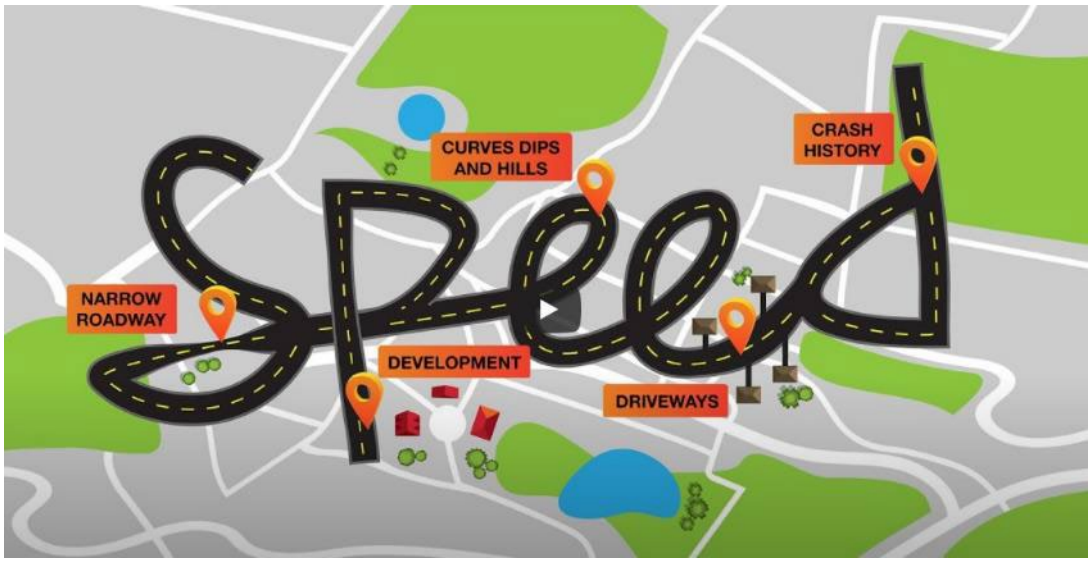
Texas Department of Transportation

Texas A&M Transportation Institute

Improving and Communicating Speed Management Practices

Workshop



Instructor's Guide

Product 5-7049-01-P2

Published: March 2025

Texas A&M Transportation Institute

Texas Department of Transportation

Improving & Communicating Speed Management Practices: Workshop

Project 5-7049-01
Product 5-7049-01-P2
July 2024

IMPROVING AND COMMUNICATING SPEED MANAGEMENT PRACTICES: WORKSHOP INSTRUCTOR GUIDE

by

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Report 5-7049-01-P2
Project 5-7049-01
Project Title: Implementation of Improving and Communicating Speed Management Practices

Performed in cooperation with the
Texas Department of Transportation
and the
Federal Highway Administration

Submitted: September 2024

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DISCLAIMER

This research was performed in cooperation with the Texas Department of Transportation (TxDOT) and the Federal Highway Administration (FHWA). The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official view or policies of FHWA or TxDOT. This report does not constitute a standard, specification, or regulation. This report is not intended for construction, bidding, or permit purposes. The engineers in charge of the project were Kay Fitzpatrick, P.E. (TX #86762) and Steve Venglar, P.E. (TX #84027).

The United States Government and the State of Texas do not endorse products or manufacturers. Trade or manufacturers' names appear herein solely because they are considered essential to the object of this report.

ACKNOWLEDGMENTS

This project was conducted in cooperation with TxDOT and FHWA. Katelyn Kasberg of TxDOT served as the project manager. The authors gratefully acknowledge the assistance and direction that the TxDOT project advisors (Dale Picha, Darren McDaniel, Derryk Blasig, Gabriel Garcia, Heather Schmidt, and Jeremy Dearing) provided over the course of the project. The authors would like to acknowledge the contributions of Texas A&M Transportation Institute staff members Chandell Billings, Clyde Hance, David Martin, Nancy Pippin, and Eric Ontiveros for their contributions to this project.

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INTRODUCTION

Regulatory speed limits are among the most visible and routinely enforced traffic control devices motorists encounter in their everyday driving. Given this high degree of exposure and scrutiny, regulatory speed limits—and the practices and procedures used to develop them, inform drivers, and help enforce them—must be appropriate for their environment, defensible from an engineering and legal perspective, and comprehensible to the full range of mobility and safety stakeholders. Regulatory speed limits are a highly complex issue involving engineering, human factors, and political and societal concerns. The Texas Department of Transportation's (TxDOT's) current practices are described in the *Procedures for Establishing Speed Zones* manual, and new directions have been discussed in national research and policy-making activities, including the National Cooperative Highway Research Program (NCHRP) Research Report 966, *Posted Speed Limit Setting Procedure and Tool: User Guide*.

TxDOT Research Project 0-7049 was designed to increase the profession's understanding of the fundamental relationships between posted and operating speed, identify procedures for the establishment of regulatory speed limits, identify technologies that increase driver awareness and comprehension, and provide content to support external and internal TxDOT dialog about speed limits and their development for all roadway environments. The Research Team conducted dialogs with TxDOT districts to learn about the practices and procedures being used. New research was performed on operating speed relationships with regulatory speed limits and with roadway characteristics for urban freeways and for rural highways and suburban arterials. Developed communication tools included videos (one for engineers, and one for the public), a pamphlet for public distribution, answers to common questions about speed and speed limits, and a workshop on state and national speed limit setting practices.

Workshop Description

The workshop is three hours and thirty minutes in length and covers practices for conducting speed zone studies and setting regulatory speed limits, methodologies for analyzing site data, operating speed trends on several types of roadways, resources for communicating speed limit setting practices, and availability of speed management treatments. The format of the workshop consists primarily of a presentation using PowerPoint slides. Interactive sample problems are also conducted using an Excel-based spreadsheet program called NCHRP 17-76 Speed Limit Setting Tool (N17-76 SLS-Tool). The purpose of the N17-76 SLS-Tool is to facilitate the complex calculations needed to implement the guidance from NCHRP Report 966. Each participant is given a copy of the N17-76 SLS-Tool and instructed on its use during the sample problems.

How to Use This Document

This *Instructor Guide* provides a course instructor with the information needed for course preparation and presentation. Specifically, guidance is provided regarding course handouts and visual aids, equipment requirements, and emphasis of the key messages of the various workshop slides.

The instructor should read the front portion of this guide, titled "Instructor's Notes," during preparation for the workshop. This material explains the objectives and intended audience of the workshop, describes the necessary materials for the instructor and the students, and provides a checklist of tasks to be completed before, during, and after the workshop.

The instructor should read the second portion of this guide, titled "Workshop Lesson Slides," before the workshop and keep it within view while presenting the workshop. This material provides detailed information on specific slides in the presentation, including key messages to emphasize during the presentation and background information that can help answer questions from students.

The third section provides additional helpful information in the forms of solutions to the sample problems, an acronym and abbreviation list, copies of the communication materials developed in TxDOT Research Project 0-7049, and a list of references and source documents. This portion should be reviewed as needed, both before and during the workshop.

WORKSHOP OBJECTIVES

The first objective of this workshop is to review and discuss practices for conducting speed zone studies and setting regulatory speed limits. This material focuses first on TxDOT's current practices as described in the *Procedures for Establishing Speed Zones* manual, and then on new directions described in national research and policy-making activities, including NCHRP Research Report 966 (*Posted Speed Limit Setting Procedure and Tool: User Guide*). Students will have an opportunity to analyze two sample roadway speed zones twice: first using the *Procedures for Establishing Speed Zones* methodology, and then using the spreadsheet-based N17-76 SLS-Tool. These sample problems will provide an opportunity for the students to discuss the issues and challenges with analyzing speed zones and setting regulatory speed limits.

The second objective of this workshop is to inform the students about the availability of resources that can help them communicate speed limit setting practices and treatments that can help them manage speed on roadways. The communication resources include informational videos developed for engineers and citizens, an informational pamphlet, and talking points and frequently asked questions material. These resources were developed in TxDOT Research Project 0-7049.

After attending this workshop, the students should be able to apply the two discussed methodologies for setting regulatory speed limits (*Procedures for Establishing Speed Zones* and N17-76 SLS-Tool) and explain the methodologies to interested practitioners or citizens.

INTENDED AUDIENCE

The workshop is intended for engineers and technicians involved with setting regulatory speed limits, including conducting speed zone studies, analyzing site data, and designing speed zones. The tools (*Procedures for Establishing Speed Zones* and N17-76 SLS-Tool) discussed in the workshop were developed to document the process of setting regulatory speed limits and to assist with relevant calculations.

STUDENTS' MATERIALS

Each student is provided with one copy of the following materials:

- *Student's Guide*, which includes:
  - Agenda.
  - Slides.
  - Communication materials.
- NCHRP 17-76 Suggested Speed Limit Setting Tool:
  - Link to published versions (with macros, without macros) of N17-76 SLS-Tool: https://www.trb.org/Main/Blurbs/182038.aspx.
  - Version with macros, adapted with Texas crash data.
  - Version without macros, adapted with Texas crash data.
- Communication materials:
  - Frequently Asked Questions about Regulatory Speed Limits.
  - Common TxDOT Implementation Order for Speed Management Techniques.
  - "Setting Speed Limits," 2-page informational pamphlet.
  - Citizen 2-minute video, "Setting Texas Speed Limits," English version: https://youtu.be/9bCaHSRDUpc.
  - Citizen 2-minute video, "Setting Texas Speed Limits," Spanish version: https://youtu.be/8uD9HglDLQA.
  - Engineer 8-minute video, "The Texas Speed Zone Study Process": available from TxDOT's Traffic Safety Division.
- Link to *Speed Limits in Texas* (research report 0-7049-R1): https://library.ctr.utexas.edu/hostedpdfs/tti/0-7049-r1.pdf.

The *Student's Guide* booklet contains the workshop agenda, handout-sized copies of the PowerPoint slides (with two slides per page), communication materials developed in TxDOT Research Project 0-7049, and workshop evaluation forms that are filled out by the students. The two-page informational pamphlet is bound within the *Student's Guide*, and additional loose-leaf copies of the pamphlet can be printed, folded, and distributed if desired. Color printing should be used for the cover page and the pages containing the Common TxDOT Implementation Order matrix and the "Setting Speed Limits" pamphlet, as well as loose-leaf copies of the "Setting Speed Limits" pamphlet.

INSTRUCTOR'S MATERIALS

To conduct the workshop, the instructor must have the following materials:

- *Instructor's Guide*.
- *Student's Guide*.
- Workshop slides.
- Local copies of the engineer video and the citizen videos.
- Access to the following versions of the N17-76 SLS-Tool:
    - With macros.
    - Without macros.
    - With macros, adapted with Texas crash data.
    - Without macros, adapted with Texas crash data.

Of these five items, the slides, the videos, and the Instructor's Guide are the most essential. The four versions of the N17-76 SLS-Tool should be kept available for sample problems 3 and 4, as well as to answer questions that the students may ask about the tool.

EQUIPMENT REQUIREMENTS

In the workshop classroom, a computer must be provided for the instructor. This computer must be connected to a projector for the purpose of displaying the PowerPoint presentation slides. The provision of screenshots of the N17-76 SLS-Tool in the slides allows the presentation to be made without using the tool. However, the computer should have Excel in case a question involves its use during the workshop.

The workshop classroom must also have computers available for each student, or the students must provide their own computers. These computers must have Excel so that the participants can use the N17-76 SLS-Tool and access the N17-76 SLS-Tool through appropriate means (web download and/or USB memory drive).

WORKSHOP AGENDA

The workshop agenda is provided in Table 1. As shown, there are three hours and thirty minutes of instruction, so the workshop can be presented with a morning agenda or an afternoon agenda.

The sample problems in each lesson are designed such that students can analyze the same site multiple times using different sets of guidance. Sample problems 1 and 2 involve applying the *Procedures for Establishing Speed Zones* methodology to a rural freeway segment and a suburban arterial segment, respectively. Sample problems 3 and 4 involve applying the NCHRP Report 966 methodology to the same two segments using the N17-76 SLS-Tool and comparing the results obtained using the two methodologies. Sample problem 5 involves an open discussion of speed management treatments on the same suburban arterial segment that was analyzed in sample problems 2 and 4. Table 2 summarizes the threading of the sample problems and their analysis tasks.

Table 1. Workshop Agenda with Typical Start Times.

Start Time (Morning)	Start Time (Afternoon)	Lesson	Material Covered
8:00	1:00	Introduction and Scope	Overview of workshop agenda and scope.
8:35	1:35	Lesson 1: Speed Study Approach within Texas	A viewing of the engineer video. TxDOT guidance for setting regulatory speed limits, focusing on the *Procedures for Establishing Speed Zones* manual and the use of the 85th percentile speed. Two sample problems to apply the TxDOT guidance.
9:10	2:10	Break	Break.
9:15	2:15	Lesson 2: Recent National Activities	Directions discussed and researched in other states and at the federal level. The context-based speed limit framework synthesized in NCHRP Research Project 17-76. Two sample problems to apply the NCHRP 17-76 framework.
10:00	3:00	Lesson 3: Operating Speed Research	Findings from the analysis of operating speed relationships for rural highways, urban/suburban streets, and freeways.
10:25	3:25	Break	Break.
10:30	3:30	Lesson 3 (continued)	Continuation of Lesson 3.
10:55	3:55	Lesson 4: Helpful Resources for Communicating Practices	A viewing of the citizen video. The two-page informational pamphlet and the Frequently Asked Questions document. Speed management treatment availability and implementation order. One sample problem to apply speed management treatments.
11:15	4:15	Closure	Final questions about workshop material.
11:30	4:30	Adjourn	Adjourn.

Table 2. Sample Problem Analysis Task Matrix.

Analysis Task	Rural Freeway Segment	Suburban Arterial Segment
Apply *Procedures for Establishing Speed Zones* methodology	Problem 1	Problem 2
Apply *NCHRP Report 966* methodology using the N17-76 SLS-Tool	Problem 3	Problem 4
Compare results from methodologies	Problem 3	Problem 4
Discuss speed management treatment options	None	Problem 5

INSTRUCTOR'S CHECKLISTS

The following checklists summarize the key tasks that the instructor must complete before, during, and after the workshop.

Before the Workshop

- ☐ Confirm the date, time, and location of the workshop with the TxDOT coordinator.
- ☐ Obtain a count of expected participants no less than one week before the workshop.
- ☐ Order one set of participant materials for each participant, plus a few spare sets if desired.
- ☐ Order one set of instructor materials.
- ☐ Make all necessary arrangements to travel to the workshop venue. This may include a rental or corporate vehicle, plane tickets, and a hotel room.
- ☐ If driving to the workshop venue, place the instructor materials and the needed number of sets of participant materials in a box to be brought to the venue. If flying to the workshop venue, pack the instructor materials with personal luggage and ship the participant materials to the venue.
- ☐ Obtain a copy of the roster of expected participants at the workshop venue.
- ☐ Obtain local copies of the engineer video and the citizen videos.
- ☐ Review the portions of this *Instructor's Guide* that address the workshop lessons.
- ☐ Save a copy of the PowerPoint file of the workshop slides, the videos, and the N17-76 SLS-Tool on a USB memory drive to be brought to the workshop venue.
- ☐ Arrive at the workshop venue about 45 minutes before the start of the workshop to ensure that the classroom can be arranged and students and the instructor can log into computers.
- ☐ If the login data (name and password, as applicable) are not provided on the students' computers, write this information on a board where all students can see.
- ☐ If the students' computers are connected to a shared network drive, determine how to make the tool available via the shared network drive, in case some participants are otherwise unable to access the tool.
- ☐ Obtain the contact information for the information technology assistant at the workshop venue in case equipment problems occur during the workshop.
- ☐ Distribute the student materials to the students in the classroom.

During the Workshop

- ☐ Start on time and stay on track. Keep a copy of the workshop agenda in view and check it periodically to evaluate the presentation pace.
- ☐ Walk among the local students as they work on sample problems and offer help when needed. When most of the students are finished, return to the instructor's computer and continue presenting the workshop material.

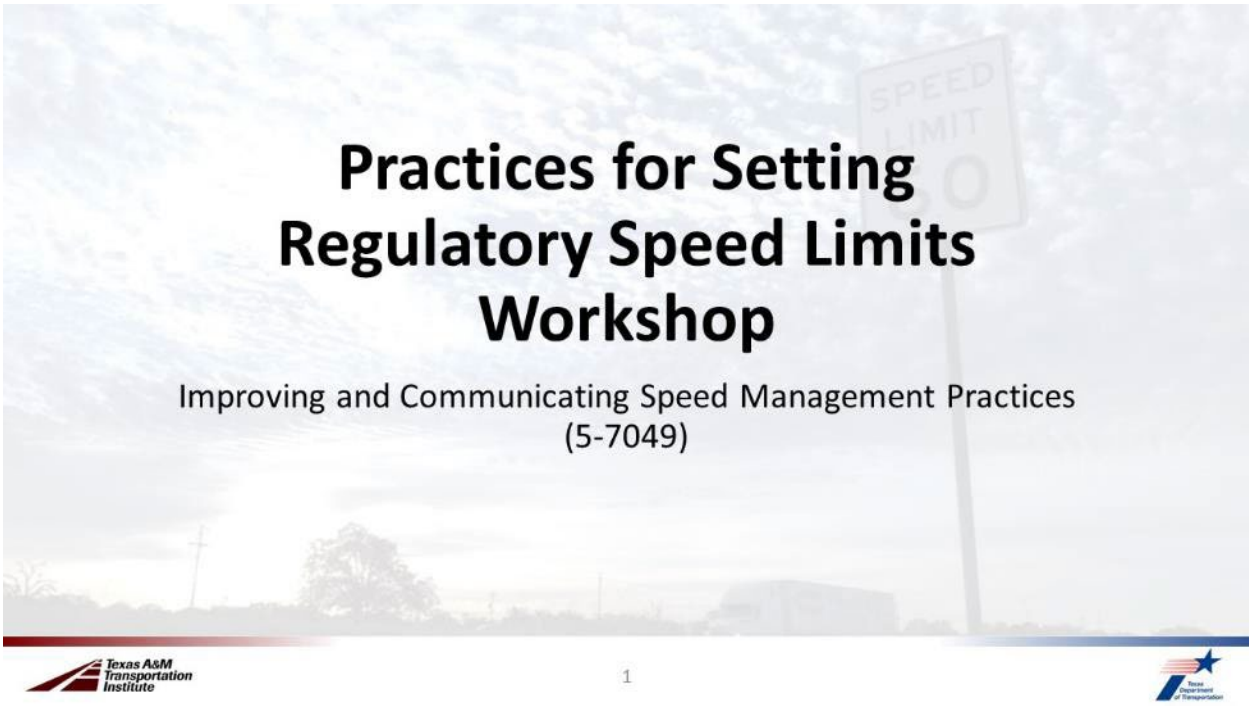
After the Workshop

- ☐ Ask the students to fill out their workshop evaluation forms.
- ☐ Collect the completed workshop evaluation forms from the students.
- ☐ Collect unused copies of the student materials.
- ☐ Obtain all workshop evaluation forms before presenting the next workshop offering. Review the comments from the students and make necessary adjustments.

WORKSHOP LESSON SLIDES

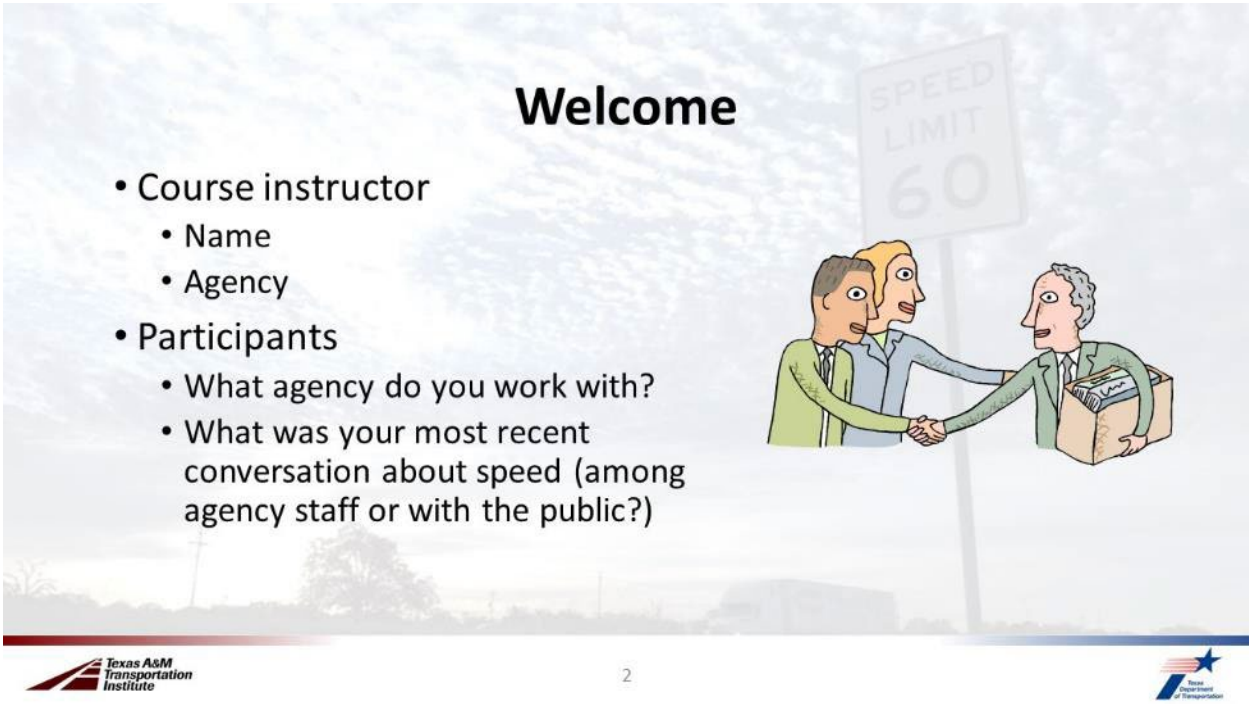
WELCOME

Slide 1



Key Message:
None.

Slide 2



Key Message:
None.

Interactivity:
Ask: What agencies do the students represent?

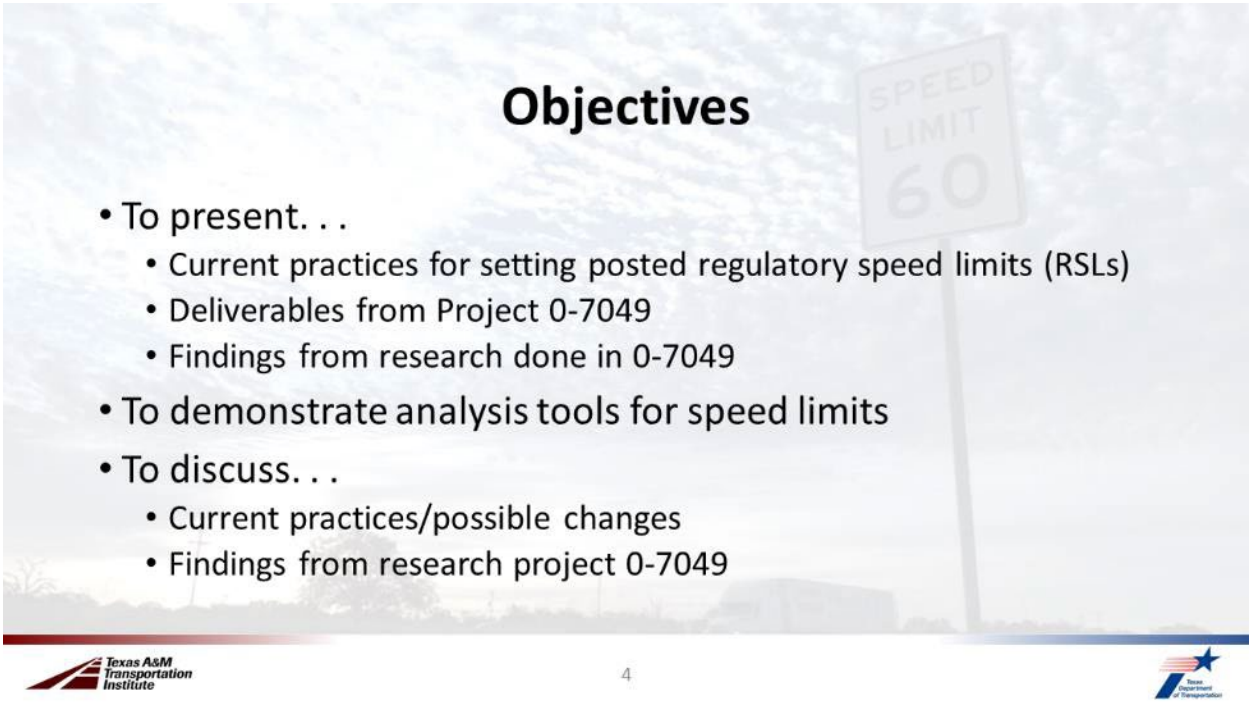
Ask: What kinds of conversations have the students recently had about speed as an operational and safety issue, and with whom?

INTRODUCTION AND SCOPE

Slide 3

Key Message:
The next few slides introduce the workshop material and define the scope.

Slide 4



Key Message:
The objectives of this workshop are to discuss practices for setting regulatory speed limits, the findings and deliverables from TxDOT Research Project 0-7049, and relevant analysis tools and communication resources available to help practitioners.

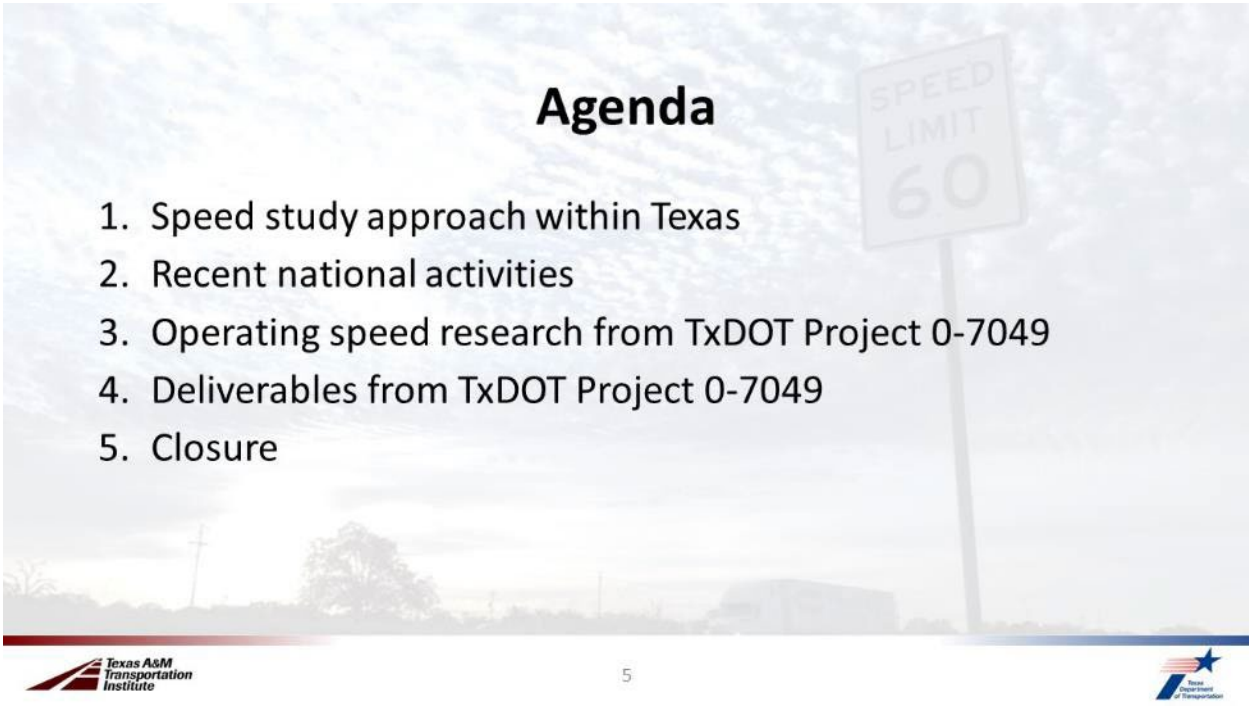
Background:
TxDOT Research Project 0-7049, Improving and Communicating Speed Management Practices, was conducted from May 2019 to August 2022.

Interactivity:
Tell: The first objective of this workshop is to present current practices for setting regulatory speed limits and the deliverables and findings from TxDOT Research Project 0-7049. The deliverables provide guidance on setting regulatory speed limits and resources to assist in communicating practices. These deliverables are listed in the front portion of the *Student's Guide*.

Tell: The second objective of this workshop is to demonstrate analysis tools. These tools include a set of spreadsheets used to estimate regulatory speed limits based on site characteristics, speed distribution, and crash history.

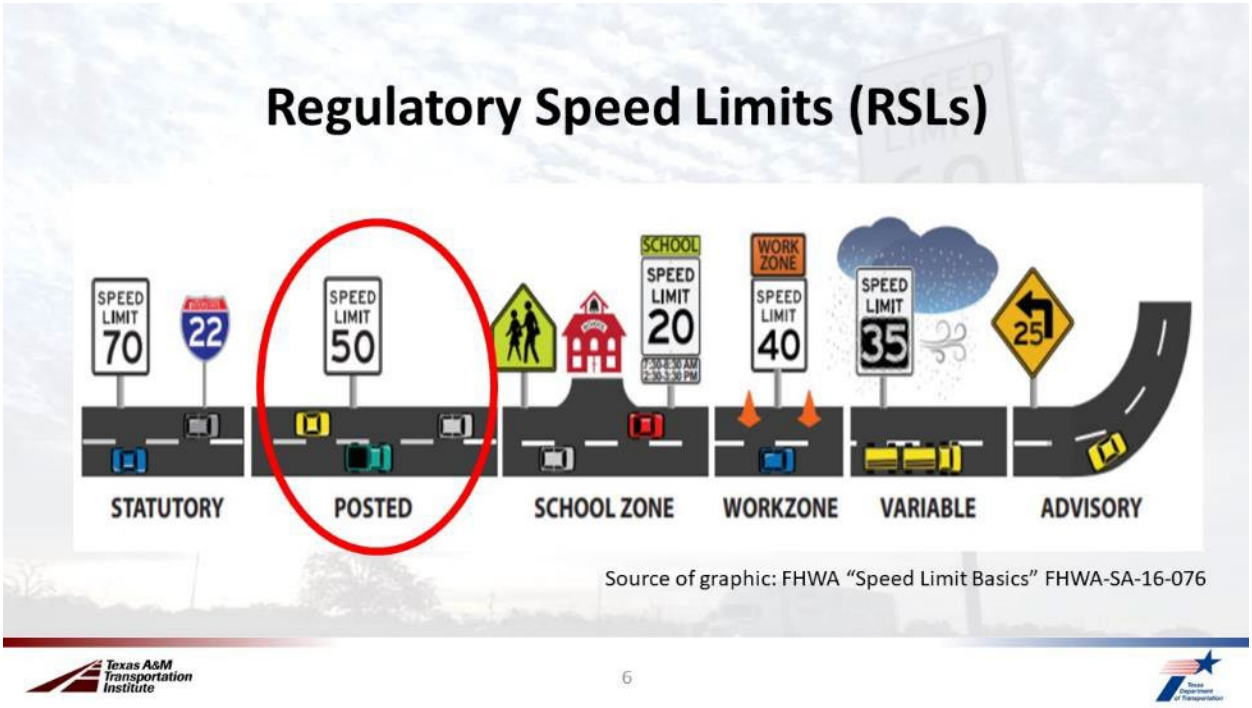
Tell: The third objective of this workshop is to provide an opportunity for open discussion on practices and findings regarding regulatory speed limits and vehicle speed trends.

Slide 5



Key Message:
This workshop focuses on the current speed study approach within Texas, recent national activities regarding discussions and revisions to the practice, and the findings and deliverables from TxDOT Research Project 0-7049. This agenda is listed in the front portion of the *Student's Guide*.

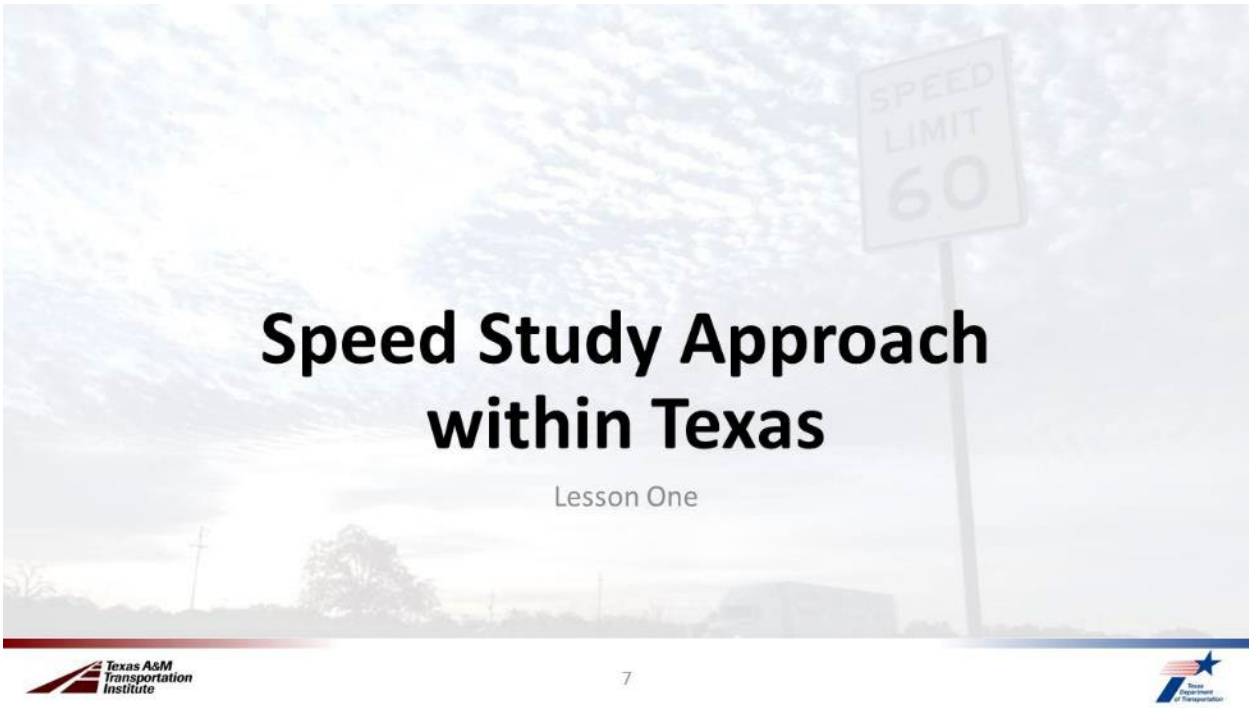
Slide 6



Key Message:
Several types of speed limits exist and are used for various purposes. This workshop focuses on regulatory speed limits that are set and posted based on the results of a speed zone study and communicate a legal requirement to motorists.

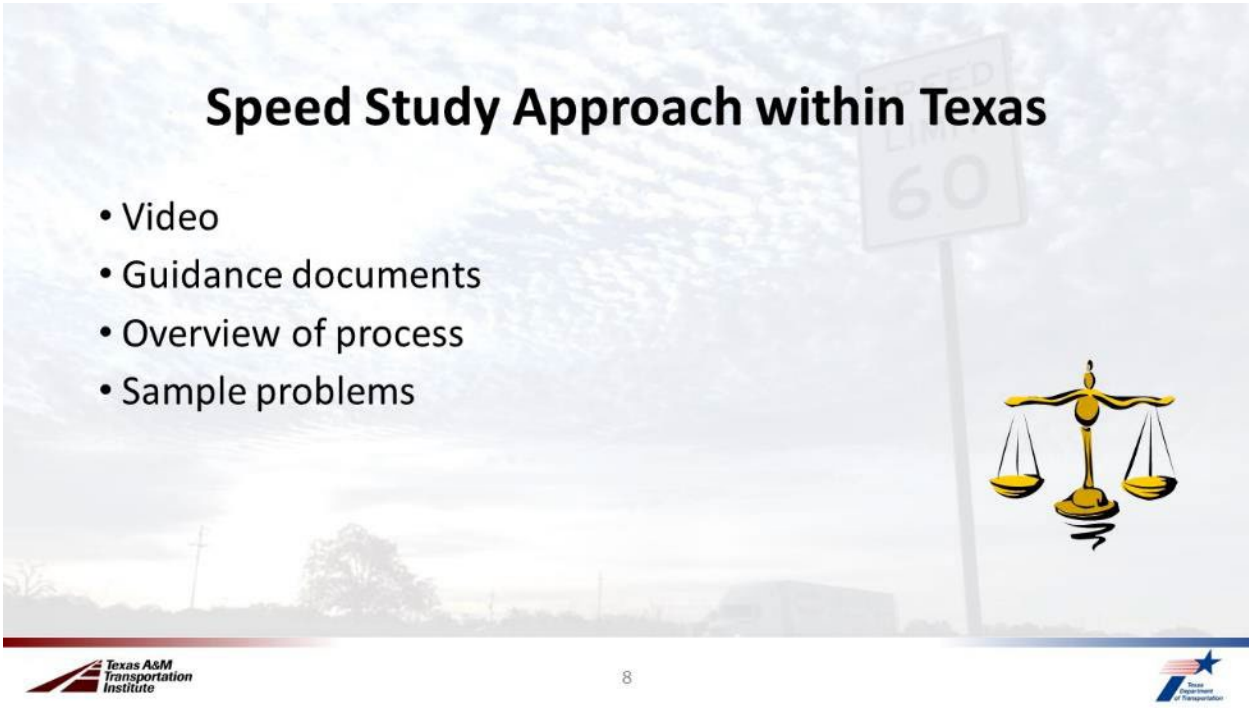
LESSON ONE: SPEED STUDY APPROACH WITHIN TEXAS

Slide 7



Key Message:
Lesson One summarizes TxDOT's regulatory speed zone study approach.

Slide 8



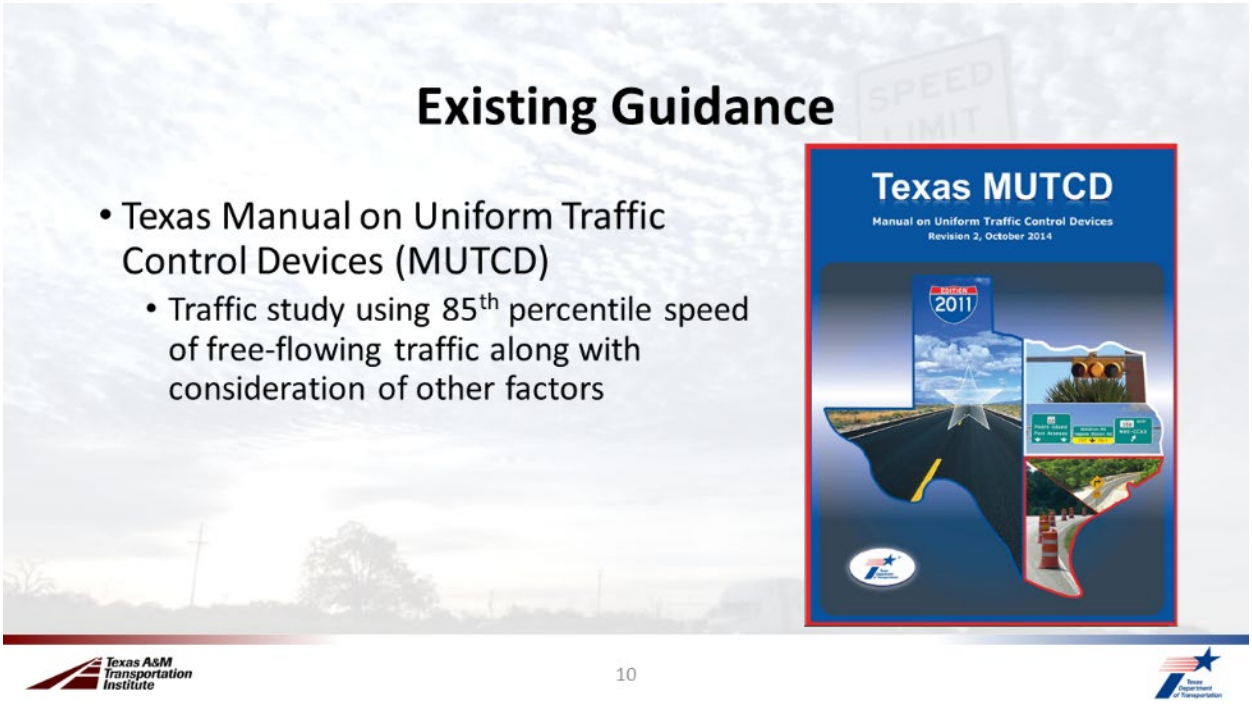
Key Message:
Lesson One will consist of a viewing of the engineer video, a review of TxDOT guidance documents, an overview of TxDOT's regulatory speed limit setting process, and two sample problems to demonstrate the process.

Slide 9

Key Message:
The engineer video describes the process for conducting a speed zone study to set regulatory speed limits in Texas. Its intended audience is engineers, technicians, and other practitioners.

Notes:
The engineer video is available from TxDOT's Traffic Safety Division. The instructor should obtain a local copy of the video before the workshop and exit the slide presentation to play the video after discussing this slide.

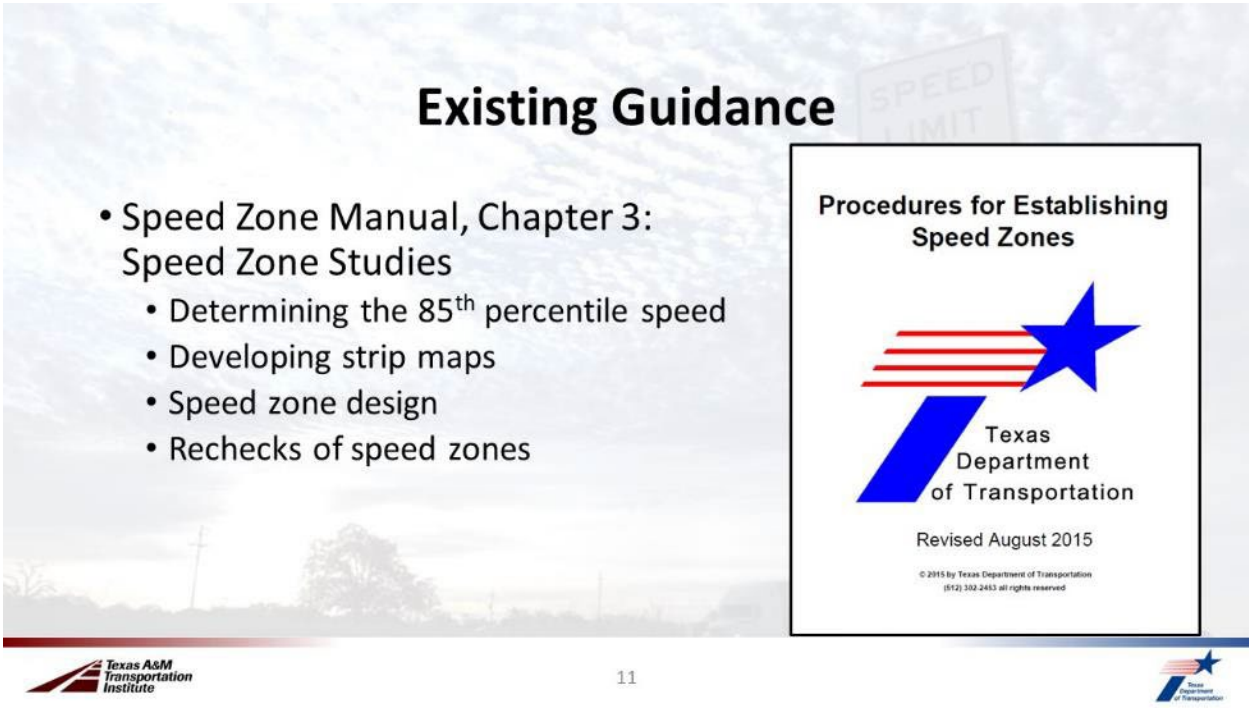
Slide 10



Key Message:
The *Texas Manual on Uniform Traffic Control Devices* (MUTCD) requires establishing speed zones based on a traffic engineering study that accounts for the 85th percentile speed of free-flowing traffic and other factors.

Background:
When this workshop material was developed, the Texas MUTCD edition in effect was the 2011 Edition, Revision 2, published October 2014. The material referenced in this slide come from Section 2B.13, Speed Limit Sign (R2-1).

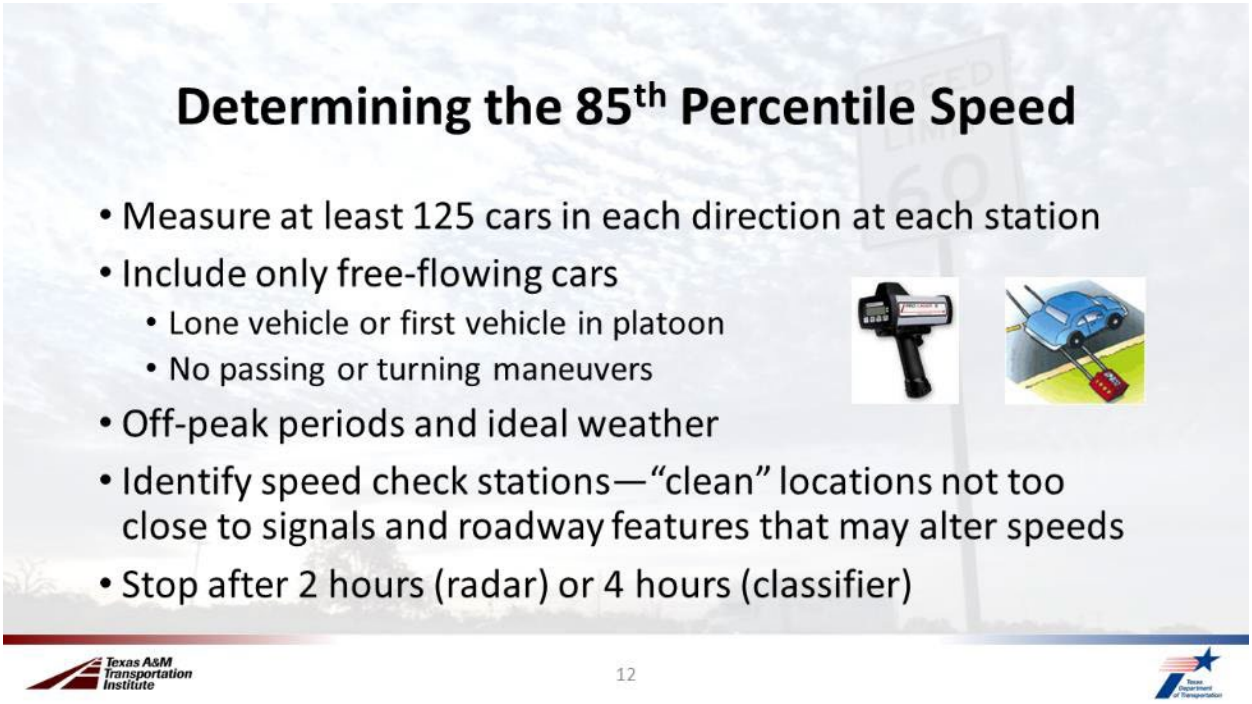
Slide 11



Key Message:
Chapter 3 of TxDOT's *Procedures for Establishing Speed Zones*, or "Speed Zone Manual," provides detailed procedures for setting regulatory speed limits.

Background:
When this workshop material was developed, the Speed Zone Manual edition in effect was the August 2015 revision.

Slide 12



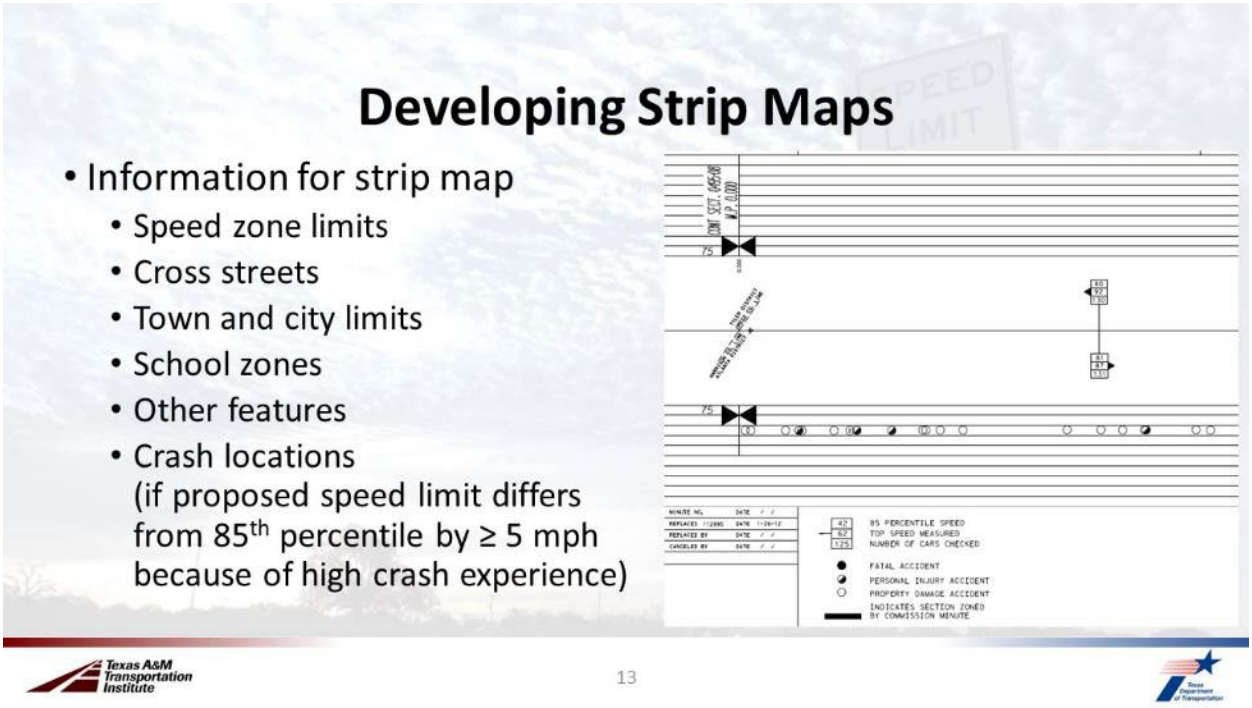
Key Message:
The key step in TxDOT's speed zone study procedure is to determine the 85th percentile speed of free-flowing traffic.

Interactivity:
Tell: The Speed Zone Manual calls for measuring at least 125 free-flowing cars (lone vehicle or first vehicle in a platoon, not performing passing or turning maneuvers) in each travel direction at each speed-measuring station.

Tell: The study should be conducted during off-peak periods, in ideal weather, and at locations that are not near signals or roadway features that may alter speeds.

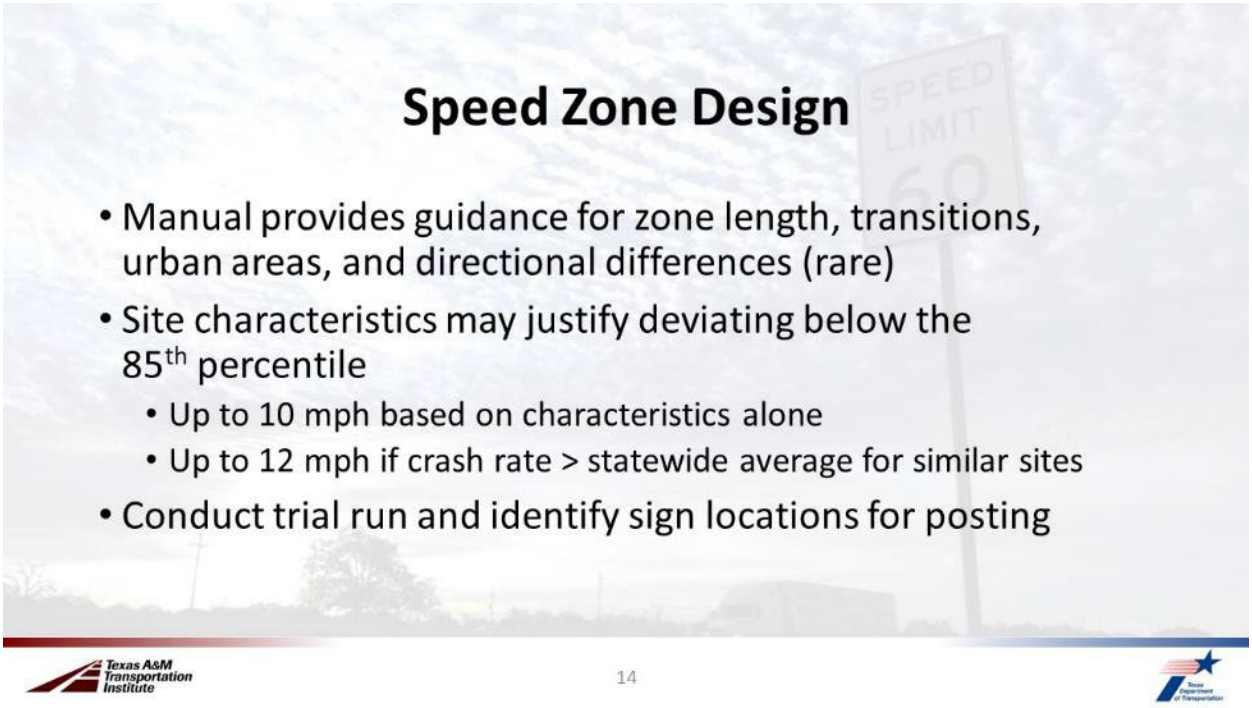
Tell: The study can be stopped after 2 hours if radar is used to measure vehicle speeds, or after 4 hours if classifiers and sensors are used.

Slide 13



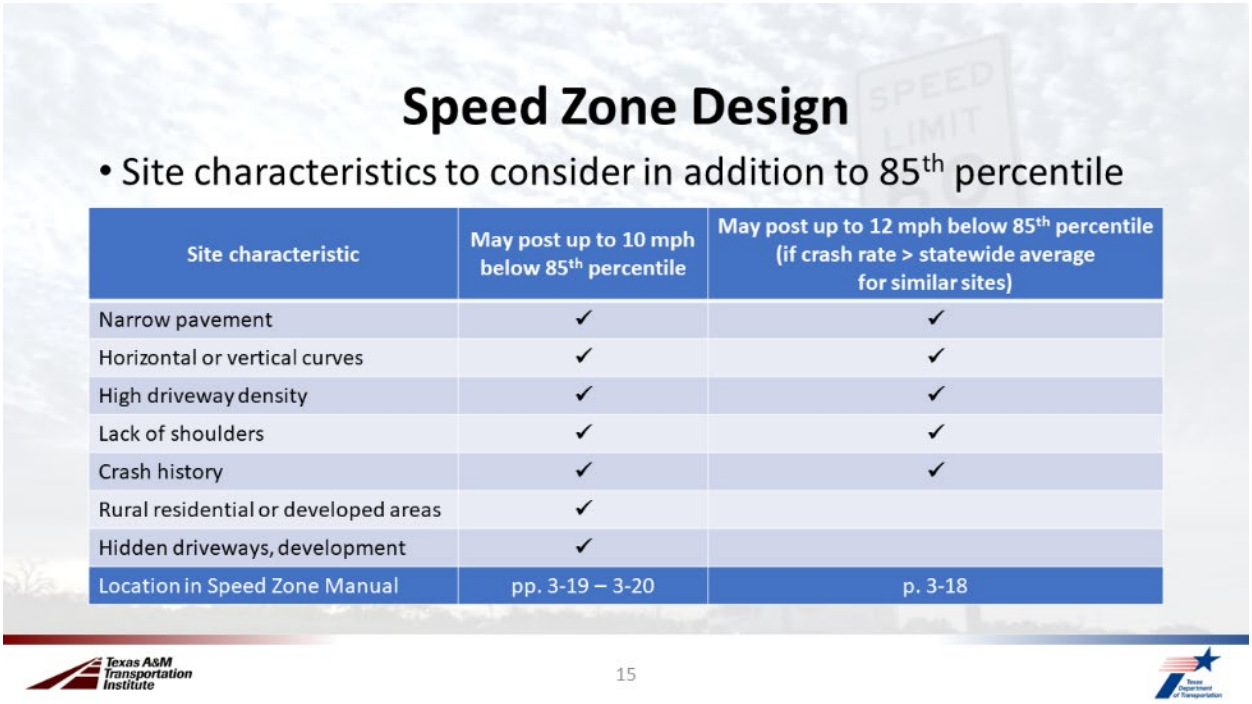
Key Message:
TxDOT's speed zone study procedure calls for creating strip maps to document speed zone limits and features, as well as crash locations if the proposed speed limit differs from the 85th percentile speed by 5 mph or more because of high crash experience.

Slide 14



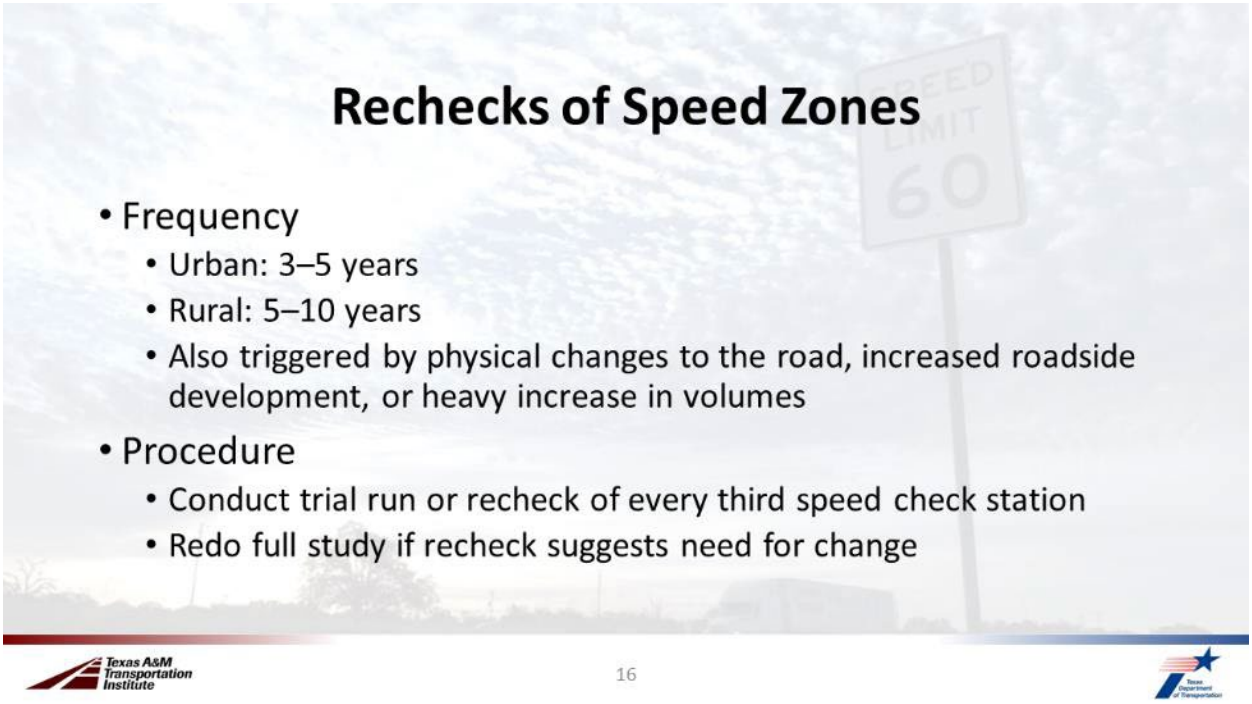
Key Message:
The Speed Zone Manual provides guidance for designing the speed zone of interest and identifying sign locations. It also lists site characteristics that may justify deviating up to 10–12 mph below the 85th percentile speed.

Slide 15



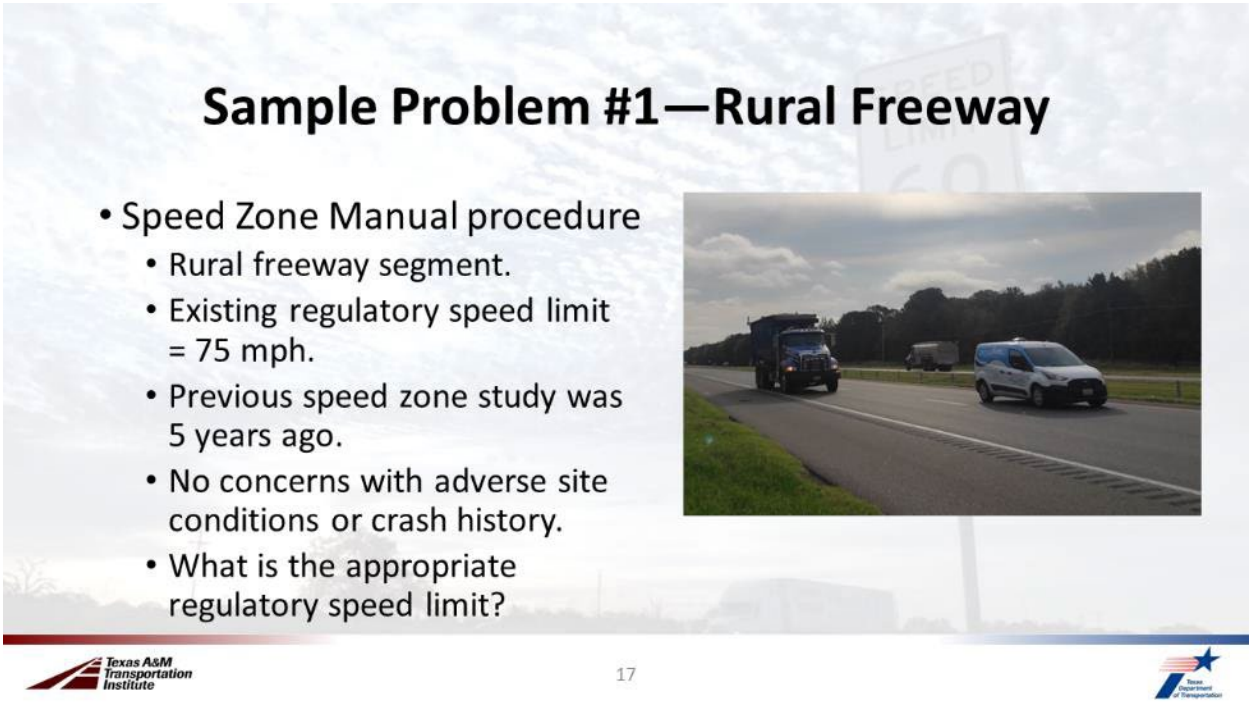
Key Message:
The Speed Zone Manual provides one list of site characteristics that may justify posting a regulatory speed limit as much as 10 mph below the 85th percentile speed, and a second list that may justify posting a regulatory speed limit as much as 12 mph below the 85th percentile speed if the crash rate at the site of interest is more than the statewide average rate for similar sites.

Slide 16



Key Message:
The Speed Zone Manual provides guidance for rechecking existing speed zones.

Slide 17



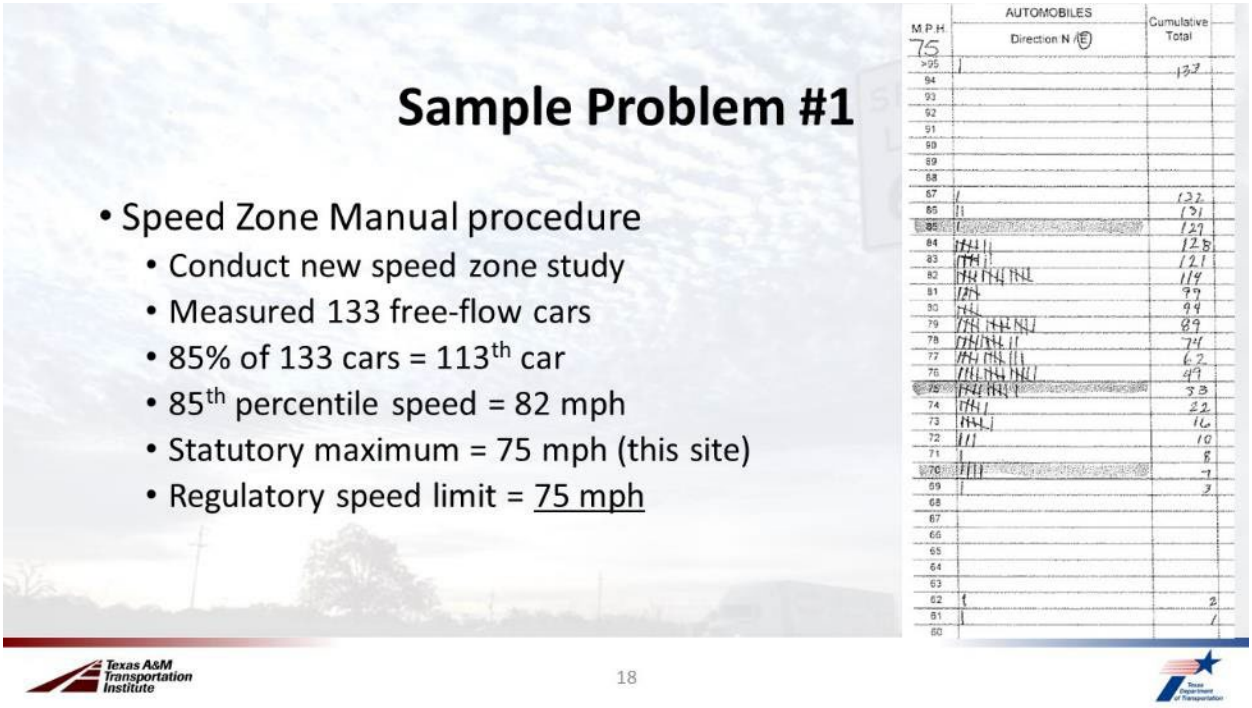
Key Message:
The Speed Zone Manual describes the procedures for setting regulatory speed limits in speed zones of interest.

Interactivity:
Tell: This sample problem involves checking and possibly changing a regulatory speed limit on a rural freeway segment. The existing regulatory speed limit is 75 mph. The last speed zone study was conducted five years ago. There are no concerns with adverse site conditions or crash history.

Ask: What is the appropriate regulatory speed limit, and what information do we need to collect to conduct our analysis?

Notes:
The input data and answer to this sample problem are provided on page R-2 of this *Instructor's Guide*.

Slide 18



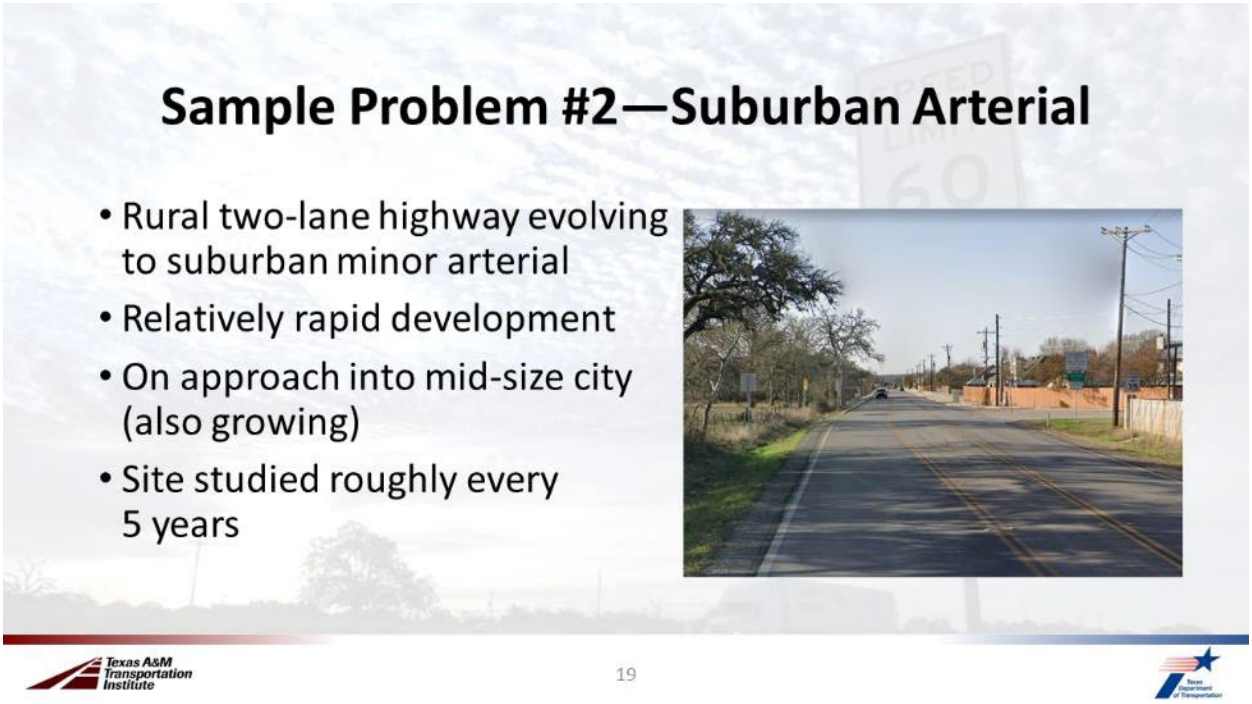
Key Message:
The key step in TxDOT's speed zone study procedure is to determine the 85th percentile speed of free-flowing traffic. In this case, the statutory maximum will constrain the setting of the regulatory speed limit.

Interactivity:
Tell: In the shown tally sheet, the field crew recorded the speeds of 133 free-flow cars. The 85th percentile speed is identified as the speed of the 113th car because 85 percent of 133 is 113.

Tell: When the vehicles in the measured sample are counted in increasing order of speed, the 113th car is found in the 82-mph bin. Therefore, the 85th percentile speed is 82 mph.

Tell: At this site, the statutory maximum speed is 75 mph. This value will control the setting of the regulatory speed limit because the 85th percentile speed was higher, but the site did not have identified concerns with adverse site conditions or crash history.

Slide 19



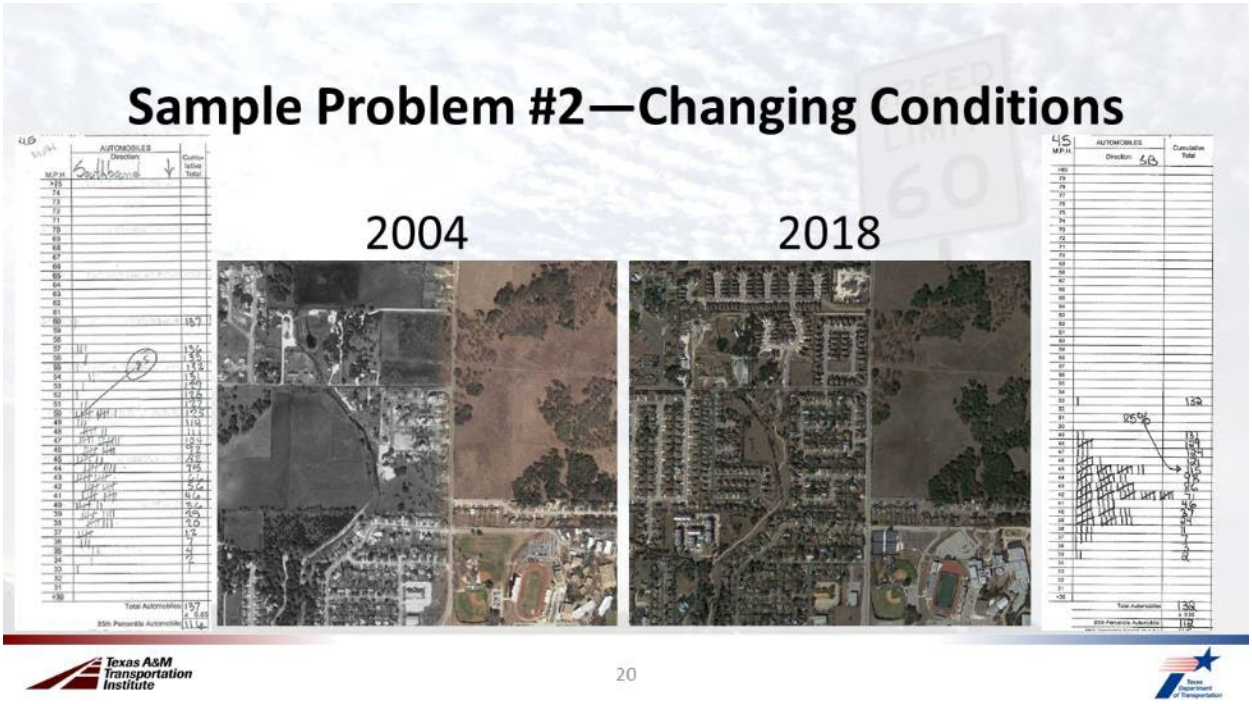
Key Message:
The Speed Zone Manual describes the procedures for setting regulatory speed limits in speed zones of interest.

Interactivity:
Tell: This sample problem involves checking and possibly changing a regulatory speed limit on a rural two-lane highway segment that is evolving into a suburban minor arterial because of recent and rapid land development.

Ask: What is the appropriate regulatory speed limit, and what information do we need to collect to conduct our analysis?

Notes:
The input data and answer to this sample problem are provided on page R-3 of this *Instructor's Guide*.

Slide 20

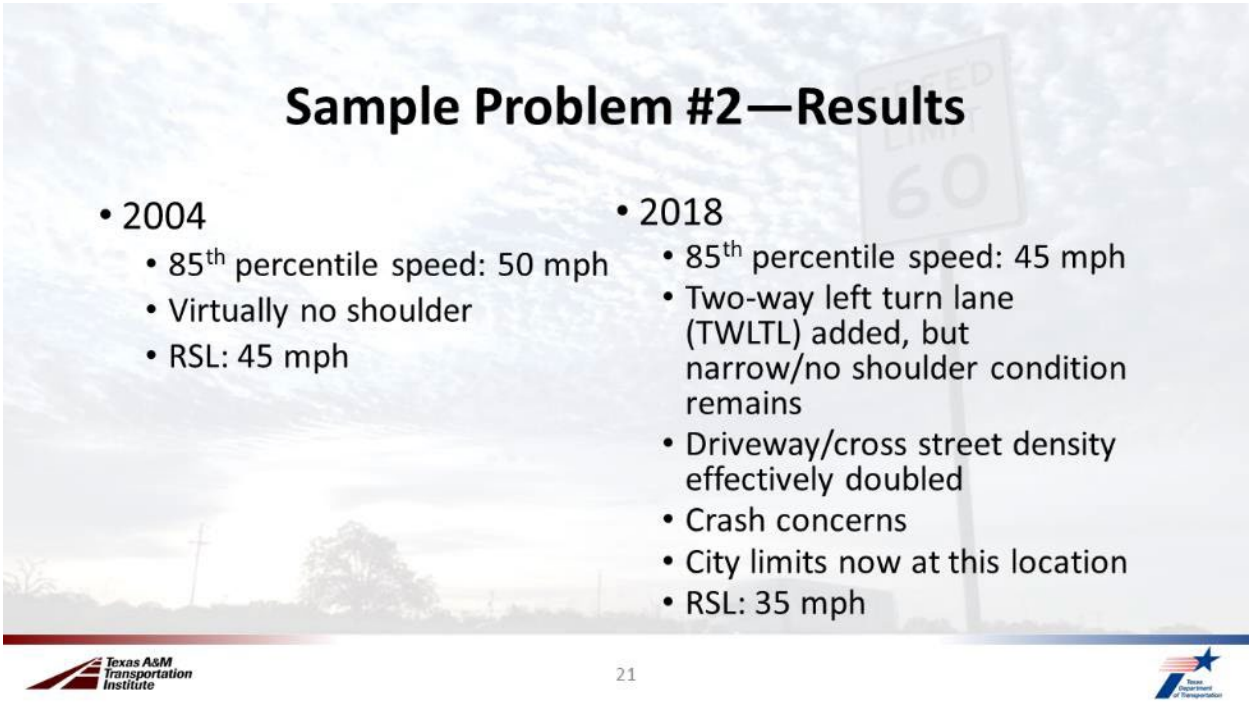


Key Message:
At this site, we have tally sheets from speed zone studies conducted in 2004 and 2018, as well as general information about the area type and land development during those two studies. The roadway of interest is the north/south segment in the aerial photographs.

Interactivity:
Tell: On the 2004 tally sheet, the 85th percentile speed is found to be 50 mph. The 2004 aerial photograph shows sparse, exurban development in the area.

Tell: On the 2018 tally sheet, the 85th percentile speed is found to be 45 mph, a 5-mph drop from 2004. The 2018 aerial photograph shows development of a more suburban character, as notable portions of the previously vacant land have been filled in with houses, apartments, or small businesses.

Slide 21



Key Message:
Based on the results of the speed zone study and identified concerns with site conditions and crash history, a reduction of the regulatory speed limit to as low as 35 mph may be justified.

Background:
A direct application of the Speed Zone Manual guidance to the site described in this sample problem could yield values in the range of 35–45 mph. At the real-world site, which formed the basis for this sample problem, a regulatory speed limit of 35 mph was chosen.

Interactivity:
Tell: In 2004, the 85th percentile speed was found to be 50 mph. Even in that year, one adverse site condition was identified—specifically, inadequate shoulders on the roadway, but without an identified concern about crash history. Hence, a regulatory speed limit of 45 mph was justified.

Tell: By 2018, the 85th percentile speed had dropped to 45 mph, a 5-mph decrease without a change in the posted regulatory speed limit. Various other site conditions have also changed, including notable new land development and the resulting addition of driveways and cross streets, an extension of the city limits to the segment of interest, and the addition of a two-way left-turn lane (TWLTL) (without improving the shoulders). Crash concerns have additionally been identified on the segment. Hence, a regulatory speed limit of 35 mph may be justified.

Slide 22

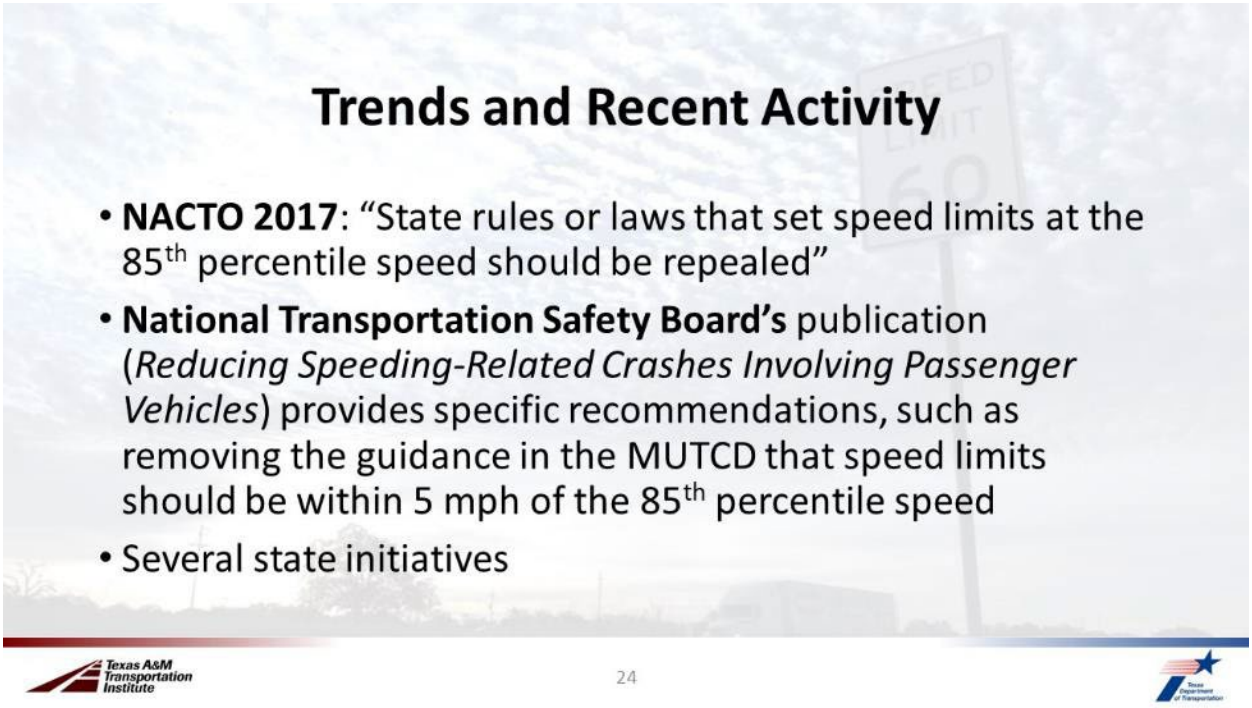
Key Message:
None.

LESSON TWO: RECENT NATIONAL ACTIVITIES

Slide 23

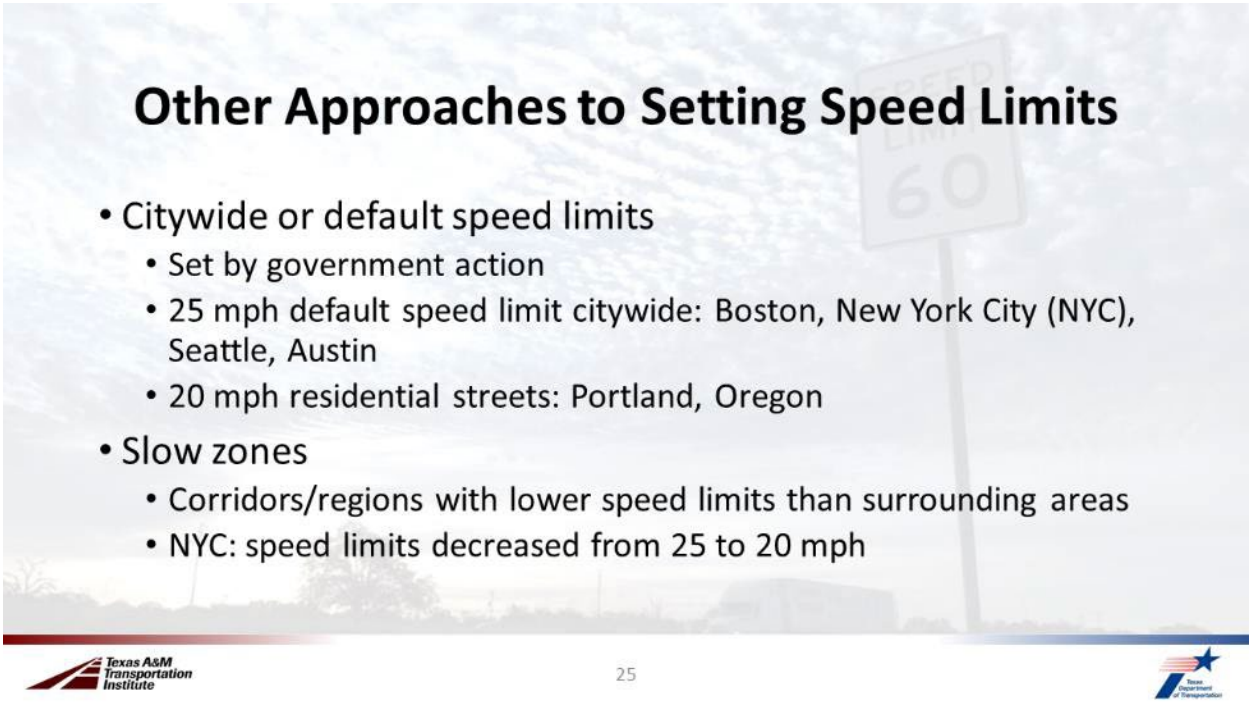
Key Message:
Lesson Two presents recent research findings and policy discussions regarding regulatory speed limit setting practices at the national level and in other states.

Slide 24



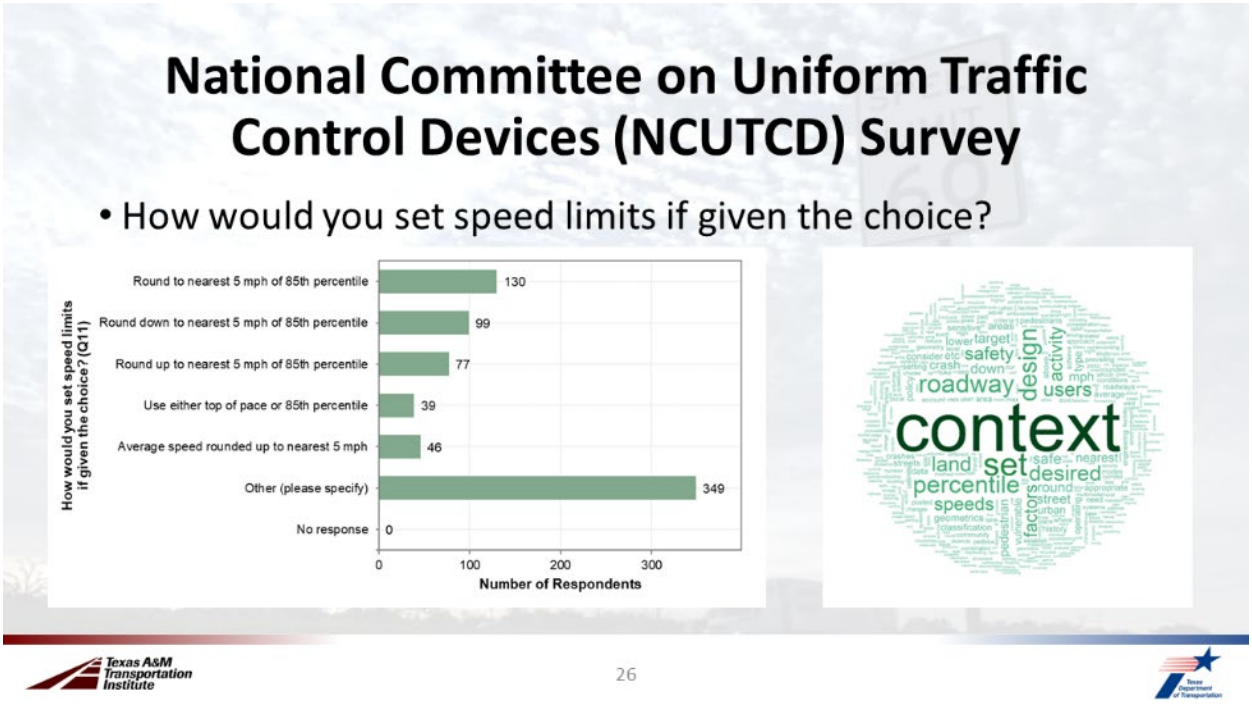
Key Message:
Some state and national organizations, including the National Association of City Transportation Officials and the National Transportation Safety Board, have suggested moving away from using the 85th percentile speed as the basis for setting regulatory speed limits.

Slide 25



Key Message:
Several cities outside Texas have taken different approaches to setting regulatory speed limits, including adopting default speed limits of a specified value for all roadways (unless otherwise specified by ordinance) or roadways of a certain type (such as residential streets), or designated "slow zones" at specified corridors or regions.

Slide 26



Key Message:
In a survey of practitioners and stakeholders conducted by the National Committee on Uniform Traffic Control Devices (NCUTCD), about half of 740 respondents called for consideration of roadway context when setting regulatory speed limits, in addition to a notable number of respondents that called for using the 85th percentile speed and rounding (up or down) to the nearest 5-mph increment.

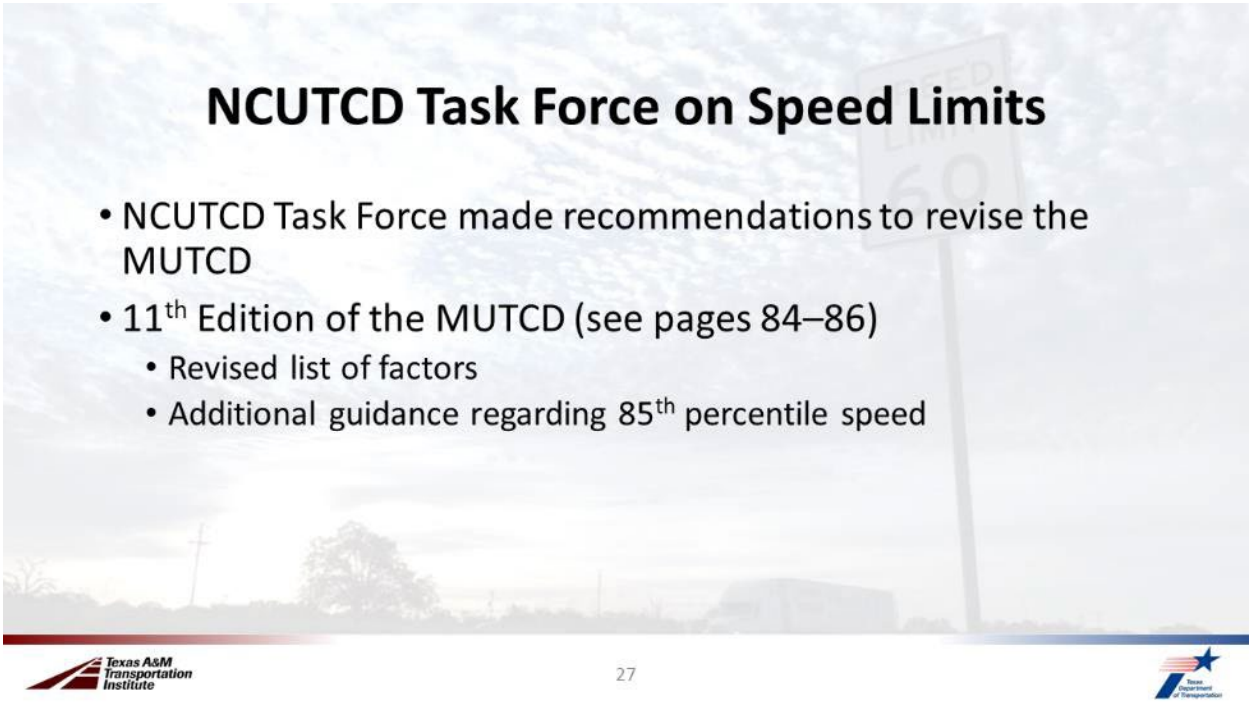
Background:
The survey results shown on this slide are discussed in NCHRP Web-Only Document 291, *Development of a Posted Speed Limit Setting Procedure and Tool*.

Interactivity:
Tell: NCUTCD conducted a survey of practitioners and stakeholders in 2018 regarding practices for setting regulatory speed limits. A total of 740 people responded.

Tell: The bar graph shows the distribution of responses to the survey question asking how the respondent would set regulatory speed limits if given the choice. The most common response was "other (please specify)," with 349 responses. Additionally, 306 respondents chose the 85th percentile speed, rounding up or down to the nearest 5-mph increment.

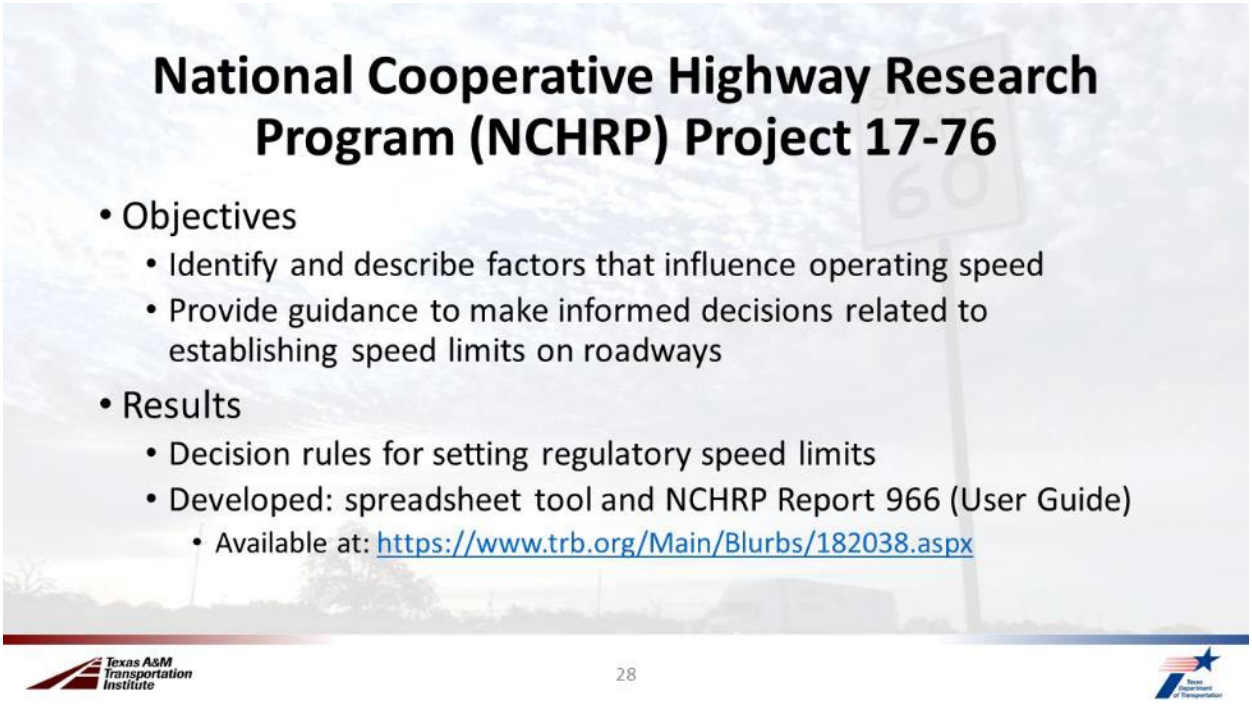
Tell: The word cloud provides visual interpretation of the free-form responses that were provided by the respondents who chose "other (please specify)". The most commonly included word was "context." Several other commonly included words, such as "land," "users," "activity," and "pedestrian," also suggest a context-sensitive approach.

Slide 27



Key Message:
The 11th Edition of the MUTCD provides more guidance for setting regulatory speed limits than was included in the 10th Edition. The changes include a revised list of factors to be considered in the engineering study and additional guidance regarding the 85th percentile speed.

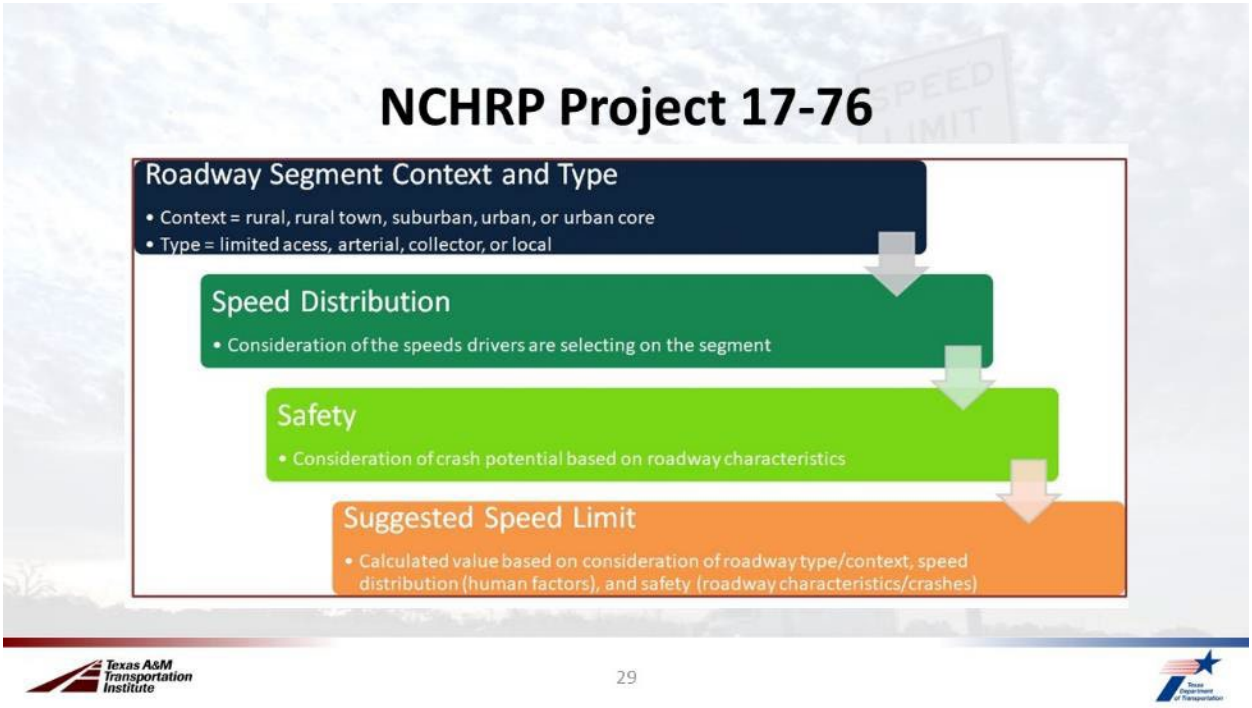
Slide 28



Key Message:
NCHRP Research Project 17-76 yielded an analysis framework for setting regulatory speed limits based on decision rules accounting for key site variables, and a spreadsheet tool and *User Guide* to assist practitioners in applying the analysis framework.

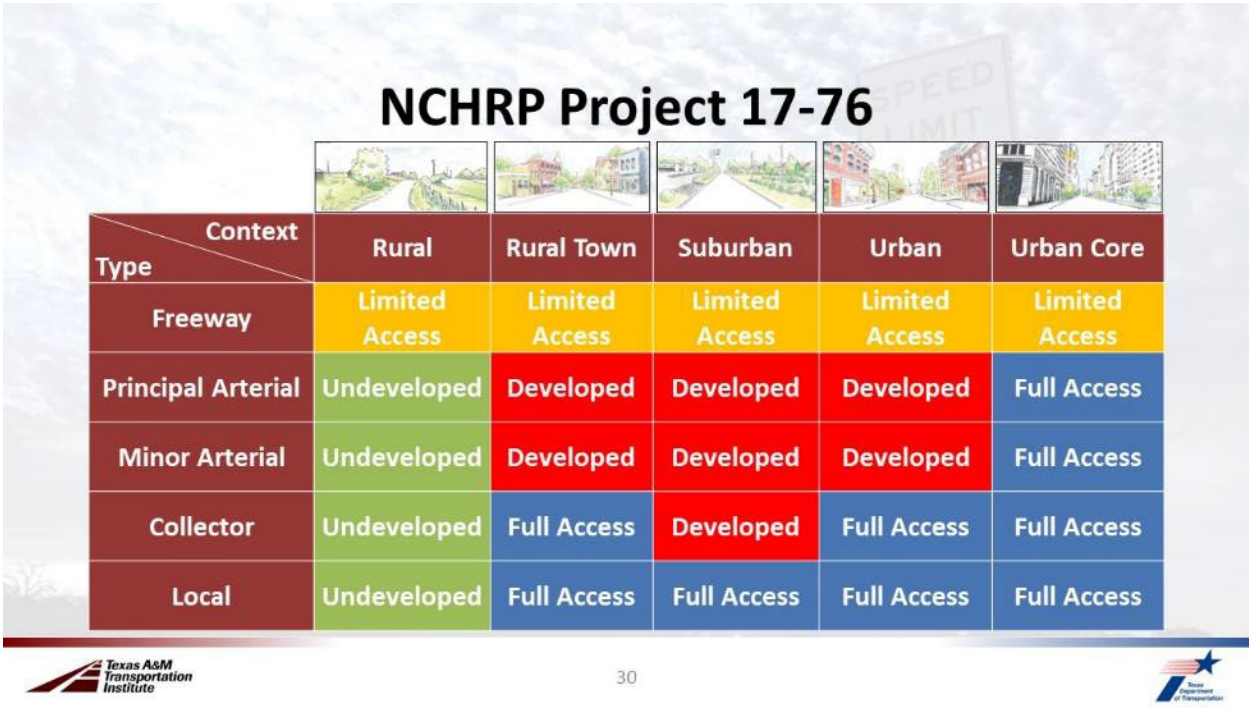
Background:
The analysis framework developed in NCHRP Research Project 17-76 was based on USLIMITS2 and recommendations from several preceding NCHRP research projects. Additional information on USLIMITS2 is available at: https://safety.fhwa.dot.gov/uslimits/.

Slide 29



Key Message:
The NCHRP 17-76 analysis framework involves classifying a roadway segment of interest by context and type, and then considering speed distribution, safety, and site characteristics and context to determine a suggested regulatory speed limit.

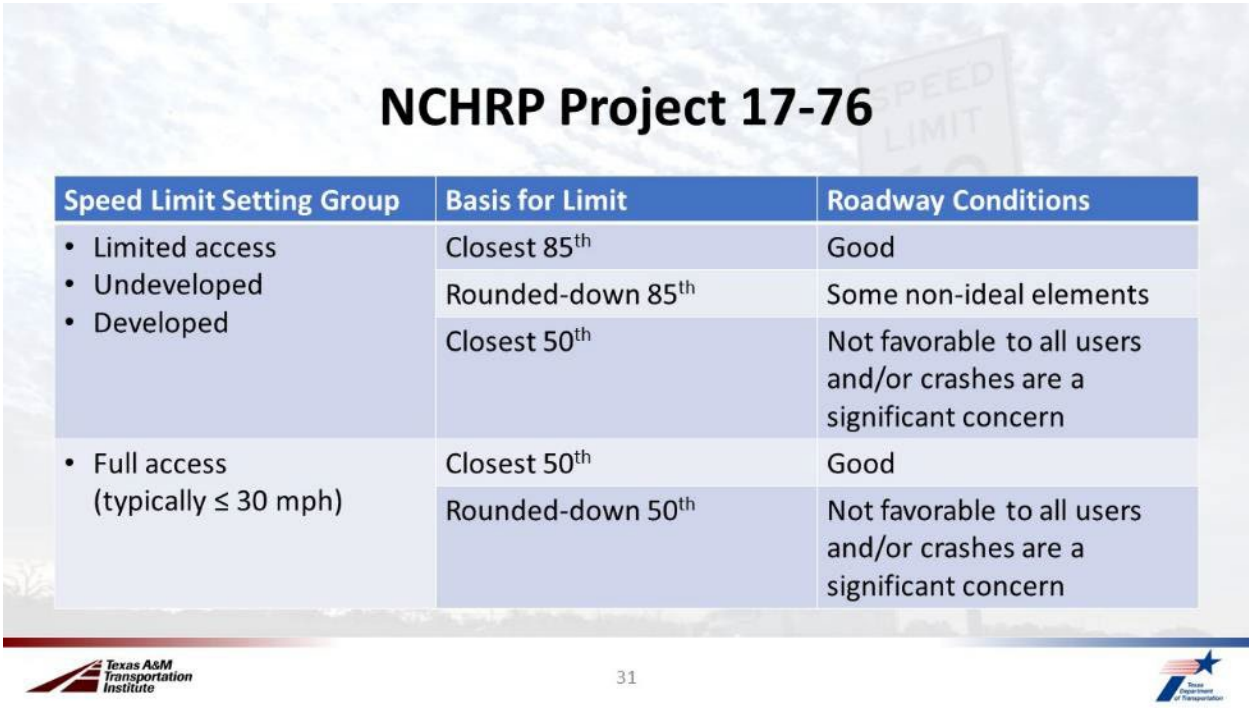
Slide 30



Key Message:
The NCHRP 17-76 analysis framework classifies the roadway segment of interest into one of four different speed limit setting groups, which are represented as the color-coded regions in a 5x5 matrix. The cells in the matrix represent combinations of five roadway context categories and five roadway type categories.

Background:
The roadway context and roadway type categories used in this 2x2 matrix are derived from the Expanded Functional Classification System documented in NCHRP Report 855, *An Expanded Functional Classification System for Highways and Streets*.

Slide 31



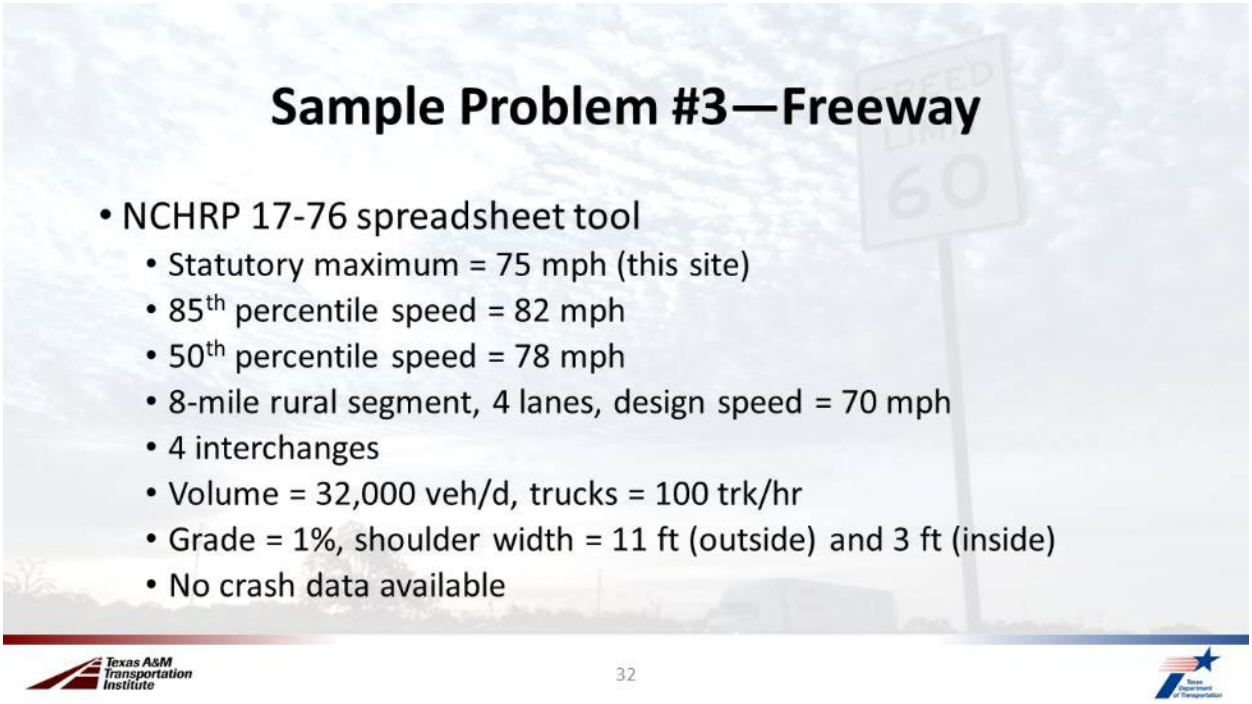
Key Message:
The NCHRP 17-76 analysis framework provides different sets of decision rules for the four speed limit setting groups. Three of the four groups (Limited Access, Undeveloped, and Developed) apply the 85th percentile speed or the 50th percentile speed in setting the regulatory speed limit depending on site conditions and crash history. The fourth group (Full Access) calls for the use of the 50th percentile speed.

Background:
The decision rules in the NCHRP 17-76 analysis framework represent a synthesis of decision rules from USLIMITS2 and new rules created by the NCHRP 17-76 research team to account for additional variables not considered in the USLIMITS2 framework.

Interactivity:
Tell: If the roadway segment of interest is in the Limited Access, Undeveloped, or Developed speed limit setting groups, the suggested speed limit will be the 85th percentile speed rounded to the closest 5-mph increment if roadway conditions are good and there are no concerns about crash history. If some non-ideal site conditions are present, the suggested speed limit will be the rounded-down 85th percentile speed. If site conditions are not favorable to all users and/or there is a concern with crash history, the suggested speed limit will be the 50th percentile speed.

Tell: If the roadway segment of interest is in the Full Access speed limit setting group, the suggested speed limit will be the closest 50th percentile speed if roadway conditions are good and there are no concerns about crash history, or the rounded-down 50th percentile speed otherwise.

Slide 32



Key Message:
The N17-76 SLS-Tool can be used to compute a suggested speed limit for a roadway segment of interest.

Interactivity:
Tell: The example freeway segment used in this sample problem is the same segment that was used in sample problem 1. Data describing the segment are presented on this slide.

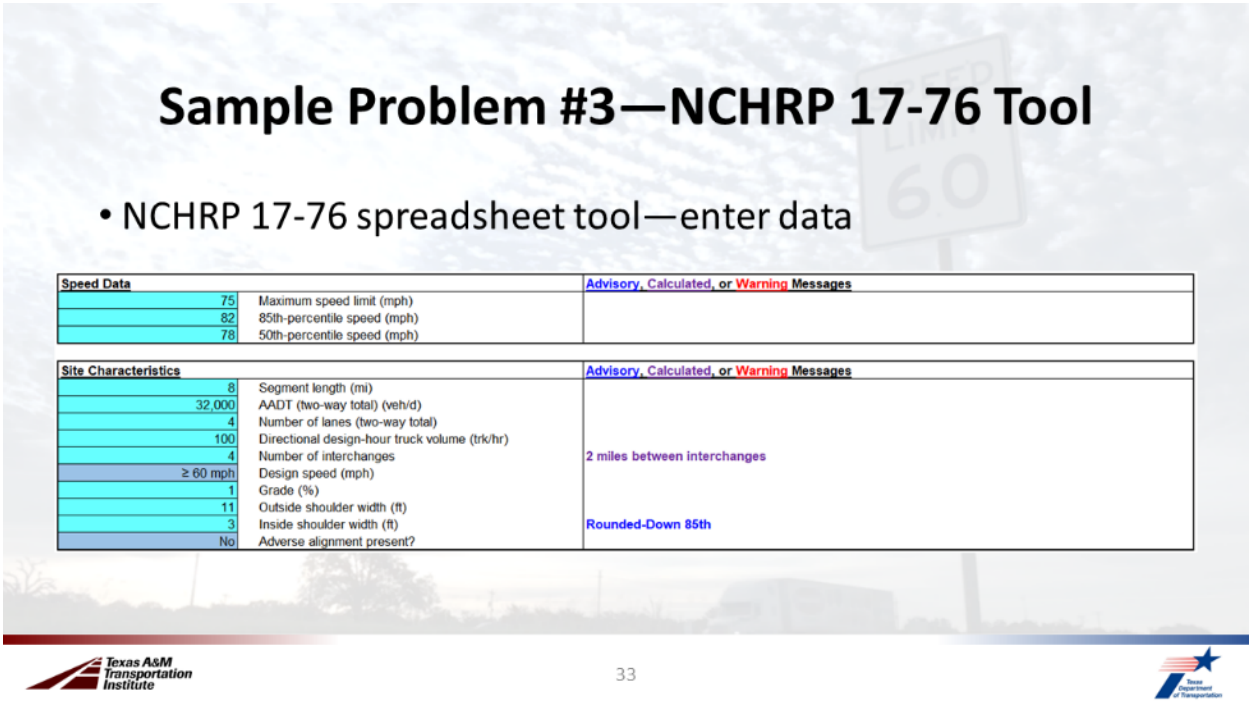
Ask: Which speed limit setting group applies to a rural freeway segment? (Limited Access)

Ask: Given the provided input data, what is the suggested regulatory speed limit for this segment?

Notes:
If the students have computers available, the instructor should give the students a few minutes to enter the data into the spreadsheet tool and walk around the room to answer individual questions while the students are working.

The input data and answer to this sample problem are provided on page R-4 of this *Instructor's Guide*.

Slide 33



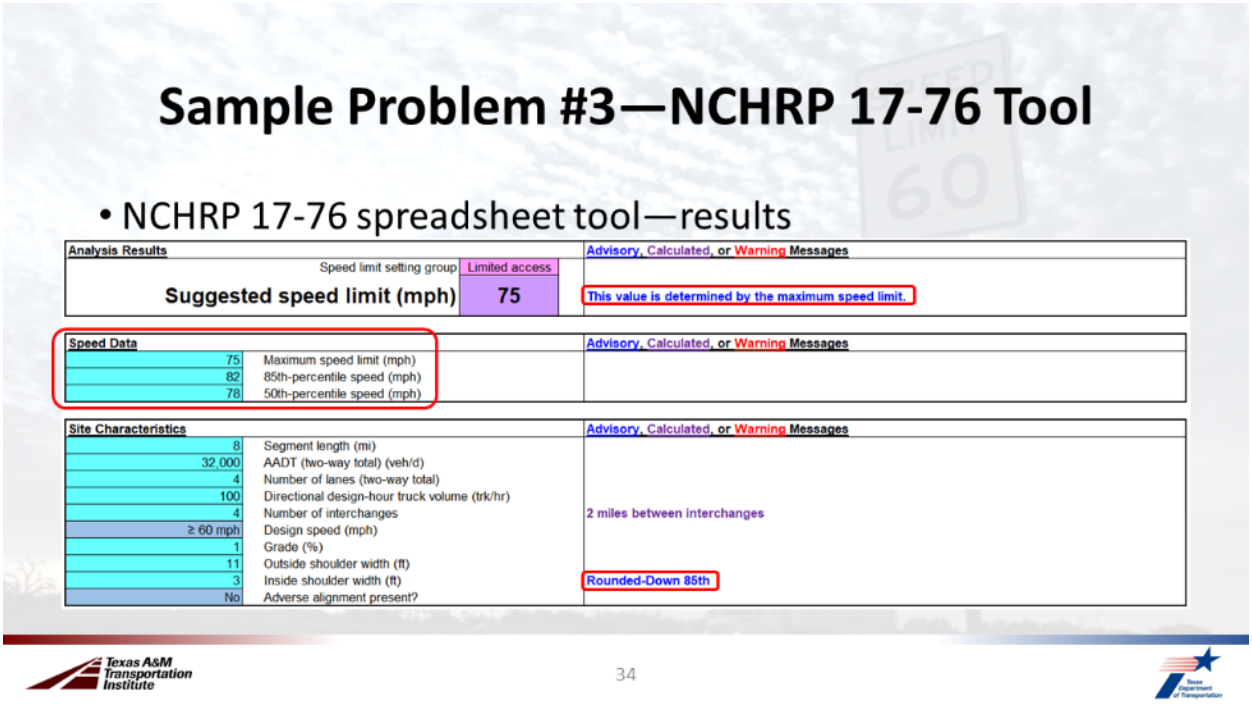
Key Message:
Data entry cells in the N17-76 SLS-Tool are color-coded and categorized in boxes. For this sample problem, the given data describing the speed distribution and site characteristics must be entered.

Interactivity:
Tell: Note the color-coded data entry cells. The aqua-colored cells are used for freeform basic data input. The denim-colored cells are used for basic data input limited to values in a drop-down menu.

Tell: For this sample problem, we must enter data to describe the speed distribution and site characteristics. These two categories are organized in the labeled data input boxes.

Notes:
After presenting this slide, the instructor may either proceed to the next slide or exit the slides and demonstrate the data entry process in the spreadsheet tool.

Slide 34



Key Message:
The N17-76 SLS-Tool applies the decision rules and provides a suggested speed limit for the roadway segment of interest. The tool provides advisory messages to allow the user to identify the key variables that controlled the analysis results.

Interactivity:
Ask: What is the suggested speed limit for this segment? (75 mph, as shown in the large purple cell)

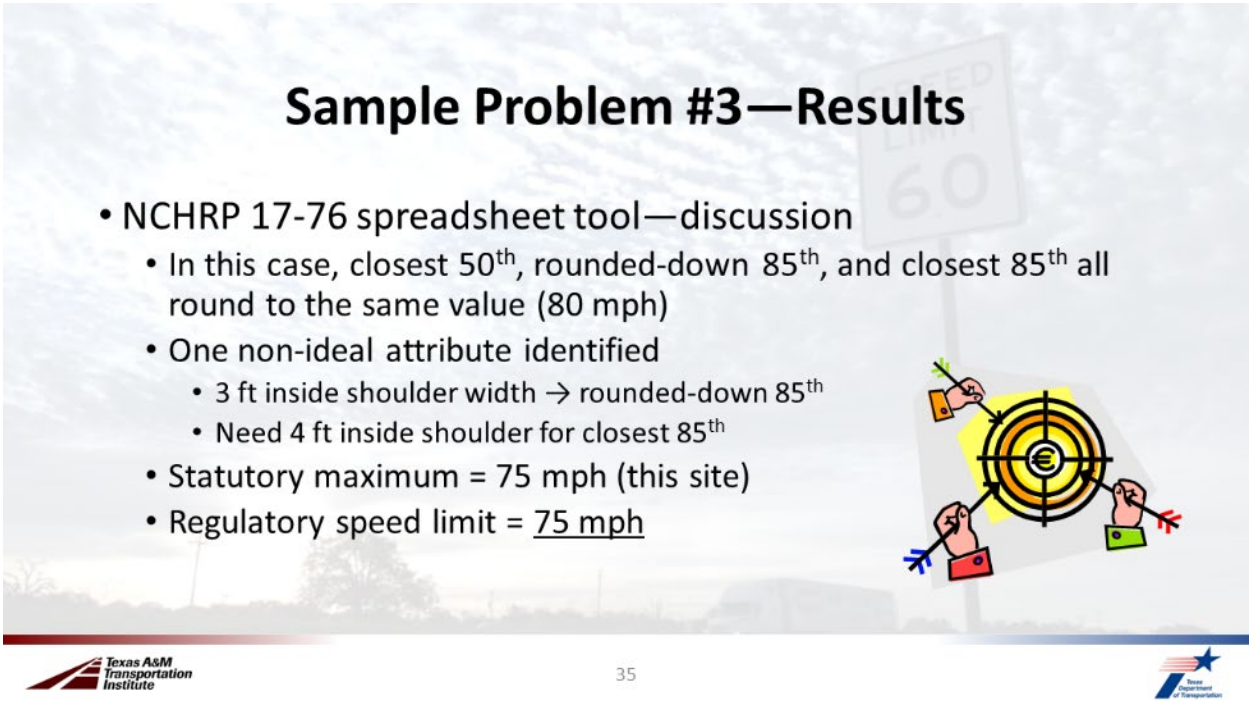
Ask: Which variable(s) controlled the analysis results? (statutory maximum speed limit, as specified in the advisory message to the right of the suggested speed limit)

Tell: The statutory maximum speed limit is entered as 75 mph, and the 85th percentile and 50th percentile speeds are entered as 82 mph and 78 mph, respectively.

Ask: Were there any other site conditions that were identified as concerns for setting the regulatory speed limit?

Tell: For the specified 3-foot inside shoulder width, the decision rules would have called for using the rounded-down 85th percentile speed instead of the closest 85th percentile speed.

Slide 35



Key Message:
For this sample problem, the variable controlling the analysis result was the statutory maximum speed limit. One non-ideal site attribute (inside shoulder width) was identified, but it did not become the controlling variable given the speed distribution at the site.

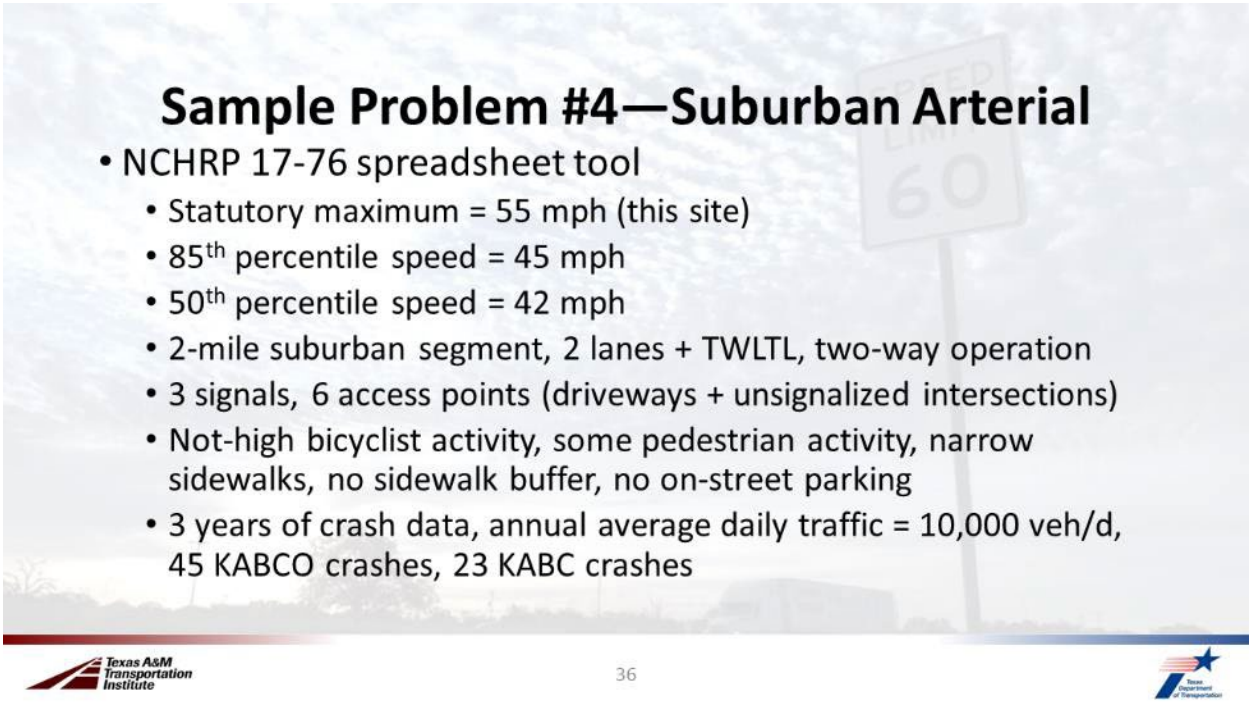
Interactivity:
Ask: What would be the suggested speed limit if we used the closest 50th percentile, rounded-down 85th percentile, or closest 85th percentile speeds? (80 mph in all cases, due to a tight distribution of speeds measured during the speed zone study)

Ask: Which site attributes were identified as non-ideal? (inside shoulder width, 3 feet)

Tell: A 3-foot inside shoulder width results in using the rounded-down 85th percentile speed to set the regulatory speed limit. The inside shoulder width needs to be at least 4 feet to allow the closest 85th percentile.

Tell: In this case, the statutory maximum speed limit (75 mph) is less than the closest 50th percentile speed. Hence, it controls the setting of the regulatory speed limit.

Slide 36



Key Message:
The N17-76 SLS-Tool can be used to compute a suggested speed limit for a roadway segment of interest.

Interactivity:
Tell: The example suburban arterial segment used in this sample problem is the same segment that was used in sample problem 2. Data describing the segment are presented on this slide.

Ask: Which speed limit setting group applies to a suburban arterial segment? (Developed)

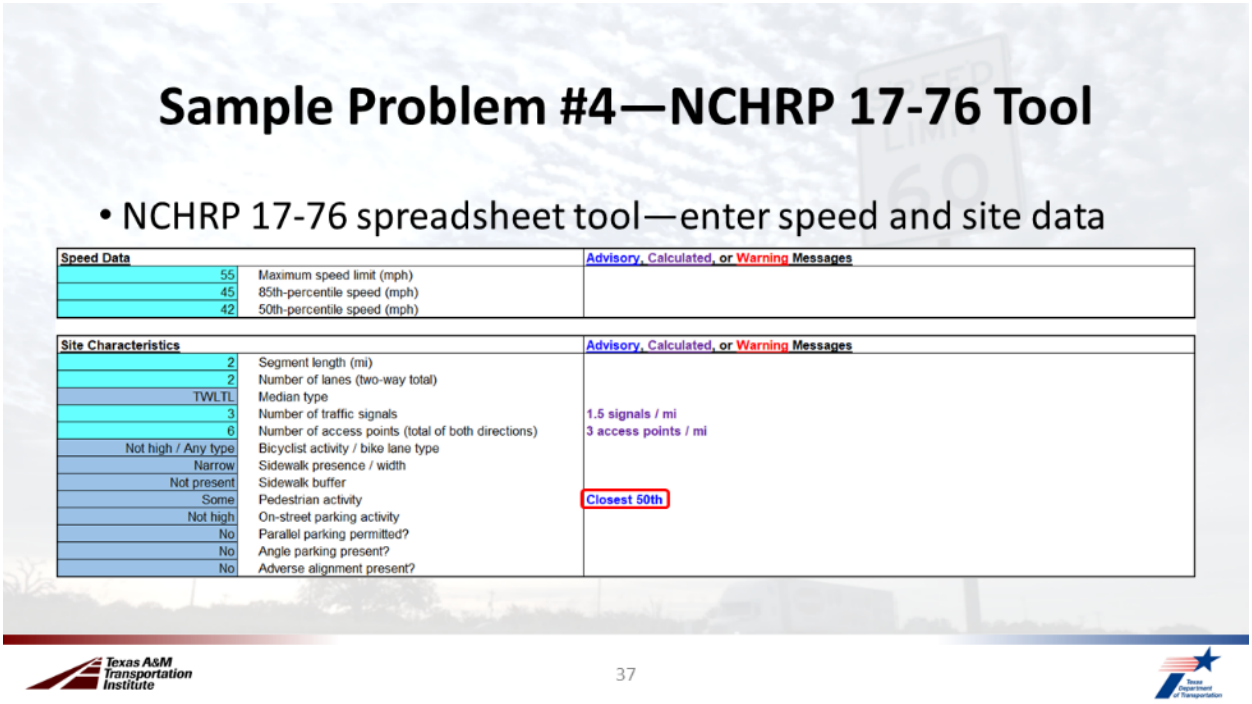
Ask: Given the provided input data, what is the suggested regulatory speed limit for this segment?

Notes:
If the students have computers available, the instructor should give the students a few minutes to enter the data into the spreadsheet tool and walk around the room to answer individual questions while the students are working.

After presenting this slide, the instructor may either proceed to the next slide or exit the slides and demonstrate the data entry process in the spreadsheet tool.

The input data and answer to this sample problem are provided on page R-5 of this *Instructor's Guide*.

Slide 37

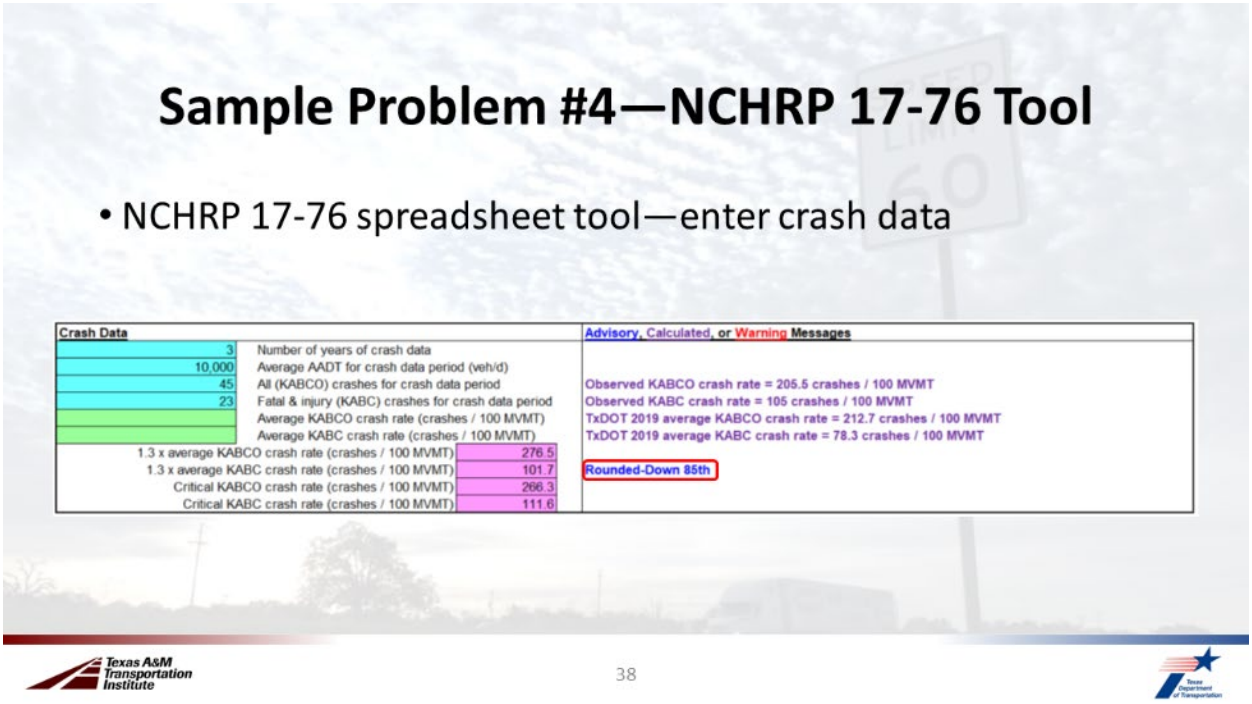


Key Message:
The N17-76 SLS-Tool applies the decision rules and provides a suggested speed limit for the roadway segment of interest. The tool provides advisory messages to allow the user to identify the key variables that controlled the analysis results.

Interactivity:
Ask: Which site characteristic variable(s) are affecting the analysis results? (pedestrian activity and sidewalk facilities, as specified in the advisory message to the right of the pedestrian activity data entry cell)

Tell: This segment has some pedestrian activity but a narrow sidewalk with no buffer between the sidewalk and the traffic lanes. This combination of conditions calls for using the closest 50^{th} percentile speed.

Slide 38



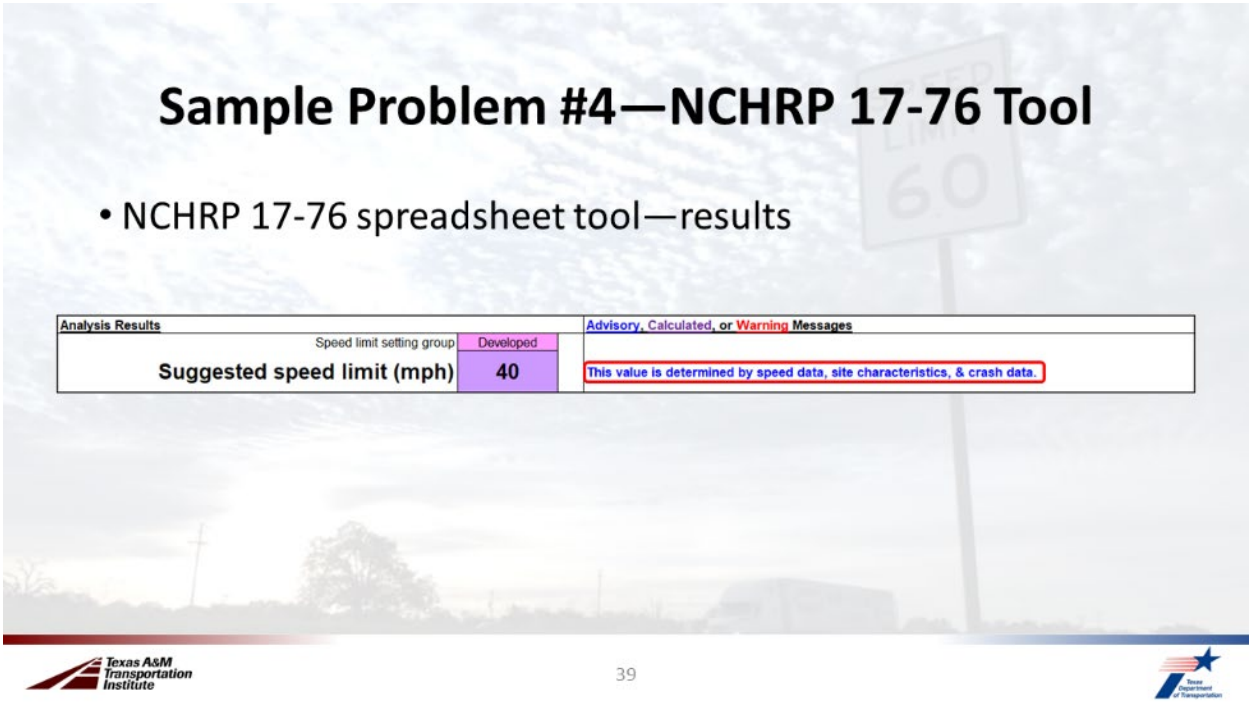
Key Message:
The N17-76 SLS-Tool applies the decision rules and provides a suggested speed limit for the roadway segment of interest. The tool provides advisory messages to allow the user to identify the key variables that controlled the analysis results.

Interactivity:
Ask: Given the available crash history, are crashes a significant concern on this segment?

Tell: The KABC crash rate on this segment is more than 1.3 times the state average rate for similar facilities. In that case, the decision rules call for using the rounded-down 85th percentile speed to set the regulatory speed limit.

Notes:
The spreadsheet version used to create this sample problem was Version 3 of the N17-76 SLS-Tool, which contains crash rates computed from TxDOT crash and exposure data from 2019.

Slide 39



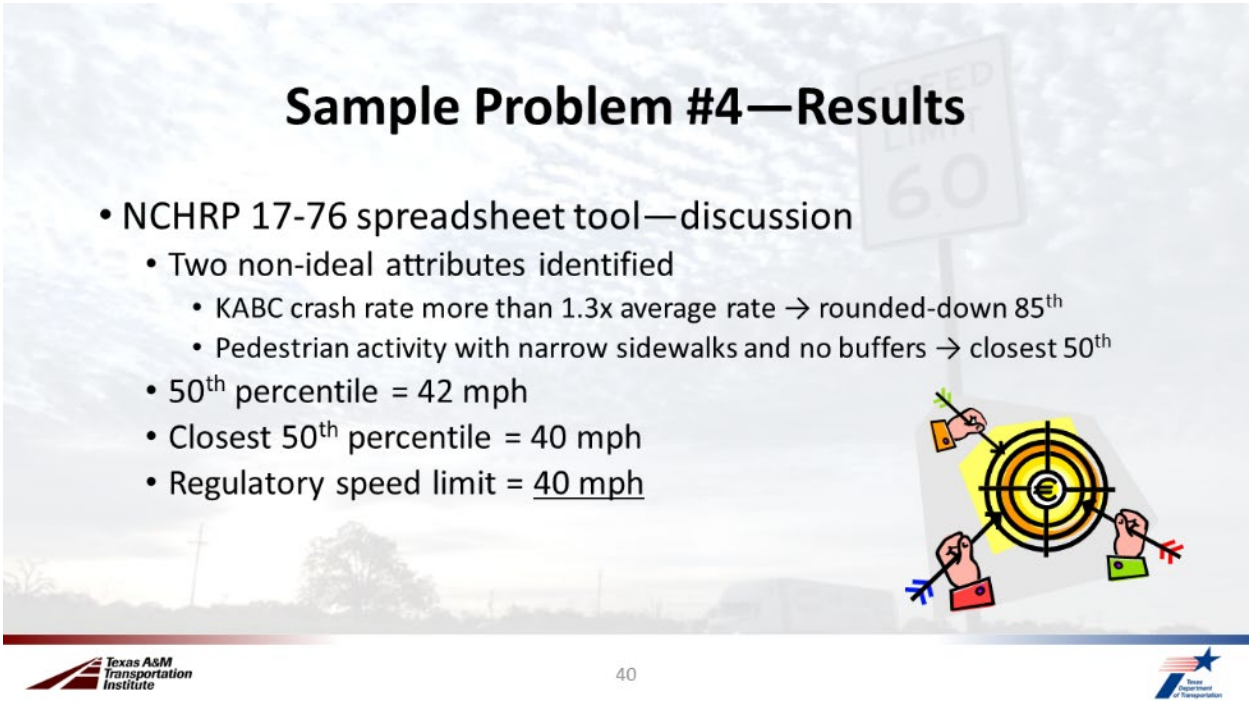
Key Message:
The N17-76 SLS-Tool applies the decision rules and provides a suggested speed limit for the roadway segment of interest. The tool provides advisory messages to allow the user to identify the key variables that controlled the analysis results.

Interactivity:
Ask: Which variable(s) controlled the analysis results?

Tell: The advisory message to the right of the suggested speed limit states that the value is determined by speed data, site characteristics, and crash data.

Tell: In this case, the statutory maximum speed limit (55 mph) did not control the analysis results. We set the regulatory speed limit on this segment based on the speed distribution, site characteristics, and crash data.

Slide 40



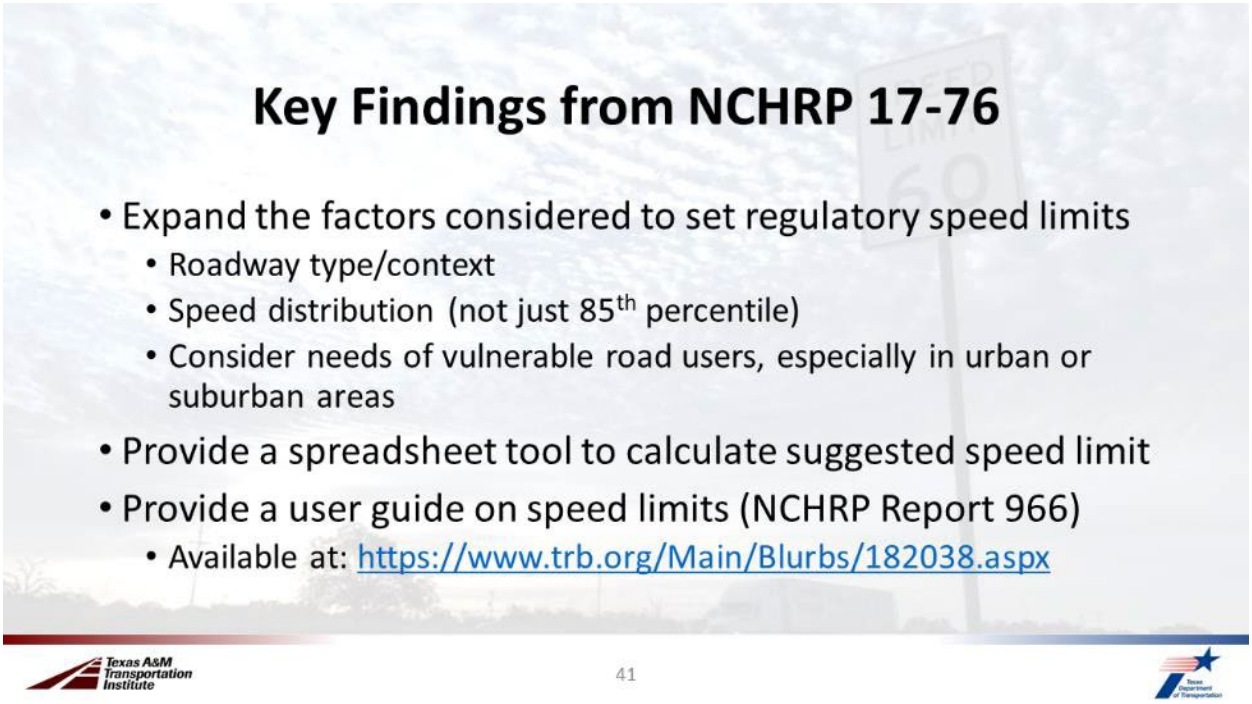
Key Message:
The N17-76 SLS-Tool applies the decision rules and provides a suggested speed limit for the roadway segment of interest. The tool provides advisory messages to allow the user to identify the key variables that controlled the analysis results.

Interactivity:
Ask: Which non-ideal site attribute(s) were identified in the analysis?

Tell: The first site attribute of concern is the KABC crash rate on this segment, which was more than 1.3 times the average rate on similar segments statewide. This condition calls for using the rounded-down 85th percentile speed. The second site attribute of concern is the occurrence of pedestrian activity without adequate sidewalk facilities, which calls for using the closest 50th percentile speed.

Ask: What is the suggested speed limit for this segment? (40 mph)

Slide 41



Key Message:
The guidance from NCHRP Research Project 17-76 provides tools and a rules-based framework for setting regulatory speed limits based on roadway type and context, speed distribution, site characteristics, and crash history, with the benefit of accounting for the needs of vulnerable road users (e.g., pedestrians and bicyclists) in relevant settings. Many of these same considerations are mentioned in TxDOT's Speed Zone Manual but are more formally incorporated into the NCHRP 17-76 analysis framework.

Slide 42

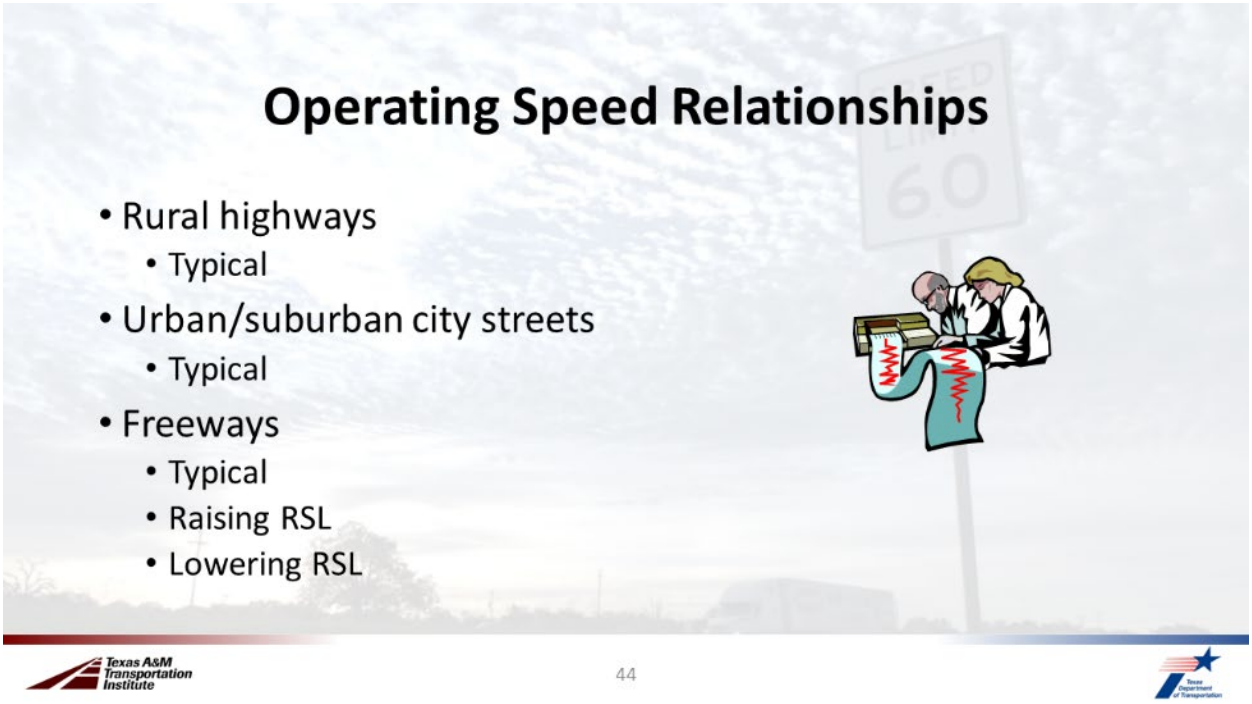
Key Message:
None.

LESSON THREE: OPERATING SPEED RESEARCH

Slide 43

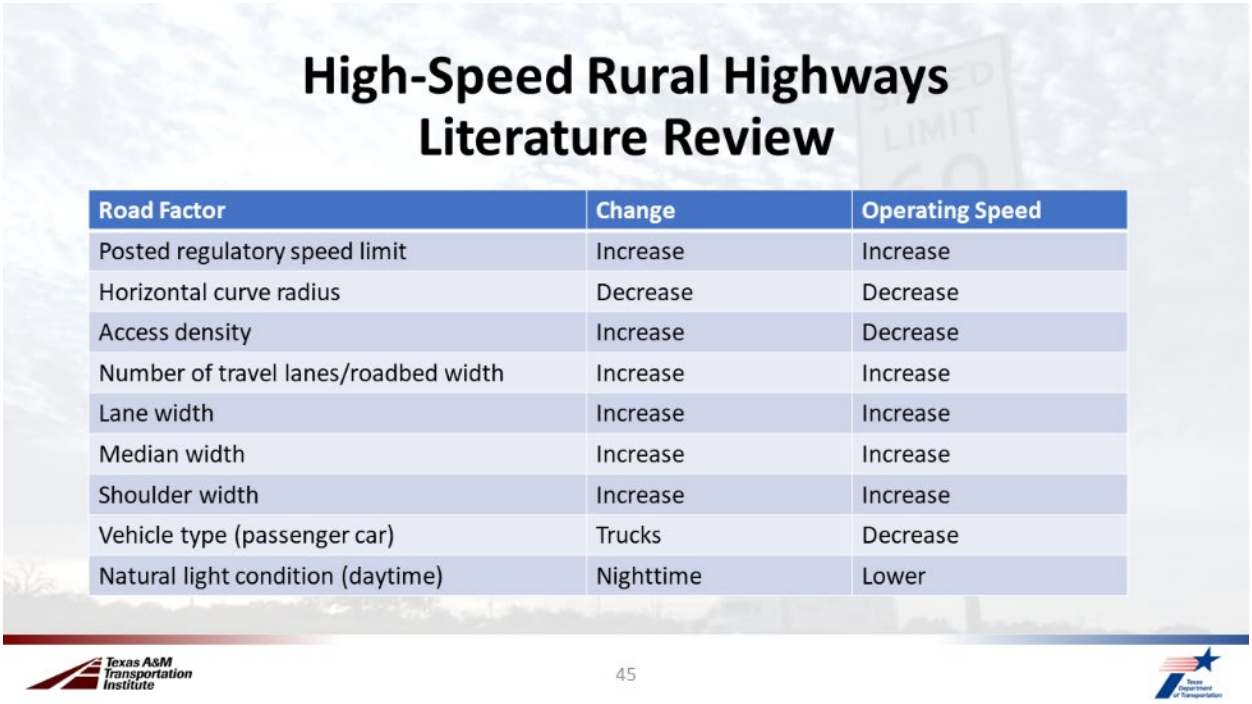
Key Message:
Lesson Three presents the findings from operating speed research conducted in TxDOT Research Project 0-7049.

Slide 44



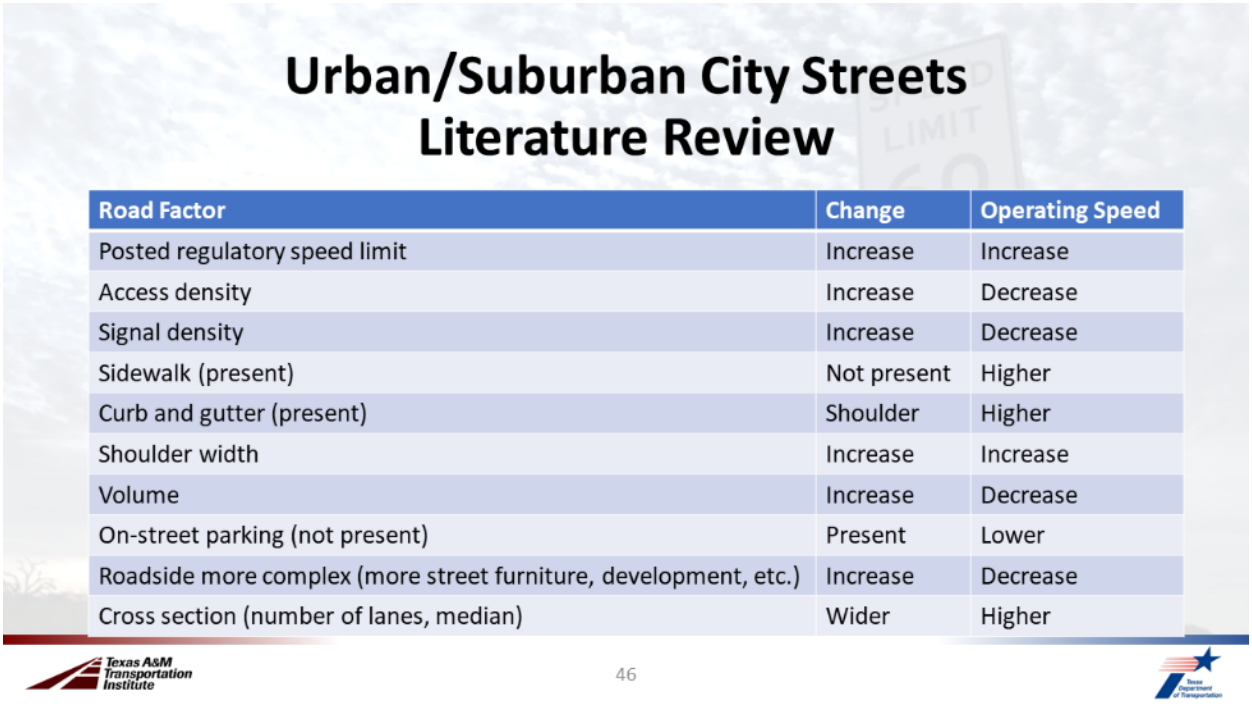
Key Message:
TxDOT Research Project 0-7049 analyzed operating speed trends on rural highways, urban and suburban city streets, and freeways. For freeways, the research included typical traffic speed trends in addition to the effects of raising or lowering posted regulatory speed limits.

Slide 45



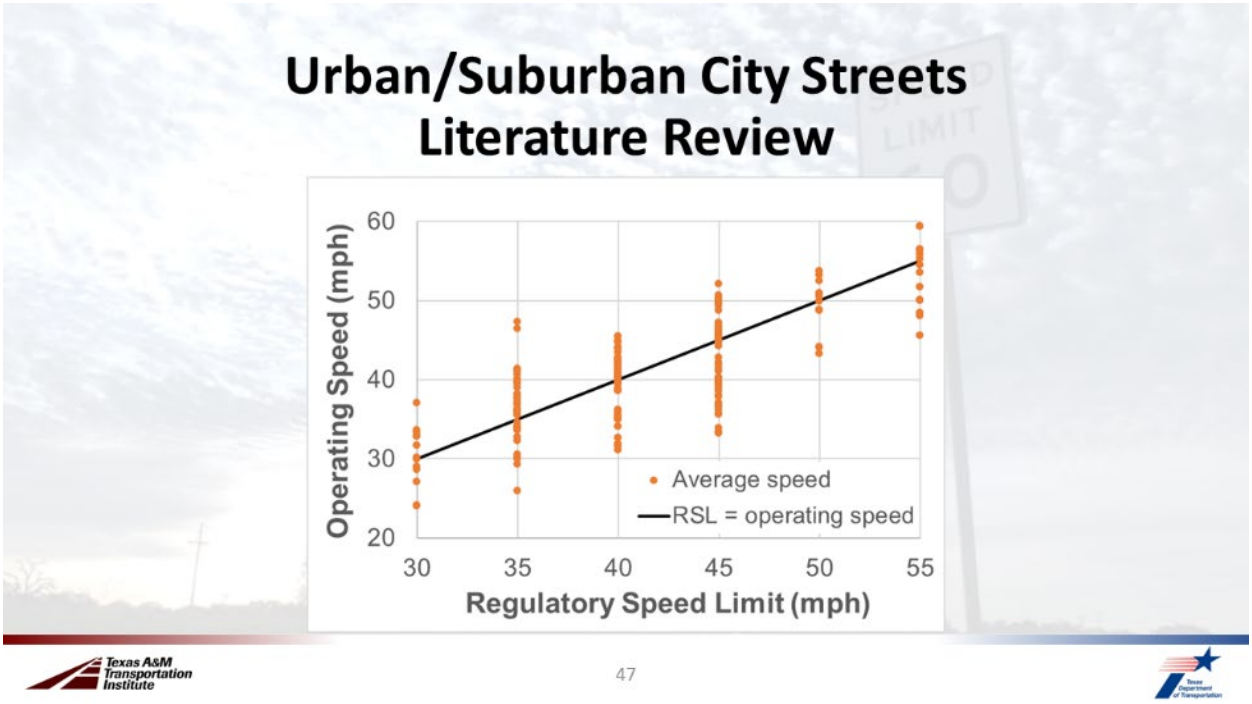
Key Message:
According to the published literature, speeds on rural highways will increase with an increase in posted regulatory speed limit, number of travel lanes, roadbed width, lane width, median width, or shoulder width. Speeds will decrease with a decrease in horizontal curve radius or an increase in access density. Speeds will be lower for trucks compared to passenger cars, and at nighttime compared to daytime.

Slide 46



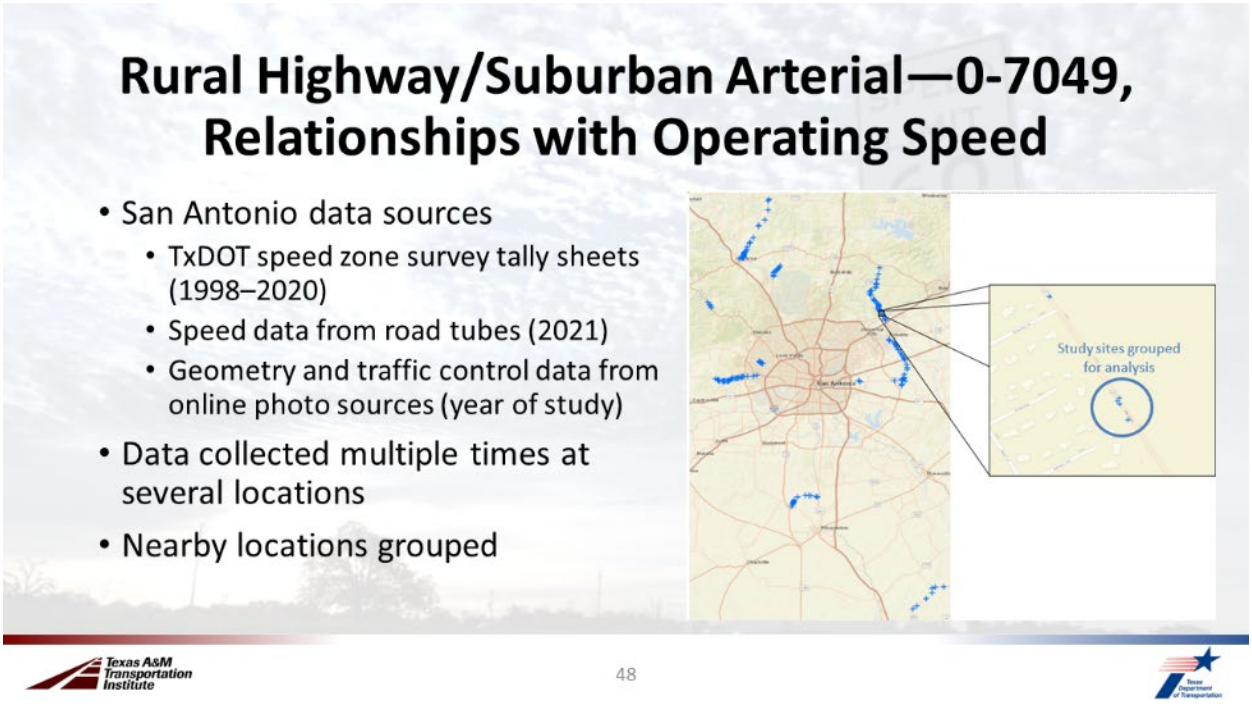
Key Message:
According to the published literature, speeds on urban and suburban city streets will increase with an increase in posted regulatory speed limit, shoulder width, median width, or number of lanes, or if sidewalks or curb and gutter are present. Speeds will decrease with an increase in access density, signal density, or traffic volume, if on-street parking is present, or if the roadside is more complex with features like more street furniture or development.

Slide 47



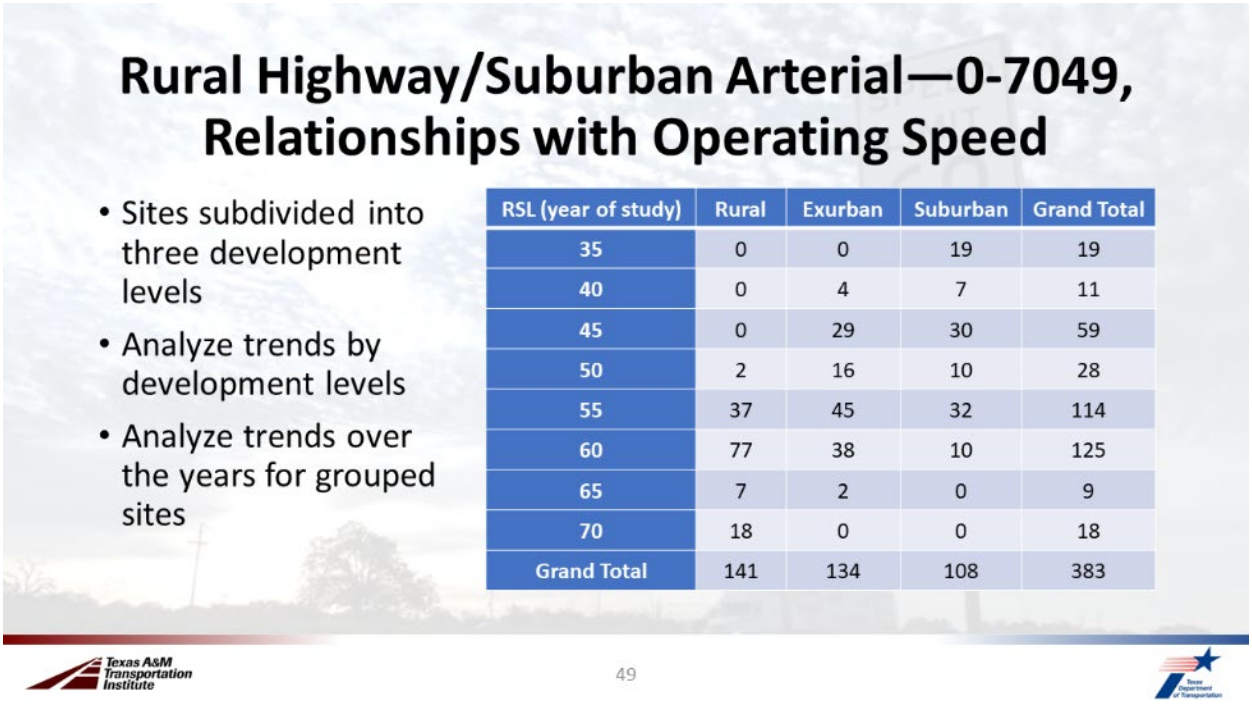
Key Message:
A published comparison of operating speeds and posted regulatory speed limits on urban and suburban city streets showed that there is often a wide range of average operating speed values for each regulatory speed limit value, with the range roughly centered on the average speed rather than the 85th percentile speed.

Slide 48



Key Message:
The TxDOT 0-7049 research team compiled speed data from speed zone study tally sheets and road tubes, geometry data, and traffic control data (including posted regulatory speed limits) at various sites around San Antonio, grouping data from sites in close proximity.

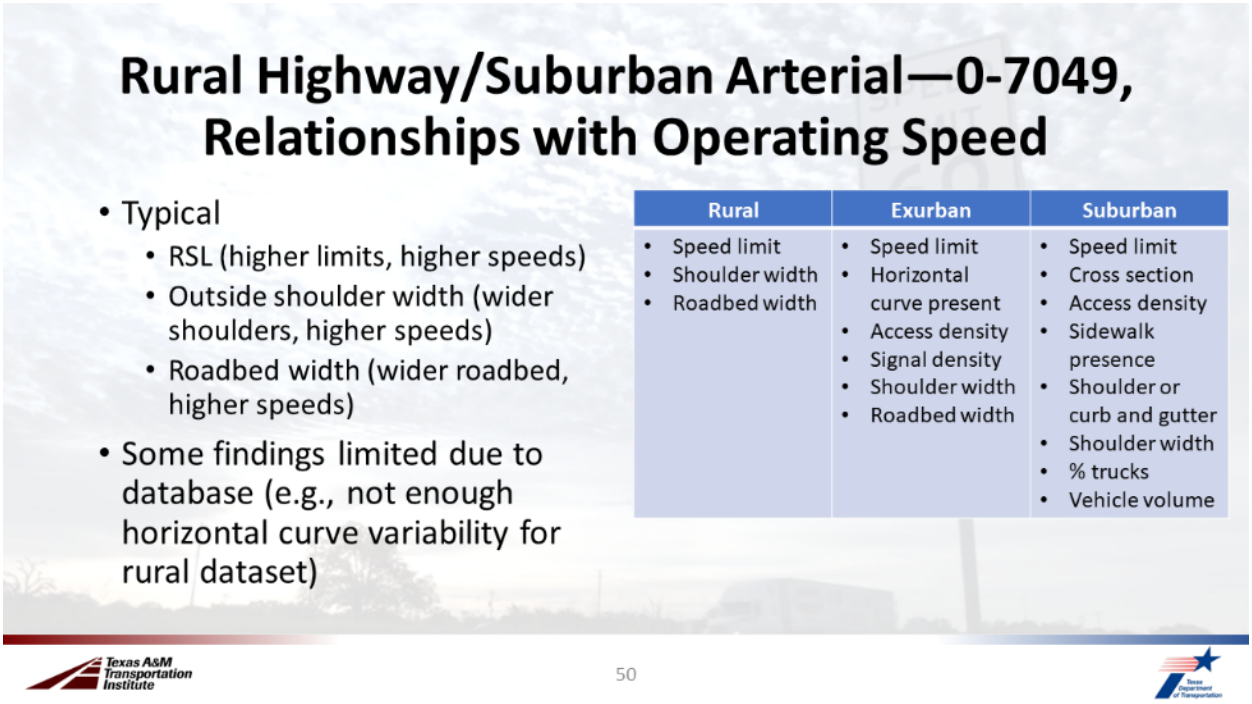
Slide 49



RSL (year of study)	Rural	Exurban	Suburban	Grand Total
35	0	0	19	19
40	0	4	7	11
45	0	29	30	59
50	2	16	10	28
55	37	45	32	114
60	77	38	10	125
65	7	2	0	9
70	18	0	0	18
Grand Total	141	134	108	383

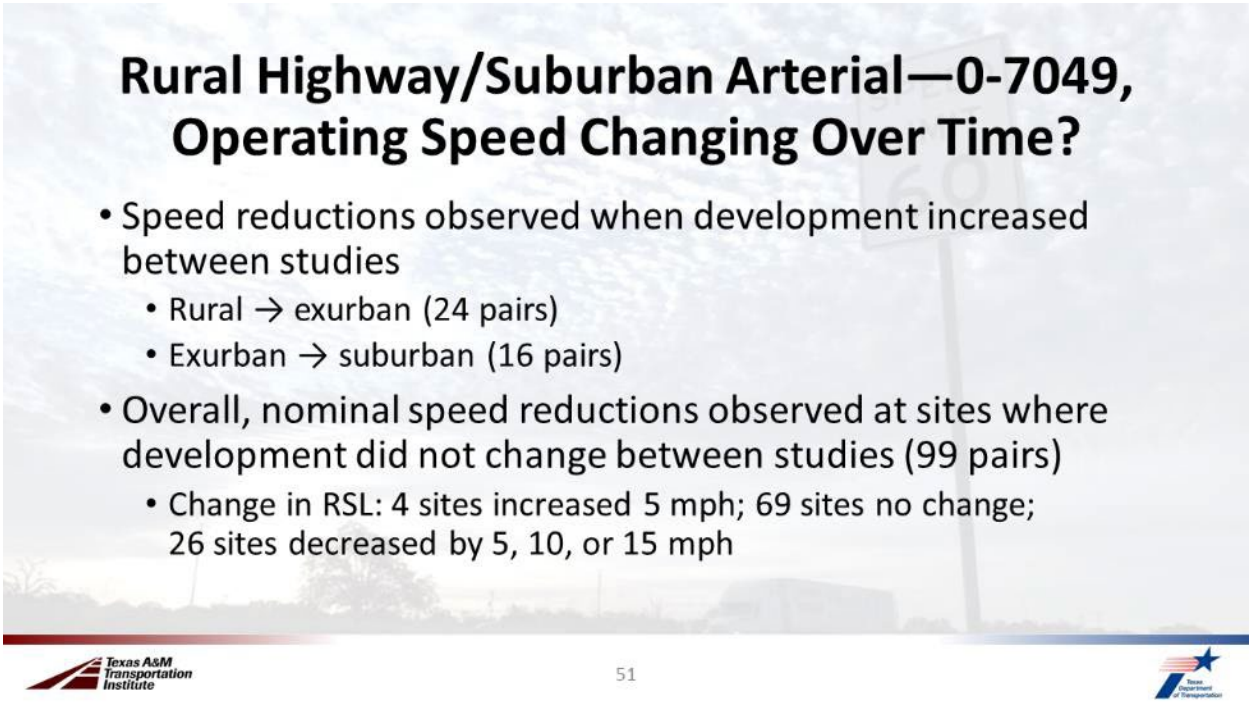
Key Message:
The TxDOT 0-7049 research team grouped the San Antonio speed data sites into three development levels (rural, exurban, and suburban) and eight regulatory speed limit values to analyze speed trends over the years. This effort included 383 sites after nearby sites were grouped.

Slide 50



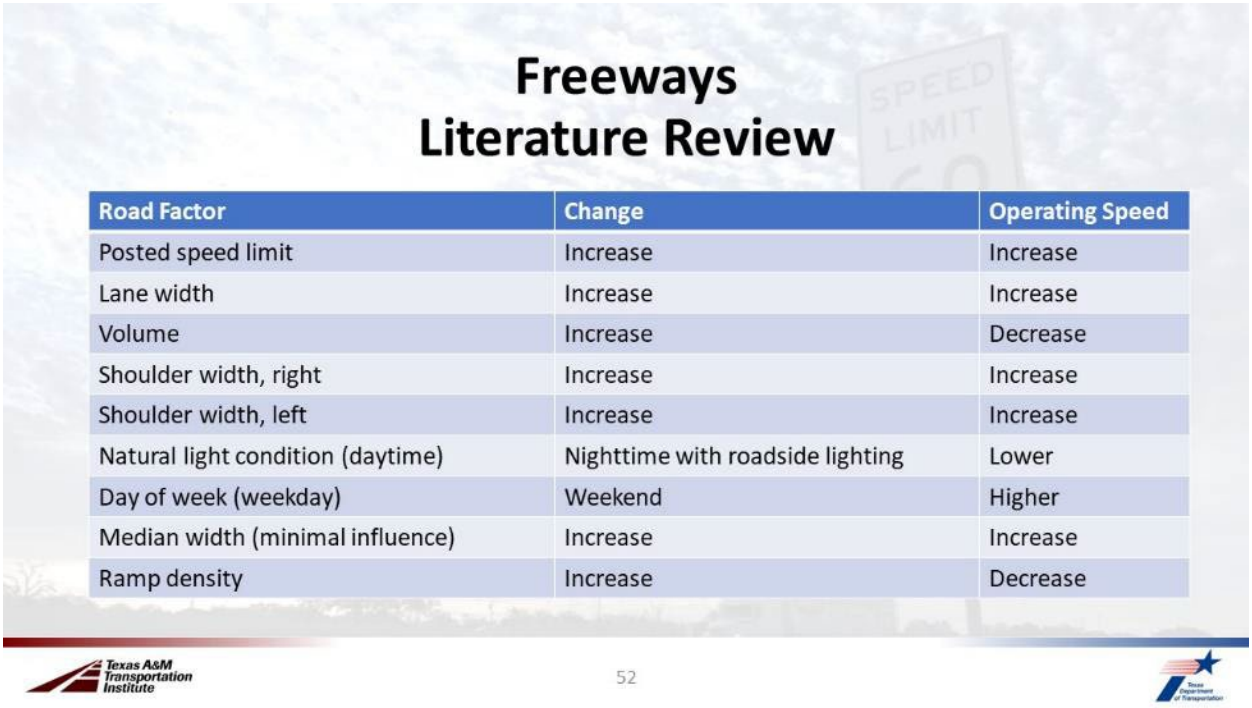
Key Message:
The TxDOT 0-7049 research team identified various factors related to traffic control, cross-sectional widths, horizontal curvature, access, roadside features, and traffic volume and mix that correlated with speed. More factors were identified as the development level increased.

Slide 51



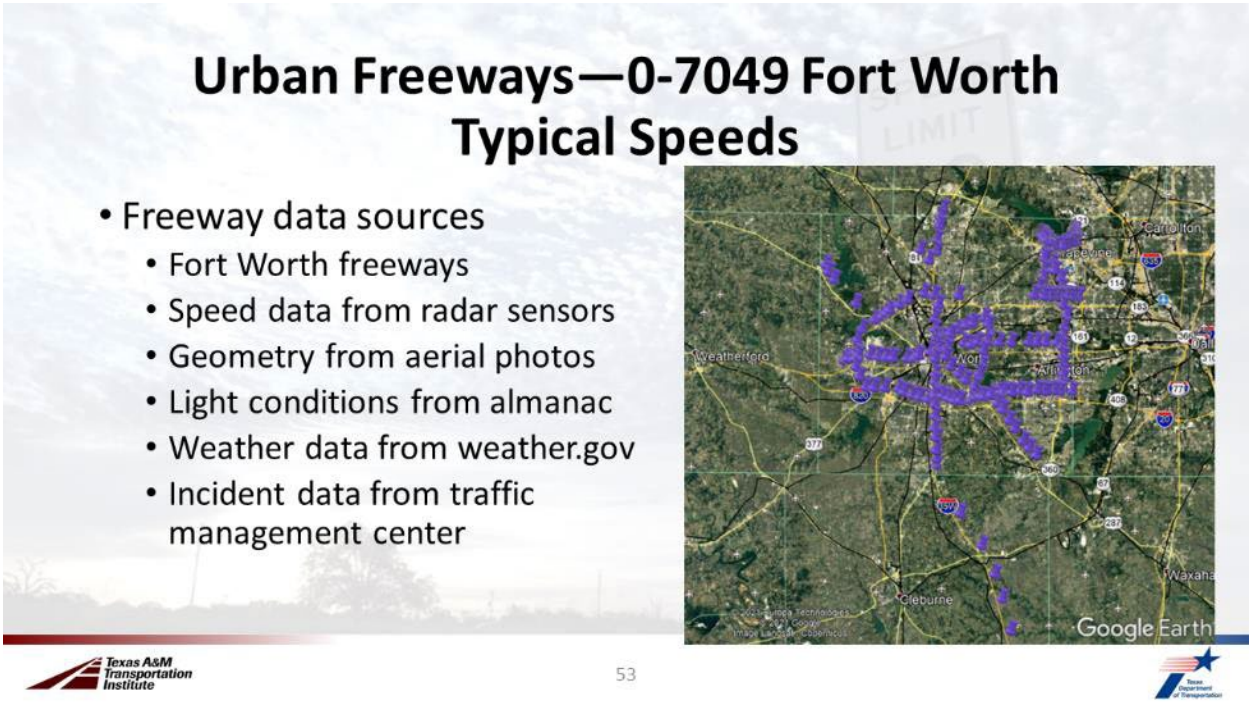
Key Message:
The TxDOT 0-7049 research team identified sites where development levels increased and found that speed reductions occurred at these sites. Speed reductions also occurred at some sites where development levels did not increase over time, but the reductions were nominal.

Slide 52



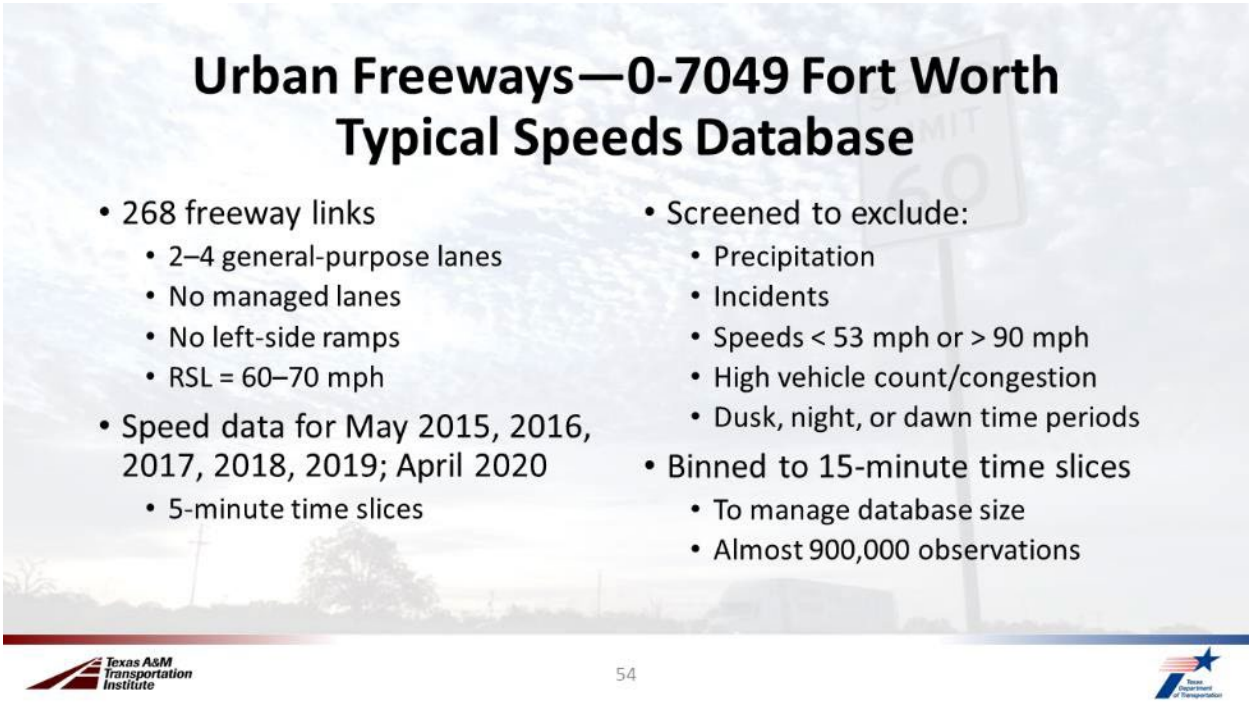
Key Message:
According to the published literature, speeds on freeways will increase with an increase in posted regulatory speed limit, lane width, shoulder width (right or left), or median width, or during the weekend when compared to weekdays. Speeds will decrease with an increase in traffic volume or ramp density, and at nighttime compared to daytime.

Slide 53



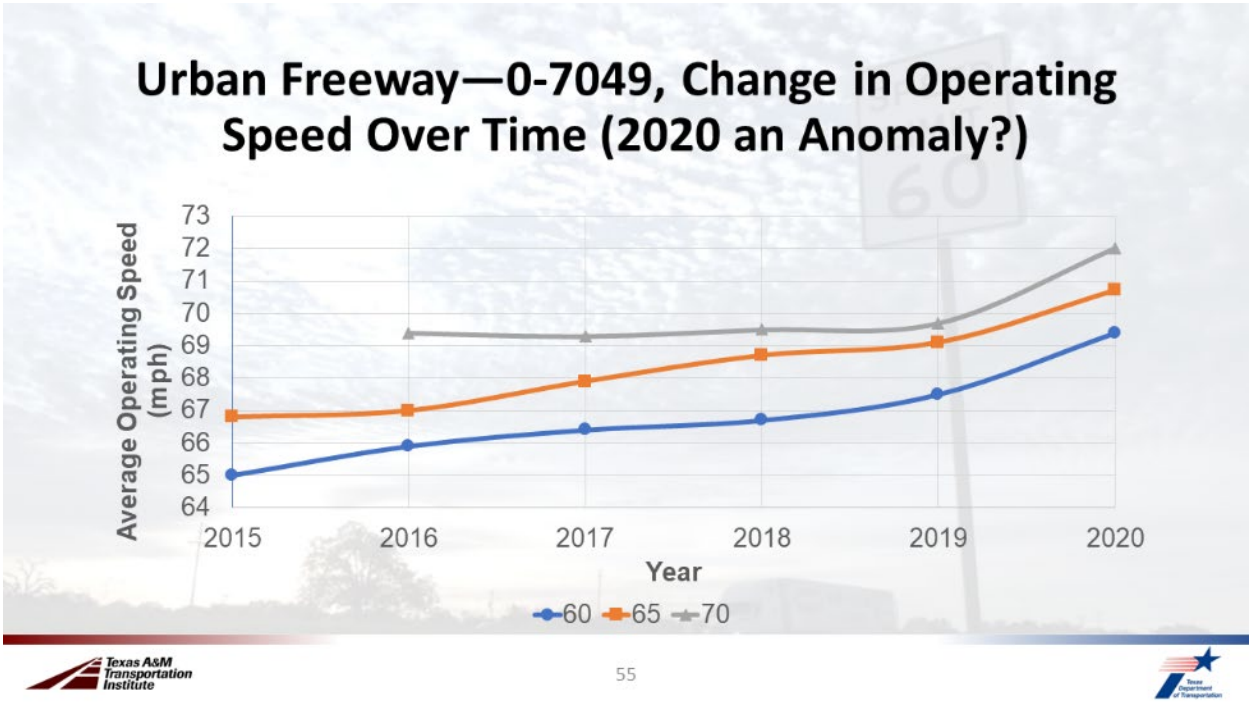
Key Message:
The TxDOT 0-7049 research team assembled a freeway speed database using archived speed data from sensors on freeway links in the Fort Worth District. They supplemented the speed data with geometry data from aerial photographs, light condition from an almanac, weather data from weather.gov, and incident data from the traffic management center.

Slide 54



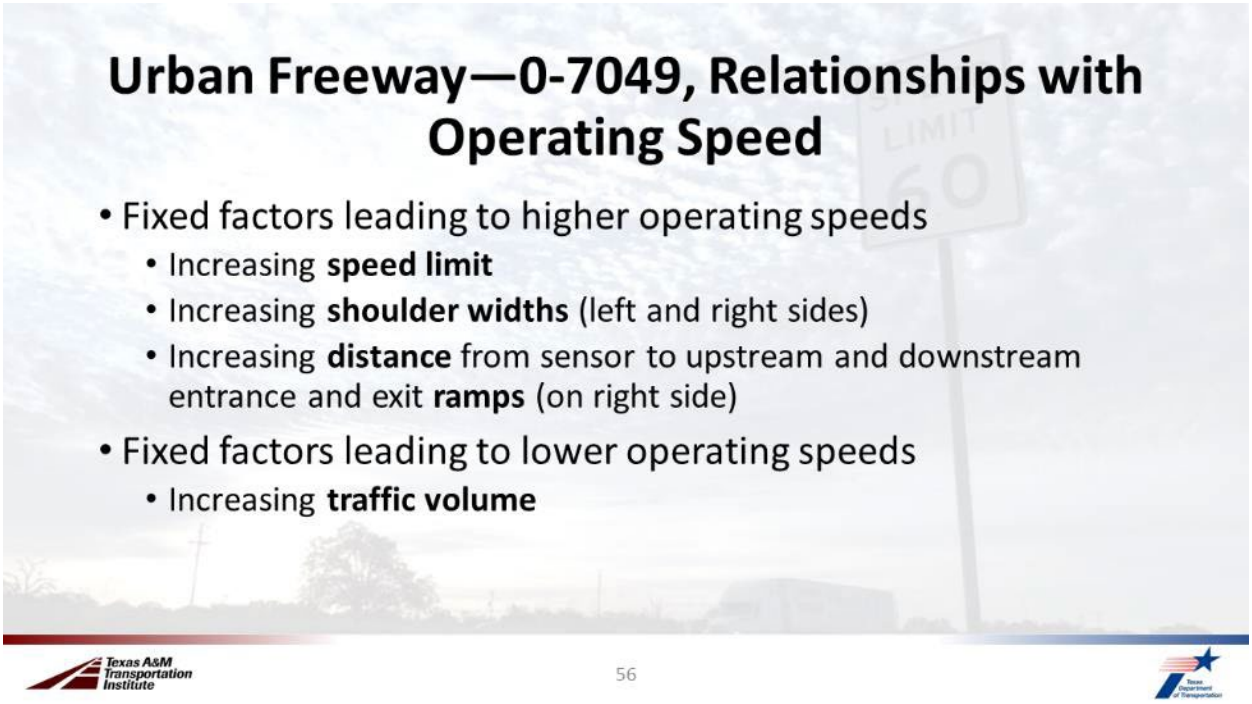
Key Message:
The assembled freeway speed database consisted of 268 freeway links with regulatory speed limits in the range of 60–70 mph. The speed observations were derived from one month each from the years 2015–2020, initially in the form of 5-minute time slices but later binned to 15-minute time slices. The TxDOT 0-7049 research team screened speed observations to exclude time periods affected by precipitation, incidents, high volumes, or congestion, and included only observations during daytime conditions with average speeds in the range of 53–90 mph.

Slide 55



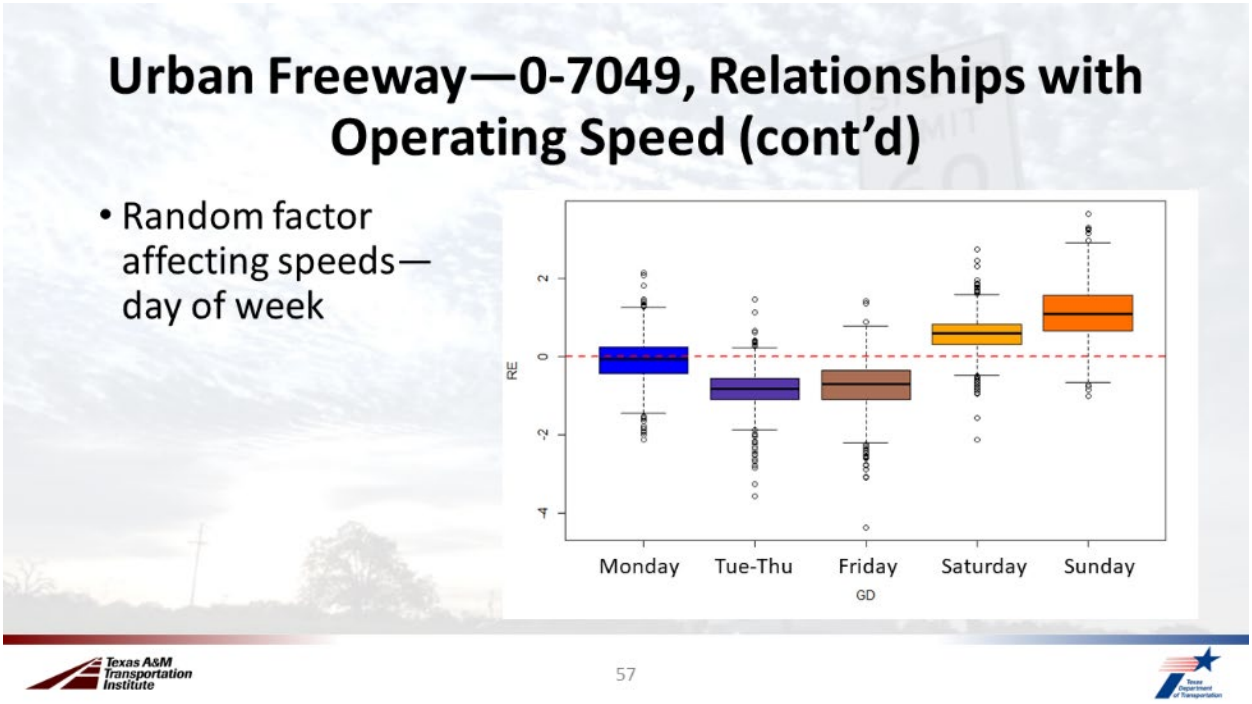
Key Message:
Average operating speed increased over time for all three levels of posted regulatory speed limit. The most notable increase occurred in 2020, which may be an anomaly due to the pandemic conditions.

Slide 56



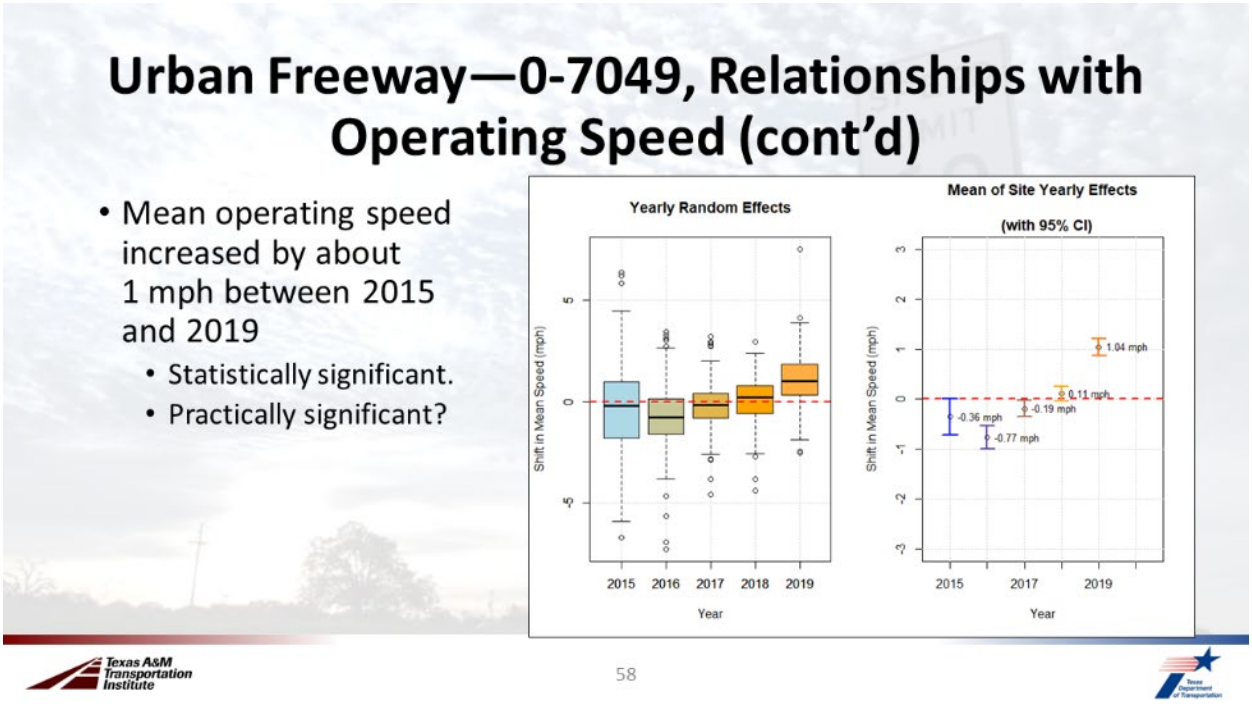
Key Message:
The TxDOT 0-7049 research team identified several fixed factors that affected freeway operating speeds. Factors associated with higher operating speeds included higher regulatory speed limits, wider shoulders (left and right), and longer distances from the speed sensor location to the nearest upstream and downstream entrance and exit ramps. Conversely, increasing traffic volume was associated with lower operating speeds. (A factor is classified as "fixed" if it affects all observations globally in the dataset.)

Slide 57



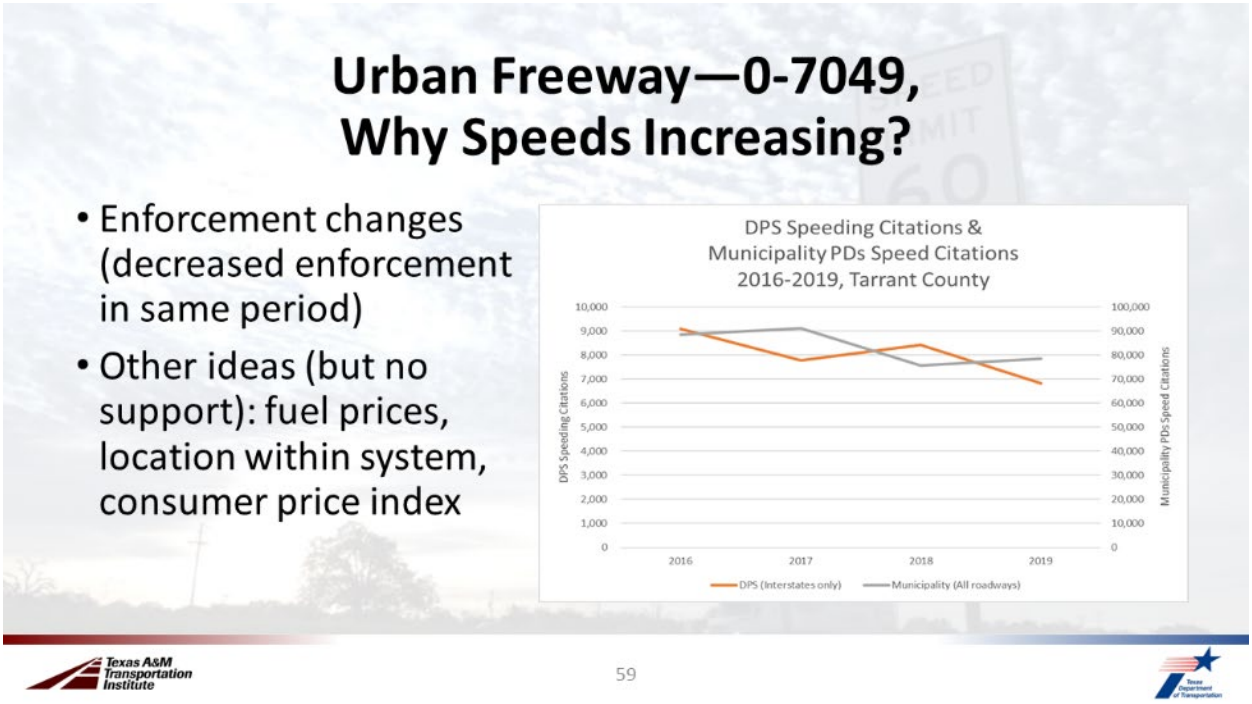
Key Message:
The TxDOT 0-7049 research team identified day of week as a random factor affecting freeway operating speeds. Compared to the average across all days of the week, operating speeds were lower on Tuesday–Friday and higher on Saturday and Sunday. (A factor is classified as "random" if it accounts for clusters or hierarchical structures in the dataset.)

Slide 58



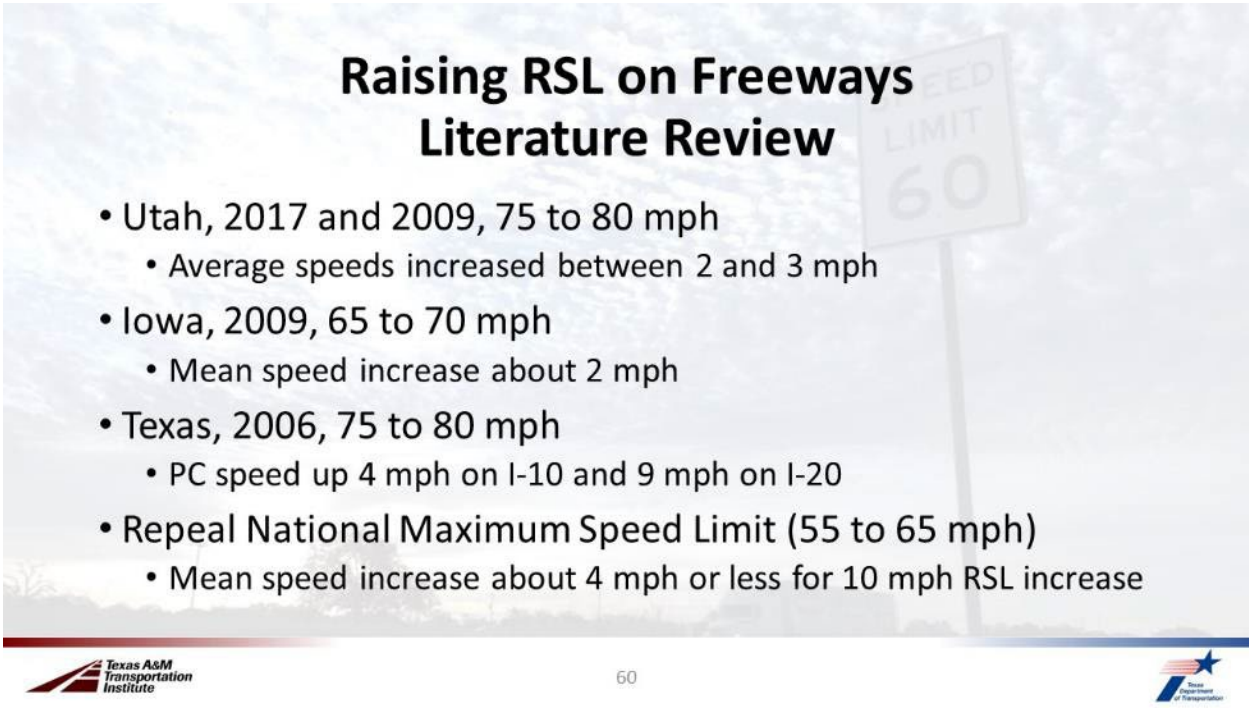
Key Message:
After accounting for all variables, the year was found to be a statistically significant random-effects variable. From 2015 to 2019, the mean freeway operating speed increased by about 1 mph. Though the variable is statistically significant due to the large sample size, the practical significance of the effect is uncertain.

Slide 59



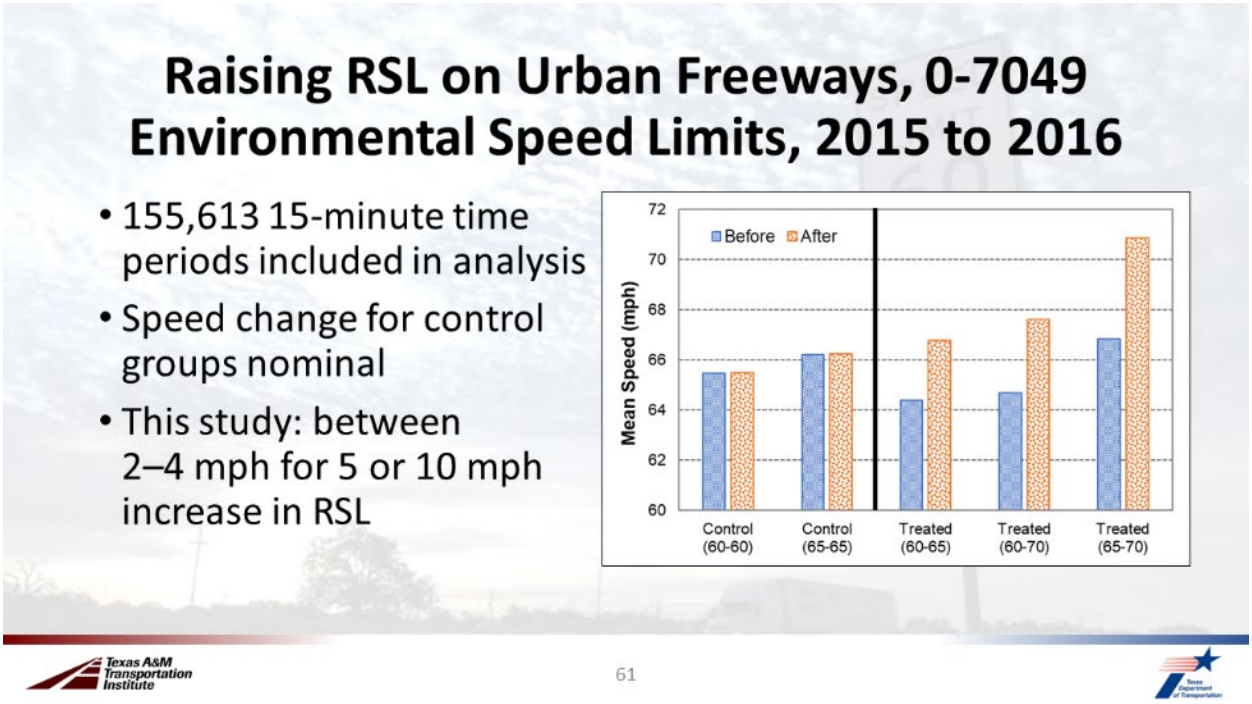
Key Message:
The TxDOT 0-7049 research team explored various factors to attempt to explain the observed increase in freeway operating speeds over time. They found that speed enforcement (measured in terms of citations issued) decreased in the 2016–2019 time frame for both the Department of Public Safety and municipal police departments in the Fort Worth District. They also explored fuel prices, speed measurement locations, and the consumer price index, but could not identify a relationship between these variables and operating speed.

Slide 60



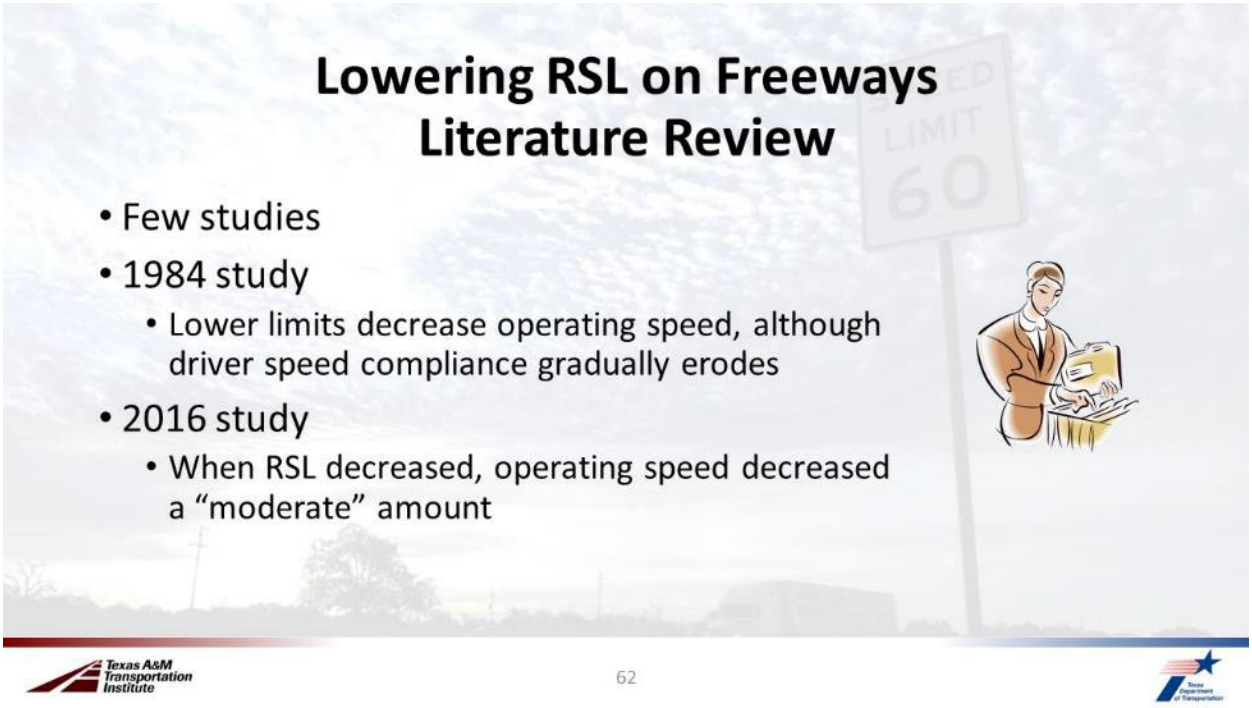
Key Message:
According to the published literature, freeway operating speeds increase when the posted regulatory speed limit is increased. The magnitude of the operating speed increase is usually smaller than the magnitude of the posted regulatory speed limit increase. This trend has been reported in various states in different parts of the country.

Slide 61



Key Message:
The TxDOT 0-7049 research team examined changes in operating speeds following the removal of environmental speed limits on some freeways in the Fort Worth District in 2015. They found that operating speeds increased on segments where the posted regulatory speed limits were increased, but not on segments where the posted regulatory speed limits did not change.

Slide 62



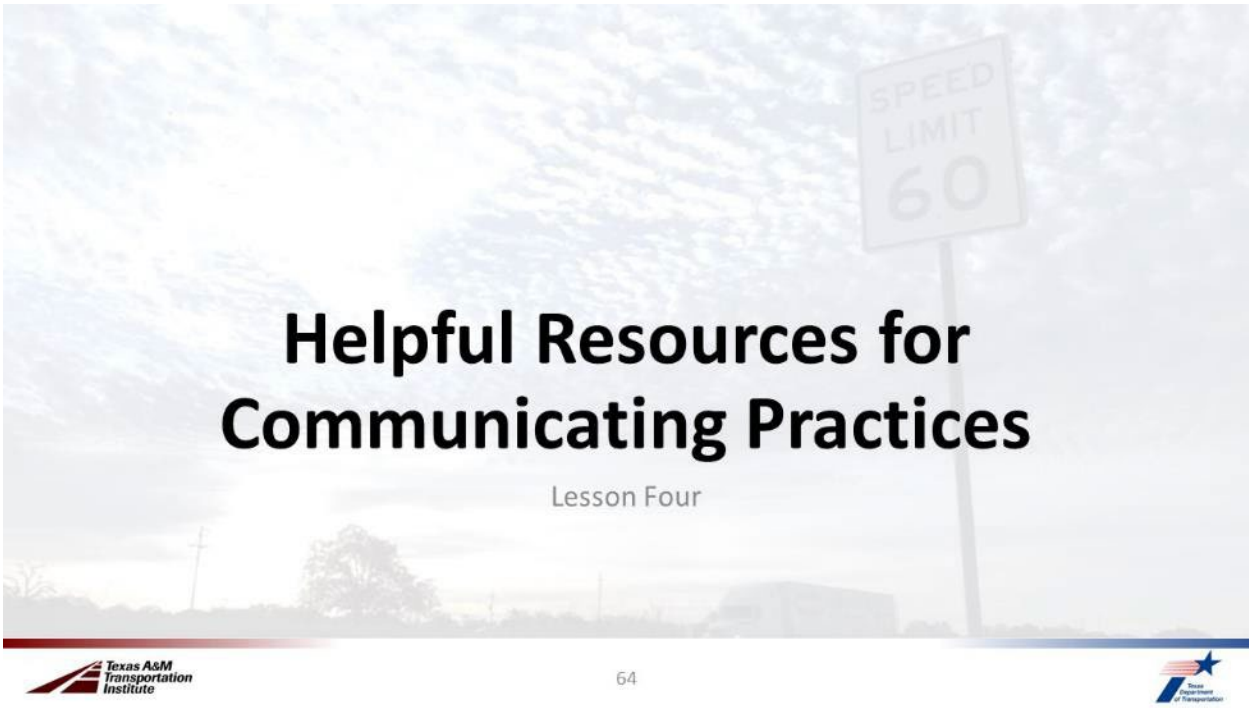
Key Message:
Few studies are available to quantify the effect of lowering posted regulatory speed limits on freeways. One study in the published literature showed a decrease in operating speed, but with compliance gradually eroding over time. Another study showed a "moderate" decrease in operating speed.

Slide 63

Key Message:
None.

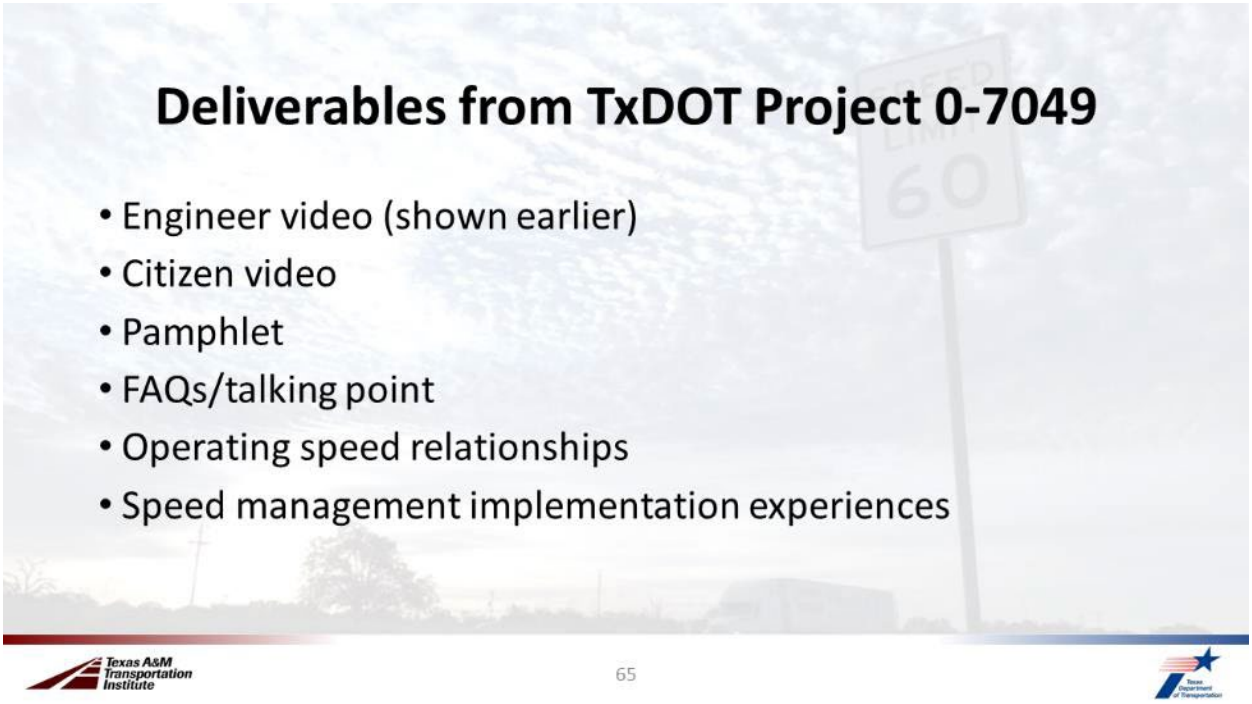
LESSON FOUR: HELPFUL RESOURCES FOR COMMUNICATING PRACTICES

Slide 64



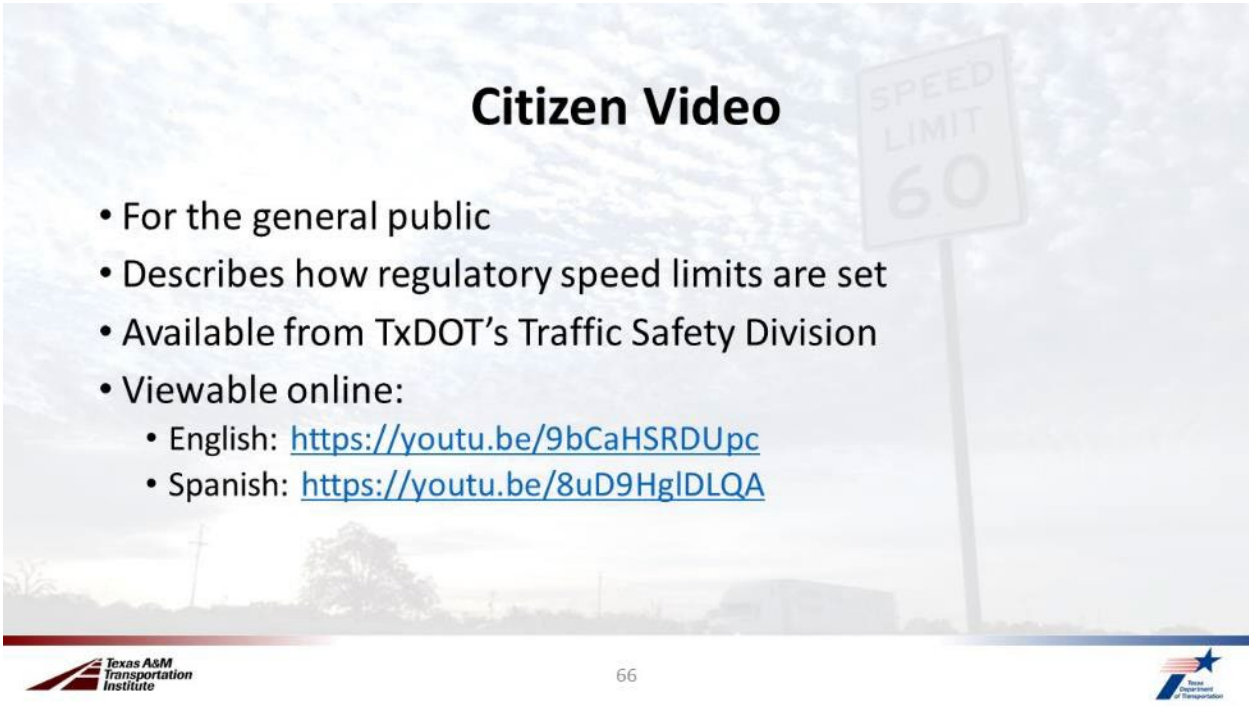
Key Message:
Lesson Four introduces the students to resources developed in TxDOT Research Project 0-7049 to help practitioners communicate regulatory speed limit and speed management practices to interested stakeholders.

Slide 65



Key Message:
Communication resources developed in TxDOT Research Project 0-7049 include two videos, an informational pamphlet, a written frequently asked question/talking point document, and material summarizing operating speed relationships and practitioner experience applying speed management treatments across the state.

Slide 66



Key Message:
The citizen video summarizes the process for setting regulatory speed limits in Texas. Its intended audience is the public. English and Spanish versions of the video are available.

Interactivity:
Click: Use the link on this slide to access the citizen video. The video is about 2 minutes long.

Notes:
The citizen videos are available online or from TxDOT's Traffic Safety Division. The instructor should obtain a local copy of the videos before the workshop, and may either use the link on the slide or exit the slide presentation to play a local copy of the video after discussing this slide. The instructor may choose which versions (English and/or Spanish) to use based on the needs of the students.

Slide 67

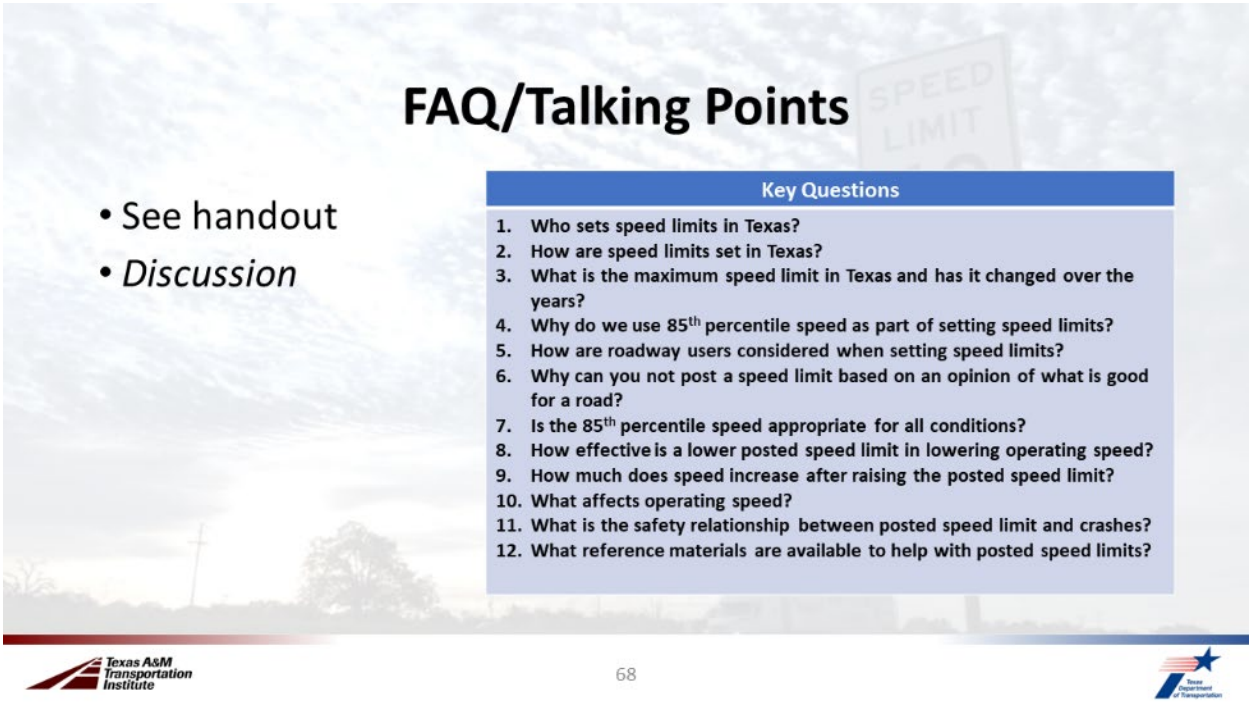
Key Message:
The informational pamphlet describes the five-step process for setting and posting regulatory speed limits.

Interactivity:
Tell: A copy of the pamphlet is bound within the *Student's Guide*. It is on the last sheet of paper before the workshop evaluation form.

Tell (if loose-leaf copies of the pamphlet are available): Loose-leaf copies of the pamphlet are available for the students or to share with other interested people.

Ask: How can this resource be useful to you and your agency?

Slide 68

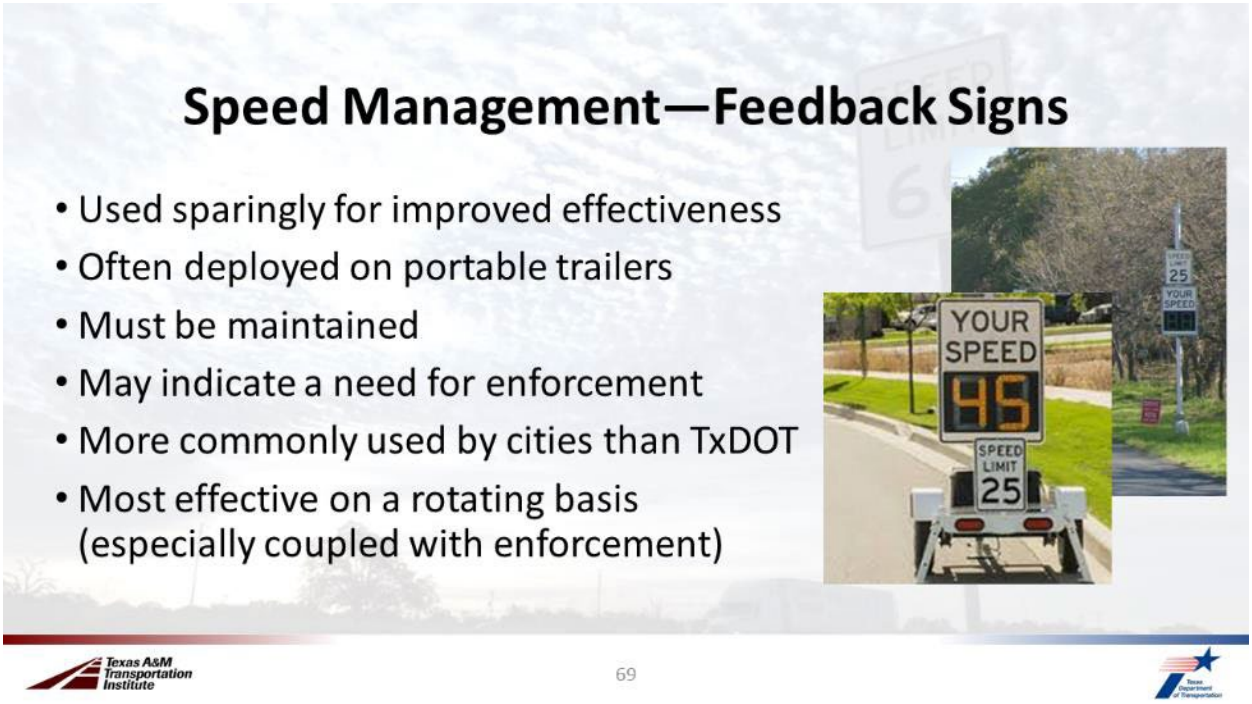


Key Message:
The Frequently Asked Questions document provides talking points and addresses 12 questions relating to regulatory speed limits, vehicle speeds, and communication materials.

Interactivity:
Tell: A copy of the Frequently Asked Questions document is bound within the *Student's Guide*. It is immediately after the presentation slides.

Ask: How can this resource be useful to you and your agency?

Slide 69



Key Message:
Speed feedback signs are commonly used as a speed management technique. They should be used sparingly on a rotating basis to maximize their effectiveness. If a speed feedback sign is often deemed necessary at a site, trends may indicate a need for enforcement at the site. This treatment is more commonly used by municipalities than TxDOT.

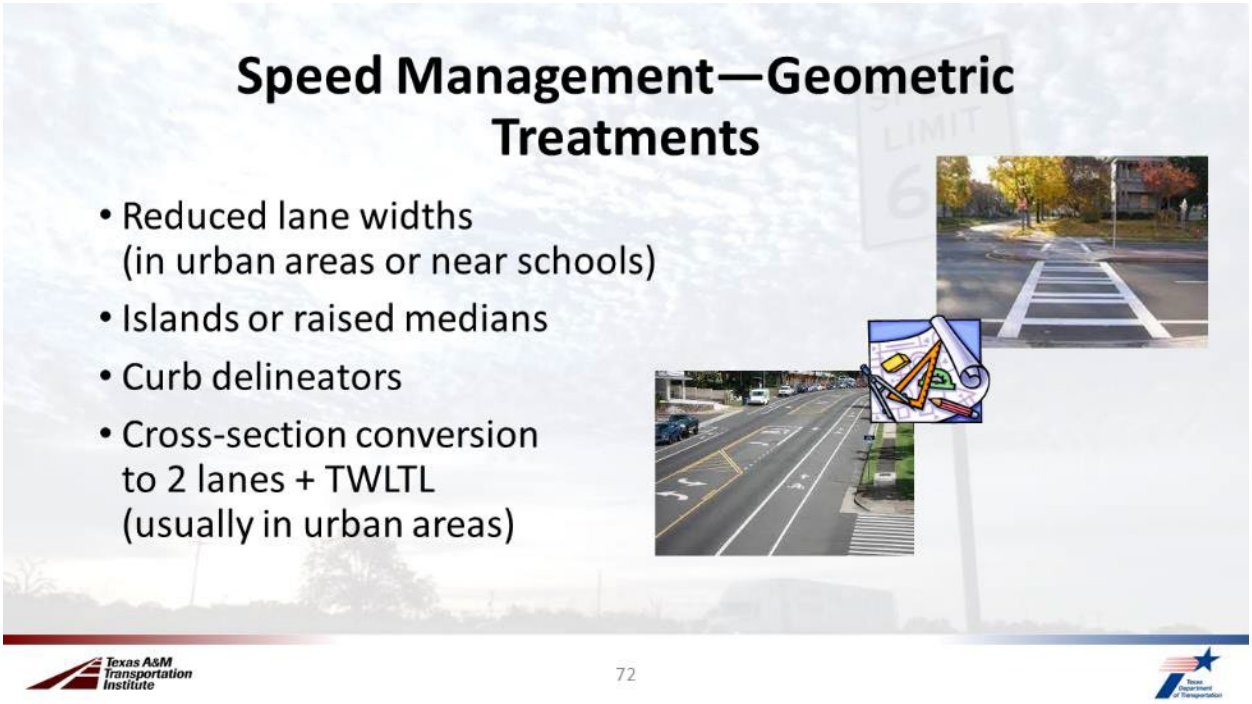
Slide 70

Key Message:
Transverse rumble strips and optical speed bars are available as pavement-based speed management treatments. Speed markings can be used for special locations like curves and school zones, but not for speed management at typical sites.

Slide 71

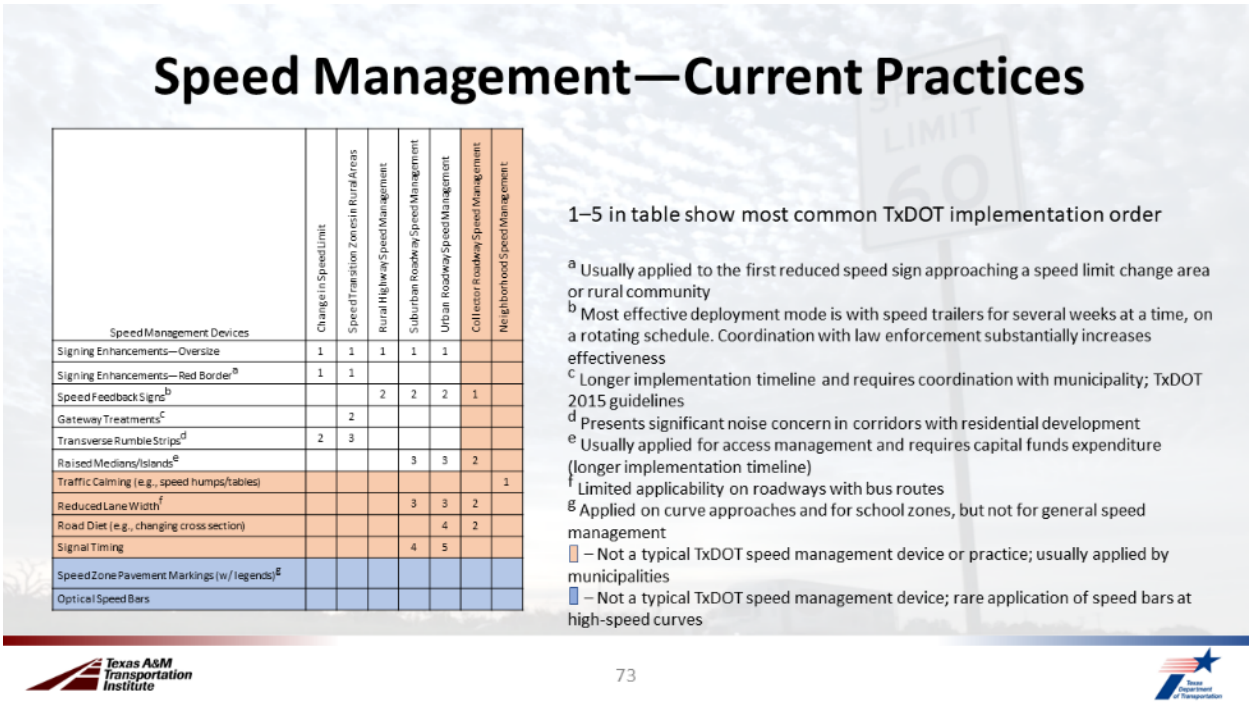
Key Message:
Several types of signing enhancements are available for use as speed management treatments. These treatments include speed limit signs with red borders, oversized signs, flags on a recently changed signs, speed reduction and step-down signing on rural town approaches, and gateway monuments.

Slide 72



Key Message:
Several types of geometric treatments are available for use as speed management treatments. These treatments include reduced lane widths (appropriate for urban areas or school zones), islands, raised medians, curb delineators, and cross-section conversion (i.e., converting a four-lane undivided segment to two lanes with TWLTL).

Slide 73



Key Message:
The TxDOT 0-7049 research team assembled a matrix to illustrate the common implementation order for the speed management techniques.

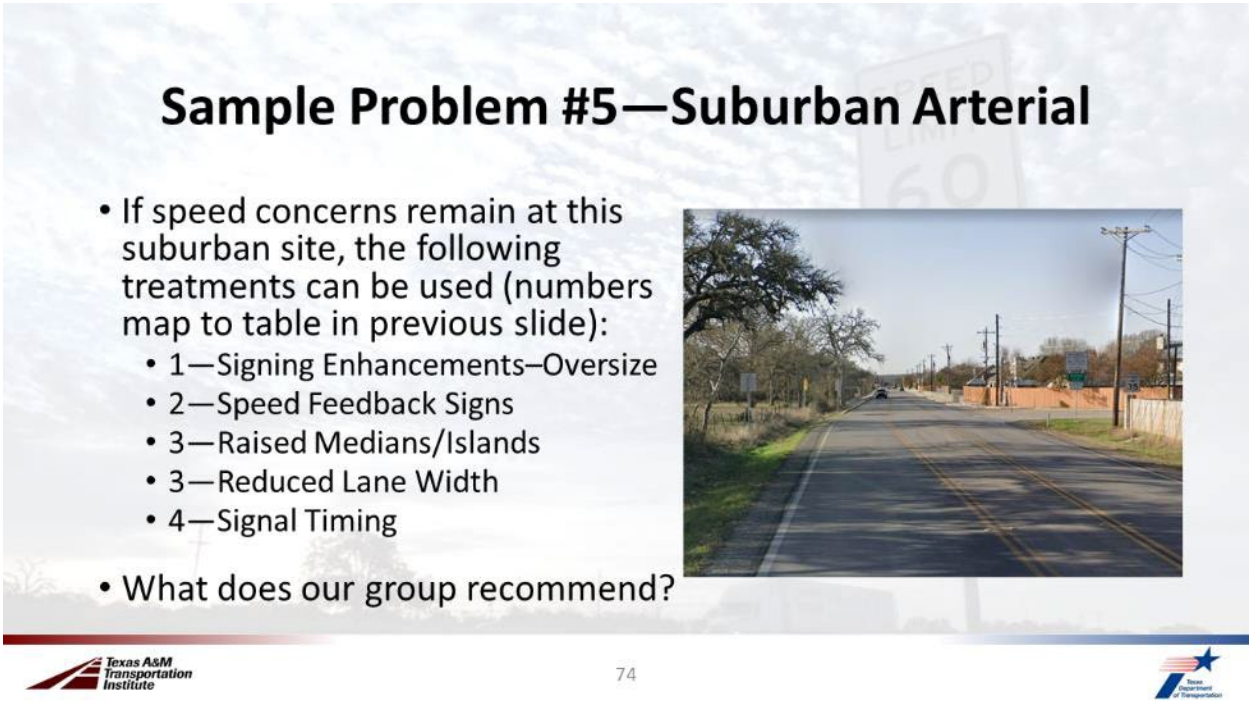
Interactivity:
Tell: A copy of the Common TxDOT Implementation Order matrix is included in the *Student's Guide* after the Frequently Asked Questions document.

Tell: The numbers in the matrix indicate the common order in which the various treatments are implemented.

Tell: The beige shading indicates treatments that are used often by municipalities but seldom by TxDOT.

Tell: The blue shading indicates treatments that are rarely used in Texas.

Slide 74



Key Message:
Speed management techniques are available for use at sites where speed concerns remain after studying and updating the posted regulatory speed limit.

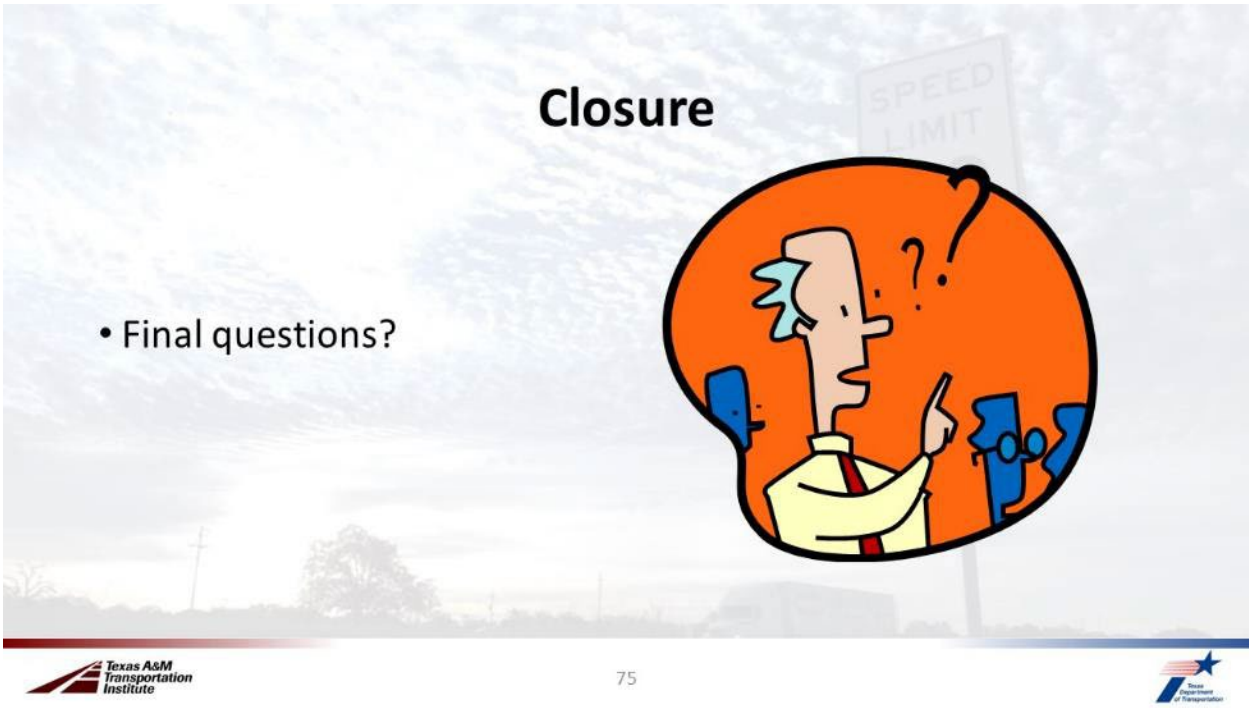
Interactivity:
Tell: The example suburban arterial segment used in this sample problem is the same segment that was used in sample problems 2 and 4.

Ask: Which speed management treatment(s) does our group recommend for this segment?

Notes:
This sample problem is an open-ended discussion. Any or all of the treatments on the list can be used. Answers may vary depending on the typical local practices used in the students' jurisdictions.

CLOSURE

Slide 75

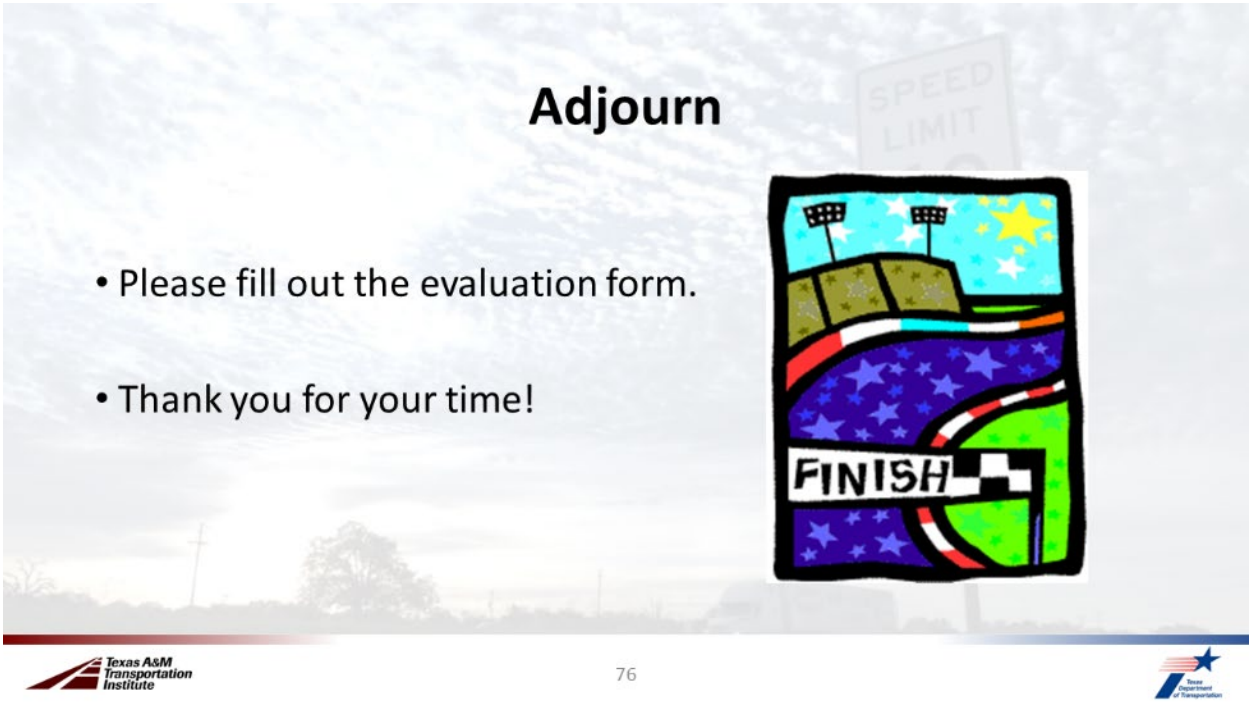


Key Message:
None.

Interactivity:
Ask: Does anyone have final questions about any of the presented material or resources?

Ask: Does anyone have future research needs to suggest to the instructor?

Slide 76



Key Message:
None.

Interactivity:
Tell: The workshop is concluded. The last sheet in the *Student's Guide* is a workshop evaluation form. Please take a minute to remove the form from your guide, fill it out, and return it to the instructor. All responses are anonymous.

SOLUTIONS TO SAMPLE PROBLEMS

1: RURAL FREEWAY SEGMENT, SPEED ZONE MANUAL PROCEDURE

2: SUBURBAN ARTERIAL SEGMENT, SPEED ZONE MANUAL PROCEDURE

3: RURAL FREEWAY SEGMENT, NCHRP 17-76 SPREADSHEET TOOL

4: SUBURBAN ARTERIAL SEGMENT, NCHRP 17-76 SPREADSHEET TOOL

5: SUBURBAN ARTERIAL SEGMENT, SPEED MANAGEMENT TREATMENTS

SAMPLE PROBLEM 1:
RURAL FREEWAY SEGMENT, SPEED ZONE MANUAL PROCEDURE

INPUT DATA

Site Description Data

Existing regulatory speed limit: 75 mph
Adverse site conditions: Not present
Crash history: Segment's crash rate does not exceed statewide average
Date of last speed zone study: 5 years ago

Speed Zone Study Data

Number of free-flow cars measured: 133 cars
85th percentile speed: 82 mph
Statutory maximum speed limit: 75 mph

OUTPUT SUMMARY

What is the new regulatory speed limit? ……..…….. | *75 mph*

The measured 85th percentile speed is 82 mph, which is above the statutory maximum speed limit for this type of roadway. There are no concerns with adverse site conditions for the site (narrow pavement, curves, driveway density, or inadequate shoulders), and the crash rate for the site does not exceed the statewide average for similar sites. Hence, the statutory maximum speed limit of 75 mph dictates the setting of the regulatory speed limit.

SAMPLE PROBLEM 2:
SUBURBAN ARTERIAL SEGMENT, SPEED ZONE MANUAL PROCEDURE

INPUT DATA

History (2004)

Roadway type: Rural two-lane highway (outside city limits)
Number of free-flow cars measured: 137 cars
85th percentile speed: 50 mph
Adverse site conditions: Negligible shoulder width
Crash history: Segment's crash rate does not exceed statewide average
Regulatory speed limit: 45 mph

Current Conditions (2018)

Roadway type: Suburban minor arterial with TWLTL (inside city limits)
Number of free-flow cars measured: 132 cars
85th percentile speed: 45 mph
Adverse site conditions:

- Negligible shoulder width
- Notable driveway/cross street density (doubled since last speed zone study because of recent residential and commercial developments)

Crash history: Segment's crash rate exceeds statewide average

OUTPUT SUMMARY

What is the new regulatory speed limit? ……..…….. | *35 mph*

In the speed zone study conducted in 2004, the 85th percentile speed was found to be 50 mph, but an adverse site condition (inadequate shoulders) existed. The crash rate at the site did not exceed the statewide average for similar sites. Hence, the speed limit was set at 45 mph, which was 5 mph below the 85th percentile speed. In the speed zone study conducted in 2018, the measured 85th percentile speed was 45 mph, which matched the previous regulatory speed limit. However, site conditions had changed since the last speed zone study, with increased driveway density and crash rate exceeding the statewide average for similar sites, and the inadequate shoulders had not been improved. The Procedures for Establishing Speed Zones manual allows a regulatory speed limit to be set as much as 12 mph below the 85th percentile speed if the crash rate exceeds the statewide average for similar sites and other adverse conditions exist. Hence, the regulatory speed limit may be lowered to 35 mph, which is 10 mph below the 85th percentile speed.

A direct application of the Speed Zone Manual guidance could yield values in the range of 35–45 mph. At the real-world site which formed the basis for this sample problem, a regulatory speed limit of 35 mph was chosen.

SAMPLE PROBLEM 3:
RURAL FREEWAY SEGMENT, NCHRP 17-76 SPREADSHEET TOOL

INPUT DATA

Speed Data

Maximum speed limit: 75 mph
85th percentile speed: 82 mph
50th percentile speed: 78 mph

Site Characteristics

Segment length: 8 mi
AADT: 32,000 veh/d
Number of lanes: 4
Directional design-hour truck volume: 100 trk/hr
Number of interchanges: 4
Design speed: ≥ 60 mph
Grade: 1%
Outside shoulder width: 11 ft
Inside shoulder width: 3 ft
Adverse alignment present? No

OUTPUT SUMMARY

What is the new regulatory speed limit? ……..…….. | *75 mph*

The only non-ideal site condition present is the 3-ft inside shoulder width, which calls for using the rounded-down 85th percentile speed instead of the closest 85th percentile speed. However, the statutory maximum speed limit for this type of roadway is 75 mph. Hence, the suggested regulatory speed limit is computed as 75 mph.

SAMPLE PROBLEM 4:
SUBURBAN ARTERIAL SEGMENT, NCHRP 17-76 SPREADSHEET TOOL

INPUT DATA

Speed Data

Maximum speed limit: 55 mph
85th percentile speed: 45 mph
50th percentile speed: 42 mph

Site Characteristics

Segment length: 2 mi
Number of lanes: 2
Median type: TWLTL
Number of traffic signals: 3
Number of access points: 6
Bicyclist activity/bike lane type: Not high/Any type
Sidewalk presence/width: Narrow
Sidewalk buffer: Not present
Pedestrian activity: Some
On-street parking activity: Not high
Parallel parking permitted? No
Angle parking permitted? No
Adverse alignment present? No

Crash Data

Number of years of crash data: 3 years
Average ADDT for crash data period: 10,000 veh/d
Is the segment a one-way street? No
All (KABCO) crashes for crash data period: 45 crashes
Fatal & injury (KABC) crashes for crash data period: 23 crashes

OUTPUT SUMMARY

What is the new regulatory speed limit? ……..…….. | *40 mph*

The KABC crash rate is computed as 105 KABC crashes per 100 million vehicle-miles, which is more than 1.3 times the average KABC crash rate for two-lane suburban minor arterial segments (78.3 crashes per 100 million vehicle-miles). Based on crash data, the regulatory speed limit would be suggested based on the rounded-down 85th percentile speed. Additionally, the non-ideal site characteristics are identified for pedestrian features. Specifically, the site has some pedestrian activity but narrow sidewalks with no buffers. That combination of attributes results in suggesting a regulatory speed limit based on the closest 50th percentile speed. Hence, the suggested regulatory speed limit is computed as 40 mph.

Note that this sample problem is solved using the TxDOT 2019 crash rates of 212.7 KABCO crashes per 100 million vehicle-miles and 78.3 KABC crashes per 100 million vehicle-miles. If different rates are entered into the "Support Tables" worksheet, the rates specified here can be used in the analysis to repeat the results documented here.

SAMPLE PROBLEM 5:
SUBURBAN ARTERIAL SEGMENT, SPEED MANAGEMENT TREATMENTS

INPUT DATA

Available Treatments

Signing enhancements—oversize
Speed feedback signs
Raised medians/islands
Reduced lane width
Signal timing

OUTPUT SUMMARY

Which treatment(s) should be used?

This sample problem is an open-ended discussion. Any or all of the treatments on the list can be used. Answers may vary depending on the typical local practices used in the students' jurisdictions.

ACRONYM AND ABBREVIATION LIST

AADT	Annual average daily traffic
CI	Confidence interval
cont'd	Continued
DPS	Department of Public Safety
FAQ	Frequently asked question
FHWA	Federal Highway Administration
KABC	Fatal and injury
KABCO	Fatal, injury, and property-damage-only
mi	Miles
mph	Miles per hour
MUTCD	Manual on Uniform Traffic Control Devices
MVMT	Million vehicle-miles traveled
NACTO	National Association of City Transportation Officials
NCHRP	National Cooperative Highway Research Program
NCUTCD	National Committee on Uniform Traffic Control Devices
NTSB	National Transportation Safety Board
NYC	New York City
PC	Passenger car
PD	Police department
RSL	Regulatory speed limit
Spd	Speed
TMC	Traffic management center
TRB	Transportation Research Board
trk/hr	Trucks per hour
TWLTL	Two-way left-turn lane
TxDOT	Texas Department of Transportation
TxMUTCD	Texas Manual on Uniform Traffic Control Devices
veh/d	Vehicles per day

FREQUENTLY ASKED QUESTIONS ABOUT REGULATORY SPEED LIMITS

The following are questions frequently asked regarding regulatory speed limits. The answers were developed based on information in the literature along with research team knowledge regarding speed limits. These questions reflect regulatory speed limits and may not apply to work zones, advisory speeds, school zones, and other types of speed limits.

WHO SETS SPEED LIMITS IN TEXAS?

State law—the Texas Transportation Code (the "Code")—establishes the framework for speed management in the State of Texas. The Code generally establishes maximum speed limits based on the type of road and driving environment:

- Urban district or street: 30 mph.
- Alley, beach, or roads adjacent to beaches: 15 mph.
- Numbered state or federal highway outside urban district: 70 mph.
- Non-numbered highways outside urban district: 60 mph.

Exceptions are allowed for speeds greater than 70 mph on select numbered state or federal highways where the Texas Transportation Commission (TTC) deems it reasonable and safe to do so, including speed limits of up to 85 mph on roadways designed for this speed. Within this framework, the posted speed limit is determined by the responsible agency of the road or highway. Speed limits on city streets are managed by the municipal transportation department and established by municipal ordinance. Speed limits on county roads are managed by the county transportation department and established by county commissioners court minute order.

Speed limits on state and federal highways are managed by the Texas Department of Transportation (TxDOT). Speed studies—a type of engineering study—are performed on all state and federal routes on a regular basis and when requested by the public. The process for studying—and potentially changing—a speed limit is shown in the flowchart in Figure 1. If it is determined that a speed limit change is justified, the roadway's location determines the legal steps for adopting the revised speed limit. Outside municipal boundaries, speed limits are

established by TTC minute order. For portions of state highways passing through a municipality, the speed limit is established by municipal ordinance.

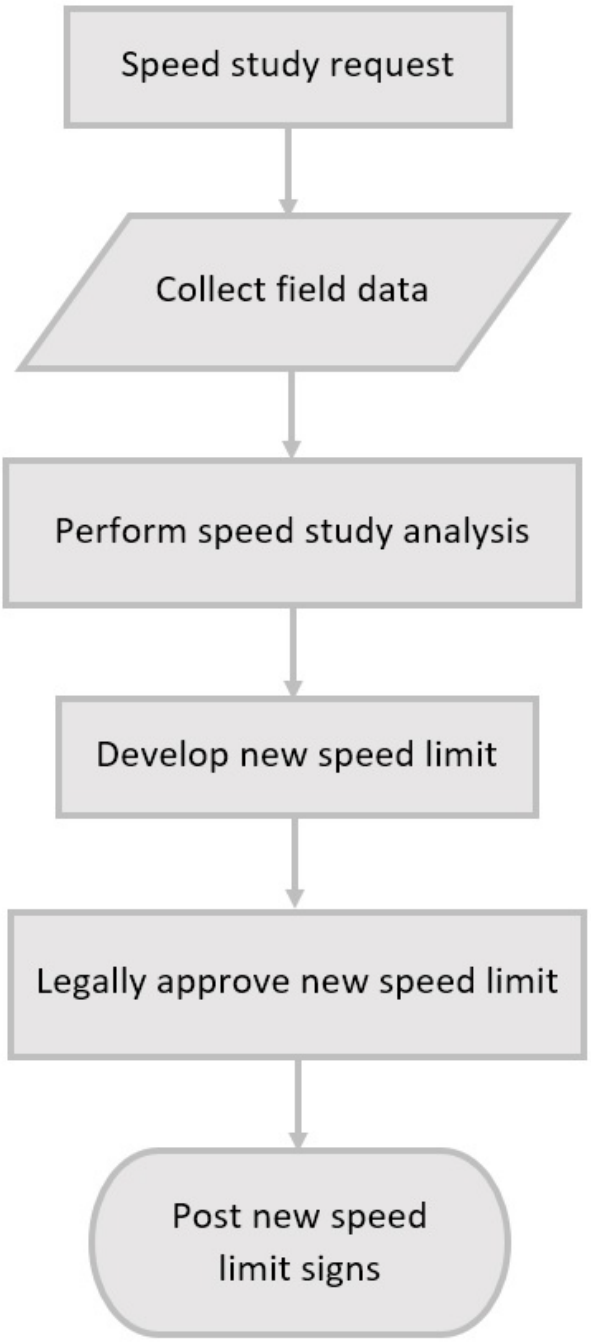


Figure 1. Setting Speed Limit Process.

HOW ARE SPEED LIMITS SET IN TEXAS?

Speed limits in Texas are based on the statutory speed limits outlined in the Code and evaluated by procedures established by TxDOT. The Texas Administrative Code (TAC) requires that speed limits be based on the 85th percentile speed, a value calculated from speed data based on typical engineering practice and that which defines a boundary for excessive speeds. As part of a speed study, the resulting suggested speed limit starts at the 85th percentile speed value and is then adjusted for the design and physical factors that can influence safe operating speeds, including:

- Horizontal and vertical curves.
- Hidden driveways and other roadside developments.
- High driveway density.
- Rural residential or developed areas.
- Lack of striped, improved shoulders.

After all such factors are considered in the speed study, an engineering recommendation is made on whether a speed limit change is necessary. If a change is recommended for a state or federal highway, the revised limit is reviewed by TxDOT staff for consistency in statewide practice and prepared for adoption by either TTC minute order (outside of municipal boundaries) or municipal ordinance (inside of municipal boundaries).

WHAT IS THE MAXIMUM SPEED LIMIT IN TEXAS AND HAS IT CHANGED OVER THE YEARS?

The statutory maximum speed limit in Texas is 75 mph on most roadways on the state highway system, 80 mph on parts of IH 10 and IH 20 in rural west Texas, and up to 85 mph on certain highways that are designed to accommodate travel at the established speed (State Highway 130 is currently the only roadway in this category).

The statutory maximum speed limit for the state highway system was 70 mph in daytime and 65 mph at night until a series of legislative changes occurred starting in 2006. Such changes were made to recognize different conditions on some types of roadways that could justify the posting of higher regulatory speed limits and included:

- 1974: National Maximum Speed Limit (NMSL) Law restricted the maximum permissible vehicle speed limit to 55 mph on all interstate roads in the United States.

- 1995: NMSL repealed.
- 2000: Environmental speed limits implemented in several Texas regions as a method to improve air quality.
- 2003: No new environmental speed limits to be implemented.
- 2006: Rural interstate highways and some other rural highways in sparsely populated counties could be signed as high as 80 mph and 75 mph, respectively.
- 2011: All highways on the state highway system could be signed as high as 75 mph. In addition, the night and truck speed limits were repealed.
- 2012: Highways that were built to exceptionally high design standards and could accommodate travel at higher speeds could be signed up to 85 mph.

WHY DO WE USE 85TH PERCENTILE SPEED AS PART OF SETTING SPEED LIMITS?

The 85th percentile speed has been used as a rule of thumb for setting regulatory speed limits since the 1930s. The concept is based on the principles that most drivers are reasonable and prudent, desire to avoid a crash, and desire to arrive at their destination in the shortest possible time. Historical speed studies have shown that cumulative speed distribution curves often bend at speeds slightly above the 85th percentile, such that there are a small number of notably fast vehicles above this value that are assumed to be driving above a reasonable speed. Using the 85th percentile results in speed limits that are credible to the public and avoids criminalizing too large a proportion of the driving population.

HOW ARE ROADWAY USERS CONSIDERED WHEN SETTING SPEED LIMITS?

The driver often plays a key role in the speed limit setting process since the speeds used toward establishing speed limits are typically measured when traffic is flowing freely. During free-flow conditions, drivers select speeds that they believe optimize the tradeoffs between travel time and risk. Basing the speed limit on the 85th percentile indicates a belief that drivers are pretty good at assessing these tradeoffs and their judgment is trustworthy in establishing a level where drivers who exceed that speed may be cited by law enforcement. While that may be so, additional conditions could exist that do not influence the 85th percentile speed but contribute to crashes. A posted speed limit that is lower than the 85th percentile speed could help to minimize the consequences of those conditions. In addition, the desire to provide roadway corridors that

encourage active transportation should be associated with appropriate posted speed limits that consider the safety and mobility needs of pedestrians and bicyclists.

WHY CAN YOU NOT POST A SPEED LIMIT BASED ON AN OPINION OF WHAT IS GOOD FOR A ROAD?

If the speed limit value decision is not based on objective data or accompanied by needed enforcement, education, or infrastructure changes, then target travel speeds may not be achieved. Drivers usually select their operating speed based on their perception of the driving environment and their own needs and preferences rather than actively considering other road users' needs and perspectives.

IS THE 85TH PERCENTILE SPEED APPROPRIATE FOR ALL CONDITIONS?

While the 85th percentile speed is an essential starting point for setting regulatory speed limits, it is not sufficient to account for all site conditions and all roadway users. The 85th percentile speed concept implicitly assumes that drivers are aware of roadway hazards that require them to reduce their speed. This assumption is questionable in some conditions, particularly on roadways with frequent curves or driveways or notable numbers of pedestrians and bicyclists (such as urban streets). Hence, it is necessary to examine and document site conditions and the frequency of vulnerable road users when conducting a speed zone study and adjust the speed limit as needed to account for these conditions. If the speed limit is adjusted notably down from the 85th percentile, it is important to provide education and enforcement to ensure credibility and compliance.

HOW EFFECTIVE IS A LOWER POSTED SPEED LIMIT IN LOWERING OPERATING SPEED?

There is evidence that in some locations a reduction in the posted speed limit will be accompanied by a reduction in average operating speed. This reduction, if present, will not be in the same magnitude as the reduction in posted speed limit. Research has shown that the reduction is 1 mph or less compared to a 5-mph speed limit drop.

HOW MUCH DOES SPEED INCREASE AFTER RAISING THE POSTED SPEED LIMIT?

In one of the most extensive studies in this area, speed limits were changed at 100 sites along non-limited-access highways where the speed limits were either raised or lowered, and speed limits were not changed at 83 control sites. The difference in operating speed at the treated

sites after these changes was typically less than 1.5 mph on average. Other research projects have also found that speed limit increases tend to result in increased vehicle speeds, but average speed increases were generally less than half the amount of the actual speed limit increase. The magnitude of the change in operating speed when there is an increase (or decrease) in posted speed is typically only a fraction of the amount of the actual speed limit change. For undivided high-speed rural roadways, mean speeds are generally 3 to 5 mph higher for every 10-mph increase in speed limit above 55 mph, with smaller increases at higher speed limits. In summary, while the research findings indicate a change in the speed limit sign can affect operating speeds, it is not as influential as the magnitude of the speed limit value change.

WHAT AFFECTS OPERATING SPEED?

Numerous factors influence the speed selected by a driver, with the amount of influence varying depending on conditions present. For example, a parent may be driving faster when going to pick up a child from day care to avoid late fees compared to when that parent is returning home after a Saturday morning soccer game.

Research has provided insights, in general, into factors that are associated with higher or lower operating speeds. Factors not related to the design of the road that can influence operating speed include natural light level (day or night), weather (i.e., rain, snow), day of the week, and driver characteristics such as age and gender.

On urban and suburban city streets, operating speeds are lower with a greater number of access points (e.g., driveways or minor streets), signals, horizontal curves, and features associated with urban development such as street furniture. On rural high-speed highways, operating speeds are lower on horizontal curves with small radii and higher access density. Higher operating speeds are associated with more travel lanes, wider lane widths, wider median widths, and wider shoulders. For freeways, increases in the number of vehicles will result in lower operating speeds as expected; however, even when the freeway is considered to be in free-flow conditions, the number of vehicles appears to affect operating speed in addition to the number of lanes and lane and shoulder width. For any roadway type and within any roadway context, higher posted speed limits are associated with higher operating speeds, as to be expected.

WHAT IS THE SAFETY RELATIONSHIP BETWEEN POSTED SPEED LIMITS AND CRASHES?

The speed-crash relationship is often confounded by many other factors (road characteristics, weather, etc.), and as a result the estimated relationship has not been consistent across different research studies. In most studies, speed variation was found to have an adverse effect on safety. The findings on the relationship between average speed (or 85th percentile speed) and crashes have had conflicting results. For example, a negative relationship between average speed and crash frequency/rates was found by some studies, while a positive relationship was found by other studies. Confounding factors have often been cited as possible reasons for such a disputable relationship. The speed-crash relationship cannot be appropriately established without considering the corresponding contexts (such as roadway type, roadway geometry, traffic, etc.), which may confound the relationship between speeds and crashes if not considered. In addition, how different factors interact must be studied.

A recent study (*1*) using city streets found crashes were lowest when the posted speed limit was within 5 mph of the average operating speed. The presence of a median or curb is associated with less crashes, while the number of signalized intersections, traffic volume, and segment length were correlated with more crashes. Another important implication from that research was the confirmation of the relation between the speed variability and crash occurrence for city streets. Increased crash occurrence was observed with larger speed variability. Larger spread/variability in operating speed is indicative of reduced smoothness in operations and higher potential for speed differentials. Another possible explanation is that the associations found could indicate that sites with more speed variability tend to be those with mixed visual cues or prone to ambiguous contextual situations (e.g., wide streets in a residential setting). These mixed visual cues may result in different drivers choosing different speeds, and perhaps by doing so a large proportion of the driving population could be more likely to exceed roadway conditions and thus increase their risk of crashing.

For high-speed highways or freeways, maximum speed limit changes have corresponded to an increase in crashes in some research studies. Speed trends appear to vary by geographic regions and may be influenced by societal factors such as driver age, population density, unemployment rate, median family income, speeding enforcement, and similar factors. Speed variability has been linked to greater crash severity at the higher speed limit thresholds.

WHAT REFERENCE MATERIALS ARE AVAILABLE TO HELP WITH POSTED SPEED LIMITS?

Within Texas, the key reference document for posted speed limits is the *Procedures for Establishing Speed Zones* (*2*) manual.

Procedures for Establishing Speed Zones

- Source: http://onlinemanuals.txdot.gov/txdotmanuals/szn/index.htm.
- Date: last modified August 2015.
- Publisher: TxDOT.
- Description: The purpose of this TxDOT manual is to provide the information and procedures necessary for establishing speed zones and advisory speeds on the state highway system.

The following sources provide additional guidance on posted speed limits.

Posted Speed Limit Setting Procedure and Tool: User Guide and NCHRP 17-76 SLS-Tool

- Source: https://www.trb.org/Main/Blurbs/182038.aspx.
- Date: last modified April 2019.
- Publisher: National Cooperative Highway Research Program (NCHRP).
- Description: NCHRP Project 17-76 investigated the factors that influence operating speed and safety. This knowledge was used to develop guidance and a speed limit setting tool (SLS-Tool) so engineers can make informed decisions about the setting of speed limits.

Speed Management Safety Website

- Source: https://safety.fhwa.dot.gov/speedmgt/.
- Date: last modified April 2019.
- Publisher: Federal Highway Administration (FHWA).
- Description: This website provides links to several publications and tools along with ongoing research.

Speed Management ePrimer for Rural Transition Zones and Town Centers

- Source: https://safety.fhwa.dot.gov/speedmgt/ref_mats/rural_transition_speed_zones.cfm.
- Date: January 2018.
- Publisher: Federal Highway Administration.
- Description: This ePrimer reviews speeding-related safety issues facing rural communities and discusses the basic elements required for data collection, information processing, and countermeasure selection by rural transportation professionals and community decision makers. The ePrimer is presented in six distinct modules developed to allow the reader to move between each to find the desired information without a cover-to-cover reading.

Traffic Calming ePrimer

- Source: https://safety.fhwa.dot.gov/speedmgt/traffic_calm.cfm.
- Date: February 15, 2017.
- Publisher**:** Federal Highway Administration.
- Description: The ePrimer presents a review of traffic calming practices in eight modules. The ePrimer presents:
  - A definition of traffic calming, its purpose, and its relationship to other transportation initiatives (i.e., complete streets and context-sensitive solutions).
  - Illustrations and photographs of 22 types of traffic calming measures.
  - Considerations for their appropriate application, including effects and design and installation specifics.
  - Research on the effects of traffic calming measures on mobility and safety for passenger vehicles; emergency response, public transit, and waste collection vehicles; and pedestrians and bicyclists.
  - Examples and case studies of both comprehensive traffic calming programs and neighborhood-specific traffic calming plans.
  - Case studies that cover effective processes used to plan and define a local traffic calming program or project and assessments of the effects of individual and series traffic calming measures.

Speed Enforcement Program Guidelines

- Source: https://safety.fhwa.dot.gov/speedmgt/ref_mats/fhwasa09028/resources/Speed%20Enforcement%20Program%20Guidelines.pdf#page=1.
- Date: March 2008.
- Publisher: U.S. Department of Transportation, National Highway Traffic Safety Administration.
- Description: The objective of the guidelines is to provide law enforcement personnel and decision makers with tools to establish and maintain an effective speed management program. The guidelines include:
  - Identification of the problem.
  - Legislature, regulation, and policy.
  - Program management, including public outreach.
  - Enforcement countermeasures.
  - Program evaluation.

USLIMITS2

- Source: https://safety.fhwa.dot.gov/uslimits. User Guide for USLIMITS2: https://safety.fhwa.dot.gov/uslimits/documents/appendix-l-user-guide.pdf.
- Date: March 2008 for initial development, December 2017 for updated user guide.
- Publisher: U.S. Department of Transportation, FHWA.
- Description: USLIMITS2 is a web-based tool that was designed to assist practitioners in setting consistent and safe speed limits. It is used to set speed limits for specific segments of roads and can be used on all types of roads (local roads to freeways).

REFERENCES

1. Fitzpatrick, K., S. Das, T. J. Gates, E. S. Park, M. P. Pratt, K. Dixon, J. Kay, M. Chakraborty (2021) *NCHRP Web-Only document 291: Development of the Posted Speed Limit Setting Procedure and Tool.*
2. TxDOT (2015) *Procedures for Establishing Speed Zones,* TxDOT, August 2015 (revised).

COMMON IMPLEMENTATION ORDER FOR SPEED MANAGEMENT TECHNIQUES

Speed Management Devices	Change in Speed Limit	Speed Transition Zones in Rural Areas	Rural Highway Speed Management	Suburban Roadway Speed Management	Urban Roadway Speed Management	Collector Roadway Speed Management	Neighborhood Speed Management
Signing Enhancements—Oversize	1	1	1	1	1	—	—
Signing Enhancements—Red Border[a]	1	1	—	—	—	—	—
Speed Feedback Signs[b]	—	—	2	2	2	1	—
Gateway Treatments[c]	—	2	—	—	—	—	—
Transverse Rumble Strips[d]	2	3	—	—	—	—	—
Raised Medians/Islands[e]	—	—	—	3	3	2	—
Traffic Calming (e.g., speed humps/tables)	—	—	—	—	—	—	1
Reduced Lane Width[f]	—	—	—	3	3	2	—
Road Diet (e.g., change cross section)	—	—	—	—	4	2	—
Signal Timing	—	—	—	4	5	—	—
Speed Zone Pavement Markings (w/legends)[g]	—	—	—	—	—	—	—
Optical Speed Bars	—	—	—	—	—	—	—

Note: Numbers in table (1–5) indicate suggested implementation order.
[a] – Usually applied to the first reduced speed sign approaching a speed limit change area or rural community.
[b] – Most effective deployment mode is with speed trailers for several weeks at a time, on a rotating schedule. Coordination with law enforcement substantially increases effectiveness.
[c] – Longer implementation timeline and requires coordination with municipality; TxDOT 2015 guidelines.
[d] – Presents significant noise concern in corridors with residential development.
[e] – Usually applied for access management and requires capital funds expenditure (longer implementation timeline).
[f] – Limited applicability on roadways with bus routes.
[g] – Applied on curve approaches and for school zones, but not for general speed management.
☐ – Not a typical TxDOT speed management device or practice; usually applied by municipalities.
☐ – Not a typical TxDOT speed management device; rare application of speed bars at high-speed curves.

TWO-PAGE INFORMATIONAL PAMPHLET

Side 1

SOME FACTS ABOUT DRIVERS, SPEED, AND SPEED LIMITS

Drivers and the Driving Environment

Numerous factors influence the speed selected by a driver, with the factors and amount varying based on conditions present. The number on the speed limit sign is a clear factor, along with the number of driveways, signals, curves, the widths of road features, and roadside objects. Weather, the day of the week, and natural light levels all play a role in driver speed choice. The amount of enforcement can strongly impact compliance with the posted speed limit.

Speed Limits and Driver Behavior

Changing speed limits can influence driver speed, but not as much as the change shown in the number on the sign. Research has found that a 5-mph speed limit reduction produces about a 1-mph reduction in average driver speed. For rural roads, increasing a speed limit by 10 mph increases average driver speed by only 3 to 5 mph.

Speed Limits and Safety

The speed-crash relationship is complex. research findings differ across studies, datasets, and speed measures. Several studies have identified speed variation (the range of individual driver speeds on the roadway) to have an adverse effect on safety. A recent study using data on city streets showed that crashes were lowest when the posted speed limit was within 5 mph of drivers' average speed. This same study confirmed that greater speed variation is linked to increased crashes. Recent research on high speed roads has also established a link between large speed variations and more severe crashes.

FOR MORE INFORMATION

To learn more about TxDOT and how speed limits are set, contact your local district office, or visit **www.txdot.gov.**

Abilene (325) 676-6800
4250 N. Clack
Abilene, Texas 79601

Amarillo (806) 356-3200
7215 Canyon Drive
Amarillo Texas 79110

Atlanta (903) 796-2851
701 E Main Street
Atlanta, Texas 75551

Austin (512) 832-7000
7901 N. I-35
Austin, TX 78753

Beaumont (409) 898-5745
8350 Eastex Freeway
Beaumont, Texas 77708-1701

Brownwood (325) 646-2591
2495 Highway 183 North
Brownwood, Texas 76802

Bryan (979) 778-2165
2591 North Earl Rudder Freeway
Bryan, Texas 77803-3150

Childress (940) 937-2571
7569 US 287
Childress, Texas 79201-9705

Corpus Christi (361) 808-2275
1701 S. Padre Island Drive
Corpus Christi, TX 78416

Dallas (214) 320-6100
4777 E. Highway 80
Mesquite, TX 75150-6643

El Paso (915) 790-4204
13301 Gateway West
El Paso, TX 79928-5410

Fort Worth (817) 370-6500
2501 S.W. Loop 820
Fort Worth, Texas 7613

Houston (713) 802-5000
7600 Washington Avenue
Houston, Texas 77007

Laredo (956) 712-7400
1817 Bob Bullock Loop
Laredo, TX 78043

Lubbock (806) 745-4411
135 Slaton Road
Lubbock, Texas 79404-5201

Lufkin (936) 633-4321
1805 N. Timberland Drive
Lufkin, Texas 75901

Odessa (432) 498-4097
3901 E. Highway 80
Odessa, Texas 79761

Paris (903) 737-9300
1365 N. Main Street
Paris, TX 75460

Pharr (956) 702-6100
600 W. Interstate 2
Pharr, TX 78577

San Angelo (325) 944-1501
4502 Knickerbocker Road
San Angelo, TX 76904

San Antonio (210) 615-1110
4615 NW Loop 410
San Antonio, Texas 78229-3928

Tyler (903) 510-9100
2709 W. Front St.
Tyler, TX 75702

Waco (254) 867-2700
100 S. Loop Drive
Waco, TX 76704-2858

Wichita Falls (940) 720-7700
1601 Southwest Parkway
Wichita Falls, TX 76302

Yoakum (361) 293-4300
403 Huck Street
Yoakum, Texas 77995

TTI-TXDOT-2116 8380-0122

SETTING SPEED LIMITS

Texas Department of Transportation

Side 2


EVER WONDER HOW SPEED LIMITS ARE SET?
SPEED LIMIT 50
STEP 1
Speed Limit Change Request:
Anyone can request a speed limit change. This is the first step in TxDOT conducting a speed study investigation to determine if such a change is warranted.
STEP 2
Data Collection and Study:
TxDOT collects field speed data to determine if the change is needed. The local TxDOT engineer also studies driver sightlines, road characteristics, and driveways (along with other speed-related safety concerns) to develop a recommended speed limit.
STEP 3
Recommendation Review:
TxDOT headquarters staff review the recommendation, verify the findings, and ensure consistency in how new speed limits are developed across the state. Once the review is complete, the new speed limit can be adopted.
STEP 4
Legal Framework:
The roadway's governing agency must provide a legal basis to enforce the new speed limit. A city council passes a new municipal ordinance for local streets; the Texas Transportation Commission approves a minute order for state roadways.
STEP 5
Sign Installation:
Once TxDOT staff install the new speed limit signs, the new limit is now enforceable. Though most jurisdictions allow a grace period for issuing warnings, law enforcement can cite violators for speeding any time after installation.
Who decides that this stretch of road should be 45 mph, while the stretch just over the hill is 55 mph? Why an interstate highway crossing west Texas is posted at 80 mph, while the limit on the same highway drops to 65 mph as it approaches the city?
Those speed limits aren't random. We don't pick a number arbitrarily and put it on the signs. There is research behind the process of establishing speed limits, and decades of experience guiding those decisions.
State law establishes the framework for speed management in Texas. Maximum speed limits are set by road type and driving environment: 30 mph for urban districts or streets, 60 mph on non-urban, non-state roadways, and 70 mph on non-urban state or federal roadways.
Some exceptions to these rules are allowed and managed under the authority of the Texas Transportation Commission. Speed limits can be adjusted and changed within these guidelines after being studied using the five-step process shown.

LIST OF REFERENCES AND SOURCE DOCUMENTS

TXDOT RESEARCH PROJECT 0-7049 DELIVERABLES

1. Fitzpatrick, K., S. Venglar, S. Das, M. Pratt, E. Park, R. Avelar, and M. Le. *Speed Limits in Texas*. Report No. FHWA/TX-22/0-7049-R1. Texas A&M Transportation Institute, College Station, Texas, 2023.
2. Setting Speed Limits. (Two-page informational pamphlet.) Texas Department of Transportation, 2023.
3. General public two-minute video. https://www.youtube.com/watch?v=6Dh5vAsTxPU
4. Stakeholder eight-minute video. https://www.youtube.com/watch?v=XNKZA1RoBHE

NCHRP RESEARCH PROJECT 17-76 DELIVERABLES

1. Fitzpatrick, K., S. Das, T. J. Gates, M. P. Pratt, and K. Dixon (2021) NCHRP Report 966, *Posted Speed Limit Setting Procedure and Tool: User Guide*.
2. Fitzpatrick, K., S. Das, T. J. Gates, E. S. Park, M. P. Pratt, K. Dixon, J. Kay, M. Chakraborty (2021) *NCHRP Web-Only document 291: Development of the Posted Speed Limit Setting Procedure and Tool.*
3. N17-76 SLS-Tool (with macros). https://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_966Toolmacro.xlsm
4. N17-76 SLS-Tool (without macros). https://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_966Toolnomacro.xlsx

RELEVANT TXDOT MANUALS

1. TxDOT (2015) *Procedures for Establishing Speed Zones,* TxDOT, August 2015 (revised).
2. TxDOT (2014) *Texas Manual on Uniform Traffic Control Devices*, TxDOT, October 2014 (revision 2).