



CPUC Railroad Bridge Program



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May 18-20, 2015



Safety Policy Statement of the California Public Utilities Commission

- Mission of CPUC Office of Rail is Safety
- Provide Adequate Tools & Training
- Develop Work Plan with Metrics
- “Coordinate with other state and federal agencies to: address gaps in public safety authority within the CPUC’s oversight; identify and detect risks; and, gain more effective compliance through improved coordination for enforcement of regulated utilities.”

California Public Utilities Commission

Safety Policy Statement of the California Public Utilities Commission

Purpose of this Policy
This is the Safety Policy adopted by the Commissioners of the California Public Utilities Commission (CPUC). It defines the role of the Commissioners, binds together the agency in consistently strengthening our safety efforts, and provides a unifying vision and guidance for the organization's multiple and disparate functions.

As described below, as a first step in applying this policy, we also will direct our staff to provide to the CPUC a more detailed Safety Plan within 300 days, laying out specific elements and staff actions on how the entire organization - including the five Commissioners and their staff, our legal and judicial staff, our policy and program staff, as well as our administrative staff - will respond to this policy in all their work.

CPUC Overarching Safety Mission
The safety mission and goal of the CPUC is to ensure to the State of California that all of us will work every day to ensure that the regulated utilities we depend on for critical services are safe and treated as they can possibly be.¹ The CPUC not only will ensure compliance with safety laws and regulations, but also challenge itself and the utilities to excellence.

Ultimately we are striving to achieve a goal of zero accidents and injuries across all the utilities and businesses we regulate, and within our own workplaces.²


We have a broad obligation in this mission, and we must assure that safety will always be an important component in all that we do and everywhere we have authority and responsibility. Our efforts must improve protection for the public, for utility workers and CPUC employees in their work, for the environment, and for utility infrastructure and systems.

To realize this Vision, the CPUC commits to these guiding principles:

- Continually assess and reduce the safety risk posed by the companies we regulate
- Hold companies (and their external contractor(s) accountable for safety of their facilities and practices
- Be accountable for the oversight of safety in the industries we regulate
- Provide clear guidance on expectations for safety management and outcomes
- Provide transparent and effective procedures for enforcement of those expectations
- Promote reliable access to utility services that support health and safety
- Promote a culture of safety vigilance by CPUC staff, and in the industries we regulate
- Learn from experience and continuously improve safety oversight and outcomes

¹ The CPUC's overall mission is to protect consumers and ensure the provision of safe, reliable utility service and infrastructure at reasonable rates, with a commitment to environmental enhancement and a healthy economy.
² The concept of zero accidents and injuries is based on the Vision Zero program established in Sweden in the 1990s, it began as an agreement to roadway safety, and can be summarized as a single sentence: "No loss of life is acceptable." Since 2007, England and the Netherlands have adopted this policy goal, and in 2014, the cities of New York, Boston, and San Francisco also adopted it as their road safety policy expectation. Similarly, the USDOT Pipeline and Hazardous Material Safety Administration (PHMSA), has issued a goal to have zero pipeline fatalities transportation.

July 18, 2014





CPUC Railroad Safety Oversight

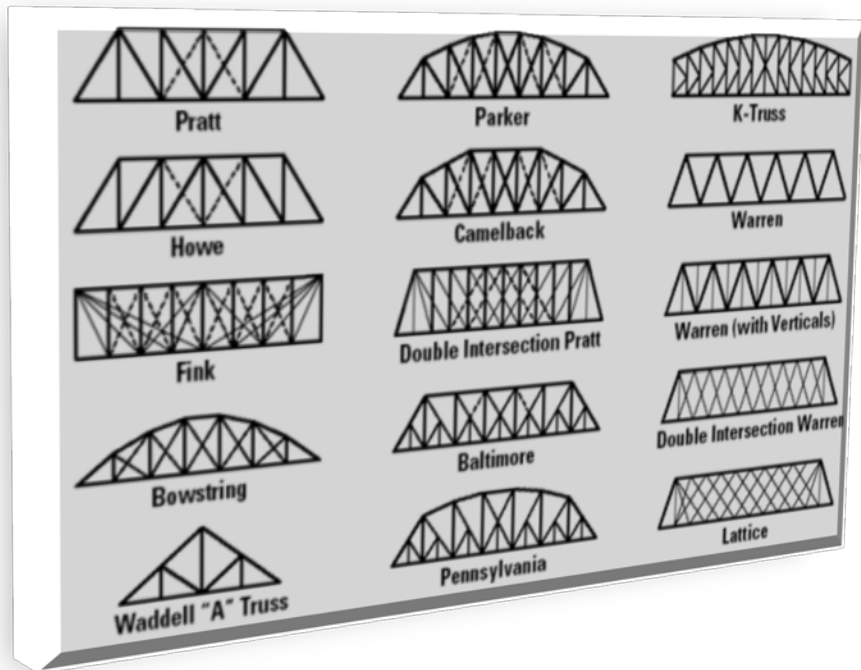
CPUC Safety Focus Areas:

1. Track
2. Operating Practices
3. Motive Power & Equipment
4. Signal and Train Control
5. Hazardous Materials
6. *Railroad Bridges (new safety focus area)*



Safety Status of California Railroad Bridges

Inventory Baseline Assessment Necessary



CPUC's Wish List Railroad Bridge Questions:

How Many Bridges?

Locations of Bridges?

Types of Bridges?

Bridge Condition/Age?

Bridge Maintenance?

Load Capacity?

Personnel Qualifications?



Bridge Program Problem Statement

Safety conditions of railroad bridges are often unknown to CPUC, hindering risk management and fulfillment of CPUC's mission to ensure the provision of safe and reliable railroad service over railroad bridge structures in California.



Should a failure on or around a bridge occur, the public, the environment, and the CA economy are placed at risk.



Federal Railroad Bridge Regulations

49 CFR 237 “Bridge Safety Standards” Requires:

- Bridge Management Program
- Bridge Inventory
- Bridge Load Capacity (*Due on or before September 2017*)
- Annual Inspections
- Qualified and Designated Personnel

Engineer

Supervisor

Inspector



PART 237—BRIDGE SAFETY STANDARDS	
Subpart A—General	
Sec.	
237.1	Application.
237.3	Responsibility for compliance.
237.5	Definitions.
237.7	Penalties.
237.9	Waivers.
Subpart B—Railroad Bridge Safety Assurance	
237.31	Adoption of bridge management programs.
237.33	Content of bridge management programs.
Subpart C—Qualifications and Designations of Responsible Persons	
237.51	Railroad bridge engineers.
237.53	Railroad bridge inspectors.
237.55	Railroad bridge supervisors.
237.57	Designation of individuals.





Railroad Bridge Count vs. Bridge Inspectors

FRA

77,000 Railroad Bridges



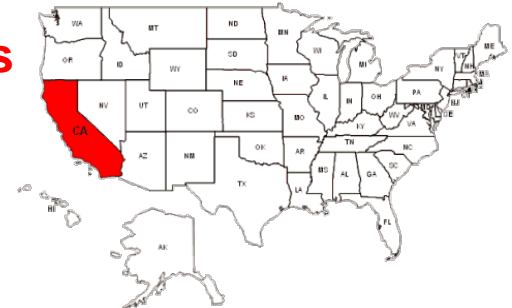
**5 Inspectors
Nationally**

**15,400
Bridges per
Inspector**

CPUC

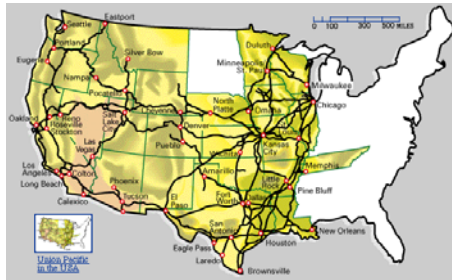
About 5,400 Railroad Bridges in CA

2 Inspectors



2,700 Bridges per inspector

**Union Pacific
19,339 Railroad Bridges
Nationally**



**56 Inspectors
Nationally**

**345 Bridges per
Inspector**

**Caltrans— as comparison (not “apples and apples”)
~26,000 (CA highway bridges)**

**100
Inspectors**



**260 Bridges per
Inspector**



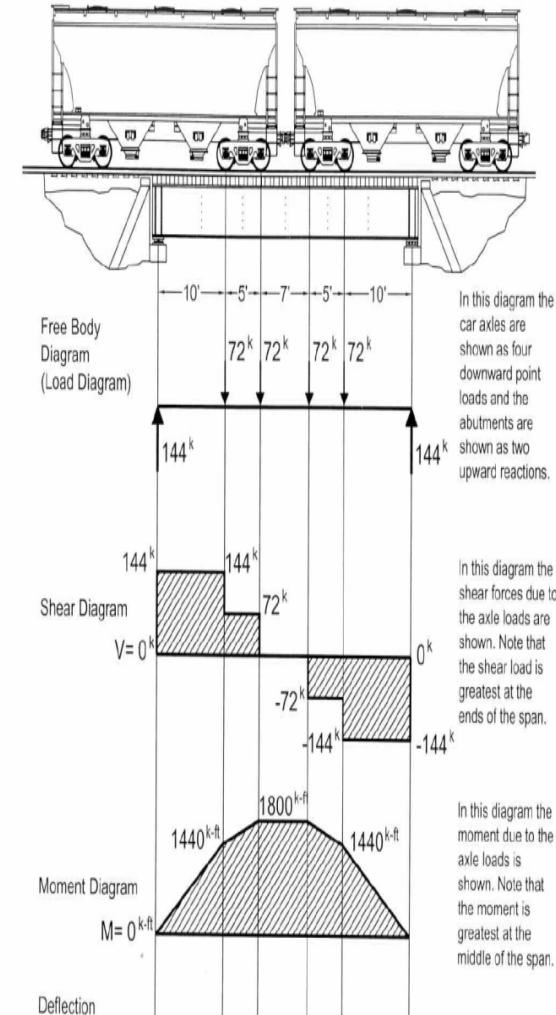
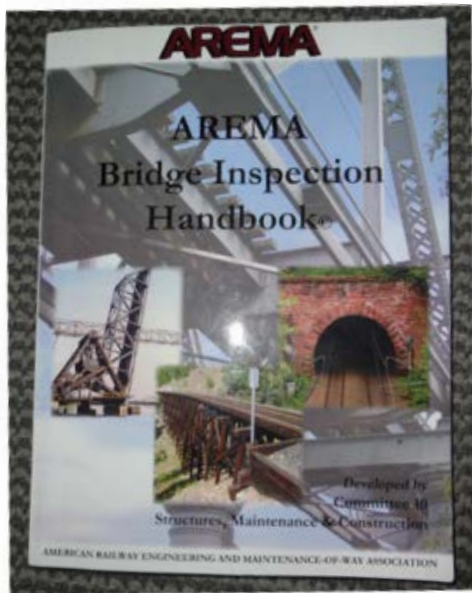
AREMA TRAINING

American Railway Engineering and Maintenance of Way Association

Inspection Training Seminar

Sacramento, CA

- Defects - Timber, Steel, and Concrete
- Remedial Actions
- Scour



**Ongoing Railroad Bridge Training
Is Essential to a Successful Railroad Bridge Program**



Bridge Preservation Conference Orlando, Florida, April 2014





Railroad Bridge Crossing Over Roadway —Railroad Guard Rails—

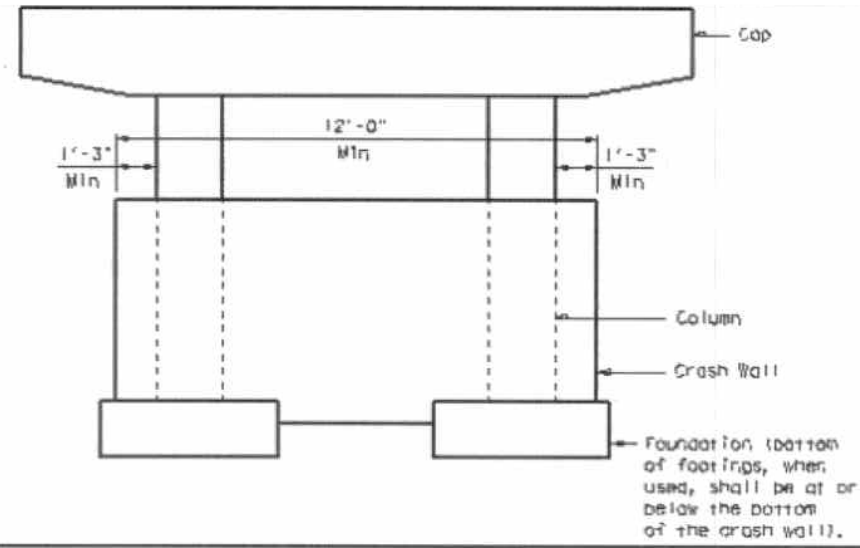




Highway Bridge Protection- Crash Walls



Railroad Crash Walls A Method To Protect Highway Bridge Structures



**May 2013, Rockview, MO
Train Damages Hwy Bridge**



Railroad Bridge Risk Assessment

$$\text{Risk} = \text{Probability} \times \text{Consequence}$$
$$(\mathbf{R} = \mathbf{P} \times \mathbf{C})$$



Philadelphia, PA. January 20, 2014
Crude oil tank car derailment on a railroad bridge.



Casselton, ND. December 30, 2014
Train carrying crude oil tank cars derails.
Derailment results in explosion.

Risks exist when transporting crude oil by train over bridges.



Track Train Dynamics on Curves Near Bridges

OVERBALANCE

Center of Gravity

Centrifugal Force

Resultant Gravity

Superelevation

EQUILIBRIUM

Center of Gravity

Centrifugal Force

Resultant Gravity

Superelevation

UNDERBALANCE

Center of Gravity

Centrifugal Force

Resultant Gravity

Superelevation

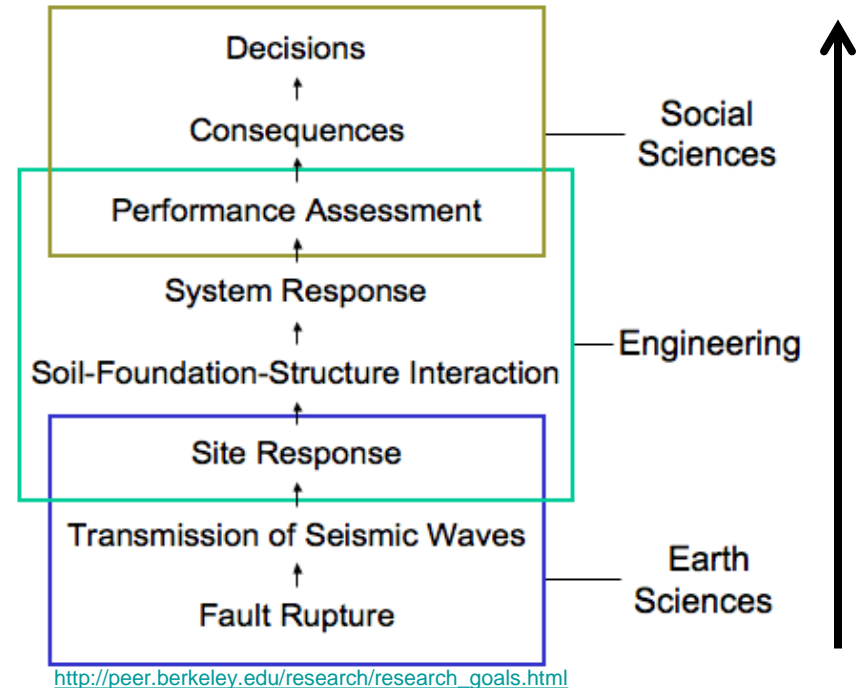
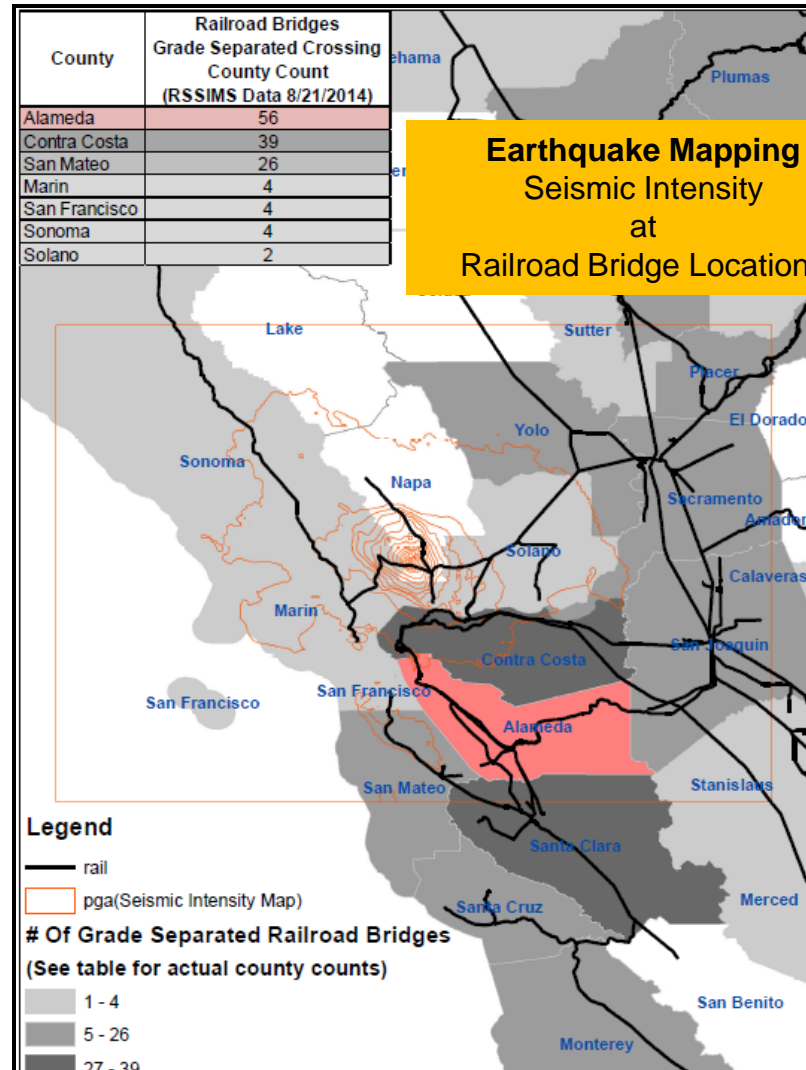
$$V_{\max} = \sqrt{\frac{E_a + 3}{0.0007D}}$$

← Amount of Underbalance

V_{\max} = Maximum allowable operating speed (mph).
 E_a = Average elevation of the outside rail (inches).
 D = Degree of curvature (degrees).

Earthquake Early Warning System International Conference

U.C. Berkeley, CA. Sept. 2014



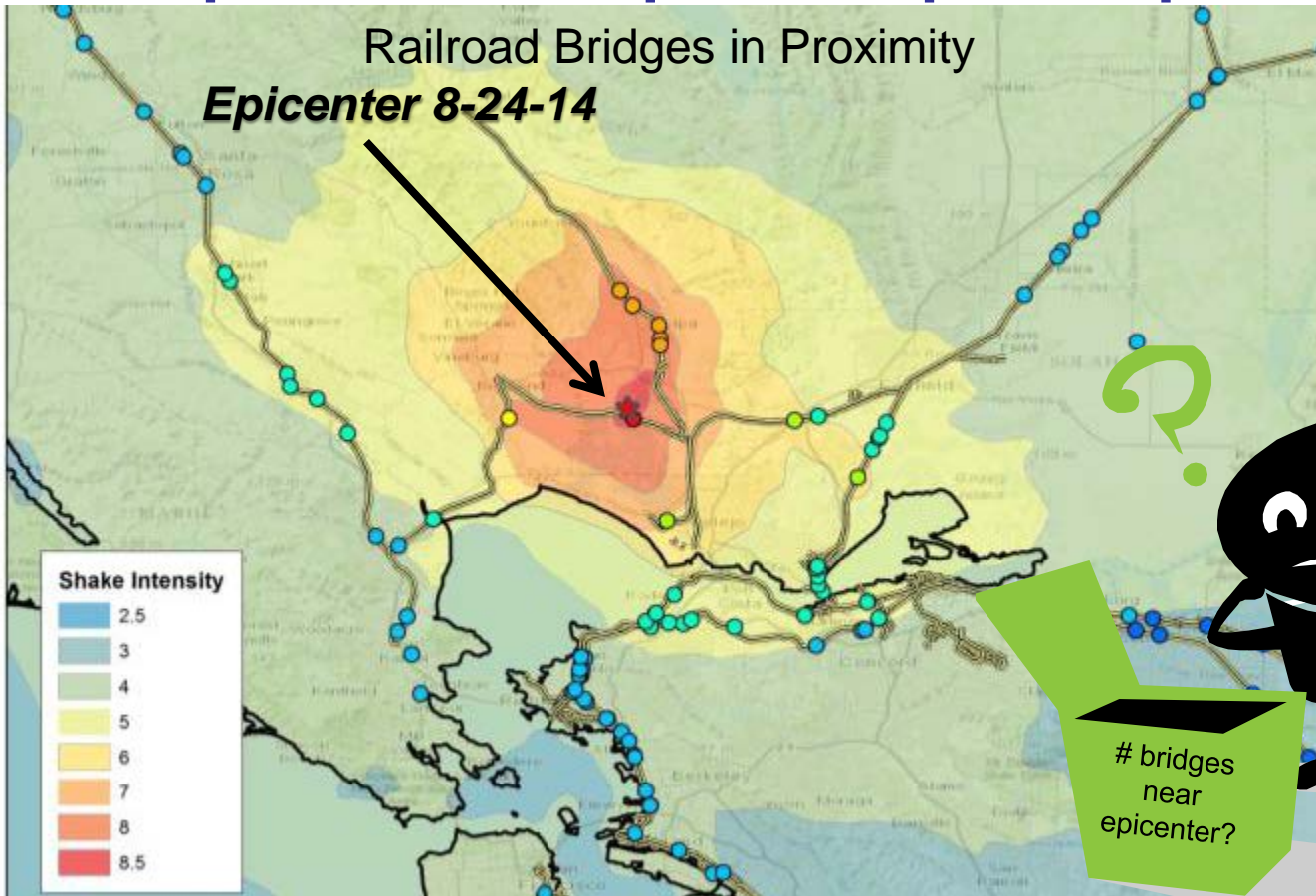
- Advance Earthquake Notification Warning Technology Exists*
- Safety Provisions May Ensure Railroad Bridge Safety Post, During, and Prior to Natural Disasters [Earthquakes/Floods]
- Bay Area Rapid Transit (BART) had eight seconds warning prior to ground movement propagating to BART rail system from epicenter

***Napa, CA earthquake, Aug. 24, 2014, BART Early Warning Advance of 8 seconds**



San Diego GIS Conference

Napa, CA. Earthquake Map Example

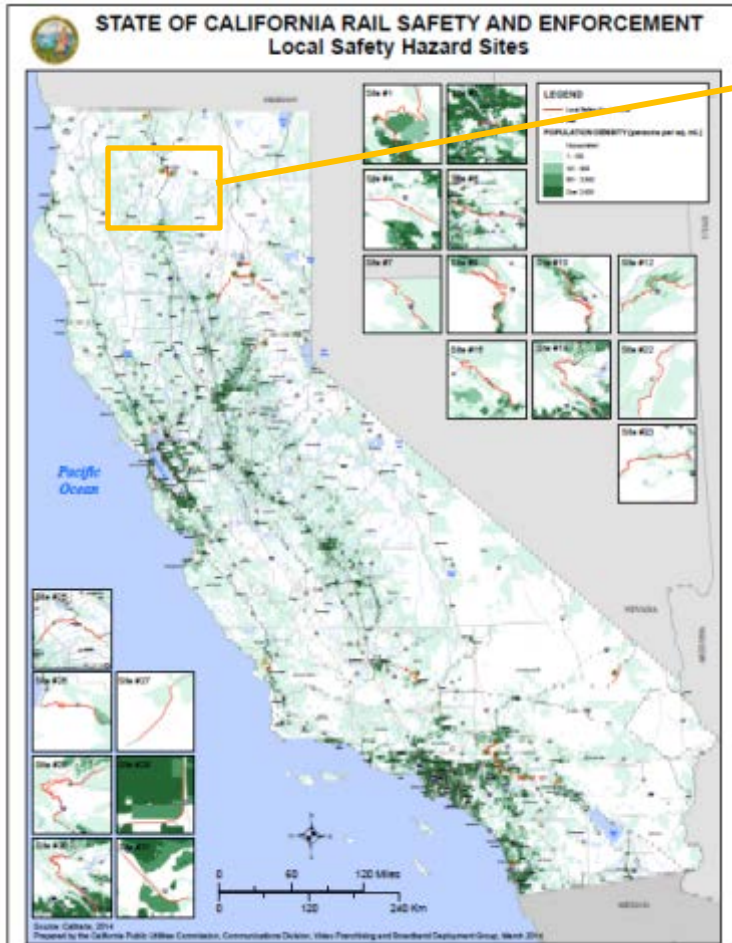


The Power of Mapping

“A geographic information system (GIS) lets us visualize, question, analyze, and interpret data to understand relationships, patterns, and trends.”



California Railroad Routes Bridges At Local Safety Hazard Sites





Bridge Segment of Cantara Loop 14° Curve

Dunsmuir, Siskiyou County, CA.

Local Safety Hazard Site #9



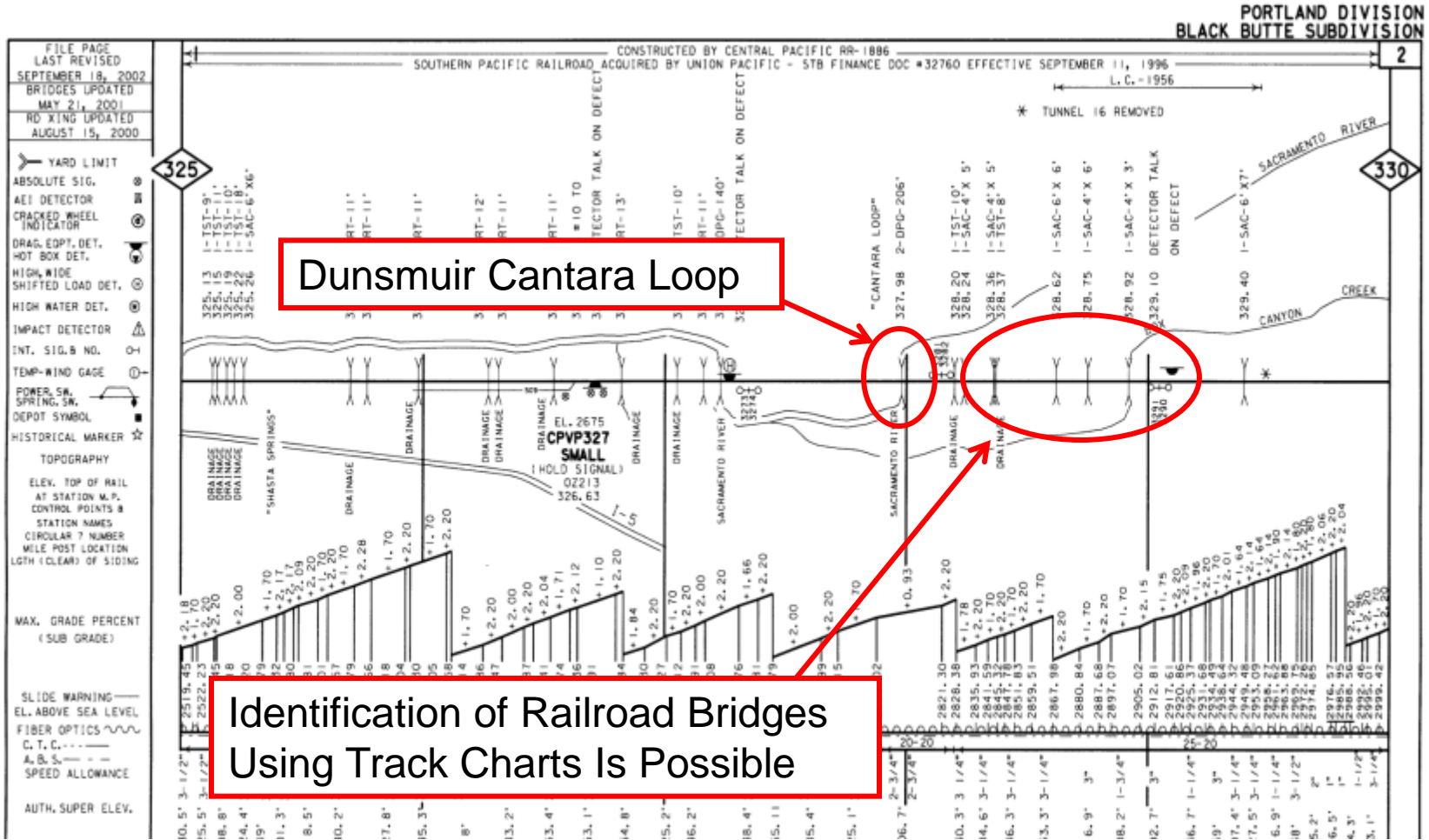
**July 1991 Southern Pacific derailment.
Tank cars shown derailed into Sacramento River.**



**Bridge gaurd rail structure added to prevent
rail cars from falling into the river.**



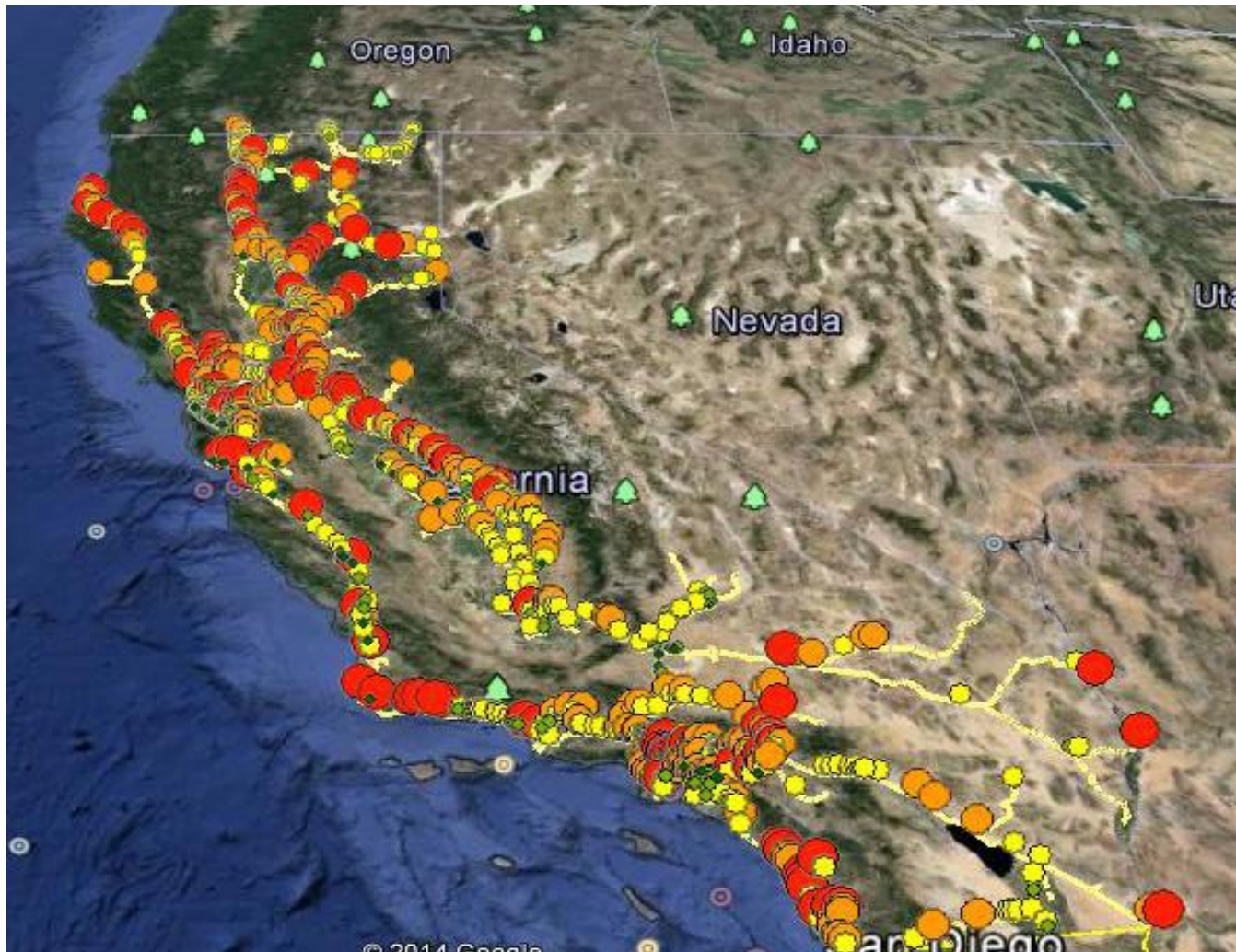
Railroad Track Chart— Local Safety Hazard Site #9



Track Charts Will Be Used To Add To Our Bridge Inventory



CA Railroad Bridge Inventory (~1,920 Railroad Bridges) Found by Research and GIS Mapping of Rail/Water Body Intersections





Prioritizing Top 200 Bridges For Observations

Weighted Factors

Short Line Railroads	0.300
Population Density	0.225
Haz-Mat Routes	0.175
Passenger Route	0.120
Size of Bridge	0.120
Seismic Fault Proximity	<u>0.060</u>
Total	1.000

The First 40 Observations of the 200 Prioritized Bridges Will Be Analyzed



Example of Bridge #0562



ID	RR	Subdiv.	MP	LAT	LONG	COUNTY	SIZE	SEIS-MIC	PASS-ENGER	HAZ-MAT	POP	SLRR	RISK	RANK	Feature Spanned
CRB0562	UP	Martinez	34.90	38.057	-122.128	Solano	10	8	10	10	5	10	8.72	1	Bayshore Rd
CRB1202	UP	Mojave	314.60	35.370	-118.962	Kern	10	5	0	10	9	10	8.31	2	Eastside Canal
CRB0375	UP	Martinez	45.10	38.193	-122.068	Solano	10	7	10	10	1	10	7.73	3	Wells Slough



Bridge Observation Form

Bridge Observation Form	14	Feature Spanned Description & Notes	29	RR's Last Inspection Date	
	15	Feature Spanned Condition	30	Diving Inspection Required	
	16	Vertical Clearance	31	Date of Last Diving Inspection	
Item # ADMINISTRATIVE DATA		GENERAL DATA	32	Deck Notes	
1	BIN	17	Year Built	33	Deck Condition
2	RR Bridge #	18	Year Rehabilitated	34	Superstructure Notes
3	RR Subdivision	19	Number of Tracks on Bridge	35	Superstructure Condition
4	RR Milepost	20	Type of Rail Service	36	Substructure Notes
5	County	21	Total Length of Bridge	37	Substructure Condition
6	Latitude	22	Number of Spans	38	Abutment Notes
7	Longitude	23	Bridge Type	39	Abutment Condition
8	Operating Railroads		LOAD RATING DATA	40	Approach Notes
9	Bridge Owner	24	Normal Rating	41	Approach Condition
10	Maintenance Responsibility	25	Maximum Rating	42	RMSR Issued
11	Inspection Responsibility	26	Design Load	43	RMSR Notes
12	Feature Carried Notes	27	Date of Rating Calculations	44	FRA 96 Report Issued
13	Other Feature Carried Condition	28	Line Capacity	45	FRA 96 Report Notes



Risk Management Status Report

Railroad Operations and Safety Branch (ROSB)

ROSB Risk Management Status Report (RMSR) Form

Inspector Name:

Railroad/Facility:

Assessed Risk:

Investigation Required (Yes or No):

Risk Assessment Description		Potential Resources Required (Time/Other)	
Risk Assessment Follow-up		Risk Management (Resolve)	
Prepared By:			
Risk Status			
Opened	Closed	Staff Involved	Hours/other resources



Crude Oil Reconnaissance Team (CORT) Bakersfield, CA. Field Trips 2014



CORT Activities Include Safety of Railroad Bridges on Crude Routes



Oil by Rail Safety in California

Preliminary Findings and Recommendations



A crude oil train travels across the Clear Creek Trestle in Plumas County, California and through the Feather River Canyon on June 5, 2014.

State of California
INTERAGENCY RAIL SAFETY WORKING GROUP

June 10, 2014



Survey Monkey

- How many state-owned railroad bridges does your state have?
- *How many multi-level joint highway/railroad bridges does your state have?*
- If your state has multi-level joint highway/railroad bridges, do you have difficulty getting cooperation from railroads when you need access to their right-of-way to do inspections?
- *Do you feel that regularly scheduled painting of steel bridges is a good idea?*
- Do you have concerns about the structural integrity of railroad bridges that overpass your highways?
- *Does your state have any crash walls to protect the supports for highway bridges that are over rail tracks?*



FRA GIS Map

<http://fragis.fra.dot.gov/Apps/GISFRASafety/>

Cal OES GIS Map

<http://california.maps.arcgis.com/apps/OnePane/basicviewer/index.html?appid=928033ed043148598f7e511a95072b89>

November, 2012
Mantua Creek
Paulsboro, NJ



October, 2006
Beaver River Bridge
New Brighton, PA

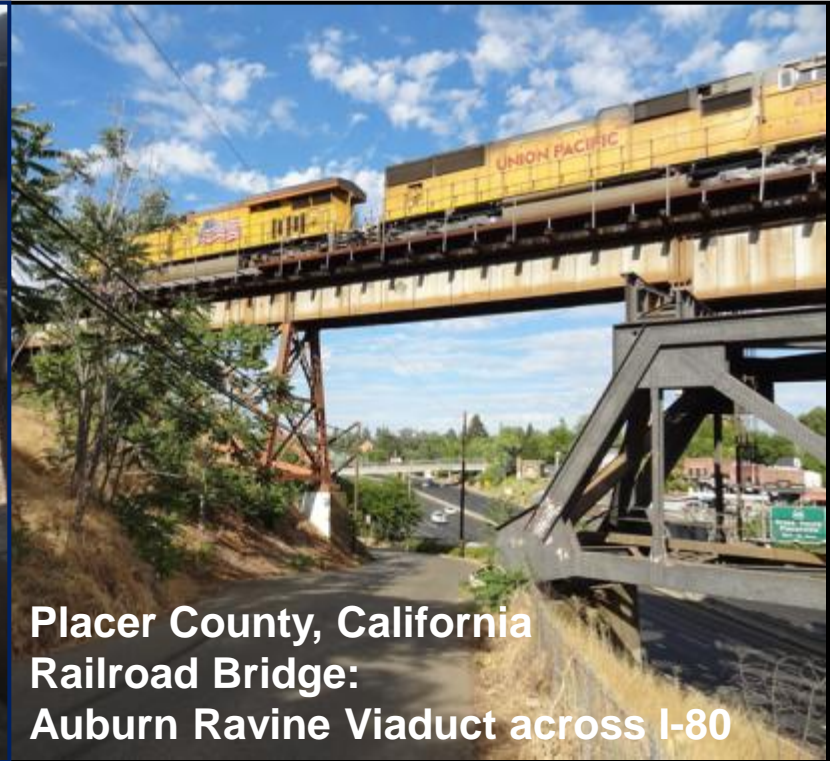




Questions?



Sanger, Fresno County, California



Placer County, California
Railroad Bridge:
Auburn Ravine Viaduct across I-80

For Media Inquiries: Terrie Prosper 415 703 2160



Thank you!
**For additional information please contact me or visit our
webpage:**

www.cpuc.ca.gov

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