Traffic Engineering 101 - The Basics

Understanding the basic principles and how these drive the decisions regarding traffic management in Louisiana
Traffic Engineering 101

• Purpose:
  – To provide an overview of engineering principles; guidelines & laws which govern traffic management in Louisiana
  – Discuss how DOTD’s decisions impact local communities
  – Facilitate feedback & questions from local agencies on state and local traffic engineering issues
Make the Most of These Webinars

• Pick topics of interest & notify others
• Invite community to participate
  - Elected officials
  - Planners & engineers
  - Law enforcement
  - Road managers
  - Economic development
• Provide feedback & ask questions
Manual on Uniform Traffic Control Devices

- Federal policy
- All states must adopt
- Set minimums for traffic control devices such as
  - Signs
  - Pavement marking
  - And signals
Engineering Directive and Standard Manual (EDSM)

- DOTT D policy
- Signed by Chief Engineer
- Provides additional requirements
Basic Principle of Traffic Engineering

“Everything is designed to meet Driver Expectancy”
TR Engineering 101

• Module:

1. Introduction & Overview (3/22/10)
2. Speed Management Overview (4/26/10)
3. School Zones (4/26/10)
4. Intersection Traffic Control (5/24/10)
5. Traffic Signal (5/24/10)
6. Roundabouts (5/24/10)
7. Sign Selection & Installation (6/28/10)
8. Work Zones (6/28/10)
9. Access Management (7/26/10)
Speed Limits

- Theory of speed limits
- State Laws
- DOTD’s policy on speed limits
- How to do a speed study
- What signs do we use?
Terrebonne Speed Study

• The Federally funded project was conducted in 2004 and 2005

• Included a review of speed limits from the engineering and enforcement perspectives

- Discussion of results brought to light by study
Enforcement of Speeds

• Discuss LSP organization

• How the State Police Enforce Speed Limits

• Aggressive Driving Task Force
School Zones

- When to set a school speed zone
- DOTD’s policy
- MUTCD guidance
- How to sign
- Flashing school sign
Safe Routes to School

• What is this program?

• How can you get involved?
Intersection Traffic Control & Management

• Different intersection types

• Control options
  – Stop control
  – Traffic signals
  – Roundabouts
  – Innovative designs

• Evaluation & selection of control device/method
Suggestions & Feedback

• Specific questions you have regarding the major topics:
  – DOTD’s traffic engineering staff & general program
  – Speed management decisions
  – Intersections
  – Traffic signals
  – Roundabouts
  – Signs
  – Access management
More Suggestions?

Other traffic issues or questions?

Contact:

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or:

Marie B. Walsh at mbwalsh@ltrc.lsu.edu
SPEED LIMITS
How do we control driving speeds?

- By setting reasonable speed limits.
Speed Limits

• What does state law require?

• State Highways/Local Roads?

• What is a reasonable and safe speed limit?

• Who sets speed limits?

• How they are set?

• Speed limit signing?
What does State law say?

• Louisiana Revised Statute 32:61

  – Sets statutory Speed Limits for “any highway of this state”

  – 55 mph max speed on all roads, except:
    • 70 mph on Interstate
    • 65 mph on divided highways
State Highway Speed Zones

RS 32:61
• DOTD to develop criteria to set lower speed limits

RS 32:63
• Lower speed limits must be based on an engineering study
• Limits become effective upon posting
Local Roads Speed Zones

RS 32:41
• Local municipal authorities may adopt ordinances establishing speed limits

RS 33:1236
• Parishes may adopt ordinances establishing speed limits
State and Local Roads

RS 32:235

• DOTD shall adopt a manual and specifications for a uniform system of traffic control devices for use upon highways within this state

• Traffic control devices erected by local municipal and parish authorities shall conform to the department's manual
What are reasonable and safe speed limits?

FHWA Synthesis of Speed Zoning Practice Report FHWA/RD-85/096
The safest speed is:

• Not necessarily the lowest speed.

• It's when everyone drives the same speed
  – Few vehicles pass and are passed.
  – Less tailgating and congestion

• The best speed limit is one which most people will follow.

• This requires measuring existing speeds.
Statistics of Speeds

What is the 85th Percentile & why is it important?

Figure 3-2  Speed distribution showing the 85th percentile speed (Krammes et al. 1996).
85th Percentile Speed

- Advantages of setting the speed limit at the 85th
  - Police are enabled to focus their enforcement efforts on the most dangerous speed outliers
  - Crash involvements are lowest near the 85th
DOTD’s Speed Limit Policy

- Engineering Directives and Standards Manual (EDSM) VI.1.1.1
- States criteria for developing lower speed limits
- Requires an engineering study commonly known as a Speed Study.
What is a Speed Study?

• Measure free flow speeds
  – Determine speed statistics

• Inventory roadway

• Recommends speed

• Recommends length
How to measure free-flow speeds?

- Equipment:
  - Stopwatch
  - Radar/Laser
  - Loops/tubes/video

- 100 vehicles or 1 hour max
Statistics of Speeds

Motor Vehicle Speed Study

Date: 7-29-81
Location: LA 464 STH 4
Direction: North/South
Time: 8:15 - 8:45 AM
Weather: Clear
Road Surface Condition: Good

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95% Speed: 47.2  
50% Speed: 41.8  
Av. Speed: LANDIS-SMITH

Spot Speed Study

Date: 7-29-81
Location: 1/2 mi. south of LA 464
Weather: Clear
Road Surface: Good
Recorder: LANDIS-SMITH
Statistics of Speeds

**Motor Vehicle Speed Study**

Date: 7-29-81  Location: LA. 464  Stat. 1  Direction: North/South

Time: 8:15-8:45 AM  Weather: Clear  Road Surface Condition: Good

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**Existing speed limit:** 45 mph
Statistics of Speeds

STATE OF LOUISIANA
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
DISTRICT 61 TRAFFIC SECTION
SPOT SPEED STUDY

LOCATION:
LA 641 ~ 1.8 MILES SOUTH OF I-10 EAST BOUND OFF RAMP
REPORTED DATE:
5/9/96
DIRECTION OF TRAVEL:
NORTH & SOUTHBOUND
NO. OF獨:
LA 641
CONTROL SECTION:
847 - 62

MAP:
CLOUDY & WARM
GOOD
FINISH:
ST. JAMES

TIMED STUDY:
10:06 AM - 10:33 AM
WIND:

NO. OF OBSERVATIONS:
110
% OF VEHICLES IN FACE RANGE:
61.0%

MEAN (AVG SPEED): 62.1
95TH PERCENTILE: 66
85TH PERCENTILE: 70
75TH PERCENTILE: 76

SLOWEST OATH (10TH PERCENTILE): 56
FASTEST SPEED (90TH PERCENTILE): 65

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<td>1</td>
<td>1.82</td>
</tr>
<tr>
<td>47</td>
<td>62</td>
<td>62</td>
<td>49</td>
<td>1</td>
<td>1.82</td>
</tr>
</tbody>
</table>

Cumulative Speed Distribution Curve

% of Vehicles at or below Speed Shown

Speed in Miles Per Hour
Statistics of Speeds

**Location:** LA 641 ~ 1.8 MILES SOUTH OF I-10 EAST BOUND OFF RAMP  
**Date:** 5/9/96  
**Time:** 10:34 - 11:33 AM  
**Weather:** CLOUDY & WARM  
**Road Conditions:** GOOD  
**Control Section:** LA 641  
**Post Speed Limit:** 65 MPH

### Speed Analysis

<table>
<thead>
<tr>
<th>Speed (MPH)</th>
<th>FREQ</th>
<th>Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>2</td>
<td>1.82%</td>
<td>1.82%</td>
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<tr>
<td>41</td>
<td>1</td>
<td>0.91%</td>
<td>0.91%</td>
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<tr>
<td>42</td>
<td>3</td>
<td>2.73%</td>
<td>3.53%</td>
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<tr>
<td>43</td>
<td>7</td>
<td>5.96%</td>
<td>9.49%</td>
</tr>
<tr>
<td>44</td>
<td>7</td>
<td>5.96%</td>
<td>15.45%</td>
</tr>
<tr>
<td>45</td>
<td>2</td>
<td>1.82%</td>
<td>2.65%</td>
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<tr>
<td>46</td>
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<td>0.91%</td>
<td>3.56%</td>
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<tr>
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<td>4.47%</td>
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<tr>
<td>48</td>
<td>2</td>
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<td>6.29%</td>
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<td>49</td>
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<td>0.91%</td>
<td>7.2%</td>
</tr>
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<td>50</td>
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<td>8.11%</td>
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<td>52</td>
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<td>10.84%</td>
</tr>
<tr>
<td>53</td>
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<td>16.3%</td>
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<tr>
<td>60</td>
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<td>22.67%</td>
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<td>25.4%</td>
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<td>26.31%</td>
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<td>0.91%</td>
<td>27.22%</td>
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<td>33.08%</td>
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<td>34.9%</td>
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<td>79</td>
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<td>0.91%</td>
<td>44.27%</td>
</tr>
</tbody>
</table>

**Cumulative Speed Distribution Curve**

The cumulative speed distribution curve shows the percentage of vehicles that are below or equal to a given speed. For example, at 70 MPH, 68.79% of vehicles are below or equal to this speed.
Inventory Roadway

- Type of roadway
- Geometric features
- Spacing of intersections/driveways
- Sight distance
- Horizontal/vertical alignment
- Crash data
- On street parking/Pedestrians
Determine 85th

- Manual on Uniform Traffic Control Devices (MUTCD)

“When a speed limit within a speed zone is posted, it should be within 5 mph of the 85th% of free-flowing traffic.”
When not to use the 85th

- Above the statutory
- Road inventory issues
  - Features
  - Geometry
  - Crashes
  - Parking/pedestrians
- Schools
Chief Engineers Order

- Engineering report that states speed limit and the length of the zone
- Signed & Stamped by a licensed Professional Engineer
- Approval of Chief Engineer
- Filed in the local courthouse
- Signs are installed
Where Do You Place Signs?

MUTCD requirements

- Where speed limits change
- Beyond major intersections
- Where necessary to remind road users
Warning Signs

• Place prior to each speed zone
Future Tools

US LIMITS

• A web based expert system for recommending speed limits in speed zones.

• uslimits.com
Radar speed displays
Questions?

Contact Information:
Peter Allain, PE, PTOE
(225) 242-4631
peter.allain@la.gov

References:
www.legis.state.la.us
www.mutcd.fhwa.dot.gov
www.dotd.la.gov/highways/traffic/home.aspx
“Rational Speed Limits”
Department of Public Safety
Terrebonne Parish Consolidated Government

Problem Statement

Speeding Drivers in Fatal Crashes by Age and Sex, 2008

Percent Speeding

- Females
- Males

15-20
21-24
25-34
35-44
45-54
55-64
65-74
75+

SPEED LIMIT 3
NHTSA and FHWA Policy on Speeding

1. Speed Limits are Reasonable and Appropriate for Conditions
2. Public Information and Education on Risks Associated with Speeding
4. Using a Variety of Techniques and Technologies for Speed Management
5. Targeted Enforcement
Key Elements of a Balanced Speed Management Program
• Speed Limits
• Education and Public Information
• Enforcement
• Research and Demonstration
SCPDC Speed Demonstration Program

- FHWA Grant
- 85th Percentile Method
- Survey of Streets in Region
- Re-Posting of Speed Limits
- Enforcement
- Evaluation
Things to Consider

- Political Implications
- Costs
- Public Buy-In
- Environment of Location
Department of Public Safety
Terrebonne Parish Consolidated Government

SCPDC Demonstration Project
http://scpdc.org/?page_id=91

Speed Concepts Information Guide
http://safety.fhwa.dot.gov/speedmgt/ref_mats/fhwasa10001

For More Information
SPEED LIMIT 9
Ralph D. Mitchell Jr.
Director of Public Safety

985-873-6405
rmitchelljr@tpcg.org

Terrebonne Parish Consolidated Government

Department of Public Safety

Ralph D. Mitchell Jr. - Director
Overview

- 675 troopers assigned to Patrol
- Assigned to nine Troop locations statewide
- Statewide jurisdiction
- Primary functions are traffic enforcement and crash investigation
- Provide support to all local police departments and sheriff’s offices
Troop Locations
2009 Enforcement Statistics

- 14,245,031 miles patrolled
- 35,508 crashes investigated
- 196,080 speeding citations
- 95,449 seatbelt and child restraint citations
- 143,285 other citations
- 13,966 DWI arrests
- 9,761 criminal arrests
- 10,568 insurance violations
Speeding Citations

- Motivation is to promote public safety, not revenue
- LSP does not receive any funds generated from fines
- Vehicle speed directly influences many factors
  - Reaction time
  - Braking distance
  - Ability to navigate roadway surface conditions and/or alignment
  - Effectiveness of vehicle restraint systems to protect occupants
  - Effectiveness of roadway systems such as guardrails, impact attenuators and barriers to protect motorists
According to the National Highway Traffic Safety Administration, in 2007:

- 31% of all fatal crashes were speeding-related
- 13,040 resulting fatalities
- Estimated economic cost to society...........

$40,400,000,000.00
Identifying Areas of Concern

TrafficStat Plan Analysis

- Provides concrete evidence of “problem areas”
- Effective tool for shift supervisors when determining staffing levels for Troop area
- All Troop personnel are issued a copy and utilize the information to identify areas in their area that warrant enhanced enforcement
- Not used as simply a “grant justification”
Identifying Areas of Concern

Citizens’ Complaints

- www.lsp.org
- Each Troop has an email address that the public may voice their concerns
- All emails are reviewed by the Troop Commander
- Complaints are also received by telephone and in person
LSP Speed Enforcement

- All LSP Patrol Vehicles are equipped with the most advanced radar units available
- Troopers also use handheld scoped LIDAR units that use laser technology to measure speed
LSP Speed Enforcement

Air Support Speed Details

- LSP Pilots coordinate with Troopers on the ground to measure vehicles’ speeds
- Conducted on all major Federal and Interstate Highways
- Effective tool against radar detectors
LSP Speed Enforcement

Motorcycle Patrol

- Provides concentrated enforcement as directed by the Troop Commander
- Generally used in school zones, construction zones, and enforcement in response to citizens’ complaints
Aggressive Driving Task Force

- How do we define Aggressive Driving?
- How do we quantitatively measure the magnitude of the issue?
- How do we effectively analyze the data we currently have?
- What data should we work to capture in the future?
- What countermeasures can we develop?
Thank You

Sgt. Robert A. Burns II

Office - (225) 925-6113 x218

Cell - (225) 754-2266

Robert.Burns@dps.la.gov
SCHOOLS

- School Warning
- Pedestrian Signs
- Speed Zone
- Flashing Sign
- School Bus Stop Ahead
- Crossing Guards
DOTD Policy

• Traffic Engineering Manual
  – Section 7A.2
  – Found on the LADOTD website under Transportation and Traffic Engineering

• MUTCD Chapter 7
School Warning Sign

- 1 driveway on state route
- Enrollment >100 students
- Combination of K-12
What Doesn’t Qualify?

- Colleges
- Universities
- Preschools
  - Headstart
- Daycares
School Crosswalks

- School warning sign installed
- Volume of children crossing >10
Crosswalks are not justified if:

- Within 600 ft of another crosswalk
- Inadequate stopping sight distance
- Speeds > 50 mph
- For loading & unloading zones
Reduced School Speed Zones

- School warning warrant
- School crosswalk warrant
Time of Reduction

• Morning:
  – 45 minutes before school starts to 15 minutes after school starts

• Afternoon
  – 15 minutes before school ends to 45 minutes after school ends
# Speed Reductions

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<th>Existing Speed</th>
<th>Reduction</th>
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<tbody>
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<td>25 mph or less</td>
<td>0 mph</td>
</tr>
<tr>
<td>30 mph</td>
<td>5 mph</td>
</tr>
<tr>
<td>35 – 45 mph</td>
<td>10 mph</td>
</tr>
<tr>
<td>50 mph</td>
<td>15 mph</td>
</tr>
<tr>
<td>55 mph or above</td>
<td>0*</td>
</tr>
</tbody>
</table>

*Engineering study required for reduction
Chief Engineers Order

• State limits of speed limit
• States time of reduction
• Signed by Chief Engineer
• Legal files in local courthouse
• Signs are installed
SIGNS

• Fluorescent yellow-green background (2009 MUTCD)

• Sizes are in Table 7B-1
Figure 7B-1. School Area Signs

SIGNS

School Advance Crossing Assembly

S1-1

W16-6P

OR

W16-2aP

OR

W16-5P

OR

W16-5P (optional)

OR

W16-6P (optional)

School Crossing Assembly

S1-1

W16-7P

School Zone Sign

S1-1

W16-5P (optional)

OR

W16-6P (optional)

School Speed Limit Assembly

S4-3P

S4-1P

S4-2P

S4-4P

S4-1P

S4-8P

S3-1

S3-2

S4-5

S4-5a

S5-1

S5-2

S5-3

R2-10

R2-11

END SCHOOL ZONE

END SCHOOL SPEED LIMIT

BEGIN HIGHER FINES ZONE

END HIGHER FINES ZONE

SCHOOL

SCHOOL BUS TURN AHEAD

20 MPH SCHOOL ZONE AHEAD

SCHOOL SPEED LIMIT

SCHOOL SPEED LIMIT

SCHOOL

R2-6P

FINES HIGHER
Advanced School Sign

S1-1

W16-9P

School Crosswalk Sign

S1-1

W16-7P
School Speed Limit Warning

School Speed Limit Sign

S4-5

S5-1
Figure 7B-5. Example of Signing for a School Zone with a School Speed Limit and a School Crossing

Note: The use of a School Advance Crossing Assembly is optional within a signed school zone (see Section 7B.11)
Figure 7B-5. Example of Signing for a School Zone with a School Speed Limit and a School Crossing

Note: The use of a School Advance Crossing Assembly is optional within a signed school zone (see Section 7B.11)
Figure 7B-5. Example of Signing for a School Zone with a School Speed Limit and a School Crossing

Note: The use of a School Advance Crossing Assembly is optional within a signed school zone (see Section 7B.11)
Figure 7B-5. Example of Signing for a School Zone with a School Speed Limit and a School Crossing

Note: The use of a School Advance Crossing Assembly is optional within a signed school zone (see Section 7B.11)
Figure 7B-5. Example of Signing for a School Zone with a School Speed Limit and a School Crossing

Note: The use of a School Advance Crossing Assembly is optional within a signed school zone (see Section 7B.11)
Flashing Beacons

• Traffic control permit – maintenance by owner of sign (not DOTD)

• DOTD approval for state roads
School Bus Stop Ahead

Guidance

In the MUTCD (7B.13)

To be used when:

- There is inadequate stopping sight distance
- And the bus stop cannot be relocated
Crossing Guard

• MUTCD
  – Type of Crossing Supervision
  – Uniform
    • Mandatory Reflective Vest
  – Operating Procedures
Crossing Guard Qualifications

1. Average Intelligence
2. Good physical condition
3. Ability to control a STOP paddle
4. Ability to communicate specific instructions
5. Ability to recognize potentially dangerous situations
Crossing Guard Qualifications

6. Mental Alertness
7. Neat Appearance
8. Good Character
9. Dependability
10. An overall sense of responsibility for the safety of students
Questions?

Contact
Jody Colvin
225-242-4635
jody.colvin@la.gov
Louisiana Safe Routes to School
Safe Routes to School goals

Where it’s safe, get kids walking and biking

Where it’s not safe, make it safe
The Safe Routes To School Program (SRTS) was created by Section 1404 of SAFETEA-LU (HIGHWAY FUNDING BILL) - Signed into law in August, 2005

- Funded for 5 Federal fiscal years (FY 2005-2009)
- Funding level determined by each state’s K-8th grade enrollment
- Administered by State Dept. of Transportation

<table>
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<tr>
<th></th>
<th>FY 05</th>
<th>FY 06</th>
<th>FY 07</th>
<th>FY 08</th>
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<tr>
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<td>$1,000,000</td>
<td>$1,404,776</td>
<td>$1,864,469</td>
<td>$2,106,118</td>
<td>$2,588,373</td>
<td>$8,963,736</td>
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Community conditions make it hard to walk or bike
Safe Routes to School Programs

Make walking and bicycling safe ways to get to school

Encourage more children to walk or bike to school
Elements of Safe Routes to School programs

Education

Encouragement

Enforcement

Engineering

Evaluation
Education

Teaches safety skills

Creates safety awareness

Fosters life-long safety habits

Includes parents, neighbors and other drivers
Encouragement

Increases popularity of walking and biking

Is an easy way to start SRTS programs

Emphasizes fun of walking and biking
Enforcement

- Increases awareness of pedestrians and bicyclists
- Improves driver behavior
- Helps children follow traffic rules
- Decreases parent perceptions of danger
Evaluation

- SAFETY BENEFITS
- BEHAVIORAL CHANGES
- OTHER BENEFITS
- PRE and POST DATA
- LONG TERM EVALUATION
Engineering
Louisiana Safe Routes to School Program

• 4\textsuperscript{rd} application cycle opened 1/4/10

• 50 projects approved for funding between 2007 and 2010

• 3 statewide conferences
Preparing To Apply

- Don’t Wait – Start Now
- Form A Team
- Collect Information
- Identify Problems
- Identify Solutions
Project Funding

Reimbursable Program – Not A Grant
  – Sponsor pays and is reimbursed

Federal Share Is 100%
  – No match is required
  – Use of other sources encouraged

Some Activities Will Not Be Funded
  – Right of Way
  – Utility Relocations
Project Funding (Cont.)

- Maximum of $250,000 for infrastructure
- Maximum of $50,000 for non-infrastructure
- Maximum of $150,000 for large scale Non-infrastructure only projects
Inappropriate Use Of Funds

- Projects that do not specifically serve the stated purpose of the SRTS program
- Funds for reoccurring costs
- Projects solely to accommodate drivers or bus transportation
- Projects not within 2 miles of elementary or middle school
Project Selection

• Initial Review
  – Check Required Information

• Committee Review
  – Score Applications
  – Rank Application

• Select Projects To Be Funded

• Sponsor Notified
For more information...

*Louisiana Safe Routes to School*
www.dotd.louisiana.gov/planning/highwaysafety/saferoutes

*National Center for Safe Routes to School*
www.saferoutesinfo.org

*US DOT Federal Highway Administration*
http://safety.fhwa.dot.gov/saferoutes/
LA-DOTD SRTS Contact information

**BRIAN PARSONS**  
BICYCLE/PED. Coordinator and SRTS Program Manager  
Brian.Parsons@la.gov  
(225) 379-1954

**SHALANDA COLE, MBA**  
SRTS Coordinator  
Shalanda.Cole@la.gov  
(504) 234-6261

**DENNIS BABIN, P.E.**  
SRTS Engineer  
Dennis.Babin@la.gov  
(225) 242-4585
Traffic Engineering 101

• Thank You!

• See you on May 24\textsuperscript{th} at 2:00PM for Intersection Control and Management---All way stop, Traffic Signals, Roundabouts