DRISI Research Program:
FY 2023/24 Approved Research

CALTRANS DIVISION OF RESEARCH, INNOVATION AND SYSTEM INFORMATION

TRANSFORMING IDEAS INTO SOLUTIONS

Updated October 2023

Division Chief Message

Every year when the Research and Deployment Advisory Committee (RDAC) approves a new slate of research, it is exciting to think about the many solutions that will be developed to address the new challenges we have been presented with. These are exciting times with new products and processes being created.

This year, RDAC members reviewed each recommended research request, in addition to having their delegate score. This new endeavor was successful in increasing RDAC involvement and vetting the slate of new research.

I would like to thank the RDAC members, Scorers, and the Division of Research, Innovation and System Information (DRISI) team for all the hard work performed to get us to this point.

Sincerely,
Dara Wheeler
DRISI Chief

DRISI Research Program

The DRISI Research Program is a valuable resource that holds potential to transform the California Department of Transportation (Caltrans) challenges into tangible, actionable solutions. Each fall, Program Steering Committees assess their current challenges and submit their research requests by January. Requests go through a ranking and review process and approved requests are executed after July 1, the beginning of the state's fiscal year (FY).

What is in the FY 2023/24 Approved Research?

- 99 research requests were submitted by 15 Divisions and Offices
- Each Division's #1 request was funded
- Research supports Caltrans goals with emphasis on safety, equity, and climate change
- 50 projects were approved
- Total Funding: Over $22 million

Strategic Goal Alignment

Safety First: 20 Tasks

Cultivate Excellence: 4 Tasks

Enhance and Connect Multimodal Transportation Network: 1 Task

Strengthen Stewardship and Drive Efficiency: 14 Tasks

Lead Climate Action: 4 Tasks

Advance Equity and Livability in All Communities: 7 Tasks

Advanced Research Program Steering Committee

Prepare Multi-Modal Intelligent Transportation Signal System for Deployment in California

Task 4346

This project addresses the need to refine, document source code and provide a user manual for Caltrans staff.

Contact: Supanpreet Kaur
Funding Total: $350,000
Caltrans Goal Alignment: Cultivate Excellence

Improving Intersection Safety and Mobility through Artificial Intelligence-Based Video Data Collection and Vehicle-To-Everything Communications

Task 4337

This project will develop capability assessment of Artifical Intelligence (AI)-based video detection systems and recommend AI-powered video sensor specifications/ placement. Researcher will study an enhanced Vehicle-To-Everything communications system with safety features for vulnerable road users, improve Arterial Performance Measurement and recommend standardized data formats, cloud storage/schemes, data processing workflows, etc.

Contact: Melissa Clark
Funding Total: $550,000
Caltrans Goal Alignment: Safety First

Construction Program Steering Committee

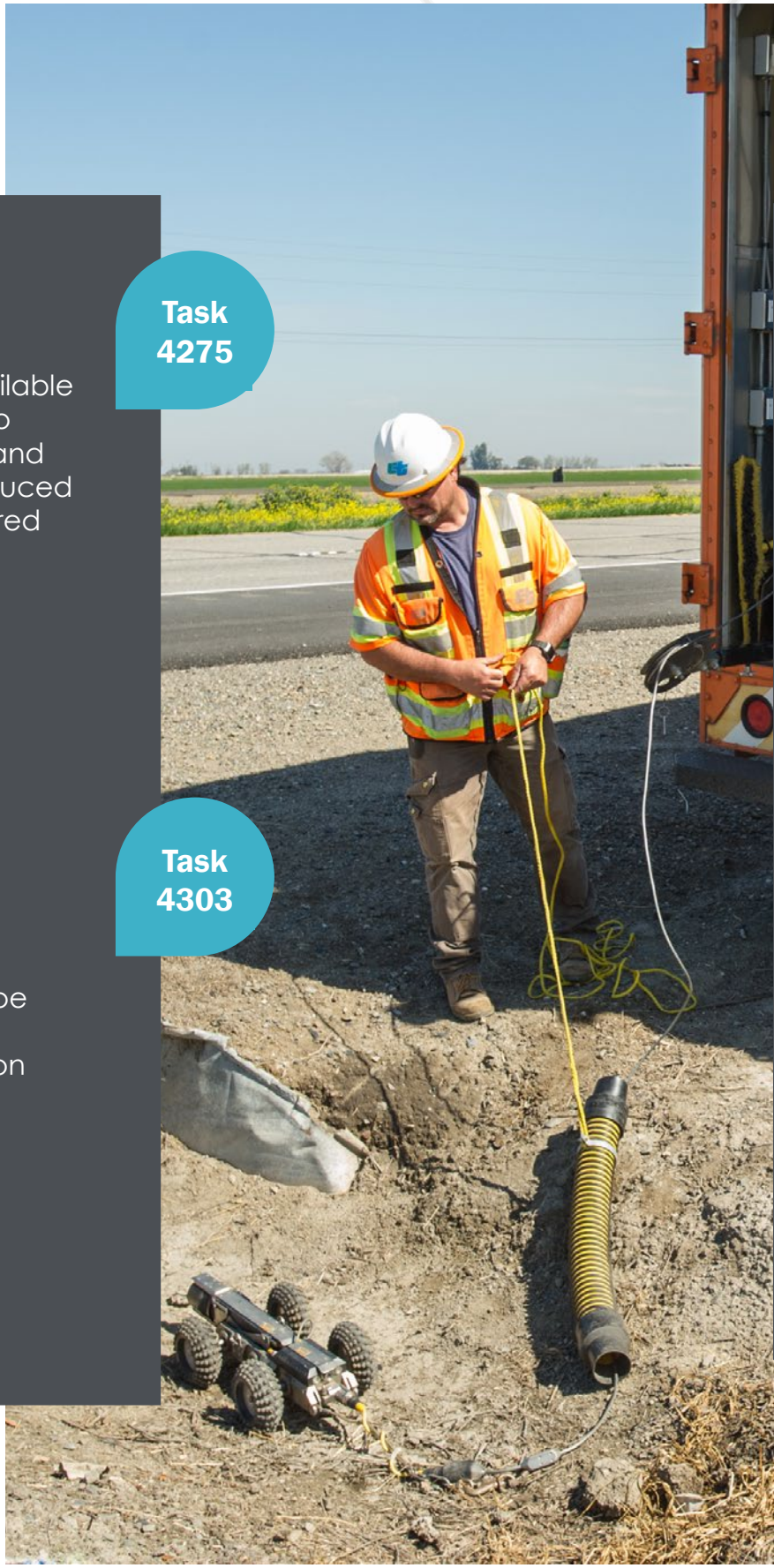
Task 4239

Concrete and Asphalt Pavement Smoothness and Asphalt Quality Incentive/Disincentive Analysis

This project will develop a user-friendly solution with better functionality whereby eliminating the multiple steps and streamlining the current process needed for submitting and verifying the pavement smoothness and asphalt concrete quality pay adjustment.

Contact: Colman Cronin
Funding Total: $565,074
Caltrans Goal Alignment: Strengthen Stewardship and Drive Efficiency

Design Program Steering Committee



Culvert Rehabilitation Technique (Cementitious Liner)

Task 4275

This project will expand the methods available for culvert rehabilitation, methods that do not require lane closures or excavation, and minimize environmental impacts with reduced construction footprints and without required excavation.

Contact: Akber Ali
Funding Total: $500,000
Caltrans Goal Alignment: Strengthen Stewardship and Drive Efficiency

Signalized Intersection Design Research Aid Calibration for Roundabouts in California

Task 4303

This project will produce a tool that can be directly used by Caltrans engineers and external partners for Signalized Intersection Design Research Aid roundabout model calibration.

Contact: Akber Ali
Funding Total: $450,000
Caltrans Goal Alignment: Strengthen Stewardship and Drive Efficiency

Design Program Steering Committee

Induction Potential/Safe Distances to Underground Electrical Distribution Lines

Task 4306

This project will provide guidelines for future utility installations to establish safe distances that vary with the voltages that the line carries.

Contact: Akber Ali
Funding Total: $450,000
Caltrans Goal Alignment: Safety First

RemoteDirect Current Fast Chargers Reliability and Downtime Detection Tool

Task 4353

This project is aimed to further study the chargers installed under the Caltrans 30-30 project and to develop criteria for charging reliability and dependability, maintenance needs, users' experience and policies that can then be used for future installation of chargers.

Contact: Fouad Ziaa
Funding Total: $200,000
Caltrans Goal Alignment: Lead Climate Action

Environmental Program Steering Committee

Task 4351

Stormwater Management to Address Highway Runoff Toxicity Associated with Tire Wear: Transportation Pooled Fund Study

This project will develop cost-effective solutions for a demonstrated tire generated 6ppd-quinone toxicity on threatened and endangered fish species before regulatory agencies impose treatment requirements based on Caltrans' ability to use recycled tire paving products.

Contact: Simon Bisrat
Funding Total: $500,000
Caltrans Goal Alignment: Strengthen Stewardship and Drive Efficiency

Task 4056

Central Valley Swainson's Hawk Research

This project will develop guidance for the protection of Swainson's Hawk.

Contact: Simon Bisrat
Funding Total: $250,000
Caltrans Goal Alignment: Strengthen Stewardship and Drive Efficiency

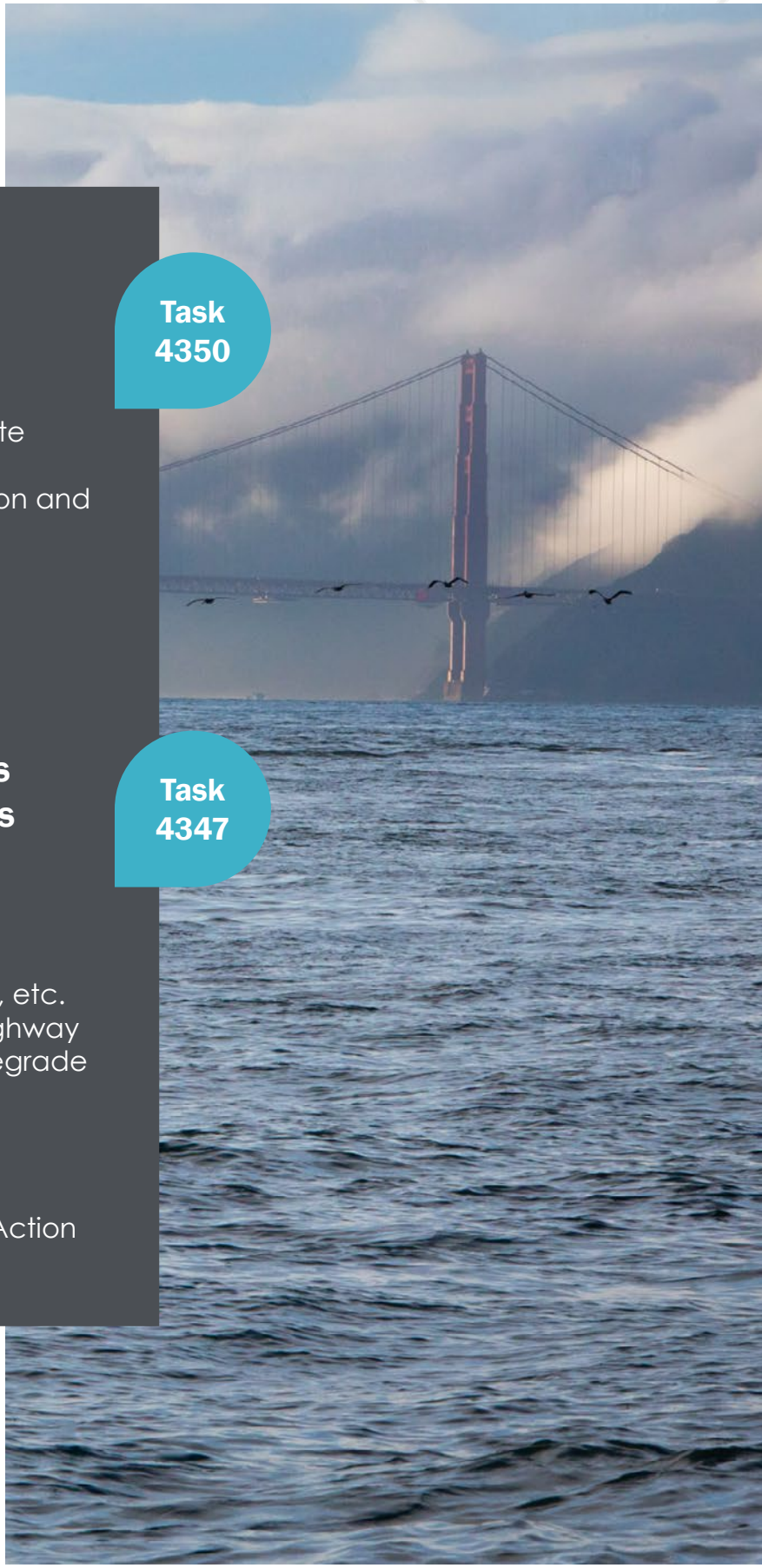
Task 4349

Bats in Transportation Structures: Alternative Night Roosting Strategies and Noise Monitoring Methods

This project will develop alternative night roosting strategies and noise monitoring techniques for bats during construction activities.

Contact: Simon Bisrat
Funding Total: $300,000
Caltrans Goal Alignment: Cultivate Excellence

Environmental Program Steering Committee



Wildlife Connectivity - Phase 2: Transportation Pooled Fund Study

Task 4350

This project will address the gaps in understanding how Caltrans can integrate wildlife habitat connectivity and wildlife crossing programs into our project initiation and development process.

Contact: Simon Bisrat
Funding Total: $500,000
Caltrans Goal Alignment: Safety First

Plastic Greenhouse Gas Emissions Field Measurement Along Caltrans Right of Way

Task 4347

This project will conduct statewide field experimentation on plastics found in the highway from trash, thermoplastic stripes, etc. and determine if the conditions in the highway will cause plastics to photochemically degrade to green house gasses.

Contact: Simon Bisrat
Funding Total: $350,000
Caltrans Goal Alignment: Lead Climate Action

Traffic Operations Program Steering Committee

High Speed Data Distribution and Collection Prototype

Task 4276

This project will develop a prototype of California Digital Transportation Infrastructure for Caltrans. This will assist Caltrans in defining a viable strategy for replacing its current digital assets and provide information to assist in obtaining more funding for full-scale system.

Project Contacts: Edwin Yeung
Funding Total: $300,000
Caltrans Goal Alignment: Advance Equity and Livability in All Communities

Light Detection and Ranging Data Fusion for Multi-Modality at Traffic Signals

Task 4371

This project will integrate Light Detection and Ranging (LiDAR) sensors into traffic signal systems to improve safety of pedestrians, cyclists as well as the traveling public.

Contact: Steven Turner
Funding Total: $150,000
Caltrans Goal Alignment: Advance Equity and Livability in All Communities

Equipment Program Steering Committee

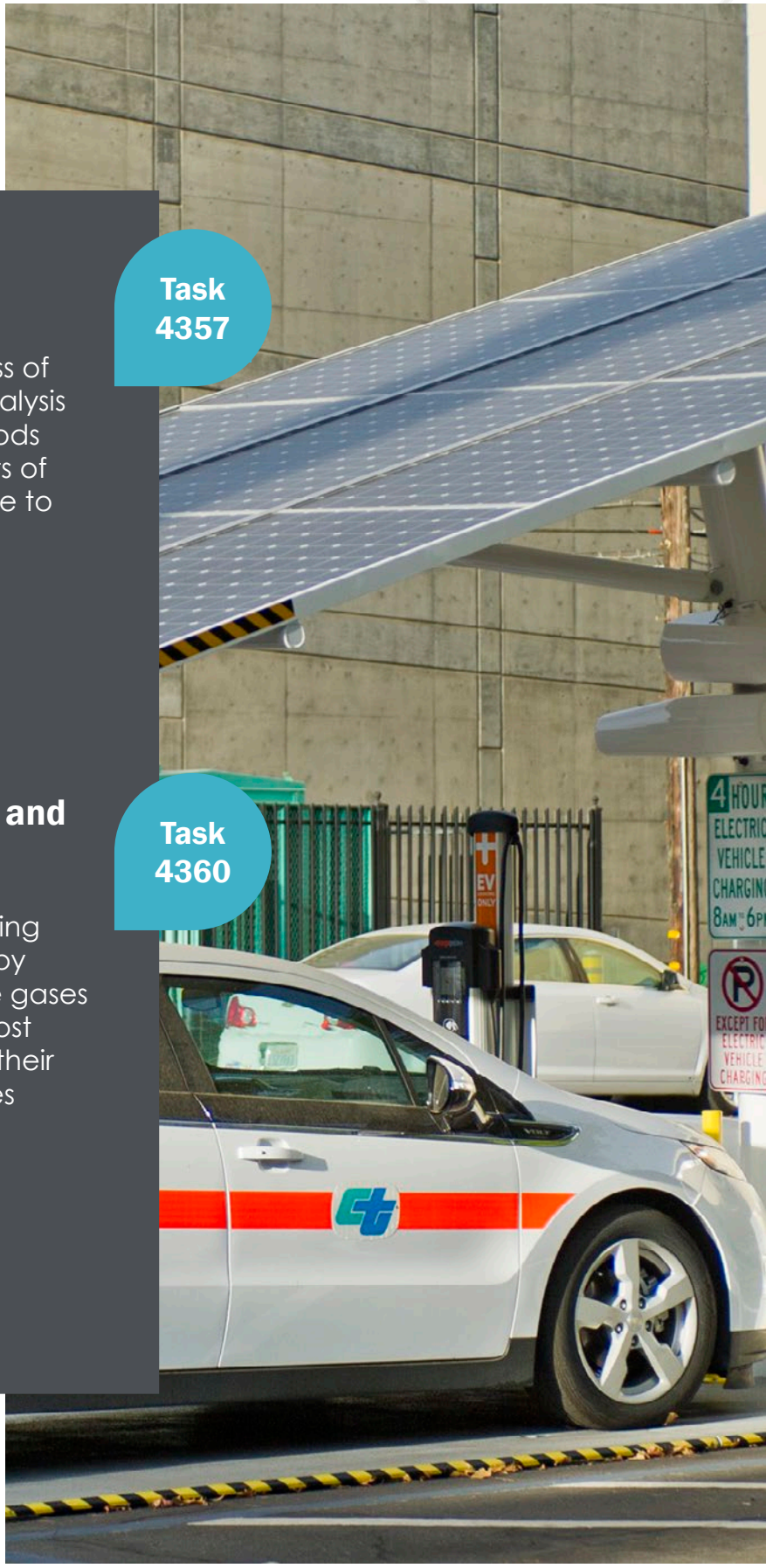
Task 4288

Evaluation of Mobile Robot Teams for Security of Caltrans Equipment Yards and Maintenance Stations

This project aims to evaluate the effectiveness of a team of robot security guards.

Contact: Alexander Pham
Funding Total: $365,000
Caltrans Goal Alignment: Cultivate Excellence

Executive Program Steering Committee



Induced Travel and Calculation of Benefits

Task 4357

This project will assess the appropriateness of including induced travel in economic analysis and methods for doing so. Current methods of cost benefit analysis may show benefits of new capacity that will not materialize due to re-congestion from induced travel.

Contact: Tyler Monson
Funding Total: $150,000
Caltrans Goal Alignment: Enhance and Connect the Multimodal Transportation Network

Decarbonizing Caltrans' Facilities and Operations

Task 4360

This project will investigate carbon-reducing strategies in use that could be adopted by Caltrans to achieve net-zero greenhouse gases emissions including prioritization of the most impactful actions Caltrans can adopt in their operations to eliminate greenhouse gases emissions.

Contact: Tyler Monson
Funding Total: $200,000
Caltrans Goal Alignment: Strengthen Stewardship and Drive Efficiency

Executive Program Steering Committee

The Equity and Environmental Impacts of Supercommuting

Task 4379

This project will investigate potential causes and estimate the societal costs of commutes over 50 miles in California.

Contact: Tyler Monson
Funding Total: $150,000
Caltrans Goal Alignment: Advance Equity and Livability in All Communities

Induced Travel from Managed Lanes

Task 4361

This project will investigate the amount of vehicle miles expected to be added on managed facilities to determine if it differs from a general purpose lane, and if so, by how much.

Contact: Tyler Monson
Funding Total: $225,000
Caltrans Goal Alignment: Strengthen Stewardship and Drive Efficiency

Review of Induced Travel Elasticities

Task 4359

This project will use the latest research and data to revisit the amount of total vehicles miles travelled expected to be generated by the addition of highway capacity.

Contact: Tyler Monson
Funding Total: $200,000
Caltrans Goal Alignment: Strengthen Stewardship and Drive Efficiency

Geotechnical/Structures Program Steering Committee

Task 4044

Crash Testing and Verification of Retrofit Type 85 Barrier on Existing Bridge Deck Overhangs

This project will determine if current bridge barrier upgrade design guidance, which relies on classical analytical methods, is too conservative and develop alternative guidance. Current methods and guidance require costly strengthening and reconstruction.

Contact: Christopher Traina
Funding Total: $350,000
Caltrans Goal Alignment: Safety First

Task 4291

Model Test for Buried Structures Crossing Highways under Seismic Loading

This project will conduct model tests to investigate the soil-structure interaction structural failure mechanism for structures crossing under highways. Results will be used to develop and improve design criteria for Structure Technical Policy and Bridge Design Memoranda.

Contact: Christopher Traina
Funding Total: $700,000
Caltrans Goal Alignment: Safety First

Task 4271

Seismically Isolated Bridges under Beyond Design Shaking

This project will conduct a series of experimental and numerical studies to evaluate the system behavior of seismically isolated bridge systems to provide data on the distribution of demands within the isolation system and columns as limit states are reached under various seismic loadings.

Contact: Christopher Traina
Funding Total: $550,000
Caltrans Goal Alignment: Safety First

Geotechnical/Structures Program Steering Committee

Task 4270

Seismic Design Evaluation of Shallow Foundations at Potentially Liquefiable Soil Sites

This project will investigate the seismic performance of shallow bridge foundations on sites with liquefiable soils, and identify conditions under which acceptable performance is realized. Results will be used to propose guidance for bridges with shallow foundations.

Contact: Anhdan Le
Funding Total: $1,100,00
Caltrans Goal Alignment: Safety First

Task 4281

Bridge Rapid Assessment Center for Extreme Event – Phase II

This project will refine the application developed in Phase I in accordance with current Caltrans Information Technology standards and ensure compatibility with structural analysis models developed using CSiBridge instead of the OpenSees platform used the the Phase I Bridge Rapid Assessment Center for Extreme Event contract.

Contact: Christopher Traina
Funding Total: $450,000
Caltrans Goal Alignment: Safety First

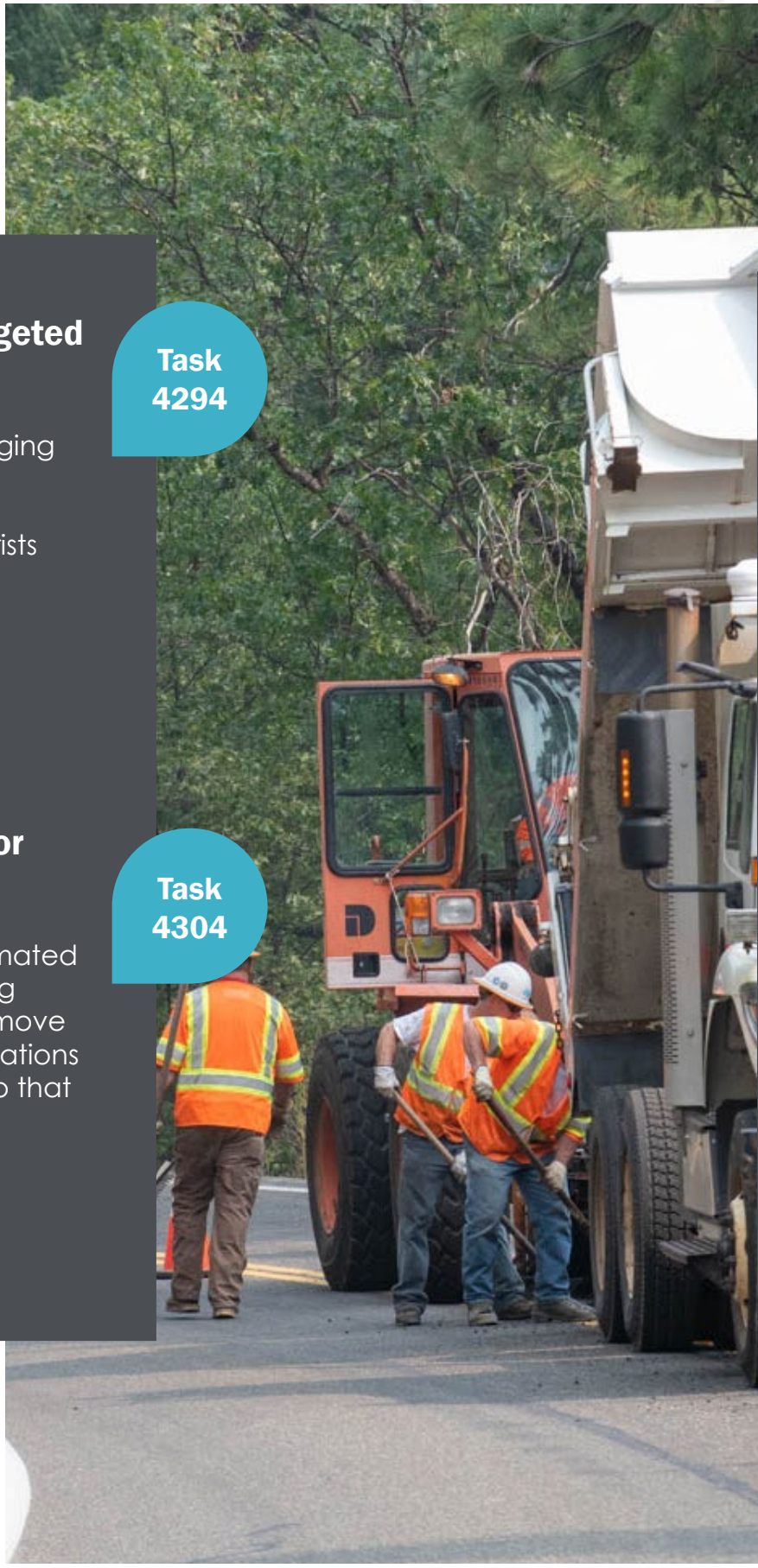
Task 4332

Implementation of Advanced Sustainability and Performance-Based Practices for Concrete Infrastructure

This project will conduct a risk-benefit analysis and performance evaluation to support adoption of innovative advanced alternative materials in concrete.

Contact: Christopher Traina
Funding Total: $350,000
Caltrans Goal Alignment: Lead Climate Action

Maintenance Program Steering Committee



Deployment and Evaluation of Targeted Warning Messaging System

Task 4294

This project will deploy a targeted messaging system on message boards in work zones to increase the safety of both highway maintenance workers and passing motorists in order to mitigate vehicles unsafely approaching a highway lane closure.

Contact: Eemon Amini
Funding Total: $326,539
Caltrans Goal Alignment: Safety First

Long Range Automated Lookout for Roadside Operations

Task 4304

This project will evaluate the use of automated lookout systems that detect unsafe driving behaviors and alert roadside workers to move to a safe location. Current roadside operations require continuous vigilance of workers so that they can quickly identify unsafe drivers.

Contact: Eemon Amini
Funding Total: $348,120
Caltrans Goal Alignment: Safety First

Maintenance Program Steering Committee

Evaluation of Electric Vehicle Heavy Equipment for Use in Caltrans' Operations

Task 4307

This project will evaluate the suitability of heavy electric vehicle efficiencies in Caltrans operations. Heavy construction machines such as loaders and excavators account for industrial related greenhouse gas emissions.

Contact: Hamid Ikram
Funding Total: $433,812
Caltrans Goal Alignment: Advance Equity and Livability in All Communities

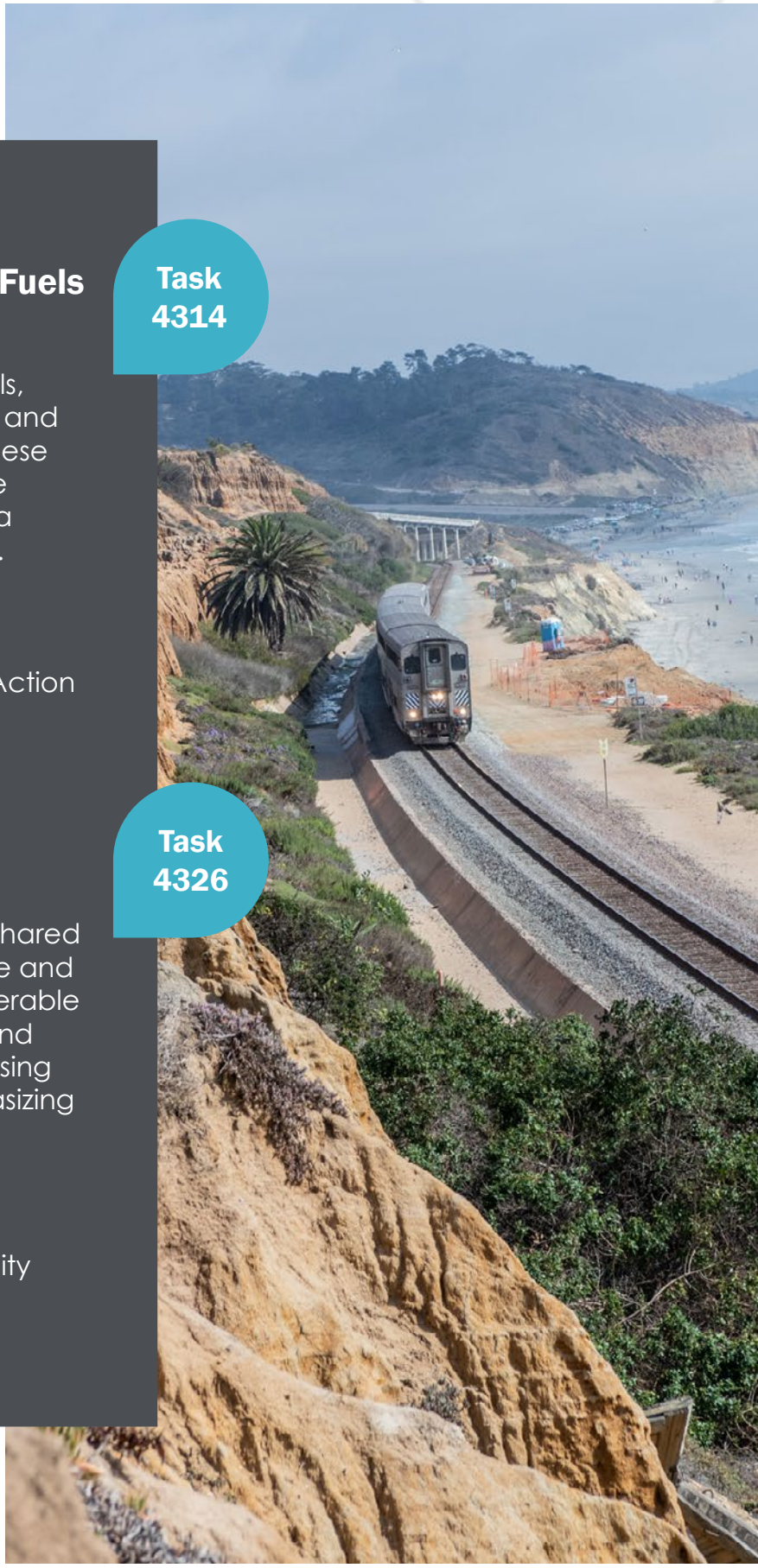
Post-Wildfire Debris Flow Transportation Pooled Fund Study

Task 4389

This project is necessary to address the challenges posed by post-wildfire debris flows.

Contact: Azzeddine Benouar
Funding Total: $75,000
Caltrans Goal Alignment: Safety First

Modal Program Steering Committee



Overcoming Barriers to the Rapid Deployment of Unleaded Aviation Fuels

Task 4314

This project will develop a report that will identify barriers to the deployment of fuels, from different stakeholders' perspectives and make recommendations to overcome these barriers. The report will include a literature review, research tools and methods, data analysis, findings, and recommendations.

Contact: Nathan Loebs
Funding Total: $250,000
Caltrans Goal Alignment: Lead Climate Action

Equity in Payments for Transit and Congestion Charging

Task 4326

This project will develop a framework of shared standards and actionable steps to create and implement payment solutions for interoperable systems across transportation providers and modes. This framework will assist in increasing transportation access for all while emphasizing the transit dependent and unbanked.

Contact: Bradley Mizuno
Funding Total: $200,000
Caltrans Goal Alignment: Advanced Equity and Livability in all Communities

Modal Program Steering Committee

Task 4290

Americans with Disability Act Van as a Technology Demonstrator for Disabled Travelers

This project will conduct a range of advanced experimental research in the areas of connected automated vehicles, paratransit & micro-transit automation, disabled traveler assistance & user experience, Vehicle-To-Everything and Artificial Intelligence applications.

Contact: Fouad Ziaa
Funding Total: $600,000
Caltrans Goal Alignment: Advance Equity and Livability in All Communities

Task 4312

Incorporating New Unmanned Aircraft Systems into the Caltrans Safety Management System

This project will update safety, training, and best practices of the Caltrans Unmanned Aircraft Systems Safety Management System to incorporate use of new unmanned aircraft models and operations including tethered, autonomous, Beyond Visual Line of Site and fixed wing.

Contact: Nathan Loebs
Funding Total: $250,000
Caltrans Goal Alignment: Strengthen Stewardship and Drive Efficiency

Task 4325

Strategies for Improving Safety and Efficiency of Interactions Between Surface Traffic and Trunkline Transit

This project plans to focus on understanding safety and efficiency issues involving interaction between transit and surface traffic and study ways to apply intelligent transportation system technologies to detect and manage hazards while optimizing the operation of all modes.

Contact: Juan Esparza
Funding Total: $450,357
Caltrans Goal Alignment: Safety First

Pavement Program Steering Committee

Task 4214

Continued Support for Implementation of Performance Related Tests and Specifications for Balanced Mix Design, Increased Recycling of Asphalt Mixes, and Integration of Mix Design and Structural Design

This project supports further research, development, and implementation of balanced mix design, which relies on performance related testing and specifications to help ensure the mechanistic properties of asphalt mixes are integrated with mix design properties and mechanistic empirical structural design inputs.

Contact: Junxia Wu
Funding Total: $4,519,431
Caltrans Goal Alignment: Strengthen Stewardship and Drive Efficiency

Planning, Policy & Programming Program Steering Committee

Task 4356

Shoulder Width Data Accuracy Improvement for Bicycle Facilities

This project will study the impact of inconsistent shoulder width data, which is part of the Transportation System Network. This project will identify the impact of shoulder width inaccuracies with an emphasis on bicycle and pedestrian planning efforts and methods to improve estimates.

Contact: Tyler Monson
Funding Total: $125.000
Caltrans Goal Alignment: Strengthen Stewardship and Drive Efficiency

Task 4315

Impacts of Changing Agriculture Supply Chains on California Roads and Bridges

This project will examine California's agriculture production and transportation networks, determine metrics that could be used in prioritization of new freight facilities, and explore best practices for assessing network resiliency.

Contact: Tyler Monson
Funding Total: $125,000
Caltrans Goal Alignment: Strengthen Stewardship and Drive Efficiency

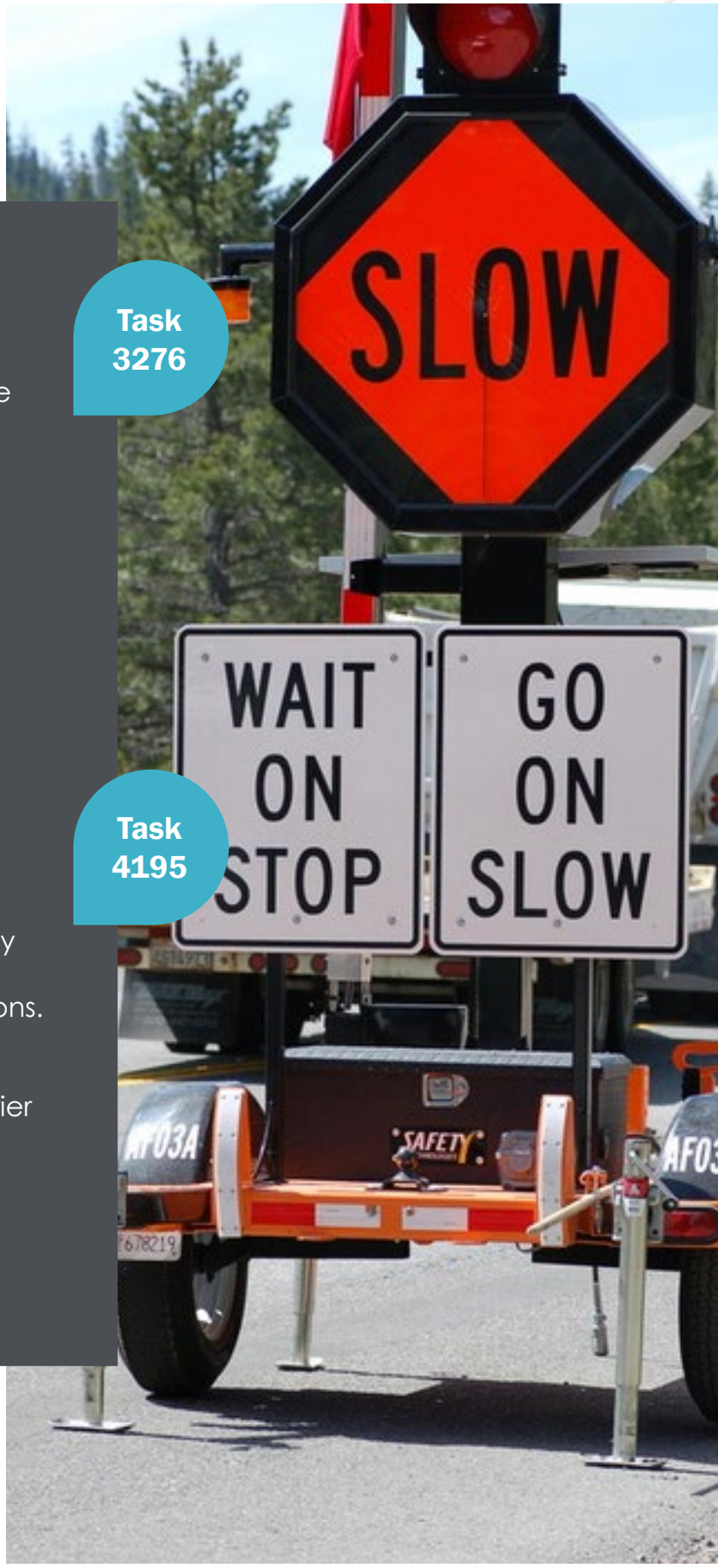
Task 4358

Innovative Tools and Concept Strategies for System Planning Phase 2

This project will focus on developing innovative alternatives to incorporate into the preliminary tool, including large-scale multimodal mobility projects.

Contact: Tyler Monson
Funding Total: $150,000
Caltrans Goal Alignment: Strengthen Stewardship and Drive Efficiency

Research Support



Midwest Roadside Safety Facility: Transportation Pooled Fund Study

Task 3276

This project is focused on improving roadside safety for California and the nation. Crashworthy products are reviewed and adopted by Caltrans with many becoming Caltrans standards, such as the Midwest guardrail system.

Contact: Bob Meline
Funding Total: $134,000
Caltrans Goal Alignment: Safety First

Texas Transportation Institute Roadside Safety - Phase 3: Transportation Pooled Fund Study

Task 4195

This project will supplement testing underway at Texas Transportation Institute completing tests required for specific barrier configurations. Specifically, the testing will include barriers anchored with shallow embedment for bridge decks less than 7 ½" thick and a barrier transition.

Contact: Bob Meline
Funding Total: $120,000
Caltrans Goal Alignment: Safety First

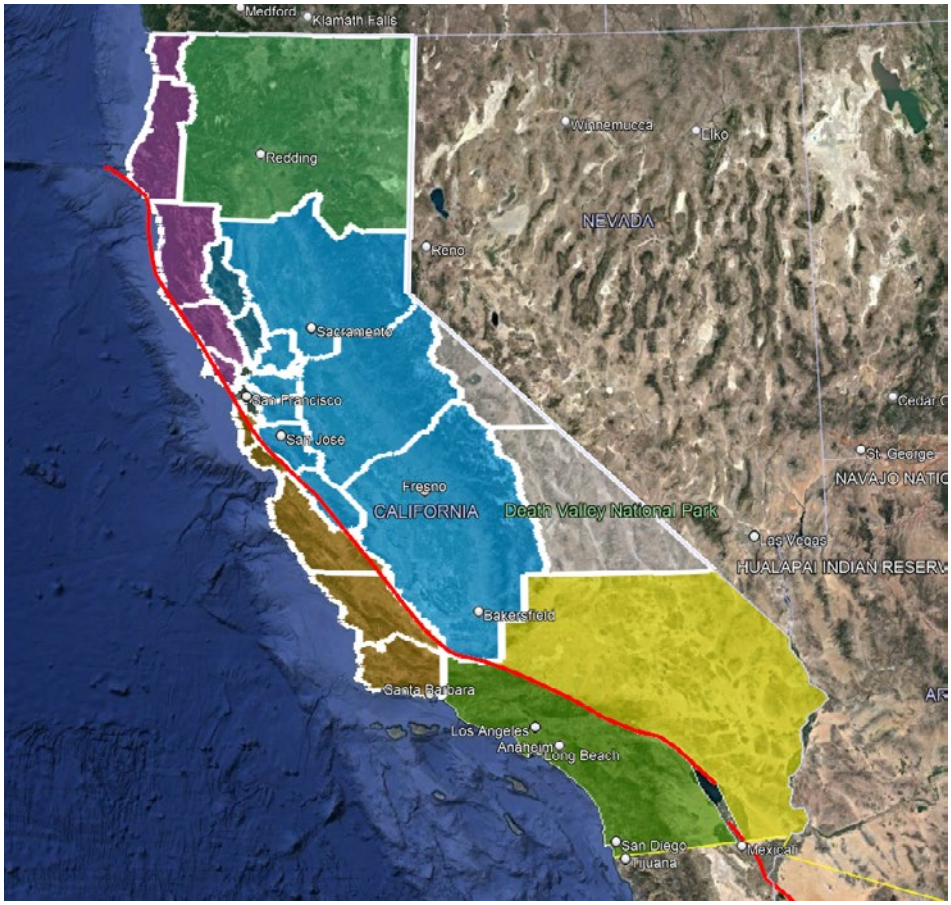
Right of Way & Land Surveys Program Steering Committee

Task 4317

Statewide 3-Dimensional Motion Analysis for Optimal Caltrans Spatial Reference Network Performance and Geospatial Data Management

This project will conduct a research analysis and develop of a statewide digital map with model-based data to maintain accuracy of the Caltrans Spatial Reference Network and future Geodetic control networks. The Caltrans Spatial Reference Network Performance locates features for highway improvement projects and asset management.

Contact: Arvern Lofton
Funding Total: $350,000
Caltrans Goal Alignment: Safety First



Map of Regional Boundaries for Sub-networks of the Caltrans Spatial Reference Network (CTSRN)

Rural Program Steering Committee

Task 4296

Vehicle Detection on Rural Roads Using Optical Fiber Sensing Technology

This project will study emerging fiber optic technology that could provide a cost-effective alternative to detection station deployment. Detection is crucial for managing highways, providing data on vehicle count, classification, occupancy, and speed.

Contact: Sean Campbell
Funding Total: $350,000
Caltrans Goal Alignment: Strengthen Stewardship and Drive Efficiency

Task 4298

Use of Small Unmanned Aerial Systems for Rural Communications Tower Inspection

This project will evaluate unmanned aerial systems feasibility for microwave inspections, Radio Frequency analysis, and Fresnel zone clearance inspections.

Contact: Sean Campbell
Funding Total: $261,000
Caltrans Goal Alignment: Safety First

Task 4297

Development and Testing of an Unmanned Aerial System Cellular & Wi-Fi Repeater: Phase 2

This project aims to design and test a next-generation unmanned aerial system communication payload to improve results from a previous effort, benefiting state forces during emergency responses.

Contact: Sean Campbell
Funding Total: $227,000
Caltrans Goal Alignment: Cultivate Excellence

Safety Program Steering Committee

Task 4287

Phase 2: Identification of Speeding-related, Run-Off-Road, Cross-Over, and Wrong-Way Collisions Locations

This project will develop a Safe System Approach based methodology and tool that will be used for safety programs on Run-Off-Road, Cross-Over, Wrong-Way, and Speeding-related collisions.

Contact: Jerry Kwong
Funding Total: $500,000
Caltrans Goal Alignment: Safety First

Task 4284

Estimating Wet-Pavement Exposure with Precipitation Data

This project will develop up-to-date wet-pavement exposure factors that will be used in Wet Table C and Wet-Safety Performance Function on the State Highway System.

Contact: Jerry Kwong
Funding Total: $500,000
Caltrans Goal Alignment: Safety First

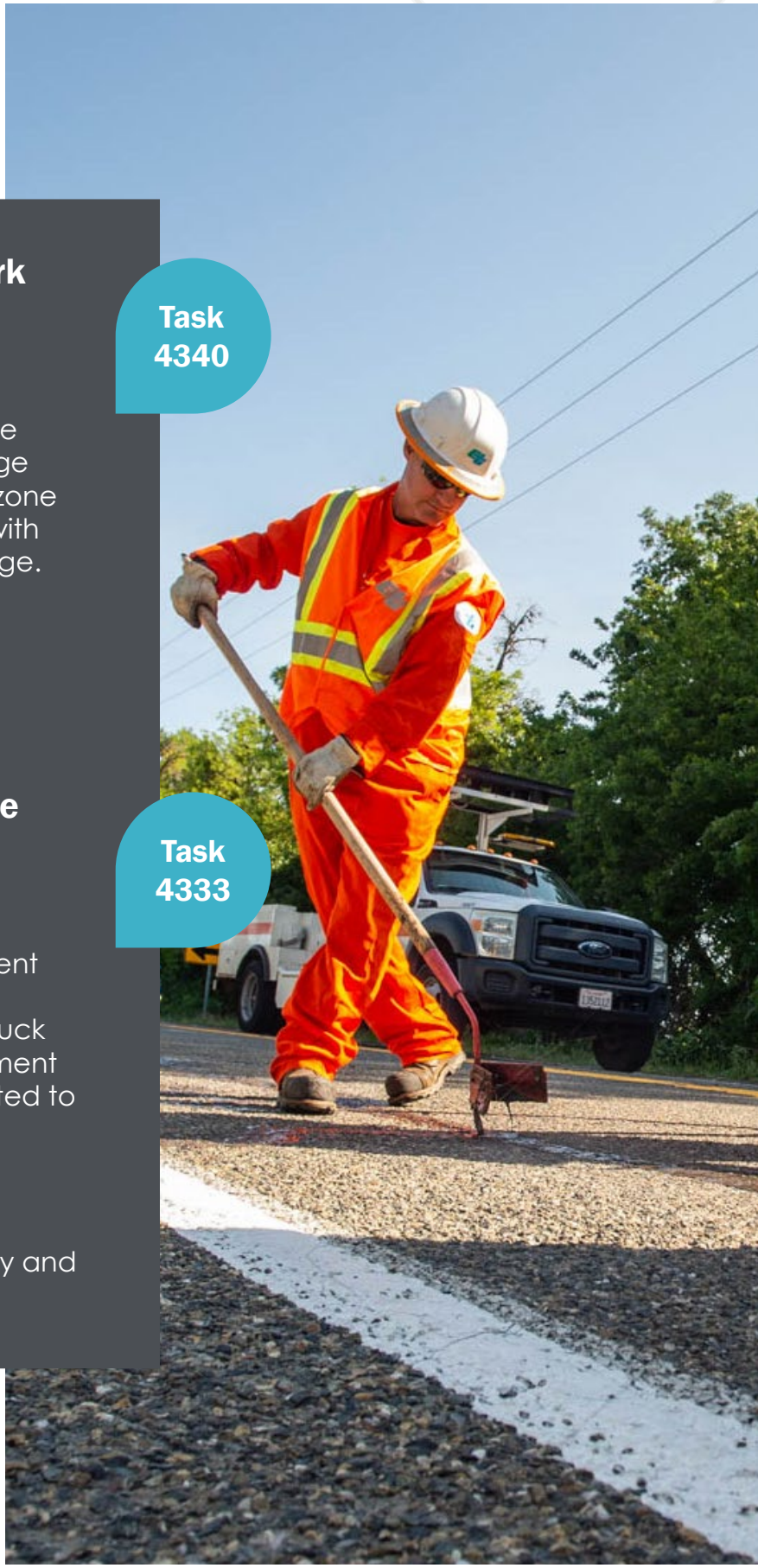
Task 4376

Evaluation of Proximity Warning Systems for Work Zones

This project plans to evaluate commercially available Proximity Warning Systems to determine their worker safety benefits. Contractor will identify Proximity Warning Systems and procure selected Proximity Warning Systems. Contractor will then develop testing and evaluation protocols and assess the performance of each Proximity Warning Systems.

Contact: Hamid Ikram
Funding Total: $370,000
Caltrans Goal Alignment: Safety First

Traffic Operations Program Steering Committee



Effects of Using Standardized Work Zone Data to Improve Work Zone Safety

Task 4340

This project will help Caltrans evaluate the effectiveness of work zone data exchange as the countermeasure to address work zone intrusion issues. Also, it will help Caltrans with best-practice of work zone data exchange.

Contact: Edwin Yeung
Funding Total: $400,000
Caltrans Goal Alignment: Safety First

Use of Third-Party Data to Enhance Truck Monitoring in High-Traffic Networks

Task 4333

This project will create guidance document to outline how third-part vehicle tracking data could be used to reliably monitor truck movement within a network. It will document in a succinct how-to guide to be distributed to relevant staff within Caltrans.

Contact: Edwin Yeung
Funding Total: $240,000
Caltrans Goal Alignment: Advance Equity and Livability in All Communities

https://dot.ca.gov/programs/research-innovation-system-information

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Caltrans