



# 2024

## Transportation Research Board (TRB) Annual Meeting

KEY TAKEAWAYS &  
LESSONS LEARNED





Aerial view of Highway 1 along the California Pacific Coast

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The San Diego Trolley at a station in the San Diego metropolitan area. Editorial Credit: Shutterstock / meunierd

# California Delegation



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# California Delegation *(continued)*



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**Diana Gomez**  
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*Executive Safe System Advisor*



**Jennifer Hunt**  
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*Chief, Office of Safety Innovation & Cooperative Research*



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# California Delegation *(continued)*



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# California Delegation *(continued)*



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**Zhongren Wang**  
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# 2024 TRB Annual Meeting Overview

This report details Caltrans staff participation at the 2024 Transportation Research Board (TRB) Annual Meeting held January 7 - 11, 2024. Caltrans was able to send 29 delegates representing 15 different Districts/Divisions/Programs within the Department to Washington D.C. for this significant meeting. This continues the trend for in-person TRB Annual Meeting attendance post pandemic.

TRB is the major national multimodal transportation organization that brings together practitioners and researchers to solve critical transportation problems. TRB provides an information infrastructure that is designed to serve the nation's highly decentralized transportation system in which no single organization dominates. With more than 175 committees, almost every transportation topic is represented in the standing committee structure. Each committee proposes research, shares research findings, sponsors special activities, and provides a forum for transportation professionals to discuss today's and tomorrow's transportation issues. The 2024 TRB Annual Meeting program covers all transportation modes, with sessions and workshops addressing topics of interest to policy makers,



Caltrans delegates at the 2024 Transportation Research Board (TRB) Annual Meeting, held January 7-11, 2024 in Washington, D.C.

administrators, practitioners, researchers, and representatives of government, industry, and academic institutions. This year's meeting, the TRB Executive Committee has identified several Critical Issues in Transportation. There were many sessions in support of these issues. All of

these issues have one or more connection to the Caltrans 2020-2024 Strategic Plan's Goals. The following graphic displays the Critical Issues in Transportation and its nexus to one or more of the Caltrans 2020-2024 Strategic Plan's Goals:



## CALTRANS STRATEGIC GOALS

[Critical Issues in Transportation for 2024 and Beyond](#) calls for reassessing the role of transportation in addressing major societal challenges and the research that informs the choices that society will need to make in 2024 and coming years.

Critical Issue in Transportation	Connected Strategic Goal					
	Safety First	Cultivate Excellence	Multimodal Network	Stewardship & Efficiency	Climate Action	Equity & Livability
Climate Change					●	
Economic Competitiveness, Funding, & Finance		●	●	●	●	
Equity						●
Infrastructure Systems			●	●		●
International						
Land Use & Governance			●	●		●
Moving People & Goods	●		●	●		●
Public Health	●					●
Safety	●					
Technology: Artificial Intelligence	●	●	●	●	●	●
Technology: Automated Transportation Systems			●			
Technology: Electric Vehicles & Alternative Fuels			●	●		
Workforce, Including Young Professionals & Students		●				



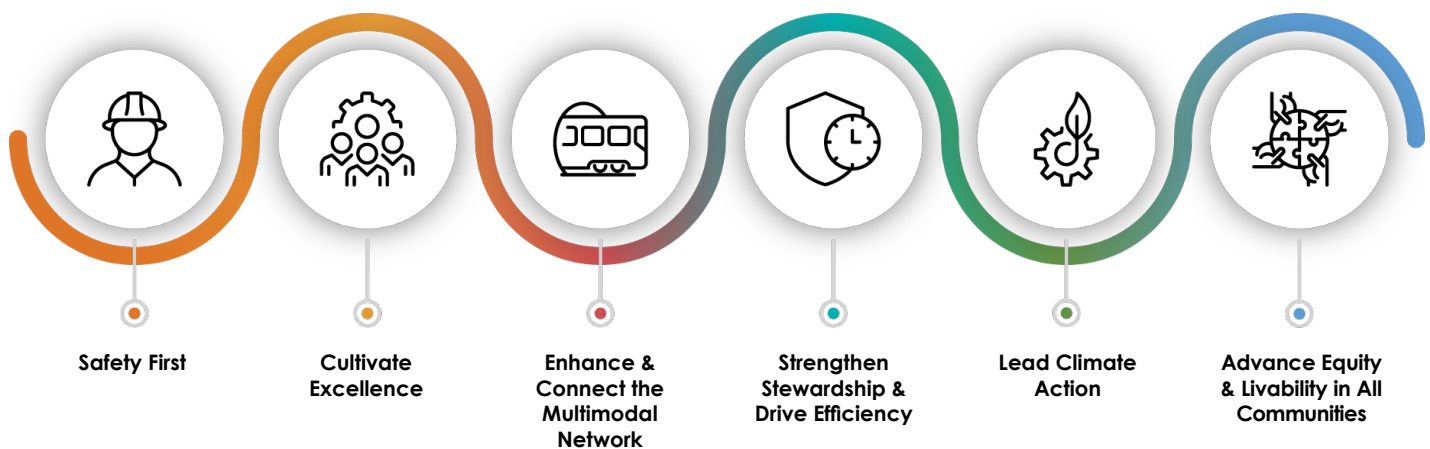
Aerial view of the Ventura Freeway near Thousand Oaks, California.



# Implementation Highlights

Caltrans receives substantial benefits from being a sponsoring organization of TRB. TRB is a major focus of the Caltrans National Strategic Engagement Plan. The TRB's major sources of revenue are state departments of transportation, federal agencies, other transportation organizations, and TRB self-generated revenue. With a contribution of \$620,554 in 2022, Caltrans was able to leverage \$24 in research-related activity for every \$1 invested.

In helping with this investment, each Caltrans employee that attended the TRB Annual Meeting was tasked with identifying an innovation that they will be responsible for implementing. Below are some highlighted innovations that supports Caltrans 2020-2024 Strategic Plan's Goals of:



## KEY TAKEAWAYS

The California delegation compiled key takeaways from the TRB Annual Meeting. Of the key takeaways:

- Five support Safety First
- Five support Cultivate Excellence
- Four support Enhance & Connect the Multimodal Network
- Eight support Strengthen Stewardship & Drive Efficiency
- Three support Lead Climate Action
- Three support Advance Equity & Livability in All Communities



## SAFETY FIRST

# Tort & Risk Management Committee

**Implementation Champion:**

**Alan M. Steinberg,**

Member of AJL40 & AJL70 Committees

### TAKEAWAY

Safe System Approach is often misconstrued and misapplied by transportation engineers such that engineering judgment and legal defenses are undermined and weakened. Communication and application of the Safe System Approach continues to disregard National Cooperative Highway Research Program (NCHRP) Legal Research Digest 83 guidelines for drafting liability neutral transportation engineering documents and communications strategies. The latest example of a continually troubling development in the transportation engineering community is with issuance of the new Manual on Uniform Traffic Control Devices (MUTCD) (11th ed., 2023, effective date of Jan. 18, 2024). Section 1A.01 identifies the purpose of the MUTCD as follows:

*"To establish uniform national criteria for the use of traffic control devices that meet the needs and expectancy of road users on all streets, highways, pedestrian and bicycle facilities, and site roadways open to public travel."*

The committee responsible for drafting the MUTCD deliberately omitted language that set forth the appropriate legal standard that traffic control devices (and the same can be said for design in general) is intended to meet the needs and expectancy of "reasonable and prudent" road users. It is critically important for transportation professionals to understand that standards are established based upon reasonable use and the foreseeable consequences of due care users; road devices and designs are not to be developed for unreasonable use. But the committee justified removal of the "reasonable and prudent" language based upon a fundamental misconception of the Safe System principle that people make mistakes. Many transportation professionals believe that the "people make mistakes" and "shared responsibility" elements of Safe System means that DOTs have a duty to prevent harm caused by unreasonable uses of the roadway. DOT Legal Divisions are very concerned with the increased liability exposure based upon continued misapplication of Safe System principals.

### ACTION STEPS

Working with the Tort & Risk Management Legal Committee, we are developing presentations to address this concern. In particular, we want to bring greater attention to the role of engineering judgment and emphasize that engineers must use discretion to determine the most appropriate designs for locations based upon site specific conditions and available resources. Unless there is mandatory language in policies, procedures, guidelines, and manuals, engineering decisions can deviate so long as such deviations are documented. Presentation will also focus on using liability neutral language.



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► Continued from previous highlight

Also, developing presentations solely for internal use at Caltrans; increase legal participation at MOSEAC; regular meetings with the Safety Program; work with DRISI on new research projects. Critically, at the July 2024 TRB Annual Transportation Law Workshop, FHWA plans on sending all of its attorneys. This is a once in a lifetime opportunity to get it to appreciate liability concerns of DOTs, concerns FHWA is not attuned to since it is immune from liability.

## MEASURE OF SUCCESS

If the narrative both internally at Caltrans and externally throughout the transportation community, particularly the FHWA, starts to adjust its language to demonstrate a better understanding and implementation of engineering judgment and liability neutral language.

## Exhibit Hall – Vendor Display

### Implementation Champion:

**Joe Horton,**

*Presenting as Chair of Committee Research Coordinators Council & on Research Innovation Implementation Management. Member of AJE35 & AKR50 Committees. Chair of X0031 & A0000(3) Committees Committee Research Coordinator of AKR50 & A0000(2)*

## TAKEAWAY

There is a new, lightweight sensor that uses both video and radar to detect objects on the roadway. The sensor has potential to improve roadway safety through by use in a worker alarm system. The system may also have merit for wildlife detection warning.

## ACTION STEPS

I am going to add this sensor to our upcoming worker alarm research project. This project with California State University, Sacramento (CSUS) will look at how to use new, off the shelf innovations to promote worker safety. This product will be evaluated by CSUS for reliability and its usefulness as an intrusion sensor. If successful, we will ask that it be added for Caltrans evaluation as a supplemental to our Traffic Control plan sheets.

## MEASURE OF SUCCESS

Success will be measured by the evaluation by CSUS and the acceptance by Caltrans Maintenance, Safety, and Construction.

## TRB Traffic Flow Theory & Characteristics (TFTC) Committee and TRB Access Management Committee

Implementation Champion:

**Zhongren Wang,**  
Member of ACP50 Committee

### TAKEAWAY

- Develop a research need statement for traffic flow at work zones, together with the TFTC Committee as a member on the committee.
- Involve in Greenbook V8.0 (GB 8) development. GB 8 uses a multimodal, performance-based approach. It will be developed by end of this year, which is the perfect time for us DOTs to chime in. For example, the freeway access management issues when Managed Lane and Ramp Metering are involved, GB 8 should not continue to remain silent.
- Georgia Tech may be able to do a presentation for Caltrans, on "Curvature safety performance diagnosis and Georgia Department of Transportation (GDOT) implementation." Georgia Tech's team developed a new cellphone-based sensor to replace the traditional Ball Bank Indicator (BBI). A new performance measure was then developed to help better prioritize curves that call for safety improvement over a network with efficiency.

### ACTION STEPS

- TRB TFTC Committee. Call a meeting with the Research Subcommittee Chair, and vet through ideas. Then work with Caltrans National Research Coordinators to vet through Caltrans management, hoping to get our management buy in to support the ideas.
- Already engaged with the GB 8 vendors at TTI and shared comments. Will continue to review the drafts.
- Vet through management about the idea. Ask the researchers and GDOT to share their presentation slides. Plan to dedicate a session in the Traffic Operations Education Forum (TOEF), inviting statewide participation.

### MEASURE OF SUCCESS

- Better understand workzone traffic flow and characteristics, so that we can better manage work zones. For example, how can we better model the 'late merge' idea at a workzone with lane drops? How much efficiency 'late merge' can bring about?
- Make sure the freeway access management issues are considered and discussed in the new Geometric Design Policy. We have been trying to get Ramp Metering design into the GB for years without success.
- TOEF session delivery. Hope our districts could learn from GDOT practices to manage curve-related crashes in a more efficient manner.



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## Multiple Sessions

- **Analysis of International Road Safety Data**
- **Network-Wide Road Safety Assessment: Methodology of the European Union**

**Implementation Champion:**

**Harsimran Bains,**  
*New TRB Annual Meeting Attendee*

### TAKEAWAY

I learned about the latest trends in international road safety performance and methodologies for assessing performance from European road safety data and analysis experts. These methodologies can be very effective in developing proactive safety investment plans for the state highway system in California and provide robust, leading-performance-metrics to assess progress towards a safer highway system.

### ACTION STEPS

This approach augments the US Road Assessment Plan (usRAP) effort being led by my office and the statewide Safety Performance Function development and Road Safety Infrastructure Plan (RSIP) development efforts being led by the Office of Strategic Safety and Investment (OSSAI). The action steps are:

- Meet with the OSSAI and present the proposed framework to combine usRAP in RSIPs.
- Participate in the technical working group to lead the technical methodology for RSIP's.

### MEASURE OF SUCCESS

The success will be determined by the extent to which these concepts are incorporated into the RSIP methodology.

## Multiple Sessions

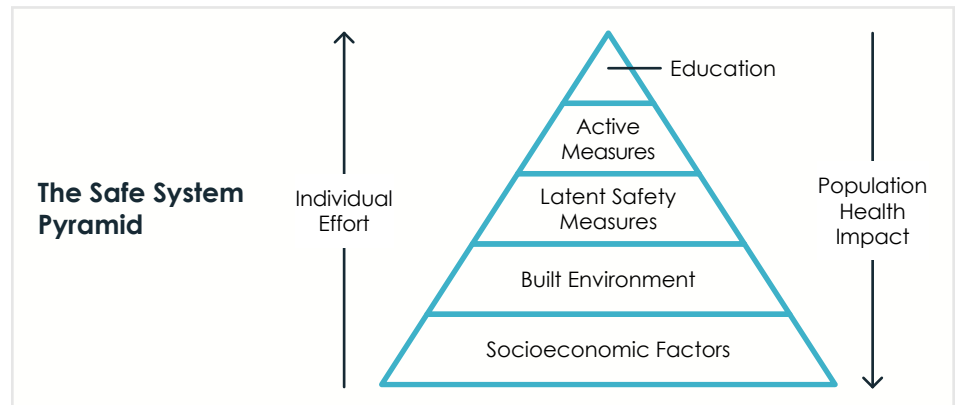
- **Workshop 1001: International Innovations to Improve Pedestrian Safety on Urban Arterials**
- **Institute of Transportation Engineers (ITE)-hosted Safety and Public Health Roundtable**
- **World Bank-hosted Speed Management Event**

### Implementation Champion:

**Rachel Carpenter,**  
Member of ACS10, AJE70, & B0180  
Committees

## TAKEAWAY

Based on an article published in the journal of Transportation Research Interdisciplinary Perspectives, a new framework for road safety could help us reach our zero death and serious injury goal. The Safe System Pyramid is based on public health principles. It prioritizes policies and interventions that focus on population health impact with less emphasis on modifying individual behavior (see diagram).



## ACTION STEPS

- **Action Step 1:** Download and read paper published in the journal of Transportation Research Interdisciplinary Perspectives titled "The Safe System Pyramid: A new framework for traffic safety" from Science Direct.
- **Action Step 2:** Distribute paper to Division of Safety Programs (DOSP) leadership team and discuss during 2/13/2024 DOSP leadership meeting. Advocate for viewing fatal and serious injury crashes as a public health problem. Discuss possible Safe System Pyramid implementation steps.
- **Action Step 3:** Distribute paper to Safety OKR "owners" from California Highway Patrol (CHP), Office of Traffic Safety (OTS), Department of Motor Vehicles (DMV) and CalSTA. Discuss during 1/26/2024 Safety OKR meeting.
- **Action Step 4:** Invite lead author, Kari Watkins, to present an overview of Safe System Pyramid during 3/13/2024 DOSP All Staff meeting. Encourage dialog amongst the team on Safe System Pyramid.
- **Action Step 5:** Based on feedback and receptiveness to Safe System Pyramid, consider proposing a joint policy memo focusing on treating road crashes as public health issue that needs to be addressed at the population level. The memo would be jointly signed by CalSTA's Secretary Omishakin and Secretary Ghaly of the California Health & Human Services Agency.



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► Continued from previous highlight

## MEASURE OF SUCCESS

The actions will be determined to be a success if the following descriptions are met:

- **Action Step 1:** "The Safe System Pyramid: A new framework for traffic safety" is downloaded and read.
- **Action Step 2:**
  - "The Safe System Pyramid: A new framework for traffic safety" is distributed to DOSP leadership team.
  - Safe System Pyramid is discussed during 2/13/2024 DOSP leadership meeting.
- **Action Step 3:**
  - "The Safe System Pyramid: A new framework for traffic safety" is distributed to Safety OKR "owners."
  - Safe System Pyramid is discussed during 1/26/2024 Safety OKR meeting.
- **Action Step 4:** Dr. Watkins presents an overview of Safe System Pyramid during 3/13/2024 DOSP All Staff meeting.
- **Action Step 5:** Decision is made on whether to pursue a joint policy memo between CalSTA and California Health and Human Services (CalHHS).



## CULTIVATE EXCELLENCE

# Building Information Modeling (BIM) in Design and Construction

### Implementation Champion:

**Jennifer Hunt,**

*New TRB Annual Meeting Attendee & Member of AJL20 Committee*

### TAKEAWAY

- The importance of openBIM models as opposed to proprietary models for connected BIM and interoperability.
- The potential for openBIM and the need for legal to understand its potential and areas of risk to help our client navigate how to use this tool and safeguards that will help limit risk.

### ACTION STEPS

- Share slides and resources from TRB from this presentation and also resources that Federal Highway Administration (FHWA) representative identified.
- Discuss with colleagues in legal concepts that were learned and areas that legal will want to engage and stay current on how client is engaging and using this technology.
- Follow articles on openBIM and legal articles on this technology.

### MEASURE OF SUCCESS

- More attorneys aware of BIM, collaborative meetings amongst different legal practice areas to discuss potential impacts of BIM on contracting, litigation, and project delivery.
- Multiple attorneys able to engage in advice on openBIM best practices for client.
- Contract attorneys able to understand and issue spot BIM related language in contracts.





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## TRB Careers in Motion

### Implementation Champion:

**Aaron Ochoco,**

*New TRB Annual Meeting Attendee  
& Caltrans Lead at Careers in Motion  
Networking Fair*

### ACTION STEPS

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#### Recruitment:

The Caltrans booth at TRB Career in Motion event had over 120 people sign up to get more information on jobs and student intern positions. Human Resources (HR) recruitment staff will contact all of them by 1/31/2024. HR staff will answer questions, provide resources, and be an on-going contact for job seekers. I am challenging Caltrans HR to onboard 5 people who expressed interest at TRB Career in Motion event.

#### Mental Health/Suicide Awareness:

Administration Corporate Governance has directed Office of Employee Health and Safety (OEHS) to research additional mental health and suicide awareness resources, including those provided at TRB. Administration Corporate Governance is scheduled to have a brainstorming session at February's meeting. The focus is how we get these resources directly to staff, specifically those who do not access to email and field staff. OEHS will engage with maintenance and discuss challenges in communication of resources to field staff. We will review TRB resources and identify additional ways of communication with employees throughout the department.

### MEASURE OF SUCCESS

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I am challenging Caltrans HR to onboard 5 people who expressed interest at TRB Career in Motion event. Tom Hicks, Deputy Division Chief at Department of Human Resources (DHR) will own and track goal.

I will challenge Administration Corporate Governance to come up with at least one new suicide awareness tool that is readily available to field staff who do not have access to email. Andrea Vine, Division Chief of Safety and Management Services will own and track the goal.



## Multiple Sessions

- **Open Innovation: Public-Sector Engagement with Private Sector to Advance Equity**
- **Panel on Unsolicited Advice: How to Rethink Procurement to Enable Innovation**

### Implementation Champion:

#### **Dara Wheeler,**

*Caltrans TRB State Representative.  
Member of X0014, AFE20, AJE70, & E0005A  
Committees*

## TAKEAWAY

That we are applying our new innovative strategies to support many of the recommendations in this presentation. The two major points raised in this discussion were DOTs' need to think innovatively and undertake new ideas for procuring innovation. New strategies were defined as: wholesale process improvement; unsolicited proposals; proofs of concepts; and pre-development agreements.

- Related to wholesale process improvements – “broken processes are at the root of much stagnation”; procurement, hiring and budget are often pain points and technology is NOT a shortcut.
- Related to unsolicited proposals – consider unsolicited proposals or request for proposals; use public forms to generate ideas; and create a process for employees to submit ideas.
- Related to proofs of concepts – create a pathway for proofs of concepts and advertise it; a point-of-contact (POC) can be no cost where technology can be tested before going to a Request for Proposal (RFP); and be sure to agree on what success looks like.
- Lastly, related to pre-development agreements – these helps foster innovation in project outcomes, can better align risk and responsibilities between public and private partnerships, and requires significant up-front work to create a buy-in process across the organization.

Take aways and lessons learned – new processes take time, but they are worth it. Some of the best ideas can come from those with fresh eyes. Be sure to agree on what success looks like, don't substitute technology for process improvement, and procurement needs buy-in.

## ACTION STEPS

Through the Division of Research, Innovation and System Information (DRISI) innovation program, we are working on most of the strategies. We are standing up a new Vendor Day to get fresh ideas and engage with private partnerships. We have an internal ideation program for employees to submit ideas and improvements. We had until recently, a process improvement program that managed large scale / enterprise process improvements for the department. We should look into working with the programs that have some process improvement responsibility to coordinate. We are testing a proof-of-concept project via the Governor's Executive Order N-12-23 on AI. If successful, I would like to pursue having a permanent sandbox to test more POCs. We should investigate more on pre-development agreements.



► Continued from previous highlight

## MEASURE OF SUCCESS

Success will be measured by expedited procurements; more POCs; a successful inaugural Vendor Day and expectation of more Vendor Day events; and building a bigger process improvement program using existing resources.

# Workshop on Developing Crosscutting Maintenance Research Needs Statements (RNS)

**Implementation Champion:**

**Ken Murray,**

*Presenting at Developing Maintenance Research Needs Statements. Vice Chair of AKR20 Committee*

## TAKEAWAY

Discussion of new research topics to pursue for RNS for AKR20 and potentially for Caltrans application.

## ACTION STEPS

Take the items that were identified and see how they may be applicable for Caltrans purposes.

## MEASURE OF SUCCESS

Utilize opportunities in the DRISI funding process for submitting research ideas for Preliminary Investigation (PI) searches. If the PI search identifies completed research, then take that information and share with the relevant areas within Caltrans. If the PI identifies that there is further research needed, then gather the support needed for further study in the topic area.



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## Poster Sessions

### Implementation Champion:

**Sang Le,**

*Presenting at High Value Research & Careers in Motion Networking Fair*

### TAKEAWAY

While visiting and reviewing the multiple days of poster sessions and presenting Caltrans' High Value Research winner poster, I noticed that there were many posters that had a California or Caltrans nexus.

### ACTION STEPS

When I write the Caltrans TRB Annual Report, I plan to include a section dedicated to California posters at TRB.

### MEASURE OF SUCCESS

The inclusion of a section dedicated to California posters at TRB in this year's report. I may have missed a few posters this year, but hopefully I can capture a higher percentage next year and make it a part of the TRB experience to memorialize the influence that California has on the national stage in regard to transportation research.



## ENHANCE & CONNECT THE MULTIMODAL NETWORK

### Multiple Sessions

- Standing Committee Intercity Passenger Rail AR010
- Safety Sessions
- Risk-Taking Session
- Chairs Plenary Session

### Implementation Champion:

**Diana Gomez,**  
*Member of AR010 Committee*

### TAKEAWAY

My involvement with the Passenger Rail committee helps Caltrans understand how we can better connect with our partners and focus on multimodal efforts. Also, a possible opportunity to improve our working relationship with Union Pacific Railroad (UPRR) and BNSF Railway Company (BNSF) and our Transit Partners. There was a 400% increase in funding for rail projects. We need to better understand our partners needs that could lead to funding for our projects.

### ACTION STEPS

- Reach out to our Transit Partners.
- Meet with the San Joaquin Joint Power Authority (SJ JPA) to see how we can write grants together for the Cross Valley Rail.
- Work with the Design Division to see how we can strength our relationship with UPRR and BNSF.

### MEASURE OF SUCCESS

- Additional funding for our rail projects and some of road projects that enhance the rail projects.
- Reduction of time required with RRs.

## Technology to Improve Performance of Managed Lanes

### Implementation Champion:

**Joseph Rouse,**

*Presenting at Managed Lane Committee.  
Member of ACP35 Committee*

### TAKEAWAY

The Colorado Transportation Investment Office (CTIO), the tolling division of the Colorado DOT, tested and procured a system known as the Wireless Autonomous Lane Enforcer (WAL-E) to address violations on their express lane network. This photo enforcement system has been extremely successful in helping to address and reduce the number of violations, improving safety for all users. According to the representative from CTIO, the WAL-E system can also support vehicle occupancy data collection and electronic toll collection transactions. With the state starting to develop its own priced managed lane facilities, we will need to procure systems to support electronic toll collection. The WAL-E system may be able to meet this need. It could also prove useful on HOV lanes to help with occupancy data and address vehicle occupancy or other violations on managed lanes.

### ACTION STEPS

- Follow up with representative from Colorado with more questions about the system – namely its reliability on dual lane facilities.
- Follow up with California agencies who observed the Colorado test for their observations.
- Initiate contact with vendor (Blissway) to get more details about the system, and their ability to support electronic toll collection.
- Put vendor in touch with staff in District 3 to discuss using the technology on either the I-5 managed lane project in Orange County or the I-80 managed lane project in Yolo County.
- Invite vendor to present on the technology to the Managed Lane Working Group for a potential test for HOV data collection.

### MEASURE OF SUCCESS

- Demonstration of the system on selected HOV lane(s) to aid in data collection for those facilities (and possibly automated enforcement).
- Selection of the system for electronic toll collection on the I-80 managed lane project in Yolo County.



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## Poster Session

### Implementation Champion:

**Eric Sundquist,**

*Presenting at USDOT Demand Elasticity Workshop. Member of City Transportation Issues Coordinating Council*

### TAKEAWAY

Regional accessibility drives Vehicle Miles Traveled (VMT) outcomes in rural areas, whereas local accessibility drive VMT outcomes in urban areas.

### ACTION STEPS

This is an interesting finding to an ongoing research project on accessibility as a predictor of VMT. We hope to use findings from that for more precisely estimating VMT for California Environmental Quality Act (CEQA) purposes. My immediate action step is to share the research I saw at TRB with our Preliminary Investigation (PI).

### MEASURE OF SUCCESS

Ultimately, success is having an efficient, effective way to estimate VMT that addresses some of the complaints of our current system (one-size-fits-all). The insight from this poster and my discussion with the presenter can help improve that product.

## Multiple Sessions

- [Metrics.mta.info](https://metrics.mta.info)
- [Transit Data Challenge](#)

### Implementation Champion:

**Katrina Kaiser,**

*New TRB Annual Meeting Attendee & Presenting at Transit Data Challenge Workshop*

## TAKEAWAY

Metropolitan Transportation Authority (MTA) implemented an Open Data Portal and metrics dashboard in response to a 2021 state law requiring more transparency from MTA. This has parallels for Senate Bill 125 (SB125) and California State Transportation Agency (CalSTA's) Transit Transformation Task Force, which requires the development of new performance metrics for California (CA) transit agencies and publishing how agencies are doing on these metrics. Caltrans, via California Integrated Travel Project (Cal-ITP) in the Division of Data and Digital Services (DDS), can learn about best practices for open data publishing and linking our visualizations to that open data when supporting the Transit Transformation Task Force.

## ACTION STEPS

- Reach out to MTA to discuss with DDS – done.
- Identify what performance metrics MTA is using and compare with CA's as we are developing them.
- Identify what raw and intermediate data tables need to be published to our Open Data Portal vs continue to be warehoused.
- Identify what visualizations MTA is using that are linked to their Open Data portal and see what can be borrowed.
- Identify how this would fit within DDS's existing analytics stack, or if changes need to be made (e.g. using Tableau or PowerBI).
- Liaise with CT Open Data stewards to publish additional tables.
- Create and publish data visualizations based on new/existing Open Data tables.

## MEASURE OF SUCCESS

Success is measured by on-time completion of the Transit Transformation Task Force data website, per deadlines established in SB125.





## STRENGTHEN STEWARDSHIP & DRIVE EFFICIENCY

# Novel Life Cycle Consideration of Digital Project Delivery Workflows and Data Exchange

### Implementation Champion:

**Aaron Chamberlin,**

*New TRB Annual Meeting Attendee & Assisting the Federal Highway Administration (FHWA) in presenting on Unmanned Aerial Systems (UAS)*

### TAKEAWAY

Various speakers talked about emerging data exchange methods regarding digital delivery, and specifically IFC 4.3 schema and the Building Smart Data Dictionary which recently gained International Organization for Standardization (ISO) acceptance. There are emerging data structures and validation tools being developed by Building Smart International (BSI) that need to be further explored and integrated as part of the BIM4I program.

### ACTION STEPS

Key contacts have been made with representatives of BSI. Follow up meetings have been scheduled with BSI staff to have follow up conversations about technologies such as the Building Smart Data Dictionary, which we may be able to utilize as part of the data exchange between contractors and Caltrans.

### MEASURE OF SUCCESS

Success will be measured by the overall implementation of the Digital Products Catalog project, and the overall Digital As-Builts initiative being led by the Division of Construction. Emerging digital tools will be critical as we move towards increasing data interoperability and data exchange between Design, Construction, and Maintenance/Asset Management.



# All About Concrete Pavement Curing

**Implementation Champion:**

**Dulce Rufino Feldman,**  
Member of AKP20 & AKP50 Committees

## TAKEAWAY

Innovative concrete pavement curing tools have improved recently.

## ACTION STEPS

- **Step 1:** Work with a California area where curing is critical, like the desert.
- **Step 2:** Contact the Caltrans construction personnel in charge of some major concrete pavement projects in the desert (I-10 in D8) to attempt to include some of these innovative concrete pavement curing practices via change order.
- **Step 3:** Work with D8 and some key investigators like Dr. Zollinger from Texas A&M to attempt to use his innovative tools to improve curing practices in the desert as a pilot project.
- **Step 4:** Evaluate the effectiveness of these tools to improve concrete pavement curing.
- **Step 5:** Potentially change our concrete pavement specifications.

## MEASURE OF SUCCESS

- Quantify early pavement performance, especially in terms of shrinkage cracking on the section where these innovative concrete pavement curing practices were used and compare it with the performance of the section where conventional curing practices were adopted.
- Make a similar comparison for long-term pavement performance after one year of construction.

## ADDITIONAL INFORMATION

We have developed the Non-Standard Special Provision (NSSP) below for EA 08-1C802, which was also included in other two projects on I-10 in D8 with the intent to improve curing practices, but we need to take further steps like using those innovative tools that have been further improved as learned and discussed with consultants presenting at this TRB Workshop.

{ XE "NSSP\_40-1.0D\_D07-03-20\_2018" }  
Page 1 of 1

**Add after the last paragraph of section 40-1.01D(7)(a):**

Monitor and report concrete surface evaporation rates at the paving location during paving production based on ambient temperature, concrete temperature, relative humidity and wind velocity. Develop control charts per section 40-1.01D(7)(a) for concrete temperature and evaporation rate determined hourly per ACI 305R.



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## Multiple Sessions

- **The Use of Artificial Intelligence for Site Characterization and Pile Design**
- **Machine Learning Applications in Foundation Design and Performance: Site Variability in Load and Resistance Factor Design**
- **Innovative Solutions, Applications, and New Advances in Foundation Design, Performance, and Integrity**
- **Roadway Digital Infrastructure Strategy**

### Implementation Champion:

**Sharid Amiri,**

*Presenting at Foundations of Bridges & Other Structures. Member of AKG00 & Chair of AKG70 Committees*

## TAKEAWAY

Here is my takeaway from the workshops and sessions:

- AI and data analytics will be playing a critical role in the transportation field and the geotechnical and geological engineering is not an exception.
- There is a wide gap between the state of AI and the state of practice in geotechnics.
- As an agency, we have a dire shortage of skilled personnel who are geo-professionals but also knowledgeable about AI and machine learning.

## ACTION STEPS

- First and foremost, we must educate and inform our staff. Taking advantage of the digital communication tools at our disposal here in Caltrans, especially after COVID, and given the limited resources I came up with the idea of developing and moderating quarterly webinars here in Geotechnical Services (Statewide). I had moderated to date, 8 webinars covering innovative topics including but not limited to AI and machine learning by inviting guest speakers and presenters from California, out of the state and internationally.
- Secondly, I have conducted bi-monthly virtual “innovation brief” meetings with my deputy here in Geotechnical Services where I have briefed her on TRB activities and technology transfer.
- Third, I (on behalf of the committee that I chair) have also proposed to TRB for TRB webinars, which have been approved. These webinars have been conducted by TRB with a national audience.
- Finally, I have developed a draft innovation strategic plan for Geotechnical Services (GS), as its representative on Division of Engineering Services (DES) innovation committee. It has been submitted to the GS deputy/management for review and comment.



► Continued from previous highlight

## MEASURE OF SUCCESS

I measure success incrementally. First step toward success is taken if/when the GS management adapts a strategy on how to create a data driven ecosystem. Second important and critical step is when/how to use AI within that ecosystem. I realize this is an ambitious plan and would face challenges along the way, but we have to take the necessary steps toward a future that will be digital and data driven.

## Inspection of Welded Anisotropic Steel Plates

**Implementation Champion:**

**Nina Choy,**

*New TRB Annual Meeting Attendee.  
Presenting at the Impact of Climate Change on the Seismic Design of Bridges.  
Member of AKC70 Committee*

## TAKEAWAY

There are challenges with the inspection of steel manufactured using Thermo Mechanical Controlled Processing (TMCP). While there are many advantages to the use of TMCP steels, including improved toughness and weldability, there is a unique anisotropy to TMCP steels which can pose challenges in the inspection of them.

## ACTION STEPS

Review of the existing research, including NCHRP 908. Meet with Materials Engineering and Testing Services (METS) Steel Committee to discuss and share findings, including existing ballots being proposed by the American Association of State Highway and Transportation Officials (AASHTO)/American Welding Society (AWS) D1.5 Bridge Welding Code to address the anisotropic issues. As Chair of AASHTO/AWS D1.5, there is an existing ballot to address the velocity portion of the issue. We will work with those that have done research into anisotropic steels to develop an inspection method to address the beam splitting effects.

## MEASURE OF SUCCESS

Success will be measured when the ballot(s) are approved by AASHTO. There is a need to move quickly on this, as the code needs to get in front of the issue before FHWA issues a memorandum against the use of TMCP steels. This revised verbiage can be issued as an addendum/ or interim to the Bridge Welding Code.



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## Redundancy of Steel Bridges: From Research to Design Practice and Implementation

### Implementation Champion:

**Nina Choy,**

*New TRB Annual Meeting Attendee.  
Presenting at the Impact of Climate Change on the Seismic Design of Bridges.  
Member of AKC70 Committee*

### TAKEAWAY

There are new terms that govern the classification of steel bridge members subjected to tension, specifically in terms of how redundancy is achieved. Members that previously would have been classified as Fracture Critical, can now undergo additional analysis to determine internal or system redundancy, thereby reducing the need for in situ hands on inspection. This will affect in situ inspection (Maintenance/ Asset managers), design, and fabrication.

### ACTION STEPS

DES Bridge Design has been working on design guidance for Nonredundant Steel Tension Members (NSTMs), Internally Redundant Members (IRMs), and System Redundant Members (SRMs).

According the FHWA Memo May 9, 2022, owners will need a written policy statewide if they choose to implement procedures to identify members with system or internal redundancy. This topic will be discussed at the Structure Policy Board.

AASHTO/AWS D1.5 has a ballot in development to update the Code to address NSTM, IRM, and SRM. Regardless of classification, all are still fabricated to Clause 12 of the Code, however the code will address these terms.

### MEASURE OF SUCCESS

The Structure Policy Board will ultimately determine whether Caltrans will choose to develop procedures to identify member with system or internal redundancy. If so, this will result in lower inspection frequencies and less hands-on inspection for steel bridges.

AASHTO/AWS D1.5 Bridge Code Ballot approved for an interim publication.



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## All About Concrete Pavement Curing

### Implementation Champion:

**Robert Hogan,**

*New TRB Annual Meeting Attendee.  
Presenting at Advancement in Pavement  
Preservation. Member of AKT10 Committee*

### TAKEAWAY

While it is understood that concrete pavement curing is a critical performance factor, it is a complex process where the national state of practice regarding curing specification requirements, timing, construction inspection, measurement, and enforcement is underdeveloped. Texas A&M has been researching Performance Engineered Curing requirements that should be considered for pilot project evaluation.

### ACTION STEPS

Coordinate with the Concrete Pavement Office to review current curing practices and evaluate best practices nationwide. Identify and evaluate potential improvements. Consider piloting nonstandard specification requirements on multiple concrete pavement projects under different climate and placement conditions. Work with FHWA to use the mobile concrete lab trailer to help with evaluation.

### MEASURE OF SUCCESS

- Number of concrete pavements curing practice changes evaluated and pursued for adopting.
- Number of concrete pavements curing pilot projects.
- Long-term: improved concrete pavement durability and performance.



## Multiple Sessions:

- **Implementing New Performance Tests into Pavement Quality Assurance Program**
- **All About Concrete Pavement Curing**
- **What is New with Concrete Durability Research**

## Implementation Champion:

**Seungwood “David” Lim,**  
*Member of AKM90 Committee*

## TAKEAWAY

As a concrete materials and pavement specialist, I have focused on the events related to the subjects and learned about the best practices and advanced technologies that could be adopted in our practice to enhance the performance of concrete materials and pavements. Among the topics of my interest, I specifically would like to take further reviews on the following technologies for their potential implementation in our practices of producing concrete mixtures and pavements:

- Performance engineered mixture (PEM) design for paving concrete
  - Optimized aggregate gradation
  - Advanced testing methods for workability and durability
  - Resistivity to assess concrete curing and permeability
- Internal curing of concrete pavements with natural or manufactured light weight aggregates

## ACTION STEPS

- More in-depth literature review
- Laboratory evaluation
- Field applications with pilot projects
- Performance evaluation

## MEASURE OF SUCCESS

- Produce progress summary report for each milestone of the action steps
- Take stakeholder feedback, especially from district engineers and contractors



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## Multiple Sessions

- **Poster Presentation: Determining Asphalt Milling Best Practices Through Enhanced Understanding of Milling Operations**
- **Pavement Management Committee Meeting**
- **Innovations in Pavement Condition Evaluation Sub-Committee Meeting**
- **Caltrans Hiring Booth Session**

### Implementation Champion:

**Venkata Mandapaka,**

*New TRB Annual Meeting Attendee.  
Presenting at Advancement in Pavement Preservation. Member of AJL10 Committee*

## TAKEAWAY

- **Poster Presentation:** According to the Minnesota (Mn) Road study presented during the poster presentation, the pavement strength reduces by 20% only after milling and leaving the road section open for traffic for about two weeks before performing the filling operation.
- **Pavement Management Committee Meeting:** Working on a roadmap for improving Pavement management practices nationwide.
- Innovations in Pavement condition evaluation sub-committee meeting: The
- **Sub-Committee:** Proposed a research study to explore the effectiveness of using Light Detection and Ranging (LIDAR) technology to collect International Roughness Index (IRI). Caltrans collects IRI data using inertial profiler technology. The manufacturers claim that the LIDAR technology is more accurate than the current technology.
- **Hosted Caltrans Hiring Booth Event in Hall A:** About 150 candidates have showed up at the hiring booth expressing interest in career with Caltrans. Many of the candidates submitted their resumes and filled in sign in sheets to be contacted by HR for further guidance.

## ACTION STEPS

- Share Mn Road study information with Office of Asphalt pavement. This information will be useful to evaluate the current mill and fill specifications and update if necessary.
- Volunteered to review the research statement and participate in the evaluation of LIDAR technology to collect IRI data.

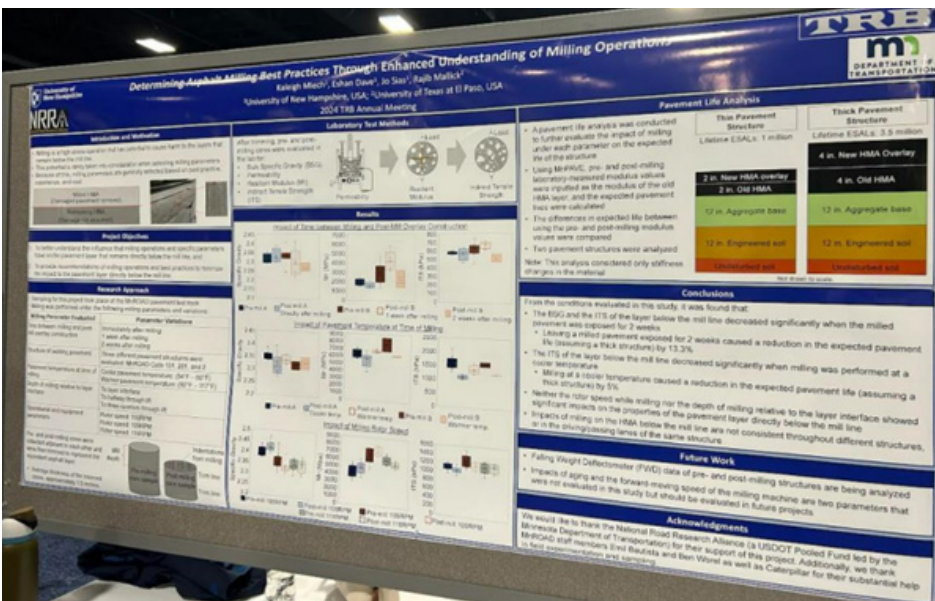




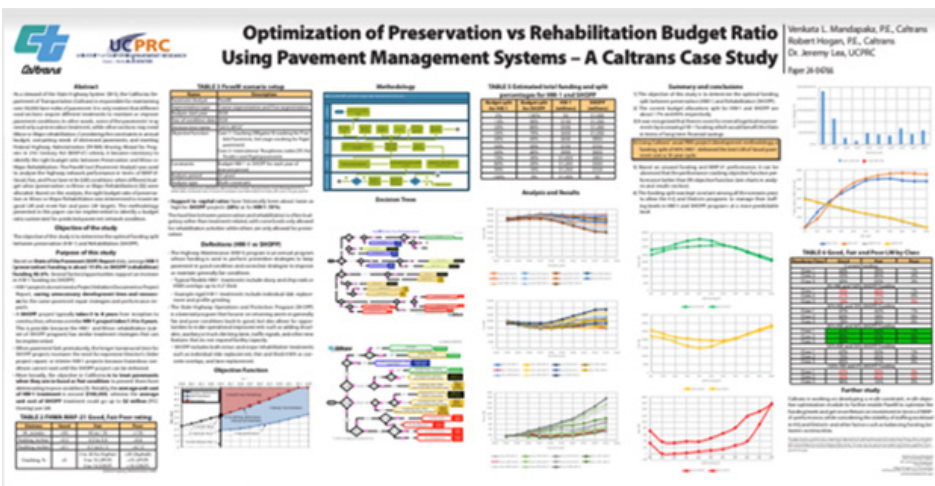
► Continued from previous highlight

## MEASURE OF SUCCESS

- Share Mn Road study with Office of Asphalt Pavement.
- Contact the Pavement condition evaluation sub-committee and participate in the evaluation of problem statement for LIDAR technology (to measure IRI data). Success- Provide feedback and guide the study that would be most beneficial for Caltrans. Note that Caltrans collects Automated Pavement Condition survey (APCS) data on a continuous basis, so this information will be very important for shaping the data collection contract and collecting/evaluating the IRI data.



(Top Left) Poster Presentation on Determining Asphalt Milling Best Practices Through Enhanced Understanding of Milling Operations.



(Bottom Left) Poster Presentation on the Optimization of Preservation vs Rehabilitation Budget Ratio Using Pavement Management Systems - A Caltrans Case Study. Lead Author: Venkata Mandapaka.



## LEAD CLIMATE ACTION

# Recycled Plastics in Asphalt Pavements

**Implementation Champion:**

**Cathrina Barros Dmytrow,**  
New TRB Annual Meeting Attendee

### TAKEAWAY

There are several plastic waste additives available, with different methodologies for addition. Initial testing shows these may affect cracking resistance of the binder.

### ACTION STEPS

- A Non-State System Pavement (nSSP) to Section 39 will be developed to include plastic waste additives in asphalt binder.
- Pilot projects, using the nSSP, will be planned for construction in FY 24/25.
- Pilots will be tested and monitored by one of our academic partners – either University of California Pavement Research Center (UCPRC) or Chico State.
- Testing data will be evaluated to determine cracking and fatigue performance.
- Test sections will be monitored for 3 – 5 years.
- If performance is good, Office of Asphalt Pavements (OAP) will make the nSSP available to the districts.

### MEASURE OF SUCCESS

- Initial construction of 5 or more pilot projects.
- Performance of test sections comparable to hot mix asphalt.
- Successful outcome is the development of a nSSP available to the districts to use on projects as another sustainability tool.



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## Geotechnical Asset Management Subcommittee

### Implementation Champion:

**Nina Choy,**

*New TRB Annual Meeting Attendee.  
Presenting at the Impact of Climate Change on the Seismic Design of Bridges.  
Member of AKC70 Committee*

### TAKEAWAY

Risk Informed Asset Management Framework for Geohazards.

### ACTION STEPS

- Benchmark with DOT's that have already begun implementing a Geotechnical Asset Management (GAM) program.
- Form a task group within GIS to collect data, implement data management.
- Reach out to Maintenance partners regarding integrating geotechnical related asset data with other assets data management systems and Geographic Information System (GIS).

### MEASURE OF SUCCESS

This is a long-term project, but success will be measured initially by completion of milestone implementation.

Milestones will include:

- Benchmarking with internal partners.
- Standing up a technical team to develop the GAM Roadmap.
- Gathering GAM data into a central database. Once the data is centralized, then we will be able to pilot/demonstrate GAM Risk Management in action and develop a proposal for resourcing a program.



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## The Air We Breathe: Intersectionality of Sustainability, Resilience, and Society in Transportation and Public Health

**Implementation Champion:**

**Abigail Jackson,**  
New TRB Annual Meeting Attendee

### TAKEAWAY

I learned some solutions for adapting transportation during times of poor air quality events (wildfire smoke days), to better protect the health of vulnerable populations.

### ACTION STEPS

- I will look into pending research funded by Caltrans by Dr. Regan Patterson and see how I can apply that to my work.
- Thinking about corridor planning guidance, this should be updated to emphasize multi-modal connections to regional climate centers, and not just in rural areas. A regional climate center is a refuge space that can offer access to clean air and more during times of emergency and poor air quality days.
- For areas disproportionately burdened by poor air quality, such as west Oakland, explore opportunities to utilize mass transit as spaces of climate relief, where folks can access good air quality on their daily trips, especially during poor air quality days.
- Continue to explore freeway rerouting and removal research to understand the effects on air pollution exposure and neighborhood attributes during corridor planning processes and through the Reconnecting Communities Highways to Boulevards Pilot Program.

### MEASURE OF SUCCESS

I'd like to arrange for Dr. Patterson to present her research at a California Interagency Transportation Equity Advisory Committee Meeting or at a Caltrans Planning Horizons seminar to create better awareness of the intersection of transportation equity, public health, and sustainability among our planning staff.



## ADVANCE EQUITY & LIVABILITY IN ALL COMMUNITIES

# Managed Lanes Rising: Technologies and Equity

**Implementation Champion:**

**Charles “Muggs” Stoll,**  
*Member of AEP10 Committee*

### TAKEAWAY

#### High-Occupancy Vehicle/ High-occupancy Toll (HOV/HOT) Enforcement

Vehicle occupancy enforcement has been stubbornly difficult to implement and get violations under control – largely due to need/use of “physical” enforcement (officers visually identifying and pulling over violators).

The introduction of technology has been tried but not widely adopted as legal requirements have proved challenging. However, the presentation made the case that technology is needed and getting better. Artificial Intelligence (AI) and machine learning is emerging and practical.

The newest technology, Vehicle Occupancy Detection (VOD), can address eligibility, identify vehicles, and produce court admissible data. Further, the equipment is automated, small, portable and addresses privacy, policy, and legal issues. AI can be used to sort through the photographs taken and automatically send to officers for review.

### ACTION STEPS

The first step is formally requesting an update from our partners at Los Angeles metropolitan (LA Metro) on their enforcement efforts on two of their existing projects in the LA Metro area (I-10 and I-110 express lane project corridors). Give LA Metro contact information from the workshop presenter, Pete Marshall, Director of Project Management, D2 Traffic Technologies.

### MEASURE OF SUCCESS

Success would be measured by improved matching of automated self-selection of carpool status data from users to field observations of carpools on the I-10 and I-110 corridors. Preliminary measure of success would be VOD deployment and testing in the two corridors.

## Homelessness Within the Right-of-Way

### Implementation Champion:

**John “Frederick” Smith,**  
New TRB Annual Meeting Attendee &  
Member of AJL60 Committee

### TAKEAWAY

Texas Department of Transportation (DOT) designated a vacant maintenance yard in Austin as a sanctioned tent encampment in 2019. It did not perform well, primarily due to lack of services. In 2020 the State partnered with a community organization and others to transition the site to a non-congregate, tiny house, bridge shelter community (“Esparanza”), with on-site services for people experiencing homelessness. Currently, the site supports 50 emergency shelter units, with plans for up to 200 units. The operator reports success in transitioning homeless persons into stable shelter. Texas DOT reported maintenance cost savings associated with the decrease of homeless persons in other portions of the state right-of-way in the area.

California Streets & Highways Code section 104.30 authorizes the Department to enter into lease agreements with local or state agencies for temporary emergency shelter or feeding programs, subject to certain constraints. Governor Newsom issued Executive Order N-23- 20 to reduce street homelessness, including direction to the Department about leasing its own state property. While opportunities here to replicate Texas DOT’s success would be ideal, there are a lot of moving parts with a 24-hour facility. Instead, I had an idea regarding a more limited, overnight “safe spaces to park” program for individuals experiencing homelessness.

Many unsheltered persons living out of their vehicles are often experiencing homelessness for the first time. With a safe place to park their vehicles overnight, coupled with access to professional services, there may be enhanced opportunities with this cohort to transition to stable housing before their situation becomes more dire. More to the point, there may be an opportunity to implement such a program at the California Department of Transportation (Caltrans) District 11 office complex located at 4050 Taylor Street in San Diego.

The D-11 office complex is unique in Southern California in that it has an extensive, at-grade parking lot as opposed to the enclosed parking structures you see in D-7, D-8, or D-12. Additionally, the D-11 parking lot has been under-utilized during the day, let alone during overnight hours, post-Covid. So there appears to be adequate space to implement such an overnight program in a portion of the lot. Finally, there is already a potential partner in the City of San Diego which currently works with Jewish Family Services to operate safe parking locations in other portions of San Diego County.

### ACTION STEPS

First, raise the issue with Department management. Is there an interest in evaluating the feasibility of an overnight “safe parking” program at this location? Are there existing impediments ruling out the location? Second, determine who the initial stakeholders would be, to include the Department of General Services. Third, reach out to prospective partners who might be interested in operating such a program. Fourth, complete a site operational assessment to determine if such a program is feasible at this location.



► Continued from previous highlight

## MEASURE OF SUCCESS

Implementation of an overnight safe parking program at the D-11 office complex, in partnership with a local agency, would be the ultimate measure of success. But empowering staff to continue to raise “out of the box” solutions for problems like homelessness, shared by all DOTs, is its own success.

## Diversity, Equity, Inclusion and Accessibility in Transportation-Centered Sessions

### Implementation Champion:

**Velessata Kelley,**  
New TRB Annual Meeting Attendee &  
Representing and assisting with State DOT  
CEO sessions

## TAKEAWAY

Caltrans needs a more transparent and equitable process for nominating attendees. This process should not be restricted to Transportation Research Board (TRB), but for how decisions are made in general for which staff are selected to attend and/or represent the Department at these types of conferences, meetings, etc.

## ACTION STEPS

- I propose that we establish a system for creating a Cohort of Caltrans staff that will attend a selection of conference that the department participates in each year. There could be multiple different cohorts in a year who attend different meetings, etc.
- I propose that the Department task the development of this process to an upcoming Leadership Training Program (LTP) II Cohort.

## MEASURE OF SUCCESS

- Development of a sustainable process for nominating and selecting cohort participants.
- Cohorts would include a mix of staff from various programs and subject areas across the department.
- Cohorts include a mix of staff ranging from various classifications across the department.
- Cohorts would not consist of the same attendees each year unless they served on a committee.

# TRB Careers in Motion

TRB's Careers in Motion Networking Fair was held on the first day of the 2024 TRB Annual Meeting, Sunday, January 7. Transportation professionals from all career levels attended this high-energy networking event to learn about available positions from across the sector and various modes. Attendees had the opportunity to meet with and chat with hiring managers, receive feedback on their qualifications, and learn about job opportunities first hand. Caltrans' Deputy Director of Administration, Aaron Ochoco, led the effort to recruit the brightest

and ambitious talent in the transportation sector. Fellow delegates Venkata Mandapaka, Nina Choy, Aaron Chamberlin, William Woolery, David DeLuz and Sharid Amiri also took turns helping staff the Caltrans' table. Their hard work paid off with over 120 candidates signing up get more information on jobs and student intern positions!



Nina Choy, William Woolery, Aaron Ochoco, and Venkata Mandapaka discuss career opportunities with prospective talent at the TRB Careers in Motion Networking Fair.



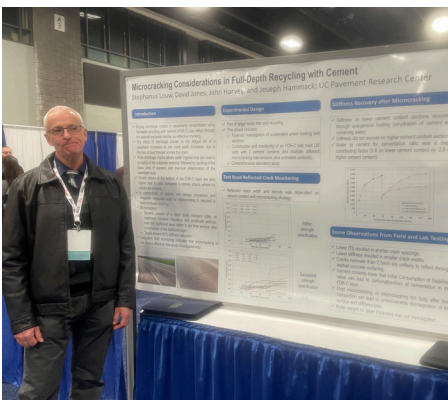
Caltrans delegates provide resources and information to attendees at the TRB Careers in Motion Networking Fair.





# California at TRB

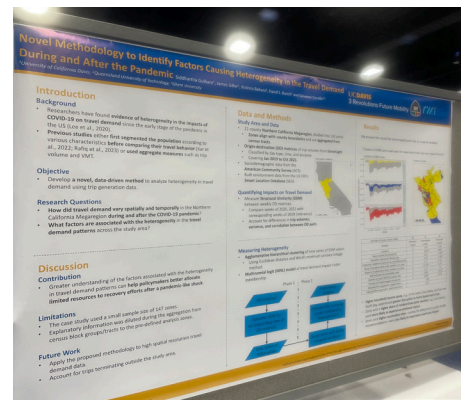
The poster sessions provided a great avenue to showcase how California contribute to national research.



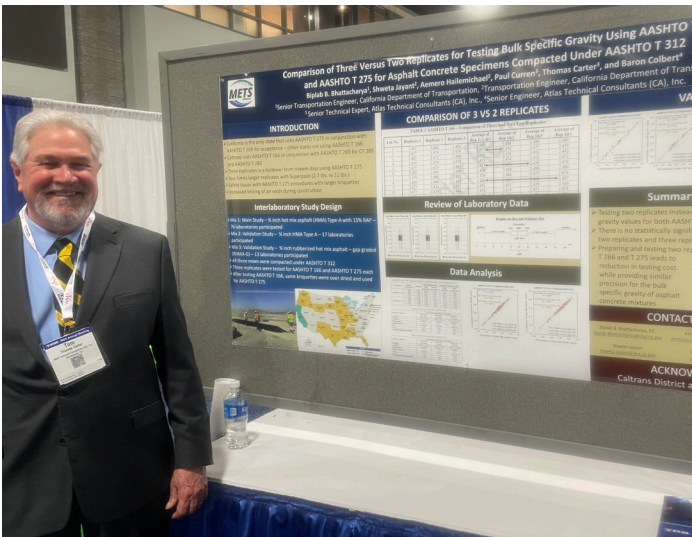
Dave Jones with the University of California Pavement Research Center (UCPRC) presents findings at the poster session on microcracking considerations in full-depth recycling with cement.



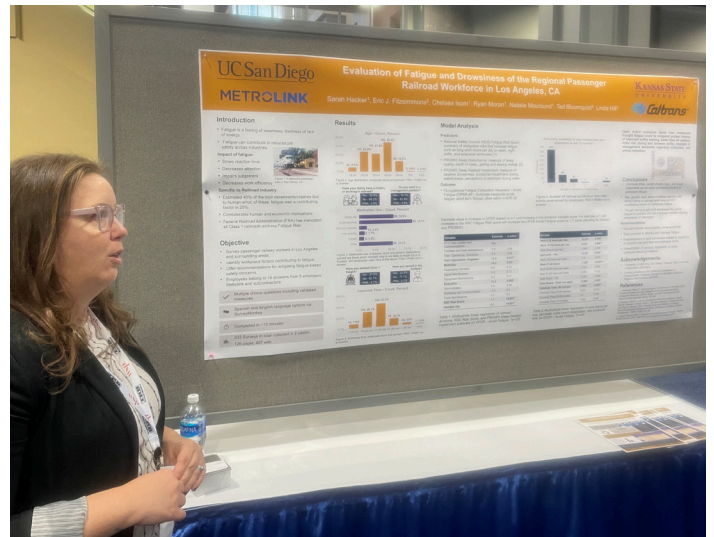
Joe Horton with Caltrans' Division of Research, Innovation & System Information (DRISI) presenting at the Committee Research Coordinators Council Meeting.



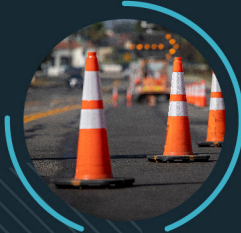
UC Davis research that found evidence of heterogeneity in the impacts of COVID-19 on travel demand with funding from California Senate Bill 1, The Road Repair and Accountability Act.



Thomas Carter presents research comparing three versus two replicates for testing bulk specific gravity using AASHTO T 166 and AASHTO T 275 with sponsorship from Caltrans' Materials Engineering and Testing Services (METS).



A researcher presents a joint finding from UC San Diego, Metrolink and Caltrans on the evaluation of fatigue and drowsiness of the Los Angeles regional passenger railroad workforce.



California Department of Transportation  
[www.dot.ca.gov](http://www.dot.ca.gov)

Division of Research, Innovation and System Information  
[www.dot.ca.gov/research](http://www.dot.ca.gov/research)

Transportation Research Board  
[www.trb.org](http://www.trb.org)