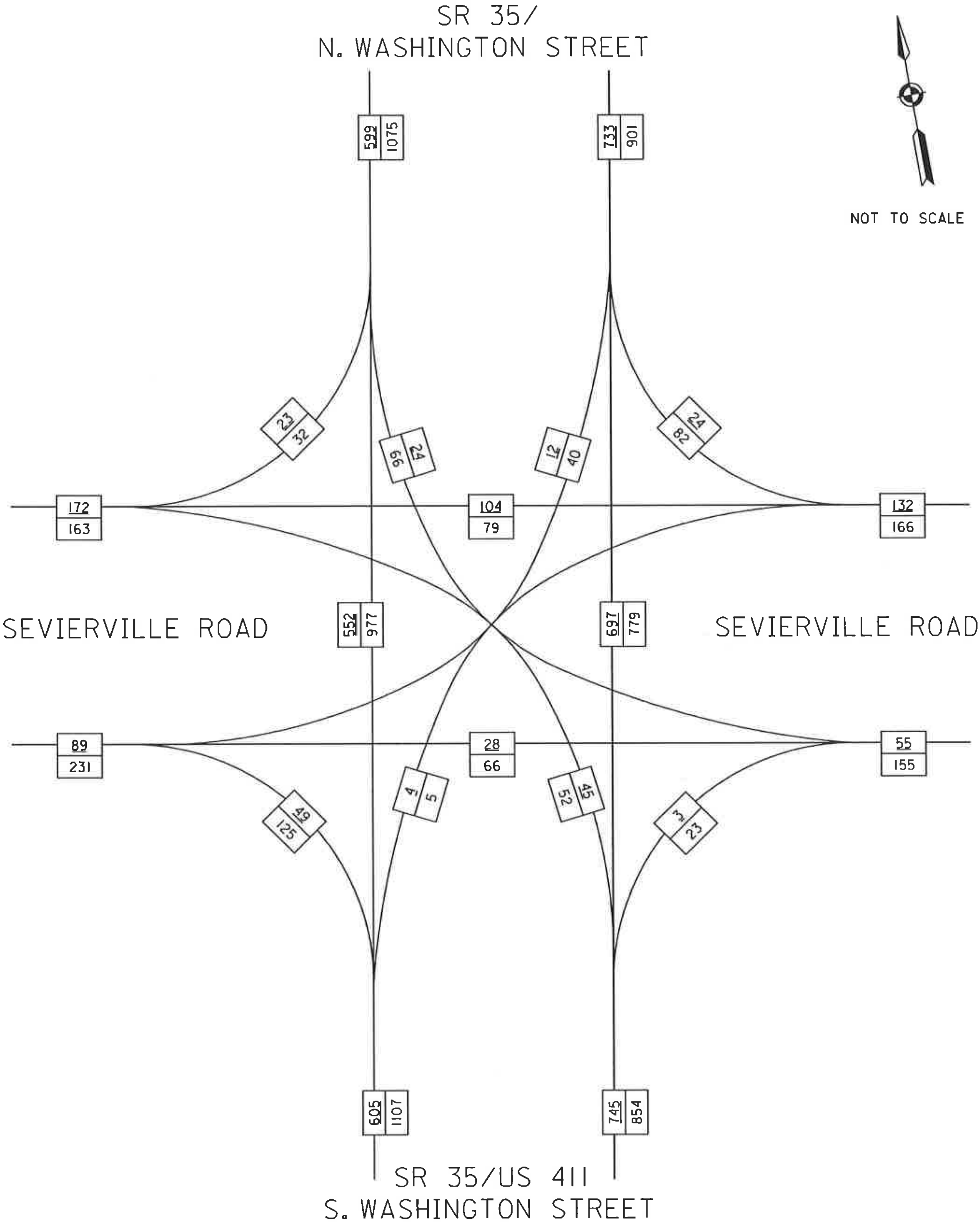
2040 DHV WITH PPE AM / PM	SR 33 @ I-140 / PELLISSIPPI PKWY EXTENSION



2040 DHV WITH PPE AM / PM	SR 33 @ HORN STREET/ WILDWOOD ROAD

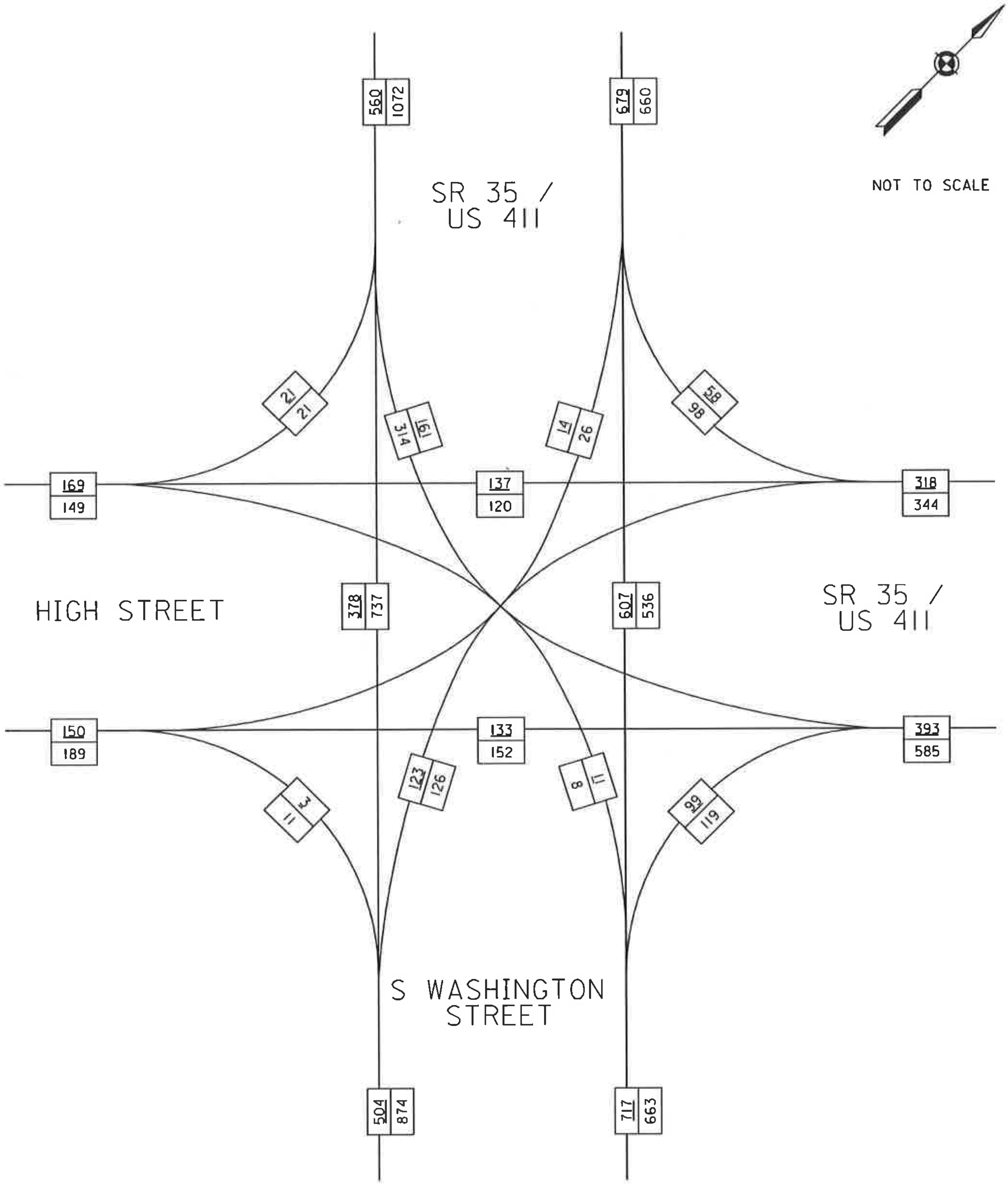


2040 DHV WITH PPE AM / PM	SR 33 @ SR 35



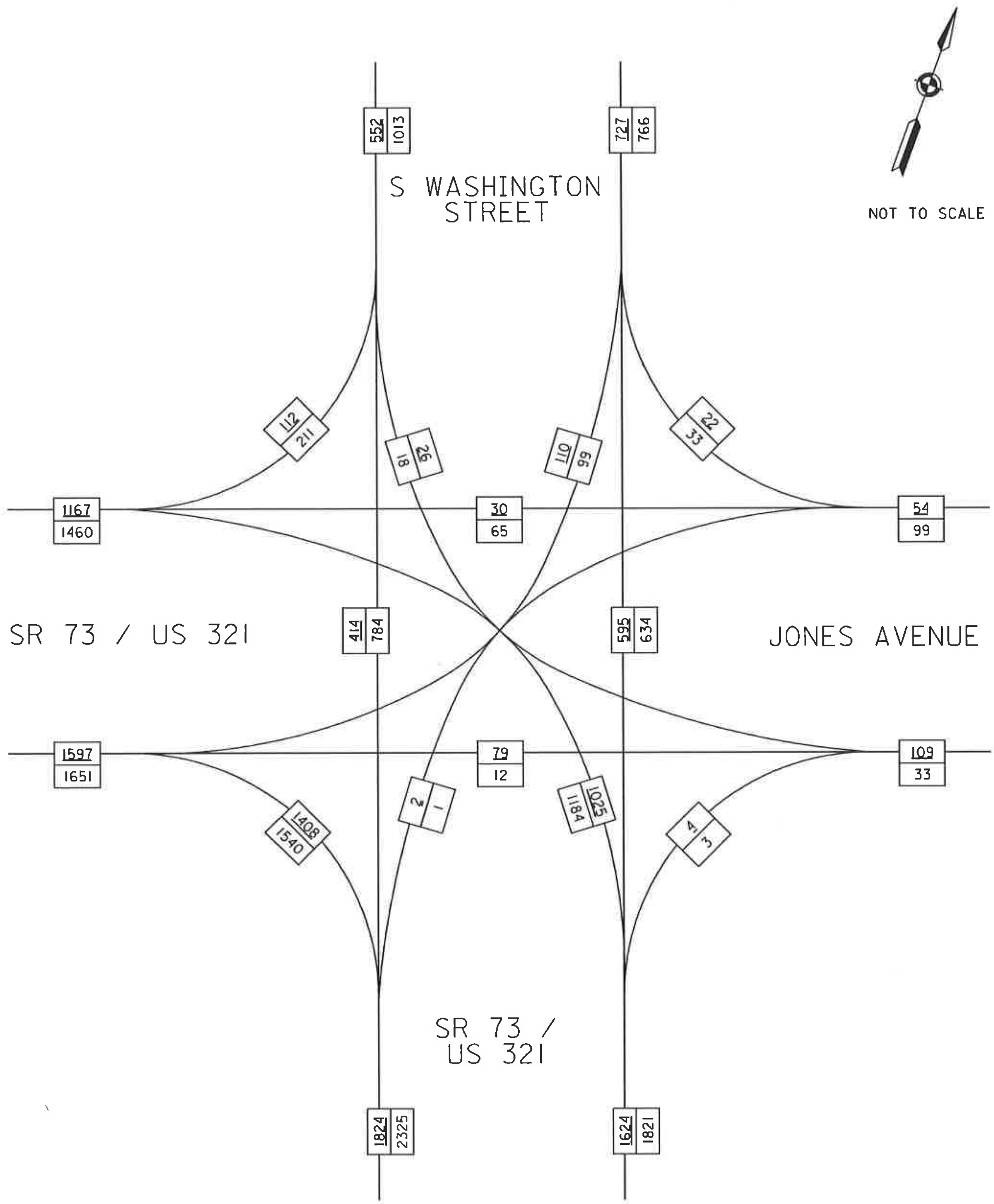
2040 DHV WITH PPE
AM / PM

SEVIERVILLE ROAD @
SR 35/WASHINGTON STREET



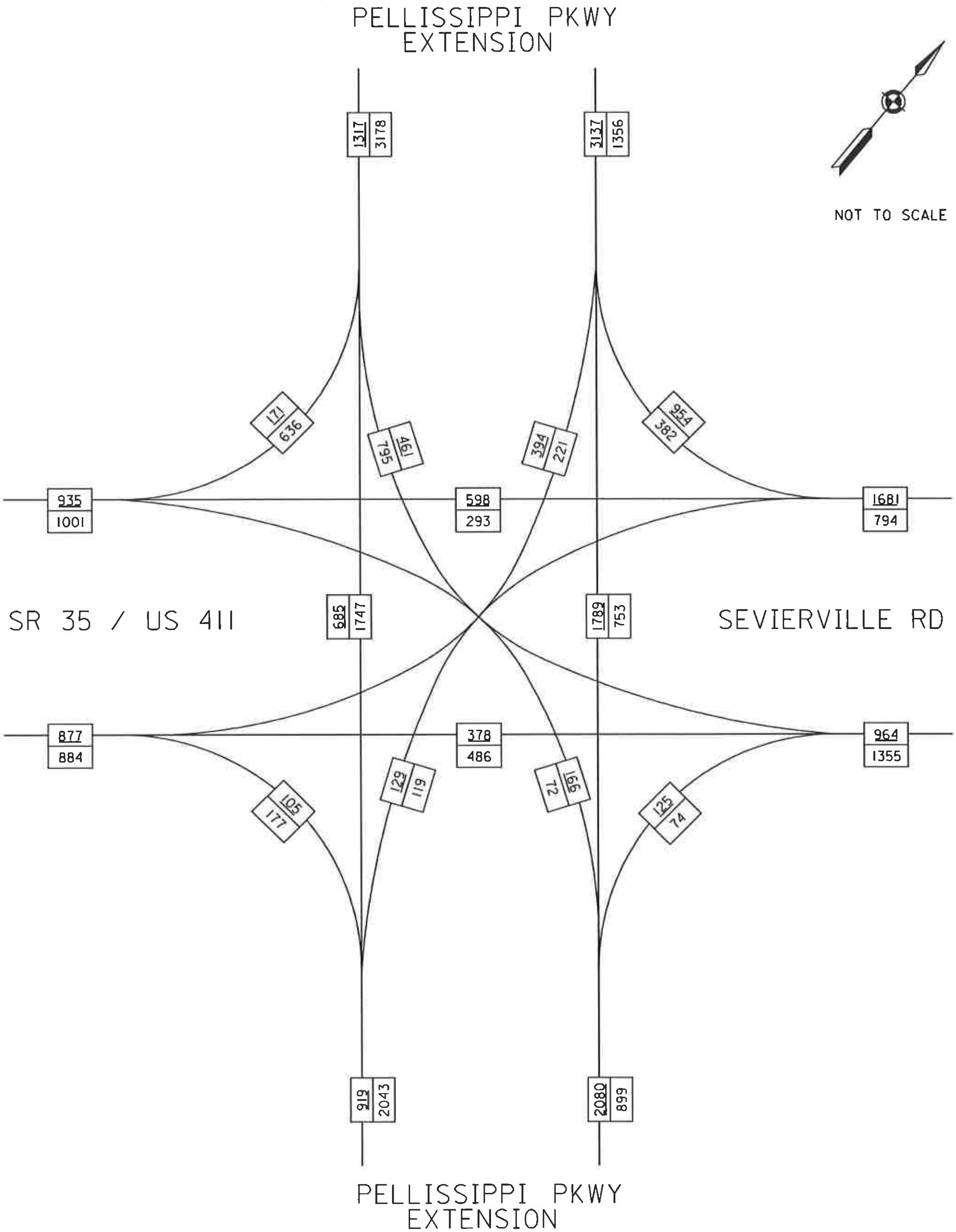
2040 DHV WITH PPE
AM / PM

S WASHINGTON ST / SR 35
@ HIGH ST / SR 35

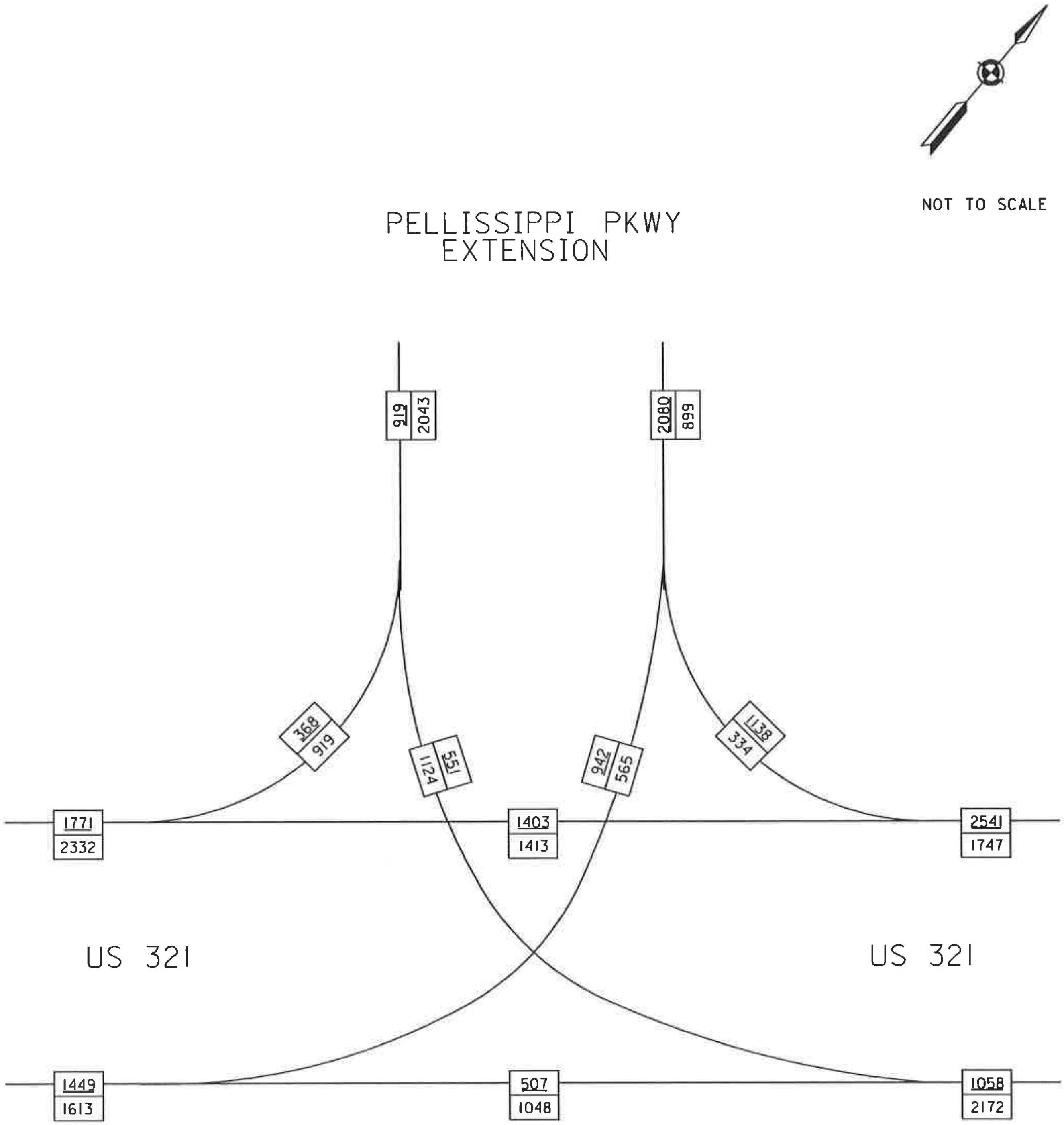


2040 DHV WITH PPE
AM / PM

S WASHINGTON ST
@ SR 73/ US 321

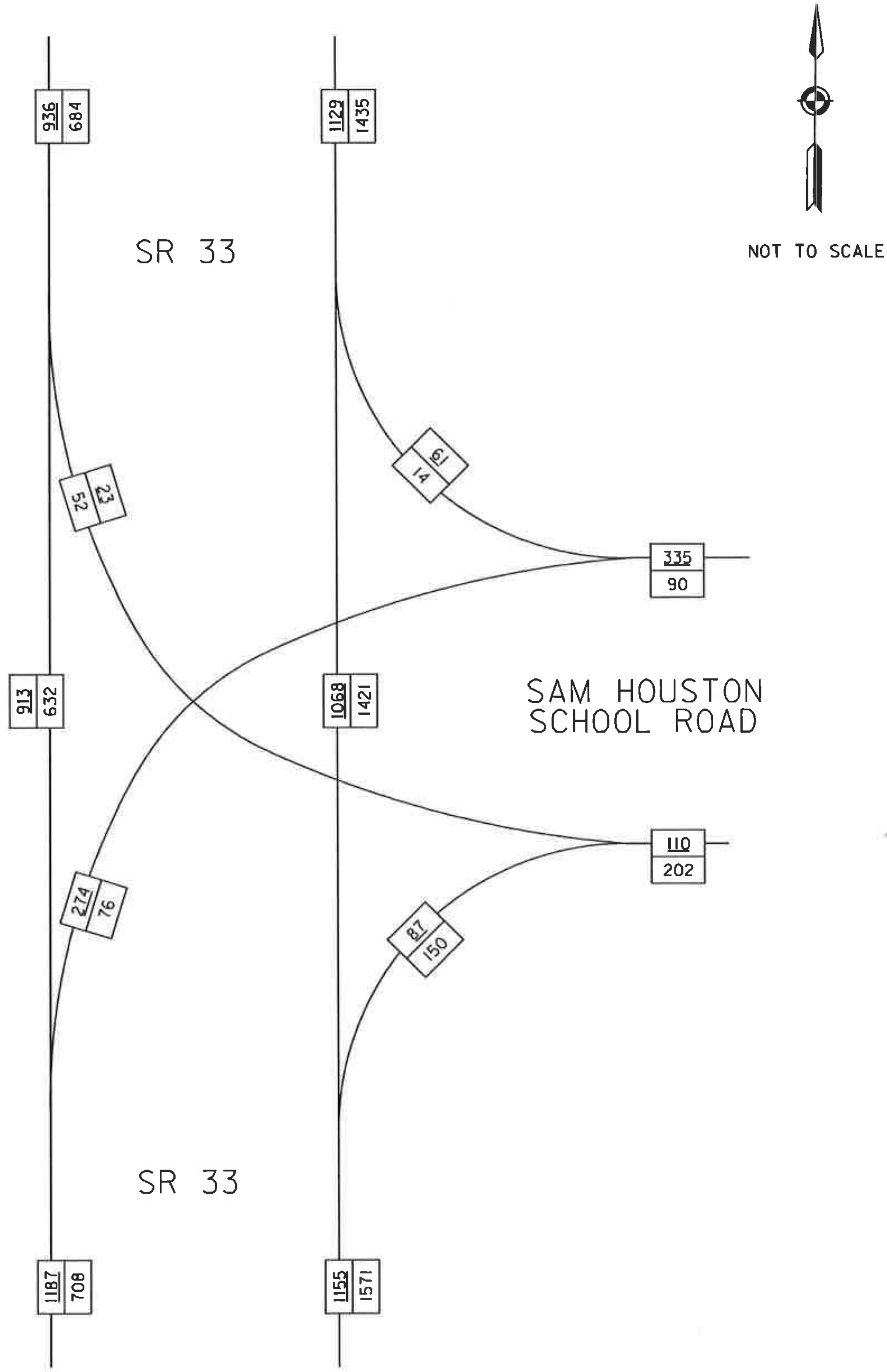


2040 DHV WITH PPE AM / PM	PELLISSIPPI PKWY EXTENSION @ SR 35 / US 411 / SEVIERVILLE RD



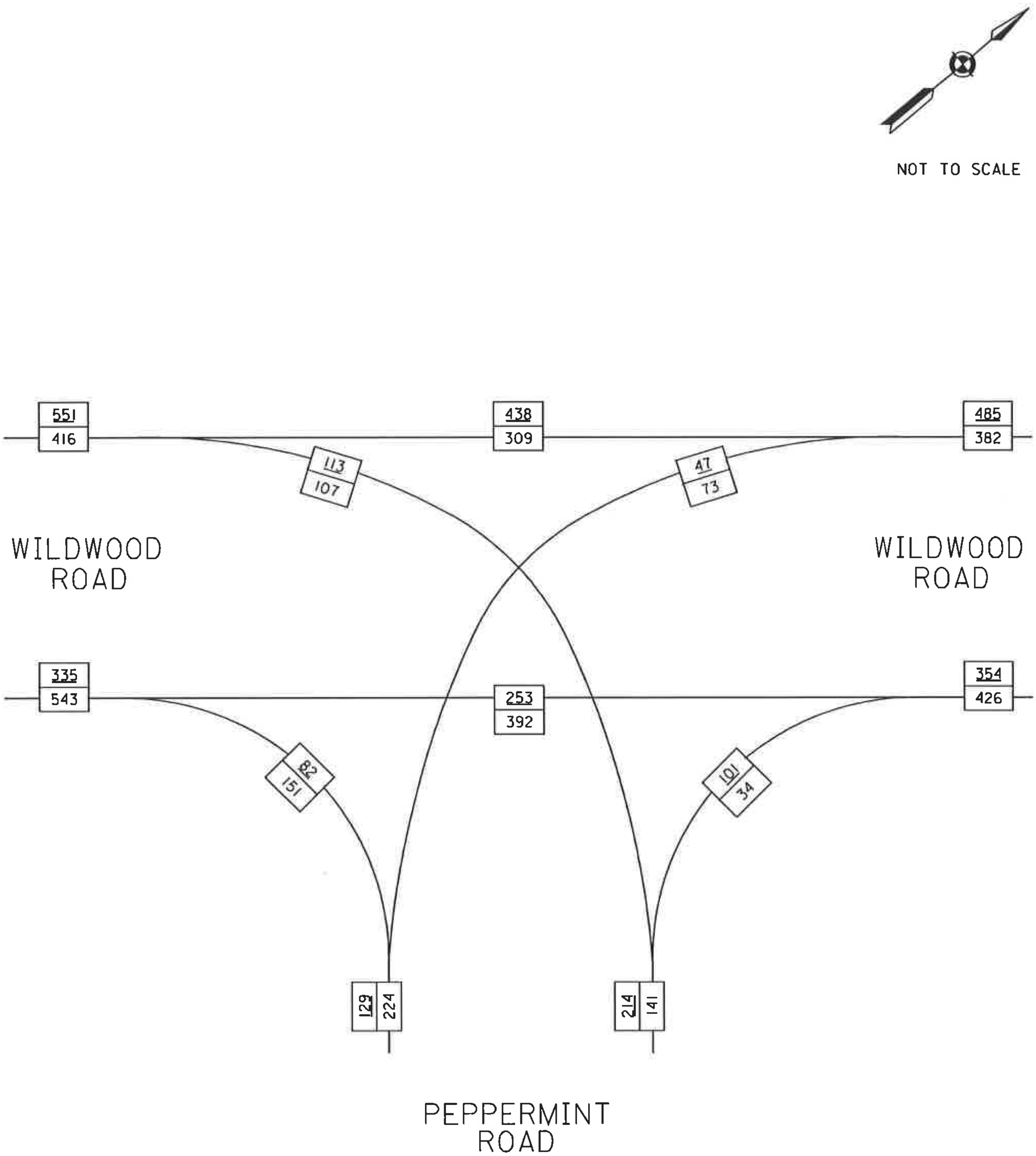
2040 DHV WITH PPE
AM / PM

PELLISSIPPI PKWY EXTENSION @
US 321

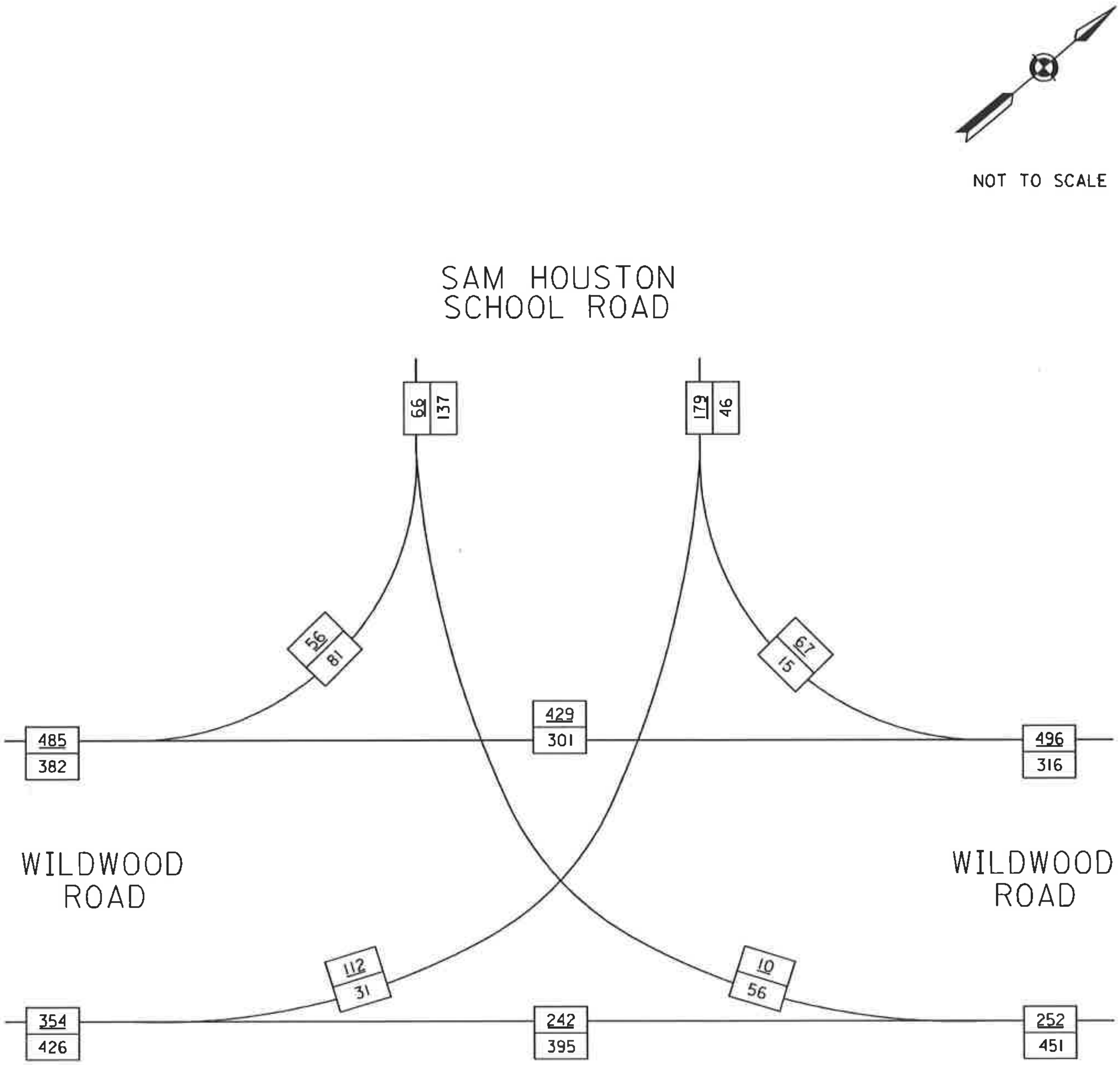


2040 DHV WITH PPE
AM / PM

SR 33 @
SAM HOUSTON SCHOOL ROAD

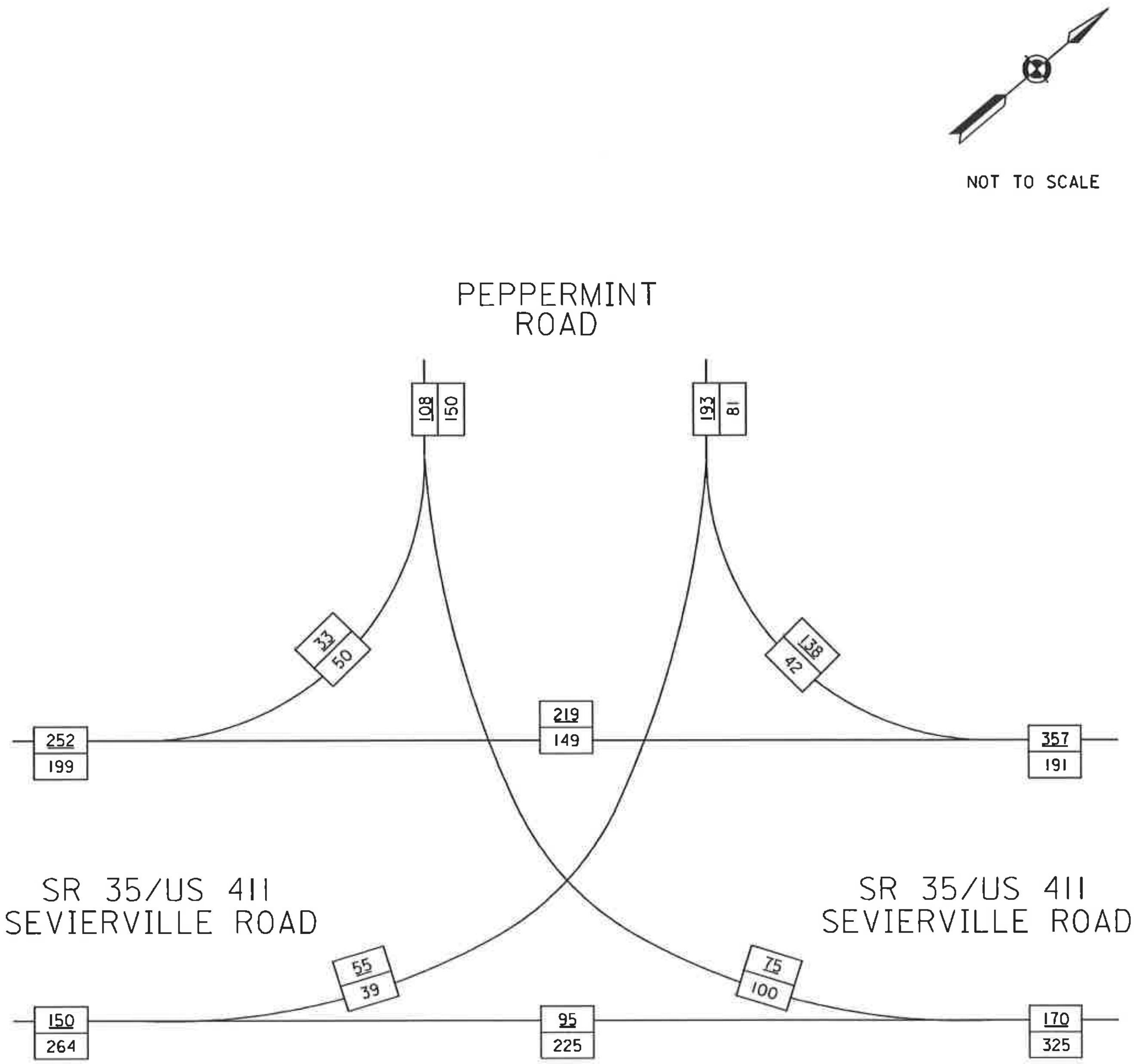


2040 DHV WITH PPE AM / PM	PEPPERMINT ROAD @ WILDWOOD ROAD



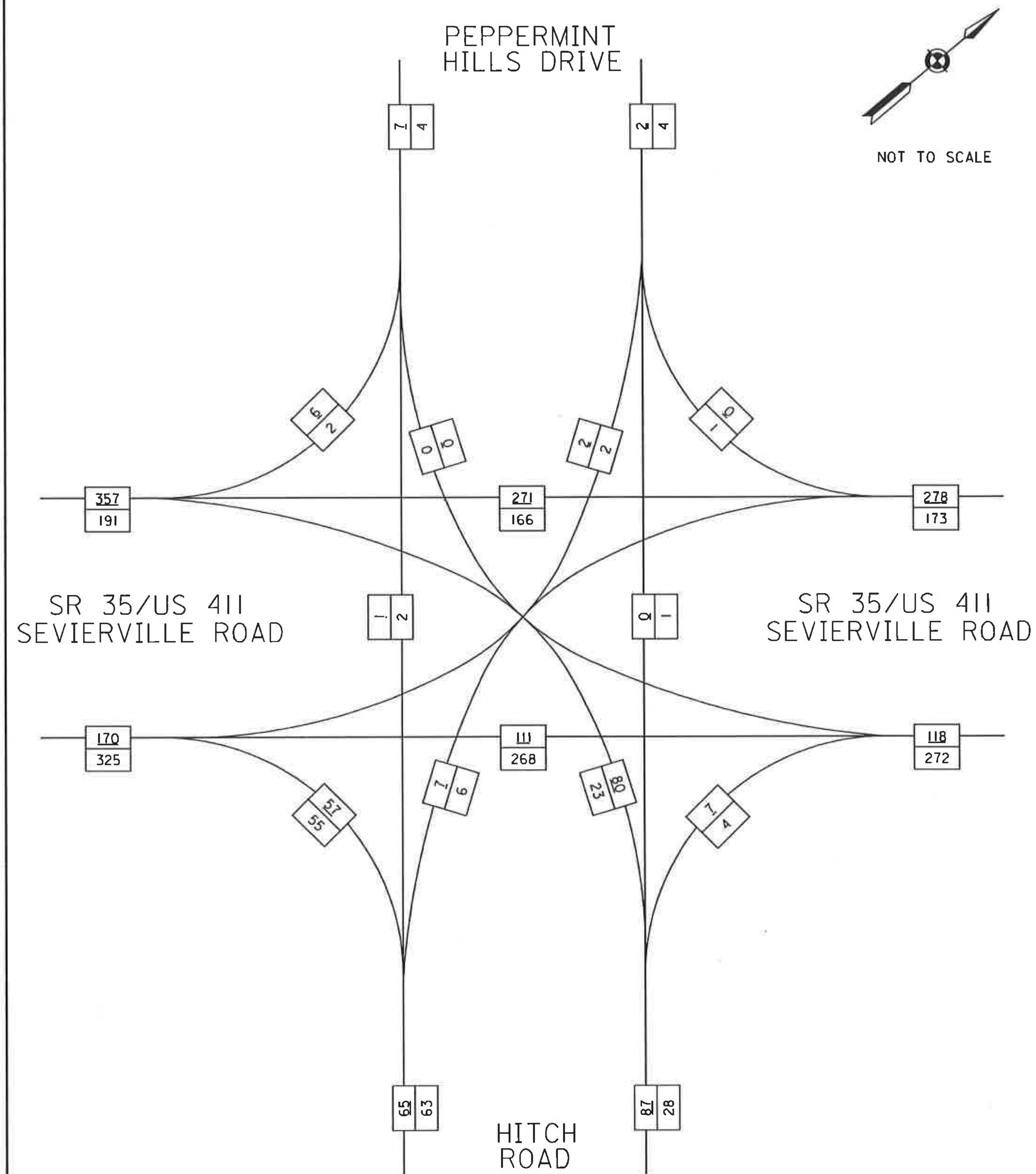
2040 DHV WITH PPE
AM / PM

SAM HOUSTON SCHOOL ROAD @
WILDWOOD ROAD

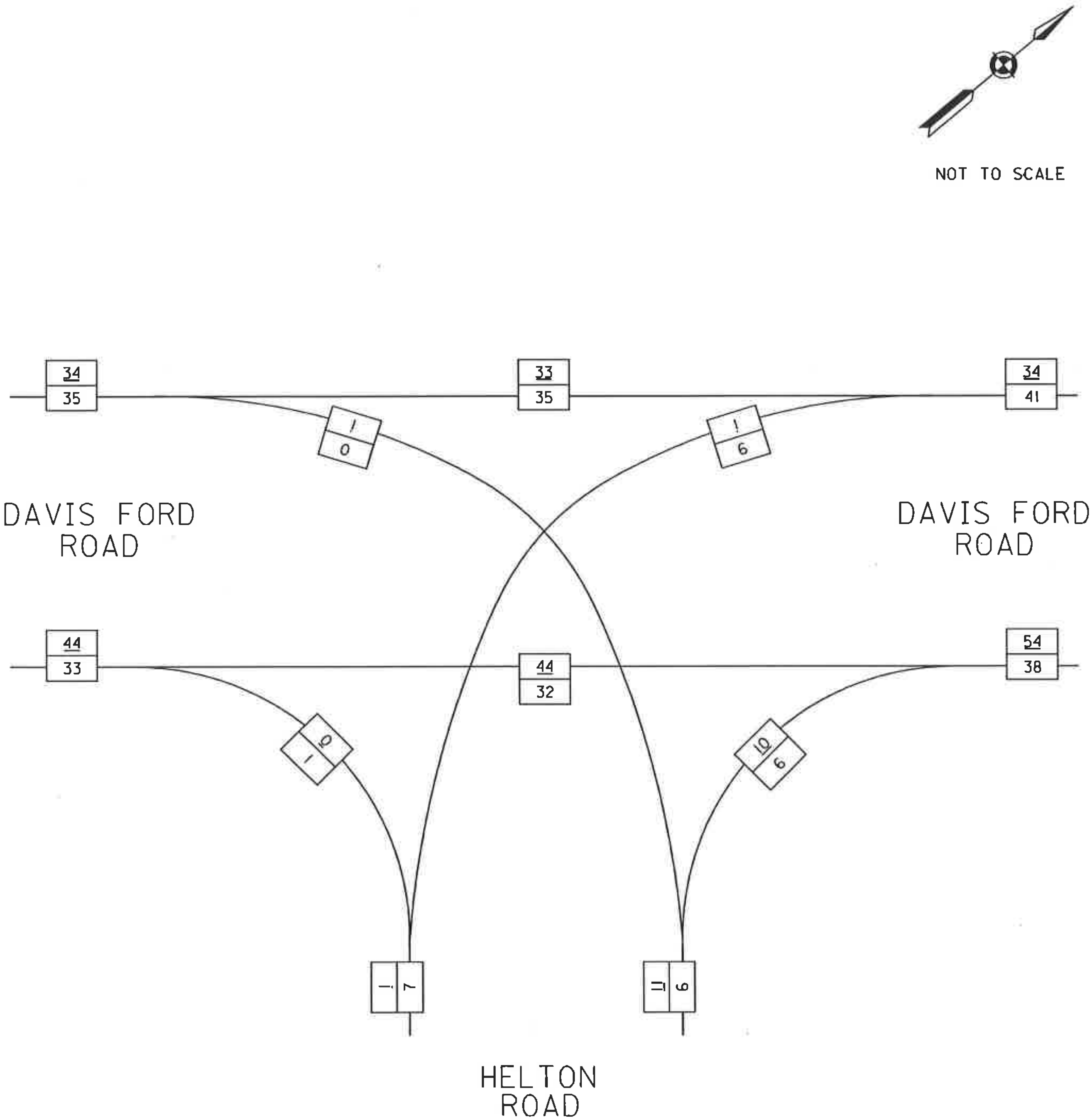


2040 DHV WITH PPE
AM / PM

SR 35/US 411/SEVIERVILLE ROAD @ PEPPERMINT ROAD

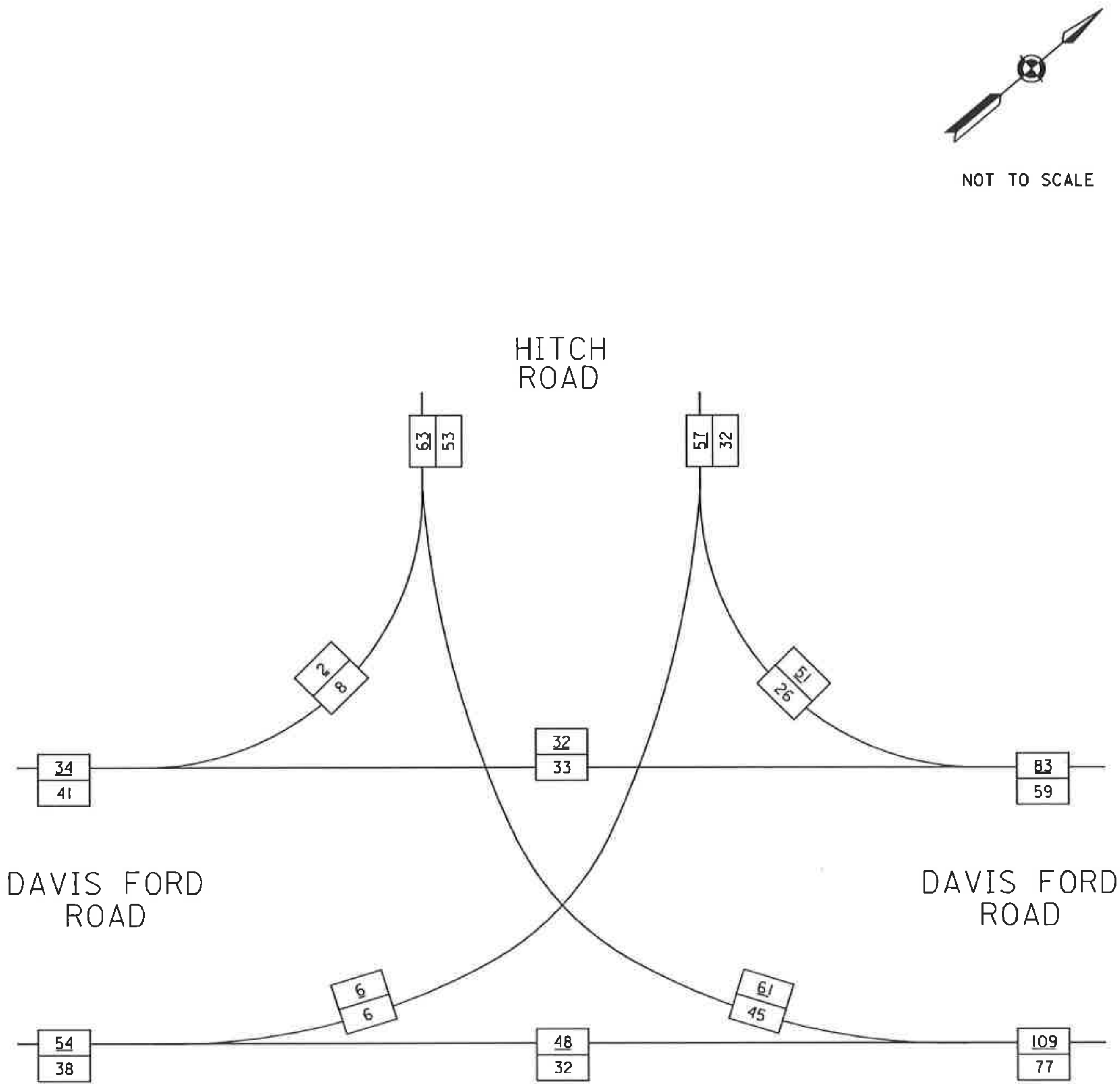


2040 DHV WITH PPE AM / PM	SR 35/US 411/SEVIERVILLE ROAD @ HITCH ROAD/PEPPERMINT HILLS DR



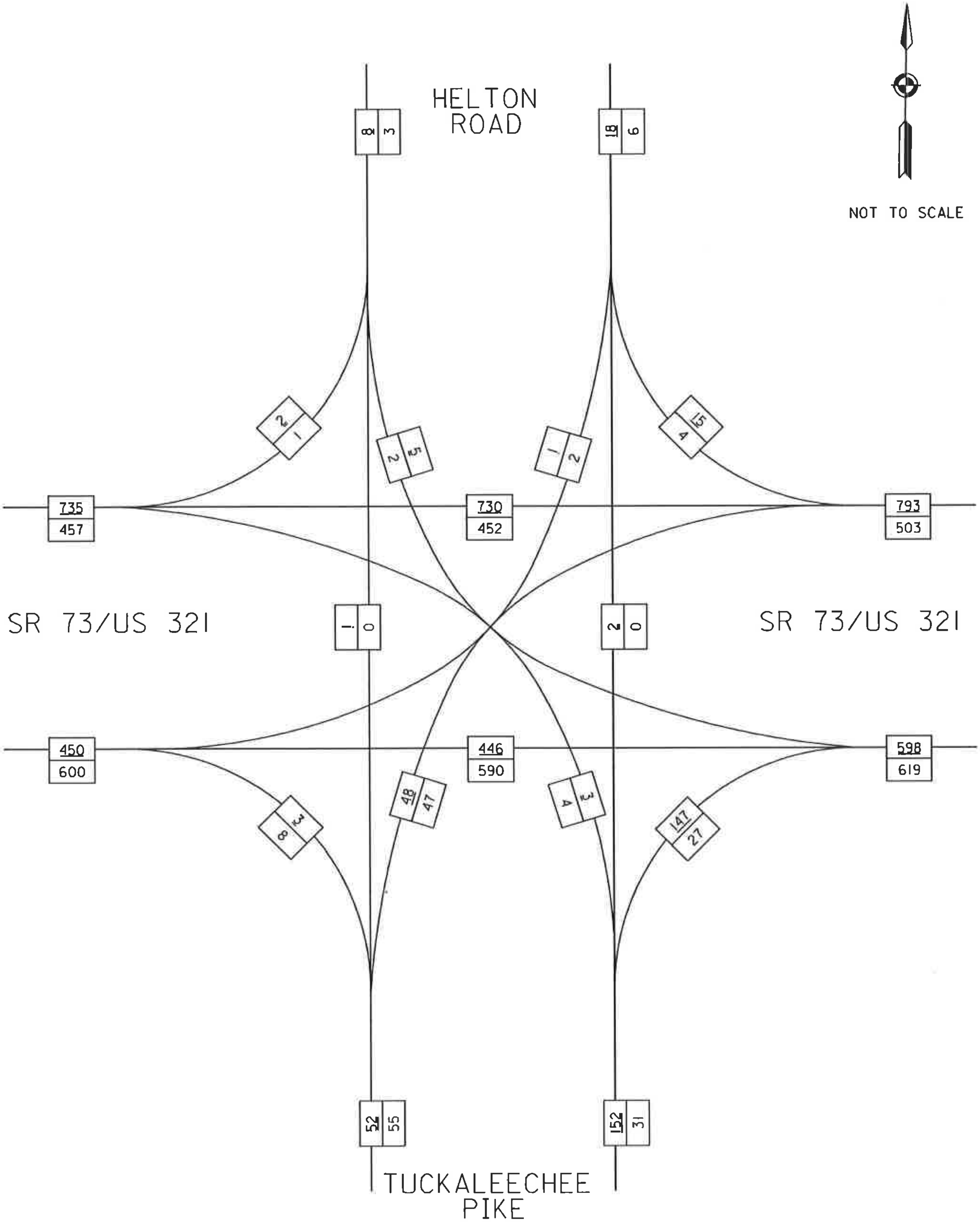
2040 DHV WITH PPE
AM / PM

DAVIS FORD ROAD @ HELTON ROAD



2040 DHV WITH PPE
AM / PM

DAVIS FORD ROAD @ HITCH ROAD



2040 DHV WITH PPE AM / PM	SR 73/US 321 @ HELTON ROAD/TUCKALEECHEE PIKE

SR 162 (PELLISSIPPI PARKWAY EXTENSION)

ADDENDUM TO THE
TRAFFIC OPERATIONS TECHNICAL REPORT

BLOUNT COUNTY, TENNESSEE
P.I.N. 101423.00

Prepared for:

Prepared by:

Parsons Brinckerhoff

Lindsay Walker, PE, PTOE, AICP

February 2014

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AASHTO – American Association of State Highway and Transportation Officials
EIS – Environmental Impact Statement
FHWA – Federal Highway Administration
HCM – Highway Capacity Manual 2010
HCS 2010 – Highway Capacity Software 2010
LOS – Level of Service
NEPA – National Environmental Policy Act
RAH – Relocated Alcoa Highway
TDOT – Tennessee Department of Transportation
TRIMS – Tennessee Roadway Information Management System

1.0 INTRODUCTION

The Tennessee Department of Transportation (TDOT), in cooperation with the Federal Highway Administration (FHWA), is proposing to extend and construct Pellissippi Parkway (Interstate 140 or I-140) from its current terminus at State Route (SR) 33 (Old Knoxville Highway) to SR 73 (US 321 or Lamar Alexander Highway) in Blount County.

TDOT and FHWA have prepared a Draft Environmental Impact Statement (DEIS) in accordance with the National Environmental Policy Act (NEPA) to identify and evaluate the environmental effects of the proposed project and to identify measures to minimize impacts. A traffic operations technical study was prepared in October 2008 and the results of this technical study were incorporated into Chapters 1 and 3 of the DEIS.

Following approval of the DEIS in April 2010, the review period began for agencies and the public. Comments have been received from a number of sources including agencies, the general public, Citizens Against the Pellissippi Parkway Extension, Inc. (CAPPE), City of Alcoa, and the Knoxville Regional Transportation Planning Organization (TPO). A revised traffic report (September 7, 2011) served as an addendum to the original and previously updated Traffic Operations Technical Report and included updates resulting from public and agency comments provided during the DEIS review period.

In 2012, TDOT announced the selection of Build Alternative A as the Preferred Alternative for analysis in the FEIS. In June 2013, TDOT made a minor alignment modification to the Preferred Alternative in the southern portion of the project; the refined alternative is referred to as the Preferred Alternative with West Shift.

Subsequent to the 2011 traffic report update, the Knoxville TPO updated its Regional Travel Demand Model (adopted in June 2013 for horizon year 2034). As a result of the updated model, TDOT determined the need to prepare new traffic forecasts and to conduct a new traffic operations analysis for the Preferred Alternative with West Shift (also referred to in this memorandum as the Preferred Alternative). TDOT contracted with Sain Associates, Inc. to prepare new traffic forecasts for the study area; the results are included in the *Traffic Forecasts Study*, December 23, 2013.

This latest traffic operations report addendum evaluates the No-Build Alternative and the Preferred Alternative and incorporates traffic forecasts developed by Sain Associates, Inc. resulting from the 2013 model update. The revised traffic forecasts are shown in **Figures 1** and **2** on the following pages.

The scenarios evaluated are as follows:

- No-Build (Years 2013, 2020 and 2040)
- Preferred Alternative with West Shift (Years 2020 and 2040)

The following sections provide the updated analysis for these alternatives. For the purposes of the model results, the findings for Preferred Alternative with West Shift would also be the same for the DEIS Alternatives A and C and the previously considered and dismissed Preferred Alternative with East Shift, since the travel demand model is not sensitive enough to determine differences between these four-lane alternatives.

Figure 1: No-Build Forecasted AADT

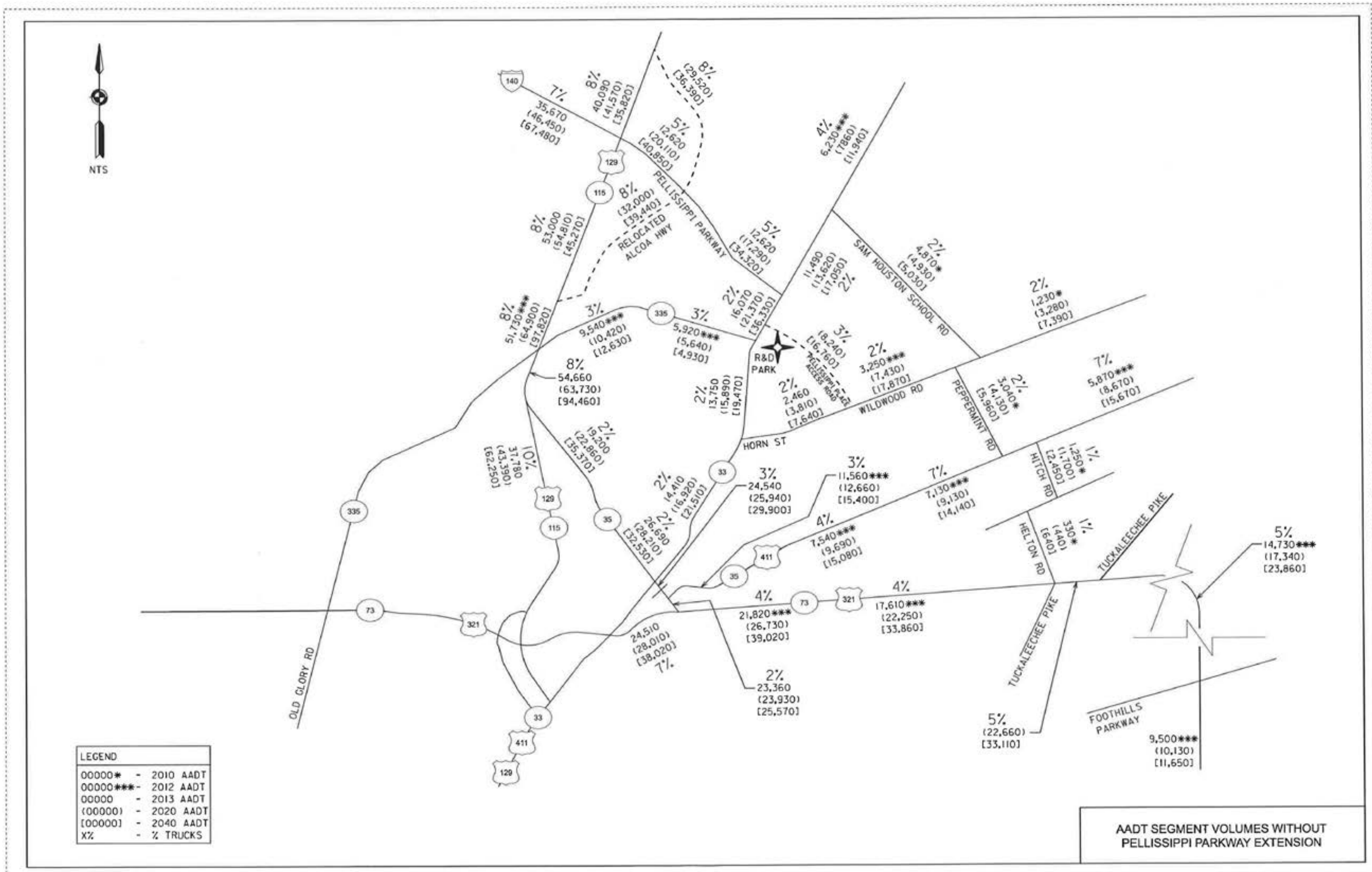
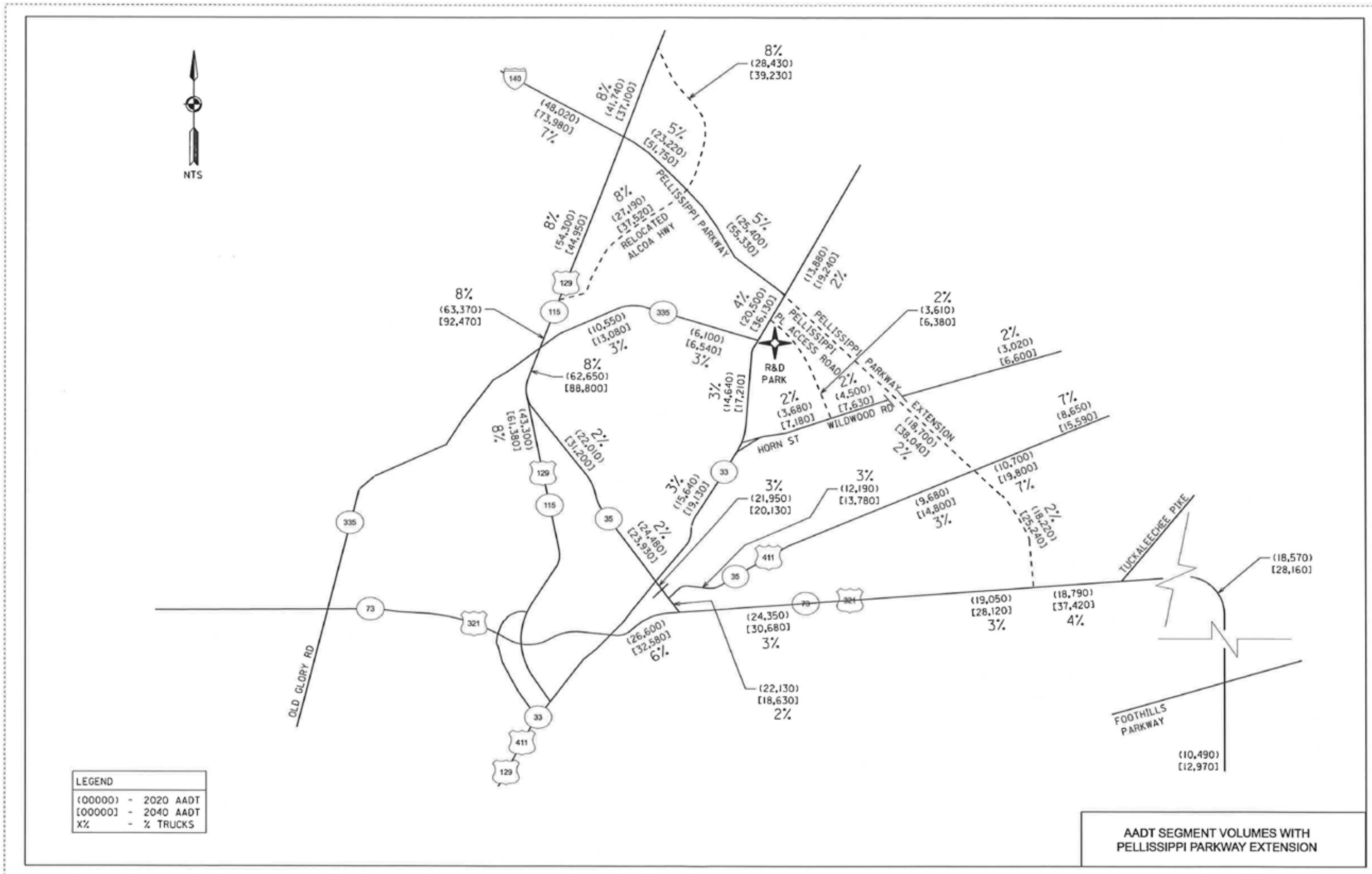


Figure 2: Build Forecasted AADT



2.0 CORRIDOR LEVEL OF SERVICE ANALYSIS

To evaluate the effects of the project on traffic in the study area, the traffic operations analysis including a Level of Service (LOS) analysis was conducted at the corridor level (roadway sections) for the No-Build Alternative and Preferred Alternative for the years 2020 and 2040. Existing (2013) LOS was determined for comparison purposes. Traffic operations analysis was conducted for Design Hour Volume (DHV). The methodology and updated results for the corridor level traffic analysis are presented in the following subsections. Section 3.0 that follows presents the updated results for the traffic analysis at key intersections.

2.1 Study Area Roadways

The following roadways were identified as either routes along proposed interchanges with an extension of Pellissippi Parkway or as routes currently used in lieu of the proposed Pellissippi Parkway Extension.

- East Broadway / Old Knoxville Highway (SR 33)
- US 411 (SR 35)
- Lamar Alexander Parkway (SR 73 / US 321)
- Alcoa Highway (SR 115 / US 129)
- Hall Road (SR 35)
- Washington Street (SR 35)
- Wildwood Road
- Sam Houston School Road
- Peppermint Road
- Hitch Road
- Helton Road

Each of these roadways has been evaluated for all analysis years to determine the effects of the proposed project on existing and future traffic operations in the vicinity of the project.

The proposed Relocated Alcoa Highway (RAH), which would extend east of the existing Alcoa Highway (SR 115 / US 129) generally between Cusick Road and south of the Blount / Knox County line, is included in this analysis. It is part of the 2020 and 2040 No-Build and Preferred Alternative analysis since it is included in the region's long range transportation plan, *Regional Mobility Plan 2040,* as a constrained roadway project for the period 2016-2019.

The proposed Southern Loop was originally included in the 2035 Future Build Analysis for the previous iteration of traffic analysis. The Southern Loop was not included in the *Regional Mobility Plan 2040* and therefore is not considered as part of the traffic operations analysis for this update.

2.2 Methodology

LOS is a qualitative measure of traffic conflicts, delay, driver discomfort, and congestion. LOS is described according to a letter rating system ranging from LOS A (free flow, minimal or no delays – best conditions) to LOS F (stop and go conditions, very long delays – worst conditions). There are several ways to estimate LOS depending on the type of facility. The analysis methodologies used for this study are described below.

It should be noted that since the last update to the project's traffic operations report, the Highway Capacity Software (HCS) has undergone a substantial update to the operating system which is based on the updates to the *Highway Capacity Manual 2010* (HCM 2010). The current version is HCS 2010 which replaces the HCS Plus version used for the previous analysis. Any comparisons to previous traffic operation evaluations should note that there are some differences in the analysis methodology and cannot be directly compared for a magnitude in change.

<u>Two-Lane Highway Analysis</u>

The HCS 2010 two-lane road analysis software module based on the HCM 2010 was used to evaluate two-lane highways (e.g., SR 33, US 411, Wildwood Road, Sam Houston School Road, Peppermint Road, Hitch Road, and Helton Road). For this method, there are three classes of roadways: Class I highways that include higher speed arterials and daily commuter routes; Class II highways that include lower speed collector roadways and roads primarily designed to provide access; and Class III highways that serve moderately developed areas. The two-lane roadways in this study area are either Class I or Class III; there are no identified Class II roadways in the study area.

As SR 33 and US 411 are major state and nationally designated routes in this section of Tennessee, they were assumed to be Class I highways.

As they currently exist, Wildwood Road, Sam Houston School Road, Peppermint Road, Hitch Road, and Helton Road, were assumed to be Class III highways based on their lower speeds limits (between 25 mph and 45 mph) and the fact that they are within a moderately developed area.

LOS for Class I highways is based on the estimated average travel speeds and percent time vehicles spend following other vehicles. For Class II highways LOS is based on the percent time vehicles spend following other vehicles only. The LOS criteria for two-lane highways is shown in **Table 1.**

Table 1: LOS Criteria for Two-Lane Highways

LOS	Class I Highways Percent Time Spent Following (%)	Class I Highways Average Travel Speed (mi/h)	Class II Highways Percent Time Spent Following (%)	Class III Highways Percent of Free Flow Speed (%)
A	≤ 35	>55	≤ 40	>91.7
B	>35 – 50	>50 – 55	>40 – 55	>83.3 – 91.7
C	>50 – 65	>45 – 50	>55 – 70	>75.0 – 83.3
D	>65 – 80	>40 – 45	>70 – 85	>66.7 – 75.0
E	>80	≤40	>85	≤66.7
F	LOS F applies whenever the flow rate exceeds the capacity*			

Source: *Highway Capacity Manual 2010*
*Capacity is 3,200 passenger cars per hour (pc/h) for the two-way flow rate

LOS D is the threshold for desirable traffic operations in this study. According to the *AASHTO-Geometric Design of Highways and Streets* reference manual, a LOS D threshold for freeways and arterials can be an appropriate threshold in developed areas. While the study area is not currently a heavily developed, urbanized area, substantial development pressures may be expected in the future due to the population growth occurring in Blount County. This also includes the consideration of on-going and future development such as the Pellissippi Place research and development park currently under construction east of SR 33 in the vicinity of the proposed Pellissippi Parkway Extension. Therefore, as most of the study area fits this criterion (or will in the future) it is acceptable practice to use this as the traffic operations threshold. LOS below this threshold (i.e., LOS E or F) is noted as undesirable and warranting improvement.

<u>Multilane Highway Analysis</u>

To analyze traffic operations for the four-lane or greater highway sections (US 129, SR 35, US 321, and the RAH) the HCS 2010 multilane analysis module was used. This is based on the HCM 2010 methodology. For each section, the estimated travel speed and the resulting LOS was calculated.
LOS for multilane highway sections is based on density in terms of passenger cars per mile per lane (pc/mi/ln) as shown in **Table 2**. Density is used to define LOS because it is an indicator of freedom to maneuver within the traffic stream and the proximity to other vehicles. Speed in terms of mean passenger-car speed and volume-to-capacity (v/c) ratios are interrelated with density and can be used to characterize a multilane highway segment.

Similar to the two-lane highway analysis, LOS D is the lowest threshold for desirable traffic operations used in this study. For multilane highways, LOS D corresponds to a density between 26 and 35 pc/mi/ln. Refer to the Chapter 14, Volume 2 of HCM 2010 for more specific information.

Table 2: LOS Criteria for Multilane Highways

LOS	Density Range (pc/mi/ln)
A	0 – 11
B	> 11 – 18
C	> 18 – 26
D	>26 – 35
E (55 mph)	> 35 – 41
E (45 mph)	> 35 – 45
F	Demand exceeds capacity*
F (55 mph)	> 41
F (45 mph)	> 45

Source: *Highway Capacity Manual 2010*
*Capacity depends on Free Flow Speed (FFS) & ranges from 1,900 to 2,200 pc/h/ln

Freeway Analysis

To analyze peak hour traffic operations for Pellissippi Parkway (I-140), the HCS 2010 Freeways analysis package was used which is also based on the HCM 2010 methodology. For each section of I-140, the estimated travel speed and the resulting LOS was calculated. LOS for freeway sections is also based on density similar to the ranges used for multilane highways (refer to Table 2). Again, LOS D is the threshold for desirable traffic operations used in this study. For freeways, a LOS D corresponds to a density between 26 and 35 passenger cars per mile per lane. Refer to the Chapter 11, Volume 2 of HCM 2010 for more specific information.

2.3 No-Build Corridor LOS Results

The 2013 average annual daily traffic volumes and forecasted traffic volumes (2020 and 2040) for the No-Build Alternative were provided as part of the 2013 *Traffic Forecast Study* prepared for this project by Sain Associates, Inc. Also included in the *Traffic Forecast Study* were truck percentages for all analysis years. Design Hour Volume (DHV) for highway segments were calculated using a K-factor[1] obtained from TDOT's Tennessee Roadway Information Management System (TRIMS) Blount County Traffic Database. Functional classification, median type, directional split, current lane widths, shoulder widths, percent passing, speed limit, and access points per mile were also obtained from TRIMS as well as from observations of roadways during field visits.

The RAH (also referred to as Alcoa Highway Bypass) is shown for the future years of 2020 and 2040. For RAH, several geometric assumptions were made based on initial design plans and the current operating characteristics of existing Alcoa Highway (US 129). These assumptions include an assumed K-factor of 0.100, a 55 mph posted speed, four access points per mile, three lanes per direction, and a 55/45 directional percentage split of traffic. The percent trucks were provided in the traffic forecast.

Generally, most highway characteristics were available through TRIMS for the non state-maintained roads of Sam Houston School Road, Peppermint Road, Hitch Road, and Helton Roads. Several assumptions were made for these roadways for the operational analysis including:

- Class III Roadway
- No passing zones
- Eight (8) access points per mile
- Zero (0) percent recreational vehicles

The calculated LOS for each highway segment is shown on the following tables, **Tables 3** through **5** and on **Figures 3** through **5**. It should be noted that sections with an associated speed less than 45 mph were not analyzed as the HCS 2010 software will not calculate a LOS if the free-flow speed (conservatively assumed to be the posted speed limit for the purpose of analysis) is less than 45 mph. Typically these sections are located in an urbanized area where traffic signals dictate the traffic operations. Therefore, to

[1] The K-factor is used to compute design hour volumes (DHV) and is based on the 30th highest hourly volume of the year.

determine the operations along these sections please refer to the intersection traffic analysis provided in Section 3.0 of this report.

The shading on the tables and figures indicates acceptable versus poor operating conditions. Green shading was used to indicate acceptable traffic operations (LOS D or better) with red used to indicate poor traffic operations (LOS E or F). Gray shading indicates that the LOS could not be calculated due to the inability of these software modules to determine the corridor LOS for urban streets with speeds less than 45 mph.

Table 3: 2013 Existing Corridor LOS

Route	Section	Begin Milepoint	End Milepoint	Section Length (miles)	2013 ADT	K-Factor	2013 DHV	Posted Speed Limit (mph)	% Trucks and Buses	Estimated Travel Speed (MPH)	% Time Spent Following	Density (pc/mi/ln)	LOS
Wildwood Road	1	E. Broadway/Old Knoxville Hwy (SR 33) MP 0.000	Reservoir Rd MP 1.309	1.31	2,460	0.110	271	45	2.0%	34.1	54.7	N/A	B
	2	Reservoir Rd MP 1.309	Sam Houston School Rd MP 2.650	1.34	3,250	0.110	358	45	2.0%	32.8	59.7	N/A	B
	3	Sam Houston School Rd MP 2.650	End of Study Area MP 4.740	2.09	1,230	0.110	135	45	2.0%	36.4	44.4	N/A	A
Pellissippi Parkway	1	Topside Rd MP 0.810	Alcoa Hwy (SR 115/US 129) MP 2.240	1.43	35,670	0.120	4280	60	7.0%	60.0	N/A	21.9	C
	2	Alcoa Hwy (SR 115/US 129) MP 2.240	Relocated Alcoa Highway MP 3.240	1.00	12,620	0.120	1514	60	5.0%	60.0	N/A	7.5	A
	3	Relocated Alcoa Highway MP 3.240	E. Broadway/Old Knoxville Hwy (SR 33) MP 4.710	1.47	12,620	0.130	1641	60	5.0%	60.0	N/A	8.2	A
Lamar Alexander Parkway (SR 73 / US 321)	3	E. Broadway/Old Knoxville Hwy (SR 33) MP 11.650	Jones Ave MP 12.526	0.87	24,510	0.100	2451	40	7.0%				
	4	Jones Ave MP 12.520	Merritt Rd MP 13.980	1.46	21,820	0.100	2182	50	4.0%	50.0	N/A	16.7	B
	5	Merritt Rd MP 13.980	Tuckaleechee Pk MP 17.020	3.04	17,610	0.100	1761	50	4.0%	50.0	N/A	12.6	B
	6	Tuckaleechee Pk MP 17.020	Melrose Station Rd MP 20.020	3.00	14,730	0.100	1473	55	5.0%	55.0	N/A	8.9	A
	7	Melrose Station Rd MP 20.020	Foothills Pkwy MP 22.400	2.38	9,500	0.100	950	55	5.0%	55.0	N/A	5.8	A
Hall Road (SR 35)	1	Alcoa Hwy (SR 115/US 129) MP 0.000	Bessemer St MP 1.520	1.52	19,200	0.110	2112	45	2.0%	45.0	N/A	15.0	B
	2	Bessemer St MP 1.520	E. Broadway/Old Knoxville Hwy (SR 33) MP 2.590	1.07	26,690	0.100	2669	35	2.0%				
Washington Street (SR 35)	1	E. Broadway/Old Knoxville Hwy (SR 33) MP 2.590	US 411 (SR 35) MP 2.820	0.23	25,540	0.100	2554	30	3.0%				
	2	US 411 (SR 35) MP 0.000	Lamar Alexander Pkwy (SR 73/US 321) MP 0.160	0.16	23,360	0.100	2336	30	2.0%				
US 411 (SR 35)	1	Washington St (SR 35) MP 2.820	S. Everett High Rd MP 3.690	0.87	11,560	0.100	1156	40	3.0%				
	2	S. Everett High Rd MP 3.690	Westfield Dr 4.527	0.84	7,540	0.100	754	45	4.0%	24.2	73.4	N/A	E
	3	Westfield Dr 4.527	Hitch Rd 7.254	2.73	7,130	0.110	784	45	7.0%	26.4	74.4	N/A	E
	4	Hitch Rd 7.254	End of Study Area 7.990	0.74	5,870	0.110	646	45	7.0%	27.2	71.3	N/A	E

Table 3: 2013 Existing Corridor LOS (cont.)

Route	Section	Begin Milepoint	End Milepoint	Section Length (miles)	2013 ADT	K-Factor	2013 DHV	Posted Speed Limit (mph)	% Trucks and Buses	Estimated Travel Speed (MPH)	% Time Spent Following	Density (pc/mi/ln)	LOS
E. Broadway / Old Knoxville Highway (SR 33)	3	Hall Rd MP 12.340	Wildwood Rd MP 14.206	1.87	14,410	0.100	1441	30	2.0%				
	4	Wildwood Rd MP 14.206	Hunt Rd MP 15.470	1.26	13,750	0.100	1375	40	2.0%				
	5	Hunt Rd MP 15.470	Pellissippi Pky MP 15.920	0.45	16,070	0.110	1768	40	2.0%				
	6	Pellissippi Pky MP 15.920	Sam Houston School Rd MP 16.370	0.45	11,490	0.130	1494	40	2.0%				
	7	Sam Houston School Rd MP 16.370	County Line MP 20.660	4.29	6,230	0.140	872	50	4.0%	34.7	77.1	N/A	E
Alcoa Highway (SR 115 / US 129)	3	Louisville Rd (MP 13.020)	Hall Rd (SR 35) MP 14.280	1.26	37,780	0.110	4156	55	10.0%	54.8	N/A	27.1	D
	4	Hall Rd (SR 35) MP 14.280	Hunt Rd MP 15.020	0.74	54,660	0.110	6013	55	8.0%	51.3	N/A	40.9	E
	5	Hunt Rd MP 15.020	Cusick Rd MP 16.000	0.98	51,730	0.110	5690	50	8.0%	*	N/A	*	F
	6	Cusick Rd MP 16.000	Pellissippi Pky MP 17.660	2.64	53,000	0.110	5830	50	8.0%	*	N/A	*	F
	7	Pellissippi Pky MP 17.660	County Line MP 20.400	2.74	40,090	0.110	4410	55	8.0%	50.0	N/A	28.0	D
Sam Houston	1	SR 33 MP 0.000	Wildwood Rd MP 2.650	2.65	4,870	0.160	779	45	2.0%	31.1	72.1	N/A	C
Peppermint Road	1	Wildwood Rd MP 0.000	Sevierville Rd MP 1.100	1.10	3,040	0.130	395	35	2.0%	28.3	61.7	N/A	C
Hitch Road	1	Sevierville Rd MP 1.202	Davis Ford Rd MP 0.000	1.20	1,250	0.150	188	25	1.0%	26.4	48.6	N/A	B
Helton Road	1	Davis Ford Rd MP 0.875	Lamar Alexander Pkwy MP 0.000	0.88	330	0.150	50	25	1.0%	28.3	35.0	N/A	A

Table 4: 2020 No-Build Corridor LOS

Route	Section	Begin Milepoint	End Milepoint	Section Length (miles)	2020 ADT	K-Factor	2020 DHV	Posted Speed Limit (mph)	% Trucks and Buses	Estimated Travel Speed (MPH)	% Time Spent Following	Density (pc/mi/ln)	LOS
Wildwood Road	1	E. Broadway/Old Knoxville Hwy (SR 33) MP 0.000	Reservoir Rd MP 1.309	1.31	3,810	0.110	419	45	2.0%	32.4	64.0	N/A	C
	2	Reservoir Rd MP 1.309	Sam Houston School Rd MP 2.650	1.34	7,430	0.110	817	45	2.0%	30.2	74.2	N/A	C
	3	Sam Houston School Rd MP 2.650	End of Study Area MP 4.740	2.09	3,280	0.110	361	45	2.0%	32.8	60.1	N/A	B
Pellissippi Parkway	1	Topside Rd MP 0.810	Alcoa Hwy (SR 115/US 129) MP 2.240	1.43	46,450	0.120	5574	60	7.0%	59.8	N/A	28.6	D
	2	Alcoa Hwy (SR 115/US 129) MP 2.240	Relocated Alcoa Highway MP 3.240	1.00	20,110	0.120	2413	60	5.0%	60.0	N/A	12.0	B
	3	Relocated Alcoa Highway MP 3.240	E. Broadway/Old Knoxville Hwy (SR 33) MP 4.710	1.47	17,290	0.130	2248	60	5.0%	60.0	N/A	11.2	B
Lamar Alexander Parkway (SR 73 / US 321)	3	E. Broadway/Old Knoxville Hwy (SR 33) MP 11.650	Jones Ave MP 12.526	0.87	28,010	0.100	2801	40	7.0%				
	4	Jones Ave MP 12.520	Merritt Rd MP 13.980	1.46	26,730	0.100	2673	50	4.0%	50.0	N/A	20.4	C
	5	Merritt Rd MP 13.980	Tuckaleechee Pk MP 17.020	3.04	22,250	0.100	2225	50	4.0%	50.0	N/A	16.0	B
	6	Tuckaleechee Pk MP 17.020	Tuckaleechee Pk MP 17.320	0.30	22,660	0.100	2266	55	5.0%	55.0	N/A	13.8	B
	7	Tuckaleechee Pk MP 17.320	Melrose Station Rd MP 20.020	2.70	17,340	0.100	1734	55	5.0%	55.0	N/A	10.5	A
	8	Melrose Station Rd MP 20.020	Foothills Pkwy MP 22.400	2.38	10,130	0.100	1013	55	5.0%	55.0	N/A	6.1	A
Hall Road (SR 35)	1	Alcoa Hwy (SR 115/US 129) MP 0.000	Bessemer St MP 1.520	1.52	22,860	0.110	2515	45	2.0%	45.0	N/A	17.9	B
	2	Bessemer St MP 1.520	E. Broadway/Old Knoxville Hwy (SR 33) MP 2.590	1.07	28,210	0.100	2821	35	2.0%				
Washington Street (SR 35)	1	E. Broadway/Old Knoxville Hwy (SR 33) MP 2.590	US 411 (SR 35) MP 2.820	0.23	25,940	0.100	2594	30	3.0%				
	2	US 411 (SR 35) MP 0.000	Lamar Alexander Pkwy (SR 73/US 321) MP 0.160	0.16	23,930	0.100	2393	30	2.0%				
US 411 (SR 35)	1	Washington St (SR 35) MP 2.820	S. Everett High Rd MP 3.690	0.87	12,660	0.100	1266	40	3.0%				
	2	S. Everett High Rd MP 3.690	Westfield Dr 4.527	0.84	9,690	0.100	969	45	4.0%	22.8	79.7	N/A	E
	3	Westfield Dr 4.527	Hitch Rd 7.254	2.73	9,130	0.110	1004	45	7.0%	25.0	80.5	N/A	E
	4	Hitch Rd 7.254	End of Study Area 7.990	0.74	8,670	0.110	954	45	7.0%	25.3	79.2	N/A	E

Table 4: 2020 No-Build Corridor LOS (cont.)

Route	Section	Begin Milepoint	End Milepoint	Section Length (miles)	2020 ADT	K-Factor	2020 DHV	Posted Speed Limit (mph)	% Trucks and Buses	Estimated Travel Speed (MPH)	% Time Spent Following	Density (pc/mi/ln)	LOS
E. Broadway / Old Knoxville Highway (SR 33)	3	Hall Rd MP 12.340	Wildwood Rd MP 14.206	1.87	16,920	0.100	1692	30	2.0%				
	4	Wildwood Rd MP 14.206	Hunt Rd MP 15.470	1.26	15,890	0.100	1589	40	2.0%				
	5	Hunt Rd MP 15.470	Pellissippi Pky MP 15.920	0.45	21,370	0.110	2351	40	2.0%				
	6	Pellissippi Pky MP 15.920	Sam Houston School Rd MP 16.370	0.45	13,620	0.130	1771	40	2.0%				
	7	Sam Houston School Rd MP 16.370	County Line MP 20.660	4.29	7,860	0.140	1100	50	4.0%	33.3	83.0	N/A	E
Alcoa Highway (SR 115 / US 129)	3	Louisville Rd (MP 13.020)	Hall Rd (SR 35) MP 14.280	1.26	43,390	0.110	4773	55	10.0%	53.7	N/A	31.8	D
	4	Hall Rd (SR 35) MP 14.280	Hunt Rd MP 15.020	0.74	63,730	0.110	7010	55	8.0%	*	N/A	*	F
	5	Hunt Rd MP 15.020	Relocated Alcoa Hwy MP 16.000	0.98	64,900	0.110	7139	50	8.0%	*	N/A	*	F
	6	Relocated Alcoa Hwy MP 16.000	Pellissippi Pky MP 17.660	2.64	54,810	0.110	6029	50	8.0%	*	N/A	*	F
	7	Pellissippi Pky MP 17.660	County Line MP 20.400	2.74	41,570	0.110	4573	55	8.0%	49.9	N/A	29.1	D
Sam Houston	1	SR 33 MP 0.000	Wildwood Rd MP 2.650	2.65	4,930	0.160	789	45	2.0%	31.0	73.9	N/A	C
Peppermint Road	1	Wildwood Rd MP 0.000	Sevierville Rd MP 1.100	1.10	4,130	0.130	537	35	2.0%	27.5	67.8	N/A	C
Hitch Road	1	Sevierville Rd MP 1.202	Davis Ford Rd MP 0.000	1.20	1,700	0.150	255	25	1.0%	25.2	53.5	N/A	B
Helton Road	1	Davis Ford Rd MP 0.875	Lamar Alexander Pkwy MP 0.000	0.88	440	0.150	66	25	1.0%	28.1	37.0	N/A	A
Relocated Alcoa Highway	1	Alcoa Highway (SR 115 / US 129)	Pellissippi Pky	Not Determined	32,000	0.100	3200	55	8.0%	50.0	N/A	13.3	B
	2	Pellissippi Pky	Alcoa Highway (SR 115 / US 129)	Not Determined	29,520	0.100	2952	55	8.0%	50.0	N/A	12.2	B

Table 5: 2040 No-Build Corridor LOS

Route	Section	Begin Milepoint	End Milepoint	Section Length (miles)	2040 ADT	K-Factor	2040 DHV	Posted Speed Limit (mph)	% Trucks and Buses	Estimated Travel Speed (MPH)	% Time Spent Following	Density (pc/mi/ln)	LOS
Wildwood Road	1	E. Broadway/Old Knoxville Hwy (SR 33) MP 0.000	Reservoir Rd MP 1.309	1.31	7,640	0.110	840	45	2.0%	30.0	74.1	N/A	C
	2	Reservoir Rd MP 1.309	Sam Houston School Rd MP 2.650	1.34	17,870	0.110	1966	45	2.0%	21.6	94.4	N/A	E
	3	Sam Houston School Rd MP 2.650	End of Study Area MP 4.740	2.09	7,390	0.110	813	45	2.0%	30.2	74.2	N/A	C
Pellissippi Parkway	1	Topside Rd MP 0.810	Alcoa Hwy (SR 115/US 129) MP 2.240	1.43	67,480	0.120	8098	60	7.0%	45.7	N/A	54.3	F
	2	Alcoa Hwy (SR 115/US 129) MP 2.240	Relocated Alcoa Highway MP 3.240	1.00	40,850	0.120	4902	60	5.0%	60.0	N/A	24.4	C
	3	Relocated Alcoa Highway MP 3.240	E. Broadway/Old Knoxville Hwy (SR 33) MP 4.710	1.47	34,320	0.130	4462	60	5.0%	60.0	N/A	22.2	C
Lamar Alexander Parkway (SR 73 / US 321)	3	E. Broadway/Old Knoxville Hwy (SR 33) MP 11.650	Jones Ave MP 12.526	0.87	38,020	0.100	3802	40	7.0%				
	4	Jones Ave MP 12.520	Merritt Rd MP 13.980	1.46	39,020	0.100	3902	50	4.0%	49.7	N/A	30.0	D
	5	Merritt Rd MP 13.980	Tuckaleechee Pk MP 17.020	3.04	33,860	0.100	3386	50	4.0%	50.0	N/A	24.3	C
	6	Tuckaleechee Pk MP 17.020	Tuckaleechee Pk MP 17.320	0.30	33,110	0.100	3311	55	5.0%	55.0	N/A	20.1	C
	7	Tuckaleechee Pk MP 17.320	Melrose Station Rd MP 20.020	2.70	23,860	0.100	2386	55	5.0%	55.0	N/A	14.5	B
	8	Melrose Station Rd MP 20.020	Foothills Pkwy MP 22.400	2.38	11,650	0.100	1165	55	5.0%	55.0	N/A	7.1	A
Hall Road (SR 35)	1	Alcoa Hwy (SR 115/US 129) MP 0.000	Bessemer St MP 1.520	1.52	35,370	0.110	3891	45	2.0%	45.0	N/A	27.7	D
	2	Bessemer St MP 1.520	E. Broadway/Old Knoxville Hwy (SR 33) MP 2.590	1.07	32,530	0.100	3253	35	2.0%				
Washington Street (SR 35)	1	E. Broadway/Old Knoxville Hwy (SR 33) MP 2.590	US 411 (SR 35) MP 2.820	0.23	29,900	0.100	2990	30	3.0%				
	2	US 411 (SR 35) MP 0.000	Lamar Alexander Pkwy (SR 73/US 321) MP 0.160	0.16	25,570	0.100	2557	30	2.0%				
US 411 (SR 35)	1	Washington St (SR 35) MP 2.820	S. Everett High Rd MP 3.690	0.87	15,400	0.100	1540	40	3.0%				
	2	S. Everett High Rd MP 3.690	Westfield Dr 4.527	0.84	15,080	0.100	1508	45	4.0%	19.2	89.1	N/A	E
	3	Westfield Dr 4.527	Hitch Rd 7.254	2.73	14,140	0.110	1555	45	7.0%	21.1	89.2	N/A	E
	4	Hitch Rd 7.254	End of Study Area 7.990	0.74	15,670	0.110	1724	45	7.0%	19.9	91.3	N/A	E

Table 5: 2040 No-Build Corridor LOS (cont.)

Route	Section	Begin Milepoint	End Milepoint	Section Length (miles)	2040 ADT	K-Factor	2040 DHV	Posted Speed Limit (mph)	% Trucks and Buses	Estimated Travel Speed (MPH)	% Time Spent Following	Density (pc/mi/ln)	LOS
E. Broadway / Old Knoxville Highway (SR 33)	3	Hall Rd MP 12.340	Wildwood Rd MP 14.206	1.87	21,510	0.100	2151	30	2.0%				
	4	Wildwood Rd MP 14.206	Hunt Rd MP 15.470	1.26	19,470	0.100	1947	40	2.0%				
	5	Hunt Rd MP 15.470	Pellissippi Pky MP 15.920	0.45	36,330	0.110	3996	40	2.0%				
	6	Pellissippi Pky MP 15.920	Sam Houston School Rd MP 16.370	0.45	17,050	0.130	2217	40	2.0%				
	7	Sam Houston School Rd MP 16.370	County Line MP 20.660	4.29	11,940	0.140	1672	50	4.0%	29.3	91.4	N/A	E
Alcoa Highway (SR 115 / US 129)	3	Louisville Rd (MP 13.020)	Hall Rd (SR 35) MP 14.280	1.26	62,250	0.110	6848	55	10.0%	*	N/A	*	F
	4	Hall Rd (SR 35) MP 14.280	Hunt Rd MP 15.020	0.74	94,460	0.110	10391	55	8.0%	*	N/A	*	F
	5	Hunt Rd MP 15.020	Relocated Alcoa Hwy MP 16.000	0.98	97,820	0.110	10760	50	8.0%	*	N/A	*	F
	6	Relocated Alcoa Hwy MP 16.000	Pellissippi Pky MP 17.660	2.64	45,270	0.110	4980	50	8.0%	43.4	N/A	40.0	E
	7	Pellissippi Pky MP 17.660	County Line MP 20.400	2.74	35,820	0.110	3940	55	8.0%	50.0	N/A	25.0	C
Sam Houston	1	SR 33 MP 0.000	Wildwood Rd MP 2.650	2.65	5,030	0.160	805	45	2.0%	31.0	74.2	N/A	C
Peppermint Road	1	Wildwood Rd MP 0.000	Sevierville Rd MP 1.100	1.10	5,960	0.130	775	35	2.0%	26.1	72.1	N/A	D
Hitch Road	1	Sevierville Rd MP 1.202	Davis Ford Rd MP 0.000	1.20	2,450	0.150	368	25	1.0%	23.5	60.2	N/A	C
Helton Road	1	Davis Ford Rd MP 0.875	Lamar Alexander Pkwy MP 0.000	0.88	640	0.150	96	25	1.0%	27.7	39.9	N/A	A
Relocated Alcoa Highway	1	Alcoa Highway (SR 115 / US 129)	Pellissippi Pky	Not Determined	39,440	0.100	3944	55	8.0%	50.0	N/A	16.4	B
	2	Pellissippi Pky	Alcoa Highway (SR 115 / US 129)	Not Determined	36,390	0.100	3639	55	8.0%	50.0	N/A	15.1	B

Figure 3: 2013 Existing Corridor LOS

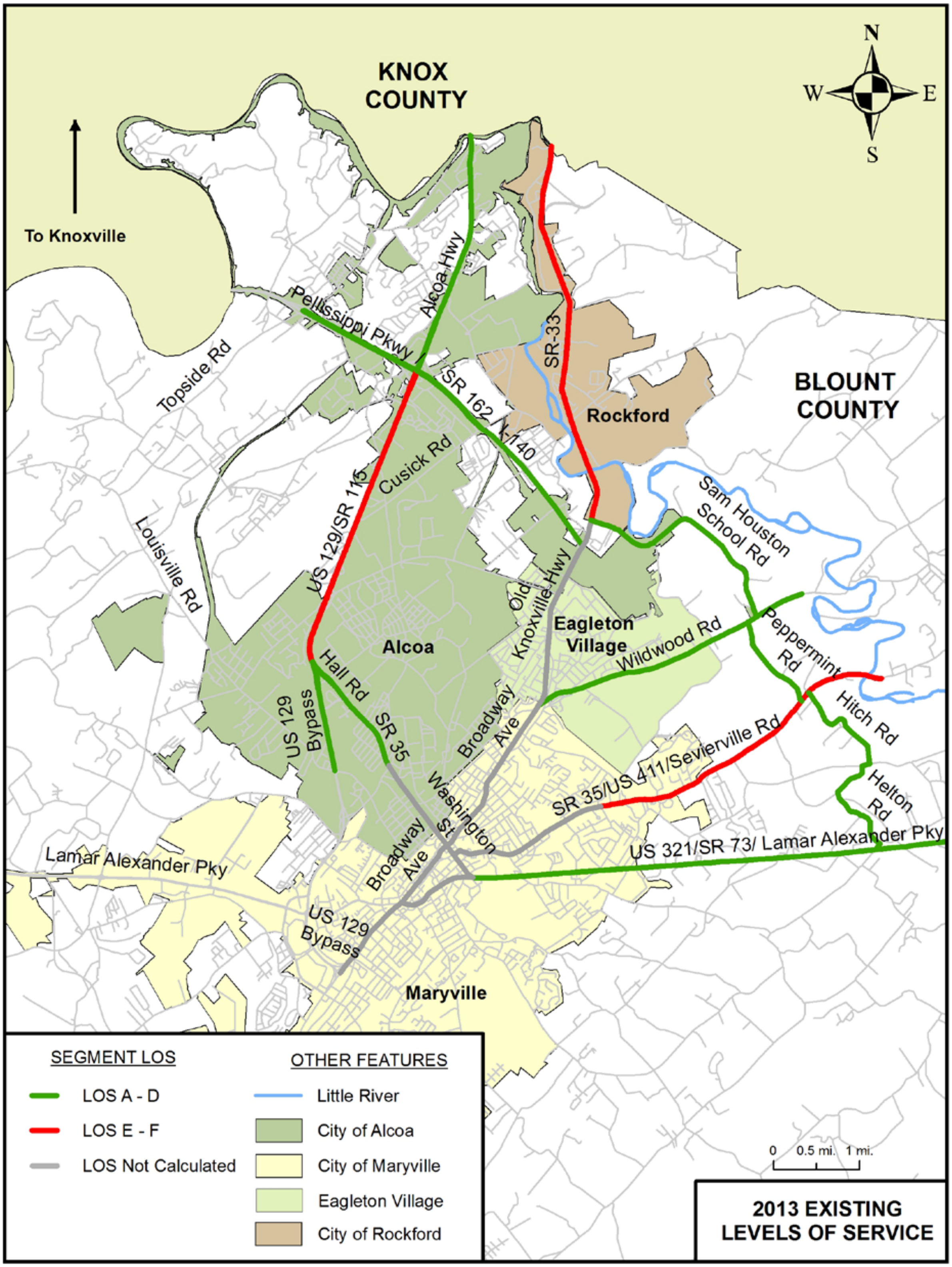


Figure 4: 2020 Corridor No-Build LOS

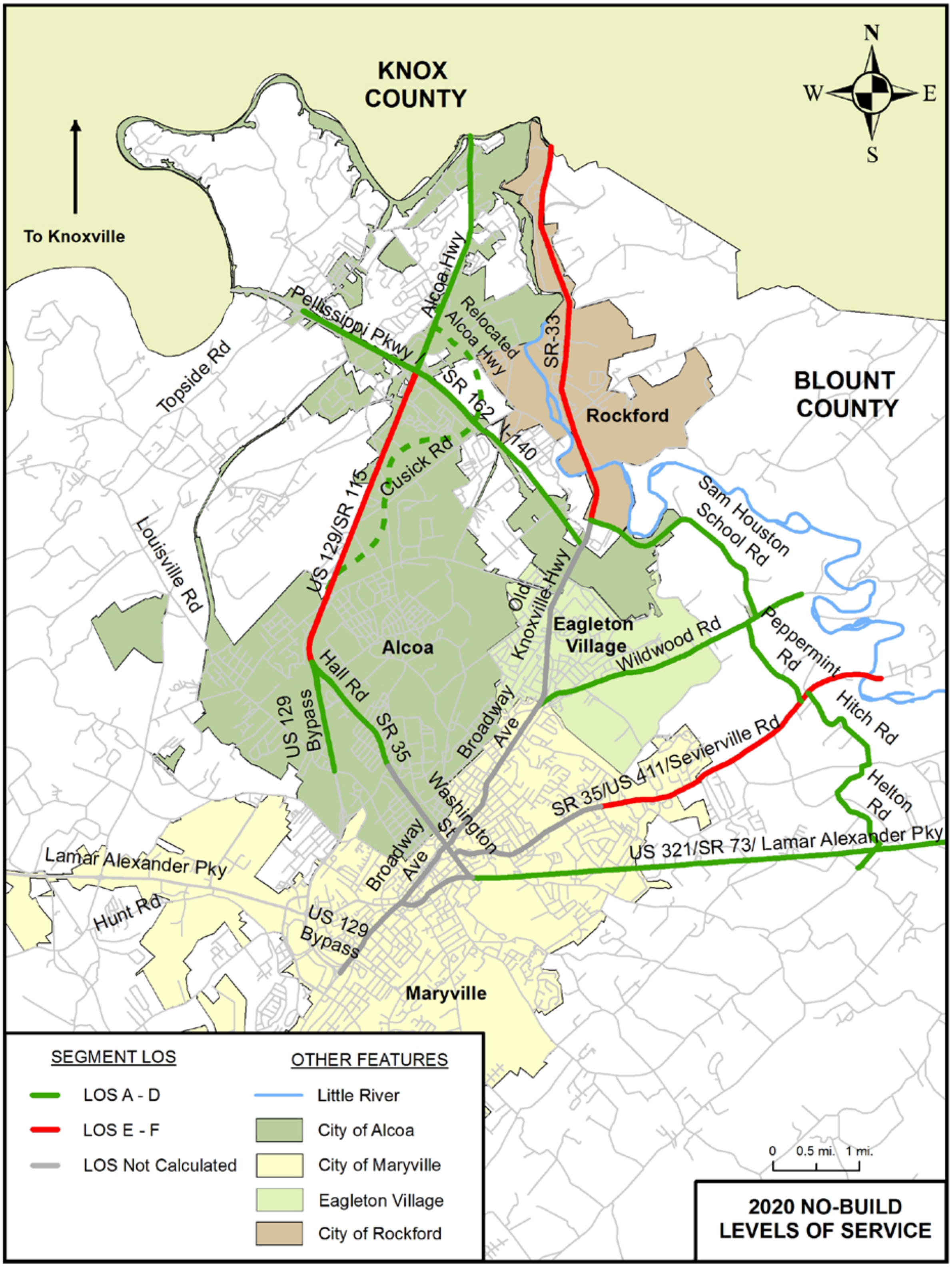
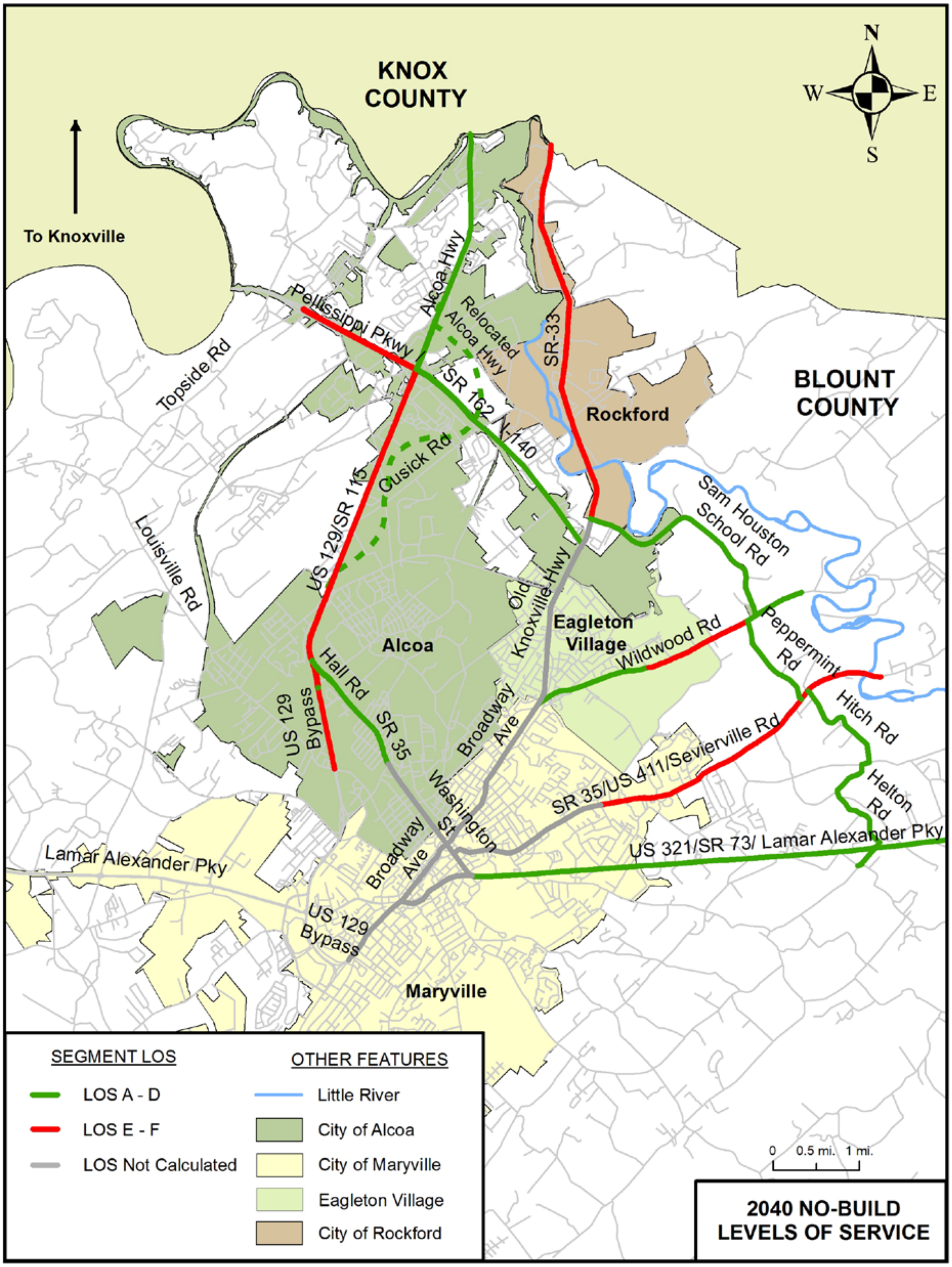


Figure 5: 2040 Corridor No-Build LOS



2.4 Preferred Alternative Corridor LOS Results

The forecasted Preferred Alternative traffic volumes (2020 and 2040) included as part of the updated 2013 *Traffic Forecast Study* prepared for this project by Sain Associates, Inc. were used to determine corridor LOS. The same methodology used for the No-Build analysis was also used in the analysis of the Preferred Alternative.

The following tables and figures, **Tables 6 – 7** and **Figures 6 – 7** show the resulting LOS for the Preferred Alternative.

Table 6: 2020 Preferred Alternative Corridor LOS

Route	Section	Begin Milepoint	End Milepoint	Section Length (miles)	2020 ADT	K-Factor	2020 DHV	Posted Speed Limit (mph)	% Trucks and Buses	Estimated Travel Speed (MPH)	% Time Spent Following	Density (pc/mi/ln)	LOS
Wildwood Road	1	E. Broadway/Old Knoxville Hwy (SR 33) MP 0.000	Reservoir Rd MP 1.309	1.31	3,680	0.110	405	45	2.0%	32.5	61.7	N/A	C
	2	Reservoir Rd MP 1.309	Sam Houston School Rd MP 2.650	1.34	4,500	0.110	495	45	2.0%	32.0	66.1	N/A	C
	3	Sam Houston School Rd MP 2.650	End of Study Area MP 4.740	2.09	3,020	0.110	332	45	2.0%	33.1	58.4	N/A	B
Pellissippi Parkway	1	Topside Rd MP 0.810	Alcoa Hwy (SR 115/US 129) MP 2.240	1.43	48,020	0.120	5762	60	7.0%	59.5	N/A	29.7	D
	2	Alcoa Hwy (SR 115/US 129) MP 2.240	Relocated Alcoa Highway MP 3.240	1.00	23,220	0.120	2786	60	5.0%	60.0	N/A	13.9	B
	3	Relocated Alcoa Highway MP 3.240	E. Broadway/Old Knoxville Hwy (SR 33) MP 4.710	1.47	25,400	0.130	3302	60	5.0%	60.0	N/A	16.4	B
	4	E. Broadway/Old Knoxville Hwy (SR 33) MP 4.710	US 411 (SR 35)	Not Determined	18,700	0.130	2431	60	2.0%	60.0	N/A	11.6	B
	5	US 411 (SR 35)	Lamar Alexander Pkwy (SR 73 / US 321)	Not Determined	18,220	0.130	2369	60	2.0%	60.0	N/A	11.3	B
Lamar Alexander Parkway (SR 73 / US 321)	3	E. Broadway/Old Knoxville Hwy (SR 33) MP 11.650	Jones Ave MP 12.526	0.87	26,600	0.100	2660	40	6.0%				
	4	Jones Ave MP 12.520	Merritt Rd MP 13.980	1.46	24,350	0.100	2435	50	3.0%	50.0	N/A	18.6	C
	5	Merritt Rd MP 13.980	Tuckaleechee Pk MP 17.020	3.04	19,050	0.100	1905	50	3.0%	50.0	N/A	13.7	B
	6	Tuckaleechee Pk MP 17.020	Tuckaleechee Pk MP 17.320	0.30	18,790	0.100	1879	55	4.0%	55.0	N/A	11.4	B
	7	Tuckaleechee Pk MP 17.320	Melrose Station Rd MP 20.020	2.70	18,570	0.100	1857	55	5.0%	55.0	N/A	11.3	B
	8	Melrose Station Rd MP 20.020	Foothills Pkwy MP 22.400	2.38	10,490	0.100	1049	55	5.0%	55.0	N/A	6.4	A
Hall Road (SR 35)	1	Alcoa Hwy (SR 115/US 129) MP 0.000	Bessemer St MP 1.520	1.52	22,010	0.110	2421	45	2.0%	45.0	N/A	17.2	B
	2	Bessemer St MP 1.520	E. Broadway/Old Knoxville Hwy (SR 33) MP 2.590	1.07	24,480	0.100	2448	35	2.0%				
Washington Street (SR 35)	1	E. Broadway/Old Knoxville Hwy (SR 33) MP 2.590	US 411 (SR 35) MP 2.820	0.23	21,950	0.100	2195	30	3.0%				
	2	US 411 (SR 35) MP 0.000	Lamar Alexander Pkwy (SR 73/US 321) MP 0.160	0.16	22,130	0.100	2213	30	2.0%				
US 411 (SR 35)	1	Washington St (SR 35) MP 2.820	S. Everett High Rd MP 3.690	0.87	12,190	0.100	1219	40	3.0%				
	2	S. Everett High Rd MP 3.690	Westfield Dr 4.527	0.84	9,680	0.100	968	45	3.0%	22.8	79.7	N/A	E
	3	Westfield Dr 4.527	Hitch Rd 7.254	2.73	9,680	0.110	1065	45	3.0%	24.6	82.0	N/A	E
	4	Hitch Rd 7.254	End of Study Area 7.990	0.74	10,700	0.110	1177	45	7.0%	23.9	84.0	N/A	E

Table 6: 2020 Preferred Alternative Corridor LOS (cont.)

Route	Section	Begin Milepoint	End Milepoint	Section Length (miles)	2020 ADT	K-Factor	2020 DHV	Posted Speed Limit (mph)	% Trucks and Buses	Estimated Travel Speed (MPH)	% Time Spent Following	Density (pc/mi/ln)	LOS
E. Broadway / Old Knoxville Highway (SR 33)	3	Hall Rd MP 12.340	Wildwood Rd MP 14.206	1.87	15,640	0.100	1564	30	3.0%				
	4	Wildwood Rd MP 14.206	Hunt Rd MP 15.470	1.26	14,640	0.100	1464	40	3.0%				
	5	Hunt Rd MP 15.470	Pellissippi Pky MP 15.920	0.45	20,500	0.110	2255	40	4.0%				
	6	Pellissippi Pky MP 15.920	Sam Houston School Rd MP 16.370	0.45	13,880	0.130	1804	40	2.0%				
	7	Sam Houston School Rd MP 16.370	County Line MP 20.660	4.29	13,880	0.140	1943	50	2.0%	28.6	93.5	N/A	E
Alcoa Highway (SR 115 / US 129)	3	Louisville Rd (MP 13.020)	Hall Rd (SR 35) MP 14.280	1.26	43,300	0.110	4763	55	8.0%	53.7	N/A	31.7	D
	4	Hall Rd (SR 35) MP 14.280	Hunt Rd MP 15.020	0.74	62,650	0.110	6892	55	8.0%	*	N/A	*	F
	5	Hunt Rd MP 15.020	Relocated Alcoa Hwy MP 16.000	0.98	63,370	0.110	6971	50	8.0%	*	N/A	*	F
	6	Relocated Alcoa Hwy MP 16.000	Pellissippi Pky MP 17.660	2.64	54,300	0.110	5973	50	8.0%	*	N/A	*	F
	7	Pellissippi Pky MP 17.660	County Line MP 20.400	2.74	41,740	0.110	4591	55	8.0%	49.8	N/A	29.2	D
Sam Houston	1	SR 33 MP 0.000	Wildwood Rd MP 2.650	2.65	-	0.160	-	-	-	-	-	-	-
Peppermint Road	1	Wildwood Rd MP 0.000	Sevierville Rd MP 1.100	1.10	-	0.130	-	-	-	-	-	-	-
Hitch Road	1	Sevierville Rd MP 1.202	Davis Ford Rd MP 0.000	1.20	-	0.150	-	-	-	-	-	-	-
Helton Road	1	Davis Ford Rd MP 0.875	Lamar Alexander Pkwy MP 0.000	0.88	-	0.150	-	-	-	-	-	-	-
Relocated Alcoa Highway	1	Alcoa Highway (SR 115 / US 129)	Pellissippi Pky	Not Determined	27,190	0.100	2719	55	8.0%	50.0	N/A	11.3	B
	2	Pellissippi Pky	Alcoa Highway (SR 115 / US 129)	Not Determined	28,430	0.100	2843	55	8.0%	50.0	N/A	11.8	B

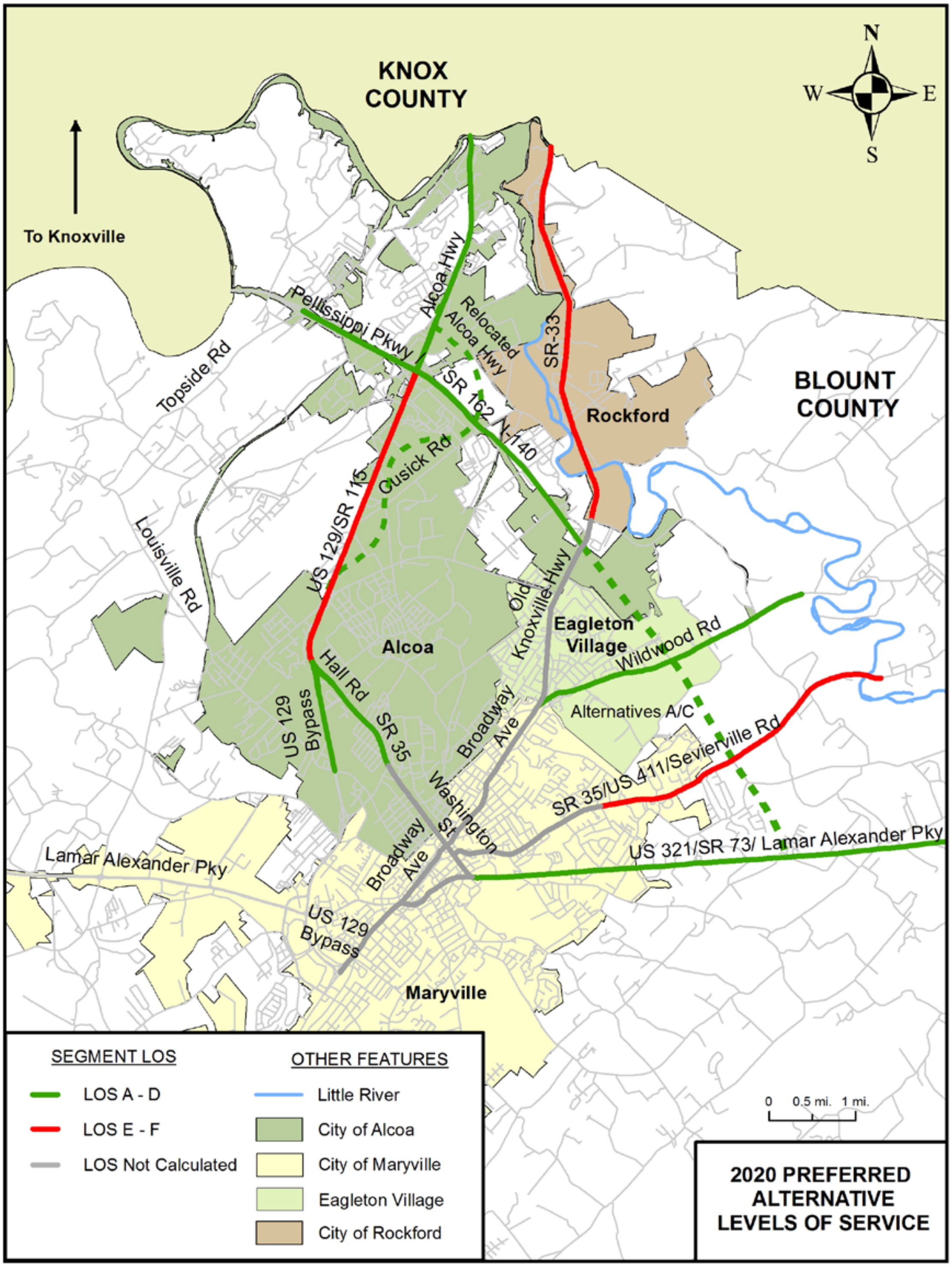
Table 7: 2040 Preferred Alternative Corridor LOS

Route	Section	Begin Milepoint	End Milepoint	Section Length (miles)	2040 ADT	K-Factor	2040 DHV	Posted Speed Limit (mph)	% Trucks and Buses	Estimated Travel Speed (MPH)	% Time Spent Following	Density (pc/mi/ln)	LOS
Wildwood Road	1	E. Broadway/Old Knoxville Hwy (SR 33) MP 0.000	Reservoir Rd MP 1.309	1.31	7,180	0.110	790	45	2.0%	30.3	73.9	N/A	C
	2	Reservoir Rd MP 1.309	Sam Houston School Rd MP 2.650	1.34	7,630	0.110	839	45	2.0%	30.0	74.1	N/A	C
	3	Sam Houston School Rd MP 2.650	End of Study Area MP 4.740	2.09	6,600	0.110	726	45	2.0%	30.7	71.9	N/A	C
Pellissippi Parkway	1	Topside Rd MP 0.810	Alcoa Hwy (SR 115/US 129) MP 2.240	1.43	73,980	0.120	8878	60	7.0%	37.0	N/A	73.6	F
	2	Alcoa Hwy (SR 115/US 129) MP 2.240	Relocated Alcoa Highway MP 3.240	1.00	51,750	0.120	6210	60	5.0%	58.8	N/A	31.5	D
	3	Relocated Alcoa Highway MP 3.240	E. Broadway/Old Knoxville Hwy (SR 33) MP 4.710	1.47	55,330	0.130	7193	60	5.0%	54.5	N/A	39.4	E
	4	E. Broadway/Old Knoxville Hwy (SR 33) MP 4.710	US 411 (SR 35)	Not Determined	38,040	0.130	4945	60	2.0%	60.0	N/A	23.6	C
	5	US 411 (SR 35)	Lamar Alexander Pkwy (SR 73 / US 321)	Not Determined	25,240	0.130	3281	60	2.0%	60.0	N/A	15.6	B
Lamar Alexander Parkway (SR 73 / US 321)	3	E. Broadway/Old Knoxville Hwy (SR 33) MP 11.650	Jones Ave MP 12.526	0.87	32,580	0.100	3258	40	6.0%				
	4	Jones Ave MP 12.520	Merritt Rd MP 13.980	1.46	30,680	0.100	3068	50	3.0%	50.0	N/A	23.5	C
	5	Merritt Rd MP 13.980	Tuckaleechee Pk MP 17.020	3.04	28,120	0.100	2812	50	3.0%	50.0	N/A	20.2	C
	6	Tuckaleechee Pk MP 17.020	Tuckaleechee Pk MP 17.320	0.30	37,420	0.100	3742	55	4.0%	55.0	N/A	22.7	C
	7	Tuckaleechee Pk MP 17.320	Melrose Station Rd MP 20.020	2.70	28,160	0.100	2816	55	5.0%	55.0	N/A	17.1	B
	8	Melrose Station Rd MP 20.020	Foothills Pkwy MP 22.400	2.38	12,970	0.100	1297	55	5.0%	55.0	N/A	7.9	A
Hall Road (SR 35)	1	Alcoa Hwy (SR 115/US 129) MP 0.000	Bessemer St MP 1.520	1.52	31,200	0.110	3432	45	2.0%	45.0	N/A	24.4	C
	2	Bessemer St MP 1.520	E. Broadway/Old Knoxville Hwy (SR 33) MP 2.590	1.07	23,930	0.100	2393	35	2.0%				
Washington Street (SR 35)	1	E. Broadway/Old Knoxville Hwy (SR 33) MP 2.590	US 411 (SR 35) MP 2.820	0.23	20,130	0.100	2013	30	3.0%				
	2	US 411 (SR 35) MP 0.000	Lamar Alexander Pkwy (SR 73/US 321) MP 0.160	0.16	18,630	0.100	1863	30	2.0%				
US 411 (SR 35)	1	Washington St (SR 35) MP 2.820	S. Everett High Rd MP 3.690	0.87	13,780	0.100	1378	40	3.0%				
	2	S. Everett High Rd MP 3.690	Westfield Dr 4.527	0.84	14,800	0.100	1480	45	3.0%	19.4	88.6	N/A	E
	3	Westfield Dr 4.527	Hitch Rd 7.254	2.73	14,800	0.110	1628	45	3.0%	20.6	90.6	N/A	E
	4	Hitch Rd 7.254	End of Study Area 7.990	0.74	19,800	0.110	2178	45	7.0%	16.3	95.9	N/A	E

Table 7: 2040 Preferred Alternative Corridor LOS (cont.)

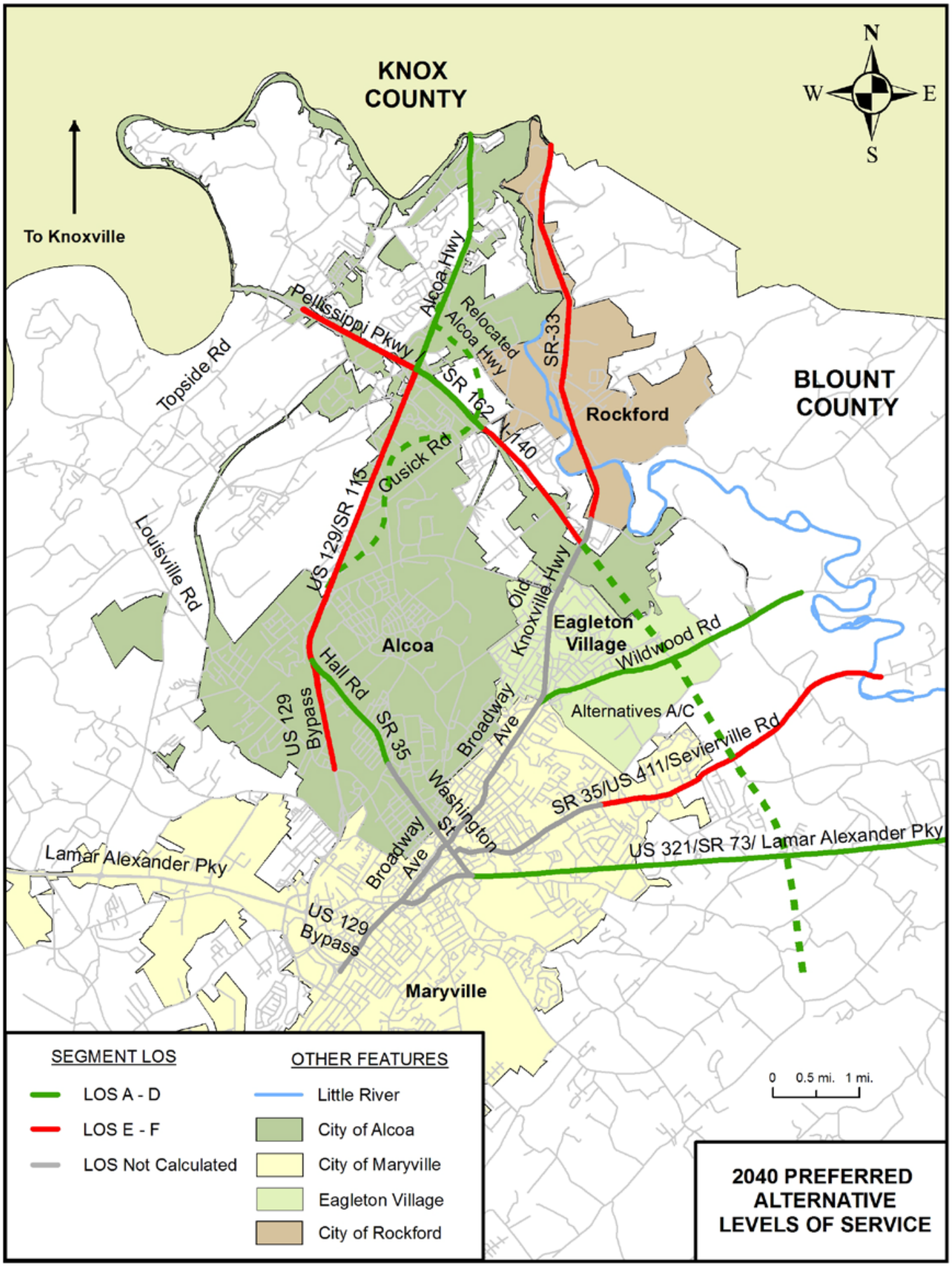
Route	Section	Begin Milepoint	End Milepoint	Section Length (miles)	2040 ADT	K-Factor	2040 DHV	Posted Speed Limit (mph)	% Trucks and Buses	Estimated Travel Speed (MPH)	% Time Spent Following	Density (pc/mi/ln)	LOS
E. Broadway / Old Knoxville Highway (SR 33)	3	Hall Rd MP 12.340	Wildwood Rd MP 14.206	1.87	19,130	0.100	1913	30	3.0%				
	4	Wildwood Rd MP 14.206	Hunt Rd MP 15.470	1.26	17,210	0.100	1721	40	3.0%				
	5	Hunt Rd MP 15.470	Pellissippi Pky MP 15.920	0.45	36,130	0.110	3974	40	4.0%				
	6	Pellissippi Pky MP 15.920	Sam Houston School Rd MP 16.370	0.45	19,240	0.130	2501	40	2.0%				
	7	Sam Houston School Rd MP 16.370	County Line MP 20.660	4.29	19,240	0.140	2694	50	2.0%	21.2	100.0	N/A	F
Alcoa Highway (SR 115 / US 129)	3	Louisville Rd (MP 13.020)	Hall Rd (SR 35) MP 14.280	1.26	61,380	0.110	6752	55	8.0%	*	N/A	*	F
	4	Hall Rd (SR 35) MP 14.280	Hunt Rd MP 15.020	0.74	88,800	0.110	9768	55	8.0%	*	N/A	*	F
	5	Hunt Rd MP 15.020	Relocated Alcoa Hwy MP 16.000	0.98	92,470	0.110	10172	50	8.0%	*	N/A	*	F
	6	Relocated Alcoa Hwy MP 16.000	Pellissippi Pky MP 17.660	2.64	44,950	0.110	4945	50	8.0%	43.4	N/A	39.6	E
	7	Pellissippi Pky MP 17.660	County Line MP 20.400	2.74	37,100	0.110	4081	55	8.0%	50.0	N/A	25.9	C
Sam Houston	1	SR 33 MP 0.000	Wildwood Rd MP 2.650	2.65	-	0.160	-	-	-	-	-	-	-
Peppermint Road	1	Wildwood Rd MP 0.000	Sevierville Rd MP 1.100	1.10	-	0.130	-	-	-	-	-	-	-
Hitch Road	1	Sevierville Rd MP 1.202	Davis Ford Rd MP 0.000	1.20	-	0.150	-	-	-	-	-	-	-
Helton Road	1	Davis Ford Rd MP 0.875	Lamar Alexander Pkwy MP 0.000	0.88	-	0.150	-	-	-	-	-	-	-
Relocated Alcoa Highway	1	Alcoa Highway (SR 115 / US 129)	Pellissippi Pky	Not Determined	37,520	0.100	3752	55	8.0%	50.0	N/A	15.6	B
	2	Pellissippi Pky	Alcoa Highway (SR 115 / US 129)	Not Determined	39,230	0.100	3923	55	8.0%	50.0	N/A	16.3	B

Figure 6: 2020 Preferred Alternative Corridor LOS



Note: The Pellissippi Parkway Extension is shown for conceptual purposes only; no specific alignment or location has been determined.

Figure 7: 2040 Preferred Alternative Corridor LOS



Note: The Pellissippi Parkway Extension is shown for conceptual purposes only; no specific alignment or location has been determined.

2.5 Summary of Corridor LOS Results

The following tables present a comparative summary of the No-Build and Preferred Alternative. **Table 8** lists the LOS for the Preferred Alternative compared to the No-Build Alternative. **Table 9** lists the corresponding LOS for the other study area roadways for the No-Build Alternative as well as the Preferred Alternative.

Table 8: Basic Freeway Corridor LOS Summary

Route	Section	Begin Milepoint	End Milepoint	2013 Existing	2020 No-Build	2040 No-Build	2020 Preferred Alternative	2040 Preferred Alternative
Pellissippi Parkway	1	Topside Rd	Alcoa Hwy (SR 115/US 129)	C	D	F	D	F
	2	Alcoa Hwy (SR 115/US 129)	Relocated Alcoa Hwy	A	B	C	B	D
	3	Relocated Alcoa Hwy	E. Broadway / Old Knoxville Hwy (SR 33)	A	B	C	B	E
	4	E. Broadway/Old Knoxville Hwy (SR 33)	US 411 (SR 35)	N/A	N/A	N/A	B	C
	5	US 411 (SR 35)	Lamar Alexander Pkwy (SR 73/US 321)	N/A	N/A	N/A	B	B

Table 9: Study Area Highways Corridor LOS Summary

Route	Section	Begin Milepoint	End Milepoint	2013 Existing	2020 No-Build	2040 No-Build	2020 Preferred Alternative	2040 Preferred Alternative
Wildwood Road	1	E. Broadway / Old Knoxville Hwy (SR 33)	Reservoir Rd	B	C	C	C	C
	2	Reservoir Rd	Sam Houston School Rd	B	C	E	C	C
	3	Sam Houston School Rd	End of Study Area	A	B	C	B	C
Lamar Alexander Parkway (SR 73 / US 321)	3	E. Broadway / Old Knoxville Hwy (SR 33)	Jones Ave					
	4	Jones Ave	Meritt Rd	B	C	D	C	C
	5	Meritt Rd	Tuckaleechee Pk	B	B	C	B	C
	6	Tuckaleechee Pk	Tuckaleechee Pk	A	B	C	B	D
	7	Tuckaleechee Pk	Melrose Station Rd	A	A	B	B	B
	8	Melrose Station Rd	Foothills Pkwy	A	A	A	A	A
Hall Road (SR 35)	1	Alcoa Hwy (SR 115 / US 129)	Bessemer St	B	B	D	B	C
	2	Bessemer St	E. Broadway / Old Knoxville Hwy (SR 33)					
Washington Street (SR 35)	1	E. Broadway / Old Knoxville Hwy (SR 33)	US 411 (SR 35)					
	2	US 411 (SR 35)	Lamar Alexander Pkwy (SR 73 / US 321)					
US 411 (SR 35)	1	Washington St (SR 35)	S. Everett High Rd					
	2	S. Everett High Rd	Westfield Dr	E	E	E	E	E
	3	Westfield Dr	Hitch Rd	E	E	E	E	E
	4	Hitch Rd	End of Study Area	E	E	E	E	E
E. Broadway / Old Knoxville Highway (SR 33)	3	Hall Rd	Wildwood Rd					
	4	Wildwood Rd	Hunt Rd					
	5	Hunt Rd	Pellissippi Pkwy					
	6	Pellissippi Pkwy	Sam Houston School Rd					
	7	Sam Houston School Rd	County Line	E	E	E	E	F
Alcoa Highway (SR 115 / US 129)	3	Louisville Rd	Hall Rd (SR 35)	D	D	F	D	F
	4	Hall Rd (SR 35)	Hunt Rd	E	F	F	F	F
	5	Hunt Rd	Cusick Rd	F	F	F	F	F
	6	Cusick Rd	Pellissippi Pkwy	F	F	E	F	E
	7	Pellissippi Pkwy	County Line	D	D	C	D	C
Relocated Alcoa Highway	1	Alcoa Hwy (SR 115 / US 129)	Pellissippi Pky	Not Determined	B	B	B	B
	2	Pellissippi Pky	Alcoa Highway (SR 115 / US 129)	Not Determined	B	B	B	B

The following observations are made regarding the analysis provided in the previous tables:

- Under all scenarios, traffic operations remain generally at an acceptable LOS (LOS D or better) on Lamar Alexander Parkway (US 321/SR 73) through 2040.
- Alcoa Highway (SR 115/US 129) operates at poor traffic conditions (worse than LOS D) under all scenarios.
- Wildwood Road declines to LOS E (poor) under 2040 No-Build conditions; under the 2040 Preferred Alternative it will operate at LOS C (acceptable).
- Traffic operations decline on existing Pellissippi Parkway to below a desirable LOS just west of Alcoa Highway for both the Build and No-Build Alternatives for the year 2040. Between the RAH and SR 33 in the year 2040 the LOS declines to LOS E for the Preferred (Build) Alternative only.
- RAH operates at acceptable traffic levels under all scenarios.
- The proposed sections of Pellissippi Parkway from SR 33 to SR 73 / US 321 operate at an acceptable level through the analysis year 2040.

3.0 INTERSECTION LOS ANALYSIS

An intersection LOS analysis was conducted for the No-Build Alternative and Preferred Alternative for the years 2020 and 2040 along with the Existing (2013) for comparison purposes. The methodology and results are presented in the following sections.

3.1 Study Area Intersections

A list of major study area intersections are noted below. For this update, as indicated, several intersections were removed from the analysis as during the traffic forecasting stage they were determined to not be influenced by the Pellissippi Parkway Extension.

1. SR 115 / US 129 @ I-140 / Pellissippi Parkway (Interchange – two STOP Controlled Ramp Terminals)
2. SR 115 / US 129 @ SR 35 (Interchange – STOP Controlled Ramp Terminals)
3. SR 115 / US 129 @ SR 73 / US 321 (Signalized) - Removed
4. SR 33 / US 411 @ SR 15 / US 129 (Interchange - two STOP Controlled Ramp Terminals) - Removed
5. SR 33 @ I-140 / Pellissippi Parkway (STOP Controlled)
6. SR 33 @ Wildwood Road (Signalized)
7. SR 33 / E. Broadway Avenue @ SR 35 / S. Washington Street (Signalized)
8. SR 33 @ SR 73 / US 321 (Signalized) - Removed
9. SR 35 / S. Washington Street @ Sevierville Road (Signalized)
10. S. Washington Street / SR 35 @ High Street / SR 35 (Signalized)
11. S. Washington Street @ SR 73 / US 321 (Signalized)
12. SR 73 / US 321 @ SR 335 / Old Glory Road (Signalized) - Removed

The existing ramp terminal intersections that currently operate without signal control were not initially evaluated as part of the LOS analysis (Intersections 1 and 2 above). The highway segments surrounding the interchanges were evaluated as part of the previous segment analysis.

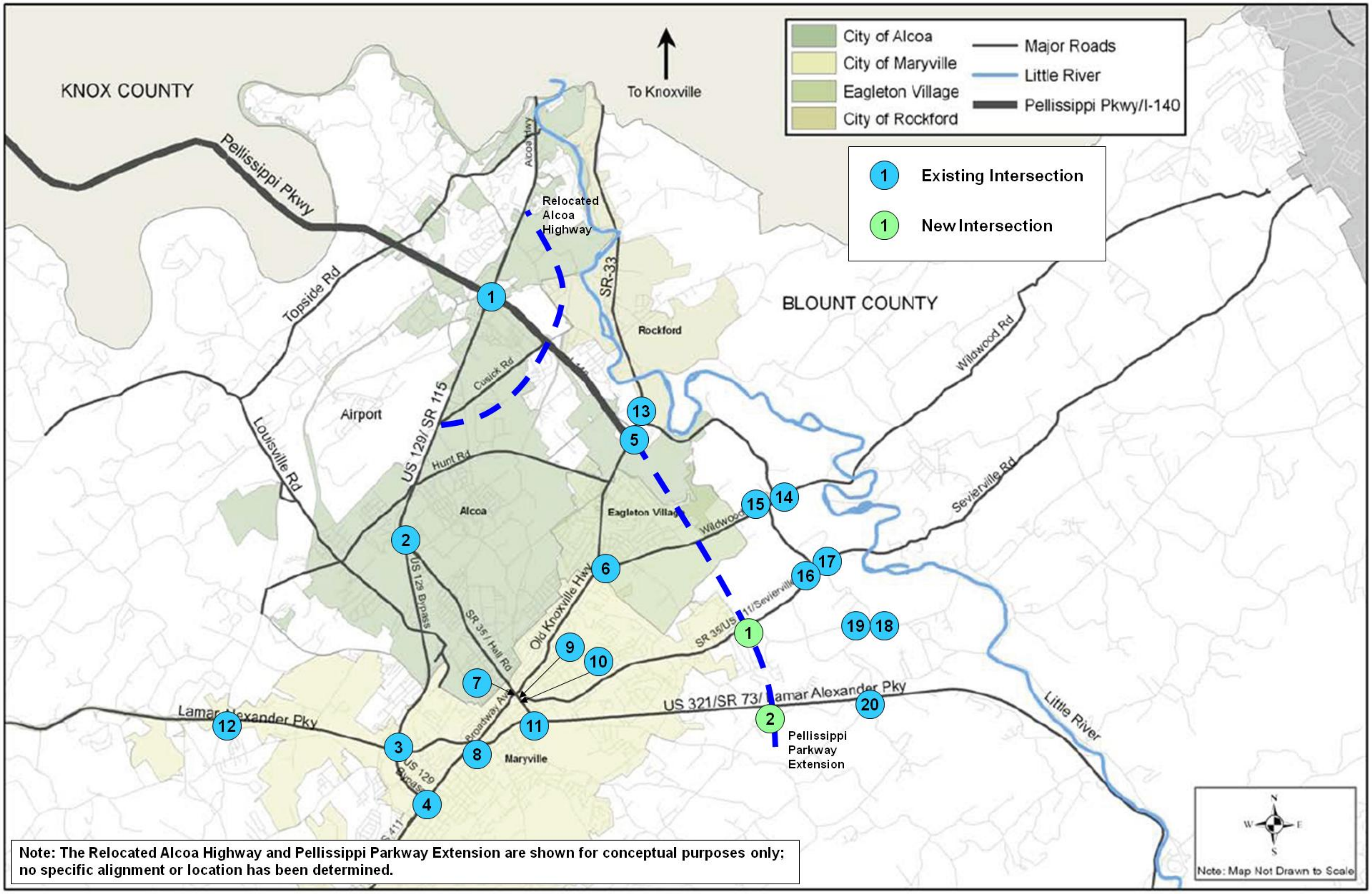
TDOT provided Signing and Striping design plans for proposed improvements to SR 33, which include changes to the configuration of the SR 33 and Pellissippi Parkway intersections. The layouts proposed were used for the future analysis years 2020 and 2040 for the No-Build scenarios. Installation of a traffic signal at the off-ramp intersection is being completed along with the re-configuration. As a result, the future year analysis for this intersection is being conducted assuming a signalized intersection. The Preferred Alternative considers some modifications to the ramp terminal intersections for SR 33 and Pellissippi Parkway which includes the additional ramps leading to the extension.

SR 33 at Wildwood Road was originally evaluated as a signalized intersection. Following the previous traffic analysis, the intersection has been re-routed and now follows a portion of Horn Street and is considered a STOP controlled intersection for this analysis.

In addition, two new intersections would be created by the proposed Pellissippi Parkway Extension. **Figure 8** shows the location of each new intersection in a green circle, indicated by number as shown below.

1. Pellissippi Parkway Extension @ SR 35 / US 411 / Sevierville Road (Interchange – two Signalized Ramp Terminal intersections)
2. Pellissippi Parkway Extension @ US 321 (Interchange – loop ramps, i.e., no intersections)

Figure 8: Intersection Location Map



For this analysis, a typical diamond interchange has been assumed for the Pellissippi Parkway Extension at SR 35 / US 411 / Sevierville Road interchange (Site 1 depicted in the green circle), resulting in the creation of two new intersections. LOS and delay were calculated for the same scenarios as discussed above for the SR 33 / I-140 interchange. The Pellissippi Parkway Extension at US 321 may include directional loop ramps and was not evaluated at this time.

Several additional intersections would be impacted by the proposed Preferred Alternative and were included in the current analysis. The following intersections were evaluated for the existing, No-Build and Preferred Alternative Scenarios. **Figure 8** shows the location of each intersection in a blue circle, indicated by number as shown below:

13. SR 33 @ Sam Houston School Road (Signalized)
14. Sam Houston School Road @ Wildwood Road (STOP Controlled)
15. Peppermint Road @ Wildwood Road (STOP Controlled)
16. SR 35 / US 411 / Sevierville Road @ Peppermint Road (STOP Controlled)
17. SR 35 / US 411 / Sevierville Road @ Hitch Road / Peppermint Hills Drive (STOP Controlled)
18. Davis Ford Road @ Helton Road (STOP Controlled)
19. Davis Ford Road @ Hitch Road (STOP Controlled)
20. SR 73 / US 321 @ Helton Road / Tuckaleechee Pike (STOP Controlled)

3.2 Methodology

For this analysis, HCS 2010 was used to analyze the AM and PM peak hour traffic operating conditions. This software package implements the HCM 2010 intersection analysis methodology to compute LOS. For each study intersection, average vehicle delays were calculated to determine the resulting LOS. For intersections, the HCM 2010 defines LOS based on the average delay due to signal or STOP control as shown in **Table 10**.

Table 10: LOS Criteria for Intersections

LOS	Signalized Intersections Control Delay (seconds per vehicle)	Unsignalized Intersections Control Delay (seconds per vehicle)
A	$\leq$ 10	$\leq$ 10
B	>10 – 20	>10 – 15
C	>20 – 35	>15 – 25
D	>35 – 55	>25 – 35
E	>55 – 80	>35 – 50
F	>80	>50

Source: Highway Capacity Manual 2010

In general terms, a facility is considered to have reached its physical capacity at LOS E. TDOT typically uses LOS D as the threshold for acceptable traffic service for all but the more rural roads. Because of the urban character of the study area, LOS D is used as the threshold. Operations below this threshold are noted as undesirable and warrant improvement. LOS D corresponds to $\leq$ 55 seconds of delay per vehicle at a signalized intersection and $\leq$ 35 seconds of delay at an unsignalized intersection. Refer to the Chapters 18 & 19, Volume 3 of HCM 2010 for more details.

3.3 Intersection LOS Results

Turning movement volumes for the AM and PM peak hours were provided in the updated 2013 *Traffic Forecast Study.* These are included in the attached appendix for reference. Using these volumes, intersection LOS was developed for the existing (2013), 2020 and 2040 No-Build, and the 2020 and 2040 Preferred Alternative scenarios.

Optimized signal timings were assumed for all future analysis years for the signalized intersections.

It should be noted that since the previous iteration of this traffic analysis addendum / memorandum, the Highway Capacity Manual and Software were updated. The changes were substantial enough between versions such that direct comparisons should not be made between previous values and those provided in this update.

Tables 11 through **19** show the intersection LOS for each scenario.

Table 11: 2013 Existing Intersection LOS

Intersection	Type	Approach	AM Peak Hour Avg. Delay (sec)	LOS	PM Peak Hour Avg. Delay (sec)	LOS
5: SR 33 @ I-140 Off-Ramp	STOP Controlled	Eastbound	17.8	C	70.1	F
		Northbound	-	-	-	-
		Southbound	-	-	-	-
5: SR 33 @ I-140 On-Ramp	STOP Controlled	Eastbound	-	-	-	-
		Northbound	62.6	F	19.1	C
		Southbound	-	-	-	-
4: SR 33 @ Wildwood (Horn) Road	STOP Controlled	Westbound	26.4	D	50.9	F
		Northbound	-	-	-	-
		Southbound	8.8	A	9.9	A
7: SR 33 / E. Broadway Avenue @ SR 35 / S. Washington Street	Signalized	Eastbound	34.4	C	112.9	F
		Westbound	34.1	C	132.6	F
		Northbound	38.9	D	89.6	F
		Southbound	24.6	C	29.4	C
		Whole Int.	32.6	C	70.5	E
9: SR 35 / S. Washington Street @ Sevierville Road	Signalized	Eastbound	38.5	D	45.0	D
		Westbound	39.5	D	47.2	D
		Northbound	12.5	B	19.5	B
		Southbound	10.7	B	21.7	C
		Whole Int.	14.6	B	24.0	C
10: S. Washington Street / SR 35 @ High Street / SR 35	Signalized	Eastbound	42.3	D	50.3	D
		Westbound	37.9	D	45.6	D
		Northbound	27.2	C	39.6	D
		Southbound	21.6	C	26.4	C
		Whole Int.	27.9	C	34.5	C
11: S. Washington Street @ SR 73 / US 321	Signalized	Eastbound	278.7	F	465.1	F
		Westbound	56.9	E	52.6	D
		Northbound	31.7	C	161.6	F
		Southbound	114.7	F	265.4	F
		Whole Int.	135.8	F	275.9	F

Table 11: 2013 Existing Intersection LOS (cont.)

Intersection	Type	Approach	AM Peak Hour Avg. Delay (sec)	LOS	PM Peak Hour Avg. Delay (sec)	LOS
13: SR 33 @ Sam Houston School Road	Signalized	Westbound	21.3	C	21.3	C
		Northbound	20.1	C	20.1	C
		Southbound	15.9	B	15.9	B
		Whole Int.	**19.5**	**B**	**19.5**	**B**
14: Sam Houston School Road @ Wildwood Road	STOP Controlled	Eastbound	9.0	A	7.7	A
		Westbound	-	-	-	-
		Southbound	12.9	B	12.3	B
15: Peppermint Road @ Wildwood Road	STOP Controlled	Eastbound	-	-	-	-
		Westbound	7.8	A	8.2	A
		Northbound	12.7	B	13.5	B
16: SR 35 / US 411 / Sevierville Road @ Peppermint Road	STOP Controlled	Eastbound	9.0	A	8.1	A
		Westbound	-	-	-	-
		Southbound	21.5	C	22.2	C
17: SR 35 / US 411 / Sevierville Road @ Hitch Road / Peppermint Hills Drive	STOP Controlled	Eastbound	8.3	A	7.8	A
		Westbound	7.9	A	8.5	A
		Northbound	20.1	C	17.1	C
		Southbound	11.4	B	12.4	B
18: Davis Ford Road @ Hitch Road	STOP Controlled	Eastbound	7.5	A	7.4	A
		Westbound	-	-	-	-
		Southbound	10.1	B	9.6	A
19: Davis Ford Road @ Helton Road	STOP Controlled	Eastbound	-	-	-	-
		Westbound	7.3	A	7.3	A
		Northbound	8.7	A	8.6	A
20: SR 73 / US 321 @ Helton Road / Tuckaleechee Pike	STOP Controlled	Eastbound	11.3	B	9.2	A
		Westbound	9.6	A	10.7	B
		Northbound	16.3	C	17.3	C
		Southbound	89.9	F	32.3	D

Table 12: 2020 No-Build Intersection LOS

Intersection	Type	Approach	AM Peak Hour Avg. Delay (sec)	LOS	PM Peak Hour Avg. Delay (sec)	LOS
5: SR 33 @ I-140 Off-Ramp	Signalized	Eastbound	47.3	D	87.9	F
		Northbound	44.9	D	46.1	D
		Southbound	11.8	B	17.7	B
		Whole Int.	39.7	D	56.5	E
5: SR 33 @ I-140 On-Ramp	STOP Controlled	Eastbound	-	-	-	-
		Northbound	215.0	F	44.4	E
		Southbound	-	-	-	-
4: SR 33 @ Wildwood (Horn) Road	STOP Controlled	Westbound	88.2	F	239.7	F
		Northbound	-	-	-	-
		Southbound	9.1	A	11.0	B
7: SR 33 / E. Broadway Avenue @ SR 35 / S. Washington Street	Signalized	Eastbound	41.8	D	199.9	F
		Westbound	41.5	D	188.5	F
		Northbound	41.0	D	113.5	F
		Southbound	25.5	C	29.3	C
		Whole Int.	35.8	D	95.5	F
9: SR 35 / S. Washington Street @ Sevierville Road	Signalized	Eastbound	38.6	D	44.8	D
		Westbound	39.0	D	46.8	D
		Northbound	13.4	B	21.4	C
		Southbound	11.5	B	25.1	C
		Whole Int.	15.4	B	26.4	C
10: S. Washington Street / SR 35 @ High Street / SR 35	Signalized	Eastbound	46.4	D	54.2	D
		Westbound	41.3	D	87.8	F
		Northbound	30.0	C	43.6	D
		Southbound	24.9	C	28.1	C
		Whole Int.	31.1	C	42.1	D
11: S. Washington Street @ SR 73 / US 321	Signalized	Eastbound	235.4	F	615.0	F
		Westbound	56.7	E	52.4	D
		Northbound	98.5	F	234.7	F
		Southbound	206.4	F	286.6	F
		Whole Int.	168.4	F	358.7	F

Table 12: 2020 No-Build Intersection LOS (cont.)

Intersection	Type	Approach	AM Peak Hour Avg. Delay (sec)	LOS	PM Peak Hour Avg. Delay (sec)	LOS
13: SR 33 @ Sam Houston School Road	Signalized	Westbound	25.2	C	31.8	C
		Northbound	27.6	C	11.6	B
		Southbound	19.3	B	5.1	A
		Whole Int.	**24.4**	**C**	**11.6**	**B**
14: Sam Houston School Road @ Wildwood Road	STOP Controlled	Eastbound	11.2	B	8.2	A
		Westbound	-	-	-	-
		Southbound	23.1	C	24.0	C
15: Peppermint Road @ Wildwood Road	STOP Controlled	Eastbound	-	-	-	-
		Westbound	8.3	A	9.5	A
		Northbound	46.2	E	62.1	F
16: SR 35 / US 411 / Sevierville Road @ Peppermint Road	STOP Controlled	Eastbound	9.9	A	8.4	A
		Westbound	-	-	-	-
		Southbound	55.7	F	71.7	F
17: SR 35 / US 411 / Sevierville Road @ Hitch Road / Peppermint Hills Drive	STOP Controlled	Eastbound	8.7	A	7.3	A
		Westbound	8.1	A	7.2	A
		Northbound	41.5	E	15.6	C
		Southbound	12.6	B	27.9	D
18: Davis Ford Road @ Hitch Road	STOP Controlled	Eastbound	7.6	A	7.5	A
		Westbound	-	-	-	-
		Southbound	10.8	B	10.0	B
19: Davis Ford Road @ Helton Road	STOP Controlled	Eastbound	-	-	-	-
		Westbound	7.4	A	7.3	A
		Northbound	8.8	A	8.6	A
20: SR 73 / US 321 @ Helton Road / Tuckaleechee Pike	STOP Controlled	Eastbound	13.6	B	10.1	A
		Westbound	10.8	B	13.0	B
		Northbound	44.0	E	29.3	D
		Southbound	630.7	F	74.2	F

Table 13: 2040 No-Build Intersection LOS

Intersection	Type	Approach	AM Peak Hour Avg. Delay (sec)	LOS	PM Peak Hour Avg. Delay (sec)	LOS
5: SR 33 @ I-140 Off-Ramp	Signalized	Eastbound	469.0	F	393.1	F
		Northbound	248.1	F	304.1	F
		Southbound	17.7	B	29.1	C
		Whole Int.	284.9	F	307.4	F
5: SR 33 @ I-140 On-Ramp	STOP Controlled	Eastbound	-	-	-	-
		Northbound	1375.0	F	741.9	F
		Southbound	-	-	-	-
4: SR 33 @ Wildwood (Horn) Road	STOP Controlled	Westbound	847.8	F	2782.0	F
		Northbound	-	-	-	-
		Southbound	10.0	B	16.0	C
7: SR 33 / E. Broadway Avenue @ SR 35 / S. Washington Street	Signalized	Eastbound	85.0	F	449.8	F
		Westbound	54.5	D	263.0	F
		Northbound	63.5	E	77.6	E
		Southbound	29.2	C	129.2	F
		Whole Int.	53.8	D	170.1	F
9: SR 35 / S. Washington Street @ Sevierville Road	Signalized	Eastbound	39.0	D	53.2	D
		Westbound	38.1	D	55.2	E
		Northbound	16.0	B	26.4	C
		Southbound	13.6	B	37.7	D
		Whole Int.	17.5	B	35.5	D
10: S. Washington Street / SR 35 @ High Street / SR 35	Signalized	Eastbound	50.2	D	158.5	F
		Westbound	83.5	F	176.8	F
		Northbound	48.7	D	52.5	D
		Southbound	23.4	C	48.1	D
		Whole Int.	46.0	D	74.8	E
11: S. Washington Street @ SR 73 / US 321	Signalized	Eastbound	430.6	F	892.6	F
		Westbound	51.7	D	56.8	E
		Northbound	276.7	F	345.8	F
		Southbound	373.3	F	542.4	F
		Whole Int.	350.0	F	571.3	F

Table 13: 2040 No-Build Intersection LOS (cont.)

Intersection	Type	Approach	AM Peak Hour Avg. Delay (sec)	LOS	PM Peak Hour Avg. Delay (sec)	LOS
13: SR 33 @ Sam Houston School Road	Signalized	Westbound	36.4	D	54.7	D
		Northbound	31.3	C	15.0	B
		Southbound	30.5	C	6.7	A
		Whole Int.	**32.6**	**C**	**15.9**	**B**
14: Sam Houston School Road @ Wildwood Road	STOP Controlled	Eastbound	80.0	F	10.5	B
		Westbound	-	-	-	-
		Southbound	174.2	F	940.3	F
15: Peppermint Road @ Wildwood Road	STOP Controlled	Eastbound	-	-	-	-
		Westbound	11.0	B	22.0	C
		Northbound	3226.0	F	9169.0	F
16: SR 35 / US 411 / Sevierville Road @ Peppermint Road	STOP Controlled	Eastbound	12.7	B	9.2	A
		Westbound	-	-	-	-
		Southbound	747.7	F	756.5	F
17: SR 35 / US 411 / Sevierville Road @ Hitch Road / Peppermint Hills Drive	STOP Controlled	Eastbound	9.6	A	8.5	A
		Westbound	8.6	A	10.4	B
		Northbound	497.6	F	93.8	F
		Southbound	17.1	C	22.3	C
18: Davis Ford Road @ Hitch Road	STOP Controlled	Eastbound	7.7	A	7.6	A
		Westbound	-	-	-	-
		Southbound	12.9	B	11.2	B
19: Davis Ford Road @ Helton Road	STOP Controlled	Eastbound	-	-	-	-
		Westbound	7.5	A	7.4	A
		Northbound	9.1	A	8.8	A
20: SR 73 / US 321 @ Helton Road / Tuckaleechee Pike	STOP Controlled	Eastbound	21.5	C	12.5	B
		Westbound	15.4	C	24.3	C
		Northbound	1799.0	F	781.3	F
		Southbound	*	F	599.5	F

*Delay too high to calculate

Table 14: 2020 Preferred Alternative Intersection LOS

Intersection	Type	Approach	AM Peak Hour Avg. Delay (sec)	LOS	PM Peak Hour Avg. Delay (sec)	LOS
4: SR 33 @ Wildwood (Horn) Road	STOP Controlled	Westbound	56.3	F	136.0	F
		Northbound	-	-	-	-
		Southbound	8.9	A	10.6	B
7: SR 33 / E. Broadway Avenue @ SR 35 / S. Washington Street	Signalized	Eastbound	39.1	D	50.4	D
		Westbound	39.9	D	46.1	D
		Northbound	28.8	C	70.7	E
		Southbound	20.8	C	43.5	D
		Whole Int.	**29.0**	**C**	**52.6**	**D**
9: SR 35 / S. Washington Street @ Sevierville Road	Signalized	Eastbound	38.6	D	45.1	D
		Westbound	39.4	D	47.2	D
		Northbound	12.6	B	19.6	B
		Southbound	10.8	B	21.5	C
		Whole Int.	**14.7**	**B**	**24.0**	**C**
10: S. Washington Street / SR 35 @ High Street / SR 35	Signalized	Eastbound	42.2	D	49.9	D
		Westbound	37.4	D	55.4	E
		Northbound	27.5	C	37.8	D
		Southbound	22.5	C	24.4	C
		Whole Int.	**28.5**	**C**	**34.5**	**C**
11: S. Washington Street @ SR 73 / US 321	Signalized	Eastbound	274.3	F	573.1	F
		Westbound	57.3	E	52.9	D
		Northbound	39.4	D	217.6	F
		Southbound	256.6	F	222.5	F
		Whole Int.	**167.2**	**F**	**322.7**	**F**

Table 14: 2020 Preferred Alternative Intersection LOS (cont.)

Intersection	Type	Approach	AM Peak Hour Avg. Delay (sec)	LOS	PM Peak Hour Avg. Delay (sec)	LOS
13: SR 33 @ Sam Houston School Road	Signalized	Westbound	42.2	D	51.5	D
		Northbound	42.0	D	9.8	A
		Southbound	19.0	B	4.3	A
		Whole Int.	**35.4**	**D**	**11.4**	**B**
14: Sam Houston School Road @ Wildwood Road	STOP Controlled	Eastbound	9.1	A	7.9	A
		Westbound	-	-	-	-
		Southbound	13.5	B	13.4	B
15: Peppermint Road @ Wildwood Road	STOP Controlled	Eastbound	-	-	-	-
		Westbound	7.9	A	8.5	A
		Northbound	15.7	C	18.6	C
16: SR 35 / US 411 / Sevierville Road @ Peppermint Road	STOP Controlled	Eastbound	8.8	A	8.0	A
		Westbound	-	-	-	-
		Southbound	18.0	C	18.3	C
17: SR 35 / US 411 / Sevierville Road @ Hitch Road / Peppermint Hills Drive	STOP Controlled	Eastbound	8.1	A	7.8	A
		Westbound	7.8	A	8.4	A
		Northbound	17.4	C	15.5	C
		Southbound	11.0	B	11.9	B
18: Davis Ford Road @ Hitch Road	STOP Controlled	Eastbound	7.4	A	7.4	A
		Westbound	-	-	-	-
		Southbound	9.9	A	9.4	B
19: Davis Ford Road @ Helton Road	STOP Controlled	Eastbound	-	-	-	-
		Westbound	7.3	A	7.3	A
		Northbound	8.7	A	8.5	A
20: SR 73 / US 321 @ Helton Road / Tuckaleechee Pike	STOP Controlled	Eastbound	10.6	B	8.9	A
		Westbound	9.2	A	10.2	B
		Northbound	14.1	B	14.9	B
		Southbound	57.8	F	26.4	D

Table 15: 2020 Preferred Alternative New SR 33 at I-140 Intersection LOS

Intersection	Type	Approach	AM Peak Hour Avg. Delay (sec)	LOS	PM Peak Hour Avg. Delay (sec)	LOS
SR 33 @ I-140 North of Pellissippi Pkwy	Signalized; Dual Turn Lanes for NB Left, All others Single Lanes	Westbound	19.8	B	27.4	C
		Northbound	17.4	B	3.8	A
		Southbound	10.3	B	3.0	A
		Whole Int.	**15.6**	**B**	**5.4**	**A**
SR 33 @ I-140 South of Pellissippi Pkwy	Signalized; Separate Turn Lane for All Movements	Eastbound	23.8	C	48.7	D
		Northbound	25.6	C	23.5	C
		Southbound	18.8	B	31.3	C
		Whole Int.	**23.9**	**C**	**29.8**	**C**

Table 16: 2020 Preferred Alternative New US 411 at I-140 Intersection LOS

Intersection	Type	Approach	AM Peak Hour Avg. Delay (sec)	LOS	PM Peak Hour Avg. Delay (sec)	LOS
US 411 @ I-140 West of Pellissippi Pkwy	Signalized; Separate Turn Lanes for All Movements	Eastbound	7.8	A	9.5	A
		Westbound	5.3	A	5.8	A
		Southbound	32.1	C	25.6	C
		Whole Int.	**9.6**	**A**	**12.3**	**B**
US 411 @ I-140 East of Pellissippi Pkwy	Signalized; Separate Turn Lanes for All Movements	Eastbound	4.8	A	4.4	A
		Westbound	10.9	B	8.0	A
		Northbound	36.1	D	26.9	C
		Whole Int.	**12.8**	**B**	**9.1**	**A**

Table 17: 2040 Preferred Alternative Intersection LOS

Intersection	Type	Approach	AM Peak Hour Avg. Delay (sec)	LOS	PM Peak Hour Avg. Delay (sec)	LOS
4: SR 33 @ Wildwood (Horn) Road	STOP Controlled	Westbound	531.4	F	1484.0	F
		Northbound	-	-	-	-
		Southbound	9.6	A	14.0	B
7: SR 33 / E. Broadway Avenue @ SR 35 / S. Washington Street	Signalized	Eastbound	35.2	D	51.6	D
		Westbound	36.0	D	51.0	D
		Northbound	42.7	D	123.7	F
		Southbound	25.8	C	87.3	F
		Whole Int.	**34.6**	**C**	**85.0**	**F**
9: SR 35 / S. Washington Street @ Sevierville Road	Signalized	Eastbound	33.4	C	44.0	D
		Westbound	33.6	C	46.0	D
		Northbound	14.1	B	21.7	C
		Southbound	12.2	B	23.0	C
		Whole Int.	**16.1**	**B**	**26.2**	**C**
10: S. Washington Street / SR 35 @ High Street / SR 35	Signalized	Eastbound	36.9	D	35.9	D
		Westbound	32.0	C	43.3	D
		Northbound	32.6	C	204.4	F
		Southbound	24.4	C	35.5	D
		Whole Int.	**30.2**	**C**	**86.1**	**F**
11: S. Washington Street @ SR 73 / US 321	Signalized	Eastbound	354.2	F	487.8	F
		Westbound	63.6	E	58.8	E
		Northbound	99.4	F	276.1	F
		Southbound	365.3	F	551.8	F
		Whole Int.	**243.6**	**F**	**408.6**	**F**

Table 17: 2040 Preferred Alternative Intersection LOS (cont.)

Intersection	Type	Approach	AM Peak Hour Avg. Delay (sec)	LOS	PM Peak Hour Avg. Delay (sec)	LOS
13: SR 33 @ Sam Houston School Road	Signalized	Westbound	48.4	D	51.5	D
		Northbound	76.0	E	9.8	A
		Southbound	23.4	C	4.3	A
		Whole Int.	**51.9**	**D**	**11.4**	**B**
14: Sam Houston School Road @ Wildwood Road	STOP Controlled	Eastbound	9.0	A	7.9	A
		Westbound	-	-	-	-
		Southbound	13.6	B	13.4	B
15: Peppermint Road @ Wildwood Road	STOP Controlled	Eastbound	-	-	-	-
		Westbound	8.2	A	8.5	A
		Northbound	26.0	D	18.6	C
16: SR 35 / US 411 / Sevierville Road @ Peppermint Road	STOP Controlled	Eastbound	8.3	A	8.0	A
		Westbound	-	-	-	-
		Southbound	13.8	B	18.3	C
17: SR 35 / US 411 / Sevierville Road @ Hitch Road / Peppermint Hills Drive	STOP Controlled	Eastbound	7.9	A	7.8	A
		Westbound	7.7	A	8.4	A
		Northbound	13.7	B	15.5	C
		Southbound	10.3	B	11.9	B
18: Davis Ford Road @ Hitch Road	STOP Controlled	Eastbound	7.4	A	7.4	A
		Westbound	-	-	-	-
		Southbound	9.5	A	9.4	B
19: Davis Ford Road @ Helton Road	STOP Controlled	Eastbound	-	-	-	-
		Westbound	7.3	A	7.3	A
		Northbound	8.6	A	8.5	A
20: SR 73 / US 321 @ Helton Road / Tuckaleechee Pike	STOP Controlled	Eastbound	9.6	A	9.6	A
		Westbound	8.6	A	8.6	A
		Northbound	14.1	B	11.6	B
		Southbound	57.8	F	31.5	D

Table 18: 2040 Preferred Alternative New SR 33 at I-140 Intersection LOS

Intersection	Type	Approach	AM Peak Hour Avg. Delay (sec)	LOS	PM Peak Hour Avg. Delay (sec)	LOS
SR 33 @ I-140 North of Pellissippi Pkwy	Signalized; Dual Turn Lanes for NB Left, All others Single Lanes	Westbound	169.1	F	49.5	D
		Northbound	182.3	F	53.3	D
		Southbound	9.0	A	6.1	A
		Whole Int.	133.8	F	41.4	D
SR 33 @ I-140 South of Pellissippi Pkwy	Signalized; Separate Turn Lane for All Movements; Dual EB Left Turn Lanes	Eastbound	195.8	F	187.7	F
		Northbound	110.9	F	125.7	F
		Southbound	41.9	D	144.1	F
		Whole Int.	120.4	F	147.4	F

Table 19: 2040 Preferred Alternative New US 411 at I-140 Intersection LOS

Intersection	Type	Approach	AM Peak Hour Avg. Delay (sec)	LOS	PM Peak Hour Avg. Delay (sec)	LOS
US 411 @ I-140 West of Pellissippi Pkwy	Signalized; Separate Turn Lanes for All Movements	Eastbound	36.6	D	96.5	F
		Westbound	22.2	C	34.2	C
		Southbound	37.4	D	67.0	E
		Whole Int.	31.4	C	70.6	E
US 411 @ I-140 East of Pellissippi Pkwy	Signalized; Separate Turn Lanes for All Movements	Eastbound	24.2	C	12.1	B
		Westbound	25.9	C	5.5	A
		Northbound	53.7	D	57.5	E
		Whole Int.	27.7	C	12.7	B

Table 20 provides a summary of the intersection LOS.

Several of the intersections currently operate at a poor LOS (LOS E or F) with some additional intersections having failing operations by the year 2040 (SR 33 at the I-140 Ramp, SR 33 at Wildwood Road, and S. Washington Street at High Street / SR 35) in the No-Build scenario. The stop controlled intersections evaluated along Sam Houston School Road, Peppermint Road, Hitch Road, and Helton Road generally operate at an acceptable LOS in the No-Build scenario with some poor operations by the year 2020 for some approaches.

Based on this analysis, the construction of the Pellissippi Parkway Extension (Preferred Alternative) would degrade the LOS at one intersection. The LOS for the intersection of SR 33 with Sam Houston School Road goes from a LOS B in the 2020 No-Build to a LOS D in the 2020 Preferred Alternative and from a LOS C in the 2040 No-Build to a LOS D in the 2020 Preferred Alternative during the AM peak hour.

The proposed project would improve the LOS at eight intersections. The locations include:

- SR 33 / E. Broadway Avenue and SR 35 / S. Washington Street intersection. Improvements include LOS D to a LOS C in the AM peak hour and LOS F to LOS D in the 2020 PM peak hour.
- SR 35 / S. Washington Street and Sevierville Road intersection. The LOS improves from LOS D to LOS C in the 2040 PM peak hour.
- S. Washington Street / SR 35 at High Street / SR 35 intersection. The LOS improves from LOS D in the No-Build scenario to LOS C in the Preferred Alternative scenario in the 2040 AM peak hour. In the PM peak hour, The LOS for the year 2020 is LOS C for the Preferred Alternative which is an improvement over the LOS D for the No-Build scenario. However, for the year 2040 in the PM peak hour, the LOS declines to a LOS F in the Preferred Alternative compared to a LOS E for the No-Build scenario.
- Sam Houston School Road at Wildwood Road. The Preferred Alternative improves the LOS to B in both the AM and PM peak hours for both analysis years (2020 and 2040).
- Peppermint Road at Wildwood Road. The Preferred Alternative improves the LOS to LOS C for both the AM and PM peak hours in the year 2020. In the year 2040, the LOS is improved to LOS D for the AM peak hour and remains at a LOS C in the PM peak hour.
- SR 35 / US 411 / Sevierville Road at Peppermint Road. The Preferred Alternative improves the LOS to LOS C for both the AM and PM peak hours for the analysis year 2020. In the year 2040 the LOS improves to LOS B for the AM peak hour and remains at LOS C for the PM peak hour.
- SR 35 / US 411 / Sevierville Road at Hitch Road / Peppermint Hills. The Preferred Alternative improves the LOS to LOS C for both the AM and PM peak hours for the analysis year 2020. In the year 2040 the LOS improves to LOS B for the AM peak hour and remains at LOS C for the PM peak hour.
- SR 73 / US 321 at Helton Road / Tuckaleechee Pike. In the year 2040 in the PM peak hour, the Preferred Alternative improves the LOS to D.

The new interchanges created by this project at SR 33 and US 411 are shown to operate at an acceptable level in the year 2020. By the year 2040, some of the movements / operations begin to degrade given the volumes forecasted for these intersections. Further consideration would need to be given to the specific design for these interchanges in future project stages.

Table 20: Intersection LOS Summary

Intersection	AM Peak Hour					PM Peak Hour				
	2013 Existing	2020 No-Build	2040 No Build	2020 Preferred Alternative	2040 Preferred Alternative	2013 Existing	2020 No-Build	2040 No Build	2020 Preferred Alternative	2040 Preferred Alternative
SR 33 @ I-140 Off-Ramp	C	D	F	-	-	F	E	F	-	-
SR 33 @ I-140 On-Ramp	F	F	F	-	-	C	E	F	-	-
SR 33 @ Wildwood Rd	D	F	F	F	F	F	F	F	F	F
SR 33 / E. Broadway Ave @ SR 35 / S. Washington St	C	D	D	C	C	E	F	F	D	F
SR 35 / S. Washington St @ Sevierville Rd	B	B	B	B	B	C	C	D	C	C
S. Washington St / SR 35 @ High St / SR 35	C	C	D	C	C	C	D	E	C	F
S. Washington St @ SR 73 / US 321	F	F	F	F	F	F	F	F	F	F
SR 33 @ Sam Houston School Road	B	B	C	D	D	B	B	B	B	B
Sam Houston School Road @ Wildwood Road	B	C	F	B	B	B	C	F	B	B
Peppermint Road @ Wildwood Road	B	F	F	C	D	B	F	F	C	C
SR 35 / US 411 / Sevierville Road @ Peppermint Road	C	F	F	C	B	C	F	F	C	C
SR 35 / US 411 / Sevierville Road @ Hitch Road / Peppermint Hills	C	D	F	C	B	C	D	F	C	C
Davis Ford Road @ Hitch Road	B	B	B	A	A	A	B	B	B	B
Davis Ford Road @ Helton Road	A	A	A	A	A	A	A	A	A	A
SR 73 / US 321 @ Helton Road / Tuckaleechee Pike	F	F	F	F	F	D	F	F	D	D

3.4 Intersection Delay Results

The delay associated with the LOS is another measure to determine changes in traffic operations. Delay is a measure of the additional travel time experienced by a driver through an intersection. The average delay per movement is shown on the previous tables (**Tables 11-19**), which detail intersection LOS. To provide a summary of the impacts associated with the Preferred Alternative, the delay was compared to the No-Build Alternative. **Table 21** summarizes the expected change in the amount of delay (in terms of seconds of delay) at key intersections in the design year 2040 in comparison with the No-Build Alternative. **Figure 9** displays the percentage difference in delay between the No-Build and the Preferred Alternative at those intersections in 2040.

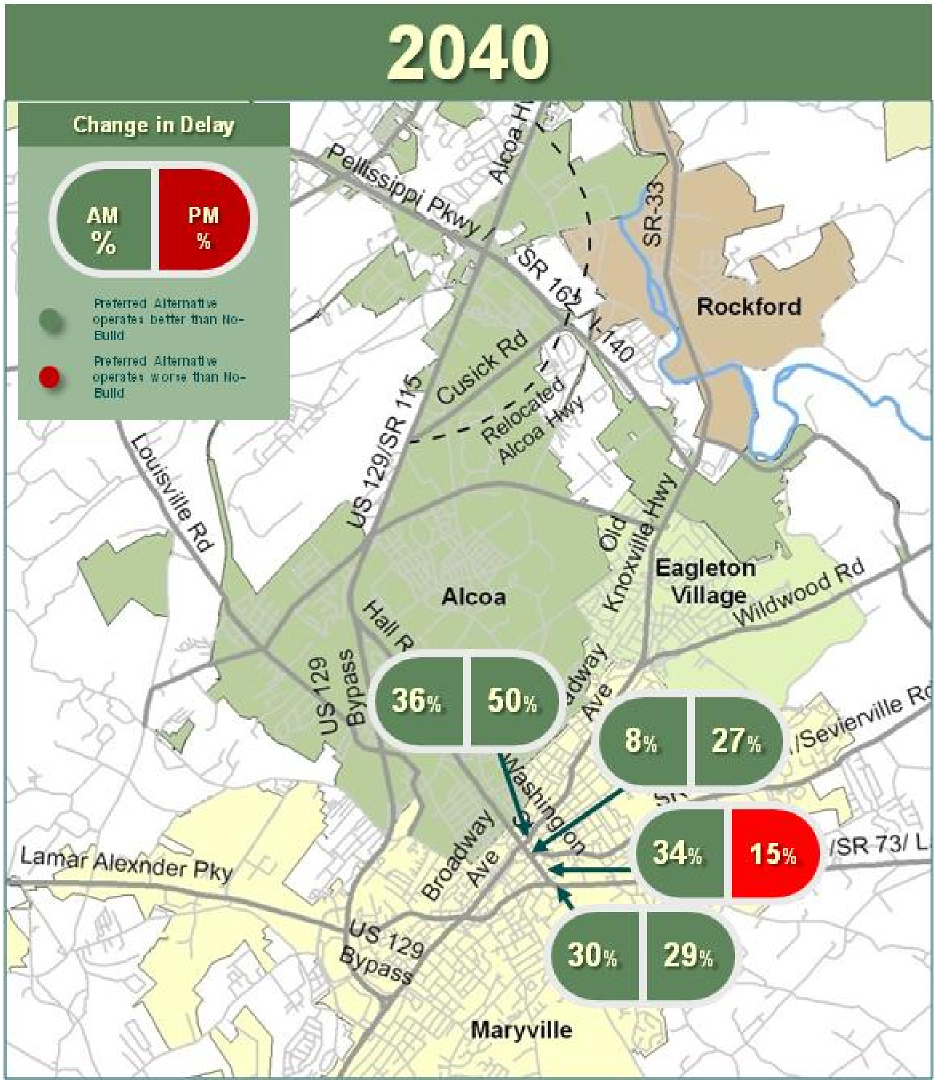
Table 21: 2040 Intersection Delay Change for Preferred Alternative Compared to No-Build

Intersection	2040	
	AM Change in Delay (seconds)	PM Change in Delay (seconds)
SR 33/E Broadway Ave @ SR 35/S Washington St	19.2	85.1
SR 35/S Washington St @ Sevierville Rd	1.4	9.4
S Washington St/SR 35 @ High St/SR 35	15.8	-11.3
S Washington St @ SR 73/US 321	106.4	162.7

Preferred Alternative operates better than No-Build

Preferred Alternative operates worse than No-Build

Figure 9: Intersection Delay Comparison between 2040 No-Build and Preferred Alternative



As shown in **Table 21** and **Figure 9**, the Preferred Alternative shows substantial improvement in delay in most of the intersections in the Alcoa / Maryville core. The improvements range from 8% reduction in delay to 50% reduction in delay (compared to the No-Build). In actual terms of seconds of delay, these improvements correspond to a reduction in delay of between 1 second and 85 seconds over the No-Build.

4.0 SUMMARY OF CHANGES

Following the most recent update to the Knoxville Regional Travel Demand Model (adopted in June 2013 for horizon year 2034), it was requested that the traffic operations analysis for the Pellissippi Parkway Extension EIS be updated. A new *Traffic Forecast Study* was prepared by Sain Associates, Inc. (December 31, 2013) and was used in this analysis. Some key points related to this update include the following:

- A substantial update to the Highway Capacity Manual and Software was completed since the last Traffic Operations Technical Report Addendum. The previous analysis was completed using the HCS Plus Software; this update utilized the HCS 2010 software. This should be taken into consideration when comparing results from the previous analysis.
- The proposed Pellissippi Parkway Extension (from SR 33 to US 411) will operate at an acceptable LOS through the analysis year 2040.
- Several key intersections in the Maryville / Alcoa core area show reductions in delay (measured in seconds) as a result of the Preferred Alternative.
- Intersections in the eastern portion of the study area with the local roads (i.e. Sam Houston School Road at Wildwood Road, Peppermint Road at Wildwood Road, SR 35 at Peppermint Road, SR 35 at Hitch Road) improve to an acceptable LOS with the Preferred Alternative.

MEMORANDUM

Date: **May 14, 2014**

Project: **Pellissippi Parkway Extension (SR-162), Blount County, Tennessee**

Subject: **Updated Traffic Analysis for DEIS Alternative D**

Summary

The new regional travel demand model, adopted by the Knoxville Transportation Planning Organization (Knoxville TPO) in June 2013, resulted in reduced projected traffic on the Pellissippi Parkway Extension. The result of the new model raised the question of whether the forecasted traffic volumes for the improved two-lane DEIS Alternative D have been reduced enough to make DEIS Alternative D operate at an acceptable level of service (LOS) in the design year. This memorandum documents the poor performance of DEIS Alternative D based on updated traffic volumes and reinforces the conclusion that the previously selected Preferred Alternative with West Shift remains valid.

Background

The Knoxville TPO adopted a new travel demand model in June 2013, and in August 2013 the Tennessee Department of Transportation (TDOT) determined the need to prepare new traffic forecasts and traffic operations analysis for the Preferred Alternative with West Shift. The results of the forecasts and analysis are documented in the February 2014 *Addendum to the Traffic Operations Technical Report*.

The February 2014 Addendum evaluated two scenarios:

- No-Build (Years 2013, 2020 and 2040)
- Preferred Alternative with West Shift (Years 2020 and 2040)

The results of the analysis of the Preferred Alternative with West Shift apply equally to the previously dismissed DEIS Alternative C, Preferred Alternative (A) and Preferred Alternative with East Shift. The regional travel demand model is not sensitive enough to differentiate among these four-lane alternatives. As a result, the corridor LOS, intersection LOS, and time delay at intersections are the same for all of the four-lane alternatives.

The February 2014 Addendum did not include updated forecasts and analyses for DEIS Alternative D, a previously considered improved two-lane alternative that performed poorly in a prior evaluation (see *Addendum to the Traffic Operations Technical Report*, dated June 2011). The June 2011 Addendum included the following statement:

> *"Sam Houston School Road, Peppermint Road, Hitch Road, and Helton Road all operate at a poor LOS in the year 2035 for Build Alternative D. The two lanes along these roadways as included in this alternative do not have the capacity to accommodate the additional traffic under the Build scenario."*

Traffic Forecasts

Using existing volumes and the updated regional model, forecasts for DEIS Alternative D for years 2020 and 2040 were prepared. The revised forecast volumes are shown in Table 1. For reference, Table 2 presents the forecasted volumes (2015 and 2035) from the 2011 evaluation of DEIS Alternative D.

Table 1: DEIS Alternative D Traffic Forecasts with the Updated Knoxville TPO Travel Demand Model

Route	From	To	2020 AADT* Forecast	2040 AADT Forecast
Sam Houston School Rd	SR 33	Wildwood Rd	9,340	16,800
Peppermint Rd	Wildwood Rd	Sevierville Rd	9,620	20,580
Hitch Rd	Sevierville Rd	Davis Ford Rd	6,360	14,890
Helton Rd	Davis Ford Rd	Lamar Alexander Pkwy	6,130	15,790

*AADT = annual average daily traffic

Table 2: DEIS Alternative D Traffic Forecasts from 2011 Addendum

Route	From	To	2015 AADT Forecast	2035 AADT Forecast
Sam Houston School Rd	SR 33	Wildwood Rd	15,740	20,840
Peppermint Rd	Wildwood Rd	Sevierville Rd	20,890	27,550
Hitch Rd	Sevierville Rd	Davis Ford Rd	13,880	21,850
Helton Rd	Davis Ford Rd	Lamar Alexander Pkwy	13,880	21,850

Under the new model, forecasted volumes on the local roads that are part of DEIS Alternative D would be substantially lower than the volumes forecasted under the previous model. Not accounting for the five year difference in forecasts, the volumes show a 41 to 56 percent decline for the new base year (2020) compared with the old base year (2015). The horizon year volumes (2040) under the new model declined 19 to 32 percent from the volumes forecasted for 2035 under the previous model. Table 3 summarizes the decline in forecast volumes for each roadway.

Table 3: Changes in Forecasted Volumes for DEIS Alternative D between Previous and Current Regional Models

Route	From	To	Change in Base Year Forecasts (2015 to 2020)	Change in Horizon Year Forecasts (2035 to 2040)
Sam Houston School Rd	SR 33	Wildwood Rd	-41%	-19%
Peppermint Rd	Wildwood Rd	Sevierville Rd	-54%	-25%
Hitch Rd	Sevierville Rd	Davis Ford Rd	-54%	-32%
Helton Rd	Davis Ford Rd	Lamar Alexander Pkwy	-56%	-28%

Corridor LOS Results

The updated AADTs for DEIS Alternative D were analyzed using the two-lane highway analysis methodology described on pages 5-7 of the February 2014 Addendum. The analysis was conducted using HCS 2010 (based on the *Highway Capacity Manual 2010*), a more current version of the *Highway Capacity Software* that replaces the HCS Plus version used for the 2011 Addendum. The critical inputs and results of the updated capacity analysis for 2020 and 2040 volumes are shown in Tables 4 and 5, respectively.

Table 6 provides a summary comparison of corridor LOS for the updated traffic volumes with DEIS Alternative D versus existing and No-Build conditions. Table 7 compares the LOS results for DEIS Alternative D with the updated traffic volumes compared to previously analyzed volumes based on the prior regional model.

Observations

- Even with lower forecasted traffic volumes based on the current regional travel demand model, DEIS Alternative D would operate poorly (LOS E or F) in the 2020 and 2040 horizon years. The corridor LOS analysis clearly indicates that the forecast volumes for DEIS Alternative D exceed the carrying capacity of a two-lane road. This is true even if that network of two-lane roads is improved by wider lanes, improved shoulders, and the straightening of substandard curves.
- Given that the corridor LOS analysis demonstrates that the forecast volumes for DEIS Alternative D exceed the carrying capacity of a two-lane road, an intersection LOS analysis is expected to yield poor results like the corridor LOS analysis produced. Even if some intersection movements are acceptable with DEIS Alternative D, the overall corridor would provide poor traffic operations as demonstrated by the corridor LOS.

Table 4: DEIS Alternative D (2020) Corridor Level of Service

Route	Begin Milepoint	End Milepoint	Section Length (miles)	2020 ADT	K-Factor	2020 DHV	Posted Speed Limit (mph)	% Trucks and Buses	Estimated Travel Speed (MPH)	% Time Spent Following	LOS
Sam Houston	SR 33 MP 0.000	Wildwood Rd MP 2.650	2.65	9,340	0.160	1494	50	2.0%	35.5	88.1	E
Peppermint Road	Wildwood Rd MP 0.000	Sevierville Rd MP 1.100	1.10	9,620	0.130	1251	50	2.0%	37.2	83.9	E
Hitch Road	Sevierville Rd MP 1.202	Davis Ford Rd MP 0.000	1.20	6,360	0.150	954	50	1.0%	39.2	77.8	E
Helton Road	Davis Ford Rd MP 0.875	Lamar Alexander Pkwy MP 0.000	0.88	6,130	0.150	920	50	1.0%	39.4	76.3	E

LOS E - F
LOS A - D
Speed <45, Not Analyzed

Table 5: DEIS Alternative D (2040) Corridor Level of Service

Route	Begin Milepoint	End Milepoint	Section Length (miles)	2040 ADT	K-Factor	2040 DHV	Posted Speed Limit (mph)	% Trucks and Buses	Estimated Travel Speed (MPH)	% Time Spent Following	LOS
Sam Houston	SR 33 MP 0.000	Wildwood Rd MP 2.650	2.65	16,800	0.160	2688	50	2.0%	25.9	100.0	F
Peppermint Road	Wildwood Rd MP 0.000	Sevierville Rd MP 1.100	1.10	20,580	0.130	2675	50	2.0%	26.0	100.0	F
Hitch Road	Sevierville Rd MP 1.202	Davis Ford Rd MP 0.000	1.20	14,890	0.150	2234	50	1.0%	29.8	96.4	E
Helton Road	Davis Ford Rd MP 0.875	Lamar Alexander Pkwy MP 0.000	0.88	15,790	0.150	2369	50	1.0%	28.6	97.5	F

LOS E - F
LOS A - D
Speed <45, Not Analyzed

Table 6: Corridor Level of Service Comparison for Updated DEIS Alternative D vs. No-Build

Route	Begin Milepoint	End Milepoint	Existing	2020 No-Build	2040 No-Build	2020 Alternative D	2040 Alternative D
Sam Houston	SR 33 MP 0.000	Wildwood Rd MP 2.650	C	C	C	E	F
Peppermint Road	Wildwood Rd MP 0.000	Sevierville Rd MP 1.100	C	C	D	E	F
Hitch Road	Sevierville Rd MP 1.202	Davis Ford Rd MP 0.000	B	B	C	E	E
Helton Road	Davis Ford Rd MP 0.875	Lamar Alexander Pkwy MP 0.000	A	A	A	E	F

Table 7: Corridor Level of Service Comparison for Updated DEIS Alternative D vs. Prior Analysis

Route	Begin Milepoint	End Milepoint	2015 Alternative D	2035 Alternative D	2020 Alternative D	2040 Alternative D
Sam Houston	SR 33 MP 0.000	Wildwood Rd MP 2.650	F	F	E	F
Peppermint Road	Wildwood Rd MP 0.000	Sevierville Rd MP 1.100	F	F	E	F
Hitch Road	Sevierville Rd MP 1.202	Davis Ford Rd MP 0.000	E	F	E	E
Helton Road	Davis Ford Rd MP 0.875	Lamar Alexander Pkwy MP 0.000	E	F	E	F

SR 162 (PELLISSIPPI PARKWAY EXTENSION)

CRASH ANALYSIS REPORT UPDATE

BLOUNT COUNTY, TENNESSEE
P.I.N. 101423.00

Prepared for:

Tennessee Department of Transportation

Prepared by:

Parsons Brinckerhoff, Inc.
1900 Church Street, Suite 400
Nashville, Tennessee, 37203

February 2014

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PROJECT BACKGROUND AND STUDY AREA

This report documents a traffic safety analysis conducted for the areas impacted by the proposed State Route 162 (Pellissippi Parkway) extension. The objective of the analysis is to review crash data from the study area during a defined study period to determine historical trends in crashes and investigate the impact the proposed project may have on crashes in the study area. The analysis includes breakdowns of crashes by severity, time, location, and type, as well as discussion of the effects of the proposed project on these parameters.

The project, proposed by the Tennessee Department of Transportation (TDOT), would extend State Route 162 (Pellissippi Parkway) from its existing terminus at State Route (SR) 33 (Old Knoxville Highway) in Alcoa approximately 4.5 miles southeast to SR 73 (US 321, Lamar Alexander Parkway) east of Maryville in Blount County.

The project is currently undergoing an environmental review by TDOT and the Federal Highway Administration (FHWA); a reevaluation of the Draft Environmental Impact Statement (DEIS) is in the process of being finalized prior to the preparation of a Final EIS (FEIS) and a Record of Decision (ROD). Pursuant to the environmental review, this report provides information on the proposed project's impacts to traffic safety, and updates the original August 2007 traffic safety document, subsequently revised in May 2009 and June 2013.

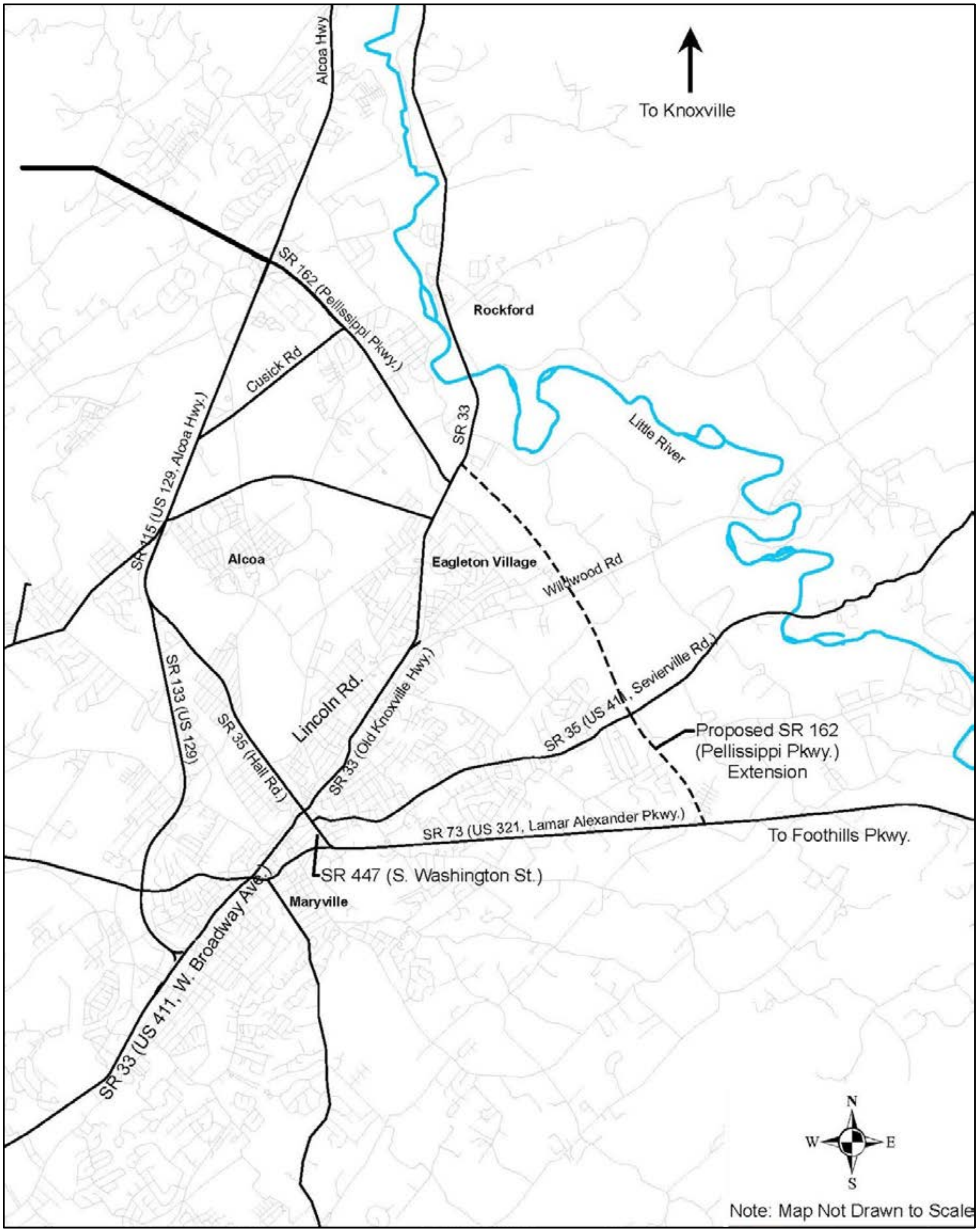
The study area includes approximately 50 miles of roadways currently used by drivers whom the proposed project would serve by linking the northwestern and eastern sections of Blount County. These roadways include:

- **Cusick Road** in Alcoa from SR 115 (US 129, Alcoa Highway) [log mile (LM) 0.00] to SR 162 (Pellissippi Parkway) (LM 1.76), a distance of approximately 1.76 miles;
- **Wildwood Road** from Old Knoxville Pike (LM 0.00) in Maryville to the bridge over the Little River (LM 3.75) east of Eagleton Village; a distance of approximately 3.75 miles;
- **SR 162 (Pellissippi Parkway)** in Alcoa from SR 115 (US 129, Alcoa Highway) (LM 0.00) to SR 33 (Old Knoxville Highway) (LM 2.54), a distance of approximately 2.54 miles;
- **SR 73 (US Route 231, Lamar Alexander Parkway)** from SR 115 (US Route 129) (LM 10.57) in Maryville to Foothills Parkway (LM 22.33) east of Maryville, a distance of approximately 11.76 miles;
- **SR 35 (US 411/Sevierville Road)** from SR 115 (US 129, Alcoa Highway) (LM 0.00) in Alcoa to the bridge over the Little River (LM 4.95) east of Eagleton Village, a distance of approximately 4.95 miles;
- **SR 447 (South Washington Street)** in Maryville from SR 35 (LM 0.00) to SR 73 (US Route 231, Lamar Alexander Parkway) (LM 0.16), a distance of approximately 0.16 miles;
- **SR 33** from SR 115 (US 129) (LM 10.38) in Maryville to the Knox County Line (LM 20.64) in Rockford, a distance of approximately 10.26 miles;
- **SR 115 (US 129)** from SR 33 (US 411, West Broadway Avenue) (LM 10.45) in Maryville to the Knox County Line (LM 20.40) in Alcoa, a distance of approximately 9.95 miles; and

- **Lincoln Road** from State Route 35 (Hall Road) (LM 0.42) in Alcoa to Old Knoxville Pike (LM 2.14) in Maryville, a distance of approximately 1.72 miles.

Figure 1 displays a location map of the proposed project and study area, including major roadways and municipal boundaries.

Figure 1 — Study Area Location Map



TRAFFIC SAFETY ANALYSIS

To account for differences in roadway conditions that influence crashes (such as geometry, roadway surface, lane configuration, access density, and traffic volume), roadways within the study area are divided into segments that feature similar conditions throughout. **Table 1** lists the segments by route, termini (in LM and by the nearest feature) and length in miles.

Table 1 — Study Area Roadway Segments

Route	Start Segment		End Segment		Lgth. (mi.)
	LM	Feature	LM	Feature	
Cusick Rd.	0.00	SR 115 (US 129, Alcoa Hwy.)	1.76	SR 162 (Pellissippi Pkwy.)	1.76
Wildwood Rd.	0.00	Old Knoxville Pike	3.75	Bridge over Little River	3.75
SR 162 (Pellissippi	0.00	SR 115 (US 129, Alcoa Hwy.)	2.54	SR 33 (Old Knoxville Hwy.)	2.54
SR 73 (US 231, Lamar Alexander Pkwy.)	10.57	SR 115 (US 129)	11.65	SR 33 (US 411, W. Broadway Ave.)	1.08
	11.66	SR 33 (US 411, W. Broadway Ave.)	11.83	SR 336	0.17
	11.84	SR 336	12.52	S. Washington St.	0.68
	12.53	S. Washington St.	17.21	Knoxville Urban Boundary	4.68
	17.22	Knoxville Urban Boundary	22.33	Foothills Pkwy.	5.11
SR 35	0.00	SR 115 (US 129, Alcoa Hwy.)	2.02	Lincoln Rd.	2.02
	2.03	Lincoln Rd.	2.97	High St.	0.94
	2.98	High St.	7.93	Bridge over Little River	4.95
SR 447 (S. Washington St.)	0.00	SR 35	0.16	SR 73 (US 231, Lamar Alexander	0.16
SR 33	10.38	SR 115 (US 129)	10.67	N. of Henry St.	0.29
	10.68	N. of Henry St.	12.34	SR 35 (US 411, Washington St.)	1.66
	12.35	SR 35 (US 411, Washington St.)	13.16	Everett High Rd.	0.81
	13.17	Everett High Rd.	14.18	Lincoln Rd.	1.01
	14.19	Lincoln Rd.	15.47	SR 335 (E. Hunt	1.28
	15.48	SR 335 (E. Hunt Rd.)	15.86	SR 162 (I-140, Pellissippi Pkwy.)	0.38
	15.87	SR 162 (I-140, Pellissippi Pkwy.)	18.75	Caney Branch Rd.	2.88
	18.76	Caney Branch Rd.	20.64	Knox County Line	1.88
SR 115 (US 129)	10.45	SR 33 (US 411, W. Broadway Ave.)	20.40	Knox County Line	9.95
Lincoln Road	0.42	SR 35 (Hall Rd.)	0.84	Wright Rd.	0.42
	0.85	Wright Rd.	1.41	Harding St.	0.56
	1.42	Harding St.	2.14	Old Knoxville Pike	0.72

Historical Crash Data

TDOT provided historical traffic and crash data for use in the traffic safety analysis. This data includes crash data for the study area during the study period and traffic volume data at various points throughout the study area.

Crash Data

TDOT prepared crash data for the study area covering several time periods, provided as the data became available. The time periods include:

- January 1, 2006 to December 31, 2008, provided on February 18, 2009;
- January 1, 2007 to December 31, 2009, provided on January 11, 2011; and
- January 1, 2010 to December 31, 2012, provided on December 9, 2013.

The crash data includes information such as location, date, time of day, severity (including the total number of involved vehicles, injuries, and fatalities), crash events, weather conditions, and lighting conditions.

To avoid changes in traffic patterns, roadway construction, and trip origins and destinations from affecting statistical trends on crashes in the study area, the analysis only uses the last three full years of available data, from January 1, 2010 to December 31, 2012. This interval is defined as the *study period*.

Volume Data

TDOT additionally collects traffic data annually at count stations on state and local roadways throughout Tennessee; this data is then processed to determine the *annual average daily traffic* (AADT) for the roadway at the station, defined as the total volume of vehicles passing a point on a facility in a year, divided by the number of days in a year.

Table 2 lists the 36 TDOT count stations located on roadways within the study area, as well as the name of the route on which the count station is located and AADT for each year in the study period.

This historical traffic data is used in the analysis to calculate certain crash statistics for each year in the 3-year study period. The AADT for each segment in the analysis is assumed to be equal to the nearest count station or the average of all count stations in the segment.

Table 2 — TDOT Count Station Locations

Sta. No.	Route Name	AADT (vehicles/day)		
		2010	2011	2012
09000013	SR 115 (Alcoa Hwy.)	52,56	54,45	51,73
09000015	SR 115 (US 129, Alcoa Hwy.)	56,34	57,14	58,85
09000016	SR 33 (Old Knoxville Hwy.)	15,75	15,41	15,37
09000025	Wildwood Rd.	3,624	3,330	3,250
09000026	SR 33 (E. Broadway Ave.)	12,57	15,22	12,12
09000027	SR 35 (N. Hall Rd.)	18,20	17,58	17,58
09000042	SR 35 (Sevierville Rd.)	11,27	11,56	11,55
09000043	SR 73 (US 231, E. Lamar Alexander Pkwy.)	21,42	22,61	21,81
09000045	SR 73 (US 231, E. Lamar Alexander Pkwy.)	13,61	14,32	14,72

Sta. No.	Route Name	AADT (vehicles/day)		
		2010	2011	2012
09000089	SR 115 (US 129)	25,31	25,99	26,93
09000090	SR 115 (US 129)	38,64	37,09	36,31
09000091	SR 33 (US 411, W. Broadway Ave.)	16,58	18,19	16,92
09000092	SR 73 (US 231, W. Lamar Alexander Pkwy.)	22,05	23,16	22,74
09000093	SR 115 (US 129)	37,05	37,70	37,67
09000095	SR 115 (US 129)	39,59	42,73	42,16
09000096	SR 33 (US 411, W. Broadway Ave.)	11,20	10,99	11,61
09000098	SR 35 (N. Washington St.)	22,51	22,36	23,72
09000104	SR 35 (S. Washington St.)	22,27	21,57	22,27
09000105	SR 33 (E. Broadway Ave.)	8,778	9,012	8,955
09000107	Lincoln Rd.	8,079	8,321	7,581
09000111	SR 115 (US 129)	33,25	36,94	36,54
09000112	SR 115 (US 129, Alcoa Hwy.)	53,53	50,99	52,22
09000119	Cusick Rd.	1,600	1,790	1,841
09000121	Cusick Rd.	3,793	4,070	4,368
09000125	SR 35 (Sevierville Rd.)	8,161	8,528	7,538
09000139	SR 35 (N. Hall Rd.)	22,18	22,85	22,28
09000153	SR 73 (US 231, E. Lamar Alexander Pkwy.)	20,92	19,54	21,05
09000159	SR 73 (US 231, E. Lamar Alexander Pkwy.)	19,04	18,08	17,61
09000173	SR 33 (Old Knoxville Hwy.)	7,173	5,605	6,234
09000176	SR 447 (S. Washington St.)	20,18	19,30	20,83
09000180	SR 73 (US 231, W. Lamar Alexander Pkwy.)	25,38	24,42	23,09
09000191	SR 162 (Pellissippi Pkwy.)	10,99	10,09	11,30
09000216	SR 115 (US 129, Alcoa Hwy.)	42,00	44,90	45,35
09000220	SR 162 (Pellissippi Pkwy.)	10,95	11,10	10,85
93000117	SR 33 (Maryville Pike)	4,964	4,626	5,459
93000119	SR 115 (US 129, Alcoa Hwy.)	46,91	47,81	49,25

Crash Rate and Severity

Of the 1,916 recorded crashes occurring within the study area during the study period, 1,442 crashes (approximately 75%) involved only property damage, while 386 (approximately 20%) resulted in a non-incapacitating injury, 77 (approximately 4%) resulted in an incapacitating injury, and 11 (approximately 1%) resulted in a fatality. **Figure 2** displays the proportions of crashes by severity for the study period.

Table 3 lists the recorded crashes with fatalities that occurred during the study period. Of the fatal crashes, four (approximately 36%) were single-vehicle crashes, while the remaining seven (approximately 64%) involved multiple vehicles. Four crashes occurred at intersections, with an additional crash occurring at an underpass. Three crashes involved angle collisions, and one crash involved a head-on collision. Most crashes occurred under clear conditions during daylight hours, although three occurred at night under lighted conditions, the vast majority of the crashes occurred along SR 115/US 129.

Figure 2 — Recorded Crashes by Severity

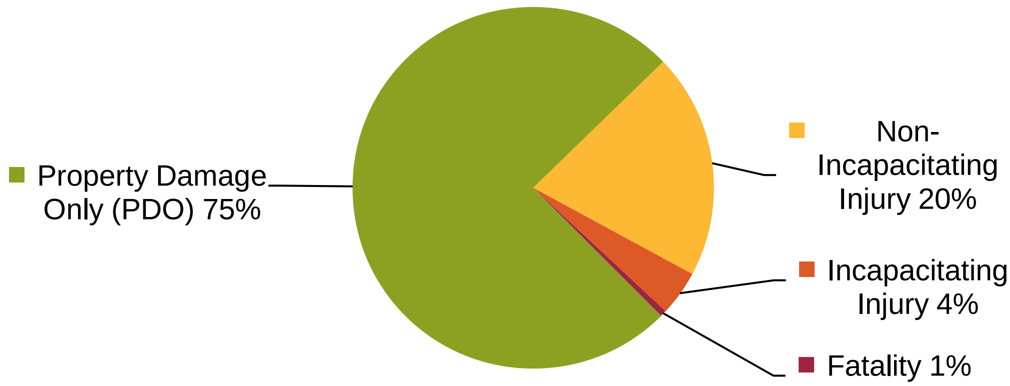


Table 3 — Fatal Recorded Crashes

Roadway	LM	Date Time	Location	Most Harmful Event	Manner of First Collision	Weather Cond.	Lighting Cond.
Wildwood Rd.	0.230	2011-08-04 04:44 PM	At an Intersection	Vehicle in Transport	Angle	Clear	Daylight
SR 73 (US 231)	17.650	2011-09-01 05:10 PM	Along Roadway	Other Non-Collision	No Collision	Clear	Daylight
SR 35	0.510	2012-06-15 05:50 AM	Along Roadway	Vehicle in Transport	Angle	Clear	Dawn
SR 35 (US 411)	5.436	2011-06-30 03:33 PM	Along Roadway	Vehicle in Transport	Sideswipe Opp. Dir.	Clear	Daylight
SR 115 (US 129)	11.150	2012-07-31 04:33 AM	Along Roadway	Vehicle in Transport	Head-On	Rain	Dark (Lighted)
SR 115 (US 129)	14.698	2010-02-27 05:22 PM	Along Roadway	Earth Embankment	No Collision	Clear	Daylight
SR 115 (US 129)	15.290	2010-06-04 08:36 PM	Underpass	Light Support	No Collision	Clear	Dark (Lighted)
SR 115 (US 129)	16.801	2012-12-06 01:25 PM	At an Intersection	Vehicle in Transport	Angle	Cloudy	Daylight
SR 115 (US 129)	17.280	2010-09-30 02:15 PM	At an Intersection	Vehicle in Transport	Angle	Clear	Daylight
SR 115 (US 129)	17.370	2010-10-16 03:04 PM	At an Intersection	Vehicle in Transport	Sideswipe Same Dir.	Clear	Daylight
SR 115 (US 129)	18.670	2011-12-17 11:08 PM	Along Roadway	Other Post / Pole / Support	No Collision	Clear	Dark (Lighted)

Several parameters are used to define the frequency and severity of crashes during the study period, locate any statistical trends in the crash data, and determine if any segments, spots, or intersections within the study area are eligible for funding for safety improvements. The parameters include:

- *Exposure rate* (E), defined as the distance traveled by vehicles in a segment of roadway and measured in the analysis by million vehicle-miles (MVM);
- *Actual crash rate* (R), defined as the number of crashes per MVM;
- *Average crash rate* (R_A), defined as the average crash rate on roadways with similar lane configurations and functional classifications throughout the state of Tennessee;
- *Critical crash rate* (R_C), defined as a limit above which the difference between the actual and average crash rates becomes statistically significant and not due to normal variation;
- *Actual crash rate / critical crash rate ratio* (R/R_C), the ratio of the actual to critical crash rates; and
- *Severity index* (SI), the weighted ratio of fatal and injury crashes to total crashes.

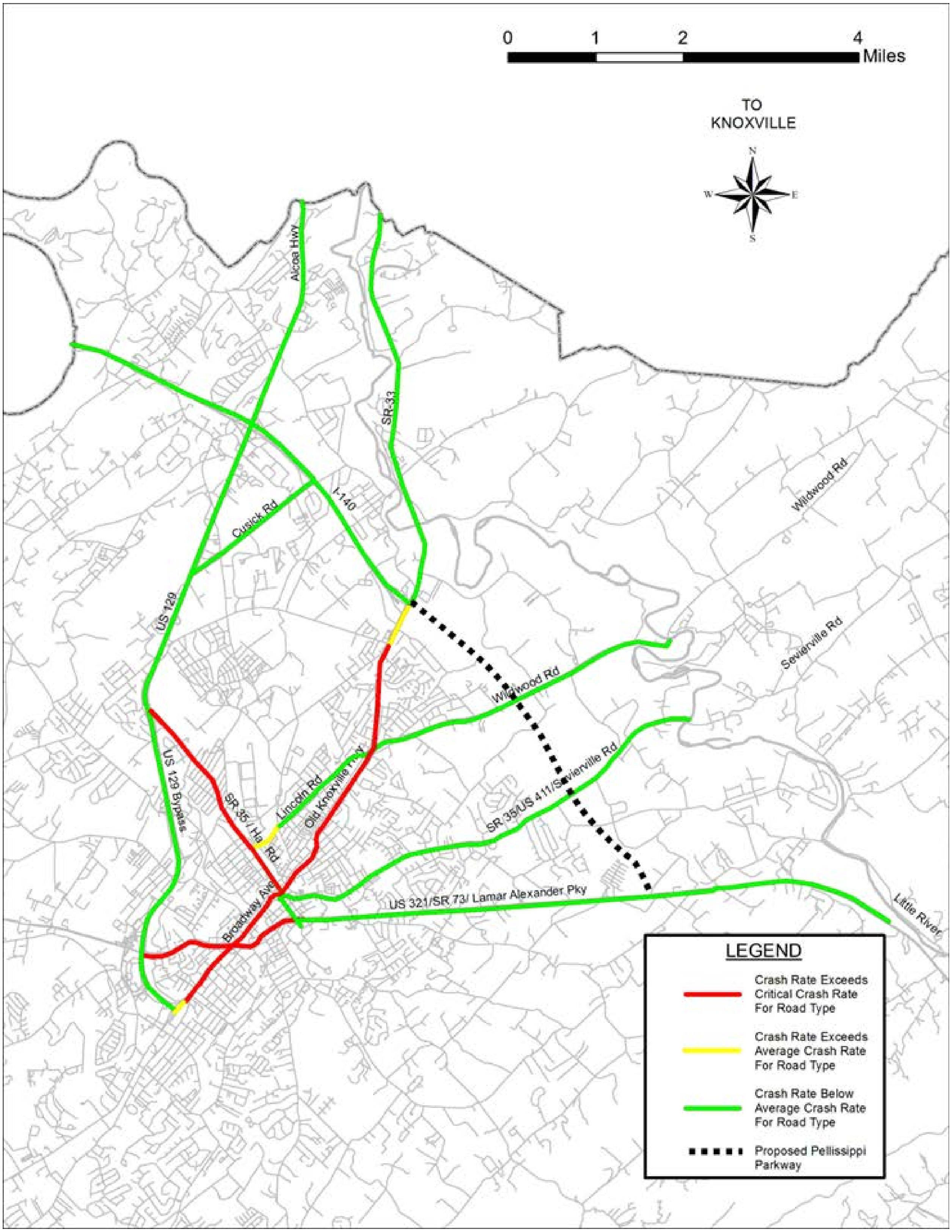
Table 4 lists crash rates and other parameters by segment for the study period.

Table 4 — Calculated Crash Parameters by Segment

Route	St. LM (mi.)	End LM (mi.)	E (MVM)	R (crash /MVM)	R_A (crash /MVM)	R_C (crash /MVM)	R / R_C	SI
Cusick Rd.	0.00	1.76	7.865	1.271	2.895	4.370	0.291	0.200
Wildwood Rd.	0.00	3.75	13.979	1.931	2.895	3.990	0.484	0.259
SR 162	0.00	2.54	30.294	0.132	0.981	1.416	0.093	0.000
SR 73 (US 231, Lamar Alexander Pkwy.)	10.5	11.6	26.814	3.580	1.777	2.394	1.495	0.219
	11.6	11.8	4.527	5.964	1.777	3.345	1.783	0.185
	11.8	12.5	15.284	3.860	1.777	2.603	1.483	0.186
	12.5	17.2	103.10	1.649	1.777	2.087	0.790	0.265
	17.2	22.3	79.667	0.577	0.733	0.963	0.600	0.391
SR 35	0.00	2.02	44.535	4.244	1.777	2.253	1.884	0.249
	2.03	2.97	23.134	4.755	2.466	3.247	1.464	0.191
	2.98	7.93	53.010	1.660	2.334	2.832	0.586	0.284
SR 447	0.00	0.16	28.429	4.254	2.466	4.554	0.934	0.133
SR 33	10.3	10.6	5.477	2.191	1.777	3.193	0.686	0.083
	10.6	12.3	31.354	3.062	2.334	2.985	1.026	0.146
	12.3	13.1	8.961	3.794	2.334	3.578	1.061	0.412
	13.1	14.1	14.732	3.733	2.334	3.295	1.133	0.145
	14.1	15.4	20.204	3.465	2.334	3.150	1.100	0.257
	15.4	15.8	6.462	5.417	2.334	3.810	1.422	0.286
	15.8	18.7	20.003	3.099	2.334	3.154	0.983	0.258
	18.7	20.6	10.337	2.128	2.334	3.488	0.610	0.409
SR 115 (US 129)	10.4	20.4	471.85	1.424	1.777	1.921	0.742	0.263
Lincoln Road	0.42	0.84	3.679	1.087	2.895	5.095	0.213	0.000
	0.85	1.41	4.906	1.427	2.404	4.135	0.345	0.571
	1.42	2.14	6.308	0.951	2.895	4.551	0.209	0.000

Figure 3 displays the crash rates by location on a map of the study area. Green lines indicate that the crash rate for the segment of roadway is below the average for similar roadways, while yellow lines indicate that the crash rate was above the average rate but below the critical rate, and red lines indicate that the crash rate exceeded the critical rate.

Figure 3 — Crash Rates by Location



Crash Dates and Times

Figure 4 displays recorded crashes during the study period by month. September had the fewest crashes in a single month during the study period (138), while June had the most (181).

Figure 4 — Recorded Crashes by Month

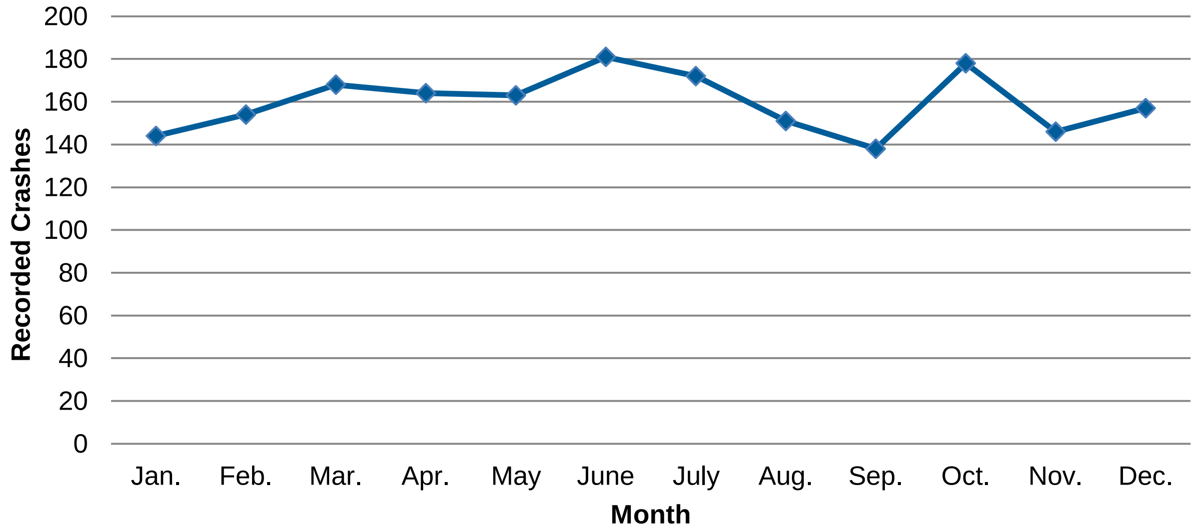


Figure 5 displays crashes by day of week. Friday had the highest number of crashes (351), while Sunday had the lowest (155). Approximately 81% of crashes (1,557) occurred on weekdays.

Figure 5 — Recorded Crashes by Day of Week

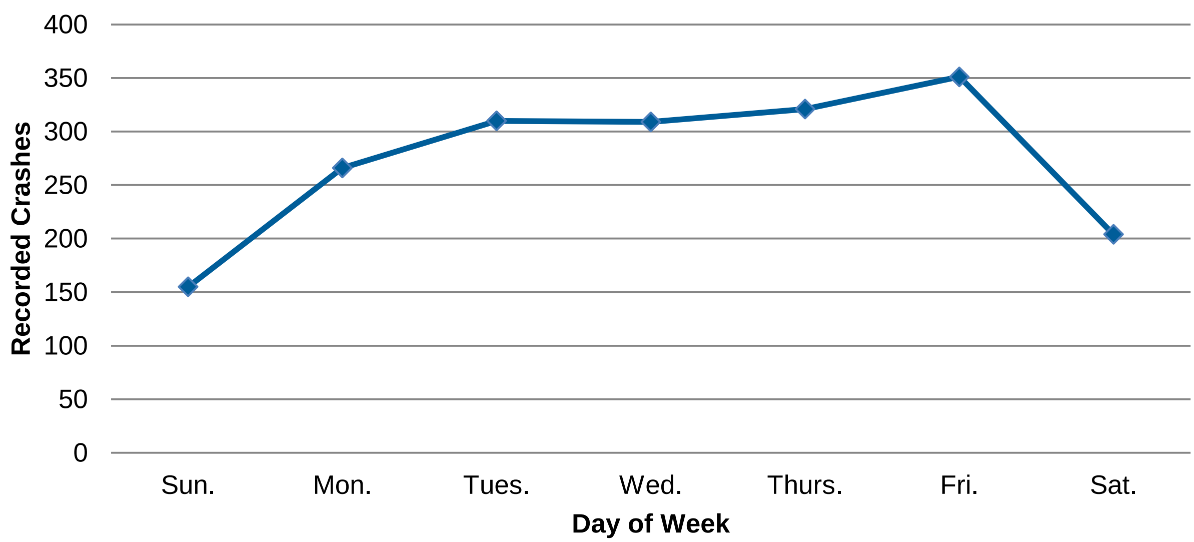
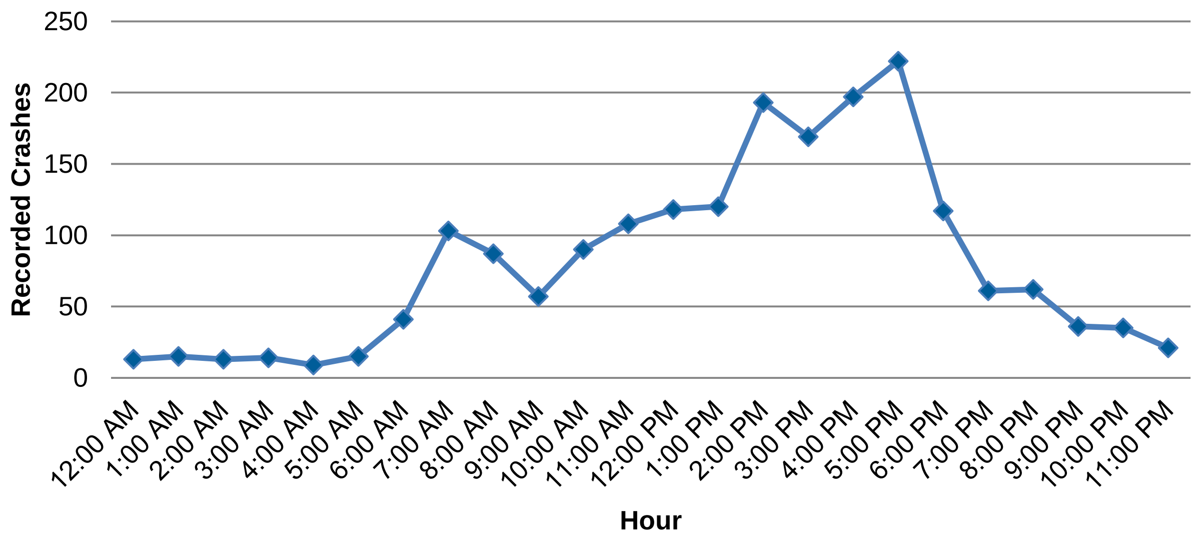


Figure 6 lists crashes by time of day. The hour with the highest number of crashes during the study period was 5:00–6:00 PM (222), while 4:00–5:00 AM had the lowest (9). Approximately 32% of crashes (609) occurred during typical peak hour periods (7:00–9:00 AM and 4:00–6:00 PM).

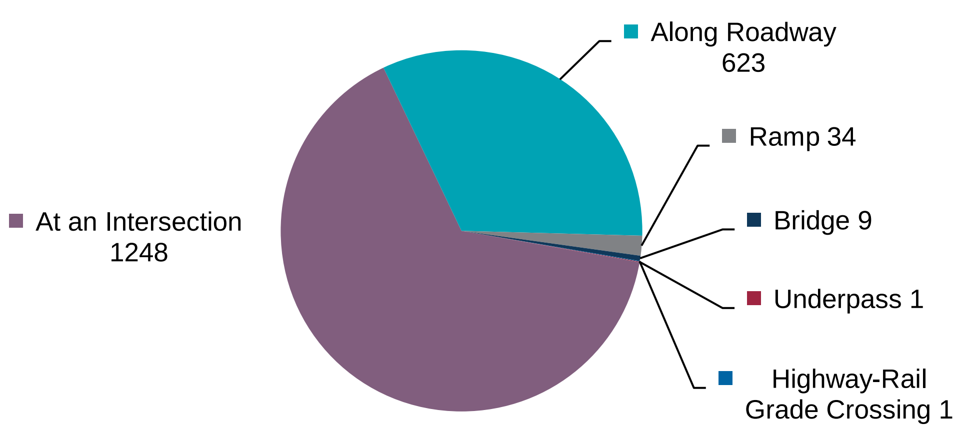
Figure 6 — Recorded Crashes by Time of Day



Crash Types

Figure 7 displays the recorded crashes by the type of location where the crash occurred. Approximately 1,248 crashes (65% of the total) occurred at an intersection, while 623 crashes (33%) occurred along the roadway outside of an intersection. Additional locations include at an on- or off-ramp (34 crashes), at a bridge or overpass (9 crashes), at an underpass (1 crash), and at a highway-rail grade crossing (1 crash).

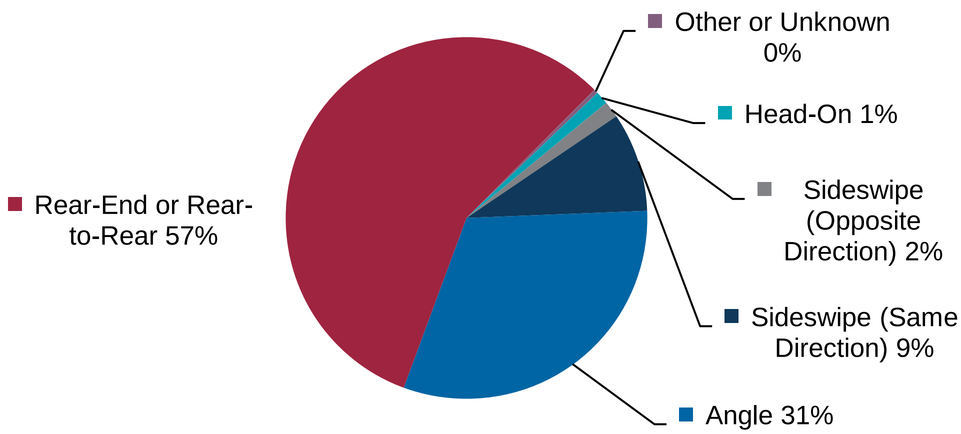
Figure 7 — Recorded Crashes by Location Type



The majority of the 1,916 recorded crashes in the study area involved collisions between two or more vehicles (1,685 crashes, or 88% of the total crashes).

Of the crashes involving two or more vehicles, 958 (approximately 57%) were rear-end or rear-to-rear crashes, while 527 (approximately 31%) were angle crashes; of the remainder, 149 (approximately 9%) were same-direction sideswipes, 25 (approximately 2%) were opposite-direction sideswipes, and 20 (approximately 1%) were head-on crashes. The manners of collision of six crashes were unknown. **Figure 8** displays the proportions of multi-vehicle crashes by manner of collision.

Figure 8 — Recorded Multi-Vehicle Crashes by Manner of Collision



CONCLUSIONS

As noted in **Table 4**, several segments of roadways within the study area exceeded the statewide average for similar roadways. Portions of three roadways exceeded the critical crash rate as well:

- SR 73 (US 321, Lamar Alexander Parkway) in Maryville from SR 115 (US 129) (LM 10.57) to SR 447 (South Washington Road) (LM 12.52);
- SR 35 from SR 115 (US 129, Alcoa Highway) (LM 0.00) in Alcoa to SR 35 (US 411, High Street) (LM 2.97) in Maryville; and
- SR 33 (Broadway Avenue) from north of Henry Street (LM 10.68) in Maryville to SR 335 (East Hunt Road) (LM 15.47) in Alcoa.

Most crashes were rear-end or angle crashes between multiple vehicles at intersections. Single-vehicle crashes accounted for approximately 12% of the total crashes.

The proposed project would be expected to divert traffic from roadways in the study area to the proposed roadway. This transfer would result in a decreased exposure rate (previously defined as the distance traveled by all vehicles traversing a segment of roadway) for roadways in the study area with a corresponding increase for the proposed roadway. However, the statewide average crash rate for roadways similar to the proposed roadway (four-lane divided freeway) is 0.981, less than the average or calculated crash rates for most of the roadways in the study area. As such, assuming crash rates for the study area remain similar to those during the study period, transferring traffic volumes from roadways in the study area to the proposed roadway may be expected to reduce the total crashes in the area.

Pellissippi Parkway Extension (SR 162): Addendum to 2009 Economic and Fiscal Impacts Analysis

April, 2015

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Executive Summary

The Tennessee Department of Transportation (TDOT), in cooperation with the Federal Highway Administration (FHWA), is proposing to extend and construct Pellissippi Parkway (State Route 162) from its current terminus at SR 33 to US 321/SR 73 (Lamar Alexander Parkway) in Blount County.

As part of the Draft Environmental Impact Statement (DEIS) that was approved in April 2010, the economic and fiscal impacts of the project were investigated and reported in the study, *Pellissippi Parkway Extension; Economic and Fiscal Impact Analysis* (Parsons Brinckerhoff, 2009). Since conducting that analysis, a major update of the Knoxville Regional Travel Demand Model occurred in 2013. The update means that a few of the underlying inputs utilized for the initial study are no longer valid. As such, using the same methodology but with more current assumptions, this report presents an updated analysis for economic and fiscal effects of the project.

This analysis investigated the economic and fiscal impacts of the Preferred Alternative, Preferred Alternative with East Shift, 2012 Preferred Alternative (A), Alternative C and Alternative D.

Summary of Findings – Economic Impact Analysis

The economic impact analysis assesses the direct, indirect, and induced effects of the one-time demand for construction labor and materials needed to implement the project alternatives. The results of the economic impact analysis is shown below in Table S-1.

Table S-1: Economic Impacts in Blount County

Characteristics	Preferred Alternative*	Alternative C	Alternative D
Jobs created	629	663	269
Labor income	$34.1 mil	$36.0 mil	$14.6 mil
Economic output	$195.1 mil	$205.6 mil	$83.4 mil

* The results for the Preferred Alternative would be the same for the 2012 Preferred Alternative (A) and for the Preferred Alternative with East Shift, due to the proximity of the alignments.

The four-lane Alternative C is expected to generate the greatest economic benefit to Blount County, primarily due to its longer length and higher construction cost. Under Alternative C, 663 jobs would be created across in Blount County, which would generate $36 million in labor income and $205.6 million in economic output (total value of goods and services produced). Alternative C would likely generate 5.4 percent more jobs, income, and output than Preferred Alternative, Preferred Alternative with East Shift, and 2012 Preferred Alternative (A), and 1461 percent more of each measure than Alternative D.

Summary of Findings – Fiscal Impact Analysis

Identification of the induced development impacts (those impacts that may result outside of the construction footprint of the proposed highway extension corridor) is key to identifying fiscal impacts to the Blount County budget.

The fiscal impact analysis focuses on a single four-lane alternative that represents the Preferred Alternative, Preferred Alternative with East Shift, 2012 Preferred Alternative (A) and Alternative C. Due to their proximity and similar length, it is not expected that the alternatives' growth and fiscal impacts would differ substantially from one another. Furthermore, the fiscal impacts of Alternative D are not analyzed since this two-lane alternative is no likely to have as substantial an impact on the operating and capital budget of Blount County as the four-lane alternatives.

A summary of the approximate increment of new residential and commercial development that would result from the Pellissippi Parkway extension project by 2025 is presented in Table S-2.

Table S-2: Summary of Induced Development Program

Dwelling Units (HH)	Office (sq. ft.)	Retail (sq. ft.)	Hotel (sq. ft.)	Total Commercial (sq. ft.)
27 -49	7,900 - 14,300	4,400 - 7,900	1,000 - 1,900	13,300 - 24,100

Key findings of the induced development analysis are:

- The primary driver of induced development in the study area would be the travel time savings resulting from the new extension. As travel times between Blount and Knox Counties and between Blount County and Oak Ridge are reduced due to the extension, more residents and commercial establishments may find it viable to live farther away from the main centers of employment and closer to the unincorporated areas of the County.

- Lack of adequate services in the unincorporated areas and a moderate projection of population and employment growth rates in the study area will, however, limit the extent of induced development.

- Induced development resulting from the extension is largely expected to be residential in nature, with commercial development being restricted to nodal areas (intersections) along primary corridors such as the Pellissippi Parkway Extension.

The expected fiscal impacts that project-related new development (induced development) would have on the operating and capital budget of Blount County at project buildout (Year 2025) is summarized in Table S-3.

Table S-3: Summary of Fiscal Impact of Induced Development Program

Revenue	Operating Expenditures	Net Fiscal Balance
$257,804	$176,844	$80,959

At project buildout, the induced development program is projected to have a modest positive fiscal benefit on the County's operating budget. In other words, the development program would generate more revenues to the County than it demands in costs for operations.

The induced development program is projected to generate an additional $159,376 in property tax revenues that will likely accrue to the County, with approximately 87 percent of that increase coming from residential development.

The induced development program analyzed herein does not account for capital costs of new public streets that may be needed to serve additional residents that result from the induced development program. A capital improvement plan for Blount County was not available at the time of this analysis.

1.0 Introduction

The Tennessee Department of Transportation (TDOT), in cooperation with the Federal Highway Administration (FHWA) is proposing to extend and construct Pellissippi Parkway (State Route 162) from its current terminus at State Route (SR) 33 to US 321/SR 73 (Lamar Alexander Highway) in Blount County. TDOT and FHWA are preparing an Environmental Impact Statement (EIS) in accordance with the National Environmental Policy Act (NEPA) to identify and evaluate the environmental effects of the proposed project and to identify measures to minimize impacts.

As part of the Draft EIS (DEIS) that was approved in April 2010, the economic and fiscal impacts of the project were investigated and reported in the study, *Pellissippi Parkway Extension; Economic and Fiscal Impact Analysis* (Parsons Brinckerhoff, 2009). Since conducting that analysis, a major update of the Knoxville Regional Travel Demand Model occurred in 2013. The update means that a few of the underlying inputs utilized for the initial study are no longer valid. As such, using the same methodology but with more current assumptions, this report presents an updated analysis for economic and fiscal effects of the project.

2.0 Description of Alternatives

Based on the results of public input during the 2007 and 2008 public meetings and comment periods, participating agency comments and concurrence process, and an environmental screening analysis, TDOT determined the alternatives that were carried forward, refined and evaluated in the DEIS:

- No-Build Alternative
- Alternative A – New Four-Lane Roadway
- Alternative C – New Four-Lane Roadway
- Alternative D – Upgraded Two-Lane Network

Subsequent to the approval of the DEIS and the selection of Alternative A as the Preferred Alternative in 2012, more detailed archaeological investigations revealed the presence of an archaeological site that was determined eligible for the National Register of Historic Places. The eligible site is within the footprint of the 2012 Preferred Alternative (A) near the southern terminus of the project. To avoid the eligible site, TDOT investigated two alignment shifts, Preferred Alternative with West Shift and Preferred Alternative with East Shift, between Davis Ford Road and US 321/SSR 72 (Lamar Alexander Parkway). TDOT studied the impacts of the two shifts, and held a community meeting on May 30, 2013, to solicit public input on the shifts. In July 2013, TDOT announced that the Preferred Alternative would be modified by the west shift (hereafter referred to as the Preferred Alternative).

For the purposes of this analysis, the Preferred Alternative, Preferred Alternative with East Shift (not selected) and the 2010 Preferred Alternative (A) are considered as a single alternative due to their proximity to each other. The analysis examines the following alternatives:

- No-Build Alternative
- Preferred Alternative (including Preferred Alternative with East Shift (not selected) and the 2010 Preferred Alternative (A)) – New Four-Lane Roadway
- DEIS Alternative C – New Four-Lane Roadway
- DEIS Alternative D – Upgraded Two-Lane Network

2.1 No-Build Alternative

Under the No-Build scenario, Pellissippi Parkway would not be extended beyond its existing terminus at SR 33 to US 321, as envisioned in local and regional plans. Eastbound traffic would continue to enter and exit the eastern terminus of Pellissippi Parkway (I-140) at the existing half-interchange with SR 33.

The No-Build Alternative assumes that several other capacity-enhancing and safety-related projects in the study area would be constructed or implemented, as identified in the Knoxville Regional Transportation Planning Organization's (TPO's) *Long Range Regional Mobility Plan 2040 (*hereafter, *Regional Mobility Plan 2040)* (TPO 2012).

2.2 Preferred Alternative, Preferred Alternative with East Shift and 2012 Preferred Alternative (A) – New Four-Lane Roadway

Under the Preferred Alternative, the existing Pellissippi Parkway would be extended from SR 33 to US 321, as a four-lane divided roadway, with interchanges at SR 33, US 411 and US 321. The Preferred Alternative is presented in Figure 1. The Preferred Alternative would add approximately 4.4 miles to the existing freeway within Blount County.

The proposed typical section consists of two 12-foot travel lanes in each direction, 12-foot outside shoulders, and a 48-foot depressed median with 6-foot inside shoulders. The proposed ROW is a minimum of 300 feet, requiring the purchase of new ROW.

The Preferred Alternative with East Shift and 2012 Preferred Alternative (A) would have the same typical section and design features as the Preferred Alternative. These alternatives have the same alignment as the Preferred Alternative north of Davis Ford Road. Between Davis Ford Road and US 321/SR 73, the alignments vary slightly, as shown in Figure 1.

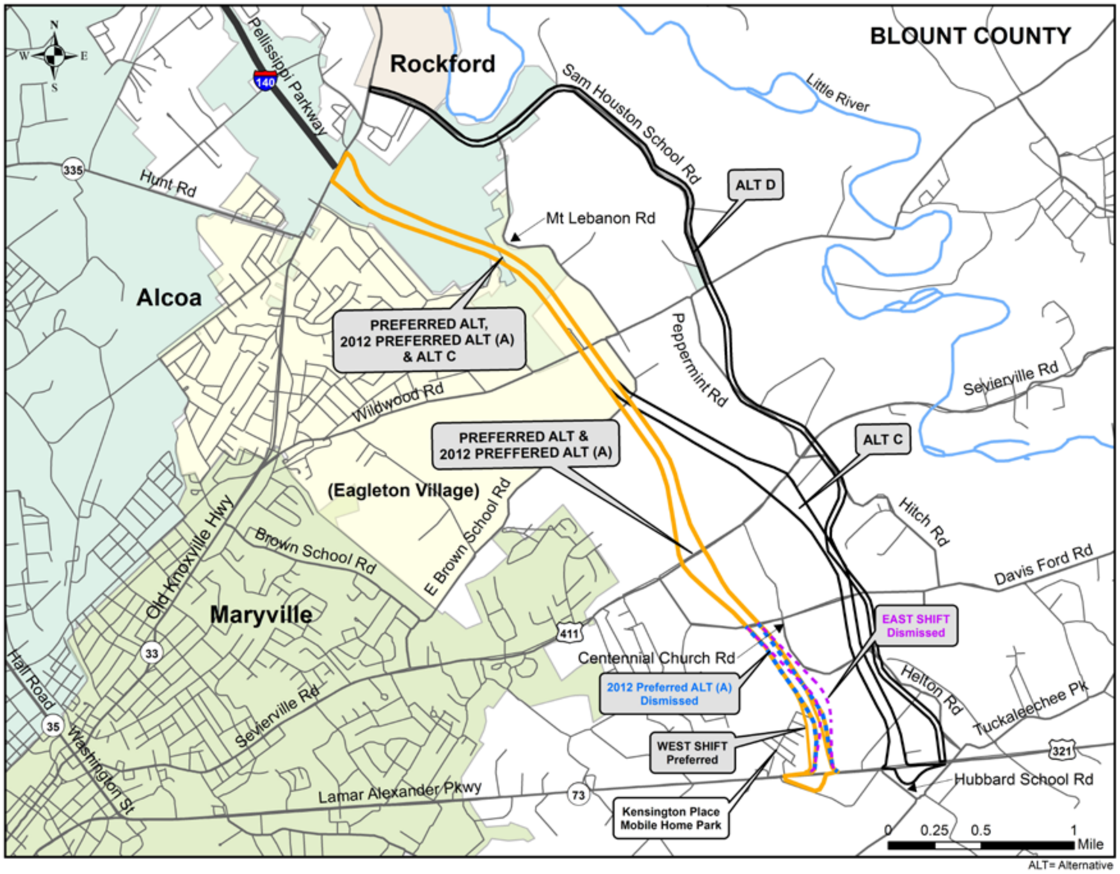
2.3 DEIS Alternative C – New Four-Lane Roadway

Alternative C would extend 4.7 miles from SR 33 to US 321/SR 73, as a four-lane divided roadway with three proposed interchanges (with SR 33, US 411/Sevierville Road and US 321/SR 73). Alternative C is presented in Figure 1.This alternative would have the same typical section and design features as the Preferred Alternative.

2.4 DEIS Alternative D– Upgraded Two-Lane Network

Alternative D proposes to upgrade a two-lane network of existing roads and new location to serve as a two-lane connection between SR 33 and US 321. This upgraded network was seen as a way to improve some of the currently deficient two-lane roads in the study area and provide a more direct connection between SR 33 and US 321 east of Maryville without having a new freeway-type facility. Under this alternative, an improved two-lane roadway with adequate shoulders would be constructed using the existing roadway alignment where possible, while straightening curves and realigning intersections and using new location to provide a continuous route with a 50 mile per hour design speed. The length of this corridor is approximately 5.77 miles. Alternative D is shown in Figure 1.

Figure 1: Preferred Alternative and Other Alternatives Considered



Source: Parsons Brinckerhoff, 2014.

3.0 Economic Impacts Analysis

To determine the economic effects of the proposed Pellissippi Parkway alternatives, an input-output based economic impact modeling approach was employed by the project team. IMPLAN economic multipliers were used as a foundation for the economic impact model employed for this study.[1] IMPLAN is an input-output model that determines the impacts of increases in final demand on employment, earnings, and economic output within a specified geographic region. Using the IMPLAN model, changes in demand can be specified at the industry level and the national, state or county level, allowing the multipliers to effectively capture the effects of local development projects such as the Pellissippi Parkway Extension.

[1] The 2009 economic impact study used the Regional Input-output Modeling System II (RIMS II), a commonly used regional economic model used to gauge the economy-wide impact of a change in economic activity on a local community or particular region of the country. In 2014, the Bureau of Economic Analysis (BEA) announced that it would no longer produce the multipliers because of sequestration and reduced funding levels. Thus, the updated economic impact analysis uses the IMPLAN input-output impact model.

Standard economic multipliers, produced by input-output models such as IMPLAN, estimate three kinds of impacts resulting from changes to an economy: 1) direct; 2) indirect; and 3) induced impacts. Each impact is defined as follows:

- **Direct** changes to an economy usually represent new spending by households, businesses, or governments due to changes in household income or wealth, firm attraction or expansion, or new government initiatives.
- **Indirect** impacts result from the inter-industry purchases necessary to support an increase in production for an industry experiencing new demand for its goods or services. The level of inter-industry trade within a given county or state determines the size of the indirect impact in that region.
- **Induced** effects stem from the re-spending of wages earned by workers affected at the direct and indirect activity within the specified geographic area. In other words, if an increase in demand occurs in a certain region for certain goods or services produced by a local firm, the employees of that firm will spend some proportion of their increased earnings at local shops, restaurants, etc.

To estimate the economic impacts of the Pellissippi Parkway expansion alternatives, the cost of each of the three alternatives was assumed to represent an increase in demand for construction services in Blount County. The three alternative measures of new one-time demand for construction services were then applied to the IMPLAN multipliers for the construction industry in Blount County to determine the employment, output and earnings effects of the proposed project.

The results of the economic impact analysis are summarized in Table 1. Details of the analysis are in Appendix A.

Table 1: Economic Impacts in Blount County

Characteristics	Preferred Alternative*	Alternative C	Alternative D
Jobs created	629	663	269
Labor income	$34.1 mil	$36.0 mil	$14.6 mil
Economic output	$195.1 mil	$205.6 mil	$83.4 mil

* The results for the Preferred Alternative would be the same for Alternative A and for the East Shift, due to the proximity of the alignments.

The four-lane Alternative C is expected to generate the greatest economic benefits to Blount County, primarily due to its longer length and higher construction cost. Under Alternative C, 663 jobs would be created across the state, which would generate $36 million in labor income and $205.6 million in economic output statewide. Alternative C would likely generate 5.4 percent more jobs, income, and output than Preferred Alternative, Preferred Alternative with East Shift, and 2012 Preferred Alternative (A), and 1461 percent more of each metric than Alternative D.

Because the Pellissippi Parkway expansion project represents an increase in demand for construction services, the construction industry is estimated to receive the largest economic benefits from the project. Each of the other industries in Blount County also benefit from the proposed project, and the level of benefit is based on the quantity of goods and services each industry must supply to create an additional dollar of construction services output.

4.0 Fiscal Impacts Analysis

For purposes of the fiscal impact analysis, the four-lane alternatives (Preferred Alternative, Preferred Alternative with East Shift, 2012 Preferred Alternative (A) and DEIS Alternative C) were compared to the No-Build alternative. The fiscal impacts of the Upgraded Two-Lane Network alternative (Alternative D) on Blount County are not assessed as part of this study. The two-lane alternative is excluded from this analysis because, with its more limited expansion and therefore more limited growth inducing effects, Alternative D is unlikely to have as substantial an impact on the operating and capital budget of Blount County as the four-lane alternatives. Furthermore, since the Preferred Alternative, Preferred Alternative with East Shift, 2012 Preferred Alternative (A) and Alternative C differ only in alignment, it is not expected that the alternatives' growth and fiscal impacts would be very different from one another. Thus the analysis focus on a single four-lane alternative that is representative of all the four-lane alternatives considered.

Section 4.1 assesses the increment of new development anticipated within the study area as result of the Preferred Alternative (representing Preferred Alternative with East Shift and 2012 Preferred Alternative (A)) and Alternative C. Section 4.2 summarizes the fiscal impacts of that new development on the operating and capital budget of Blount County and describes key assumptions and methodologies for estimating revenues and expenditures.

4.1 Induced Development

Evaluating the long-term fiscal impacts of the Build Alternatives requires an understanding of the increment of new residential and nonresidential development that may be induced with the construction of the proposed project. Induced development (or indirect land use) impacts are defined as those land use impacts spurred by the proposed project that occur later in time and removed in distance, but are still reasonably foreseeable.[2] For this project, induced development impacts may be more specifically defined as those impacts that may result from the Build Alternative outside of the construction footprint of the proposed highway extension corridor.

Estimating induced development from transportation expansion is an evolving art more than it is a science. Federal agencies such as the Council on Environmental Quality (CEQ) and the Federal Highway Administration (FHWA), while attempting to provide guidance, have concluded in position papers that there is no one correct way, nor a prescribed specific technique or method that must be used, to conduct such analysis.[3]

For this analysis, a combination of qualitative and quantitative methodologies is used to estimate the increment of new residential and nonresidential development that may be induced by the year 2025 for the Four-Lane Build Alternatives. The techniques employed herein are described in the most recent guidance on induced development, and both the quantitative and qualitative methodologies are explained in detail in Subsections 5.1.3. [4]

[2] Council of Environmental Quality Regulations Implementing NEPA (National Environmental Policy Act), 1986. 40 CFR, Parts 1500-1508.
[3] Louis Berger and Associates, 1998. *Guidance for Estimating the Indirect Effects of Proposed Transportation Projects, Report 403*. National Cooperative Highway Research Program, Transportation Research Board, National Research Council, National Academy Press, Washington, D.C.
[4] American Association of State Highway and Transportation Officials (AASHTO) Standing Committee on the Environment, 2007. *Forecasting Indirect Land Use Effects of Transportation Projects, NCHRP Project 25-25, Task 22*

4.1.1 Study Area

The geographic boundaries of the induced development study area are shown in Figure 2. The study area extends across portions of Alcoa, Maryville, Louisville, Rockford and unincorporated areas of Blount County. Because induced development effects are further removed from the project than direct impacts, the geographic limits for this analysis reach beyond the primary project study area used in other sections of the EIS. The study area boundary extends roughly 5 miles beyond the midpoint of proposed project corridor in all directions.

The induced development study area was determined, in part, based on a review of forecast travel time savings for selected Transportation Analysis Zones (TAZs) in the region under the Preferred Alternative and Alternative C, and, in part, based on land markets research. Research shows the land-value premium associated with proximity to suburban roads erodes fairly rapidly beyond several miles, suggesting the impact zones of roads generally extend out several miles.

4.1.2 Time Frame

The time frame of analysis was determined by recent empirical findings that the time between when transportation capacity is actually added, and when induced development occurs, is likely on the order of two to three years. The proposed project is expected to open to traffic sometime after 2019 according to the Knoxville Regional TPO's *Regional Mobility Plan 2040*. Since the opening date is unknown at this time, this analysis assumes the road will open sometime between 2020 and 2025. Hence, the fiscal effects of induced development are estimated in year 2025 – the year in which full build out is expected to be in place.

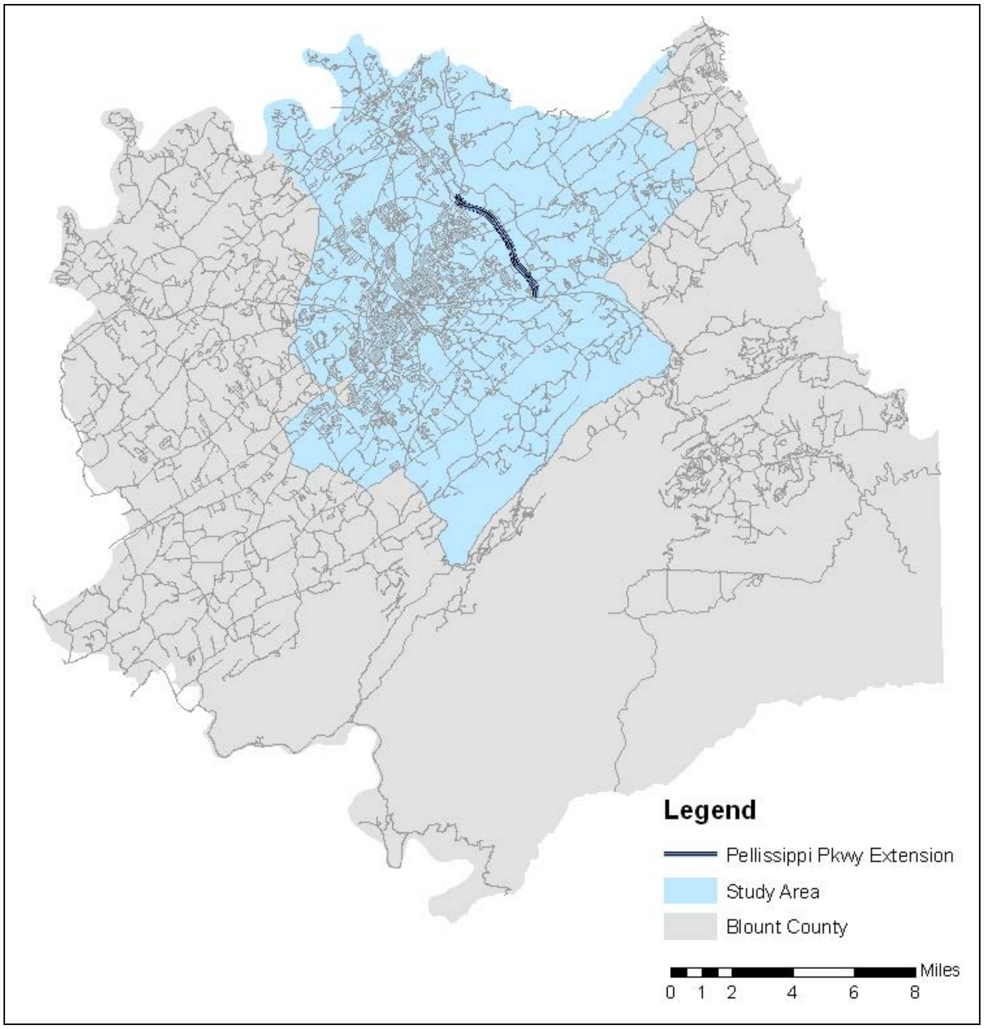
4.1.3 Methodology

This section describes the two principle techniques used to evaluate the potential effects of the Pellissippi Parkway Extension on development patterns in the study area.

First, a qualitative evaluation of the probable magnitude of induced development was conducted using *A Guidebook for Evaluating the Indirect Land Use and Growth Impacts of Highway Improvements (2001)* prepared for the Oregon Department of Transportation (hereafter referred to as ODOT Guidance). Among the guidance documents reviewed in *Forecasting Indirect Land Use Effects of Transportation Projects, NCHRP Project 25-25, Task 22* (2007) (hereafter referred to as NCHRP Guidance), the ODOT guidance was found to be among the best with respect to qualitative analysis of factors influencing the extent of induced development effects.

Second, induced travel and development elasticity parameters from prior empirical studies – in combination with Federal Highway Administration's (FHWA) *Spreadsheet Model for Induced Travel Estimation* (SMITE) – were applied to move from a qualitative assessment of induced development to a quantitative estimate of the increment of new development (i.e., number of housing units and commercial floor space) that is likely to be spurred by the Four-Lane Build Alternatives.

Figure 2: Induced Development Study Area



Source: Knoxville Regional TPO and Parsons Brinckerhoff, 2015

4.1.4 Qualitative Assessment Approach

The eight-step process described in the ODOT Guidance was used to qualitatively assess the potential for induced development effects from the Pellissippi Parkway Extension project's four-lane alternatives. See that report for full citations of literature review, case studies, and estimates of impacts. Almost all of the text that follows comes from the ODOT Guidance or the NCHRP Guidance, which restates the ODOT Guidance with modifications to make the concepts transferable to other states.

The underlying logic of the ODOT Guidance is as follows:

1. What does the transportation project do to highway performance (accessibility, travel-time, volume, mobility, and safety) that is different from what that performance would be without it?
2. How do those changes in travel performance influence factors that help shape development patterns?
3. What other factors influence development patterns?

4. Given the possible changes in development patterns and other factors, the expected magnitudes of those changes, and the relative importance of those changes, what is the qualitative assessment of the indirect land use impacts of the project?

According to the ODOT guidance, the key variables that might contribute to changes in local development patterns in response to a change in travel-time from a highway improvement include:

- **Change in accessibility**. This qualitative assessment is based on the premise that projects that improve accessibility (evidenced by changes in travel times, volumes and mobility) can impact the quantity, timing and location of development. This is typically the most important variable.

- **Expected growth**. If the forecast is for no population and employment growth, then the highway improvement is less likely to have an indirect impact on development trends. The project, however, may affect the distribution of development within the study area. In contrast, a growing city will demand new development: the greater the growth rate, the greater the pressure to develop where good access and services are available.

- **Land supply**. How does the volume of vacant, buildable land in the study area compare to anticipated growth? The more limited the supply, the more likely that improved access will contribute to pressure for zoning changes in the study area.

- A**vailability of other services**. Access alone is not sufficient to trigger development: other key public facilities like sewer and water may need to be available to the study area at a reasonable cost. If they are, improvements in access are more likely to support land use change. The potential for suburban development is not necessarily dependent upon sewer and water connections: densities upwards of a half-acre can be achieved using wells and septic, depending on health department regulations.

- **Other market factors**. Where has growth been going? How does this trend correspond with current plans and zoning? Is access (travel time) or other factors limiting conditions on development in the study area?

- **Public policy.** All the previous factors are indicators of the potential for land use change; most are market driven. But for that potential to result in change it must be allowed. What policies exist on the books to offer resistance to potential land use change?

The analysis of indirect land use impacts uses data from the following sources:

- Outputs of the 2013 Knoxville Regional Travel Demand Model, including changes in travel times for selected TAZs and Average Daily Traffic (ADT) under the No-Build and four-lane alternatives
- County property tax assessment data that allowed for an assessment of vacant, buildable lands
- Transportation Analysis Zone (TAZ) level population, household and employment forecasts for 2040
- GIS layer of geographical boundary of Blount County, City of Alcoa and City of Maryville
- Land use and zoning plans, policies and regulations, including zoning standards, urban growth plans, urban growth boundaries and property tax rates, Some of the studies that were examined in this process were:

- Blount County Policies Plan, Revised and Adopted September 25, 2008
- 1101 Growth Plan, Plan Review Workshop Presentation, Blount County Planning Commission, August 2007
- Blount County Zoning Regulations, September 2006
- Blount County Growth Strategy, Hunter interests Inc.
- Comprehensive Economic Development Study 2008-2009 Update by the ETDD (East Tennessee Development District)
- 2005-2030 Knoxville Regional Long-Range Transportation Plan
- Alcoa 2025 Comprehensive Plan (2006)
- Maryville 1990-2010 Comprehensive Plan

Qualitative Assessment

Table 2 summarizes the qualitative assessment of variables that may contribute to measurable changes in development patterns in response to the project. Column three represents one way (per the ODOT Guidance) that variables can be measured and interpreted to get a qualitative assessment of the potential for land use change that a transportation project may create.

A description of key findings and data sources with respect to each key variable is provided below.

Change in accessibility. As noted above, change in accessibility measures due to the project are important for understanding the benefits offered by the project and its potential to induce development. The proposed project would not only impact travel times of travelers on the Parkway but also on alternate routes as traffic redistributes over the network to absorb the additional capacity and accessibility provided by the new link.

Currently Pellissippi Parkway (I-140/SR 162) acts as a spinal corridor linking central Blount County with West Knoxville as well as Oak Ridge, two primary trip attractors outside the boundary of Blount County. The corridor also connects west Knoxville and Oak Ridge with the Knoxville Airport on US 321 in Alcoa. The proposed extension would improve traffic flow within the northeast quadrant of the study area by providing a speedy connection to Knox County and the Oak Ridge area. In addition, Pellissippi Parkway Extension would also provide a critical link on the southeast to Cades Cove and Townsend, the entrance to the Great Smoky Mountain National Park and facilitate tourist traffic by allowing them to bypass congested downtown Maryville. [5]

One measure of accessibility is Level of Service (LOS). Table 3 provides the projected LOS in the Preferred Alternative versus the No-Build Scenarios for the four-lane options for corridor improvement. Table 4 provides the projected LOS in Alternative D versus the No-Build Scenarios for the two-lane corridor improvement.

[5] Hunter Interests, *Blount County Growth Strategy*, 2005

Table 2: Qualitative Assessment Matrix

Change	Data sources	If value is…	…then potential for land-use change is probably…
Change in accessibility *Measured as change in travel time or delay, if available. Otherwise, assessment of v/c or change in access*	Knoxville Regional Travel Demand Model and interviews with TPO staff.	Less than a couple minutes of time savings for an average trip, or no change in v/c 2-5 minutes 5-10 minutes More than 10 minutes	None to very weak Weak to moderate Strong Very strong
Expected growth *Measured as population, employment and household for Blount County, Alcoa and Maryville*	2030 population and employment forecasts. Same forecast used to model both build and no-build alternative	Average annual growth rate (population/employment) of less than 1% 1% - 2% 2-% - 3% Over 3%	None to very weak Weak to moderate Strong Very Strong
Land supply *Measured as years of supply of vacant, buildable land zoned for residential use*	Blount County Tax Assessment Database	More than 20-year supply of all land types, all sub-areas 10 to 20-year supply Less than 10-year supply Less than 10-year supply and specific identified problems in the study area	None to very weak Weak to moderate Strong Very strong
Availability of other services *Measured number of people or employees that can be served; or barriers to service provision*	Local planning documents, Interviews with local planners and engineers Other reports generated as part of the highway project evaluation	Key services not available and difficult to provide Not available and can be provided Not available, easily provided and programmed Available now	None to weak Weak to moderate Strong Very strong
Other factors that impact the market for development	Local planning documents Socioeconomic and ROW reports generated as part of the highway project evaluation Assessment data,	Weak market for development Weak to moderate market Strong market Very strong market	None to very weak Weak to moderate Strong Very strong
Public policy	Local planning documents Interviews with local officials, local planners, reps of neighborhood or interest groups, state agency planners	Strong policy, strong record of policy enforcement and implementation Weak policy, weak enforcement No policy, weak enforcement	None to very weak Moderate to strong Very strong

Source: Parsons Brinckerhoff, 2009, and Oregon Department of Transportation, A Guidebook for Evaluating the Indirect Land Use and Growth Impacts of Highway Improvements (2001)

Table 3: Preferred Alternative and Alternative C Level of Service

Begin Milepost	End Milepost	2013 Existing	2020 No-Build	2040 No-Build	2020 Preferred & Alt C	2040 Preferred & Alt C
Topside Road	US 129/Alcoa Highway	C	D	F	D	F
US 129/ Alcoa Hwy.	Relocated Alcoa Hwy.	A	B	C	B	D
Relocated Alcoa Hwy.	SR 33	A	B	C	B	E
SR 33	US 411/ Sevierville Rd.	N/A	N/A	N/A	B	C
US 411/ Sevierville Rd.	US 321/ SR 73	N/A	N/A	N/A	B	B

Source: Addendum to Traffic Operations Technical Report, PB, June 2014.

LOS E-F

LOS A-D

Table 4: Alternative D Level of Service

Begin Milepost	End Milepost	2013 Existing	2020 No-Build	2040 No-Build	2020 Alt D	2040 Alt D
SR 33	North of Wildwood Rd.	E	N/A	N/A	E	E
North of Wildwood Rd.	Wildwood Rd.	E	N/A	N/A	E	E
Wildwood Rd.	US 411/ Sevierville Rd.	E	N/A	N/A	E	E
US 411/ Sevierville Rd.	North of Lamar Alexander Pkwy / US 321	D	N/A	N/A	E	E
North of Lamar Alexander Pkwy / US 321	Lamar Alexander Pkwy / US 321	C	N/A	N/A	B	E

Source: Addendum to Traffic Operations Technical Report, PB, June 2014.

LOS E-F

LOS A-D

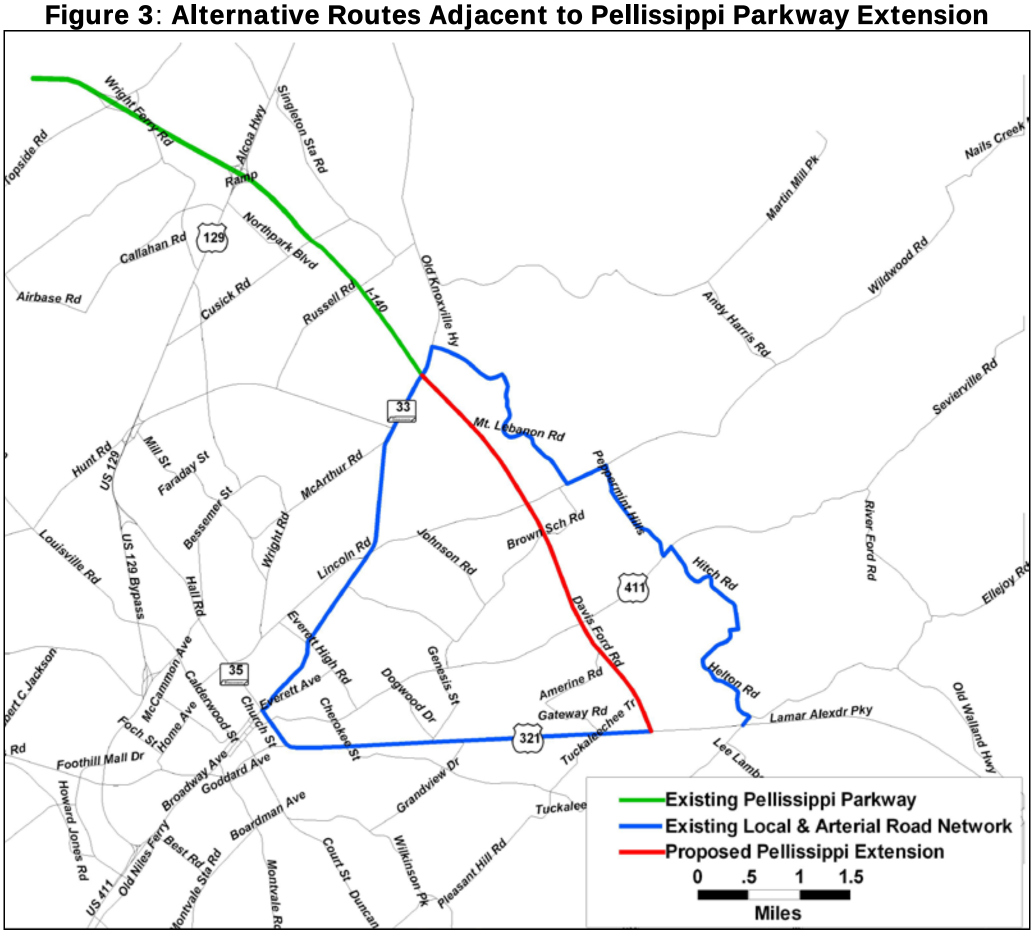
The LOS analysis was obtained from the report entitled SR 162 (Pellissippi Parkway Extension) *Addendum to the Traffic Operations Technical Report*, prepared by PB in 2014. LOS D is considered the minimum desirable threshold for traffic operations on roadways in urban and suburban areas. Operations below this threshold (LOS E and F) are considered undesirable.

The updated traffic analysis shows that the Preferred Alternative (and all four lane alternatives from SR 33 to SR 73/US 321) will operate at an acceptable level (LOS D or higher) through the design year 2040 (see Table 3). In the DEIS traffic operations analysis, the four-lane new roadway between SR 33 and US 411/Sevierville Road would operate at LOS F in 2035, and the section between US 411/Sevierville Road and US 321 would operate at LOS D. The acceptable level of service predicted for the Preferred Alternative in 2040 is due in large measure to the reduction in the traffic forecasts for the new roadway.

Even with lower forecasted traffic volumes based on the current regional model, Alternative D would operate poorly (LOS E or F) in the 2020 and 2040 horizon years (see Table 4). The corridor LOS analysis indicates that the projected volumes for Alternative D would exceed the carrying capacity of a two-lane road. This would be true even if that network of two-lane roads were improved by wider lanes, improved shoulders, and the straightening of substandard curves.

A second measure of accessibility is travel times saving. To facilitate comparison between the Build and No-Build scenarios, it was assumed that in the absence of the Parkway extension, travelers would look for the next best alternatives on the adjacent arterial roads. Based upon current traveler behavior this route (shown in Figure 3) was approximated to be the section of East Lamar Alexander Parkway west of the proposed terminus of the I-140 extension up around S. Washington St. and though Route 33 to the current terminus of I-140 on Route 33 (and in the reverse direction for traffic going south from the current terminus of the Parkway extension).[6]

Figure 3: **Alternative Routes Adjacent to Pellissippi Parkway Extension**



Source: Knoxville Regional TPO, PB, 2015.

[6] The alternative route was assumed based upon discussions with a Senior Transportation Engineer at the Knoxville Regional TPO.

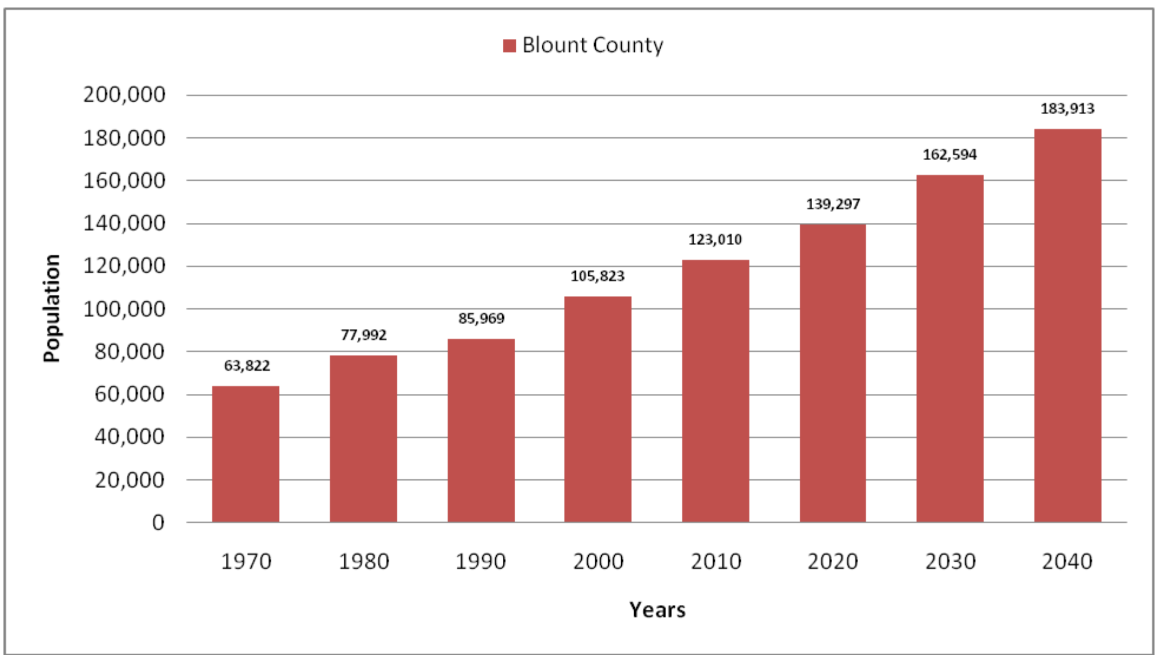
This alternate route is estimated to be 3.5 miles longer and about 10 minutes slower than the parkway extension in 2025.

It is noteworthy here that some accessibility benefits may be felt by trip originating and ending outside of the study area as well. However in the quantitative evaluation, benefits are distributed based upon Vehicle Miles Traveled (VMT) and not upon individual trips. It is unlikely that significant benefits are felt on VMTs beyond the study area since travel time impacts diminish as we go farther from the epicenter of the improvement. It is equally unlikely that all trips within the study area accrue exactly similar benefits and hence an average over the study area is considered a better metric to judge net overall travel time benefits.

Based upon these findings, it is reasonable to expect that changes in accessibility under the Four-Lane Build Alternatives have a low to moderate potential to induce growth in the study area.

Expected Growth. Population growth in Blount County has been steady, increasing at an average annual growth rate of 2.3% from 1970 to 2010. This growth trend is expected to continue at a slightly lower rate, 1.7% per year average from 2010 through 2040, according to projections in the Knoxville Regional TPO's Regional Mobility Plan 2040. (See Figure 4.)

Figure 4: Blount County Population Growth (1970-2040)



Source: Knoxville Regional TPO Long Range Regional Mobility Plan 2040, Appendix G: Socioeconomic Control Total Projections Report. Graph by Parsons Brinckerhoff, 2015.

Table 5 presents TPO's population forecast for the study area and Blount County, as a whole. The study area is forecast to grow at a slightly higher average annual growth rate (AAGR) of 1.8% compared to the County as a whole (1.7%).

Table 5: TPO Population Forecast (2010 and 2040)

Forecast Zone	2010 Population	2040 Population	Percent Change	AAGR
Study Area	92,274	142,832	54.8%	1.8%
Blount County	123,010	183,913	49.5%	1.7%

Source: Knoxville Regional TPO, 2015.

The number of jobs in the study area is forecast to grow at a slightly lower Average Annual Growth Rate (AAGR) of 1.5%, compared to that of the County (1.8%). (See Table 6.)

Table 6: TPO Employment Forecast (2005 and 2030)

Forecast Zone	2010 Employment	2040 Employment	Percent Change	AAGR
Study Area	54,324	79,174	47.7%	1.5%
Blount County	55, 894	81,035	45.0%	1.8%

Source: Knoxville Regional TPO, 2015.

A substantial portion of new jobs in the study area are attributed to the construction of Pellissippi Place, a research and development park that is being built on a 450-acre tract of land where Pellissippi Parkway (I-140) intersects with Old Knoxville Highway (S.R. 33). The first construction phase of Pellissippi Place broke ground in November 2008, and the anchor tenant constructed the first building and is expected to open for business in mid-2015. The TPO estimates that the Pellissippi Place development will create 2,242 new jobs by 2040[7].

Collectively, the socioeconomic growth forecasts indicate weak potential to facilitate induced development in the study area.

Land Supply. PB conducted a GIS-based buildable land analysis to understand how the volume of vacant, buildable land in the study area compares to anticipated growth. This analysis focuses on lands that have an improvement value equal to $5,000 or less and are classified as Residential, Commercial, Industrial, Farm or Agricultural in the Blount County Real Estate Assessment Database[8]. Lands that are not currently served by water and wastewater infrastructure are included in the buildable lands inventory. Simply because such lands have limited or no infrastructure currently does not mean that necessary capacity or new infrastructure may not be provided sometime in the future.

This analysis is a tool to help gauge the balance between land supply and demand. Further specific local analysis of the study area would be required, including an assessment of site specific environmental constraints, infrastructure capacity and zoning before actual land supply and build-out potential can be determined.

[7] Under the previous model, the Knoxville Regional TPO had estimated that the Pellissippi Place development would create 7,383 jobs by 2030. For the new model, the TPO did not conduct a specific effort to forecast the number of jobs for Pellissippi Place. Instead, as part of the population and employment allocation process to the Traffic Analysis Zones, the TPO identified the property as a certain "placetype" that would be more likely to receive growth in the future.

[8] The property class field in the Assessment Database indicates current uses – not zoning. However, in the absence of zoning information by parcel, PB relied on the property class as a proxy for zoning, which assumes that current uses are consistent with current zoning.

Based upon the analysis parameters outlined above and data provided by Blount County, PB has identified approximately 17,800 acres within study area that could accommodate future growth. Figure 5 presents the location of the identified vacant, buildable lands in the study area, and Table 7 provides a breakdown of the vacant lands by property class.[9]

Table 7: Vacant, Buildable Lands by Property Class

Property Class	Acreage	No. of Parcels
Agriculture	6,696	165
Commercial	496	238
Farm	2,209	63
Industrial	177	21
Residential	8,348	5,539
Total	17,926	6,026

Source: Blount County, 2015

Residential Land Conversion Assumptions

According to TPO's 2040 household forecasts, the study area is expected to grow by roughly 680 households per year. Assuming one residential unit per residential parcel yields a 12-year supply of residential land, this order of magnitude estimate is likely a conservative estimate as some residential class lands may be able to accommodate more than 1 residential unit. Additionally, other lands within the study area may also be appropriate to serve future development. For example, this analysis does not examine the potential of redevelopment and infill opportunities on previously developed lands (i.e., lands with an Improvement Value greater than zero).[10]

Commercial Land Conversion Assumptions

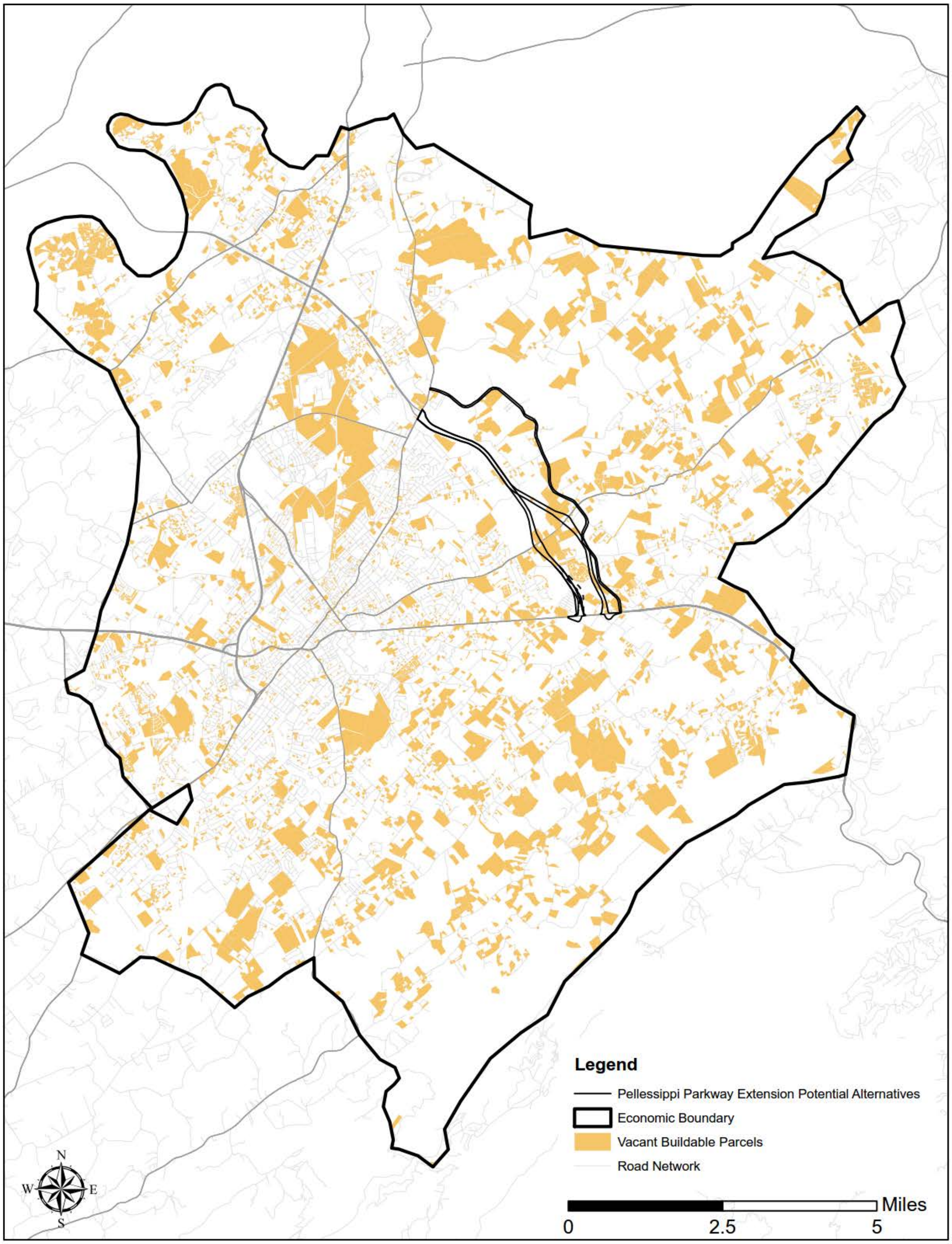
Between 2010 and 2040, about 24,850 new jobs are expected to be added to the study area. TPO estimates that roughly 75% or 18,540 of those jobs will be in commercial sectors (retail/finance, insurance, and real estate/service). Assuming a weighted average of 2.9 jobs per 1,000 square feet of commercial space, yields a commercial land consumption rate of roughly 147 acres of new commercially developed land in total. Given the nearly 500 acres of vacant commercial land in the study area, the availability of commercial land is not a potential constraint to growth.

Based on these findings, land supply has a very weak potential to facilitate induced growth in the study area.

[9] In general, publicly owned land has not included in this analysis; however, the Pellissippi Place development, which is considered "public/county" land has been included as vacant, buildable lands since it is intended to be developed for commercial, industrial and residential uses.

[10] It is important to note that environmental constraints have not explicitly been accounted for in this buildable lands analysis. While including environmental constraints would reduce the supply of buildable land, this decrease in land supply would likely be offset by increases in density contemplated for large-scale planned developments such as Pellissippi Place.

Figure 5: Location of Vacant, Buildable Parcels in the Study Area



Source: Blount County, 2015.

Note: The Pellissippi Place development is included as vacant buildable land for the purpose of this analysis, even though it is classified by the county as “public/county” property, which in general has been excluded from this analysis.

Availability of Other Services. In most cases, transportation improvements alone do not induce significant growth: other public facilities (especially sewer, water and other utilities) must also be available at a reasonable cost. This analysis focuses on potential sewer service constraints due to the limited nature of information on water and power service availability in the study area.

Sewer Service

According to the 2005 *Blount County Growth Strategy* (hereafter, *Growth Strategy*), the vast majority of unincorporated areas of the study area lack public sewer service.[11] The vast majority of residential parcels in the unincorporated portions of the study area are served by small collection systems with on-site treatment units (septic systems), and the County does not intend to extend public sewer service outside of the Urban Growth Boundaries (UGB) of incorporated municipalities.[12] However, the County will approve new development on small utility package systems, not operated nor maintained by the County, for multi-lot developments or commercial developments, but with no increase in overall density of development allowed by applicable zoning.[13]

When developers build on new land within an UGB, it is their responsibility to pay for the new sewer system throughout the subdivision, although the City will extend its sewer 100 feet toward the subdivision if needed.[14] When the development is complete, the developer transfers ownership of the subdivision's sewer lines to the City. As reported in the 2005 *Growth Strategy*, city sewer extensions are determined mainly by where development is anticipated to go. For example, sewer has been extended to the planned interchanges around the Pellissippi Parkway Extension.[15]

Given that sewer service could be extended to serve areas outside of the UGBs, the availability of septic systems is considered to have weak to moderate potential to facilitate induced growth.

Public policy. Blount County Planning Commission's 1998 *Policies Plan, updated in 2008,* focuses largely on preserving the rural and suburban residential nature of the larger part of the County. While medium and low density residential development is encouraged, commercial development is prescribed to be allowed only by exception along major corridors and key intersections. The plan emphasizes preserving the rural, small town and natural character of the County, encourages mixed use development and seeks to direct growth towards centers.

The 2000 *Conceptual Land Use Plan* goes further and defines the type of development (commercial, industrial residential, rural) and lays down the expectations of potential shape of each of these land uses. For instance commercial development is expected in the plan to be allowed to grow as needed, while industrial development is expected to be concentrated around cities of Alcoa and Maryville. This plan is generally considered easier to read and is in line with the zoning ordinance.

A review of historical building permit trends between 2005 and 2013 suggests that new residential growth outside municipal boundaries is occurring at a far more rapid pace than within those city limits. As presented in Table 8, on average about 60% of new development

[11] Hunter Interests Inc., 2005. *Blount County Growth Strategy*. Blount County Technical Memorandum #11. Wastewater Treatment Alternatives

[12] Ibid.

[13] Email conversation with John Lamb, Blount County Planning Director. January 23, 2015.

[14] Hunter Interests Inc., 2005. The Blount County Growth Strategy. Blount County Technical Memorandum #11. Wastewater Treatment Alternatives.

[15] Ibid.

throughout the period has occurred in the unincorporated portions of Blount County as compared to Alcoa and Maryville.

Table 8: New Privately Owned Residential Building Permits by Jurisdiction

Residential Building Permits	2005	2006	2007	2008	2009	2010	2011	2012	2013
Alcoa	23	39	28	18	32	1	48	33	46
Maryville	253	192	155	77	48	51	53	62	103
Unincorporated	730	707	518	486	129	155	86	240	220
Total	1,006	938	701	581	209	207	187	335	369
% New Development in Unincorporated Blount County	73%	75%	74%	84%	62%	75%	46%	72%	60%

Source: US Census Bureau, Building Permits Data, accessed January 23, 2015.
http://censtats.census.gov/bldg/bldgprmt.shtml

Based on this housing trend, it is likely that current land use controls will have a moderate to strong potential to facilitate induced development.

Qualitative Assessment Findings

The findings of the qualitative assessment are summarized below in Table 9:

Table 9: Assessment of Induced Development Indicators

Change	Conditions	Potential for land use change in the study area
Change in accessibility	10 minutes travel time savings per trip	Moderate
Expected growth	1%-2%	Weak to moderate
Land supply	12-year supply of residential, more than 20-year supply of commercial	Very weak
Availability of other services	Sewer: Not available everywhere and can be provided, and septic options are available	Weak to moderate
Public policy	Market pressures continue to steer growth to unincorporated areas, despite smart growth policies and controls	Moderate to strong

Source: Parsons Brinckerhoff, 2015.

4.1.5 Quantitative Assessment

Quantitative Assessment Approach

To quantify the increment of new development that may be induced by the project, the incremental travel generated by provision of the new roadway capacity was estimated (hereafter, induced travel demand). The Knoxville Regional Travel Demand Model does not explicitly account for induced travel.[16] In order to impute induced travel effects, PB post-processed Vehicle Miles of

[16] In addition, the traffic forecast runs for the Preferred Alternative and No-Build Alternatives rely on the same base demographic forecasts.

Travel (VMT) and speed outputs of the Knoxville Model using FHWA's *Spreadsheet Model for Induced Travel Estimation* (SMITE). [17]
The SMITE model estimates increase in travel due to highway expansion through an iterative cause-effect process. The model is based on the premise that increases in speed due to added capacity lead to more travel that, in turn, acts as a deterrent to travel since more traffic implies decreased speeds due to greater congestion. Several recent EIS studies of proposed road improvements have relied upon SMITE to estimate the combined effect of all induced travel. This was the case with the proposed I-93 improvement proposed for Manchester, New Hampshire. A description of SMITE is provided in Appendix B.

SMITE relies on travel demand elasticity results from a limited set of studies, some of which have been critiqued in more recent reviews. [18] [19] To address this shortcoming, the result of a "meta-analysis" of induced travel elasticities, which relies on averages of elasticity results from multiple empirical studies, was imputed in SMITE in lieu of the model's default elasticity parameters.[20] For purposes of this analysis, a travel demand elasticity estimate of -0.63 was used.

Indirect land use effects are only one source of induced travel. To accurately measure induced development one must net out the other sources of induced travel. Recent research in California has advanced our understanding of how the indirect effects of road expansion get expressed in terms of shorter-term behavioral shifts in travel (e.g., by route and mode) versus longer-term structural shifts in land use (i.e., indirect land use effects). Cervero (2003) examined 24 California freeway expansion projects across fifteen years to sort out the various sources of induced travel.[21] Findings from this study were used to forecast the potential number of new average daily trips (ADT) attributable to indirect land use shifts.

Finally, new vehicle trips attributed to longer-term land use shifts were attributed to households based upon trip purpose distributions obtained from the Knoxville TPO *East Tennessee Household Travel Survey* (2008), which is the latest available household survey for the region. Subsequently, home-based trips were converted into households based on an average household trip rate assumption. [22] To estimate induced retail, office and hotel development, the ratio of households to (a) retail trade employment; (b) finance, insurance, and real estate (FIRE) employment; and (c) service employment were derived from the Knoxville TPO 2040 forecasts. Each respective households-to-jobs ratio was then multiplied by the total number of new households to yield the number of forecasted new jobs in each employment category.

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[17] For the "Build" scenario, only the Preferred Alternative and Alternative C, involving the construction of a 4-lane Pellissippi Parkway extension were considered. The Vehicle miles results of the Preferred Alternative (including 2012 Preferred Alternative (A) and Preferred Alternative with East Shift) and Alternative C were close enough to be approximated as a single build scenario.

[18] The elasticity values represent proportional change in demand (e.g., VMT) as a function of proportional changes in capacity or travel times, controlling for other factors.

[19] Noland, R. and Lem, L. "A review of the evidence for induced travel and changes in transportation and environmental policy in the US and the UK." In *Transportation Research Part D: Transport and Environment Vol. 7*, Issue1. Elsevier (2002), pp. 1-26.

[20] Meta-analysis results from Uri Avin, Robert Cervero, and et.al. *Forecasting Landuse effects of Urban Transportation Projects*, prepared for AASHTO Standing Committee on Environment, 2007.

[21] Cervero, R. "Road Expansion, Urban Growth, and Induced Travel: A Path Analysis." *In Journal of the American Planning Association, Vol. 69, No. 2*. American Planning Association, Chicago (2003), pp. 145-163.

[22] Knoxville Regional Transportation Planning Organization. October 2008. 2008 East Tennessee Household Travel Survey, Final Report. Available at http://www.knoxtrans.org/plans/travsur2008.pdf.

Quantitative Assessment

Based on the elasticity parameters described above, the SMITE model estimated overall induced travel in 2025 to be 26,148 vehicle-miles.[23] With an average trip length of 7.5 miles, the extension of the Parkway would likely generate 3,486 additional individual trips in the study area.

However, this number includes trips induced by factors other than long-term land use shifts. Induced travel can be manifest in various forms. Some of the traffic gains spawned by a new or improved road are *behavioral* shifts and some are due to *structural* changes (i.e. land use shifts). Included in the former category are trips that were formerly suppressed, switches in routes and times of travel in response to increased capacity, and modal shifts. Longer term land use changes, on the other hand, are *structural* in that they represent people and firms locating to exploit the accessibility benefits created from road improvements.[24]

Cervero's (2003) study of 24 California freeway expansion projects brackets the range of induced travel attributable to long-term land use shifts at 0%-18%. Based on the results of the qualitative assessment (See Table 8), a 10%-18% range, i.e. 349 to 628 trips, appears to be a reasonable range in the context of the Pellissippi Parkway Extension.

Induced Residential Development. According to the Knoxville TPO's 2008 East Tennessee Household Travel Survey, Home-Based trips constituted nearly 67% of the total surveyed trips. Given this distribution, we can infer that between 234 and 421 trips of the roughly 349 to 628 induced trips are attributable to new households. According to the same survey the observed vehicle trip rate per household was 8.73. This trip rate and the addition of 234 to 421 daily vehicle trips suggest that approximately 27 to 49 to new households would likely be spurred from the proposed project

Induced Commercial Development. Using data obtained from Knoxville TPO regarding the ratio of households to retail; service; and FIRE employment, and holding this job/housing balance constant, 24,100 sq. ft. of induced commercial space is attributed to the project in total. More specifically, this would likely result in 14,300 sq. ft. of induced office space, 7,900 sq. ft. of induced retail space, and 1,900 sq. ft. of induced hotel space.

Retail, service and FIRE jobs are estimated based on the split of employment types in the 2030 TAZ data. For hotel employment, it is assumed that hotel jobs would constitute around 12% of service and FIRE employment.[25] In order to estimate square footage of development from new jobs, metrics for square feet per employee were used. The analysis assumes 400 sq. ft. per employee for retail development, 275 sq. ft. per employee for office development, and 600 sq. ft. per employee for hotel development.

Quantitative Assessment Findings

Based upon the above analysis, the Pellissippi Parkway Extension would likely induce development in the study area. Induced development is estimated at between 27 and 49 new households and between 13,300 and 24,100 sq. ft. of office, retail and hotel space. (See Table 10.)

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[23] See Appendix B for details regarding the SMITE process.
[24] Cervero, *Road Expansion, Urban Growth and Induced Travel- Path Analysis*, APA Journal, 2003.
[25] *http://web.utk.edu/~tourism/presentations/Blount-Co-7-10-07.pdf* The Importance of Tourism to the Blount Co. Economy

Table 10: Summary of Induced Commercial Development

Dwelling Units (HH)	Office (sq. ft.)	Retail (sq. ft.)	Hotel (sq. ft.)	Total Commercial (sq. ft.)
27 -49	7,900 - 14,300	4,400 - 7,900	1,000 - 1,900	13,300 - 24,100

As noted earlier, the process of forecasting induced development from transportation capacity improvements is more art than science. Considerable knowledge gaps surrounding induced travel and subsequent development remain. For instance, we know relatively little about how induced development varies between by type of facility and where new residential and commercial development is likely to go within a given jurisdiction. Additionally, multiple factors - such as, changes in fuel prices, unemployment and other variables - could mask or completely offset the predicted induced development effects of the proposed project.

Understanding these limitations, induced development estimates are presented as ranges to reflect the considerable variability and uncertainty underlying the forecasts.

4.2 Fiscal Impact Analysis

Section 4.1 established the induced development program to be evaluated in the Fiscal Impact Analysis. This section presents the results of the fiscal impact analysis of that development program, and describes the methodology and key assumptions used in the Fiscal Impact Model.

The fiscal impact analysis estimates the net positive or negative fiscal implications of the development program on the annual operating revenues and expenses of Blount County. The analysis focuses on the county budget because it represents revenues and expenditures for the largest portion of the government services provided in Blount County. The study does not analyze services provided by the cities of Maryville and Alcoa; nor does it assess public capital improvement requirements associated with the development program in detail. That said, the potential impact of the induced development program on demand for one-time public educational facility improvements in the County is considered.

In the 2009 study, the analysis examined the fiscal effects of two development scenarios: 2020 Business as Usual Case and the 2020 Smart Growth Case. The 2020 Business as Usual Case concept represents a “business as usual” future that would reasonably be expected to occur if a significant portion of the induced growth occurs outside designated growth areas. In the BAU scenario, it was assumed that only 20% of development would take place inside the limits of designated growth areas (incorporated lands and lands within urban growth boundaries), and 80% of development would be concentrated outside of designated growth areas. This has been the path that the County has essentially been following. The 2020 Smart Growth Case concept represents a future where most new residential and nonresidential development will be focused inward towards designated growth areas generally reflecting the objectives and guidelines of the Blount County Conceptual Land Use Plan. In the smart growth scenario it was assumed that 80% of new residential development would take place in designated growth areas, and the remaining 20% of new development would occur outside of these areas.

Since the 2009 *Economic and Fiscal Impact Analysis* was conducted, Blount County has not made progress toward the implementation of a smart growth plan. Thus, the current analysis presents a single methodology, based on the assumption of the continuation of the business as usual approach that the County has been following.

4.2.1 Methodology

This section lays out the basic methodology used to estimate the fiscal implications of the induced development program. The approach consists of the following steps:

Step 1: Estimate Additional Expenditures

Operating expenditure items were reviewed and classified as either "affected" or "not affected" by the induced development program. Affected cost categories were assigned a fixed versus variable cost ratio based on research in comparable jurisdictions. The variable portion of each affected cost category was normalized by an appropriate "estimating factor". "Estimating factors" include: per capita; per average daily membership (ADM); per sworn officer; per road mile, per service call and other factors. Total variable costs of each category were then projected by multiplying the estimated increase in population, employment, etc. by the appropriate estimating factor.

Step 2: Estimate Additional Revenues

Operating revenue items were forecast using a variety of techniques, depending on the revenue source. As an example, property tax revenue forecasts were based on estimates of the net assessment amount added to tax rolls as a result of induced development. Current local tax rates were then applied to estimate property tax revenue for the induced development.

Step 3: Determine Net Fiscal Operating Effects

Net fiscal effects were determined based on a comparison of the costs of providing public services to the induced development program and any revenues that may be collected in connection with that new development.

Step 4: Review Capital Needs

In addition to increases in operating costs, new public streets and schools infrastructure may be needed to serve additional residents that result from the induced development program. A capital improvement plan for Blount County was not available at the time of this analysis. Nevertheless, PB performed a preliminary analysis to determine the level of service thresholds for expansion or development of new schools. Current capacity information, together with *Tennessee Basic Education Program* (BEP) components and cost specifications for each component were used to determine capital needs as measured through annual debt service payments.

The assumptions used in developing the Fiscal Impact Model are based on a number of sources including the County of Blount 2013-2014 Adopted Budget, governmental and real estate trade data sources, interviews with County staff, as well as PB's experience in comparable jurisdictions. Revenues and expenses have been estimated in constant (Year 2014) dollars.

4.2.3 Blount County Revenue Assumptions

This section describes the methodology and assumptions used to forecast revenue items for selected Blount County Funds; including the General Fund (Fund 101), Highways and Public Works (Fund 131) and Education Funds (Funds 141, 142, 143 and 146). Table 11 provides a summary of selected County revenues as estimated in the 2013-2014 Blount County Adopted Budget (County Budget) as well as estimating factors. A general description of the method used for this analysis is provided for each revenue item. Several revenue items are not forecast because they are not expected to be affected by development induced by the proposed project.

TOTAL PROPERTY TAXES

Property tax forecasts are based on estimates of the net assessed value added to tax rolls as a result of induced development. In Tennessee, property is classified based on its use and assessed as follows:

- Residential Land - 25% of its market value
- Residential Improvements - 25% of its market value
- Commercial Property - 40% of its market value

In Fiscal Year 2013-2014, annual property tax in Blount County was $2.23 per $100 of assessed valuation.[26]

Residential Assessed Value Increase

The increase in appraised value attributable to new residential development is forecast at $135,000 per acre of residential land. This per-acre value was computed as the difference between the average per-acre appraised value of improved and unimproved residential land in the study area (see Appendix C).[27] The per-acre value is then multiplied by the projected acreage of new housing attributable to induced development. To compute net assessment amount, the total forecast increase in appraisal value is multiplied by 25 percent. Finally the property tax rate is applied to the net assessment amount to determine total residential property tax attributable to the new development.

Commercial Assessed Value Increase

The increase in appraised value generated by new commercial development is forecast at $4.12 per square foot of commercial land. This value was calculated as the difference between the average per-square-foot appraised value of improved and unimproved commercial land in the study area. Total commercial property tax was derived in the same manner as described for residential development, and is presented in Appendix C.

LOCAL OPTION SALES TAX

Sales tax estimates are based on the proceeds from retail purchases made by the residents and employees of the new development. The County levies a local sales tax equaling 2.25 percent of total taxable sales.

It is assumed that households living in the new residential units spend 25 percent of their total household income taxable items, and that 75 percent of these expenditures will be captured will be captured by retailers in Blount County. These proportions are based on data from the U.S. Bureau of Labor Statistics and national consumer expenditure studies. Household incomes are estimated based on per capita income statistics reported for Blount County by the East Tennessee Development District and assume an average household population of 2.5 residents.

For residential development, revenue from the local sales tax was estimated by, first determining the ratio of aggregate household income of new development to aggregate household income in the County, and then multiplying that ratio by current local sales tax revenues. This calculation assumes that new residents will have a similar incomes and expenditure patterns as current residents.

[26] Tennessee Comptroller of the Treasury, Division of Property Assessment. http://www.comptroller1.state.tn.us/PAnew/CountyAssessmentSummary.asp?c=005.

[27] For purposes of this analysis, unimproved parcels are defined as having an assessed improvement value of zero.

Table 11: Revenues Summary, Blount County Fiscal Impact Model

Revenues Summary and Estimating Factors, Blount County Fiscal Impact Model

ITEM	Table Reference	13-14 Adopted Total	Percent Variable Costs (1)	Allocation Amount	Estimating Factor (2)	Project Total
REVENUES						
Multiple Funds						
Total Property Taxes (3)	Table 1-1	56,669,793		$2.23	per $100 of assessed value	$159,376
Local Option Sales Taxes (4)	Table 1-2	13,492,556		2.25%	of estimated taxable sales	$9,127
General Fund						
Business Tax		1,160,307	100%	$20.76	per employee	$500
Natural Gas Franchise Fee		420,000	100%	$2.78	per capita (daytime pop.)	$374
Fines, Forfeitures and Penalties	Table 1-3	955,311	100%	$6.33	per capita (daytime pop.)	$851
Licenses and Permits (5)		864,861	100%	$7.03	per capita (residential pop.)	$861
Other Local Option Taxes (6)		592,652	0%	$0.00	fixed cost	$0
Statutory Local Taxes (7)		326,897	0%	$0.00	fixed cost	$0
Highway/Public Works Fund						
Gasoline & Motor Fuel Tax		2,498,969	25%	$5.08	per capita (residential pop.)	$622
Other Revenues (8)		1,131,622			fixed cost	$0
Education Revenues						
State of Tennessee		48,437,038	100.00%	52.1%	percent of Total School Expenditures	$86,093
Federal Government		10,289,760	100.00%	11.1%	percent of Total School Expenditures	$18,289
TOTAL						**$257,804**

(1) Percentage of costs that are population dependent as opposed to fixed costs

(2) Current Factors Used For Budgeting

123,101	Residential population of Blount County (U.S. Census 2010)
55,894	Employees working in Blount County 2010 (Knoxville Regional TPO, 2015)
150,957	Daytime Population (100% residential population plus 50% employees)
63	Certified Deputies (Sheriff's Office)
66,632	Sheriff's Office Service Calls
1,261	Road Miles
11,300	Average Daily Membership (K-12 students)
$93,051,724	Total Education Expenditures (2014, from Audit Report)
$165,392	Induced Development School Expenditures

(3) Includes Current Property Tax revenue items from General Fund, General Purpose School Fund and Debt Service Fund

(4) Includes Local Option Sales Tax revenue item from Highway Fund and General Purpose School Fund

(5) Includes Animal Vacc, Cable TV Franchise, Building Permits, Cleanup, Building Safety, Stormwater Fees, Adult Entertainment Permits

(6) Includes Hotel Tax, Litigation Taxes, Other City Local Options Taxes

(7) Includes Bank Excise Tax and Wholesale Beer Tax

(8) Excludes Local Option Sales Tax

Source: Parsons Brinckerhoff, 2015.

Retail and office workers that result from new commercial development will also spend money in the County, generating additional sales tax revenues. To avoid double-counting employees who live in Blount County and would have made their taxable purchases in the County already, it is assumed that 40 percent of the new workers will commute to work from other Counties (consistent with the Knoxville Regional TPO's *2008 East Tennessee Household Travel Survey*), that these employees spend approximately $2,800 per year on taxable items during the work day, and that 75 percent of these expenditures will be captured by retailers in Blount County. These proportions were based on data from the International Council of Shopping Centers and the U.S. Bureau of Labor Statistics.

BUSINESS TAX

Business taxes are a privilege tax imposed on businesses by a local jurisdiction. Business taxes are estimated at $24.47 per employee based on the County's current budget. This amount is multiplied by the projected increase in employees attributable to new development from the proposed project.

NATURAL GAS FRANCHISE FEES

Natural gas franchise fees are paid to local jurisdictions by utility companies for the rights to use public rights-of-way. Franchise fees are estimated at $11.48 per capita of the daytime population based on the County's current budget. These per capita revenue amounts are multiplied by the projected increase in daytime population attributable to new development from the proposed project.

FINES, FORFEITS & PENALTIES

Fines, forfeitures and penalties include revenues received or bail monies forfeited upon conviction of a misdemeanor or municipal infraction. Fines and forfeits are estimated at $7.57 per capita of the City's daytime population based on the current County budget.[28] These per capita revenue amounts are multiplied by the projected increase in daytime population attributable to new development from the proposed project.

LICENSES & PERMITS

Revenues from licenses and permits are generated from building permit, stormwater and other fees. Licenses and permits revenues are estimated at $7.90 per capita of the residential population based on the County's current budget. These per capita revenue amounts are multiplied by the induced residential population of the proposed project.

GASOLINE & MOTOR FUEL TAX

The current distribution of state highway aid to counties in Tennessee is distributed according to a three-part formula:[29]

- 50 percent of the total amount shared with county governments is distributed equally to each county.
- 25 percent of the total amount shared with county governments is distributed on the basis of county area.
- 25 percent of the total amount shared with county governments is distributed on the basis of population.

Based on this formula, the County will receive additional Gasoline & Motor Fuel (Gas Tax) revenue from the state due to increases in residential population only. Gas tax revenues are estimated at $5.96 per capita of residential population assuming 75% of current Gas Tax revenue is fixed. This amount is multiplied by the projected increase in population from the proposed project.

Basic Education

The Tennessee Department of Education's *Tennessee Basic Education Program* (BEP 2.0) components determine the funding level required for each school system to provide a common, basic level of service for all students. Funds are then allocated between classroom and non-classroom components. There are 42 components in the BEP regression formula. They are measured primarily on the basis of average daily membership (ADM) in specified classifications.

The BEP requires the state to pay 75% of the statewide cost of the classroom components and 50% of the statewide cost of the non-classroom components. The local portion of the revenues required to fund the formula is divided among the school systems based on differences in ability

[28] Daytime population figures were used to estimate revenues and expenditures that are not strictly attributable to either residential or commercial development. Daytime population is estimated to be the residential population plus one-half of the employed population. Only half of employees in the daytime population were counted because some employees will also be Blount County residents, and because employees who live outside of Blount County spend less total time in the County than do residents, and thus impact the County budget to a lesser degree.

[29] Tennessee Advisory Commission on Intergovernmental Relations. 2005. State Highway Aid to Local Governments in Tennessee.

to raise local revenues. This process is called equalization and is based on a weighted regression formula developed by the Tennessee Advisory Commission on Intergovernmental Relations.

Absent detailed information on current non-classroom and classroom components in Blount County, the Fiscal Impact Model assumes the County will receive the same proportion of state and federal education aid to total education expenditures as reported in the County's 2014 Audit Report as a result of additional education relating operating costs attributed to the induced development program.

In the County's 2014 Audit Report, State of Tennessee and federal education funds accounted for 52.1% and 11.1% of total education expenditures, respectively.

REVENUE SOURCES EXCLUDED FROM THE MODEL

The County's *Adopted Business Plan* includes a number of revenue sources that are not expected to be affected by induced development in the study area. The fiscal model does not include projections for Hotel/Motel Tax or any other county Local Option Taxes other than the Business Tax, nor does it include Statutory Local Taxes (i.e., Bank Excise Tax or Beer Wholesale Tax) or School Federal Projects, Central Cafeteria and Extended Day Care Program Funds.

4.2.4 Blount County Expenditure Assumptions

This section describes the methodology and assumptions used to forecast expenditure items for selected Blount County Funds; including the General Fund (Fund 101), Highways and Public Works (Fund 131) and Education Funds (Funds 141, 142, 143 and 146). Table 12 provides a summary of County expenditures for core service functions as well as estimating factors applied to each item. A general description of the method and assumptions used to forecast expenditures is provided below. Importantly, several County funds are not forecast because they are not expected to be affected by new development induced by the proposed project.[30]

GENERAL FUND

The General Fund is the general operating fund of the County. The majority of revenue for this fund comes from the collection of County property taxes.

General Fund expenditure items were categorized into five core service functions using the 2007-2008 Blount County Government Adopted Budget. The core service functions include General Government, Public Library, Administration of Justice, Public Safety, Highways, Public Health and Welfare, and Other Operations.

<u>General Government</u>

In PB's research in other jurisdictions, new development in otherwise suburban counties typically has a minimal impact on General Government costs. This analysis assumes that 10 percent of the budget for General Government services will be affected by new development; the remaining 90 percent are assumed to represent fixed costs and services that will not be affected by the proposed project. The one exception includes the Building Commission budget, which is assumed to be 50 percent variable to new development. Specific responsibilities of the Building Commission include general enforcement of zoning regulations and administration of building permits.

[30] Funds that are not forecast include the Drug Court, Drug Control, Public Library, Law Library, Courthouse & Jail Maintenance Funds.

A list of all expenditure items that are grouped into the General Government service function, and the corresponding estimating factors, based on daytime population, are provided in Table 12.

Public Library/Administration of Justice

Based on PB's experience in comparable jurisdictions, new development in otherwise suburban communities typically has a minor impact on Public Library and Administration of Justice costs. Hence, this analysis assumes that 10 percent of the budget for these core services will be affected by new development; the remaining 90 percent are assumed to represent fixed costs and services that will not be affected by the proposed project.

A list of all expenditure items that are grouped into the Public Library and Administration of Justice service functions and the corresponding estimating factors, based on daytime population, are shown in Table 12.

Public Safety

With new residential and nonresidential development, police officers may need to be added to serve the increase in residential and employment population, and the associated increases in calls for service. It is assumed that police service levels will be maintained at the current average level of service, assuming one certified deputy (Patrol Division) for every 1057 calls for service, consistent with data provided on the Blount County Sheriff's Office website. Based on data from comparable jurisdictions, the analysis assumes annual rates of 1.60 calls per residential unit, 0.20 calls per 1,000 square feet of office space, and 1.50 calls per 1,000 square feet of retail space. According to the 2013-2014 County Budget, the estimated total annual cost per certified deputy in Community Policing is $57,992.

A list of all expenditure items that are grouped into the Public Safety service functions is provided in Table 12. This analysis assumes that 30 percent of the Public Safety budget for Jail, Workhouse, Juvenile Services, County Coroner, and Emergency Management will be affected by new development; the remaining 70 percent are assumed to represent fixed costs and services that will not be affected by the proposed project. The corresponding estimating factors, based on daytime population, are shown in Table 12.

Some Public Safety expenditure items are assumed not to be affected by the proposed project. These items are identified as fixed costs in Table 12.

Litter and Trash Removal

Expenditures for litter and trash removal from streets are estimated based on the number of new road miles anticipated to accommodate induced growth and an assumed per-mile road maintenance cost of $57. This per-mile maintenance cost was calculated by dividing the County Budget total street trash removal maintenance budget by the total number of road miles in the County (1261 miles).

Expenditures for the County Highway department are described separately in the Highway/Public Works Fund section.

Table 12: Expenditures Summary, Blount County Fiscal Impact Model

ITEM	Table Reference	13-14 Adopted Total	Percent Variable Costs (1)	Allocation Amount	Estimating Factor (2)	Project Total
EXPENDITURES						
General Fund						
General Government						
County Commission		185,759	10%	0.12	per capita (daytime pop.)	$17
Board Of Equalization		553	10%	0.00	per capita (daytime pop.)	$0
Beer Board		200	10%	0.00	per capita (daytime pop.)	$0
Budget and Finance Committee		400	10%	0.00	per capita (daytime pop.)	$0
County Mayor's Office		198,275	10%	0.13	per capita (daytime pop.)	$18
Human Resources		71,865	10%	0.05	per capita (daytime pop.)	$6
Election Commission		384,896	10%	0.25	per capita (daytime pop.)	$34
Register of Deeds		562,493	10%	0.37	per capita (daytime pop.)	$50
Building Commissioner		-	50%	-	per capita (daytime pop.)	$0
Building Codes Compliance		532,773	10%	0.35	per capita (daytime pop.)	$47
Planning		218,539	10%	0.14	per capita (daytime pop.)	$19
Stormwater		-	10%	-	per capita (daytime pop.)	$0
Records Management		113,501	10%	0.08	per capita (daytime pop.)	$10
Risk Management		217,095	10%	0.14	per capita (daytime pop.)	$19
Accounting & Budgeting		643,688	10%	0.43	per capita (daytime pop.)	$57
Purchasing		274,394	10%	0.18	per capita (daytime pop.)	$24
Property Assessor		874,642	10%	0.58	per capita (daytime pop.)	$78
Reappraisal Program		179,609	10%	0.12	per capita (daytime pop.)	$16
County Trustee		449,279	10%	0.30	per capita (daytime pop.)	$40
County Clerk		1,049,288	10%	0.70	per capita (daytime pop.)	$94
Information Technology		558,302	10%	0.37	per capita (daytime pop.)	$50
Public Library						
Other General Administration		1,885,373	10%	1.25	per capita (daytime pop.)	$168
Operational Transfer - Public Library		-	10%	-	per capita (daytime pop.)	$0
County Buildings		155,478	10%	0.10	per capita (daytime pop.)	$14
Administration of Justice						
Circuit Judges		35,672	10%	0.02	per capita (daytime pop.)	$3
Circuit Court Clerk		1,983,864	10%	1.31	per capita (daytime pop.)	$177
General Sessions Court		4,789	10%	0.00	per capita (daytime pop.)	$0
Chancery Court		477,877	10%	0.32	per capita (daytime pop.)	$43
Equity Division		-	10%	-	per capita (daytime pop.)	$0
Office of Clerk & Master		-	10%	-	per capita (daytime pop.)	$0
Juvenille Court		438,597	10%	0.29	per capita (daytime pop.)	$39
Office of Public Defender		54,957	10%	0.04	per capita (daytime pop.)	$5
Other Admin of Justice		447,635	10%	0.30	per capita (daytime pop.)	$40
Probation		504,783	10%	0.33	per capita (daytime pop.)	$45
Public Safety						
Jail		7,237,241	10%	4.79	per capita (daytime pop.)	$645
Workhouse		10,771	10%	0.01	per capita (daytime pop.)	$1
Juvenille Services		1,232,068	10%	0.82	per capita (daytime pop.)	$110
Sheriffs Department	Table 1-4	10,577,215	100%		cost per additional certified deputy	$4,595
County Coroner		-	10%	-	per capita (daytime pop.)	$0
Emergency Management		302,132	10%	0.20	per capita (daytime pop.)	$27
Hazard Mitigation Grant		-	0%	-	fixed cost	$0
Orange Alert Grant		-	0%	-	fixed cost	$0
Emergency Management Equipment Grant		-	0%	-	fixed cost	$0
Courthouse Security Grant		-	0%	-	fixed cost	$0
Fire Prevention and Control - Haz Mat		23,250	0%	-	fixed cost	$0
Highways						
Litter and Trash Removal		72,289	100%	57.33	per road mile	$2,866
Public Health and Welfare						
Medical Personnel		1,264,757	10%	0.84	per capita (daytime pop.)	$113
Health Department Reserve		-	10%	-	per capita (daytime pop.)	$0
Ambulance Services		-	10%	-	per capita (daytime pop.)	$0
Sanitation & Waste Removal		-	100%	0.26	per capita (daytime pop.)	$35
Animal Control		320,388	10%	0.21	per capita (daytime pop.)	$29
General Welfare Assistance		-	10%	-	per capita (daytime pop.)	$0
Other Local Welfare Services		98,668	10%	0.07	per capita (daytime pop.)	$9

Table 12: Expenditures Summary, Blount County Fiscal Impact Model (continued)

Other Operations					
Tourism	-	10%	-	per capita (daytime pop.)	$0
Industrial Development	848,021	10%	0.56	per capita (daytime pop.)	$76
Communication Center	-	10%	-	per capita (daytime pop.)	$0
Visitors Centre	-	10%	-	per capita (daytime pop.)	$0
Field Line Inspection	-	10%	-	per capita (daytime pop.)	$0
Parks & Fair Board	653,585	10%	0.43	per capita (daytime pop.)	$58
Veterans Services	173,966	0%	-	fixed cost	$0
Agriculture Extensions Service	163,348	0%	-	fixed cost	$0
Soil Conservation	120,643	0%	-	fixed cost	$0
Contributions to Other Agencies	112,240	0%	-	fixed cost	$0
General Government	-	0%	-	fixed cost	$0
Other	-	0%	-	fixed cost	$0
Other General Government Projects	72,262	0%	-	fixed cost	$0
Operating Transfers	-	0%	-	fixed cost	$0
Subtotal General Fund	35,787,420				
Public Works/Highways Fund					
Highway Administration	805,275	50%	2.67	per road mile	$133
Highway and Bridge Maintenance	4,088,446	100%	27.08	per road mile	$1,354
Operation and Maintenance of Equipment	867,931	100%	5.75	per road mile	$287
Subtotal Highways/Public Works Fund	5,761,652				
General Purpose School	79,924,626	100%	7,072.98	per student	$142,096
School Federal Projects	6,249,142	100%	553.02	per student	$11,110
Central Cafeteria	5,381,264	100%	476.22	per student	$9,567
Extended Day Care Program	1,472,758	100%	130.33	per student	$2,618
TOTAL					**$176,844**

(1) Percentage of costs that are population dependent as opposed to fixed costs

(2) Current Factors Used For Budgeting

123,101	Residential population of Blount County (U.S. Census 2010)
55,894	Employees working in Blount County (U.S. BLS July 2007)
150,957	Daytime Population (100% residential population plus 50% employees
63	Certified Deputies (Sheriff's Office)
66,632	Sheriff's Office Service Calls
1,261	Road Miles
11,300	K-12 students
10%	Default Percent Variable Cost

Source: Parsons Brinckerhoff, 2015.

Public Health and Welfare

The Sanitation and Waste Removal expenditure item accounts for funds to pay landfill charges to the City of Alcoa for landfill dumping fees charged to Blount County. Sanitation and Waste Disposal expenditures are estimated based on the daytime population generated from induced development and an assumed per capita for daytime population cost of $0.26. The per capita waste disposal cost was calculated by dividing the County's total waste removal budget by the total daytime population in the County.

A list of all expenditure items that are grouped into the Public Health and Welfare service functions is provided in Table 12. This analysis assumes that 10 percent of the Public Safety budget for items other than Sanitation and Waste Removal will be affected by new development; the remaining 90 percent are assumed to represent fixed costs and services that will not be affected by the proposed project. The corresponding estimating factors, based on daytime population, are shown in Table 12.

Other Services

A list of all expenditure items that are grouped into the Other Service category is provided in Table 12. This analysis assumes that 10 percent of the Other Services budget for Tourism, Industrial Development, Communication Center, Visitors Center, Field Line Inspection and Parks and Fair Board will be affected by new development; the remaining 90 percent are assumed to represent fixed costs and services that will not be affected by the proposed project. The corresponding estimating factors, based on daytime population, are shown in Table 12.

Some Other Service expenditure items are assumed not to be affected by the proposed project. These items are identified as fixed costs in Table 12.

HIGHWAY/PUBLC WORKS FUND

The Highway/Public Works Fund is used to account for transactions by the Highway Department. The Highway Department is responsible for maintaining approximately 1,261 miles of roads and 160 plus bridges in Blount County. Approximately 55 miles of re-paving is scheduled each year. The Highway Department's operating budget is funded through sales tax, gasoline tax, mineral severance tax, and state aid programs. The department maintains its own fleet of vehicles and equipment.

Highway Administration
The mission of this department is to provide motivation, supervision and guidance to Highway Department employees and to create a good working relationship with all departments within the County Government. In the Fiscal Impact Model, Highway Administration costs are not expected to be impacted by new development induced by the proposed project.

Highway and Bridge Maintenance
Highway and Bridge Maintenance expenditures are estimated based on the number of new road miles assumed to be needed to accommodate induced growth and assumed per-mile road maintenance cost of $6,245. The Fiscal Impact Model assumes the County maintains its current level of maintenance service for new development spurred by the proposed project. The per-mile maintenance cost was calculated by dividing the County's total Highway and Bridge Maintenance budget by the total number of road miles in the City (1261 miles).

Operation and Maintenance of Equipment
The mission of this department is to safely and efficiently maintain, service and repair all vehicles, heavy equipment and stationary equipment for use of the Highway Department. In the Fiscal Impact Model, Operations and Maintenance of Equipment costs are not expected to be impacted by new development induced by the proposed project.

EDUCATION FUNDS

The Education Funds category consists of the following funds:

Fund 141: General Purpose School
Fund 142: School Federal Projects
Fund 143: Central Cafeteria
Fund 146: Extended Day Care Program

For purposes of this analysis, the per-student education cost was calculated by dividing the total expenditure of Fund 141, 142, 143 and 146 by the total Blount County school population (11,300 students).

School district population estimates were obtained from the school district's most recent year-end financial report, which contains the total average daily attendance (ADA) for all local primary and secondary schools.

The Education Debt Service and Debt Service Schools expenditure items are not included in this total. Instead, these expenditure items are included under Education Debt Service

4.2.5 Blount County Capital Expenditure Review

School Capital Costs
At the time the original economic and fiscal impact study was prepared, there were 18 elementary, middle and high schools in the county, with approximately 12,000 students attending these schools. The 2005 *Blount County Growth Strategy* report stated that "school overcrowding is an issue in the County."[31] That was confirmed by the Blount County Schools Department 2007-2008 School Capacity Designations, which showed six schools classified as "intolerable." As shown that report, Blount County used two standards (design capacity and academic capacity) to determine whether a school is above or below its capacity. If both of these standards are exceeded, the school is classified as intolerable.

Since 2007, the County has opened three new schools (Prospect Elementary in 2011, Union Grove Elementary in 2008, and Union Grove Middle School in 2008). In addition, the William Blount Middle School has been converted to the William Blount 9th Grade Academy. The overall school population at the end of 2014 was about 11,300, slightly below the school population at the time of the 2007-2008 capacity study (12,020). . Based on a conversation with a representative of the Blount County School Department on April 8, 2015, the school system is below capacity and no new or expanded are being planned at this time.

The proposed Pellissippi Parkway Extension is estimated to add 57 more students to the study area as compared to the No-Build Scenario. Given that the school system is currently under capacity, no additional school construction is assumed to 2025.

4.2.5 Conclusions of Fiscal Impact Analysis

The primary driver of induced development in the study area would be the travel time savings resulting from the new extension. As travel times between Blount and Knox Counties and between Blount County and Oak Ridge are reduced due to the extension, more residents and commercial establishments may find it viable to live farther away from the main centers of employment and closer to the unincorporated areas of the County. Lack of adequate services in the unincorporated areas and a moderate projection of population and employment growth rates in the study area will, however, limit the extent of induced development.

Induced development resulting from the extension is largely expected to be residential in nature, with commercial development being restricted to nodal areas (intersections) along primary corridors such as the Pellissippi Parkway Extension.

At project buildout (2025), the project is projected to have a modest positive fiscal benefit on the County's operating budget, approximately $80,959. The induced effect of the project is expect to generate an additional $159,376 in property tax revenues that will likely accrue to the County, with approximately 87 percent of that increase coming from residential development.

The induced development program analyzed herein does not account for capital costs of new public streets that may be needed to serve additional residents that result from the induced development program. And no new schools are anticipated to be required to 2025.

[31] Hunter Interests Inc. "Blount County Growth Strategy" (pg. 89).

APPENDIX A

ECONOMIC IMPACT ANALYSIS TABLE

Exhibit A-1: Economic Impacts in Blount County for each Expansion Alternative

Economic Impacts of Preferred Alternative by Top Ten Impacted Industries (construction-induced economic output, 2013$) - Blount County				
Impacted Industry	Total Employment	Total Labor Income	Total Value Added	Total Output
Construction of new highways and streets	388	$24,522,818	$103,764,944	$165,708,606
Real estate	13	$151,316	$1,550,453	$2,045,199
Full-service restaurants	13	$319,874	$371,780	$679,555
Architectural, engineering, and related services	13	$725,713	$642,084	$1,389,453
Employment services	12	$335,636	$425,978	$531,194
Wholesale trade	9	$635,937	$1,297,474	$1,996,972
Limited-service restaurants	9	$327,462	$443,953	$638,777
Retail - Nonstore retailers	8	$96,070	$408,191	$784,426
Truck transportation	8	$355,554	$378,492	$1,088,604
Retail - General merchandise stores	7	$187,626	$318,317	$506,647
All Other Sectors	149	$6,484,103	$11,891,322	$19,773,883
Total All Sectors	**629**	**$34,142,108**	**$121,492,987**	**$195,143,314**

Economic Impacts of Preferred Alternative by Impact Type (construction-induced economic output, 2013$) - Blount County				
Impact Type	Total Employment	Total Labor Income	Total Value Added	Total Output
Direct Effect	388	$24,522,818	$103,764,944	$165,708,606
Indirect Effect	120	$5,130,247	$8,104,990	$14,103,692
Induced Effect	121	$4,489,043	$9,623,053	$15,331,016
Total Effect	**629**	**$34,142,108**	**$121,492,987**	**$195,143,314**

Economic Impacts of Alternative C by Top Ten Impacted Industries (construction-induced economic output, 2013$) - Blount County				
Impacted Industry	Total Employment	Total Labor Income	Total Value Added	Total Output
Construction of new highways and streets	409	$25,839,818	$109,337,652	$174,608,006
Real estate	14	$159,442	$1,633,721	$2,155,037
Full-service restaurants	13	$337,053	$391,747	$716,050
Architectural, engineering, and related services	13	$764,687	$676,567	$1,464,073
Employment services	12	$353,661	$448,855	$559,721
Wholesale trade	10	$670,090	$1,367,155	$2,104,219
Limited-service restaurants	9	$345,048	$467,795	$673,083
Retail - Nonstore retailers	9	$101,230	$430,113	$826,553
Truck transportation	9	$374,649	$398,819	$1,147,067
Retail - General merchandise stores	8	$197,703	$335,412	$533,856
All Other Sectors	157	$6,832,333	$12,529,947	$20,835,841
Total All Sectors	**663**	**$35,975,714**	**$128,017,782**	**$205,623,509**

Economic Impacts of Alternative C by Impact Type (construction-induced economic output, 2013$) - Blount County				
Impact Type	Total Employment	Total Labor Income	Total Value Added	Total Output
Direct Effect	409	$25,839,818	$109,337,652	$174,608,006
Indirect Effect	126	$5,405,767	$8,540,270	$14,861,132
Induced Effect	127	$4,730,128	$10,139,860	$16,154,370
Total Effect	**663**	**$35,975,714**	**$128,017,782**	**$205,623,509**

Economic Impacts of Alternative D by Top Ten Impacted Industries (construction-induced economic output, 2013$) - Blount County				
Impacted Industry	Total Employment	Total Labor Income	Total Value Added	Total Output
Construction of new highways and streets	166	$10,479,446	$44,342,339	$70,813,003
Real estate	5	$64,663	$662,562	$873,984
Full-service restaurants	5	$136,693	$158,875	$290,397
Architectural, engineering, and related services	5	$310,122	$274,385	$593,761
Employment services	5	$143,429	$182,035	$226,997
Wholesale trade	4	$271,758	$554,455	$853,375
Limited-service restaurants	4	$139,936	$189,716	$272,972
Retail - Nonstore retailers	4	$41,054	$174,434	$335,212
Truck transportation	3	$151,940	$161,743	$465,198
Retail - General merchandise stores	3	$80,179	$136,028	$216,508
All Other Sectors	64	$2,770,881	$5,081,572	$8,450,062
Total All Sectors	**269**	**$14,590,100**	**$51,918,143**	**$83,391,469**

Economic Impacts of Alternative D by Impact Type (construction-induced economic output, 2013$) - Blount County				
Impact Type	Total Employment	Total Labor Income	Total Value Added	Total Output
Direct Effect	166	$10,479,446	$44,342,339	$70,813,003
Indirect Effect	51	$2,192,331	$3,463,542	$6,026,994
Induced Effect	52	$1,918,323	$4,112,262	$6,551,472
Total Effect	**269**	**$14,590,100**	**$51,918,143**	**$83,391,469**

APPENDIX B

SMITE MODEL ESTIMATION RESULTS

APPENDIX B: SMITE MODEL ESTIMATION RESULTS

This Appendix summarizes the results of some trial runs of the Federal Highway Administration's (FHWA) "Spreadsheet Model for Induced Travel Estimation" (SMITE) that have been conducted by VHB. Patrick DeCorla-Souza and Harry Cohen in their paper titled Accounting for Induced Travel in Evaluation of Urban Highway Expansion suggest that "the SMITE spreadsheet can be used at a sketch planning level of an analysis to estimate the potential effects of induced travel".

Two of the principal input variables for SMITE are 1) the elasticity of travel demand and 2) the ratio of freeway traffic to arterial traffic. Because much of the current debate and ongoing research is focused on quantifying the level of elasticity, it is important to recognize that any result from the spreadsheet is only as good as the input elasticity. Similarly, the ratio of freeway traffic to arterial traffic is somewhat subjective as the extent of the influence area can vary widely.

In conducting the analysis of induced travel due to the Pellissippi Parkway extension project, certain modifications were made to the SMITE model. They primarily stem from the premise that SMITE was built to estimate induced travel due to roadway capacity expansion and requires a base traffic to be on the roadway to estimate the share of traffic diverted form other parallel routes. However since this is a roadway extension project, it was assumed that the existing network of local and arterial roads in the same alignment serve the market that would be otherwise served by the extension, should it be built. The modifications are as noted below:

- The elasticity of demand was changed from -0.50 to 0.63 for the for the corridor level and to -0.75 for the region-wide impacts.
- Initial freeway and arterial speeds were obtained from the travel demand model instead of using SMITE's default procedure for calculating speeds. The speed on the freeway portion was calculated to be the average speed for a traveler on the existing portion of the freeway and that on the alternative routes to the Parkway extension.

Exhibit B-1: SMITE Model Application

PART 1: 'APPLICATION TO ESTIMATE INDUCED VMT IN A FREEWAY CORRIDOR

Alternative Forecasts for "Base" Travel

Assumed Elasticity of Demand w.r.t. Travel Time

INITIAL CONDITIONS

Travel Demand

A1	Initial daily VMT (all fac. classes)	524,199
A2	Percent on freeways	47%
A3	Percent on arterials	53%
A4	Initial freeway VMT	248,425
A5	Initial arterial VMT	275,774

Conditions Before Improvement (Freeway)

B1	Initial AADT/C ratio for freeways	6.530
B2	Initial freeway hourly capacity (in VMT)	38,044
B3	Initial freeway daily delay (hrs./1000 VMT)	0.72
B4	Initial freeway speed	57.51
B5	Initial freeway VHT	4,320

Conditions Before Improvement (Arterials)

B6	Initial AADT/C ratio for arterials	4.860
B7	Initial arterial hourly capacity (in VMT)	56,744
B8	Initial arterial daily delay (hrs./1000 VMT)	25.56
B9	Initial arterial speed	19.78
B10	Initial arterial VHT	13,944

Conditions Before Improvement (Corridor)

B11	Total corridor VHT	18,264
B12	Avg corridor speed (mph)	28.70
B13	Avg corridor travel time per mile	0.03

FREEWAY ANALYSIS

Initial Conditions After Improvement

C1	Percent increase in freeway hourly capacity	0.962
C2	Freeway hourly capacity after impr. (VMT)	74,642
C3	Initial AADT/C ratio for freeways	3.33
C4	Initial freeway hourly capacity (in VMT)	74,642
C5	Initial freeway daily delay (hrs./1000 VMT)	0.51
C6	Initial freeway speed	58.21
C7	Initial freeway VHT	4,268
C8	VMT diverted from arterials	86,356
C9	Initial freeway VMT after improvement	334,781
C10	Initial freeway ADT/C with diverted traffic	4.49
C12	Freeway daily delay with diver.(hrs./1000 VMT)	0.68
C13	Freeway avg. speed after impr., with diversion	57.65
C14	Freeway VHT with diver., for previous travelers	4,310
C15	Added VMT from diversion (in thousands)	86
C16	Previous VMT(in thousands)	248
C17	Incr. in delay (hrs.) to previous VMT due to diver.	42
C18	Added delay (hrs.) to prev. VMT/1000 added VMT	0.48

Alternative Forecasts for "Base" Travel

	Induced Travel	
D1	Initial freeway daily VHT	4,320
D2	Freeway daily VHT after impr for prev. users	4,310
D3	Time savings to prev.users initially	10
D4	Induced freeway VMT	362
D6	Final freeway daily VMT	335,144
D7	Percent change in daily freeway VMT	34.91%
	Time Savings to Prior Travelers	
F1	Final freeway AADT/C ratio, with induced VMT	4.49
F2	Freeway daily delay after impr.(hrs/1000 VMT)	0.68
F3	Freeway avg. speed after impr., with ind. VMT	57.64
F4	Freeway daily VHT to prev. users, with ind. VMT	4,310
F5	Time savings to previous users, with ind. VMT (hrs)	10
F6	Time savings to previous users, per VMT(min.)	0.00
F7	Value of time	$12.75
F8	Total value of time saved	$128
	Time Savings to Diverted (Previous Arterial) Travelers	
G1	Diverted freeway VMT	86,356
G2	Time savings per diverted VMT(min)	0.00
G3	Total time savings to diverted freeway users (hrs)	1.75
G4	Value of time	$12.75
G5	Total value of time saved	$22
	Time Savings to Induced Travelers	
G6	Induced freeway VMT	362
G7	Time savings per induced VMT(min)	0.00
G8	Total time savings to induced freeway users (hrs)	0.01
G9	Value of time	$12.75
G10	Total value of time saved	$0

ARTERIAL ANALYSIS

	Conditions Before Improvement	
H1	Initial AADT/C ratio for arterials	4.571
H2	Initial arterial hourly capacity (in VMT)	60,331
H3	Initial arterial daily delay (hrs/1000 VMT)	25.25
H4	Initial arterial speed	19.90

H5	Initial VHT for undiverted arterial VMT	9,519

Initial Conditions After Improvement

I1	VMT shifted from arterial system	86,356
I2	VMT remaining after shift	189,418
I3	Arterial ADT/C ratio after shift	3.14
I4	Arterial delay (hrs/1000 VMT) after shift	24.04
I5	Total arterial delay savings (initial)	2,075.86
I6	Average speed initially	20.39
I7	Arterial VHT after impr. for undiverted travelers	9,289
I8	Reduction in VMT(in thousands)	86
I9	Undiverted VMT(in thousands)	189
I10	Reduction in delay (hrs) to undiverted VMT	230
I11	Delay red. (hrs) to undiverted VMT/1000 diver. VMT	2.67

Alternative Forecasts for "Base" Travel

Induced Travel

I12	Induced arterial VMT	25,786
	I5/{(I11/1000)-[1/(Elasticity of demand*I6)]}	
I13	Final arterial daily VMT	215,203
I14	Percent change in daily arterial VMT	-21.96%
I15	Initial total corridor VMT, before improvement	524,199
I16	Final total corridor VMT, after improvement	550,347
I17	Percent change in corridor VMT	4.75%

Time Savings to Prior Travelers

J1	Final arterial AADT/C ratio, with induced VMT	3.57
J2	Arterial daily delay after impr.(hrs/1000 VMT)	24.35
J3	Arterial avg. speed after impr., with ind. VMT	20.26
J4	Arterial daily VHT to prev. users, with ind. VMT	9,347
J5	Initial arterial daily VHT of previous users	9,519
J6	Time savings to previous users, with ind. VMT (hrs)	171
J7	Time savings to previous users, per VMT(min.)	0.05
J8	Value of time	$12.75
J9	Total value of time saved	$2,187

Time Savings to Induced Travelers

K1	Induced arterial VMT	25,786
K2	Time savings per induced VMT(min)	0.03
K3	Total time savings to induced arterial users (hrs)	11.67
K4	Value of time	$12.75
K5	Total value of time saved	$149

COMPUTATIONS TO CHECK CORRIDOR DEMAND AND PRICE ELASTICITIES

Alternative Forecasts for "Base" Travel

Demand Elasticity Check (Corridor)

M1	Freeway VMT before	248,425
M2	Arterial VMT before	275,774
M3	Total VMT before	524,199
N1	Freeway VMT after	335,144
N2	Arterial VMT after	215,203
N3	Total VMT after	550,347
O1	Freeway VMT change	86,719
O2	Arterial VMT change	(60,571)
O3	Total VMT change	26,148
Q1	Freeway VHT before	4,320
Q2	Arterial VHT before	13,944
Q3	Total corridor VHT before	18,264
Q4	Avg corridor speed before	28.70
Q5	Avg corridor travel time per mile before	0.0348
R1	Freeway VHT after	5,814
R2	Arterial VHT after	10,620
R3	Total corridor VHT after	16,434
R4	Avg corridor speed after	33.49
R5	Avg corridor travel time per mile after	0.0299
S1	Percent change in travel time per mile	-14.30%
S2	Percent change in VMT	4.99%

Price Elasticity (Corridor)

T1	Freeway VMT before induced travel	334,781
T2	Freeway speed before induced travel	57.65
T3	Freeway VHT before induced travel	5,808
T4	Arterial VMT before induced travel	189,418
T5	Arterial speed before induced travel	20.39
T6	Arterial VHT before induced travel	9,289
T7	Total corridor VMT before induced travel	524,199
T8	Total corridor VHT before induced travel	15,096

T9	Avg corridor speed before induced travel	34.72
T10	Avg corridor travel time per mile before ind.travel	0.0288
T11	Avg corridor travel time per mile after	0.0299
T12	Percent change in travel time per mile	3.69%
T13	Percent change in VMT	4.99%

CHANGE IN DAILY VMT DUE TO EXPANSION OF FREEWAY CAPACITY

Alternative Forecasts for "Base" Travel

Freeway:	
Initial VMT	248,425
Diverted VMT	86,356
Induced VMT	362
Total VMT after improvement	335,144
Percent change in VMT	34.91%
Arterials:	
Initial VMT	275,774
Diverted VMT	(86,356)
Induced VMT	25,786
Total VMT after improvement	215,203
Percent change in VMT	-21.96%
Corridor-wide:	
Initial VMT	524,199
Diverted VMT	0
Induced VMT	26,148
Total VMT after improvement	550,347
Percent change in VMT	4.75%
Assumed trip length	7.50
Induced additional trips	3,486
Assumed % of induced trips due to new development	20%
Induced trips due to development	697

APPENDIX C

BLOUNT COUNTY FISCAL IMPACT MODEL

PROPERTY TAX CALCULATION

Exhibit C-1: Blount County Fiscal Impact Model: Property Tax Calculations

Item	Amount	Allocation Amount	Estimating Factor	Build Out	Project Total
Residential Appraised Valuation					
Improved					
Total Improved Residential Appraised Valuation	3,910,061,100				
Acres of Improved Parcels	22,851				
Per Acre Appraised Valuation	171,111				
Unimproved					
Total Unimproved Residential Appraised Valuation	280,504,200				
Acres of Unimproved Parcels	7,809				
Per Acre Appraised Valuation	35,920.63				
Added Residential Appraised Value (acres)		$135,191	per acre of new residential dev.(1)	210	28,390,011
Commercial Appraised Valuation					
Improved					
Total Improved Commercial Appraised Valuation	984,501,100				
Square Feet of Improved Parcels	151,234,248				
Per Square Foot Appraised Valuation	6.51				
Unimproved					
Total Unimproved Commercial Appraised Valuation	34,432,400				
Square Feet of Unimproved Parcels	14,381,930				
Per Square Foot Appraised Valuation	2.39				
Added Commercial Appraised Value (sq ft)		$4.12	per square foot of new commercial dev.	30,000	123,469
Property Tax					
Total Residential Assessed Value		25%	of market value		7,097,503
Total Commercial Assessed Value		40%	of market value		49,388
Property Tax Total		$2.23	per $100 of assessed value		$159,376

(1) Residential Build Out assumes a density of 1.5 acres per dwelling unit

Air Quality Technical Report Update

Pellissippi Parkway Extension (SR 162)

Blount County, Tennessee

TDOT PIN: 101423.00

State Project No. 05097-1226-04

Prepared For:

Tennessee Department of Transportation

Nashville, Tennessee

Prepared By:

Parsons Brinckerhoff, Inc.
1900 Church Street, Suite 400
Nashville, Tennessee 37203

June 2014

Table of Contents

List of Figures and Tables

List of Acronyms

AADT	Annual Average Daily Traffic
CAAA	Clean Air Act Amendments
CFR	Code of Federal Regulations
CH_4	Methane
CO	Carbon Monoxide
CO_2	Carbon Dioxide
DEIS	Draft Environmental Impact Statement
EIS	Draft Environmental Impact Statement
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
FR	Federal Register
GHG	Greenhouse Gases
GIS	Geographic Information System
LOS	Level of Service
LRTP	Long Range Transportation Plan
MPO	Metropolitan Planning Organization
MSAT	Mobile Source Air Toxics
NOx	Nitrous Oxides
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act of 1969
O_3	Ozone
Pb	Lead
$PM_{2.5}$	Particulate Matter less than or equal to 2.5 microns in size
ppm	Parts per million
SIP	State Implementation Plan
SOx	Sulfur oxides
SR	State Route
TDOT	Tennessee Department of Transportation
TIP	Transportation Improvement Program
TPO	Transportation Planning Organization
VMT	Vehicle Miles Traveled
vpd	Vehicles per day

Executive Summary

The Tennessee Department of Transportation (TDOT) proposes to extend the existing Pellissippi Parkway (SR 162) from SR 33 to US 321/SR 73 in the cities of Alcoa and Maryville and in unincorporated Blount County. The project area of the proposed extension is approximately 4.5 miles. This report documents the air quality impacts of the alternatives evaluated in the 2010 Draft Environmental Impact Statement (DEIS) and the Preferred Alternative selected in 2012, and two modifications of the Preferred Alternative (East Shift and West Shift) that were considered in 2013.

An *Air Quality Report* (revised February 2010) was prepared to analyze air quality impacts of the No-Build and Build Alternatives (A, B and C) for the DEIS. Subsequent to the circulation of the DEIS, TDOT selected Alternative A as the Preferred Alternative. In 2013 TDOT considered two minor modifications (East Shift and West Shift) of the Preferred Alternative's to avoid a sensitive archaeological site. In July 2013, TDOT announced the selection of the Preferred Alternative with West Shift. Because more than three years have passed since the DEIS was circulated, a Reevaluation of the DEIS is required. The current report addresses the DEIS alternatives, the Preferred Alternative (A) and the two modifications (East Shift and West Shift) to the Preferred Alternative.

In June 2013 the Knoxville Transportation Planning Organization (TPO) updated its travel demand model. With the availability of the new model and the age of the original traffic forecasts for the project (prepared in 2006 with minor updates in 2011), TDOT determined in August 2013 the need to update the traffic forecasts and analysis for the project alternatives. The updated forecasts have necessitated an update of the air quality analysis for the project, the findings of which are presented in this report. This study was conducted in accordance with the Air Quality section of the *Tennessee Environmental Procedures Manual.* The purpose of this analysis is to address transportation conformity, Mobile Source Air Toxics (MSATs), climate change, and construction air quality.

Blount County is classified as an attainment area for all criteria pollutants except 8-hour ozone (O_3) and particulate matter $PM_{2.5}$, for which it is classified as a nonattainment area.

The proposed project is included in the *Long Range Regional Mobility Plan 2040* as project 09-232 and in the *Knoxville Region 2014-2017 Transportation Improvement Program* (TIP) as TIP 2014-025. The project is described in the TIP as "construct a new four-lane road from Old Knoxville Highway (SR- 33) to SR-73 (US-321)." This project description and termini are consistent with all of the project alternatives except Alternative D. Therefore, the Preferred Alternative (A), Preferred Alternative with West Shift, Preferred Alternative with East Shift and DEIS Alternative C are in conformity with the State Implementation Plan (SIP).

The project has been classified as "not of air quality concern" by the Knoxville Interagency Consultation (IAC) group, which includes FHWA and EPA, in regard to $PM_{2.5.}$

Because an EIS is being prepared for this project, a carbon monoxide (CO) evaluation has been completed. The CO analysis examined the two signalized intersections along Old Knoxville Highway/SR 33 (at Pellissippi Parkway (SR 162/I-140) and at Sam Houston School Road) since both intersections would operate at level of service (LOS D) or worse in 2040. None of the alternatives are predicted to cause new violations of the National Ambient Air Quality Standards (NAAQS) in the design year 2040.

No roadways in the project area, including the new portion of the Pellissippi Parkway, will have annual average daily traffic (AADT) approaching the range of 140,000 to 150,000 vehicles per day (vpd). Therefore, the project qualifies as a project with low potential Mobile Source Air Toxics (MSATs) effects and a qualitative analysis was performed for this project. For each alternative, the amount of MSATs emitted would be proportional to the vehicle miles traveled (VMT), assuming that other variables such as fleet mix are the same for each alternative. When compared to the No-Build Alternative, the VMT for the four-alternatives (Preferred Alternative (A), Preferred Alternative with West Shift, Preferred Alternative with East Shift, and DEIS Alternative C) is predicted to have less than a 9 percent increase. (The travel demand model is not sensitive enough to distinguish between the various four-lane alternatives in this study; therefore, the results would be the same for all four-lane alternatives considered.) The 9-percent increase is not considered an appreciable difference in VMT, and therefore is not expected to result in a measurable difference in MSAT emissions when compared to the No-Build Alternative. Also, emissions as a result of the Preferred Alternative with West Shift and the other four-lane alternatives will likely be lower than present levels in the design year as a result of EPA's national control programs that are projected to reduce annual MSATs emissions by 72 percent from 1999 to 2050. Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth) that MSATs emissions in the study area are likely to be lower in the future in virtually all locations.

Under each alternative there may be localized areas where VMT would increase and other areas where VMT would decrease. Therefore, it is possible that localized increases and decreases in MSATs emissions may occur. There are several residential areas adjacent to this new roadway corridor, both on the east and west sides of the project area. However, even if increases do occur at these locations, they are expected to be substantially reduced in the future due to implementation of EPA's vehicle and fuel regulations.

Construction-related effects of the project would be limited to short-term increased fugitive dust and mobile-source emissions during construction. These construction-related impacts will be mitigated through the implementation of Best Management Practices, which are included in TDOT's *Standard Specifications for Road and Bridge Construction*.

Finally, the evaluation concluded that the project will have no significant climate change effects.

1. INTRODUCTION

This report summarizes the results of an analysis of the potential air quality effects of the proposed Pellissippi Parkway Extension (State Route (SR) 162) in Blount County, Tennessee. The purpose of this analysis is to address transportation conformity; carbon monoxide (CO) hot spots, Mobile Source Air Toxics (MSATs); climate change; and construction air quality.

1.1. Project Description

Pellissippi Parkway (SR 162) is a major northwest/southeast route connecting Interstate 40 (I-40)/I-75 and SR 33 in Knox and Blount Counties, Tennessee. Pellissippi Parkway (designated as I-140) between I-40/I-75 and SR 33 was designed and built in four sections between 1987 and 2005. The section of Pellissippi Parkway between SR 33 and US 321/SR 73 is the remaining undeveloped portion of the parkway that was identified in the State's 1986 Urgent Highway Needs Plan. The Tennessee Department of Transportation (TDOT) proposes to extend the existing Pellissippi Parkway from SR 33 to US 321/SR 73 in the cities of Alcoa and Maryville and in unincorporated Blount County. The total length of the proposed extension is about 4.5 miles (average for the four-lane alternatives).

The project is proposed by TDOT for the following purposes:

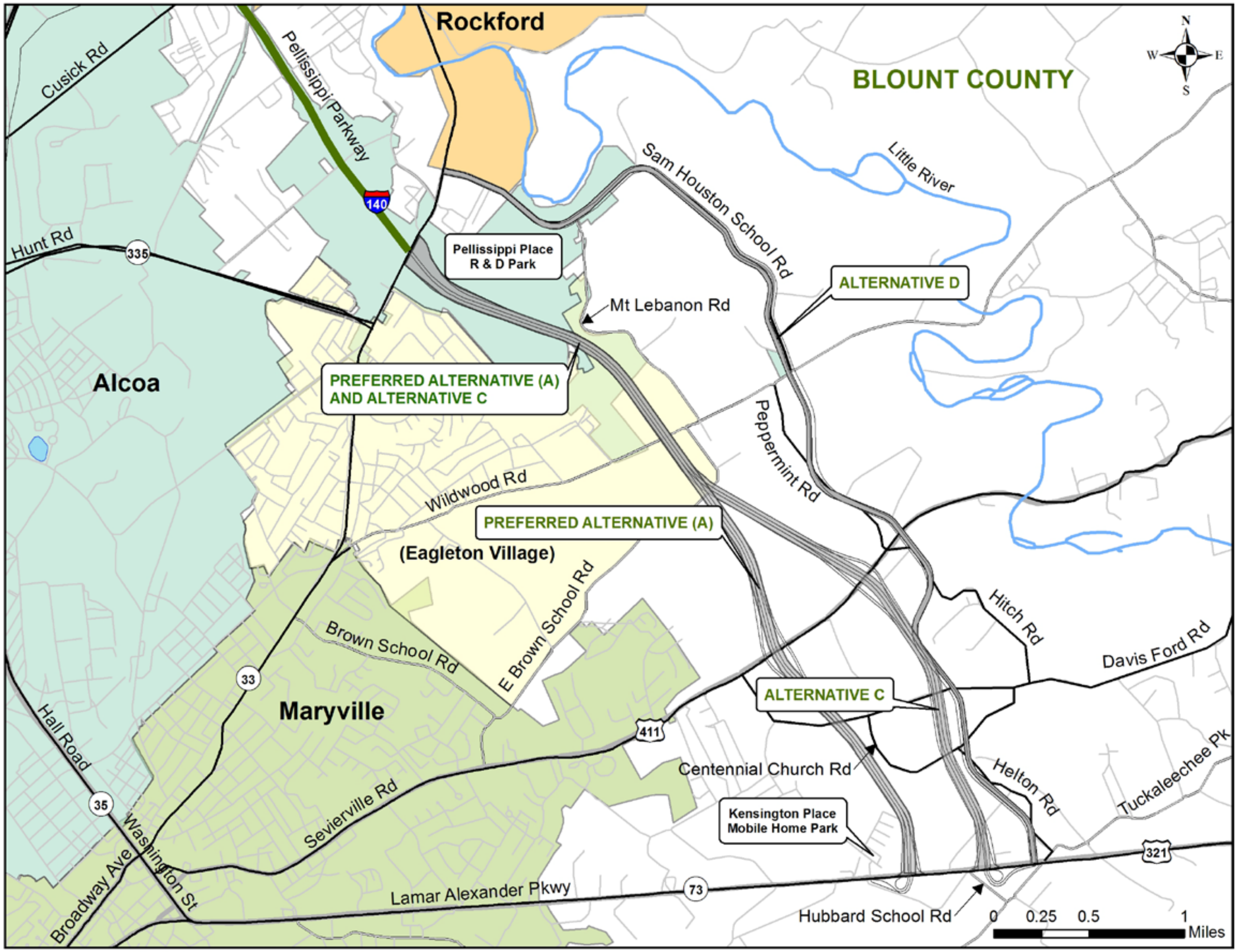
- Provide travel options for motorists to the existing radial roadway network;
- Enhance regional transportation system linkages;
- Assist in achieving acceptable traffic flows (level of service) on the transportation network; and
- Enhance roadway safety on the roadway network, including the Maryville core.

In April 2006, TDOT initiated an Environmental Impact Statement (EIS) for the project with the publication of a formal Notice of Intent to prepare an EIS in the Federal Register. Public and agency scoping was conducted in the Spring and Summer of 2006. At that time, TDOT asked the public to provide input on the purpose and need for the project and to identify potential alternatives for consideration in the Draft EIS. Additional public meetings were held in November 2007 and February 2008 to gather public input on the refined purpose and need and potential project corridors and alternatives.

Based on public input and preliminary screening, TDOT determined that the following alternatives, shown on Figure 1, would be evaluated in the Draft EIS (DEIS):

- **No-Build Alternative:** The No-Build Alternative would not extend Pellissippi Parkway beyond its existing terminus at SR 33.
- **Extend Pellissippi Parkway in one of two option alignments**: Under the Build Alternative, existing Pellissippi Parkway would be extended from SR 33 to US 321, as a four-lane divided roadway, with interchanges at SR 33, US 411 and US 321. The two alternate alignments were Alternative A and Alternative C.

Figure 1. Project Study Area Showing Preferred Alternative



- **Upgrade Existing Two-Lane Network – Corridor D**: This alternative would upgrade a two-lane network of existing roads to serve as a two-lane connection between SR 33 and US 321.

TDOT conducted evaluations on the four alternatives described above and presented the findings in the DEIS, which was circulated for public comment in May 2010. A public hearing was held in July 2010. In May 2012, TDOT announced the selection of Build Alternative A as the Preferred Alternative. This selection was based on the environmental analysis presented in the DEIS and consideration of the comments received from the public and federal, state, regional and local agencies.

In early 2013, TDOT considered two minor modifications to the Preferred Alternative to avoid a sensitive archaeological site. A West Shift and an East Shift to the Preferred Alternative were evaluated between Davis Ford Road and the project's southern terminus at US 321. In July 2013, TDOT determined that the Preferred Alternative should be modified with the west shift (Preferred Alternative with West Shift). Figure 2 illustrates the Preferred Alternative and the modifications,

Because more than three years have passed since the DEIS was circulated, a Reevaluation of the DEIS is being prepared to evaluate the DEIS.

This report addresses the air quality impacts of the following alternatives:

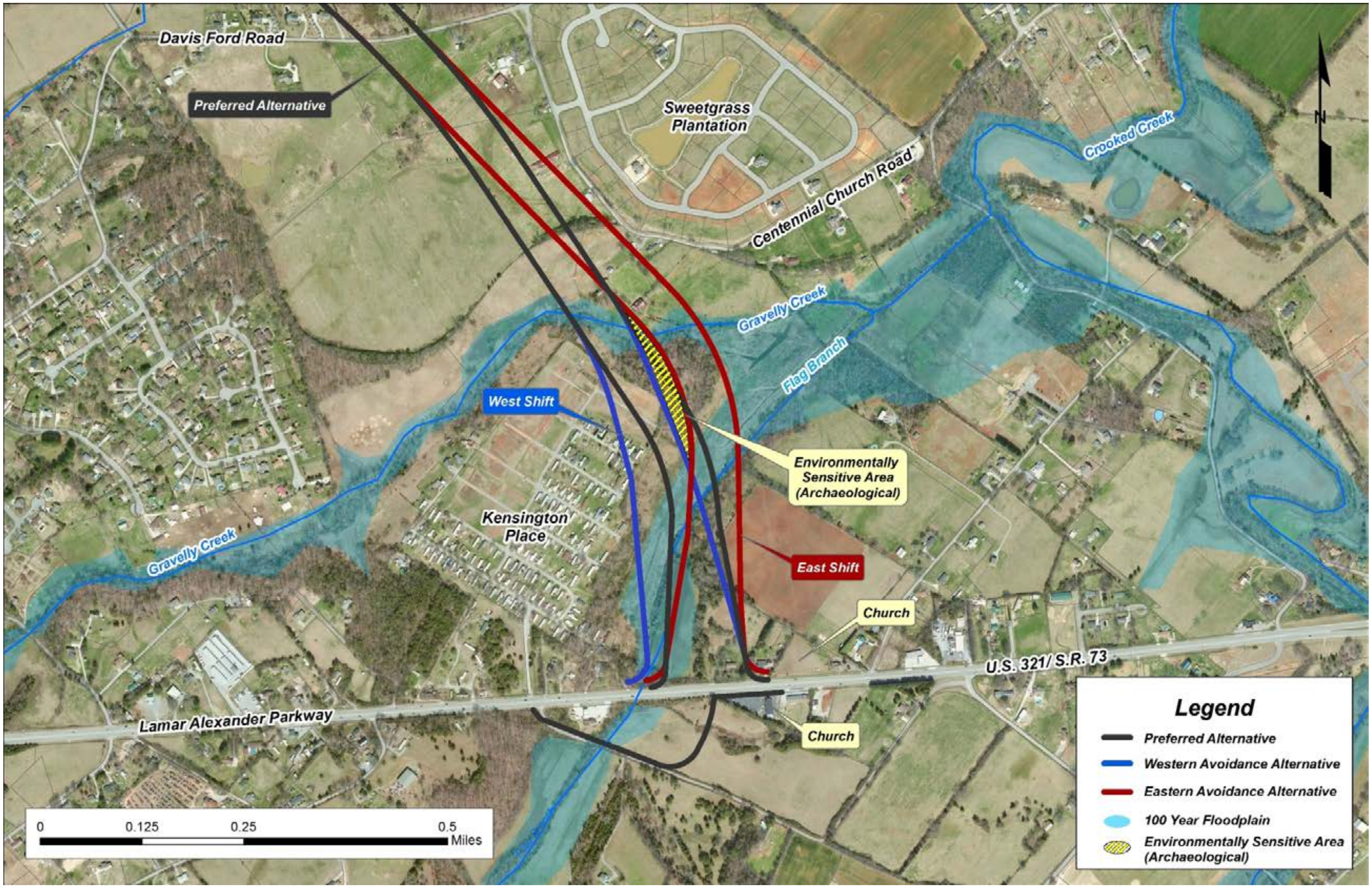
- Preferred Alternative (DEIS Alternative A)
- Preferred Alternative with East Shift
- Preferred Alternative with West Shift
- DEIS Alternative C
- DEIS Alternative D

1.2. Reason for the Current Update

The Knoxville TPO adopted a new travel demand model in June 2013. The original traffic forecasts for this project were prepared in 2006 with a minor update in 2011. Considering the age of the project's traffic forecasts and the availability of the new model, TDOT determined in August 2013 the need to update the traffic forecasts and operational analysis for the Preferred Alternative with West Shift and the No-Build Alternative. The update of the traffic forecasts for the project shows several substantial changes in the operations of the existing and proposed road network. The results of the traffic forecasts and the operational analysis of Preferred Alternative and the No-Build Alternative are presented in the December 2013 *Traffic Forecast Study* (Sain Associates, Inc.) and the February 2014 *Addendum to the Traffic Operations Technical Report* (Parsons Brinckerhoff, Inc.).

In May 2014, FHWA requested traffic forecasts and analysis for the previously considered DEIS Alternatives C and D, as well as the Preferred Alternative with East Shift. The results presented for the Preferred Alternatives as the same for the DEIS Alternative C, as well as the Preferred Alternative with West Shift and Preferred Alternative with East Shift Options, since the model is not sensitive enough to differentiate between the various four-lane alternatives for this project.

Figure 2: Preferred Alternative and Proposed Alignments Shifts



The results of the traffic forecasts and operational analysis for Alternative D are presented in TDOT memorandum dated May 14, 2014 to FHWA.

In addition, the City of Alcoa is currently installing a traffic signal at the existing intersection of SR 33 and I-140 (Pellissippi Parkway).

This current air quality update is prepared to reflect the current design year traffic forecasts and operations for the project. The design year (2040) vehicle miles traveled (VMT) projections on the affected roadway network are about 30 percent lower than the original 2035 design year VMT projections for the No-Build and Preferred Alternative with West Shift.

2. ENVIRONMENTAL ANALYSIS

This study was conducted in accordance with Section 5.3.5 (Air Quality) of the *Tennessee Environmental Procedures Manual*.

2.1. Affected Environment

Air pollution is a general term that refers to one or more chemical substances that degrade the quality of the atmosphere. Individual air pollutants degrade the atmosphere by reducing visibility, damaging property, reducing the productivity or vigor of crops or natural vegetation, or harming human or animal health.

2.1.1. Clean Air Act Amendments of 1990

The Clean Air Act Amendments (CAAA) of 1990 and the Final Transportation Conformity Rule [40 Code of Federal Regulations (CFR) Parts 51 and 93] direct the U.S. Environmental Protection Agency (EPA) to implement environmental policies and regulations that will ensure acceptable levels of air quality. The Clean Air Act and the Final Transportation Conformity Rule affect proposed transportation projects. According to Title I, Section 176 (c) 2:

> "No federal agency may approve, accept, or fund any transportation plan, program, or project unless such plan, program, or project has been found to conform to any applicable State Implementation Plan (SIP) in effect under this act."

The Final Conformity Rule defines conformity as follows:

> "Conformity to an implementation plan's purpose of eliminating or reducing the severity and number of violations of the National Ambient Air Quality Standards (NAAQS) and achieving expeditious attainment of such standards; and that such activities will not:
>
> - Cause or contribute to any new violation of any NAAQS in any area;
> - Increase the frequency or severity of any existing violation of any NAAQS in any area; or
> - Delay timely attainment of any NAAQS or any required interim emission reductions or other milestones in any area."

2.1.2. National and State Ambient Air Quality Standards

The EPA has established allowable concentrations and exposure limits called the National Ambient Air Quality Standards (NAAQS) for various "criteria" pollutants. These pollutants include carbon monoxide (CO), nitrogen oxides (NOx), ozone (O_3), particulate matter (PM_{10} and $PM2_{.5}$), sulfur oxides (SOx), and lead (Pb).

In accordance with the CAAA of 1990, EPA identified areas that did not meet the NAAQS for the criteria pollutants and designated them as "nonattainment" areas. Once a nonattainment area meets the NAAQS, it is redesignated as a "maintenance" area.

Blount County is classified as an attainment area for all criteria pollutants except for 8-hour O_3 and $PM_{2.5}$, for which is classified as a nonattainment area.

2.2. Environmental Consequences

2.2.1. Transportation Conformity

Transportation conformity is a process required of Metropolitan Planning Organizations (MPOs) pursuant to the CAAA of 1990. CAAA require that transportation plans, programs, and projects in nonattainment or maintenance areas that are funded or approved by the Federal Highway Administration (FHWA) be in conformity with the State Implementation Plan (SIP), which represents the State's plan to either achieve or maintain the NAAQS for a particular pollutant.

Projects conform to the SIP if they are included in a fiscally constrained and conforming Long Range Transportation Plan (LRTP) or Transportation Improvement Program (TIP).

The project is within the Knoxville Nonattainment Area. The project is included in the *Long Range Regional Mobility Plan 2040* as project 09-232 and in the *Knoxville Region 2014-2017 Transportation Improvement Program* (TIP) as TIP 2014-025. The project is described in the TIP as "construct a new four-lane road from Old Knoxville Highway (SR- 33) to SR-73 (US-321)." This project description and termini are consistent with the proposed project. Therefore, the project is in conformity with the SIP. Copies of the TIP project sheet and the Regional Mobility Plan project page are provided in Appendix A.

***$PM_{2.5}$* Hot-Spot Analysis**

Since the project is in an area designated as being in nonattainment for particulate matter, an analysis for $PM_{2.5}$ is required. TDOT completed a $PM_{2.5}$ Hot-Spot Determination for the project that concluded that the project was "not a project of air quality concern." TDOT submitted this determination to the Knoxville Area Interagency Consultation (IAC) group on December 1, 2008. The IAC members concurred with TDOT's determination on the following dates: FHWA January 13, 2009; EPA January 13, 2009; and TDEC January 9, 2009. The $PM_{2.5}$ Hot-Spot Determination, IAC concurrence responses, and $PM_{2.5}$ clearance record are provided in Appendix B.

Following the update of the Design Year 2040 traffic projections in 2013, TDOT asked the IAC to review the 2009 decision and validate the finding. The updated 2040 traffic projections are substantially lower than the previous Design Year 2035 projections used for the 2009 $PM_{2.5}$ Hot-Spot Determination. Under the 2040 forecasts, the projected percentage of trucks remains the same. During a conference call on January 27, 2014, the IAC agreed that the previous determination ("not a project of air quality concern") remains valid. Appendix B contains a copy of the January 30, 2014 email documenting the IAC's concurrence with the 2009 finding.

2.2.2. Carbon Monoxide (CO) Hot-Spot Analysis

Carbon monoxide (CO) is a colorless, odorless gas that interferes with the delivery of oxygen to a person's organs and tissues. The health effects of CO exposure depend on the duration and intensity of exposure as well as a person's health. CO concentrations are usually higher during the winter months because vehicles emit higher CO emissions in cold weather due to the characteristics of internal combustion engines.

Blount County is an attainment area for CO. However, a CO evaluation is needed since an EIS is being prepared for the project.

The NAAQS for CO include a 1-hour standard of 35 parts per million (ppm) and an 8-hour standard of 9 ppm. The *Guideline for Modeling Carbon Monoxide from Roadway Intersections* published by EPA (hereafter referred to as the EPA Guideline) indicates that signalized intersections that operate at Level of Service (LOS) A, B, or C do not require further analysis because the delay and congestion would not likely cause or contribute to an exceedence of the CO NAAQS. As a result, CO modeling is only required at signalized intersections that operate at LOS D or worse during any hour.

Identification of Analysis Intersections

The methodology contained in the EPA Guideline requires that all intersections be reviewed for the potential to create an adverse air quality impact. EPA has determined that intersections that operate at LOS A, B, or C probably do not require further analysis because the delay and congestion would not likely cause or contribute to an exceedance of the CO NAAQS.

The Build Alternatives would involve modifications to the following signalized intersections:

- Pellissippi Parkway (SR 162/I-140) and Old Knoxville Highway (SR 33): the four-lane alternatives (Preferred Alternative (A), Preferred Alternative with East Shift, Preferred Alternative with West Shift, and Alternative C)
- Old Knoxville Highway (SR 33) and Sam Houston School Road: Alternative D

Intersection capacity analyses for design year 2040 for these intersections and Build Alternatives were completed. The analysis periods for each intersection included the AM (morning) and PM (afternoon) peak hours. Table 1 presents the LOS results for these intersections.

Table 1: Level-of-Service Summary for Signalized Intersections

Intersection	Level-of-Service					
	No-Build		4-lane Alternatives		Alternative D	
	AM	PM	AM	PM	AM	PM
Pellissippi Parkway (SR 162/I-140) and Old Knoxville Highway (SR 33)	F	F	F	F	F	F
Old Knoxville Highway (SR 33) and Sam Houston School Road	C	B	D	E	D	E

Since both intersections are predicted to operate at LOS D or worse in the design year during both the morning and afternoon peak hours, CO modeling of those intersections was completed.

An additional step in CO analysis is to assess the types of land uses abutting the analysis intersections. Table 2 summarizes the land uses near each intersection.

Table 2: Summary of Land Uses, Intersections Identified for CO Modeling

Intersection	Surrounding Sensitive Land Uses	Distance to Closest Sensitive Land Use
Pellissippi Parkway (SR 162/I-140) and Old Knoxville Highway (SR 33)	Residential	1,024 feet
Old Knoxville Highway (SR 33) and Sam Houston School Road	Residential	154 feet

Dispersion Modeling

Dispersion modeling for the intersections was conducted using the CAL3QHC computer model recommended by EPA for predicting CO concentrations near roadway intersections.

The CAL3QHC model is used to represent the roadway network, traffic operations, and nearby receptors. A coordinate-geometry system is used to represent the location of the receptors and roadways. The effects of vehicle queuing at traffic signals are also evaluated in CAL3QHC.

Receptors should be located outside the "mixing zone" of the free flow links and in areas where human activity is expected to occur. The mixing zone is considered to be the area of uniform emissions in which no dispersion is assumed to occur. Receptor points were located approximately 15 feet outside the mixing zone of the intersection near points of anticipated queuing activity as well as at various points along the property boundaries of abutting parcels.

Receptor points were also located just outside the mixing zone on each corner of the intersection as well as approximately 150 feet and 300 feet back from the stop bars on each intersection approach. These receptor points adequately represent locations near the intersections where human activity might occur. Locating the receptors just outside the mixing zone provides a "worst case" analysis since concentrations will decrease with increased distances from the intersection.

As stated above, there are currently no sensitive uses near where the receptor points were located. Therefore, the analysis provides a conservative estimate of the maximum CO concentrations that might occur if sensitive land uses are constructed near the intersection in the future.

Based on the traffic analysis, average speeds of 40 and 50 (north of Sam Houston Road) miles per hour (mph) were modeled on Old Knoxville Highway (SR 33), average speed of 45 mph was modeled on Sam Houston Road and average speed of 35 mph was modeled on the Pellissippi Parkway ramps.

A number of worst case meteorological assumptions (e.g., low wind speeds, low vertical mixing height) were applied. Wind direction was evaluated from 0º to 360º in 10º increments. A local background concentration of 1 parts per million (ppm) was assumed.

Emission factors for vehicle operations on the roadway network were computed using EPA's MOVES emissions model. Input parameters provided by Knox County were used for the analysis. MOVES models several factors including those related to controls on the vehicles. Some factors relate to characteristics of the on-road vehicle fleet, including average speeds, age distribution, mix of diesel and gasoline-fueled vehicles, and low-emitting vehicles. Other factors are related to fuels, including volatility and oxygenation. Finally, meteorological factors such as temperature and humidity are modeled. The CAL3QHC and MOVES files are provided in Appendix C.

Results

Table 3 summarizes the highest predicted 1-hour and 8-hour average CO concentrations, including background, at each receptor. As shown, the worst case predicted 1-hour concentrations are well below the 1-hour NAAQS of 35 ppm.

In accordance with the EPA Guideline, a persistence factor of 0.70 was applied to the predicted CAL3QHC 1-hour CO concentrations (less background) and added to the background concentration of 1 ppm to obtain the expected eight-hour average concentrations shown in Table 3. As shown, the predicted 1-hour concentrations are well below the NAAQS of 35 ppm and the predicted 8-hour concentrations are well below the NAAQS of 9 ppm.

Table 3: Maximum 1-hour and 8-hour CO Concentrations, Design Year 2040

Intersection	No-Build		4-lane Alternatives		Alternative D	
	AM	PM	AM	PM	AM	PM
1-Hour CO Concentrations						
Pellissippi Parkway (SR 162/I-140) and Old Knoxville Highway (SR 33)	1.6	1.7	1.7	2.0	2.1	2.0
Old Knoxville Highway (SR 33) and Sam Houston School Road	1.2	1.2	1.3	1.3	1.6	1.6
8-Hour CO Concentrations						
Pellissippi Parkway (SR 162/I-140) and Old Knoxville Highway (SR 33)	1.5		1.7		1.8	
Old Knoxville Highway (SR 33) and Sam Houston School Road	1.1		1.2		1.4	

In conclusion, none of the alternatives are predicted to cause new violations or contribute to existing violations of the NAAQS in the design year 2040. Violations of the CO NAAQS would also not be predicted in any interim year since the maximum traffic volumes and worst congestion will occur in the design year.

2.2.3. MSAT Assessment

On February 3, 2006, the FHWA released *Interim Guidance on Air Toxic Analysis in NEPA Documents*. This guidance was superseded on September 30, 2009 and most recently on December 6, 2012 by FHWA's *Interim Guidance Update on Air Toxic Analysis in NEPA Documents.* The purpose of FHWA's guidance is to advise on when and how to analyze MSATs in the NEPA process for highways. This guidance is interim because MSAT science is still evolving. As the science progresses, FHWA will update the guidance.

The qualitative analysis presented below provides a basis for identifying and comparing the potential differences among MSAT emissions, if any, for the various alternatives. The assessment is derived in part from a study conducted by the FHWA entitled *A Methodology for Evaluating Mobile Source Air Toxic Emissions Among Transportation Project Alternatives.* Additional information regarding MSATs is provided in Appendix D.

FHWA's Interim Guidance groups projects into the following tier categories:

1. Exempt Projects and Projects with no Meaningful Potential MSAT Effects;
2. Projects with Low Potential MSAT Effects; and,
3. Projects with Higher Potential MSAT Effects.

FHWA's Interim Guidance provides examples of "Projects with Low Potential MSAT Effects." These projects include minor widening projects and new interchanges, such as those that replace a signalized intersection on a surface street or where design year traffic projections are less than 140,000 to 150,000 AADT.

As described previously, the Preferred Alternative (A), Preferred Alternative with East Shift, Preferred Alternative with West Shift, and Alternative C includes the construction of a new four-lane divided highway with three new interchanges. Design year traffic projections on the proposed four-lane extension are projected to be between 25,240 and 38,040 vpd in 2040. The design year traffic projections along the two-lane roadway of Alternative D would be 14,890 and 20,580 vpd. These volumes are substantially lower than the FHWA criterion. As a result, the project is considered to be a "Project with Low Potential MSAT Effects."

For the project alternatives, the amount of MSATs emitted would be proportional to the VMT, assuming that other variables such as fleet mix are the same for each alternative.

The VMTs of the No-Build Alternative and the four-lane alternatives were determined for the affected roadway network as shown in Table 4. The link-by-link VMT analysis is provided in Table E-1 in Appendix E. It is expected that there would be no appreciable difference in overall MSAT emissions among the No-Build and the four-lane alternatives.

Table 4: Design Year VMT Projections on Affected Roadway Network (Four-Lane Alternatives)

Alternative	Year 2040 VMT	Change over No-Build
No-Build	1,359,807	n/a
Four-lane alternatives: Preferred Alternative (A), Preferred Alternative with East Shift Preferred Alternative with West Shift Alternative C	1,476,516	8.6%

The traffic projections for the project were developed using the Knoxville TPO's travel demand model that uses travel time as an impedance rather than travel distance. The calculated increase in VMT with the project likely occurs because the Preferred Alternative with West Shift will offer a more efficient travel route and will divert traffic from other more congested routes. New routes that utilize a four-lane Pellissippi Parkway Extension might be longer than existing routes but will have shorter travel times. So while the VMT in the area might increase, the vehicle hours of travel would likely not increase and might actually decrease. Additionally, the new capacity of the Pellissippi Parkway Extension will free up capacity on existing travel routes making the entire system more efficient even though travel distances might increase.

There may be localized areas where VMT would increase, and other areas where VMT would decrease. The localized increases in MSAT concentrations would likely be most pronounced along the new roadway sections that would be built near or adjacent to area subdivisions such as Jackson Hills, Sweetgrass Plantation, and Kensington Place. However, even if these increases do occur, they too will be substantially reduced in the future due to implementation of EPA's vehicle and fuel regulations.

A full analysis of Alternative D's impact on the broader study area roadways was not conducted since the forecast volumes for Alternative D exceed the carrying capacity of a two-lane road. This is true even if that network of two-lane roads is improved by wider lanes, improved shoulders, and the straightening of substandard curves. However, the traffic projections for Alternative D only included projections for the improved two-lane roads (Sam Houston School Road, Peppermint Road, Hitch Road and Helton Road) that are incorporated into Alternative D. Traffic projections for existing roads from which traffic would be diverted, including Wildwood Road, Riverford Drive, Tuckaleechee Pike, and East Brown School Road, were not developed, although it is likely that a significant portion of the projected trips on Alternative D would be rerouted from these roads. As a result, the reduced VMT on these roads is not accounted for in Table 5 and the projected increase in VMT of 94.3 percent is significantly overestimated.

Table 5: Design Year VMT Projections for Alternative D Roadways

Alternative	Year 2040 VMT	Change over No-Build
No-Build	50,158	n/a
Alternative D	97,454	94.3%

The link-by-link VMT analysis is provided in Table E-2 in Appendix E.

Regardless of the alternative chosen, emissions will likely be lower than present levels in the design year as a result of EPA's national control programs that are projected to reduce annual MSAT emissions by over 80 percent from 2010 to 2050. Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future in virtually all locations.

Under the proposed project it is expected there would be reduced MSAT emissions in the immediate area of the project, relative to the No-Build Alternative, due to the reduced VMT associated with more direct routing, and due to EPA's MSAT reduction programs. Substantial construction-related MSAT emissions are not anticipated for this project as construction is not planned to occur over an extended building period. However, construction activity may generate temporary increases in MSAT emissions in the project area.

2.2.4. Greenhouse Gas Emissions (Climate Change)

Climate change is an important national and global concern. While the earth has gone through many natural changes in climate in its history, there is general agreement that the earth's climate is currently changing at an accelerated rate and will continue to do so for the foreseeable future. Anthropogenic (human-caused) greenhouse gas (GHG) emissions contribute to this rapid change. Carbon dioxide (CO_2) makes up the largest component of these

GHG emissions. Other prominent transportation GHGs include methane (CH_4) and nitrous oxide (N_2O).

Many GHGs occur naturally. Water vapor is the most abundant GHG and makes up approximately two thirds of the natural greenhouse effect. However, the burning of fossil fuels and other human activities are adding to the concentration of GHGs in the atmosphere. Many GHGs remain in the atmosphere for time periods ranging from decades to centuries. GHGs trap heat in the earth's atmosphere. Because atmospheric concentration of GHGs continues to climb, our planet will continue to experience climate-related phenomena. For example, warmer global temperatures can cause changes in precipitation and sea levels.

To date, no national standards have been established regarding GHGs, nor has EPA established criteria or thresholds for ambient GHG emissions pursuant to its authority to establish motor vehicle emission standards for CO_2 under the Clean Air Act. However, there is a considerable body of scientific literature addressing the sources of GHG emissions and their adverse effects on climate, including reports from the Intergovernmental Panel on Climate Change, the US National Academy of Sciences, and EPA and other Federal agencies. GHGs are different from other air pollutants evaluated in Federal environmental reviews because their impacts are not localized or regional due to their rapid dispersion into the global atmosphere, which is characteristic of these gases. The affected environment for CO_2 and other GHG emissions is the entire planet. In addition, from a quantitative perspective, global climate change is the cumulative result of numerous and varied emissions sources (in terms of both absolute numbers and types), each of which makes a relatively small addition to global atmospheric GHG concentrations. In contrast to broad scale actions such as actions involving an entire industry sector or very large geographic areas, it is difficult to isolate and understand the GHG emissions impacts for a particular transportation project. Furthermore, presently there is no scientific methodology for attributing specific climatological changes to a particular transportation project's emissions.

Under NEPA, detailed environmental analysis should be focused on issues that are significant and meaningful to decision-making.1 FHWA has concluded, based on the nature of GHG emissions and the exceedingly small potential GHG impacts of the proposed action, that the GHG emissions from the proposed action will not result in "reasonably foreseeable significant adverse impacts on the human environment" (40 CFR 1502.22(b)). The GHG emissions from the project build alternatives will be insignificant, and will not play a meaningful role in a determination of the environmentally preferable alternative or the selection of the preferred alternative. More detailed information on GHG emissions "is not essential to a reasoned choice among reasonable alternatives" (40 CFR 1502.22(a)) or to making a decision in the best overall public interest based on a balanced consideration of transportation, economic, social, and environmental needs and impacts (23 CFR 771.105(b)). For these reasons, no alternatives-level GHG analysis has been performed for this project.

The context in which the emissions from the proposed project will occur, together with the expected GHG emissions contribution from the project, illustrate why the project's GHG emissions will not be significant and will not be a substantial factor in the decision-making. The transportation sector is the second largest source of total GHG emissions in the U.S., behind electricity generation. The transportation sector was responsible for approximately 27 percent

1. [1] *See* 40 CFR 1500.1(b), 1500.2(b), 1500.4(g), and 1501.7

of all anthropogenic (human caused) GHG emissions in the U.S. in 2009.2 The majority of transportation GHG emissions are the result of fossil fuel combustion. U.S. CO_2 emissions from the consumption of energy accounted for about 18 percent of worldwide energy consumption CO_2 emissions in 2010.3 U.S. transportation CO_2 emissions accounted for about 6 percent of worldwide CO_2 emissions.4 However, while the contribution of GHGs from transportation in the U.S. as a whole is a large component of U.S. GHG emissions, as the scale of analysis is reduced the GHG contributions become quite small.

Mitigation for Global GHG Emissions

To help address the global issue of climate change, the U.S. Department of Transportation (USDOT) is committed to reducing GHG emissions from vehicles traveling on our nation's highways. USDOT and EPA are working together to reduce these emissions by substantially improving vehicle efficiency and shifting toward lower carbon intensive fuels. The agencies have jointly established new, more stringent fuel economy and first ever GHG emissions standards for model year 2012-2025 cars and light trucks, with an ultimate fuel economy standard of 54.5 miles per gallon for cars and light trucks by model year 2025. Further, on September 15, 2011, the agencies jointly published the first ever fuel economy and GHG emissions standards for heavy-duty trucks and buses.5 Increasing use of technological innovations that can improve fuel economy, such as gasoline- and diesel-electric hybrid vehicles, will improve air quality and reduce CO_2 emissions in future years.

Consistent with its view that broad-scale efforts hold the greatest promise for meaningfully addressing the global climate change problem, FHWA is engaged in developing strategies to reduce transportation's contribution to GHGs—particularly CO_2 emissions—and to assess the risks to transportation systems and services from climate change. In an effort to assist States and MPOs in performing GHG analyses, FHWA has developed a *Handbook for Estimating Transportation GHG Emissions for Integration into the Planning Process*. The Handbook presents methodologies reflecting good practices for the evaluation of GHG emissions at the transportation program level, and will demonstrate how such evaluation may be integrated into the transportation planning process. FHWA has also developed a tool for use at the statewide level to model a large number of GHG reduction scenarios and alternatives for use in transportation planning, climate action plans, scenario planning exercises, and in meeting state GHG reduction targets and goals. To assist states and MPOs in assessing climate change vulnerabilities to their transportation networks, FHWA has developed a draft vulnerability and risk assessment conceptual model and has piloted it in several locations.

2. [2] Calculated from data in U.S. Environmental Protection Agency, Inventory of Greenhouse Gas Emissions and Sinks, 1990-2009.
[3] Calculated from data in U.S. Energy Information Administration International Energy Statistics, Total Carbon Dioxide Emissions from the Consumption of Energy, http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=90&pid=44&aid=8, accessed 9/12/11.
3. [4] Calculations from 2009 data in EIA Emissions of Greenhouse Gases in the United States 2009, March 2011, Table 7 ftp://ftp.eia.doe.gov/environment/057309.pdf (US data) and EIA International Energy Statistics, Total Carbon Dioxide Emissions from the Consumption of Energy http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=90&pid=44&aid=8 (World data)
4. [5] For more information on fuel economy proposals and standards, see the National Highway Traffic Safety Administration's Corporate Average Fuel Economy website: http://www.nhtsa.gov/fuel-economy/.

Summary for Global GHG Emissions

This document does not incorporate an analysis of the GHG emissions or climate change effects of each of the alternatives because the potential change in GHG emissions is very small in the context of the affected environment. Because of the insignificance of the GHG impacts, those impacts will not be meaningful to a decision on the environmentally preferable alternative or to a choice among alternatives. As outlined above, FHWA is working to develop strategies to reduce transportation's contribution to GHGs—particularly CO_2 emissions—and to assess the risks to transportation systems and services from climate change. FHWA will continue to pursue these efforts as productive steps to address this important issue.

2.3. Construction Impacts on Air Quality

This project will result in the temporary generation of construction-related pollutant emissions and dust that could result in short-term air quality impacts. These construction-related impacts will be mitigated through the implementation of Best Management Practices, which are included in TDOT's *Standard Specifications for Road and Bridge Construction*. All construction equipment shall be maintained, repaired and adjusted to keep it in full satisfactory condition to minimize pollutant emissions.

2.4. Indirect and Cumulative Effects

The forecasted traffic volumes for most projects typically account for any redistribution of traffic that would occur as a result of the project. Therefore, the air quality analysis addresses any indirect traffic-related air quality impacts that might occur.

Additionally, the forecasted traffic volumes include expected traffic growth and other planned and programmed projects in the area. As a result, the air quality analysis addresses the traffic-related cumulative air quality impacts of the project.

2.5. Conclusions

The purpose and need of the project includes addressing current and future regional transportation needs of the area. The project is not predicted to cause or exacerbate a violation of the NAAQS. The project has been classified as one "not of air quality concern" by the EPA and FHWA in regard to $PM_{2.5.}$

A qualitative analysis for projects with low potential MSAT impacts was performed for this project. No roadways in the project area, including the proposed Pellissippi Parkway Extension, will have AADT approaching the range of 140,000 to 150,000 vehicles per day. Furthermore, for each alternative in this EIS, the amount of MSAT emitted would be proportional to the VMT, assuming that other variables such as fleet mix are the same for each alternative. When compared to the No-Build Alternative, the VMT for the Pellissippi Parkway Extension is predicted to have less than a 9 percent increase. This is not considered an appreciable difference in VMT, and therefore is not expected to result in a measurable difference in MSAT emissions, when compared to the No-Build Alternative. Also, emissions as a result of the Pellissippi Parkway Extension will likely be lower than present levels in the design year as a result of EPA's national control programs that are projected to reduce annual MSAT emissions by 80 percent from 2010 to 2050. Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future in virtually all locations.

Under each alternative there may be localized areas where VMT would increase, and other areas where VMT would decrease. Therefore, it is possible that localized increases and decreases in MSAT emissions may occur. There are several residential areas adjacent to this new roadway corridor, both on the east and west sides of the project area. However, even if increases do occur at these locations, they are expected to be substantially reduced in the future due to implementation of EPA's vehicle and fuel regulations.

Construction-related effects of the project would be limited to short-term increased fugitive dust and mobile-source emissions during construction. These construction-related impacts will be mitigated through the implementation of Best Management Practices, which are included in TDOT’s *Standard Specifications for Road and Bridge Construction*.

3. REFERENCES

Tennessee Environmental Procedures Manual, Tennessee Department of Transportation, Spring 2011.

Guideline for Modeling Carbon Monoxide From Roadway Intersections, U.S. EPA, November, 1992.

Interim Guidance on Air Toxic Analysis in NEPA Documents, FHWA, February 3, 2006. http://www.fhwa.dot.gov/environment/airtoxic/020306guidmem.htm

Interim Guidance Update on Air Toxic Analysis in NEPA Documents, FHWA, September 30, 2009. http://www.fhwa.dot.gov/environment/airtoxic/100109guidmem.htm

Interim Guidance Update on Air Toxic Analysis in NEPA Documents, FHWA, December 6, 2012. http://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/aqintguidmem.cfm.

Claggett, M., et. al., "*A Methodology for Evaluating Mobile Source Air Toxic Emissions Among Transportation Project Alternatives,"* Federal Highway Administration, Resource Center.

Traffic Forecast Study, Sain Associates, Inc., December 2013.

Addendum to the Traffic Operations Technical Report, Parsons Brinckerhoff, Inc., February 2014.

Memorandum: Response to FHWA's April 17, 2014 General Comment #2 Regarding Updating Traffic Analysis for Alternative D, Margaret Slater, TDOT, May 14, 2014.

APPENDIX A: KNOXVILLE TPO'S 2014-2017 TIP PROJECT SHEET AND REGIONAL MOBILITY PLAN 2040 PROJECT PAGE

Knoxville Regional Transportation Planning Organization

TRANSPORTATION IMPROVEMENT PROGRAM FY 2014-2017

TIP No.	2014-025	Revision No.	0
TDOT PIN	101423.00	Mobility Plan No.	09-232
Project Name	Pellissippi Pkwy. (SR-162) Extension		
Lead Agency	TDOT		
Total Project Cost	$49,440,200		

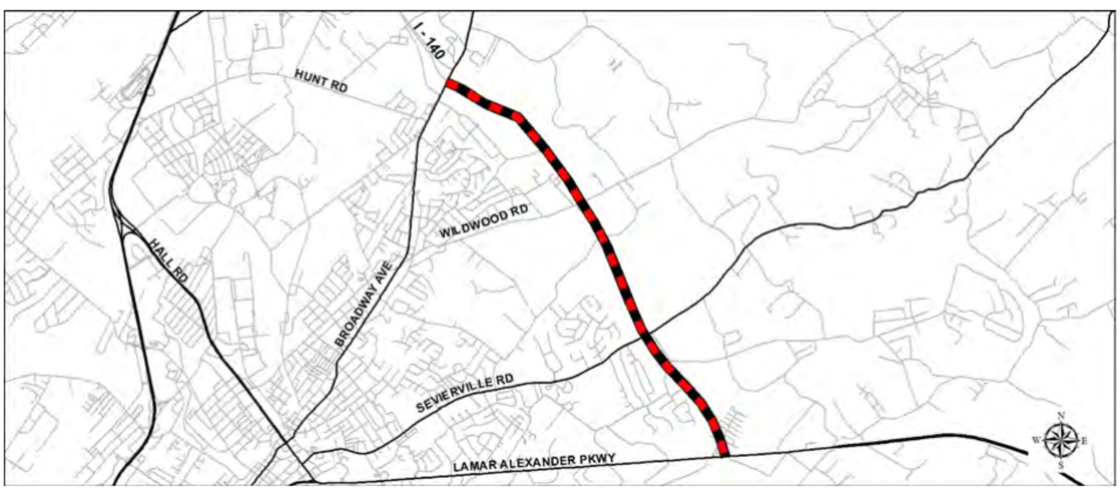
Project Description	HPP #TN053 (Section 1602-TEA21). Construct new 4 lane.		
Termini/Intersection	Old Knoxville Hwy (SR-33) to SR-73 (US-321)		
Counties	Blount		
City/Agency	Alcoa		
Length	4.4 (miles)	Conformity Status	Non-Exempt

Additional Details

Programmed Funds

FY	Type of Work	Funding Type	Total Funds	Federal	State	Local	Other
2014	PE-D	HPP	$2,500,000	$2,000,000	$500,000	$0	$0
2016	ROW	HPP	$7,590,163	$6,072,130	$1,518,033	$0	$0
2016	ROW	NHPP	$1,700,000	$1,360,000	$340,000	$0	$0
		Total	$11,790,163	$9,432,130	$2,358,033	$0	$0

Revision Date	
Revision Details	
Previous TIP No.	2002-030, 2004-020, 2006-017, 2008-039, 2011-025



RMP#	Jurisdiction	Project Name	Termini	Length (mi.)	Project Description	Priority	Horizon Year	Total Horizon Year Cost	Funding Source	Federal Share (%)	State Share (%)	Local Share (%)
13-103	Oak Ridge	New Signalized Intersection at Lafayette Dr	Half way between Midway Rd and Midland Rd	0.0	Construction would include right-of-way acquisition of private property from Midway across the CSX railroad to Lafayette.	5	2019	$372,429	Local	0%	0%	100%
09-208	Maryville	Maryville Streetscaping	Various locations	0.0	Street-scaping and "Complete Street" types of projects throughout Maryville	4	2019	$319,225	TA	80%	0%	20%
09-209	Blount Co	Ellejoy Rd Reconstruction	River Ford Rd to Jeffries Hollow Rd	3.7	Reconstruct 2-lane section with shoulders	4	2019	$12,894,015	HSIP	80%	0%	20%
09-211	Blount Co	Morganton Rd Reconstruction, Phase 1	Foothills Mall Dr to William Blount Dr (SR 335)	2.2	Reconstruct 2-lane section with shoulders	1	2019	$10,095,479	HSIP	80%	0%	20%
09-213	Blount Co	Old Niles Ferry Rd Reconstruction	Maryville City Limit (Willis Rd) to Calderwood Hwy (US 129 / SR 115)	3.3	Reconstruct 2-lane section with shoulders	4	2019	$15,143,219	HSIP	80%	0%	20%
09-214	Maryville	Sevierville Rd (US 411 / SR 35) Widening and Bridge Replacement	Washington St (SR 35) to Walnut St	0.4	Widen 2-lane to 3-lane with curb and gutters, sidewalks, new bridge over Browns Creek, 2 business relocations, and new entrance for Blount Memorial Hospital	1	2019	$6,070,589	NHPP	80%	20%	0%
09-216	Blount Co / Alcoa	Alcoa Hwy (US 129 / SR 115) Widening	Pellissippi Pkwy (SR 162) to Knox / Blount Co Line	2.4	Widen 4-lane to 6-lane with 2 auxiliary lanes between Singleton Station Rd and Topside Rd (SR 333)	2	2019	$50,650,311	NHPP	80%	20%	0%
09-218	Alcoa	Alcoa Hwy Parkway (US 129 / SR 115) New Road Construction	From south of Airport Rd to proposed Interchange serving McGhee Tyson Airport	1.3	Construct new 8-lane highway	3	2019	$53,204,108	NHPP	80%	20%	0%
09-221	Blount Co	Burnett Station Rd Reconstruction	Sevierville Rd (US 411 / SR 35) to Chapman Hwy (US 441 / SR 71)	4.4	Reconstruct 2-lane section with shoulders	4	2019	$15,333,424	HSIP	80%	0%	20%
09-232	Blount Co	Pellissippi Pkwy (SR 162) Extension / New Road Construction	Old Knoxville Hwy (SR 33) to Lamar Alexander Pkwy (US 321 / SR 73)	4.4	Construct new 4-lane freeway	2	2019	$52,608,434	NHPP	80%	20%	0%
09-237	Maryville	E Broadway Ave (SR 33) / Eagleton Rd / Brown School Rd Intersection Improvements	From south of Brown School Rd to north of Eagleton Rd		Re-align Eagleton Rd with Brown School Rd to remove offset and create 4-leg, signalized intersection. Widening to include left-turn lanes at all approaches with curb & gutter and sidewalk.	1	2019	$2,427,171	STP	80%	20%	0%
09-257	Alcoa	Alcoa Hwy Parkway (US 129 / SR 115) New Road Construction	From Proposed Interchange serving McGhee Tyson Airport to Pellissippi Pkwy (SR 162)	2.4	Construct new 8-lane highway	2	2019	$53,736,149	NHPP	80%	20%	0%
09-258	Alcoa	Alcoa Hwy Parkway (US 129 / SR 115) New Road Construction	From Pellissippi Pkwy (SR 162) to Existing Alcoa Hwy near Singleton Station Rd	1.4	Construct new 8-lane highway	2	2019	$53,204,108	NHPP	80%	20%	0%
09-262	Maryville	Montvale Rd (SR 336) Widening	Montvale Station Rd to Lamar Alexander Pkwy (SR 73 / US 321)	0.6	Widen from 2-lane to 3-lane	1	2019	$13,620,252	STP	80%	20%	0%
13-207	Alcoa	Louisville Rd (SR 334) Reconstruction	W Hunt Rd to Alcoa city limits (Liberty St)	1.3	Reconstruct existing 2-lane facility with shoulders	3	2019	$6,149,065	STP	80%	20%	0%

APPENDIX B: PM2.5 CONCURRENCE INFORMATION

From: Darlene Reiter
To: Margaret Slater; Skinner, Nancy T.
Subject: FW: Updated Traffic Projections, Pellissippi Parkway Extension, Blount County
Date: Thursday, January 30, 2014 1:26:48 PM
Attachments: IAC-PM2.5-Determination-PellissippiPrkwy-101423.00-010709.pdf
Current and Previous Traffic Projections for Pellissippi Parkway Extension.pdf

FYI.

From: Darlene Reiter
Sent: Thursday, January 30, 2014 1:26 PM
To: Alan Jones; Angela Midgett; Cantrell, Teresa; Conger, Mike; Davis, Corbin; Jim Ozment; Lynne Liddington; Marc Corrigan; Martin, Elizabeth; Renfro, Jim; Rich DesGroseilliers ; Robert Rock; Ronnie Porter; scott.allen@dot.gov; Sheckler, Kelly; Smith, Dianna; Steve McDaniel; Theresa Claxton ; Welch, Jeff
Subject: Updated Traffic Projections, Pellissippi Parkway Extension, Blount County

Good Afternoon Knoxville IAC –

Per the discussion at the end of our call on Monday, I have attached the updated traffic projections for the Pellissippi Parkway (SR 162) Extension in Blount County for your records. As discussed, a $PM_{2.5}$ Hot-Spot Determination was prepared for the project in January 2009, and the IAC concurred that the project was "Not of Air Quality Concern." The Determination and concurrence responses are attached.

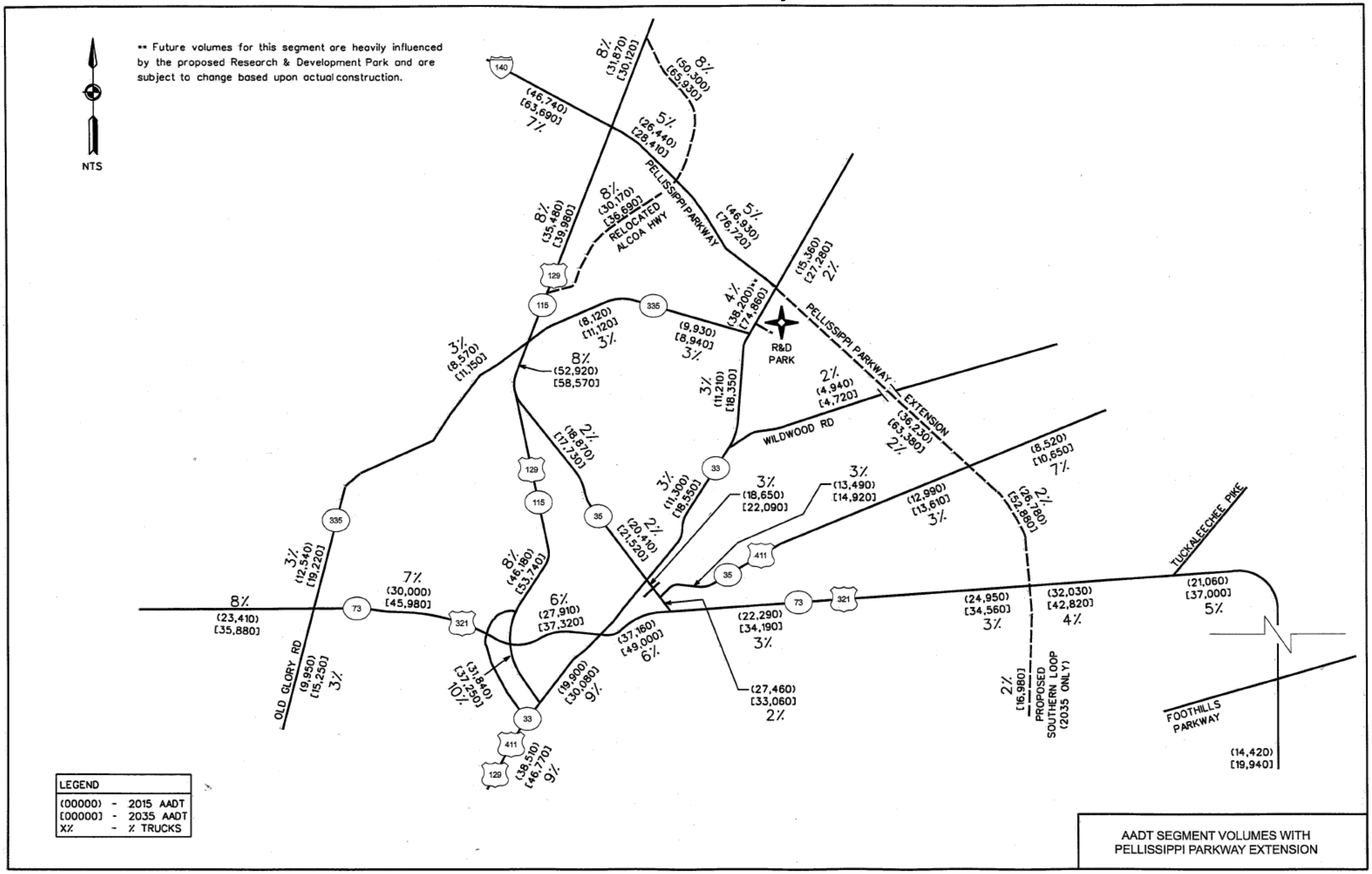
As shown, the updated Design Year 2040 projections are much lower than the previous Design Year 2035 projections used for the $PM_{2.5}$ Hot-Spot Determination. The projected percentage of trucks remains the same. As a result, the IAC agreed that the previous Determination remains valid.

Thank you for your guidance on this matter.

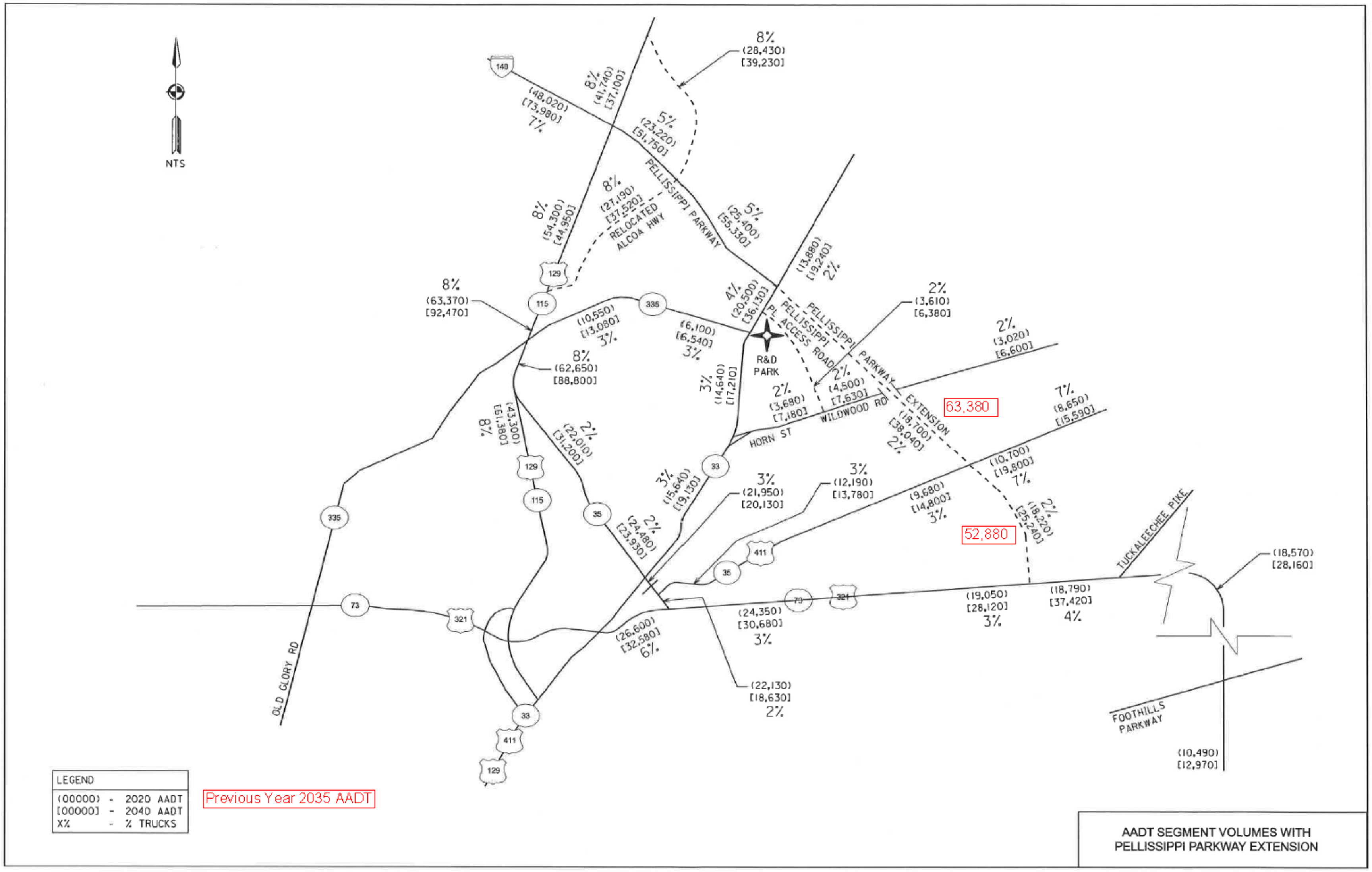
Darlene

Darlene Reiter, Ph.D., P.E.
TDOT Environmental Division Consultant
(615) 574-8102

Previous 2035 Traffic Projections



Current 2040 Traffic Projections



From: Marc Corrigan
To: McAdoo, Mark
Date: 1/9/2009 10:51 AM
Subject: Re: PM 2.5 Determination for Pellissippi Parkway Project (PIN# 101423.00)

Mark,

Based on the information provided, and no new information is provided from other IAC participants, I concur with TDOT's determination.

Marc

>>> Mark McAdoo 12:17 PM 1/8/09 >>>
Marc -
In response to your question, our consultant informs me "the rows in the table were shaded just to make the truck changes in volume stand out from the no-build to the build scenario. We thought that this important with regard to impacts as it shows that most of the volumes decrease in the build scenario."

TDOT requests your concurrence with our recommendation that this project be classified as NOT OF AIR QUALITY CONCERN. Please respond no later than close of business (4:30 central time) on**January 20, 2009**. If TDOT does not receive a response to the contrary within 10 business days of this email then TDOT will assume that you concur with our recommended determination.

Thanks,

Mark

TDOT - Environmental Division
615-741-6834

If you want your budget in the black - think green!

>>> Marc Corrigan 1/8/2009 8:28 AM >>>
Mark,

What is the significance of the of the shaded rows in the tables?

Marc

>>> Mark McAdoo 8:53 AM 1/7/09 >>>
Knoxville Area IAC -
This project was previously submitted to the IAC for concurrence. However, on December 19, 2008, Kelly Sheckler (EPA) left a voice message with me requesting us to revise the determination and resubmit. EPA requested truck numbers (not percentages) for the build and no build in the design year.

Our consultant for this project has made those revisions and TDOT is now resubmitting the determination that this project be classified as NOT OF AIR QUALITY CONCERN to the IAC for concurrence. Details are provided in the attached document.

TDOT requests your concurrence with our recommendation that this project be classified as NOT OF AIR QUALITY CONCERN. Please respond no later than close of business (4:30 central time) on January 20, 2009. If TDOT does not receive a response to the contrary within 10 business days of this email then TDOT will assume that you concur with our recommended determination.

Happy New Year,

Mark

TDOT - Environmental Division
615-741-6834

If you want your budget in the black - think green!

From: <Sheckler.Kelly@epamail.epa.gov>
To: "Mark McAdoo" <Mark.McAdoo@state.tn.us>
Date: 1/13/2009 11:48 AM
Subject: Re: PM 2.5 Determination for Pellissippi Parkway Project (PIN# 101423.00)- (1 project)
Attachments: PM2 5HotSpotDeterminationQA-Pellissippi- 1-6-08 final.doc

CC: <Smith.Dianna@epamail.epa.gov>
Mark- thank you for providing the updated material. Based upon what you have provided in the write-up, EPA concurs that this projects is not of air quality concern per the Transportation conformity provisions.

Kelly Sheckler
US Environmental Protection Agency- Region 4
Diesel Collaborative and Transportation Outreach Liaison
61 Foryths Street
Atlanta, Georgia 30303
(404) 562-9222
Sheckler.Kelly@epa.gov

"Mark McAdoo" <Mark.McAdoo@state.tn.us>
01/07/2009 09:53 AM

To
<asmcdaniel@aqm.co.knox.tn.us>, <laliddington@aqm.co.knox.tn.us>, "Abigail Rivera" <Abigail.Rivera@dot.gov>, "Jeffery Anoka" <Jeffery.Anoka@dot.gov>, Lynorae Benjamin/R4/USEPA/US@EPA, Kelly Sheckler/R4/USEPA/US@EPA, Dianna Smith/R4/USEPA/US@EPA, Amanetta Wood/R4/USEPA/US@EPA, <Cecilia.Crenshaw@fhwa.dot.gov>, "Charles Oneill" <Charles.Oneill@fhwa.dot.gov>, <LeighAnn.Tribble@fhwa.dot.gov>, <Michael.Roberts@fhwa.dot.gov>, "Tameka Macon" <Tameka.Macon@fhwa.dot.gov>, "Vic Otero" <Victor.Otero@fhwa.dot.gov>, <Jeff.Welch@knoxtrans.org>, <Mike.Conger@knoxtrans.org>, <Shannon.Tolliver@knoxtrans.org>, <richd@mymorristown.com>, <jim_renfro@nps.gov>, <liana_reilly@nps.gov>, <teresa_cantrell@nps.gov>, "Alan Jones" <Alan.Jones@state.tn.us>, "Angela Midgett" <Angela.Midgett@state.tn.us>, "Marc Corrigan"

<Marc.Corrigan@state.tn.us>,
"Mark McAdoo"
<Mark.McAdoo@state.tn.us>,
"Robert Rock"
<Robert.Rock@state.tn.us>,
"Ronnie Porter"
<Ronnie.Porter@state.tn.us>
cc
"Nancy T. Skinner"
<SkinnerN@pbworld.com>, "Jim
Ozment" <Jim.Ozment@state.tn.us>,
"Tom Love" <Tom.Love@state.tn.us>
Subject
PM 2.5 Determination for
Pellissippi Parkway Project (PIN#
101423.00)

Knoxville Area IAC -
This project was previously submitted to the IAC for concurrence. However, on December 19, 2008, Kelly Sheckler (EPA) left a voice message with me requesting us to revise the determination and resubmit. EPA requested truck numbers (not percentages) for the build and no build in the design year.

Our consultant for this project has made those revisions and TDOT is now resubmitting the determination that this project be classified as NOT OF AIR QUALITY CONCERN to the IAC for concurrence. Details are provided in the attached document.

TDOT requests your concurrence with our recommendation that this project be classified as NOT OF AIR QUALITY CONCERN. Please respond no later than close of business (4:30 central time) on January 20, 2009. If TDOT does not receive a response to the contrary within 10 business days of this email then TDOT will assume that you concur with our recommended determination.

Happy New Year,

Mark

TDOT - Environmental Division
615-741-6834

If you want your budget in the black - think green!

From: <Victor.Otero@dot.gov>
To: <Mark.McAdoo@state.tn.us>, <asmcdaniel@aqm.co.knox.tn.us>, <laliddington...
Date: 1/13/2009 12:58 PM
Subject: RE: PM 2.5 Determination for Pellissippi Parkway Project (PIN#101423.00)- (1 project)

CC: <SkinnerN@pbworld.com>, <Jim.Ozment@state.tn.us>, <Tom.Love@state.tn.us>
FHWA concurs that the Pellissippi Parkway Project (PIN#101423.00)- (1 project is not of air quality concern. Should you require additional information, please contact me at 615.781.5761

Thank you

Victor Otero
FHWA TN DIVISION

-----Original Message-----
From: Mark McAdoo [mailto:Mark.McAdoo@state.tn.us]
Sent: Tuesday, January 13, 2009 12:11 PM
To: asmcdaniel@aqm.co.knox.tn.us; laliddington@aqm.co.knox.tn.us; Rivera, Abigail <FTA>; Anoka, Jeffery <FTA>; Benjamin.Lynorae@epa.gov; Sheckler.Kelly@epa.gov; smith.dianna@epa.gov; Wood.Amanetta@epa.gov; Crenshaw, Cecilia <FHWA>; Oneill, Charles <FHWA>; Tribble, Leigh Ann <FHWA>; Roberts, Michael <FHWA>; Macon, Tameka <FHWA>; Otero, Victor <FHWA>; Jeff.Welch@knoxtrans.org; Mike.Conger@knoxtrans.org; Shannon.Tolliver@knoxtrans.org; richd@mymorristown.com; jim_renfro@nps.gov; liana_reilly@nps.gov; teresa_cantrell@nps.gov; Alan Jones; Angela Midgett; Marc Corrigan; Mark McAdoo; Robert Rock; Ronnie Porter
Cc: Nancy T. Skinner; Jim Ozment; Tom Love
Subject: Re: PM 2.5 Determination for Pellissippi Parkway Project (PIN#101423.00)- (1 project)

Kelly -
Thank you for providing concurrence from EPA. I hope FHWA and the other IAC members can provide concurrence by January 20th.

Mark

TDOT - Environmental Division
615-741-6834

If you want your budget in the black - think green!

>>> <Sheckler.Kelly@epamail.epa.gov> 1/13/2009 11:48 AM >>>
Mark- thank you for providing the updated material. Based upon what you have provided in the write-up, EPA concurs that this projects is not of air quality concern per the Transportation conformity provisions.

Kelly Sheckler
US Environmental Protection Agency- Region 4

From: Mark McAdoo [Mark.McAdoo@state.tn.us]
Sent: Monday, December 01, 2008 10:22 AM
To: asmcdaniel@aqm.co.knox.tn.us; laliddington@aqm.co.knox.tn.us; Abigail Rivera; Jeffery Anoka; Benjamin.Lynorae@epa.gov; Sheckler.Kelly@epa.gov; smith.dianna@epa.gov; Wood.Amanetta@epa.gov; Cecilia.Crenshaw@fhwa.dot.gov; LeighAnn.Tribble@fhwa.dot.gov; Michael.Roberts@fhwa.dot.gov; Tameka Macon; tony.dittmeier@fta.dot.gov; Jeff.Welch@knoxtrans.org; Mike.Conger@knoxtrans.org; Shannon.Tolliver@knoxtrans.org; richd@mymorristown.com; jim_renfro@nps.gov; liana_reilly@nps.gov; teresa_cantrell@nps.gov; Alan Jones; Angela Midgett; Marc Corrigan; Robert Rock; Ronnie Porter
Cc: Skinner, Nancy T.; Tom Love
Subject: Pellissippi Parkway (PIN# 101423.00)

Attachments: PM2 5HotSpotDeterminationQA-Pellissippi-R.doc

Knoxville Area IAC -

TDOT recommends that the following project be classified as NOT OF AIR QUALITY CONCERN for PM 2.5 Transportation Conformity:

PIN# 101423.00 - Knox County Pellissippi Parkway

More details are provided in the attached document.

TDOT requests your concurrence with our recommendation that this project is NOT OF AIR QUALITY CONCERN. Please respond to this e-mail no later than close of business (4:30 central time) on December 15, 2008. If TDOT does not receive a response to the contrary by December 15, 2008 then TDOT will assume that you concur with our recommended determination.

Mark

TDOT - Environmental Division
615-741-6834

If you want your budget in the black - think green!

$PM_{2.5}$ Hot Spot Determination

Project Name: Pellissippi Parkway (SR-33 to US 321)
Project Number: 05097-1226-04; LRTP # 70; TIP # 101423.00
Location: Pellissippi Parkway from SR 33 to US 321/SR 73 in the cities of Alcoa and Maryville and in unincorporated Blount County

Statement of Purpose and Legal Requirements

Section 176(c) of the Clean Air Act, as amended, requires that transportation agencies, such as the Tennessee Department of Transportation (TDOT), demonstrate that all proposed transportation projects that are located in nonattainment or maintenance areas, and using federal money, are consistent with the air quality goals found in the State Implementation Plan (SIP) and the corresponding Transportation Improvement Program (TIP) or other conforming plan.

The process to ensure this consistency is called Transportation Conformity. Conformity to the SIP means that transportation activities will not cause new violations of the National Ambient Air Quality Standards (NAAQS), will not worsen existing violations, and will not delay attainment of the NAAQS.

Project-level conformity is required by Title 40 Code of Federal Regulations (CFR) Part 93, more commonly known as the Transportation Conformity Rule. When evaluating project-level conformity for $PM_{2.5}$, the process is called a $PM_{2.5}$ Hot Spot Determination.

The Transportation Conformity Rule instructs the U.S. Department of Transportation (DOT) to ensure that all proposed transportation projects are in conformity before releasing federal funds for the project. To accomplish this, the FHWA and/or FTA require that all proposed transportation projects in a nonattainment or maintenance area be classified as: 1) Exempt, 2) Project Not of Air Quality Concern, or 3) Project of Air Quality Concern.

In §93.126 and §93.128, the Transportation Conformity Rule establishes a list of transportation projects that are categorically exempt from a project-level conformity determination. For nonexempt projects in nonattainment areas, TDOT must determine if the project has the potential to adversely impact air quality and FHWA and/or FTA must make the same determination.

This proposed transportation project is located in a jurisdiction currently classified as nonattainment for the $PM_{2.5}$ NAAQS by the U.S. Environmental Protection Agency. This proposed project is not classified as exempt. Therefore, TDOT is presenting the following $PM_{2.5}$ Hot Spot Determination to the Interagency Consultation (IAC) group to demonstrate this project is not of air quality concern and that it does conform to the SIP.

Project Description

Pellissippi Parkway (State Route (SR) 162) is a major northwest/southeast route connecting Interstate 40 (I-40)/I-75 and SR 33 in Knox and Blount Counties, Tennessee.

$PM_{2.5}$ Hot Spot Determination

Pellissippi Parkway (designated as I-140) between I-40/I-75 and SR 33 was designed and built in four sections between 1987 and 2005. The section of Pellissippi Parkway between SR 33 and US 321/SR 73 is the remaining undeveloped portion of the parkway that was identified in the State's 1986 Urgent Highway Needs Plan. TDOT proposes to extend the existing Pellissippi Parkway from SR 33 to US 321/SR 73 in the cities of Alcoa and Maryville and in unincorporated Blount County. The total length of the proposed extension is approximately 4.5 miles.

The project is proposed by TDOT to:

- Provide travel options for motorists to the existing radial roadway network;
- Enhance regional transportation system linkages;
- Assist in achieving acceptable traffic flows (level of service) on the transportation network; and
- Enhance roadway safety on the roadway network, including the Maryville core.

In April 2006, TDOT initiated an Environmental Impact Statement (EIS) for the project with the publication of a formal Notice of Intent (NOI) to prepare an EIS in the Federal Register. Public and agency scoping was conducted in 2006. At that time, TDOT asked the public to provide input on the purpose and need for the project and to identify potential alternatives for consideration in the Draft EIS. Additional public meetings were held in November 2007 and February 2008 to gather public input on the refined purpose and need and potential project corridors and alternatives. An initial range of alternatives and corridors were developed as a result of public input and input from local and regional agencies, including the Knoxville Regional Transportation Planning Organization (TPO). The alternatives and corridors were refined, and TDOT has determined that three build alternatives will be carried forward, refined and evaluated in the DEIS. Alternative A and C would extend the existing Pellissippi Parkway as a four-lane divided highway in one of two alignments, while Alternative D would be an upgraded two-lane network of existing roads to serve as a two-lane connection between SR 33 and US 321.

$PM_{2.5}$ Hot Spot Determination Questions and Answers

1. **Is this project in a conforming Plan/TIP?** Yes. This project is included in the Knoxville Regional Transportation Planning Organization's (Knoxville-TPO) Transportation Improvement Program (TIP) for FY 2008 – 2011. The proposed project has been found to be consistent with the Knoxville/Knox County Metropolitan Planning Organization's 2005-2030 Long Range Transportation Plan (LRTP) and will not be in conflict with the long-range planning activities of any other local or regional planning authority. The project is included in a conforming plan and program in accordance with 40 CFR §93.115

2. **Is the project on a new or expanded highway or expressway that serves a significant volume of diesel truck traffic, such as a facility with greater than 125,000 annual average daily traffic (AADT) and 8% or more of such AADT is diesel truck traffic?** The project is a new highway but does not serve a significant volume of diesel truck traffic. Based on the projections presented in the Traffic Operations Technical Report for this project, the highest AADT on any of the roadway links along the affected Pellissippi corridor (i.e., from the proposed Relocated Alcoa Highway to East Broadway/Old Knoxville Highway [SR 33]) is 76,720 in the design year of 2035; and the highest truck percentage (from Topside Road to Alcoa Highway [SR 115/US 129/MP]) is 7.0 percent. Using the example, a significant volume of diesel truck traffic would be 10,000 trucks (8% of 125,000). The highest number of trucks on the affected corridor would be 4,458 in the year 2035.

   While a few sections of the existing roadways in the project area would have 8, 9, or 10 % truck traffic in 2035, the percentages on these roadways are estimated to be the same as future No Build truck percentages on these roadways, and the projected AADT on these roadways are all less than 60,000. The highest volume of truck traffic is 5,274 vehicles on the Relocated Alcoa Highway.

   Tables 1 and 2 at the end of this documentation show these values along with the rest of the diesel truck volumes for the No Build as well as the Build Scenario for 2015 and 2035. Tables 3 and 4 list truck volumes for the Pellissippi Parkway extension (between SR 33 and SR 73/US 321). Table 3 lists values for the Build Alternatives A/C (extension of the parkway) while Table 4 lists values for Build Alternative D (upgrade of existing 2-lane roadway network). As shown on these tables, the diesel truck percentages are low and the actual volumes represent only a small portion of the expected traffic.

3. **Does the project construct new exit ramps or other highway facility improvements that connect a highway or expressway to a major freight, bus, or intermodal terminal?** No. While new interchanges would be created with the proposed alternatives, none of these would connect to or affect a major freight, bus, or intermodal facility.

4. **Does the project expand an existing highway or other facility that already has a congested intersection (Operates at LOS D, E, or F) and will this project result in a significant increase in the number of diesel trucks?** No. While several of the affected intersections would operate at LOS D, E, or F in 2035 with the proposed alternatives, the LOS of these intersections would be approximately the same (or better) than under the future No Build alternative. In addition, the number of diesel trucks on the affected roadway links is not projected to significantly increase with any of the project alternatives.

5. **Does the highway project involve a significant increase in the number of diesel transit buses and/or diesel trucks?** No. The traffic projections are primarily a function of population growth and land use. Based on the projections presented in the Traffic Operations Technical Report for this project, the highest AADT on any of the roadway links along the affected Pellissippi corridor (i.e., from the proposed Relocated Alcoa Highway to East Broadway/Old Knoxville Highway [SR 33]) is 76,720; and the highest truck percentage (from Topside Road to Alcoa Highway [SR 115/US 129/MP]) is 7.0 percent. The truck percentages on the other roadway segments range from 2 to 10 percent. The highest actual volume of diesel trucks on the affected corridor is 4,458 representing 7.0 percent of the AADT. For the rest of the roadway segments, the majority of them have a reduction in truck volumes as a result of the build alternative with a few experiencing an increase of no more than 1,700 diesel trucks (SR 33 between Hunt Road and Williams Mill Road with an AADT of 74,860). Tables 1 and 2 include a column illustrating the differences between the No Build and build alternatives. The changes resulting from the build alternatives do not cause a significant increase in the number of diesel trucks and buses.

6. **Will this project cause or worsen an existing violation?** No. Any increase in emissions due to overall growth in Tennessee's traffic volumes is expected to be offset by decreases associated with the project's operational improvements and decreases in overall mobile source emission trends. In addition, background concentrations will decrease as stationary source emissions would continue to decrease via on-going reduction measures and measures that will be implemented in the near future. A similar conclusion is supported by scientific journal articles cited in the final hot-spot analysis rule.

   The March 2006 Transportation Conformity Guidance for Qualitative Hot-Spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas issued jointly by the U.S. Environmental Protection Agency and the U.S. Department of Transportation provide examples of projects that are not of localized air quality concern. More specifically, Appendix A of the Guidance states that projects that are not an air quality concern include "any new or expanded highway project that primarily services gasoline vehicle traffic (i.e., does not involve a significant number or increase in the number of diesel vehicles), including such projects involving congested intersections operating at Level-of-Service D, E, or F."

$PM_{2.5}$ Hot Spot Determination

The nearest PM monitoring station is located at 2007 Sequoyah Avenue in Maryville. This monitor is more than three miles from this proposed project and will not likely be impacted by the project.

Conclusion

TDOT's $PM_{2.5}$ hot spot determination is that this project is **NOT A PROJECT OF AIR QUALITY CONERN**, as determined in accordance with 40 CFR §93.123(b)(1), and that this project is in conformity with the SIP. Therefore, it is assumed that the Clean Air Act and 40 CFR §93.116 requirements are met without a qualitative hot spot analysis once FHWA provides concurrence or and the IAC comment period expires without additional information provided by the IAC to cause objection from FHWA.

Table 1: Comparison of Diesel Truck Numbers for the No-Build and Build Scenarios (2015)

Route	Section	Begin Milepoint	End Milepoint	2015 No-Build ADT	2015 Build ADT	2015 No-Build % Trucks and Buses	2015 Build % Trucks and Buses	2015 No-Build # Diesel Trucks	2015 Build # Diesel Trucks	Change in Volume (Build - No-Build)
Wildwood Road	1	E. Broadway/Old Knoxville Hwy (SR 33) MP 0.000	End of Study Area MP 4.740	5,580	4,940	2.0%	2.0%	112	99	-13
Pellissippi Parkway	1	Topside Rd MP 0.810	Alcoa Hwy (SR 115/US 129) MP 2.240	43,560	46,740	7.0%	7.0%	3049	3272	223
	2	Alcoa Hwy (SR 115/US 129) MP 2.240	Relocated Alcoa Highway MP 3.240	25,880	26,440	5.0%	5.0%	1294	1322	28
	3	Relocated Alcoa Highway MP 3.240	E. Broadway/Old Knoxville Hwy (SR 33) MP 4.710	34,420	46,930	5.0%	5.0%	1721	2347	626
Lamar Alexander Parkway (SR 73 / US 321)	1	Beginning of Study Area MP 8.250	Alcoa Hwy (SR 115/US 129) MP 10.570	30,500	30,000	7.0%	7.0%	2135	2100	-35
	2	Alcoa Hwy (SR 115/US 129) MP 10.570	E. Broadway/Old Knoxville Hwy (SR 33) MP 11.650	29,090	27,910	7.0%	6.0%	2036	1675	-362
	3	E. Broadway/Old Knoxville Hwy (SR 33) MP 11.650	Jones Ave MP 12.526	37,720	37,160	7.0%	6.0%	2640	2230	-411
	4	Jones Ave MP 12.520	Merritt Rd MP 13.980	27,240	22,290	4.0%	3.0%	1090	669	-421
	5	Merritt Rd MP 13.980	Tuckaleechee Pk MP 17.020	24,080	24,950	4.0%	3.0%	963	749	-215
	6	Tuckaleechee Pk MP 17.020	MP 19.020	18,720	32,030	5.0%	4.0%	936	1281	345
	7	MP 19.020	Melrose Station Rd MP 20.020	18,720	21,060	5.0%	5.0%	936	1053	117
Hall Road (SR 35)	1	Alcoa Hwy (SR 115/US 129) MP 0.000	Bessemer St MP 1.520	23,220	18,870	2.0%	2.0%	464	377	-87
	2	Bessemer St MP 1.520	E. Broadway/Old Knoxville Hwy (SR 33) MP 2.590	27,460	20,410	2.0%	2.0%	549	408	-141
Washington Street (SR 35)	1	E. Broadway/Old Knoxville Hwy (SR 33) MP 2.590	US 411 (SR 35) MP 2.820	24,450	18,650	3.0%	3.0%	734	560	-174
	2	US 411 (SR 35) MP 0.000	Lamar Alexander Pkwy (SR 73/US 321) MP 0.160	24,620	27,460	2.0%	2.0%	492	549	57

Table 1: Comparison of Diesel Truck Numbers for the No-Build and Build Scenarios (2015) (cont.)

Route	Section	Begin Milepoint	End Milepoint	2015 No-Build ADT	2015 Build ADT	2015 No-Build % Trucks and Buses	2015 Build % Trucks and Buses	2015 No-Build # Diesel Trucks	2015 Build # Diesel Trucks	Change in Volume (Build - No-Build)
US 411 (SR 35)	1	Washington St (SR 35) MP 2.820	Westfield Dr MP 4.510	13,910	13,490	3.0%	3.0%	417	405	-13
	2	Westfield Dr MP 4.510	Near Peppermint Rd 6.510	10,660	12,990	4.0%	3.0%	426	390	-37
	3	Near Peppermint Rd 6.510	End of Study Area 7.930	6,950	8,520	7.0%	7.0%	487	596	110
E. Broadway / Old Knoxville Highway (SR 33)	1	Beginning of Study Area MP 7.854	Montgomery Lane MP 10.201	38,910	38,510	9.0%	9.0%	3502	3466	-36
	2	Montgomery Lane MP 10.201	Hall Rd MP 12.340	19,720	19,900	9.0%	9.0%	1775	1791	16
	3	Hall Rd MP 12.340	Wildwood Rd MP 14.206	13,170	11,300	2.0%	3.0%	263	339	76
	4	Wildwood Rd MP 14.206	Hunt Rd MP 15.470	13,330	11,210	2.0%	3.0%	267	336	70
	5	Hunt Rd MP 15.470	Williams Mill Rd MP 17.420	34,350	38,200	2.0%	4.0%	687	1528	841
	6	Williams Mill Rd MP 17.420	County Line MP 20.640	19,350	15,360	2.0%	2.0%	387	307	-80
Alcoa Highway (SR 115 / US 129)	1	Broadway Ave MP 10.450	Lamar Alexander Pkwy (SR 73/US 321) MP 11.340	32,550	31,840	10.0%	10.0%	3255	3184	-71
	2	Lamar Alexander Pkwy (SR 73/US 321) MP 11.340	Hall Rd (SR 35) MP 14.280	47,740	46,180	10.0%	8.0%	4774	3694	-1080
	3	Hall Rd (SR 35) MP 14.280	Hunt Rd MP 15.020	56,100	52,920	8.0%	8.0%	4488	4234	-254
	4	Hunt Rd MP 15.020	Pellissippi Pky MP 17.660	31,570	35,480	8.0%	8.0%	2526	2838	313
	5	Pellissippi Pky MP 17.660	County Line MP 20.400	22,670	31,870	8.0%	8.0%	1814	2550	736
Relocated Alcoa Highway	1	Alcoa Highway (SR 115 / US 129)	Pellissippi Pky	37,100	30,170	8.0%	8.0%	2968	2414	-554
	2	Pellissippi Pky	Alcoa Highway (SR 115 / US 129)	50,900	50,300	8.0%	8.0%	4072	4024	-48

Table 2: Comparison of Diesel Truck Numbers for the No-Build and Build Scenarios (2035)

Route	Section	Begin Milepoint	End Milepoint	2035 No-Build ADT	2035 Build ADT	2035 No-Build % Trucks and Buses	2035 Build % Trucks and Buses	2035 No-Build # Diesel Trucks	2035 Build # Diesel Trucks	Change in Volume (Build - No-Build)
Wildwood Road	1	E. Broadway/Old Knoxville Hwy (SR 33) MP 0.000	End of Study Area MP 4.740	6,250	4,720	2.0%	2.0%	125	94	-31
Pellissippi Parkway	1	Topside Rd MP 0.810	Alcoa Hwy (SR 115/US 129) MP 2.240	62,310	63,690	7.0%	7.0%	4362	4458	97
	2	Alcoa Hwy (SR 115/US 129) MP 2.240	Relocated Alcoa Highway MP 3.240	39,240	28,410	5.0%	5.0%	1962	1421	-542
	3	Relocated Alcoa Highway MP 3.240	E. Broadway/Old Knoxville Hwy (SR 33) MP 4.710	60,080	76,720	5.0%	5.0%	3004	3836	832
Lamar Alexander Parkway (SR 73 / US 321)	1	Beginning of Study Area MP 8.250	Alcoa Hwy (SR 115/US 129) MP 10.570	45,270	45,980	7.0%	7.0%	3169	3219	50
	2	Alcoa Hwy (SR 115/US 129) MP 10.570	E. Broadway/Old Knoxville Hwy (SR 33) MP 11.650	37,430	37,320	7.0%	6.0%	2620	2239	-381
	3	E. Broadway/Old Knoxville Hwy (SR 33) MP 11.650	Jones Ave MP 12.526	48,380	49,000	7.0%	6.0%	3387	2940	-447
	4	Jones Ave MP 12.520	Merritt Rd MP 13.980	38,610	34,190	4.0%	3.0%	1544	1026	-519
	5	Merritt Rd MP 13.980	Tuckaleechee Pk MP 17.020	41,200	34,560	4.0%	3.0%	1648	1037	-611
	6	Tuckaleechee Pk MP 17.020	MP 19.020	32,620	42,820	5.0%	4.0%	1631	1713	82
	7	MP 19.020	Melrose Station Rd MP 20.020	32,620	37,000	5.0%	5.0%	1631	1850	219
Hall Road (SR 35)	1	Alcoa Hwy (SR 115/US 129) MP 0.000	Bessemer St MP 1.520	23,220	17,730	2.0%	2.0%	464	355	-110
	2	Bessemer St MP 1.520	E. Broadway/Old Knoxville Hwy (SR 33) MP 2.590	27,460	21,520	2.0%	2.0%	549	430	-119
Washington Street (SR 35)	1	E. Broadway/Old Knoxville Hwy (SR 33) MP 2.590	US 411 (SR 35) MP 2.820	25,990	22,090	3.0%	3.0%	780	663	-117
	2	US 411 (SR 35) MP 0.000	Lamar Alexander Pkwy (SR 73/US 321) MP 0.160	37,890	33,060	2.0%	2.0%	758	661	-97

Table 2: Comparison of Diesel Truck Numbers for the No-Build and Build Scenarios (2035) (cont.)

Route	Section	Begin Milepoint	End Milepoint	2035 No-Build ADT	2035 Build ADT	2035 No-Build % Trucks and Buses	2035 Build % Trucks and Buses	2035 No-Build # Diesel Trucks	2035 Build # Diesel Trucks	Change in Volume (Build - No-Build)
US 411 (SR 35)	1	Washington St (SR 35) MP 2.820	Westfield Dr MP 4.510	16,910	14,920	3.0%	3.0%	507	448	-60
	2	Westfield Dr MP 4.510	Near Peppermint Rd 6.510	14,240	13,610	4.0%	3.0%	570	408	-161
	3	Near Peppermint Rd 6.510	End of Study Area 7.930	9,670	10,650	7.0%	7.0%	677	746	69
E. Broadway / Old Knoxville Highway (SR 33)	1	Beginning of Study Area MP 7.854	Montgomery Lane MP 10.201	46,990	46,770	9.0%	9.0%	4229	4209	-20
	2	Montgomery Lane MP 10.201	Hall Rd MP 12.340	30,940	30,080	9.0%	9.0%	2785	2707	-77
	3	Hall Rd MP 12.340	Wildwood Rd MP 14.206	25,060	18,550	2.0%	3.0%	501	557	55
	4	Wildwood Rd MP 14.206	Hunt Rd MP 15.470	24,310	18,350	2.0%	3.0%	486	551	64
	5	Hunt Rd MP 15.470	Williams Mill Rd MP 17.420	65,850	74,860	2.0%	4.0%	1317	2994	1677
	6	Williams Mill Rd MP 17.420	County Line MP 20.640	31,770	27,280	2.0%	2.0%	635	546	-90
Alcoa Highway (SR 115 / US 129)	1	Broadway Ave MP 10.450	Lamar Alexander Pkwy (SR 73/US 321) MP 11.340	37,280	37,250	10.0%	10.0%	3728	3725	-3
	2	Lamar Alexander Pkwy (SR 73/US 321) MP 11.340	Hall Rd (SR 35) MP 14.280	47,740	53,740	10.0%	8.0%	4774	4299	-475
	3	Hall Rd (SR 35) MP 14.280	Hunt Rd MP 15.020	61,120	58,570	8.0%	8.0%	4890	4686	-204
	4	Hunt Rd MP 15.020	Pellissippi Pky MP 17.660	40,280	39,980	8.0%	8.0%	3222	3198	-24
	5	Pellissippi Pky MP 17.660	County Line MP 20.400	26,060	30,120	8.0%	8.0%	2085	2410	325
Relocated Alcoa Highway	1	Alcoa Highway (SR 115 / US 129)	Pellissippi Pky	38,430	36,690	8.0%	8.0%	3074	2935	-139
	2	Pellissippi Pky	Alcoa Highway (SR 115 / US 129)	62,590	65,930	8.0%	8.0%	5007	5274	267

Table 3: Diesel Truck Volumes for Build Alternatives A/C

Begin Milepoint	End Milepoint	2015 ADT	2015 % Trucks and Buses	2015 # Diesel Trucks	2035 ADT	2035 % Trucks and Buses	2035 # Diesel Trucks
E. Broadway/Old Knoxville Hwy (SR 33)	US 411 (SR 35)	36,230	2.0%	725	63,380	2.0%	1268
US 411 (SR 35)	Lamar Alexander Pkwy (SR 73/US 321)	26,780	2.0%	536	52,880	2.0%	1058

Table 4: Diesel Truck Volumes for Build Alternative D

Begin Milepoint	End Milepoint	2015 ADT	2015 % Trucks and Buses	2015 # Diesel Trucks	2035 ADT	2035 % Trucks and Buses	2035 # Diesel Trucks
E. Broadway/Old Knoxville Hwy (SR 33)	US 411 (SR 35)	16,970	5.0%	849	22,390	5.0%	1120
US 411 (SR 35)	Lamar Alexander Pkwy (SR 73/US 321)	12,270	5.0%	614	17,240	5.0%	862

APPENDIX C: CAL3QHC AND MOVES FILES

CAL3QHC Results

for the Intersection of Pellissippi Parkway (SR 162/I-140) and Old Knoxville Highway (SR 33)

CAL3QHC Results

for the Intersection of Old Knoxville Highway (SR 33) and Sam Houston School Road

CO Emissions for Pellissippi Parkway Extension 2040, June 16, 2015

movesRur	yearId	monthId	dayId	hourId	linkId	pollutant	GramsPerVehMile	GramsPerVehHour	linkAvgSpeed	linkDescription
1	2040	1	5	8	1	CO	1.7172362		45	Sam Houston School Free Flow
1	2040	1	5	8	2	CO	1.818599654		40	SR 33 Free Flow
1	2040	1	5	8	3	CO		5.427884952	0	Sam Houston School Idle
1	2040	1	5	8	4	CO		5.427884952	0	SR 33 Idle
1	2040	1	5	8	5	CO	1.79905584		40	SR 33 West to Pellissippi
1	2040	1	5	8	6	CO	1.971985966		35	SR 33 West to Pellissippi
1	2040	1	5	8	7	CO		5.382705624	0	SR 33 West to Pellissippi Idle
1	2040	1	5	8	8	CO		5.382705624	0	SR 33 West to Pellissippi Idle
1	2040	1	5	8	9	CO	1.818601764		40	Pellissippi to Sam Houston School
1	2040	1	5	8	10	CO	1.993310174		35	Pellissippi to Sam Houston School
1	2040	1	5	8	11	CO		5.427890646	0	NB Pellissippi Off Ramp Idle
1	2040	1	5	8	12	CO	3.993909657		5	NB Pellissippi Off Ramp
1	2040	1	5	8	13	CO	2.766063799		10	NB Pellissippi Off Ramp
1	2040	1	5	8	14	CO	2.30897076		15	NB Pellissippi Off Ramp
1	2040	1	5	8	15	CO	2.058695923		20	NB Pellissippi Off Ramp
1	2040	1	5	8	16	CO	1.935252053		25	NB Pellissippi Off Ramp
1	2040	1	5	8	17	CO	1.856219991		30	NB Pellissippi Off Ramp
1	2040	1	5	8	18	CO	1.783013257		35	NB Pellissippi Off Ramp
1	2040	1	5	8	19	CO	1.726503102		40	NB Pellissippi Off Ramp
1	2040	1	5	8	20	CO	1.682548048		45	NB Pellissippi Off Ramp
1	2040	1	5	8	21	CO	1.649051404		50	NB Pellissippi Off Ramp
1	2040	1	5	8	22	CO	1.622095435		55	NB Pellissippi Off Ramp
1	2040	1	5	8	23	CO	1.623153674		60	NB Pellissippi Off Ramp
1	2040	1	5	8	24	CO	1.745759211		65	NB Pellissippi Off Ramp
1	2040	1	5	8	25	CO		5.42789333	0	SB Pellissippi On Ramp Idle
1	2040	1	5	8	26	CO	3.993928414		5	SB Pellissippi On Ramp
1	2040	1	5	8	27	CO	2.7660585		10	SB Pellissippi On Ramp
1	2040	1	5	8	28	CO	2.308962573		15	SB Pellissippi On Ramp
1	2040	1	5	8	29	CO	2.058690913		20	SB Pellissippi On Ramp
1	2040	1	5	8	30	CO	1.935253567		25	SB Pellissippi On Ramp
1	2040	1	5	8	31	CO	1.856217868		30	SB Pellissippi On Ramp
1	2040	1	5	8	32	CO	1.783010659		35	SB Pellissippi On Ramp
1	2040	1	5	8	33	CO	1.726503817		40	SB Pellissippi On Ramp
1	2040	1	5	8	34	CO	1.68254948		45	SB Pellissippi On Ramp
1	2040	1	5	8	35	CO	1.649055634		50	SB Pellissippi On Ramp
1	2040	1	5	8	36	CO	1.622095183		55	SB Pellissippi On Ramp
1	2040	1	5	8	37	CO	1.623152495		60	SB Pellissippi On Ramp
1	2040	1	5	8	38	CO	1.745759718		65	SB Pellissippi On Ramp

APPENDIX D: MSATS BACKGROUND INFORMATION

Mobile Source Air Toxics (MSATs)
From: FHWA's "*Interim Guidance Update on Air Toxic Analysis in NEPA Documents*," December 6, 2012.

Background

Controlling air toxic emissions became a national priority with the passage of the Clean Air Act Amendments (CAAA) of 1990, whereby Congress mandated that the U.S. Environmental Protection Agency (EPA) regulate 188 air toxics, also known as hazardous air pollutants. The EPA has assessed this expansive list in their latest rule on the Control of Hazardous Air Pollutants from Mobile Sources (Federal Register, Vol. 72, No. 37, page 8430, February 26, 2007), and identified a group of 93 compounds emitted from mobile sources that are listed in their Integrated Risk Information System (IRIS) (http://www.epa.gov/iris/). In addition, EPA identified seven compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers from their 1999 National Air Toxics Assessment (NATA) (http://www.epa.gov/ttn/atw/nata1999/). These are acrolein, benzene, 1,3-butidiene, diesel particulate matter plus diesel exhaust organic gases (diesel PM), formaldehyde, naphthalene, and polycyclic organic matter. While FHWA considers these the priority mobile source air toxics, the list is subject to change and may be adjusted in consideration of future EPA rules. The 2007 EPA rule mentioned above requires controls that will dramatically decrease MSAT emissions through cleaner fuels and cleaner engines. According to an FHWA analysis using EPA's MOBILE6.2 model, even if vehicle activity (vehicle-miles travelled, VMT) increases by 145 percent as assumed, a combined reduction of 72 percent in the total annual emission rate for the priority MSAT is projected from 1999 to 2050, as shown in Figure 1.

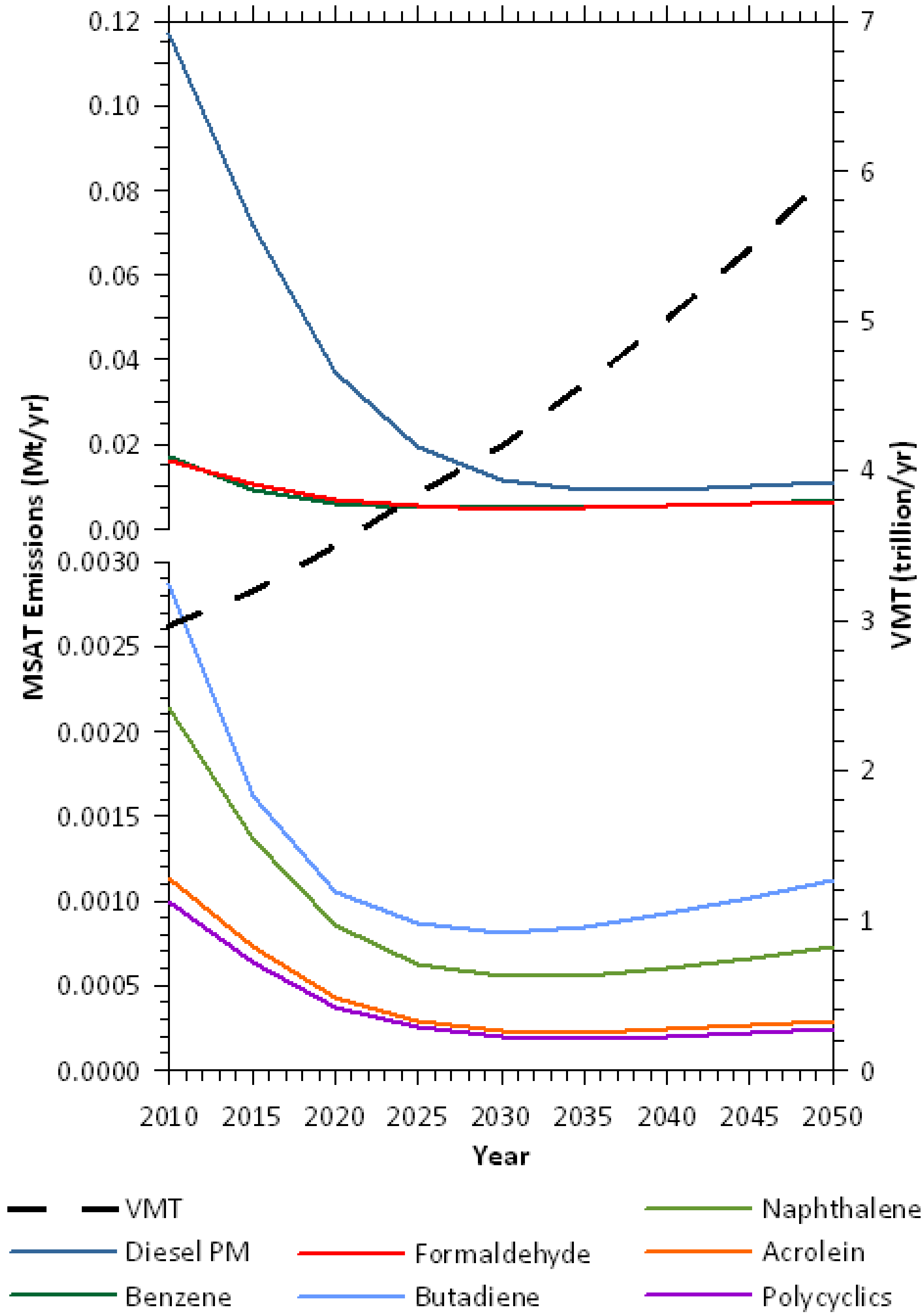
Motor Vehicle Emissions Simulator (MOVES)

According to EPA, MOVES improves upon the previous MOBILE model in several key aspects: MOVES is based on a vast amount of in-use vehicle data collected and analyzed since the latest release of MOBILE, including millions of emissions measurements from light-duty vehicles. Analysis of this data enhanced EPA's understanding of how mobile sources contribute to emissions inventories and the relative effectiveness of various control strategies. In addition, MOVES accounts for the significant effects that vehicle speed and temperature have on PM emissions estimates, whereas MOBILE did not. MOVES2010b includes all air toxic pollutants in NATA that are emitted by mobile sources. EPA has incorporated more recent data into MOVES2010b to update and enhance the quality of MSAT emission estimates. These data reflect advanced emission control technology and modern fuels, plus additional data for older technology vehicles.

Based on an FHWA analysis using EPA's MOVES2010b model, as shown in Figure 1, even if vehicle-miles travelled (VMT) increases by 102 percent as assumed from 2010 to 2050, a combined reduction of 83 percent in the total annual emissions for the priority MSAT is projected for the same time period.

The implications of MOVES on MSAT emissions estimates compared to MOBILE are: lower estimates of total MSAT emissions; significantly lower benzene emissions; significantly higher diesel PM emissions, especially for lower speeds. Consequently, diesel PM is projected to be the dominant component of the emissions total.

Figure 1: NATIONAL MSAT EMISSION TRENDS 1999 – 2050 FOR VEHICLES OPERATING ON ROADWAYS USING EPA's MOVES2010b MODEL



Note: Trends for specific locations may be different, depending on locally derived information representing vehicle-miles travelled, vehicle speeds, vehicle mix, fuels, emission control programs, meteorology, and other factors

Source: EPA MOVES2010b model runs conducted during May - June 2012 by FHWA.

MSAT Research

Air toxics analysis is a continuing area of research. While much work has been done to assess the overall health risk of air toxics, many questions remain unanswered. In particular, the tools and techniques for assessing project-specific health outcomes as a result of lifetime MSAT exposure remain limited. These limitations impede the ability to evaluate how potential public health risks posed by MSAT exposure should be factored into project-level decision-making within the context of NEPA.

Nonetheless, air toxics concerns continue to be raised on highway projects during the NEPA process. Even as the science emerges, we are duly expected by the public and other agencies to address MSAT impacts in our environmental documents. The FHWA, EPA, the Health Effects Institute, and others have funded and conducted research studies to try to more clearly define potential risks from MSAT emissions associated with highway projects. The FHWA will continue to monitor the developing research in this field.

NEPA Context

The NEPA requires, to the fullest extent possible, that the policies, regulations, and laws of the Federal Government be interpreted and administered in accordance with its environmental protection goals. The NEPA also requires Federal agencies to use an interdisciplinary approach in planning and decision-making for any action that adversely impacts the environment. The NEPA requires and FHWA is committed to the examination and avoidance of potential impacts to the natural and human environment when considering approval of proposed transportation projects. In addition to evaluating the potential environmental effects, we must also take into account the need for safe and efficient transportation in reaching a decision that is in the best overall public interest. The FHWA policies and procedures for implementing NEPA are contained in regulation at 23 CFR Part 771.

Incomplete or Unavailable Information for Project-Specific MSAT Health Impacts Analysis

In FHWA's view, information is incomplete or unavailable to credibly predict the project-specific health impacts due to changes in MSAT emissions associated with a proposed set of highway alternatives. The outcome of such an assessment, adverse or not, would be influenced more by the uncertainty introduced into the process through assumption and speculation rather than any genuine insight into the actual health impacts directly attributable to MSAT exposure associated with a proposed action.

The U.S. Environmental Protection Agency (EPA) is responsible for protecting the public health and welfare from any known or anticipated effect of an air pollutant. They are the lead authority for administering the Clean Air Act and its amendments and have specific statutory obligations with respect to hazardous air pollutants and MSAT. The EPA is in the continual process of assessing human health effects, exposures, and risks posed by air pollutants. They maintain the Integrated Risk Information System (IRIS), which is "a compilation of electronic reports on specific substances found in the environment and their potential to cause human health effects" (EPA, http://www.epa.gov/iris/). Each report contains assessments of non-cancerous and cancerous effects for individual compounds and quantitative estimates of risk levels from lifetime oral and inhalation exposures with uncertainty spanning perhaps an order of magnitude.

Other organizations are also active in the research and analyses of the human health effects of MSAT, including the Health Effects Institute (HEI). Two HEI studies are summarized in Appendix D of FHWA's Interim Guidance Update on Mobile source Air Toxic Analysis in NEPA Documents. Among the adverse health effects linked to MSAT compounds at high exposures are; cancer in humans in occupational settings; cancer in animals; and irritation to the respiratory tract, including the exacerbation of asthma. Less obvious is the adverse human health effects of MSAT compounds at current environmental concentrations (HEI, http://pubs.healtheffects.org/view.php?id=282) or in the future as vehicle emissions substantially decrease (HEI, http://pubs.healtheffects.org/view.php?id=306).

The methodologies for forecasting health impacts include emissions modeling; dispersion modeling; exposure modeling; and then final determination of health impacts - each step in the process building on the model predictions obtained in the previous step. All are encumbered by technical shortcomings or uncertain science that prevents a more complete differentiation of the MSAT health impacts among a set of project alternatives. These difficulties are magnified for lifetime (i.e., 70 year) assessments, particularly because unsupportable assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over that time frame, since such information is unavailable.
It is particularly difficult to reliably forecast 70-year lifetime MSAT concentrations and exposure near roadways; to determine the portion of time that people are actually exposed at a specific location; and to establish the extent attributable to a proposed action, especially given that some of the information needed is unavailable.

There are considerable uncertainties associated with the existing estimates of toxicity of the various MSAT, because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population, a concern expressed by HEI (http://pubs.healtheffects.org/view.php?id=282). As a result, there is no national consensus on air dose-response values assumed to protect the public health and welfare for MSAT compounds, and in particular for diesel PM. The EPA (http://www.epa.gov/risk/basicinformation.htm#g) and the HEI (http://pubs.healtheffects.org/getfile.php?u=395) have not established a basis for quantitative risk assessment of diesel PM in ambient settings.

There is also the lack of a national consensus on an acceptable level of risk. The current context is the process used by the EPA as provided by the Clean Air Act to determine whether more stringent controls are required in order to provide an ample margin of safety to protect public health or to prevent an adverse environmental effect for industrial sources subject to the maximum achievable control technology standards, such as benzene emissions from refineries. The decision framework is a two-step process. The first step requires EPA to determine an "acceptable" level of risk due to emissions from a source, which is generally no greater than approximately 100 in a million. Additional factors are considered in the second step, the goal of which is to maximize the number of people with risks less than 1 in a million due to emissions from a source. The results of this statutory two-step process do not guarantee that cancer risks from exposure to air toxics are less than 1 in a million; in some cases, the residual risk determination could result in maximum individual cancer risks that are as high as approximately 100 in a million. In a June 2008 decision, the U.S. Court of Appeals for the District of Columbia Circuit upheld EPA's approach to addressing risk in its two step decision framework. Information is incomplete or unavailable to establish that even the largest of highway projects would result in levels of risk greater than deemed acceptable.

Because of the limitations in the methodologies for forecasting health impacts described, any predicted difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with predicting the impacts. Consequently, the results of such assessments would not be useful to decision makers, who would need to weigh this information against project benefits, such as reducing traffic congestion, accident rates, and fatalities plus improved access for emergency response, that are better suited for quantitative analysis.

Due to the limitations cited, a discussion such as the example provided in this Appendix (reflecting any local and project-specific circumstances), should be included regarding incomplete or unavailable information in accordance with Council on Environmental Quality (CEQ) regulations [40 CFR 1502.22(b)]. The FHWA Headquarters and Resource Center staff Victoria Martinez (787) 766-5600 X231, Bruce Bender (202) 366-2851, and Michael Claggett (505) 820-2047, are available to provide guidance and technical assistance and support.

APPENDIX E: MSAT VMT CALCULATIONS

Table E-1: Pellissippi Parkway Extension Link by Link VMTs, Four-Lane Alternatives*

Segment	No-Build			Four-Lane Alternatives*		
	Length (mi)	2040 ADT	Daily VMT	Length (mi)	2040 ADT	Daily VMT
Wildwood Road						
E. Broadway / Old Knoxville Hwy (SR 33) to Reservoir Rd	1.31	7,640	10,008	1.31	7,180	9,406
Reservoir Rd to Sam Houston School Rd	1.34	17,870	23,946	1.34	7,630	10,224
Sam Houston School Rd to End of Study Area	2.09	7,390	15,445	2.09	6,600	13,794
Pellissippi Parkway						
Topside Rd to Alcoa Hwy (SR 115/US 129)	1.43	67,480	96,496	1.43	73,980	105,791
Alcoa Hwy (SR 115/US 129) to Relocated Alcoa Highway	1.00	40,850	40,850	1.00	51,750	51,750
Relocated Alcoa Highway to E. Broadway / Old Knoxville Hwy (SR 33)	1.47	34,320	50,450	1.47	55,330	81,335
E. Broadway / Old Knoxville Hwy (SR 33) to US 411 (SR 35)	-	-	-	2.98	38,040	113,359
US 411 (SR 35) to Lamar Alexander Pkwy (SR 73/US 321)	-	-	-	1.39	25,240	35,084
Lamar Alexander Parkway (SR 73 / US 321)						
E. Broadway / Old Knoxville Hwy (SR 33) to Jones Ave	0.87	38,020	33,077	0.87	32,580	28,345
Jones Ave to Merritt Rd	1.46	39,020	56,969	1.46	30,680	44,793
Merritt Rd to Tuckaleechee Pk	3.04	33,860	102,934	3.04	28,120	85,485
Tuckaleechee Pk to Tuckaleechee Pk	0.30	33,110	9,933	0.30	37,420	11,226
Tuckaleechee Pk to Melrose Station Rd	2.70	23,860	64,422	2.70	28,160	76,032
Melrose Station Rd to Foothills Pkwy	2.38	11,650	27,727	2.38	12,970	30,869
Hall Road (SR 35)						
Alcoa Hwy (SR 115/US 129) to Bessemer St	1.52	35,370	53,762	1.52	31,200	47,424
Bessemer St to E. Broadway / Old Knoxville Hwy (SR 33)	1.07	32,530	34,807	1.07	23,930	25,605
Washington Street (SR 35)						
E. Broadway / Old Knoxville Hwy (SR 33) / US 411 (SR 35)	0.23	29,900	6,877	0.23	20,130	4,630
US 411 (SR 35) Lamar Alexander Pkwy (SR 73 / US 321)	0.16	25,570	4,091	0.16	18,630	2,981
US 411 (SR 35)						
Washington Street (SR 35) to S. Everett High Rd	0.87	15,400	13,398	0.87	13,780	11,989
S. Everett High Rd to Westfield Dr.	0.84	15,080	12,667	0.84	14,800	12,432
Westfield Dr. to Hitch Rd	2.73	14,140	38,602	2.73	14,800	40,404
Hitch Rd to End of Study Area	0.74	15,670	11,596	0.74	19,800	14,652

Table E-1: Pellissippi Parkway Extension Link by Link VMTs, Four-Lane Alternatives*, continued

Segment	No-Build			Four-Lane Alternatives*		
	Length (mi)	2040 ADT	Daily VMT	Length (mi)	2040 ADT	Daily VMT
E. Broadway / Old Knoxville Hwy (SR 33)						
Hall Rd to Wildwood Rd	1.87	21,510	40,224	1.87	19,130	35,773
Wildwood Rd to Hunt Rd	1.26	19,470	24,532	1.26	17,210	21,685
Hunt Rd to Pellissippi Pkwy	0.45	36,330	16,349	0.45	36,130	16,259
Pellissippi Pkwy to Sam Houston School Rd	0.45	17,050	7,673	0.45	19,240	8,658
Sam Houston School Rd to County Line	4.29	11,940	51,223	4.29	19,240	82,540
Alcoa Highway (SR 115 / US 129)						
Louisville Rd to Hall Rd	1.26	62,250	78,435	1.26	61,380	77,339
Hall Rd to Hunt Rd	0.74	94,460	69,900	0.74	88,800	65,712
Hunt Rd to Relocated Alcoa Hwy	0.98	97,820	95,864	0.98	92,470	90,621
Relocated Alcoa Hwy to Pellissippi Pkwy	2.64	45,270	119,513	2.64	44,950	118,668
Pellissippi Pkwy to County Line	2.74	35,820	98,147	2.74	37,100	101,654
Sam Houston School Road						
SR 33 to Wildwood Rd	2.65	15,030	39,830	2.65	-	-
Peppermint Road						
Wildwood Rd to Sevierville Rd	1.10	5,960	6,556	1.10	-	-
Hitch Road						
Sevierville Rd to Davis Ford Rd	1.20	2,450	2,940	1.20	-	-
Helton Road						
Davis Ford Rd to Lamar Alexander Pkwy	0.88	640	563	0.88	-	-
TOTAL	**50**	**1,004,730**	**1,359,807**	**54**	**1,028,400**	**1,476,516**

* The four-lane alternatives are Preferred Alternative (A), Preferred Alternative with East Shift, Preferred Alternative with West Shift, and DEIS Alternative C.

Table E-2: Pellissippi Parkway Extension Link by Link VMTs, Alternative D

Segment	No-Build			Alternative D		
	Length (mi)	2040 ADT	Daily VMT	Length (mi)	2040 ADT	Daily VMT
Sam Houston School Road						
SR 33 to Wildwood Rd	2.65	15,030	39,830	2.65	16,800	44,520
Peppermint Road						
Wildwood Rd to Sevierville Rd	1.10	5,960	6,556	1.10	20,580	22,638
Hitch Road						
Sevierville Rd to Davis Ford Rd	1.20	2,450	2,940	0.90	14,890	13,401
Helton Road						
Davis Ford Rd to Lamar Alexander Pkwy	1.30	640	832	1.07	15,790	16,895
TOTAL	**6.25**	**24,080**	**50,158**	**5.72**	**68,060**	**97,454**