# ACP80 Research Subcommittee Program Update

Presentation to ITE Simulation and Capacity Analysis User Group

**March 23, 2022**

**ACP80 Research Subcommittee Co-Chairs**

George List, North Carolina State University

Loren Bloomberg, Jacobs



Jacobs

**NC STATE** UNIVERSITY

# About ACP80:  Traffic Simulation Committee

▶ Formerly SimSub AHB45(1) joint subcommittee (7 supporting committees)

▶ Became a TRB standing committee in 2020

▶ Strategic objective:  coordinate the efforts of the multiple TRB committees to promote and endorse use of simulation tools in transportation system analysis

▶ Specific objectives:

1. Provide a forum for presentation, discussion and dissemination of information on traffic simulation models.

2. Recommend guidance on model capabilities, best practices, improving models,and calibration/validation

3. Maintain liaison with other TRB committees and FHWA, especially with the NGSIM project.

4. Promote basic research on simulation models

5. Identify data needs and research problem statements

# Funding Progress on Simulation

- *Objective*: Identify funding sources to further the capabilities of simulation-based traffic analyses

- *Scope*: Theory and models; tools and practice

- *Funding*:

  - *Tools and practice*: license and user fees for software, contracts and subcontracts with software developers, partnerships with faculty at USDOT-UTCs and other research entities

  - *Theory and models*: NCHRP, pooled-fund studies, FHWA, DOE, USDOT research centers program, state research programs, voluntary committee efforts, other

- *The focus here:* the NCHRP funding process (related to ACP80)

  - Committee research needs statements (RHS) –you should contribute

  - Marketing the RNSs to state transportation agencies – where you can help

  - Convincing AASHTO/SCOR that initiatives should be funded – again, you

# AASHTO SCOR

# SCOR's Yearly Cycle

**Our target is here**

**Today, we are here**

A YEAR OF
## NCHRP

**Problem Statements Due Nov. 1**

Every July, AASHTO R&I invites the submission of research problem statements from state DOTs, AASHTO committee and council chairs, and FHWA. Due November 1 each year, problem statements should explain why the research represents an immediate need. The proposed research should have a high probability of success and should not duplicate other research.

RESOURCES:
Problem Statement Template
Resources on Writing Problem Statements

**Evaluation and Program Formulation**

From November through February, NCHRP receives comments on the problem statements from AASHTO, FHWA, and NCHRP staff. In February, NCHRP sends these comments and the problem statements to AASHTO R&I and RAC for review. Those committees rate each of the candidates according to need, value, and appropriateness. The results help establish a preliminary ranking to structure the discussion of candidates by R&I at its April meeting.

**Program Approval**

At its April meeting, R&I allocates funds for new and continuation projects. Once the program is developed, NCHRP sends the selected program to AASHTO; AASHTO prepares a ballot and asks the AASHTO Board of Directors for approval. Each project must receive a yes vote from at least two-thirds of the members of the Board of Directors and must be approved by FHWA and accepted by the National Academies.

**Panel Formulation**

Each research project is assigned to a volunteer panel of experts who provide technical guidance and counsel throughout the research and reporting phases. Panel members do not act as consultants or advisors to project investigators, may not submit proposals for research, and serve without compensation. Panel members are drawn from many disciplines, with dependence on practitioners from state DOTs.

RESOURCES:
Information for Panel Members
The Roles of NCHRP Panel Members and Liaisons
Panel Nominations

**Proposal Process**

Project panels analyze the problem statement, develop the final project scope and objectives, and prepare a request for proposals from qualified research agencies. Requests for proposals are posted on TRB's website, TRB E-Newsletter, and a self-subscription listserv. Proposals must comply with the format outlined in the publication "Information and Instructions for Preparing Proposals."

RESOURCES:
Information for Proposers
Information and Instructions for Preparing Proposals
Requests for Proposals

**Research Contractor Selection**

Project panels select research contractors after evaluation of all proposals and discussion of proposers' past performance on other research projects administered by NCHRP or others.

Selection of a contractor is made by the responsible project panel considering the following factors:

- The proposer's demonstrated understanding of the problem;
- The merit of the proposed research approach and methodology;
- Experience, qualifications, and objectivity of the research team in the same or closely related problem area;
- The plan for ensuring application of results;
- The proposer's Diversity and Inclusion Plan; and
- The adequacy of facilities and equipment.

**Research Phase Begins**

Once research starts, NCHRP oversees progress, which includes reviewing monthly progress schedules and quarterly progress reports and maintaining frequent contact with the research contractors. NCHRP also monitors the conduct of the research to ensure consistency with the approved research plan and consults with project panels for technical feedback on the contractor's work.

RESOURCES:
Information for Contractors
Procedural Manual for Contractors Conducting Research

NOV · DEC · JAN · FEB · MAR · APR · MAY · JUN · JUL · AUG · SEP · OCT · NOV · DEC · JAN · FEB · MAR · APR

# From ACP80's Perspective

You can play a role everywhere, directly through state DOTs and through ACP80 (TRB)

- January-October
  - Refine research needs statements / funding estimate
  - Engage sponsors/submitters
  - Develop support for funding among SCOR members
  - Ensure submitted by Nov 1
- October-January
  - Monitor and facilitate AASHTO deliberations
  - Articulate value to SCOR members
- January - Annual meeting (2nd year)
  - Identify new research needs statements
  - Develop very rough drafts
  - Identify sponsors (state DOTs, FHWA)

November-April (spans the next TRB meeting)
  Be prepared to answer questions (if asked)
April – AASHTO R&I Meeting
June-July
  Selected projects passed to NCHRP
  NCHRP seeks volunteers for project panels
October-November
  Proposal submissions / contractor selection
Beyond November until project conclusion
  Monitor contractor activity

# Our Research Schedule/Plan (ACP80/SimSub)

- September 2021 RNS Working Session
  - First cut of problem statement ideas
- ACP80 Meeting May 2022 Working Session
  - Reach agreement that we have the right problem statement summaries
  - Organize working group to flesh out problem statements
- (In between)
  - Flesh out problem statements
  - Circulate problem statement to committee members
- Midyear meeting of ACP80
  - Present problem statements for approval of full committee
  - Identify specific funding sources (NCHRP, synthesis, pooled fund, others)

# September 2021 RNS Working Session Summary

- Discussion of agency needs

- Brainstorming – 18 topics

- Prioritizing/sorting topics towards RNSs

# September 2021 RNS Working Session Summary of Problem Statement "Clouds"

**RNS Topic 1:    Improving Calibration**

- Levels of calibration confidence based on purpose and need of project; guidance for automating calibration based on level of calibration confidence
- We need to define the quality control requirements for simulation modeling to assure that models can be developed as quickly as possible while providing trustworthy results.  ("Quality control" encompasses but is not limited to calibration).
- Develop ready-to-use guidance specifying the calibration requirements (main effort and expense of the analysis, including data collection) specific to the application of the simulation model.
- Data validation guidance to provide confidence in model calibration

**RNS Topic 2:    Better Data**

- Synth Report on data availability, quality and costs cross agencies for simulation
- How to handle field data that is not internally consistent, e.g., volume data does not balance.  What should the simulation input be?
- *Guidance on moving from raw data to data that is appropriately cleaned/processed/aggregated for use in simulation components
- Data validation guidance to provide confidence in model calibration

**RNS Topic 3: Dealing with Uncertainty**

- Develop ways for modelers to quantify and communicate the uncertainty in model output, and demonstrate how that uncertainty important for decision-makers
- Guidance for conducting sensitivity analysis (variables/parameters to test, methodologies to use, etc.)

# RNS Problem Statements

RNS Topic 1:   Improving Calibration

RNS Topic 2:   Better Data

RNS Topic 3: Dealing with Uncertainty

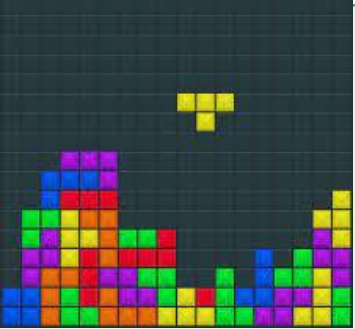Simulation Standardization for Infrastructure Performance (with AKD10/Geometric Effects)

(Develop simulation-based procedures that assure consistency in the way that simulation models are used to assess the impacts of geometric design changes)

# Categorizing Committee Interests and Agency Needs

| | | Agency Needs | | | | |
|---|---|---|---|---|---|---|
| | | Investment Decision-Making | NEPA/CEQA | Design Validation | CAV Accommodation | Others |
| **Committee Interests (ACP80 and others)** | Calibration | | | | | |
| | Data | | | | | |
| | Uncertainty | | | | | |
| | Driver Behavior | | | | | |
| | Others | | | | | |

# Categorizing Committee Interests and Agency Needs
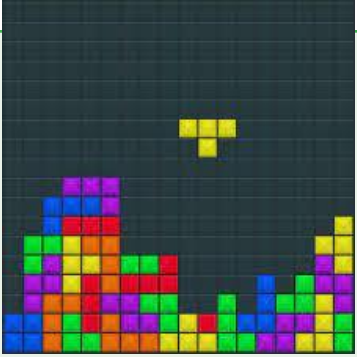


| | | Agency Needs | | | | |
|---|---|---|---|---|---|---|
| | | Investment Decision-Making | NEPA/CEQA | Design Validation | CAV Accommodation | Others |
| Committee Interests (ACP80 and others) | Calibration | RNS #1 | RNS #2 | | | |
| | Data | RNS #1 | RNS #2 | | | RNS #4 |
| | Uncertainty | RNS #2 | | | | RNS #4 |
| | Driver Behavior | RNS #2 | | RNS #3 | | RNS #4 |
| | Others | | RNS #3 | RNS #3 | | |

# Next Steps for ACP80



▶ Between now and May meeting

　▶ First cut on structure of problem statements

　▶ Problem statement summary ("What's it about?")

　▶ Possible approach

　▶ Why is it important (talk about different columns in the block diagram)

▶ May 2022 virtual subcommittee meeting:

　▶ Refine structure of problem statement "blocks"

　▶ Organize working group to flesh out problem statements

　▶ Circulate problem statement to committee members

▶ Midyear meeting of ACP80

　▶ Present problem statements for approval of full committee

　▶ Identify specific funding sources (NCHRP, synthesis, pooled fund, others)

# Problem Statement from Committee on Performance Effects of Geometric Design [AKD10(3)]

- Under development / being written
- How to make (micro) simulation more useful for geometric design
- "Simulation Standardization for Infrastructure Performance Review"

# Thank You!!

**ACP80 Research Subcommittee Co-Chairs**

- George List, North Carolina State University, gflist@ncsu.edu, 919-515-8038
- Loren Bloomberg, Jacobs, loren.bloomberg@jacobs.com, 714-227-7050

# Joint Simulation Subcommittee
## ACP80(1)

Sponsor Committees:
ACP20: Freeway Operations
ACP25: Traffic Signal Systems
ACP40: Highway Capacity and Quality of Service
ACP50: Traffic Flow Theory and Characteristics
ACP55: Traffic Control Devices
ACP80: Traffic Simulation
AEP40: Transportation Network Modeling
AMS10: Air Quality and Greenhouse Gas Mitigation

**SimCap/SimSub Joint Meeting**

March 23, 2022 | 2:00 – 3:30p ET
Virtual

**TRB**
TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

**SimSub**

# TRB Structure

**ACP80**
**Traffic Simulation**

**ACP80(1)**
**Joint Simulation**
**Subcommittee**

**ACP80(2)**
**Research**
**Subcommittee**
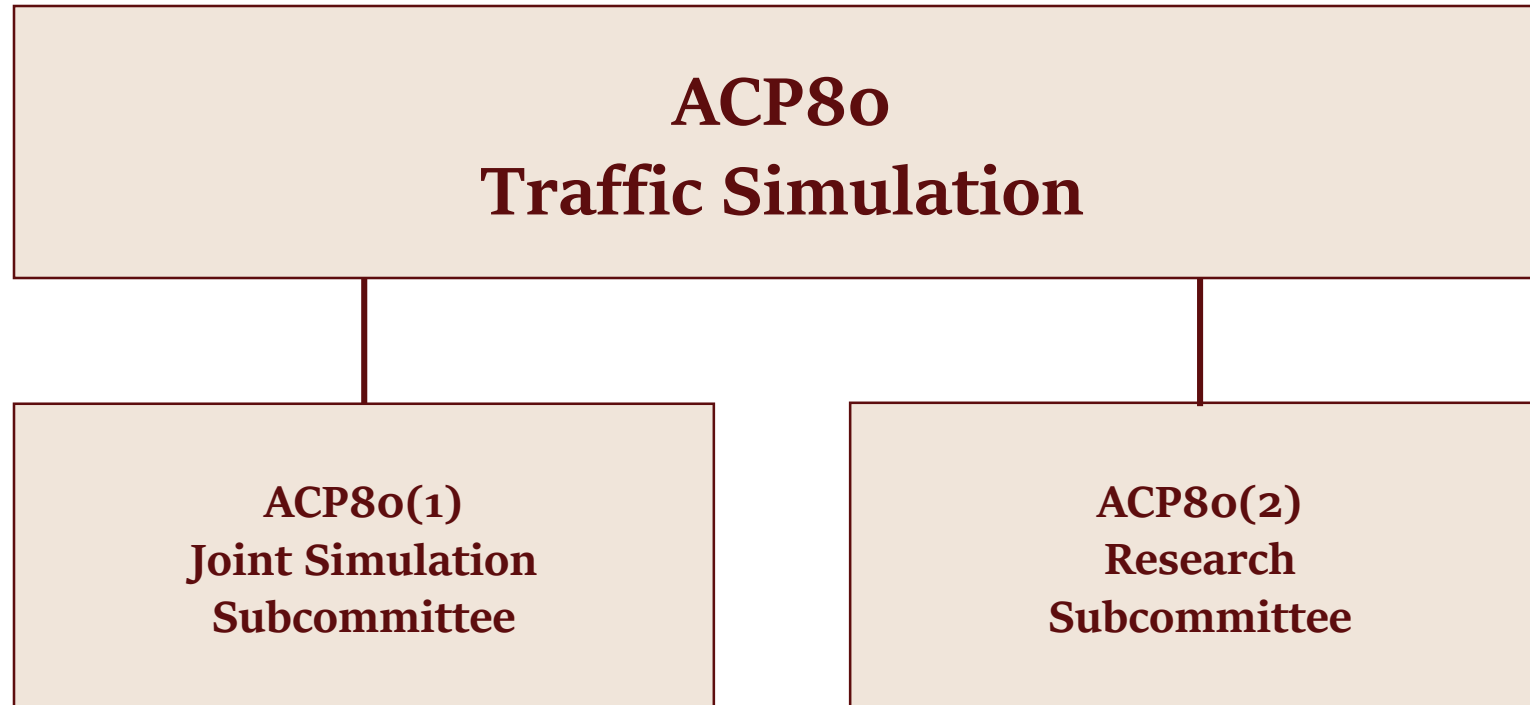
# Liaison Structure

**Research**

— ACP10: Regional TSMO
— ACP20: Freeway Operations
— ACP25: Traffic Signal Systems
— ACP30: Vehicle-Highway Automation
— ACP35: Managed Lanes
— ACP40: Highway Capacity
— ACP50: Traffic Flow
— ACP55: Traffic Control Devices
— ACP70: Highway Traffic Monitoring
— AEP40: Network Modeling
— AKD10: Effects of Geometric Design
— AMR20: Disaster Response, Evacuations
— AMS10: Air Quality
— AT015: Freight Planning

# Annual Survey

The survey will identify:

- The primary uses of traffic simulation
- Analyzed applications
- Corresponding user needs
- How these change overtime and recurring user needs

Welcome to the 2021 Traffic Simulation Survey. The TRB Standing Committee on Traffic Simulation (ACP80) is conducting this survey to get a better understanding of current and emerging uses of traffic simulation and the challenges faced by traffic simulation software users.

Which best describes your organization?

- ○ National transportation agency/ministry
- ○ State, provincial, or prefectural transportation agency/ministry
- ○ Municipal or local government agency
- ○ Toll bridge or toll road operator
- ○ Public transportation agency
- ○ Planning agency such as an MPO or RPC
- ○ Consulting firm
- ○ Academic or research institution
- ○ Simulation software developer or reseller
- ○ Other (please describe)

# Annual Survey

Includes:

- Type of simulation performed
- Size of model
- Features modeled
- Study objectives
- Difficulties encountered

What difficulties were encountered in the largest model?

| | No problem | Minor problem | Moderate problem | Serious problem | Severe problem | Extreme problem |
|---|---|---|---|---|---|---|
| Defining project scope/objectives | ○ | ○ | ○ | ○ | ○ | ○ |
| Determining existing roadway/facility geometrics | ○ | ○ | ○ | ○ | ○ | ○ |
| Determining/reconciling existing motor vehicle traffic volumes | ○ | ○ | ○ | ○ | ○ | ○ |
| Determining/reconciling existing pedestrian or bike traffic volumes | ○ | ○ | ○ | ○ | ○ | ○ |
| Determining existing traffic signal or ramp meter timings | ○ | ○ | ○ | ○ | ○ | ○ |
| Determining existing traffic speed or delay | ○ | ○ | ○ | ○ | ○ | ○ |
| Determining existing traffic queue length | ○ | ○ | ○ | ○ | ○ | ○ |
| Determining existing traffic pattern (origin-destination) | ○ | ○ | ○ | ○ | ○ | ○ |
| Overall quality control for model building | ○ | ○ | ○ | ○ | ○ | ○ |
| Replicating existing physical layout of roads, streets, and other facilities | ○ | ○ | ○ | ○ | ○ | ○ |
| Replicating existing traffic volumes | ○ | ○ | ○ | ○ | ○ | ○ |
| Replicating existing queuing and delay | ○ | ○ | ○ | ○ | ○ | ○ |

# Resource Repository

- Developed draft organizational structure
  - Mimics TSSM chapters

Resource Structure:
1. Simulation Basics
   a. What is it
2. When do agencies use it
3. Available simulation options---resolution
   a. Microscopic
      i. VISSIM
      ii. AIMSUM
      iii. SimTraffic
      iv. CORSIM
      v. TransModeler
      vi. https://ops.fhwa.dot.gov/trafficanalysistools/tat_vol2/sectapp_e.htm#top
   b. Mesoscopic
      i. DynusT
      ii. AIMSUM
      iii. Dynameq
      iv. TransModeler
      v. https://ops.fhwa.dot.gov/trafficanalysistools/tat_vol2/sectapp_e.htm#top
   c. Macroscopic
      i. Freeval
      ii. HCS
      iii. https://ops.fhwa.dot.gov/trafficanalysistools/tat_vol2/sectapp_e.htm#top
   d. Multi-resolution
   e. Resolution choice
4. Choosing Scope
   a. Temporal
   b. Spatial
   c. Modeling resolution
   d. Dynamic traffic assignment
5. Experiment Design
   a. No of runs
   b. No of scenarios
   c. Data sources
   d. Performance Measures
      i. Selection
      ii. Measurement locations
      iii. Presentation format
6. Verification, Calibration, and Validation
   a. Procedures
      i. Calibration parameters
   b. Statistics
      i. Performance Measures
      ii. Targets
7. Application
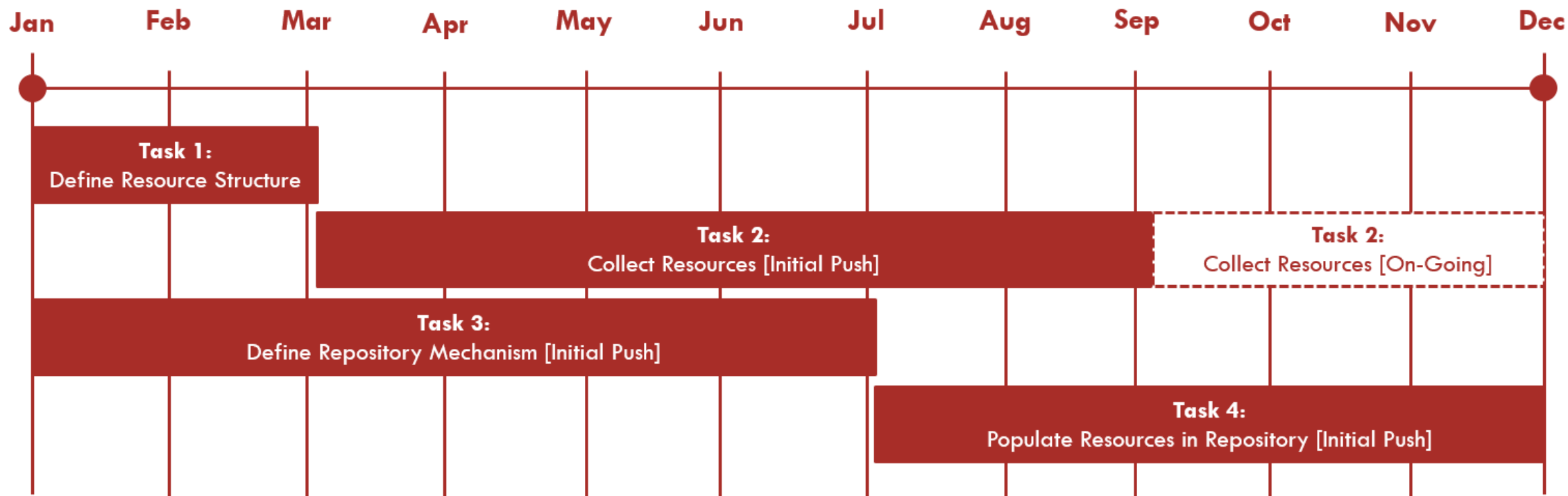
# Contact Info

**Chris Melson**
Program Manager
LTRC
**cmelson1@lsu.edu**

**John Shaw**
Researcher
InTrans
**jwshaw@iastate.edu**

**Subscribe to e-mail listserv**

# Core Competencies of TAMS Practitioner

## DATA

- Data Requirements
- Data Sources
- Data Analysis
- GIS Tools
- Statistical Analysis

## MODELING BEST PRACTICES

- Best Practices
- Internal Processes
- Technical Report and Correspondence Writing

## TRAFFIC ENGINEERING

- Traffic Flow Theory and Characteristics
- Traffic Engineering Studies
- Transportation Planning
- Traffic Signal Operation
- Geometric Design
- Driver Behavior
- Economic Evaluation

## MODELING SOFTWARE

## MODELED APPLICATIONS

- ITS Systems
- Traffic Management Strategies
- Mobility as a Service (MaaS)
- Multi-Modal Transportation Systems
- Real-Time Decision Support
- CAVs