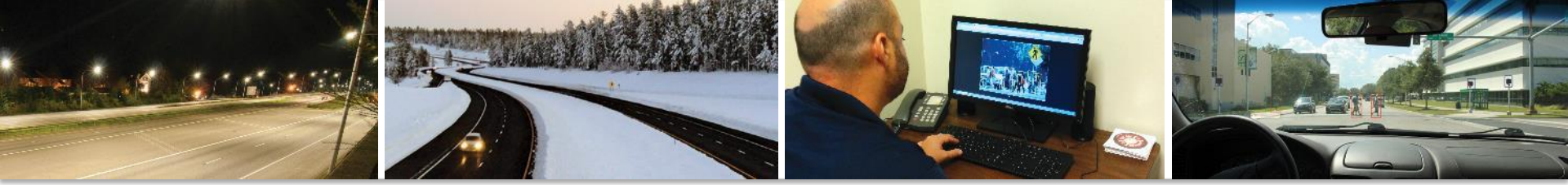


SHRP2 SOLUTIONS
STRATEGIC HIGHWAY RESEARCH PROGRAM

Safety Implementation Assistance Program Update

Pam Hutton, AASHTO SHRP2 Implementation Manager

2016 TRB Safety Data Oversight Committee
May 10-11, 2016, Woods Hole, MA

U.S. Department of Transportation
Federal Highway Administration

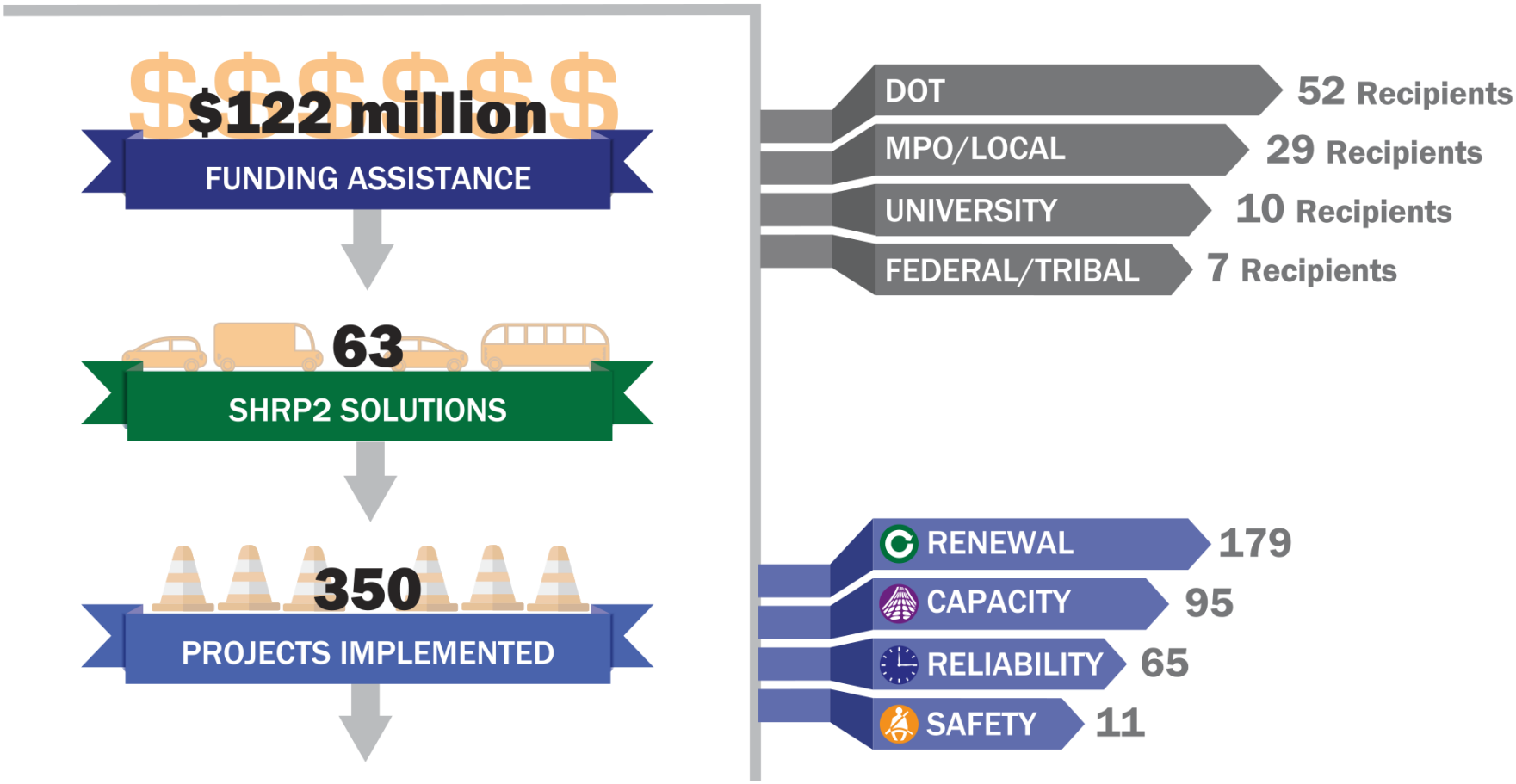
American Association of State Highway and Transportation Officials
AASHTO

Transportation Research Board
of the National Academies

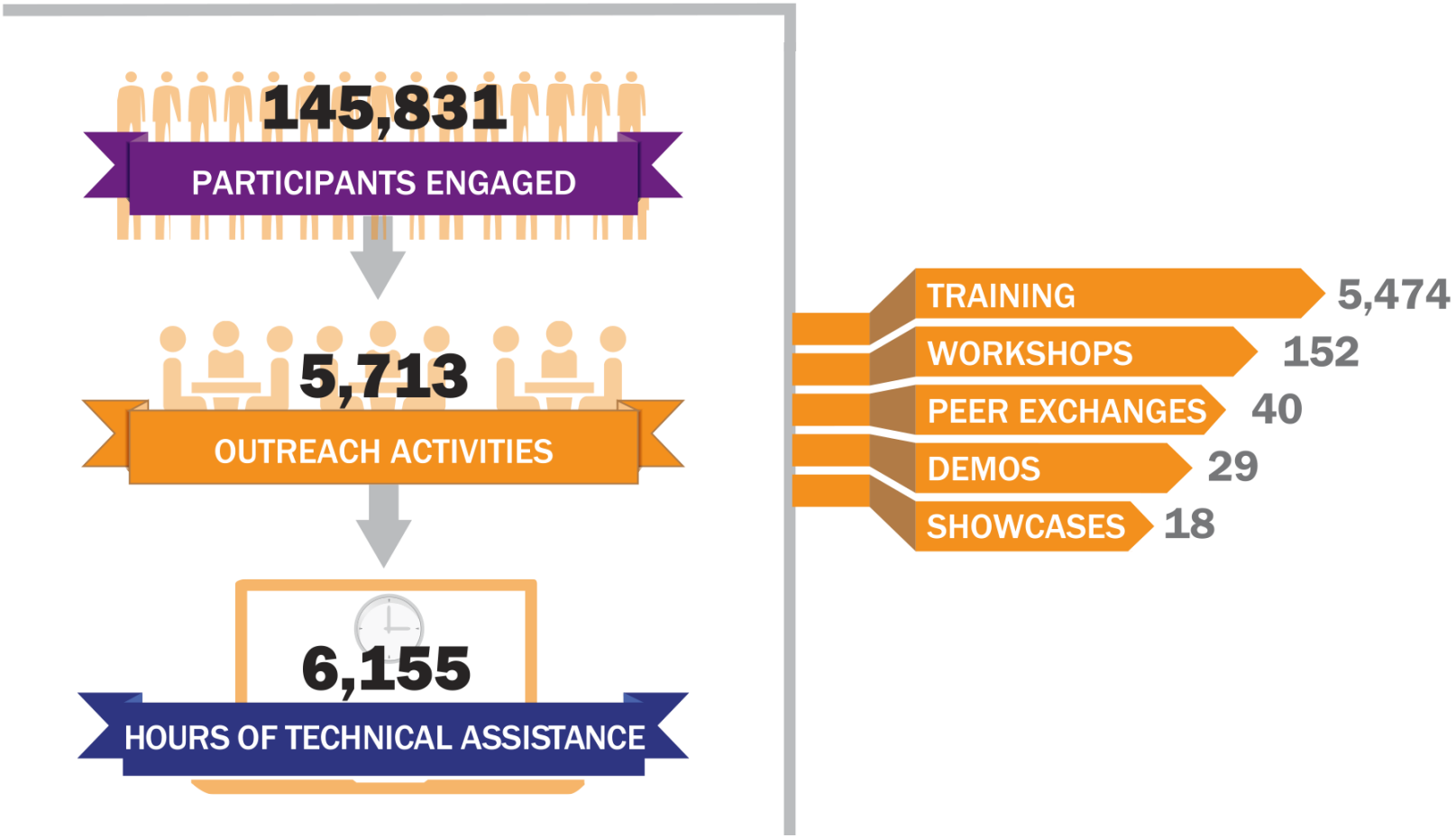
SHRP2 at a Glance

- **SHRP2 Solutions** –63 products
- **Solution Development** – processes, software, testing procedures, and specifications
- **Field Testing** – refined in the field
- **Program Implementation** – 350 transportation projects; adopt as standard practice
- **SHRP2 Education Connection** – connecting next generation professionals with next-generation innovations

SHRP2 Implementation: Moving Us Forward



SHRP2 Implementation: Moving Us Forward



SHRP2 Safety Program

Consists of Two Large Databases:

- Naturalistic driving study (NDS) database; and
- Roadway Information Database (RID)

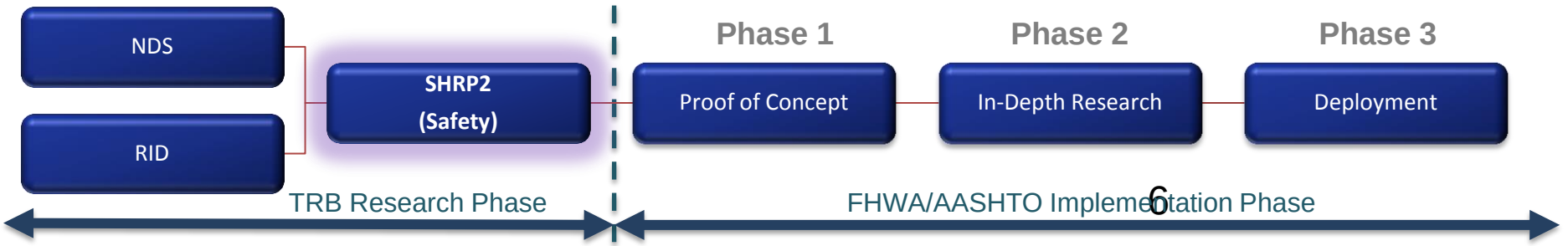
Naturalistic Driving Study (NDS):

- Crash, pre-crash, near-crash, and “normal” driving data
- 3,500+ drivers, 6 sites, all ages

Roadway Information Database (RID):

- NDS trip data can be linked to roadway data from the RID, such as the roadway location, curvature, grade, lane widths, and intersection characteristics.
- These two databases will support innovative research leading to new insights into crash causation.

SHRP2 Safety Program



Implementation Assistance Program (IAP)

Main Objectives

- Utilize IAP to demonstrate the use of the NDS Safety Data
- Increase states' understanding of the potential uses of the data
- Identify safety countermeasures based on research projects
- **Reduce crashes and save lives !**

IAP Safety Process

Phase I – Proof of concept with a sample reduced data set

Phase II – full data set and in-depth research analysis with countermeasure identification

Phase III – deployment to adopt, champion or implement countermeasure nationally

Role of Safety Task Force (STF)

- Collaborate with FHWA, TRB, and research teams
- Oversee Safety Implementation Assistance Program for AASHTO
- Review research proposals and research findings
- Promote opportunities for State DOTs and their research partners to use the NDS/RID
- Provide a customer/user perspective to SDOC

Activities

- Monthly conference calls
- Monitoring progress of teams through series of two interviews – focus on program support, not team evaluation
- Reporting findings to STF, FHWA, and TRB

Phase 1 – Proof of Concept

- 9 months
- Reduced set of NDS and RID data
- 10 states/11 projects
- Teams presented to STF – October 19th and 20th
- FHWA to selected Phase 2 projects with input from STF

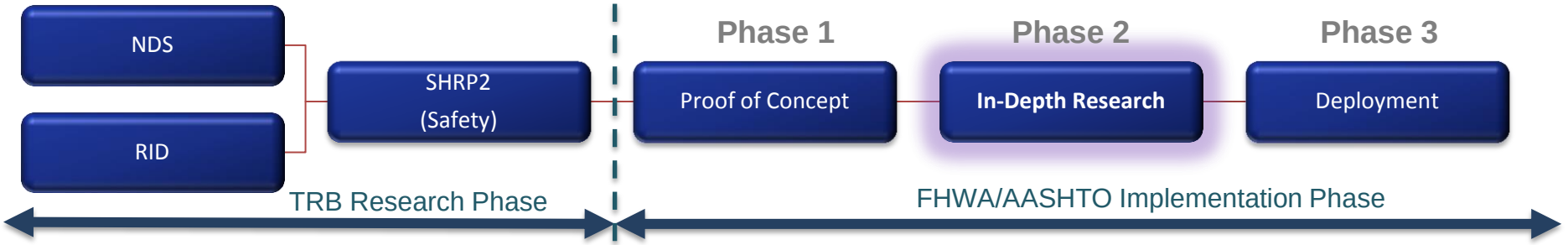
Proof of Concept	
Pedestrian Safety	Florida DOT Nevada DOT New York State DOT
Roadway Departure	Iowa DOT
Speeding	Michigan DOT Washington DOT
Work Zones	Minnesota DOT
Horizontal and Vertical Curves	North Carolina DOT
Interchange Ramps	Utah DOT
Adverse Conditions	Wyoming DOT
Roadway Lighting	Washington DOT

Phase 1 Results - Summary

- All teams excited with potential research findings
- No fatal flaws in research or ability to use NDS data
- Sample of potential outcomes through POC:
  - New data processing tools
  - New highway lighting standards
  - New crash modification factors
  - New methods for establishing speed limits and advisory speeds
  - New understanding about effectiveness of work zone devices/messaging/campaigns
- 2-year, in-depth research proposals
- Lower-than-expected Phase 2 cost proposals

Phase 2 – In-Depth Analysis

- Selections were announced in December 2015
- Phase 2 began January 2016
- Conduct in-depth research and analysis
- Countermeasure identification and refinement



Phase 2 - Safety Projects

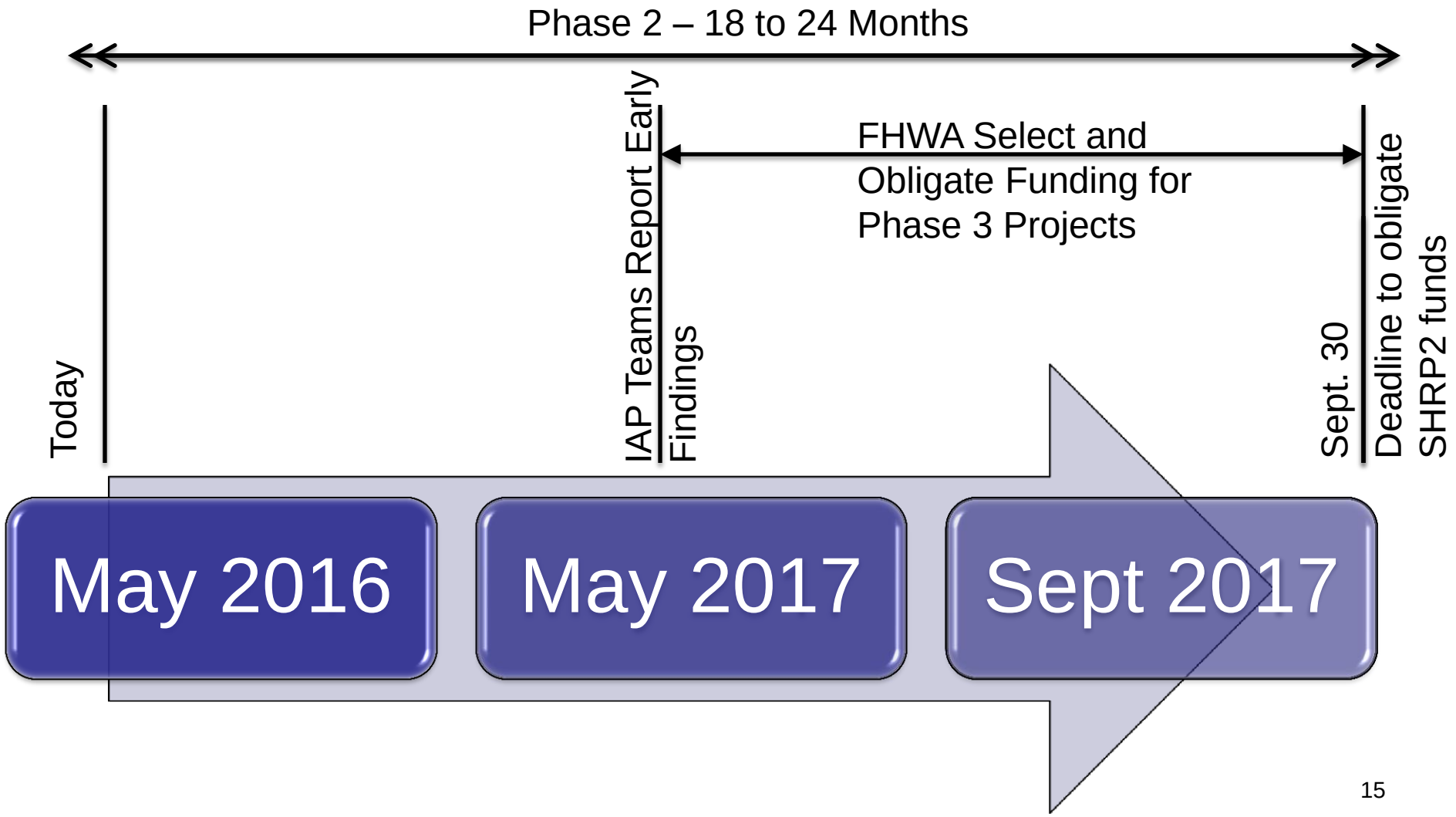
Phase 2 In-Depth Research and Analysis Projects	
Pedestrian Safety	Florida DOT
Roadway Departures	Iowa DOT
Speeding	Michigan DOT Washington State DOT
Work Zones	Minnesota DOT
Horizontal and Vertical Curves	North Carolina DOT
Interchange Ramps	Utah DOT
Adverse Conditions	Wyoming DOT
Roadway Lighting	Washington State DOT

Please see the new Safety Brochure for additional information.

Phase 2 – IAP Status Updates

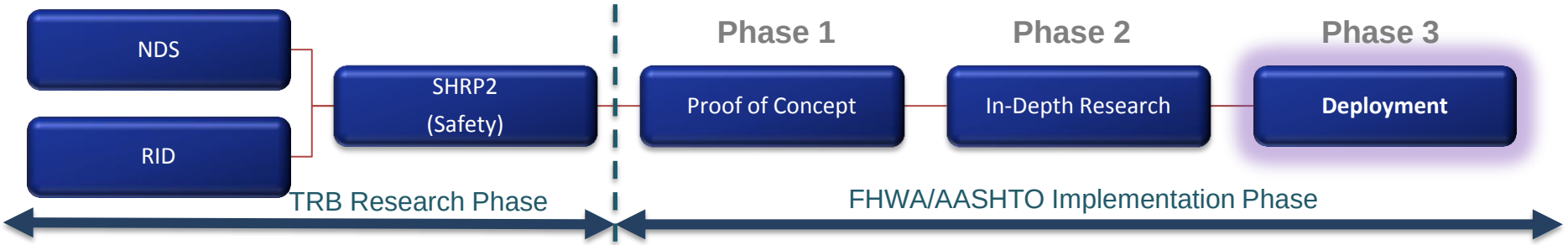
- All IAP teams under contract with the FHWA
- Most teams are not fully contracted with their subs yet
- Two teams are entering data collection process and will be in contact with VTTI shortly.
- Importance of getting under contract ASAP:
  - **September 30, 2017 -** deadline to obligate funding for Phase 3.
  - Most teams' schedules for Phase 2 are 18-24 months (starting in January 2016)
  - **May 2017** – reports due from teams on early findings.
  - Phase 3 funding decisions – May to September 30, 2017 (last day to obligate funds under SHRP2)

Safety IAP Schedule



Phase 3 - Implementation

- Adopt, champion, and implement countermeasures
- Integrate findings into Manuals, Guidelines, Policies
- Conduct pilot testing



Minnesota IAP

Evaluation of Work Zone Safety Using the SHRP2 Naturalistic Driving Study Data

Iowa State University and the Minnesota DOT

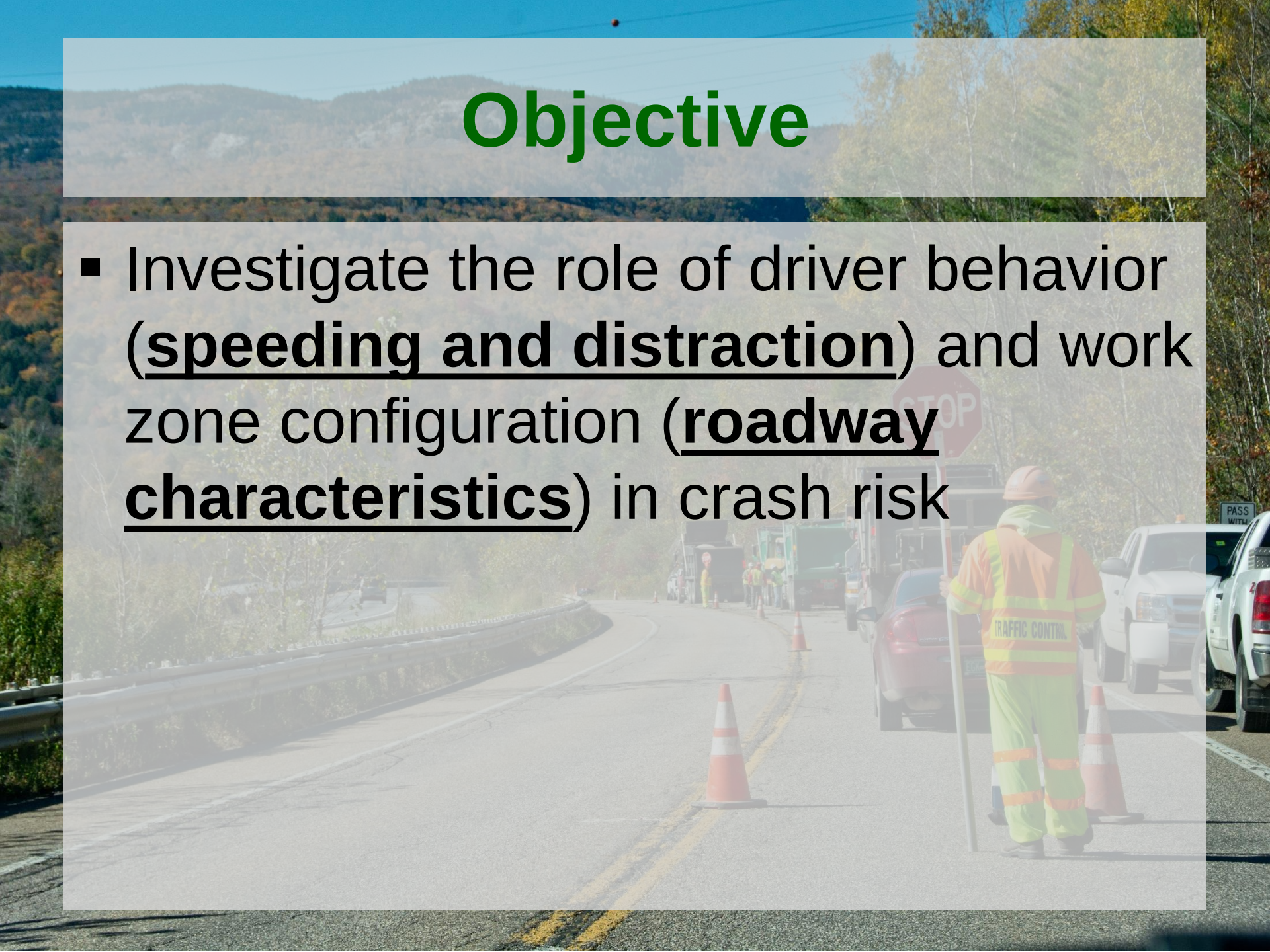
ctre
Center for Transportation Research and Education
Iowa State University

Rationale

- > 1,000 fatalities and 40,000 injuries
- Difficult to understand underlying causes of work zone crashes (**driver behavior**)
- Difficult to isolate work zone related crashes
- SHRP2 data offers unique opportunity:
  - study 1st hand account of activities leading to safety critical events and normal driving
  - identify whether safety critical events were work zone related

Objective

- Investigate the role of driver behavior (**speeding and distraction**) and work zone configuration (**roadway characteristics**) in crash risk



Modeling Safety Risk

Phase 1 analysis

- Focused on rural multi-lane
- Conducted logistic regression using 110 crash/near-crash and 89 baseline events
- Preliminary results indicated
  - **10 mph over speed limit** **11.7** times more likely to be involved in a safety critical work zone event than baseline
  - **3.3** times higher if **distracted**
  - **3.4** times more likely to be **female**
  - Higher when speed deviation is higher
  - Model showed relationship between driver & work zone characteristics and safety risk can be developed
  - Baseline not well correlated to crashes

Modeling Safety Risk

Phase 2 proposed task

- Methodology
  - Expand to include all roadway types
  - Logistic regression which provides odds ratios
    - ✓ *dependent variable: P\probability of safety critical event*
    - ✓ *co-variates: driver, roadway, work zone characteristics*
- Data Needs
  - Have location of work zone for near-crash, obtain location for crashes (need to work with VTTI)
  - Request time series data for 10 – 15 normal driving events for each safety critical work zone location
  - Reduce roadway/work zone configuration from RID, aerial imagery, forward view, 511 data
  - Reduce driver speed from time series data
  - Reduce glance location and duration at secure data enclave
  - Coordinate data needs across tasks

Speed Prediction Model

Phase 1 analysis

- Objective: develop relationship between speed and driver/work zone characteristics
- Data: utilized baseline time series data for rural multilane work zones
  - 87 baseline events included driving within work zone
  - full trace through work zone not available
  - Sampled speed (∑over 1.5 sec) at various points within work zone — dependent variable
  - 226 observations over 87 work zones
  - Extracted work zone configuration from forward video
  - Driver characteristics from Event Detail Table

Speed Prediction Model

Phase 1 analysis

- Methodology
  - Linear mixed effects model (LME)
  - Accounted for repeated sampling within same work zone
  - Developed best fit model, used AIC and other metrics
- Results
  - Presence of **curve** speed **7.2 mph lower**
  - **Lower speeds** with **more lanes closed**
  - **1.6 mph** lower when **DMS** is present
  - **2.9 mph** lower when **workers present** (90%CI)
  - Result demonstrated feasibility of approach
- Limitations
  - Similar as for safety critical events
  - Complete traces not available in baseline data
  - Secondary tasks only coded for last 6 seconds of baseline

Speed Prediction Model

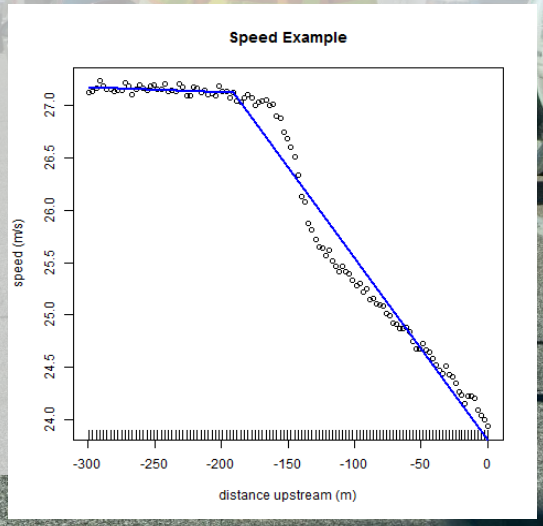
Phase 2 proposed task

- **Outcome**
  - Prediction of speed given roadway, work zone, and driver characteristic
  - Impact of specific work zone countermeasures on speed
    - ✓ *i.e. different work zone configurations*
  - Output can be used to select configurations/ countermeasures which improve speed compliance and safety

Work Zone Reaction Point

Phase 1 analysis

- Addressed question of how to get drivers attention in advance of work zone
- Data
  - Utilized baseline events with data in advance of work zone (13 traces)
  - Correlated time series data to location upstream of work zone
  - Correlated position of work zone signs to time series
  - Used driver characteristics (i.e. distraction from Event Detail Table)
- Methodology
  - change point models developed for each work zone



Work Zone Reaction Point

Phase 2 Proposal

- **Outcome/Benefit:**
  - Location where drivers react given specific work zone characteristics
  - Indicates responsiveness to signing
  - Implications for sign placement
  - Reaction to back of queue
    - ✓ *Drivers texting may be more likely to miss end of queue*

Questions?

- **FHWA SHRP2 website: fhwa.dot.gov/goSHRP2**
  - Apply for implementation assistance by
  - Product details and webinars

- **AASHTO SHRP2 website: SHRP2.transportation.org**
  - Implementation information for AASHTO members
  - Information about SHRP2 safety implementation
- **Safety Implementation Managers:**
  - Aladdin Barkawi, FHWA: aladdin.barkawi@dot.gov
  - Kelly Hardy, AASHTO: khardy@aashto.org