

A low-angle photograph showing the lower legs and feet of three people moving on a paved surface. On the left, a person in black leggings and orange-soled sneakers walks. In the center, a person in a white skirt and colorful socks walks. On the right, a person in black pants and dark sneakers with reflective stripes pedals a blue bicycle. The scene is brightly lit, suggesting a sunny day.

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**Tools for Active Transportation
Safety Measures**

Slido 1033

A low-angle photograph showing the lower legs and feet of three people. On the left, a person is wearing black leggings and blue sneakers with orange soles. In the center, a person is wearing a white skirt and colorful sneakers. On the right, a person is riding a blue bicycle, wearing black pants and black sneakers with orange soles. The background is a paved sidewalk and street.

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**Kevan Shafizadeh, Associate Dean
College of Engineering and Computer Science
at California State University, Sacramento**

A low-angle photograph showing the lower legs and feet of people walking and riding a bicycle on a paved path. The person on the left is wearing black leggings and blue sneakers with orange soles. The person in the middle is wearing a white skirt and colorful sneakers. The person on the right is riding a blue bicycle and wearing black sneakers with orange accents. The scene is brightly lit, casting shadows on the pavement.

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A background image showing the lower legs and feet of people walking and a person riding a bicycle on a paved path. The text is overlaid on this image.

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Meghan Mitman, AICP

Principal, Fehr & Peers

Rod Brown, AICP, PTP

Associate, Fehr & Peers

Strategies for Reducing Pedestrian Injury on State Roads

Acknowledgements:

Rachel Carpenter
Caltrans Pedestrian and Bicycle Safety Branch Chief

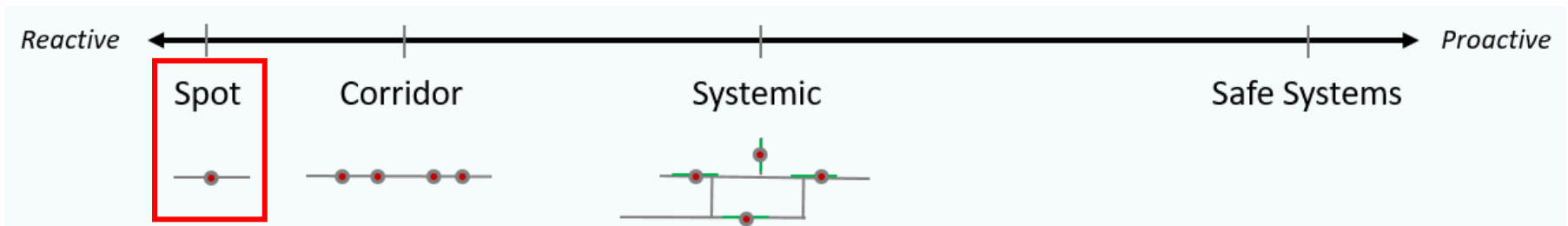
Anika Jesi
Senior Transportation Planner, Caltrans Sustainability Program

Offer Grembek
Co-Director, Safe Transportation Research and Education Center, UC Berkeley

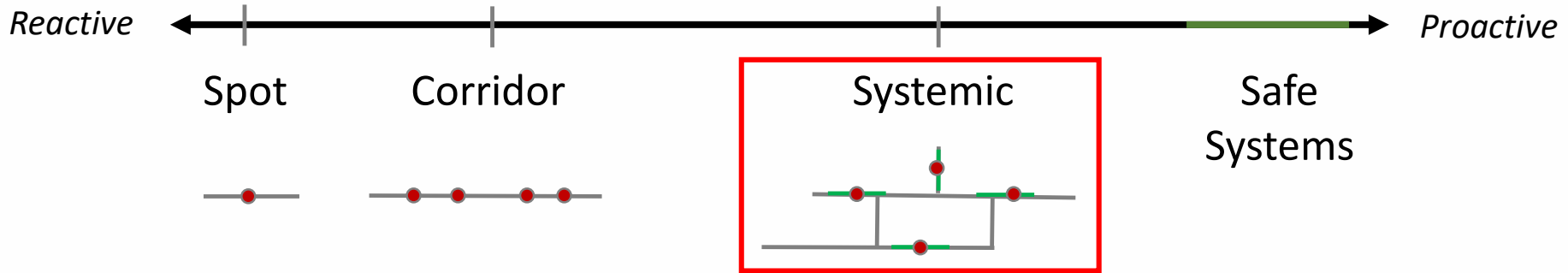
Pedestrian Safety Improvement Monitoring Program

Round 1, 2016-2017

- 129 Investigations
- 147 Improvement Actions



Where does Systemic Safety fit in?



Systemic approach

- Reactive: uses historical crash data to identify priorities
- Proactive: makes improvements also at low or non-crash sites

FHWA's Systemic Safety Program



Systemic Analysis: Collision Rates

Facility	Factor	Values
Intersection	Control	<ul style="list-style-type: none"> Two-way stop Four-way stop Yield Signalized Uncontrolled
	Approach lanes	Number on major street and number on minor street
	Average Annual Daily Traffic (AADT)	<ul style="list-style-type: none"> 0-7,000 7,000-15,000 15,000-25,000 25,000 or greater

Lanes (maj+min)	0-7,000 AADT	7,000-15,000 AADT	15,000-25,000 AADT	25,000+ AADT
All-way stops	0.03	0.28	0.38	0.43
2+2	0.02	0.20	0.13	0.50
3+2			2.00	
4+2	0.13	0.83	0.50	0.40
4+4		0.50		
6+2				0.50
Signal	0.35	0.53	0.87	1.11
2+1			0.60	
2+2	0.33	0.22	0.62	0.23
3+2	0.36	0.89	1.87	0.20
3+3	0.67	3.33	3.43	4.00
4+1			0.22	0.08
4+2	0.29	0.55	0.78	0.83
4+3	0.50	1.07	0.70	0.73
4+4		1.11	1.09	1.16
5+2		0.33	0.26	0.73
5+3			1.00	0.25
5+4			0.82	0.88
6+2		1.20	1.40	1.28
6+3				2.40
6+4			1.08	1.48
6+5				1.20
6+6			0.50	1.57
7+2				1.50
8+2				1.44
8+3				1.50
8+4				2.43

Systemic Analysis: Prioritization

Category	Source Data	Metric	Max Pts Available
Collision Rate	SafeTREC systemic analysis results	Statewide total collisions divided by total intersections for each facility type	55
Exposure	Exposure/Pedestrian Volumes Study 2013-2017 American Community Survey data by block group	Total pedestrian volumes	25
Disadvantaged Communities	CalEnviroScreen 3.0 GIS Data	If a tract with a score <25% occurs within a half mile of the facility	10
Senior Population Density	2013-2017 American Community Survey data by Block Group	Total senior population (65 and over) per square mile within a 1/2 mile of the facility	2.5
Youth Population Density	2013-2017 American Community Survey data by block group	Total youth population (under 15) per square mile within a 1/2 mile of the facility	2.5
School Proximity	California School Campus Database	If a school is within 1/4 or 1/2 mile of the facility	5

Applying Appropriate Countermeasures



COUNTERMEASURE

Paint and Plastic Curb Extension



Widens the sidewalk at intersections or midblock crossings to shorten the pedestrian crossing distance, to make pedestrians more visible to motorists, and to reduce the speed of turning vehicles.

Locations: [Signalized Intersections](#), [Unsignalized Street Crossings](#)

Note: not in CMF Clearinghouse. See Countermeasure References.

COUNTERMEASURE

High-Visibility Crosswalk



A crosswalk that is designed to be more visible to approaching drivers. Crosswalks should be designed with continental markings and use high-visibility material, such as inlay tape or thermoplastic tape instead of paint.

Locations: [Signalized Intersections](#), [Unsignalized Street Crossings](#)

Next Steps

- Gather additional infrastructure data to refine analysis
- Expand systemic analysis to bicyclists
- Develop strategic plan for pedestrian and bicycle safety
- Approach and tools can be applied for local agency analysis

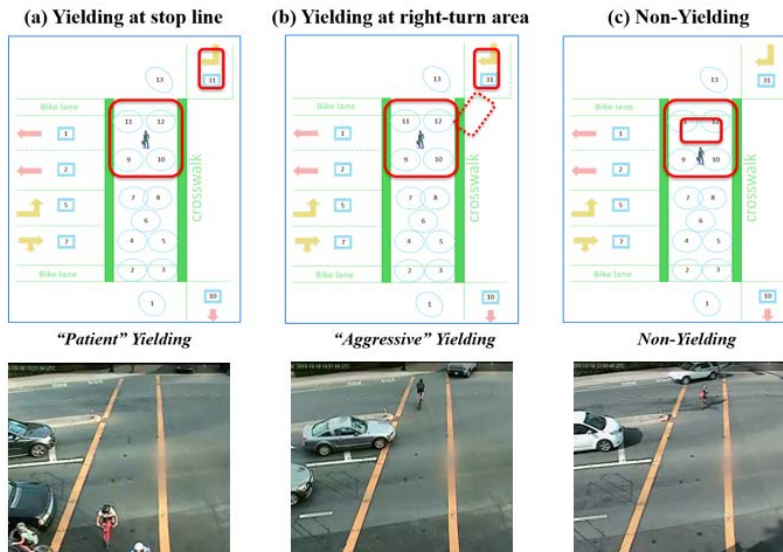


A low-angle, close-up photograph of people's legs and feet in motion. On the left, a person in black leggings and blue sneakers walks. In the center, a person in a white skirt and colorful socks walks. On the right, a person in black pants and black sneakers with yellow accents pedals a blue bicycle. The scene is set on a paved sidewalk with a red curb in the foreground. The text is overlaid in the center.

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Safe System, Vulnerable Users, and Intelligent Intersections



Presented by:

Dr. Offer Grembek
Berkeley SafeTREC

Presented at:

CA ATP Symposium
October 30, 2019

Safe System: safer roads, vehicles, speeds

Mooren et al., 2011

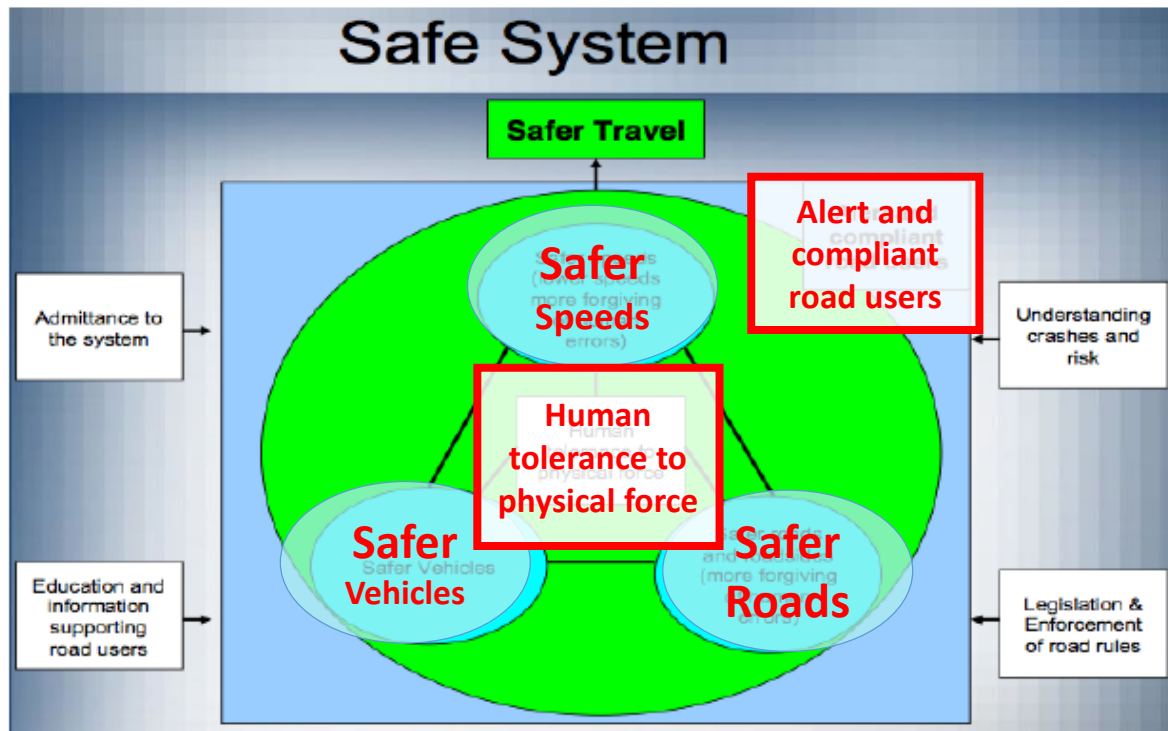


Figure 3 – The Safe System model reproduced from Howard, 2004 [25]

Cyclist Safety Considerations

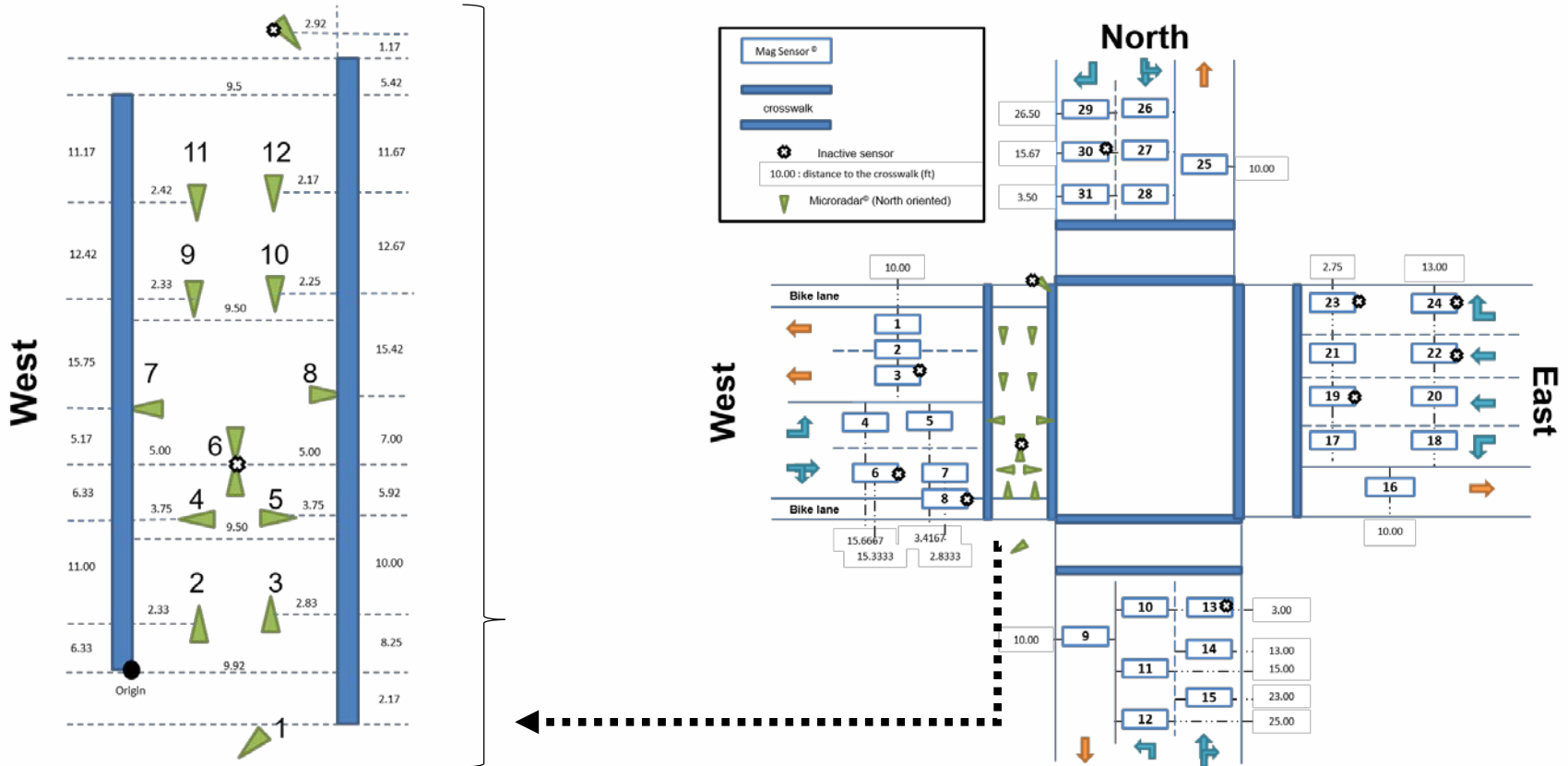
We would want alert and compliant riders, to make trips using safe bicycles, on safe street design with adequate separation from safe motorized traffic driven by alert and compliant drivers, all of which are governed by safe speeds, and supported by effective cyclist protection, and the medical emergency system, when needed.

Safety Buffers

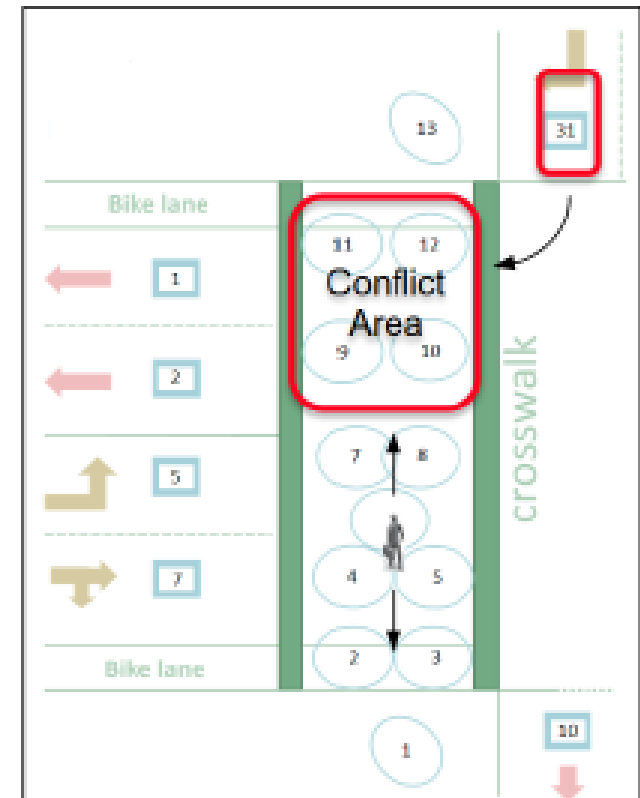
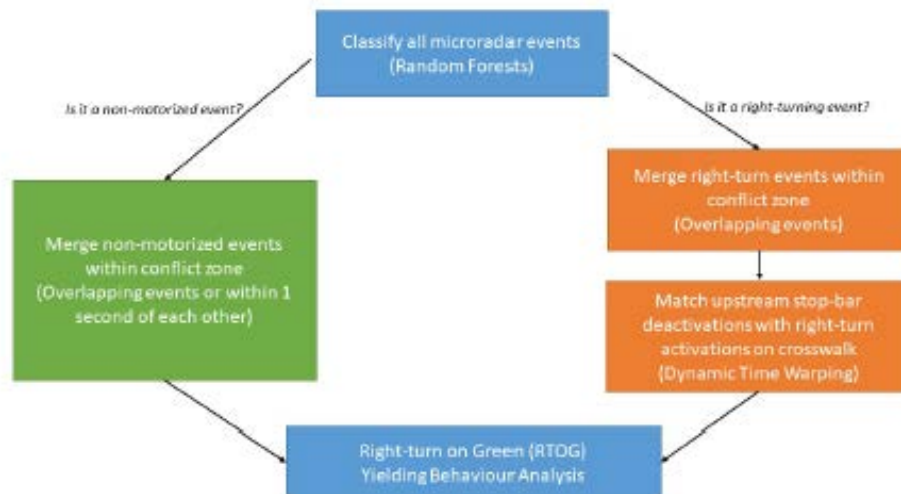
1. street design
2. street operations
3. street-user behavior
4. street-user warning
5. street-user protection
6. emergency medical services



Intelligent Intersection

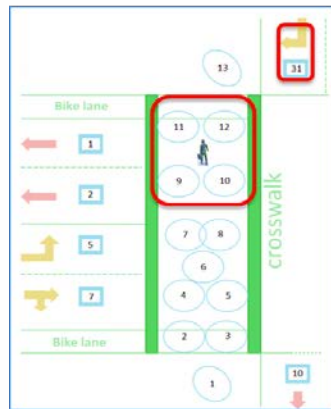


Analyzing yielding behavior during right-turns-on-green



Tools to Identify Yielding-related Interactions

(a) Yielding at stop line



“Patient” Yielding



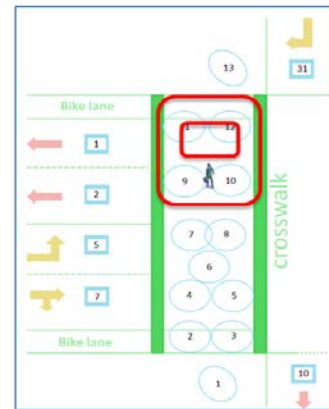
(b) Yielding at right-turn area



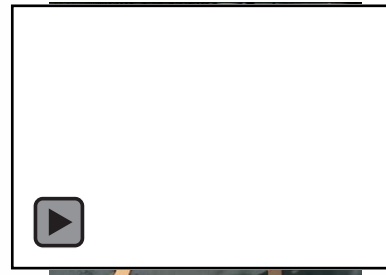
“Aggressive” Yielding



(c) Non-Yielding

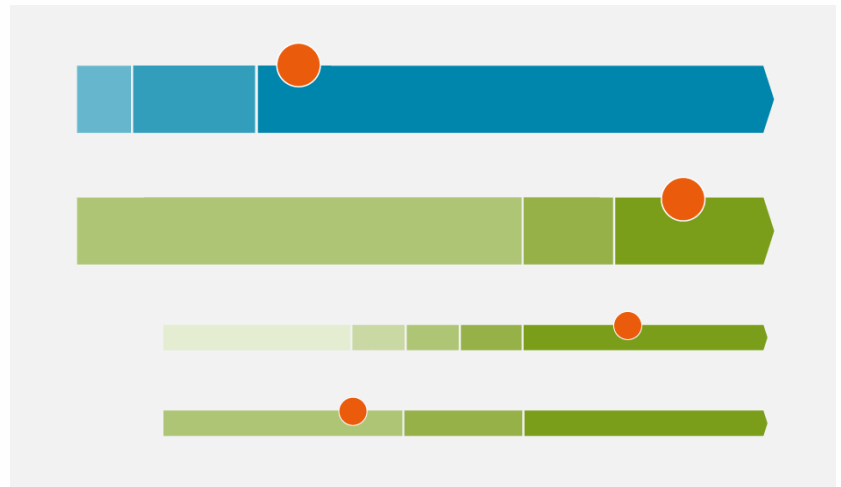


Non-Yielding



- **Statistical**
- Three types of yielding interactions
- Aggressive yielding are more similar to non-yielding interactions as opposed to patient yielding.

Proactively Monitor Safe Operations at Intersection



A low-angle, close-up photograph of people's legs and feet in motion. On the left, a person in black leggings and blue sneakers walks. In the center, a person in a white skirt and colorful socks walks. On the right, a person in black pants and black sneakers with yellow accents pedals a blue bicycle. The scene is set on a paved sidewalk with a red curb in the foreground. The text is overlaid in the center.

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Web-based Tools for Community Engagement

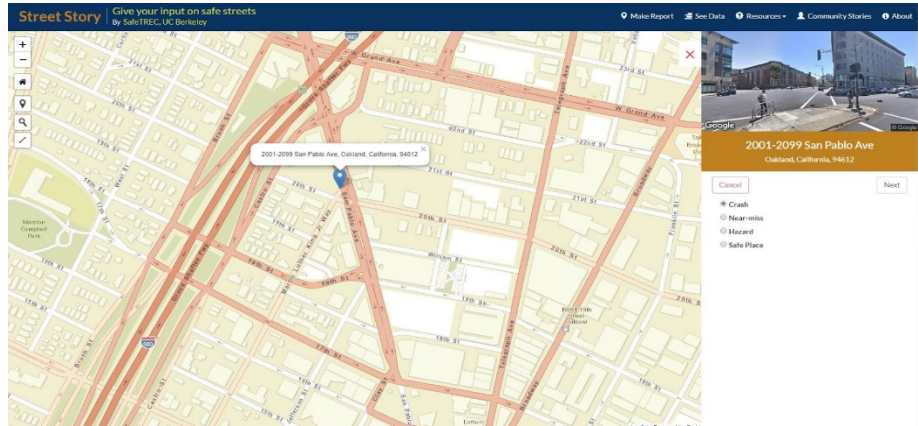
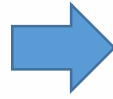
Jill Cooper

UC Berkeley Safe Transportation Research and Education
Center (SafeTREC)

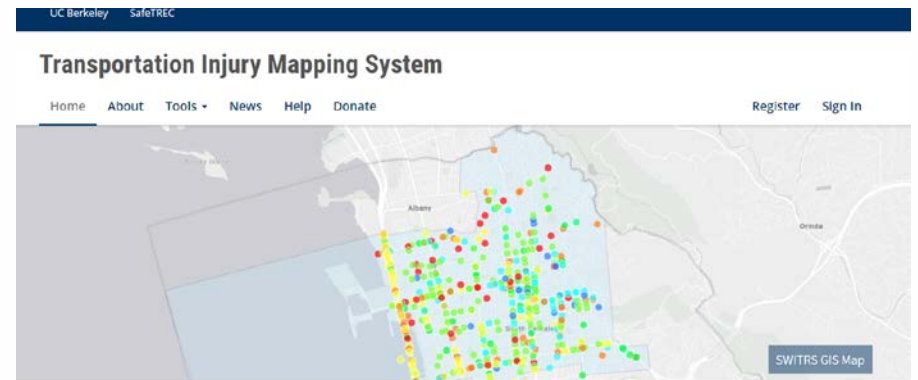
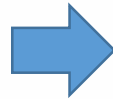
October 30, 2019

Web-based tools for communities

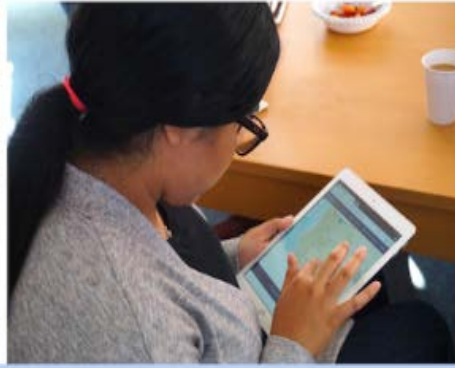
Street Story helps organizations collect information for transp. safety but is difficult to gather and analyze.



TIMS geocodes CA crash data (SWITRS) to allow users to view maps of collisions by city, county, tribe.



Street Story in Action



Browser tabs: Gmail, Sign in to Outlook, U.S. Census Bureau QuickFacts, New Road Safety Tool Lets Humboldt Cyclists and Pedestrians Report Where They Feel Safe and Unsafe

Address bar: <https://lostcoastoutpost.com/2019/jun/20/new-online-safety-tool-lets-humboldt-cyclists>


Navigation: NEWS GIZMOS, LOWDOWN, SPORTS, EARTH, OBITS, ELSEWHERE, MARKETPLACE, ABOUT

Search: Search

« In Midst of Unusual Marine Mammal Die-Off, Humboldt State Team Surveys the Coast and Looks for Answers | Yurok Biologist Discovers New Subspecies of Klamath Lamprey; Leads Team-Written Paper Published in Scientific Journal »

LoCO STAFF / THURSDAY, JUNE 20 @ 10:23 A.M. / SAFETY, TRANSPORTATION

New Road Safety Tool Lets Humboldt Cyclists and Pedestrians Report Where They Feel Safe and Unsafe



NOTIFICATIONS: OFF (CLICK TO MANAGE)

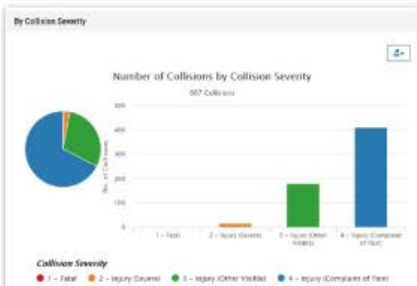
Social media icons: Facebook, Twitter, Instagram, RSS

Recently

- FoPD: AUDIBLE ALARM — 3100 Block of KENMAR RD 11:38 a.m.
- FoPD: FOUND PROPERTY — 600 Block of 11TH ST 11:36 a.m.
- THURSDAY LOWDOWN: Brinee Kellogg Will Sing for You For Free on Madaket Plaza This Evening 11:30 a.m.
- CHP: Traffic Collision, Ambulance En Route at Highway 101 and Elk Valley Cross Rd

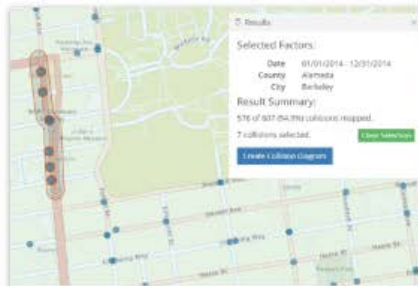
System tray: 11:43 AM

TIMS – Available Tools



SWITRS Query & Map

A basic tool for accessing fatal or injury collisions from the California Statewide Integrated Traffic Records System (SWITRS).



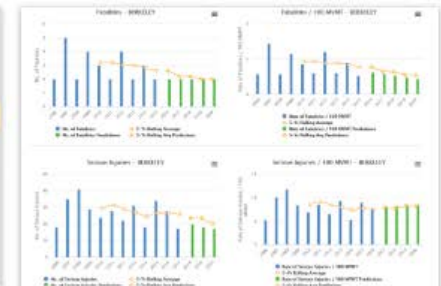
SWITRS GIS Map

The Geographic Information Systems (GIS) offers an interactive map with capability of multiple tasks including Rank by Intersection, Collision Diagram, etc.



Collision Diagram

The Collision Diagram tool allows users to generate an interactive collision diagram. The Collision Diagram is accessible through SWITRS GIS Map.



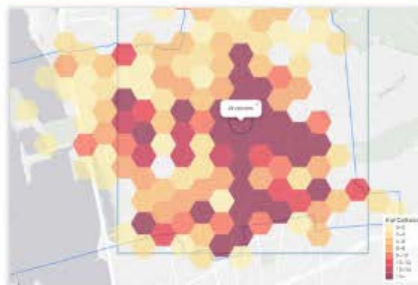
California Safety PM Target Setting

California Safety Performance Management (Safety PM) Target Setting Support Tool based on FARS, SWITRS, and HPMS data.



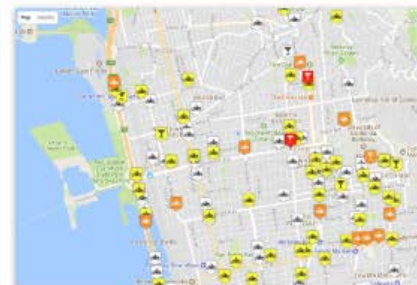
SRTS Map Viewer

Provide a pedestrian and bicycle collision map within half mile radius of public schools in California.



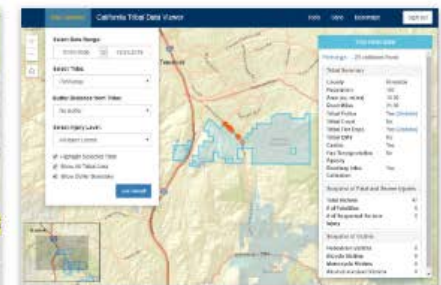
ATP Maps & Summary Data

Utilize multiple collision maps to find pedestrian and bicycle collisions hot spot and generate data summaries within specified project and/or community limits.



Motorcycle Collision Map

Provide a simple means to explore motorcycle collisions in California by selected county and/or city.



Tribal Crash Data Tool

Provide tribes with access to a web-based interactive analysis and mapping tool for tribal areas.

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Jerry Barton
Senior Transportation Planner

A low-angle, close-up photograph of people's legs and feet as they walk and ride a bicycle on a paved path. The image is bright and sunny, with shadows cast on the ground. The text is overlaid on the center of the image.

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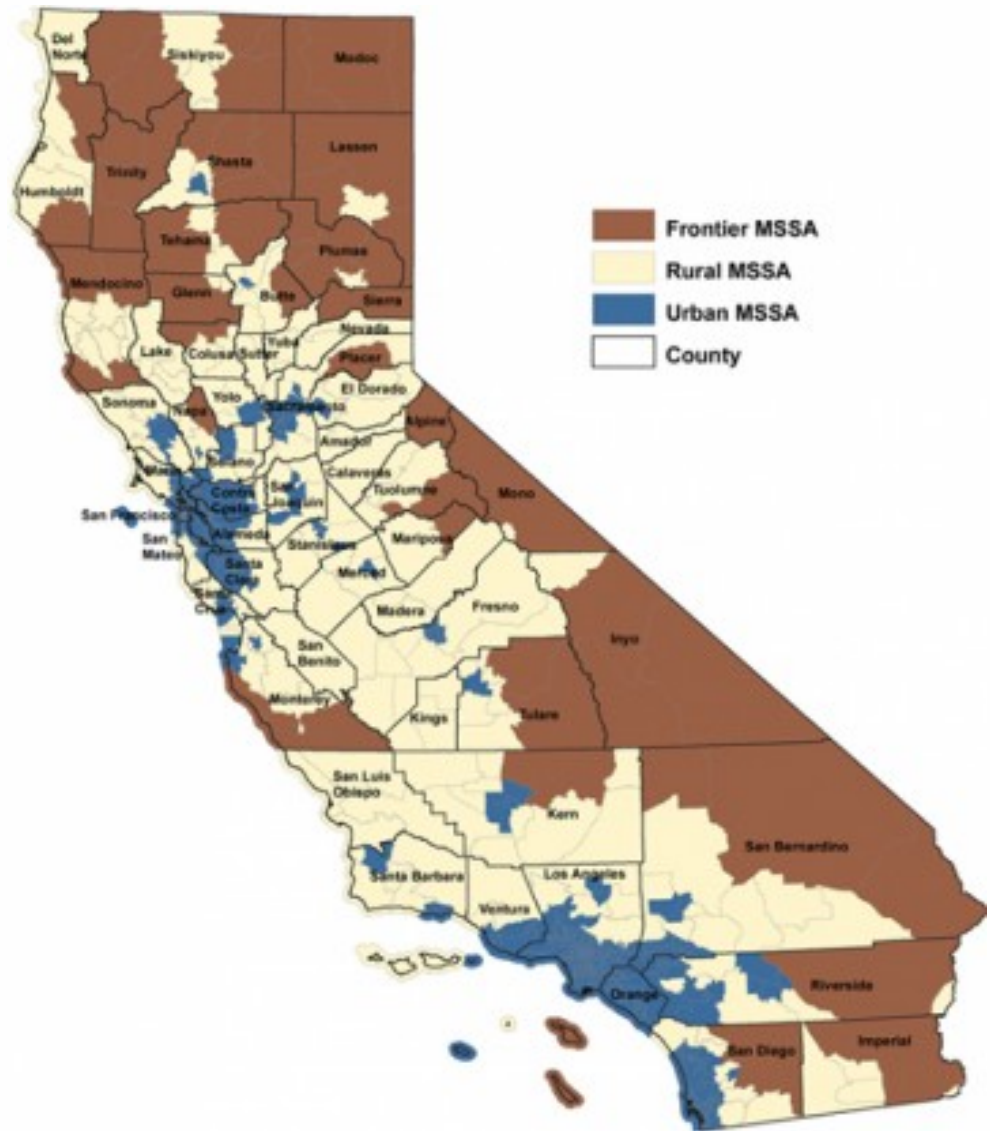
Jerry Barton
Senior Transportation Planner



Rural Active Transportation Safety Challenges

Jerry Barton, Senior Transportation Planner
El Dorado County Transportation Commission

Rural California?

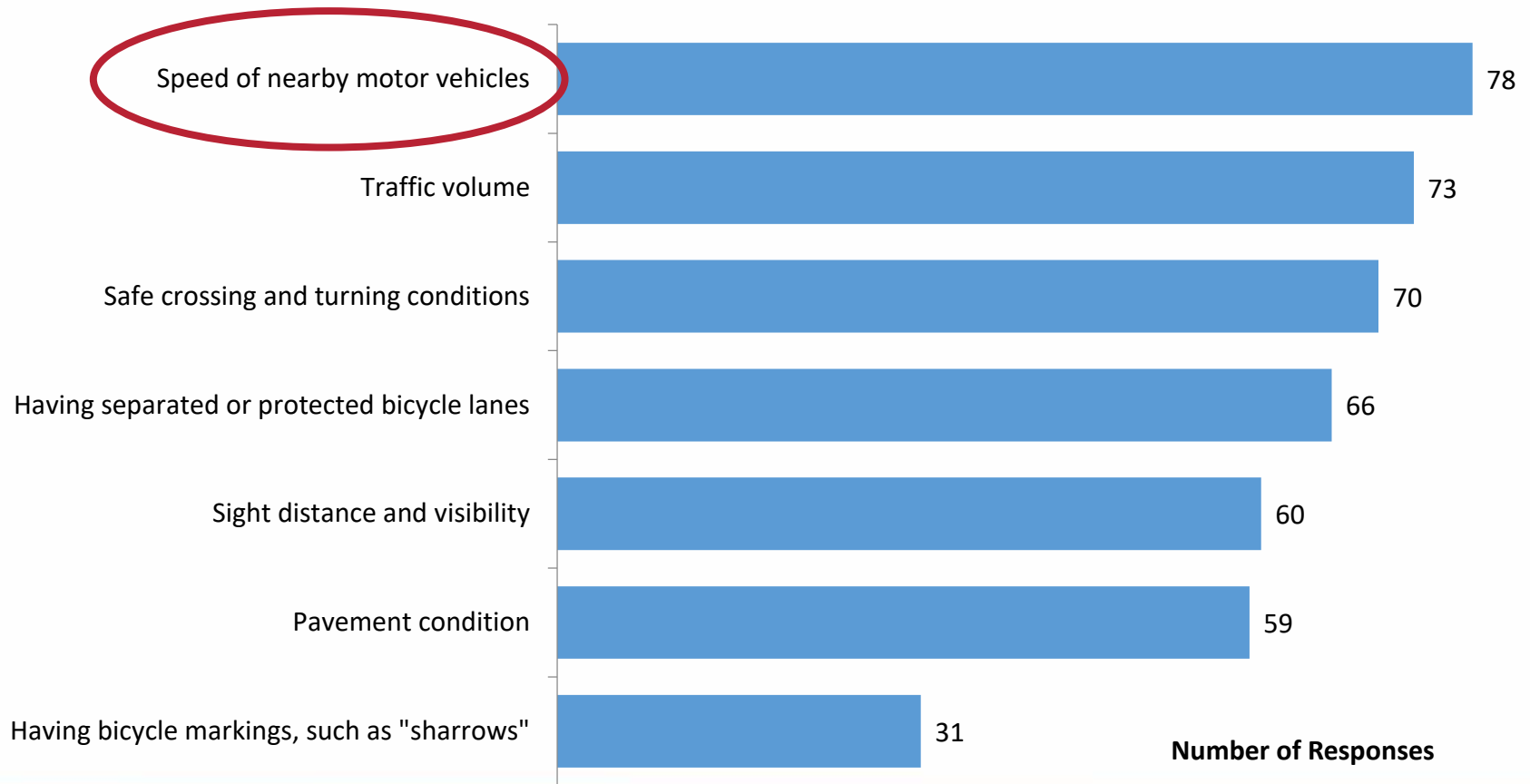


Characteristics of Rural Road Systems

- Road system originally designed to support resource based economic activities such as logging, mining, agriculture
- Demands for improvements are increasing as communities grow up around rural roads, and many carry heavier traffic loads than intended
- Community pride in rural character

Rural Survey Data – El Dorado County

Safety Factors When Choosing a Bicycle Route for “Interested but Concerned” Bicyclists



Non-Standard Design



Access Control Challenges



Unique Challenges



Lack of Facilities/Developing Areas



High Speed Crossings



Narrow Shoulders



Maintenance Needs - Shoulders




Collision Locations – Few Clusters

BICYCLE AND PEDESTRIAN COLLISIONS

Placerville, CA
 EL DORADO COUNTY AND
 CITY OF PLACERVILLE
 ACTIVE TRANSPORTATION
 PLANS






Bicycle Collisions (2013 - 2017)

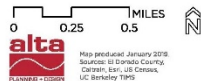
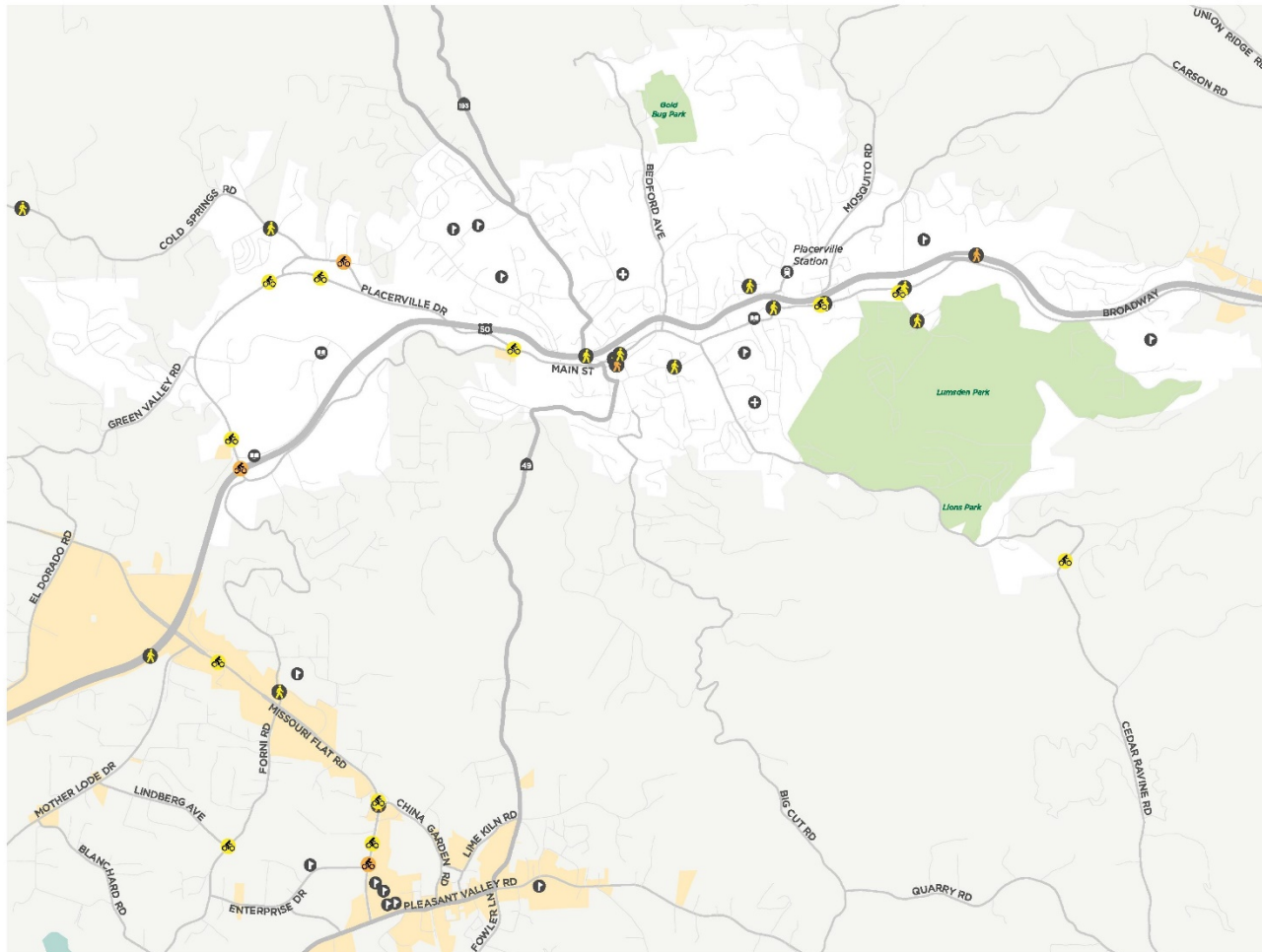
-  Severe Injury
-  Minor Injury

Pedestrian Collisions (2013 - 2017)

-  Severe Injury
-  Minor Injury

Destinations + Boundaries

-  Hospital
-  Library
-  Transit Center
-  Commercial Area
-  Water
-  Park



Opportunities

- Education & Awareness
- Community Engagement
- Creative Engineering Solutions



Creative Solutions

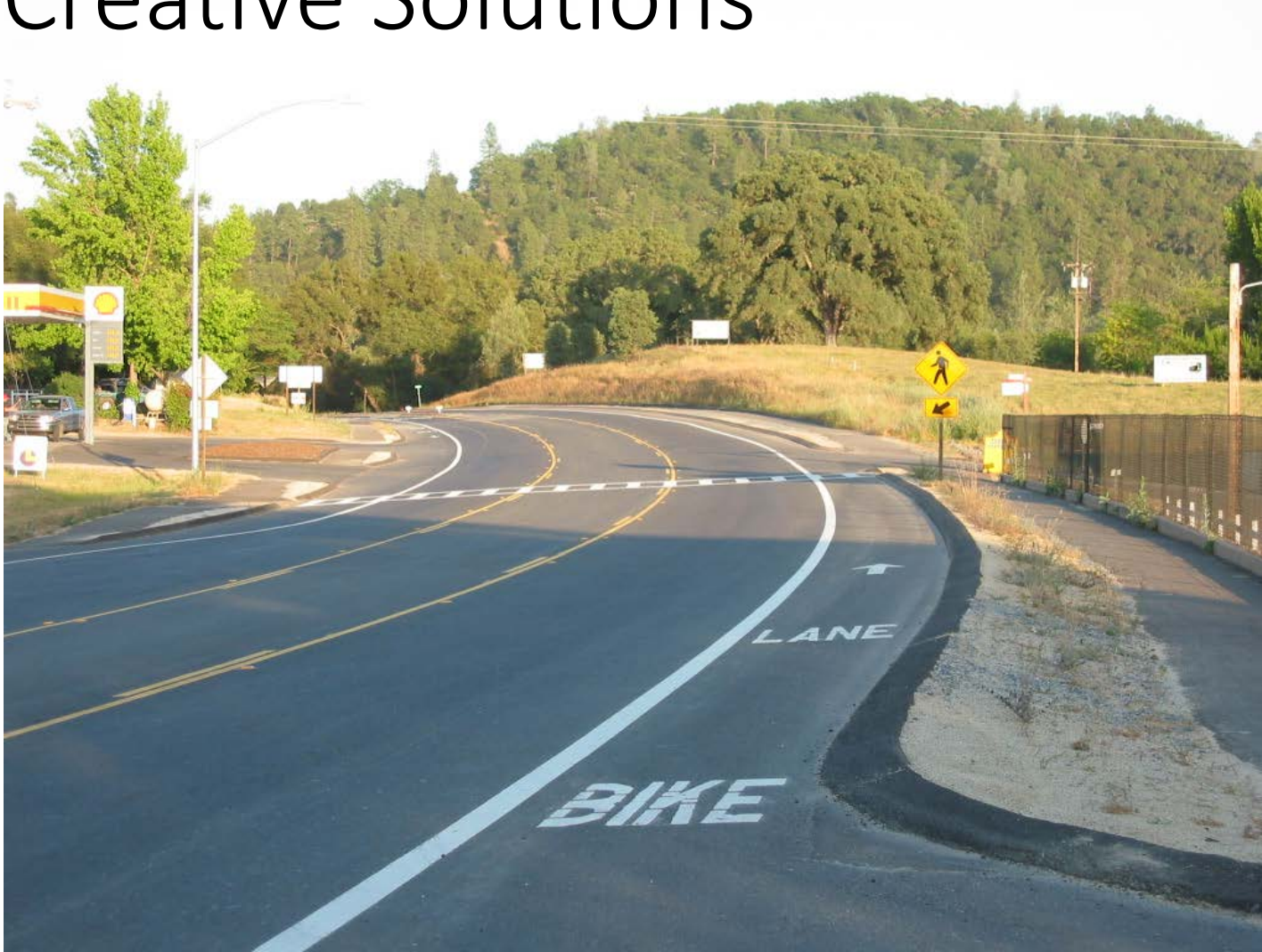


Active Transportation Symposium 2019

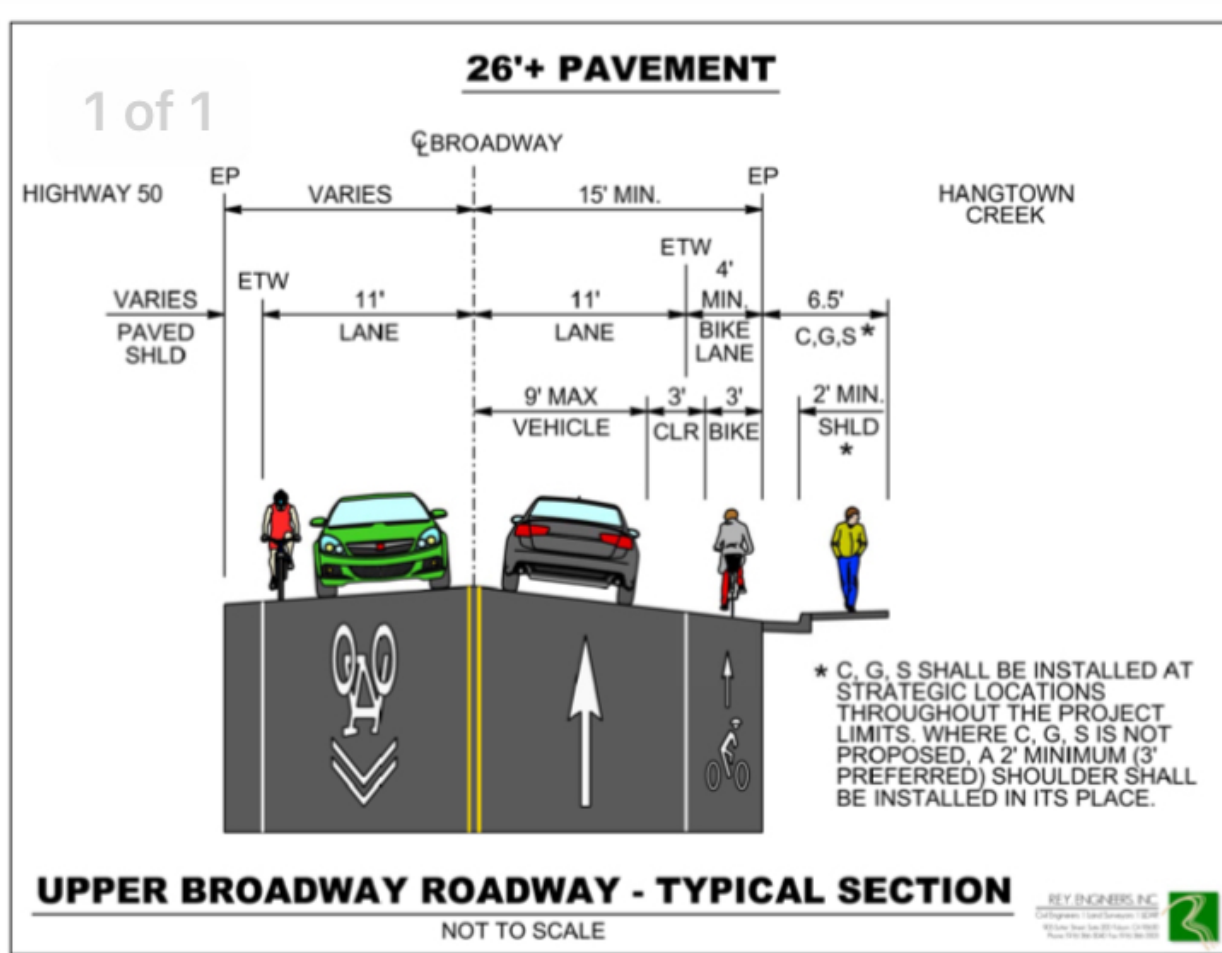
ATRC
Active Transportation
Resource Center



Creative Solutions



Creative Solutions – Uphill Class II - Downhill Sharrows



Creative Solutions – Uphill Class II - Downhill Sharrows



Room for Rural Class I Facilities



Safety Challenges Unique to Rural Areas

- Non-standard designs
- Lack of facilities
- Maintenance needs
- Random collision locations
- Low volume of active transportation users
- Recreation and tourism traffic, recreational cycling or walking
- Vehicular speed, type
- Rugged topography, narrow road widths, short sight distances, scenic viewsheds
- Darkness

Thank You!



Active Transportation Symposium 2019

ATRC
Active Transportation
Resource Center

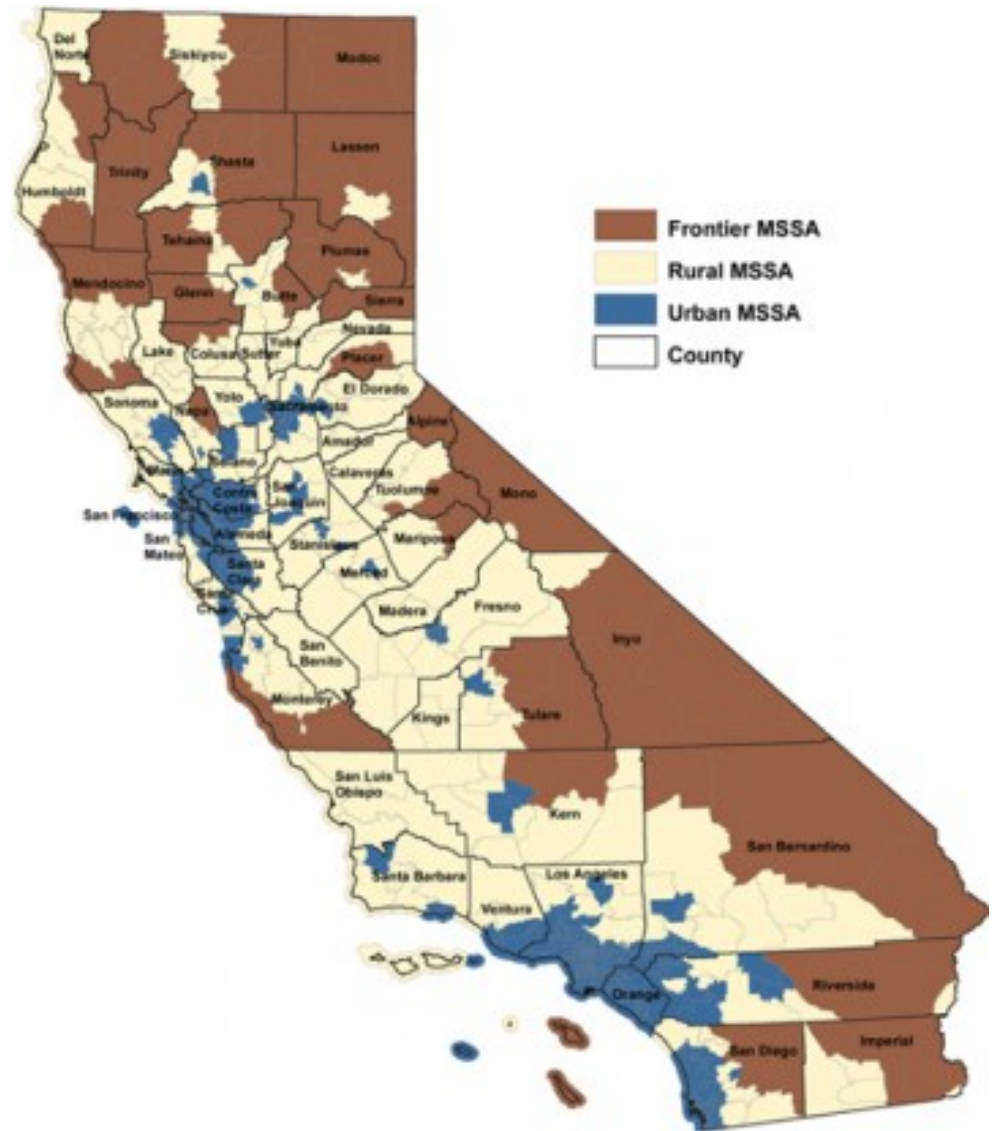




Rural Active Transportation Safety Challenges

Jerry Barton, Senior Transportation Planner
El Dorado County Transportation Commission

Rural California?

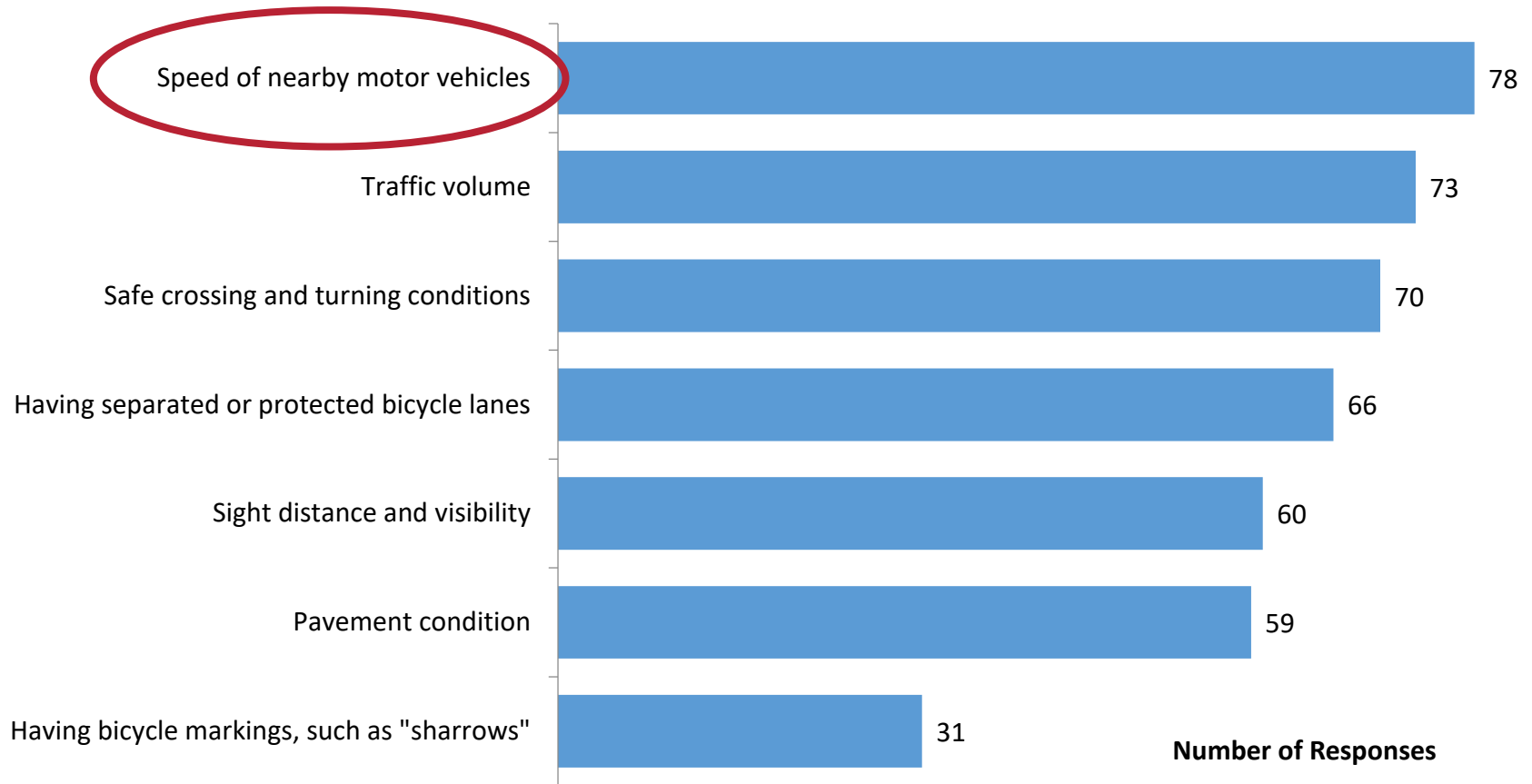


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Bicycle Collisions (2013 - 2017)

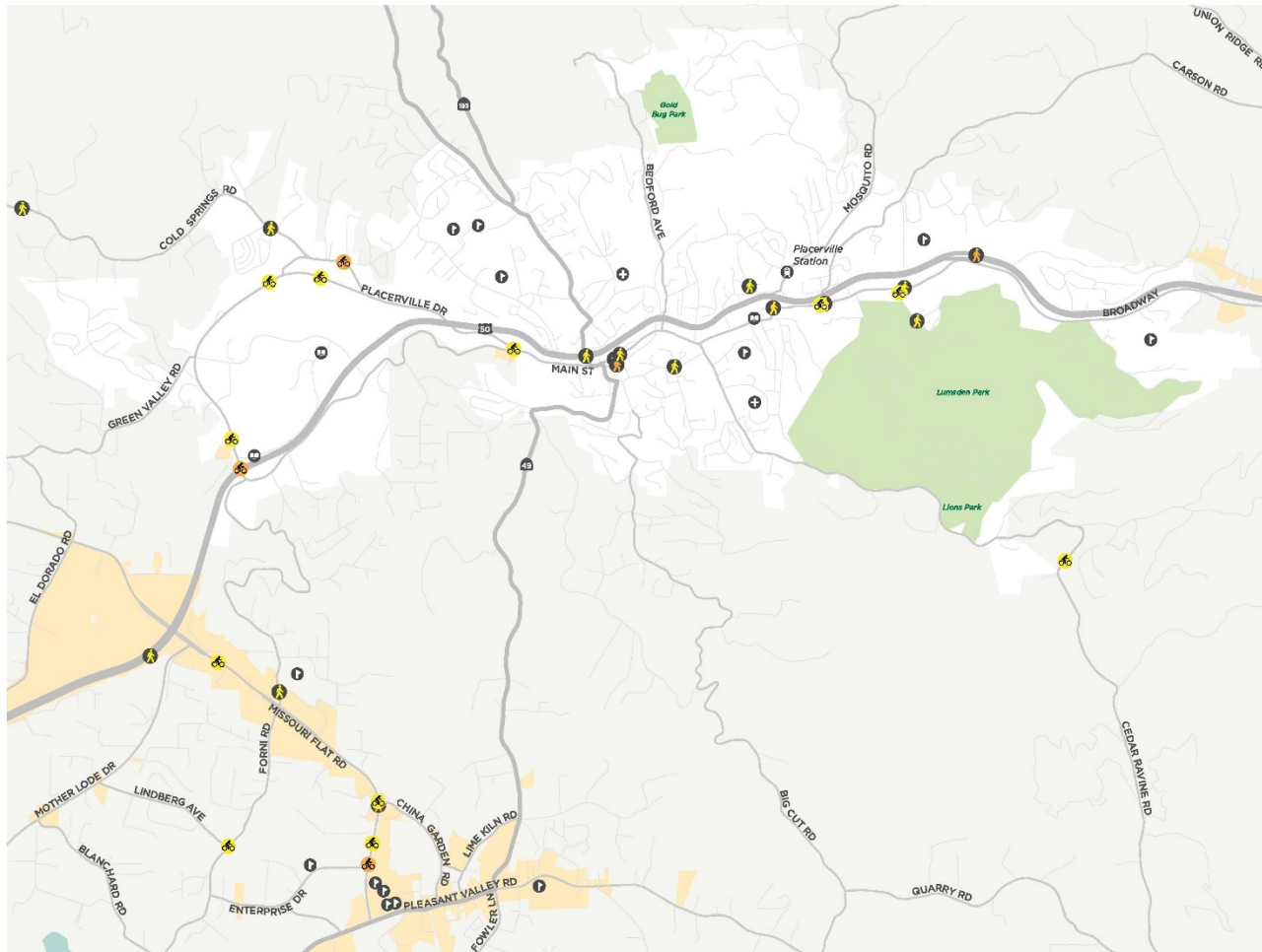
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Opportunities

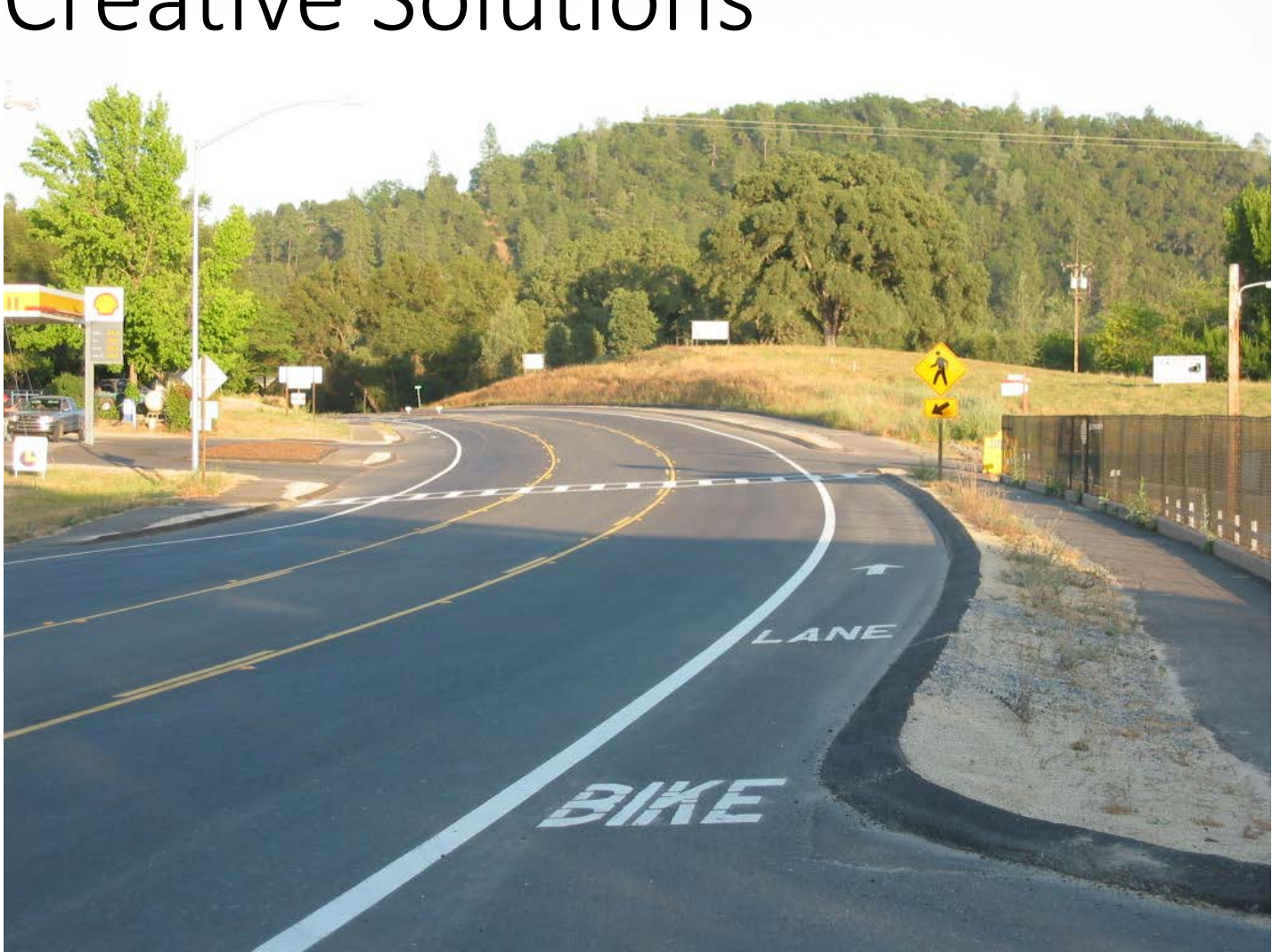
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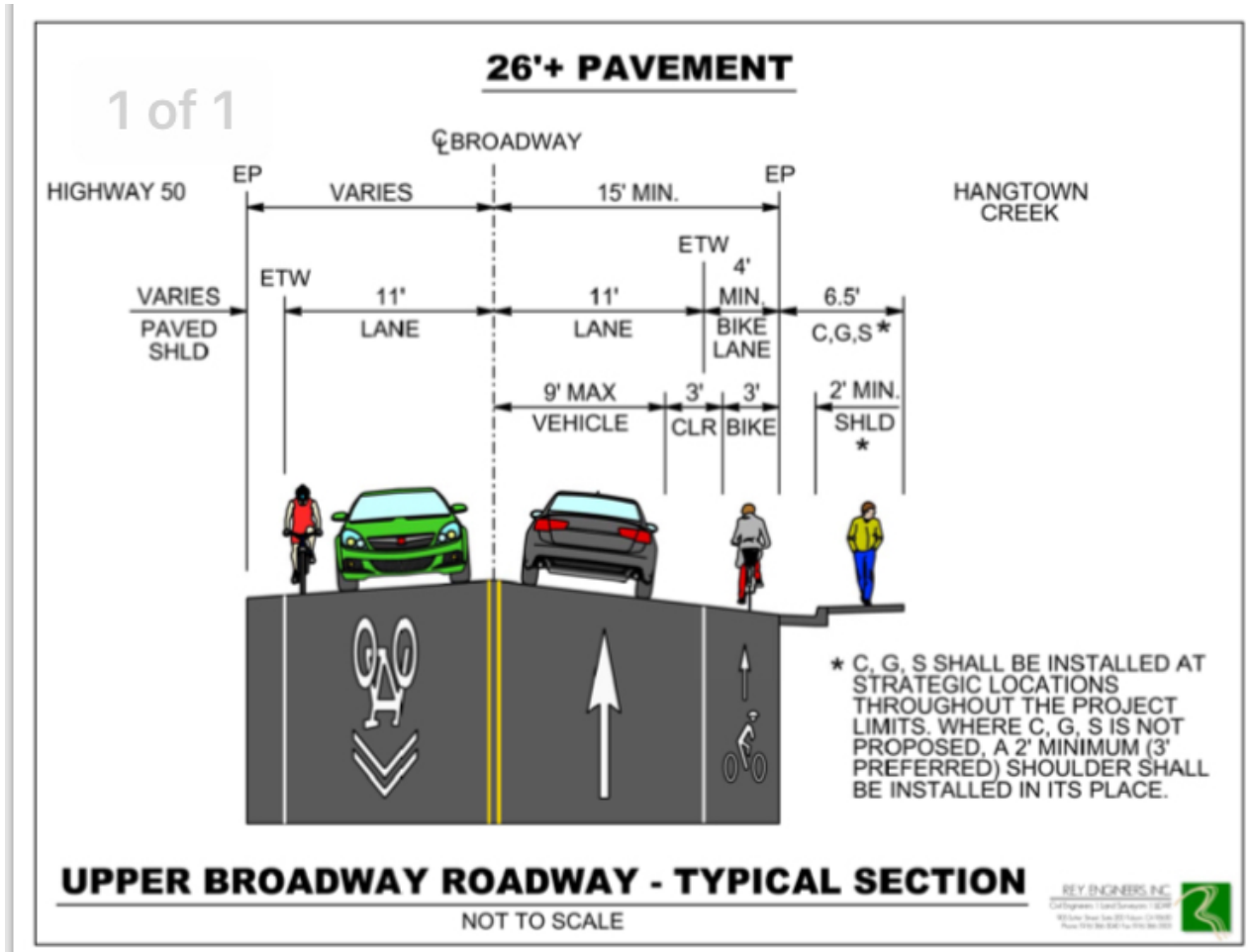
Creative Solutions



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Creative Solutions – Uphill Class II - Downhill Sharrows



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