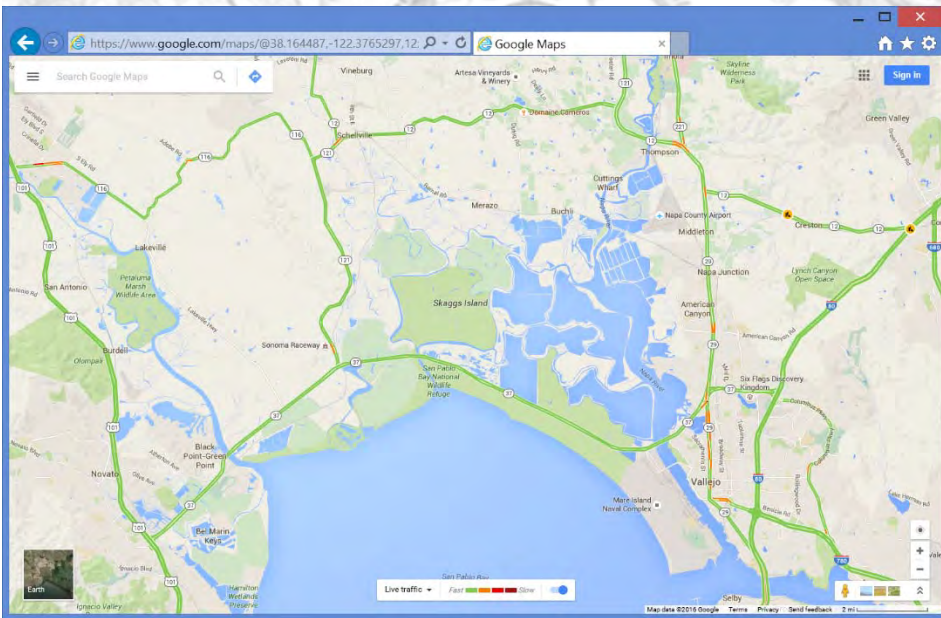
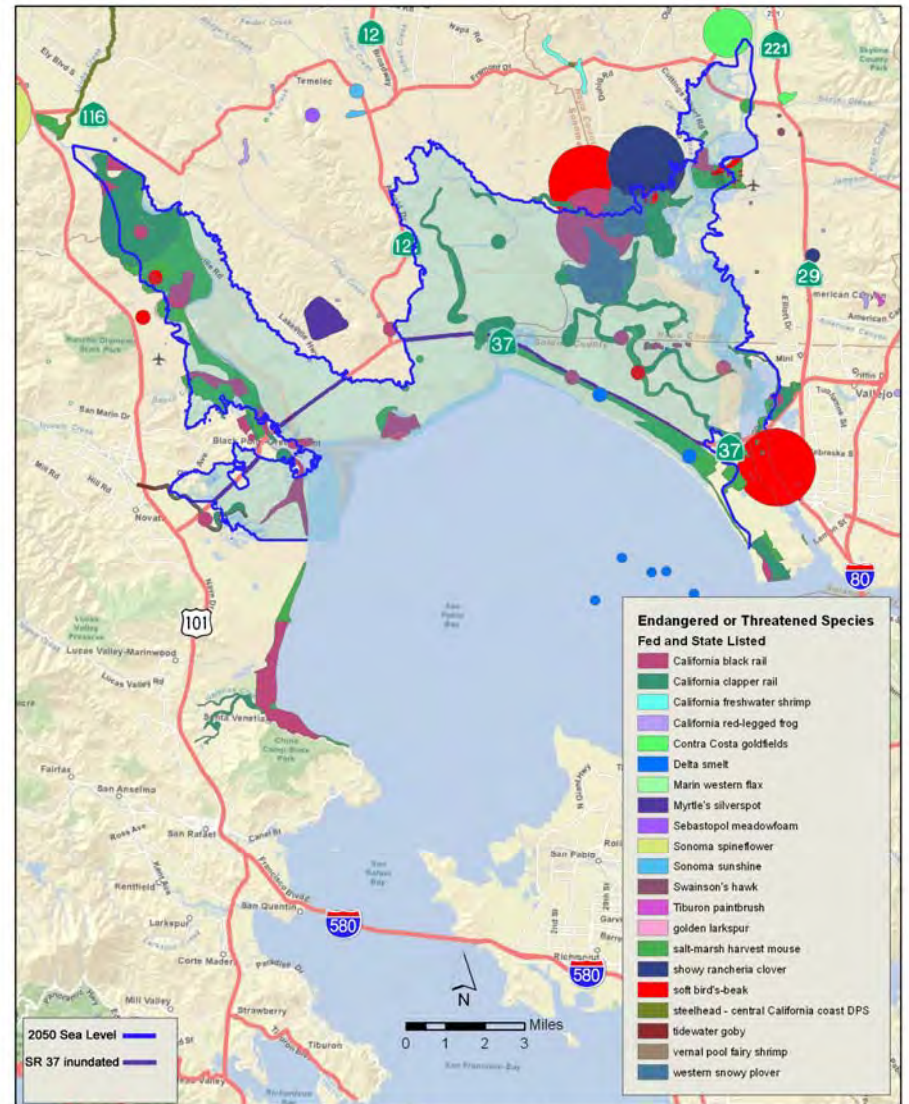


State Route 37 Integrated Traffic, Infrastructure and Sea Level Rise Analysis



Fraser Shilling, Co-Director
 Road Ecology Center
 University of California, Davis



Listed Species Map

Project Overview

Project Overview

Technical tasks complete

Reports finalized and online (<http://hwy37.ucdavis.edu>)

Project presented/published with Transportation Research Board

Stakeholder process temporarily paused

Project Overview

Project Includes:

Predicting when shoreline ecosystems and infrastructure will be affected by SLR and storms

Assessing vulnerability of highway segments

Proposes adaptive measures that could be taken (including potential cost)

Evaluates benefits and impacts of different scenarios

Stakeholder process to provide expert input and political investment in outcomes

Project Overview

Project Does Not Include:

Dealing with elevation data accuracy and bedrock depth

Consideration of bridges or tunnels across Bay proper

Moving of 37 to another alignment

Impacts of private-party toll-road option

Comprehensive economic or fiscal benefits/cost analysis

Comprehensive environmental impacts assessment

Funding the project as a public toll road or using solar or tide power generation on bridge structure

Why the Urgency?

- What we think we know
- What we don't know, but has significant consequences



Why the Urgency?

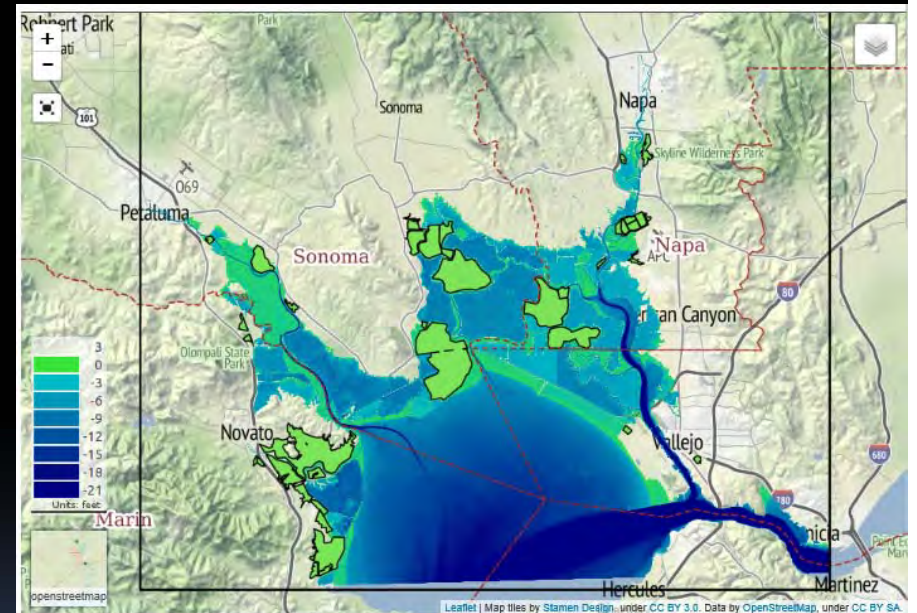
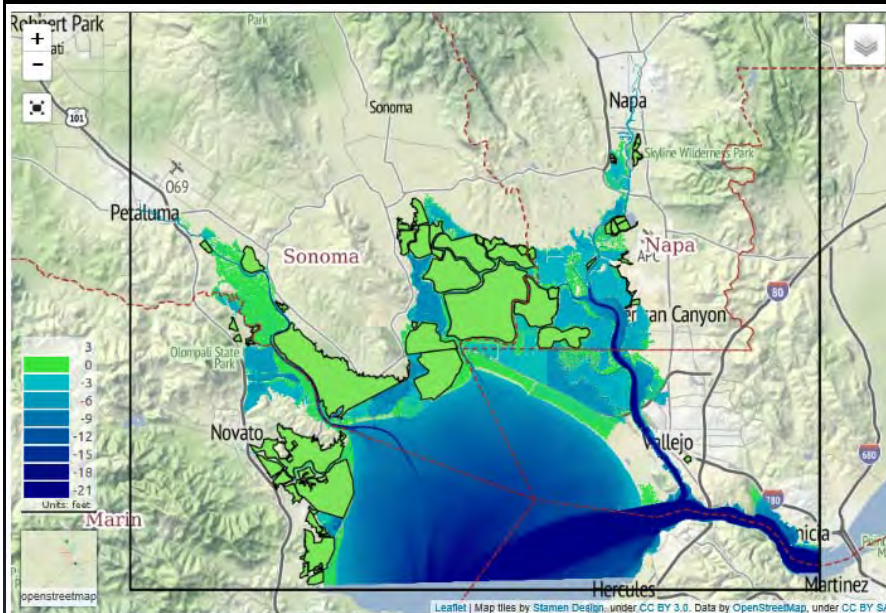
- What we think we know
- 

SLR Inundation

Website: <http://hwy37.ucdavis.edu/maps>

12"

24"

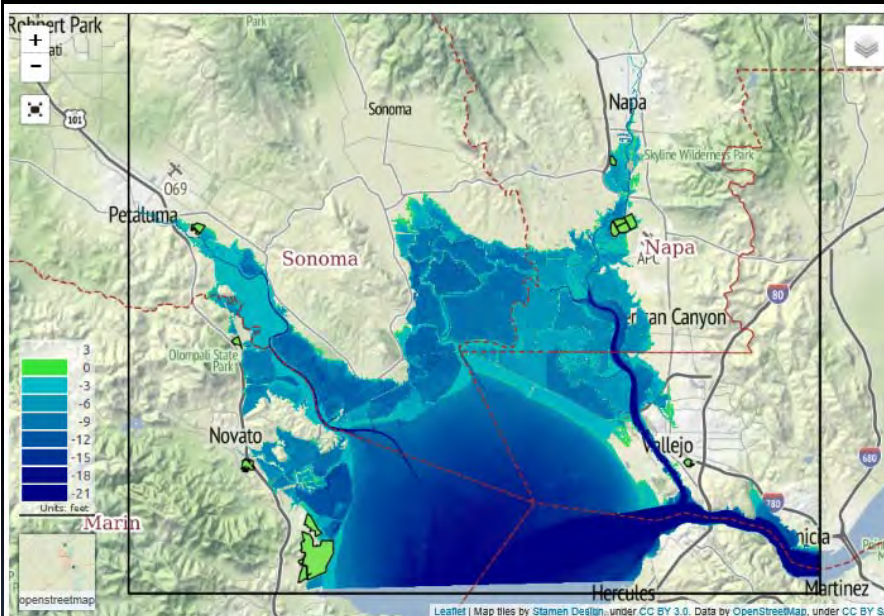


Storm Inundation

Website: <http://hwy37.ucdavis.edu/maps>

0" SLR + 100 yr storm

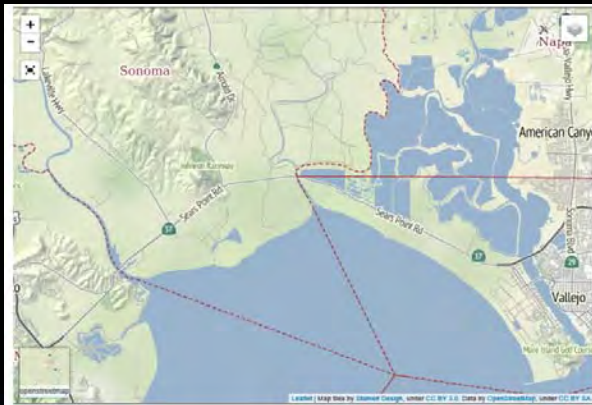
66" (SLR)



SLR: Overtopping

Website: <http://hwy37.ucdavis.edu/maps>

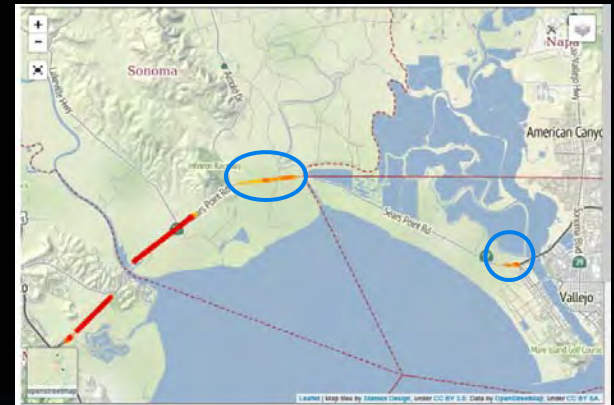
12"



24"



36"



What we don't know, but has significant consequences

Timing: Actual berm, levee and highway elevations

LiDAR from 2010

Possible reflectance from vegetation on berms/levees

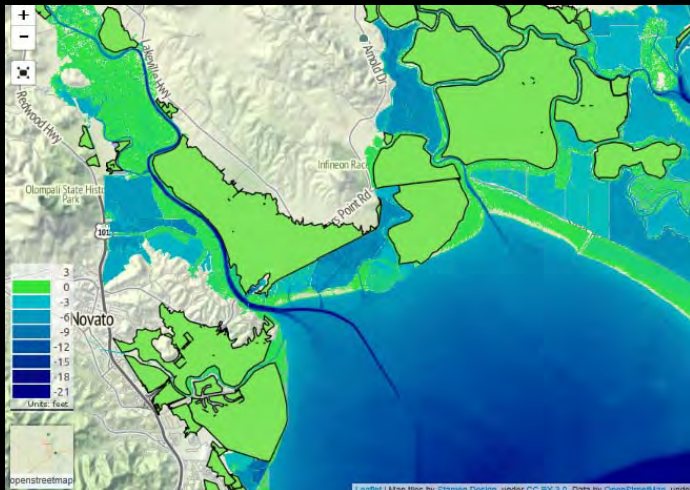
Timing & \$: Highway continuously sinking (Caltrans Maintenance)

\$: Depth to bedrock/pier foundation
etc.....

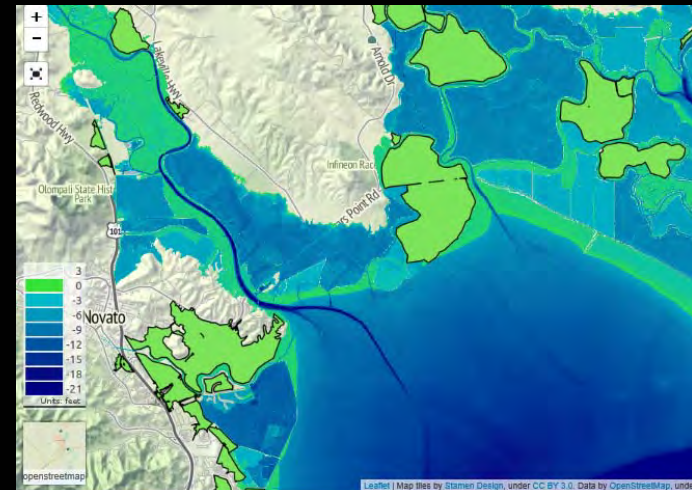
What we don't know, but has significant consequences

<http://hwy37.ucdavis.edu/maps>

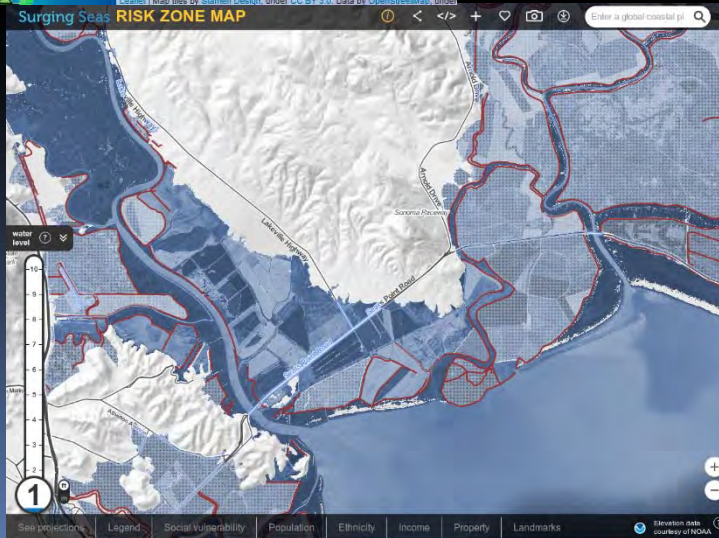
12"



24"



12"



<http://ss2.climatecentral.org>

When is 12" vs. 24" SLR

- Highest: 12" by 2030; 24" by 2050 (NRC)
- Sea levels are >8" higher than expected this winter because of El Nino
- With 4" of SLR + El Nino = 12" (next El Nino)
- One large storm + El Nino could flood Marina to Lakeville (this or next El Nino)

ToLay Lagoon at Xmas King Tide



6.7' event
12/24/2015

Bushnell

12-24-2015 11:55:08

ToLay Lagoon earlier that year



6.69' event
1/21/2015

ToLay Lagoon at Xmas King Tide

6.7' event
(12/24/2015)
Difference
between
measured and
predicted = 10"




6.69' event
(1/21/2015)
Difference
between
measured and
predicted = 4"



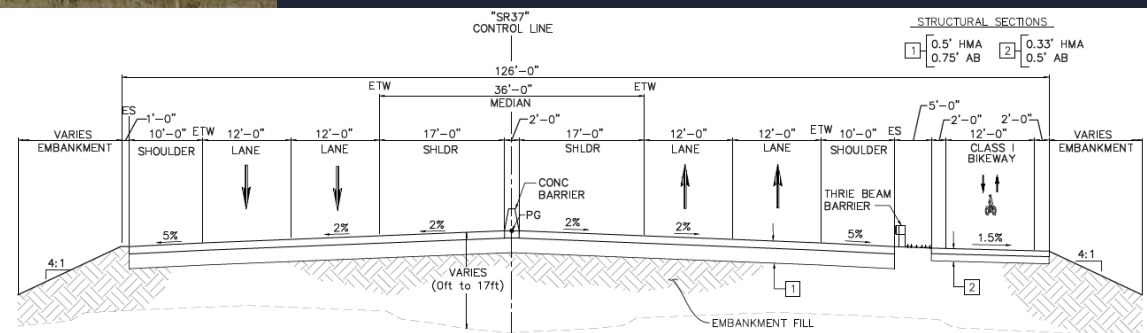


How do we adapt?

- Vertically
 - Horizontally
- 

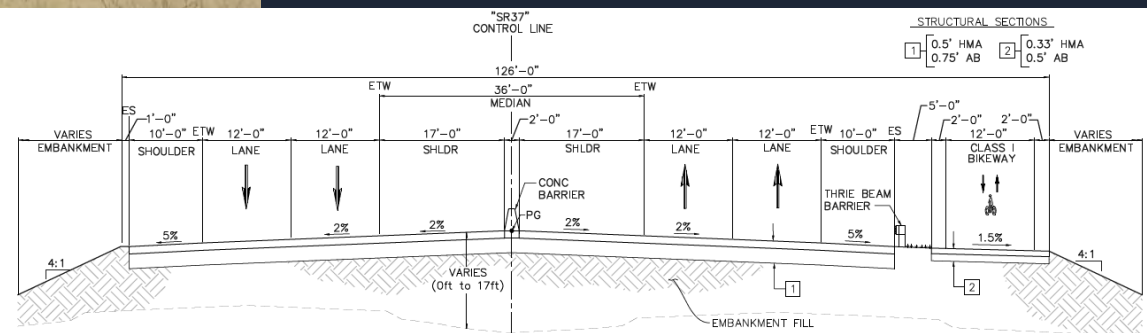
Adaptive Structural Scenarios

- Berm/Embankment
- Causeway (over land)
- Mixture of berm/causeway (e.g., berm segment C, causeway segment B)

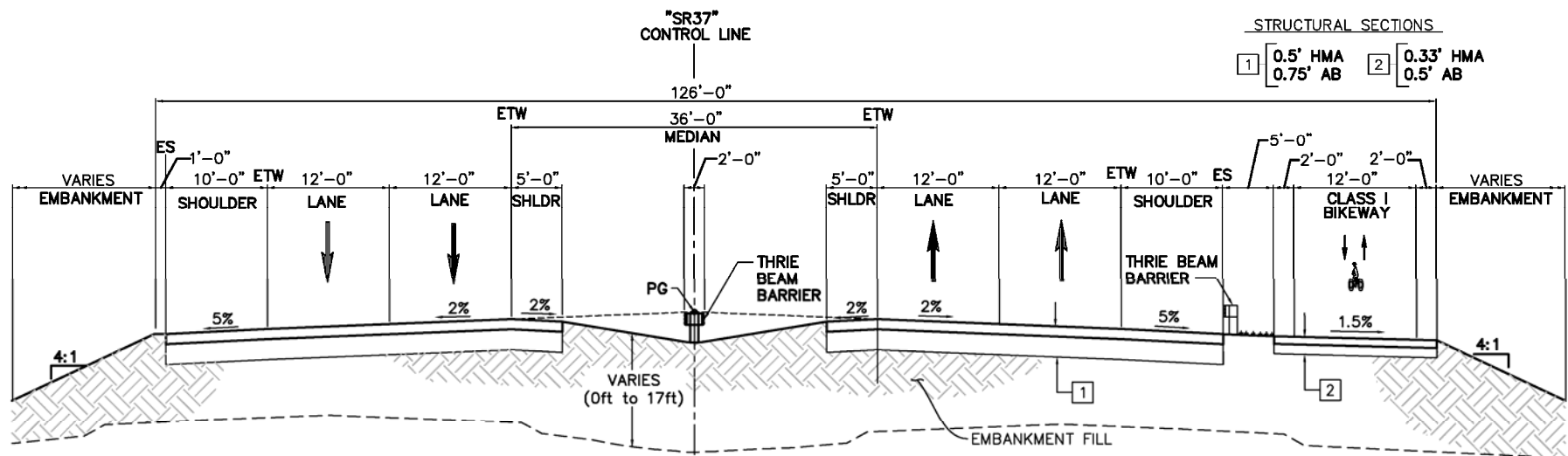


Adaptive Structural Scenarios

- Cost
- Capacity
- Environmental/community benefits/impacts



Adaptive Designs: Berm



TYPICAL SECTION - "SR37" LINE
LEVEE / EMBANKMENT
SCALE: NTS

NOTE:

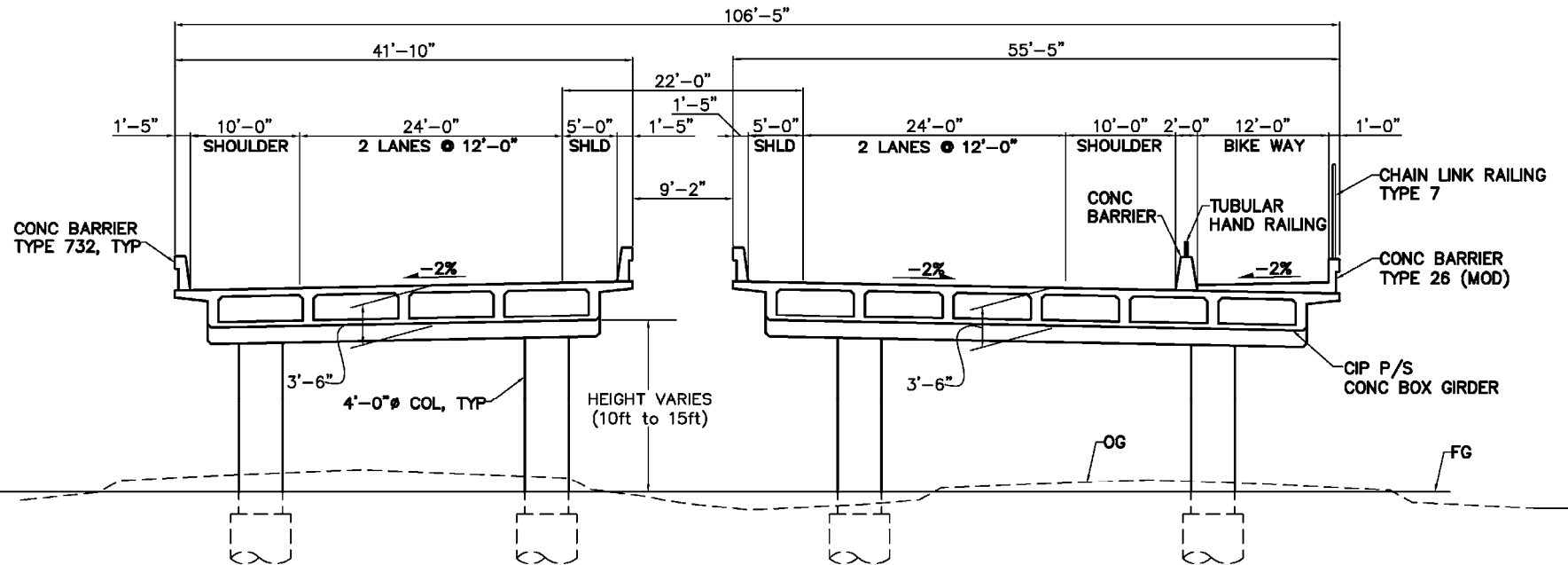
1. PROPOSED IN SCENARIO 1 - REACH A & B
2. PROPOSED IN SCENARIO 2 - AT APPROACHES TO THE BOX GIRDER CAUSEWAY.
3. DRAINAGE INLETS SPACED 300FT MIN. ON MEDIAN.

Two lanes w/ shoulder
 12 ft wide bikeway
 Height of fill varies

Adaptive Designs: Berm



Adaptive Designs: Box-girder



TYPICAL SECTION - "SR37" LINE
BOX GIRDER CAUSEWAY,
2 COLUMN CONFIGURATION

SCALE: NTS

NOTES:

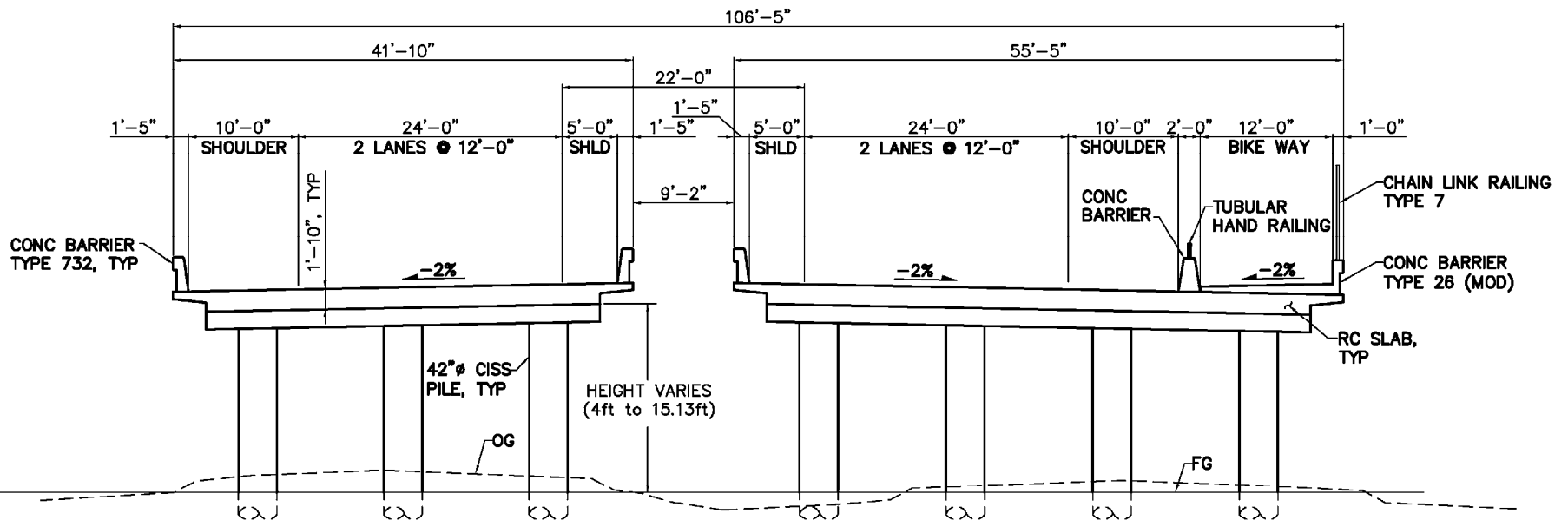
- HIGH PROFILE (10' min.)
- 3'-6" CIP P/S CONC BOX GIRDER
- SPAN LENGTH = 88 FT
- 4- 4'-0" DIA COLUMN
- PROPOSED IN SCENARIO 2

3.5 ft deep box girder
88 ft span length, 4.0 ft diameter columns
Two lanes w/ shoulder, 12 ft wide bikeway

Adaptive Designs: Box-girder



Adaptive Designs: Slab bridge



TYPICAL SECTION - "SR37" LINE
CONCRETE SLAB BRIDGE CAUSEWAY

SCALE: NTS

NOTES:

- LOW PROFILE (4' min.)
- 1'-10" RC SLAB
- SPAN LENGTH = 44 FT
- 7 - 42" DIA CISS PILES
- PROPOSED IN SCENARIO 3

22" thick slab, 44 ft span length, 3.5 ft diameter columns
Two lanes w/ shoulder, 12 ft wide bikeway

Adaptive Designs: Slab bridge



Cost Estimate Comparison



REACH	ALTERNATIVE		
	1 - Berm/ Embankment	2 - Box Girder Causeway	3 - Slab Bridge Causeway
A	\$460	\$1,400	\$1,300
B	\$650	\$2,500	\$2,200
C	\$150	\$400	\$340
TOTAL	\$1,260	\$4,300	\$3,840

(\$ in
millions)

Project Overview and Web Resources

Website

<http://hwy37.ucdavis.edu>

Reports, agendas/minutes, map tool

Web Resources

Website: <http://hwy37.ucdavis.edu/maps>

State Route 37 Meetings Data Depot Resources Maps Images Contact Us About

Integrated Traffic, Infrastructure and Sea Level Rise Analysis Highway 37 Online Maps

Map Tips

- Click on the plus (+) or minus (-) buttons—or use the mousewheel—to zoom in and zoom out of the map.
- Click on the icon below the plus (+) and minus (-) buttons to use the map in full screen mode.
- Change the map's *base layer* by moving your mouse over the square map icon in the lower left of the map. Choose one of the eight possible base layers by clicking on one of the squares when they are revealed.
- Move your mouse over the "layers" icon in the upper right of the map to see a list of the additional or *overlay layers* you can add. Click on a section heading to reveal the possible layers you can choose
- The black rectangle (shown by default) represents the study area of this project.

Note: This mapping interface is still being developed, specifically additional documentation will be added below this map about the various maps that can be selected. We currently recommend not adding too many *overlay layers* on at once, as the legend shown does not always coincide to the newly selected layers. The legends are mostly present for the *Potential Inundation* layers and the *LIDAR* layer.

Please [contact us](#) if you see any issues or have specific questions about this map.

Leaflet | Map tiles by Stamen Design, under CC BY 3.0. Data by OpenStreetMap, under CC BY SA., National Oceanic and Atmospheric Administration, Feb/Mar 2010

[Additional Information about the Maps](#)

What do we do next?

Meta-analyses of the determinants and outcomes of belief in climate change

First, many intuitively appealing variables (such as education, sex, subjective knowledge, and experience of extreme weather events) were overshadowed in predictive power by values, ideologies, worldviews and political orientation.

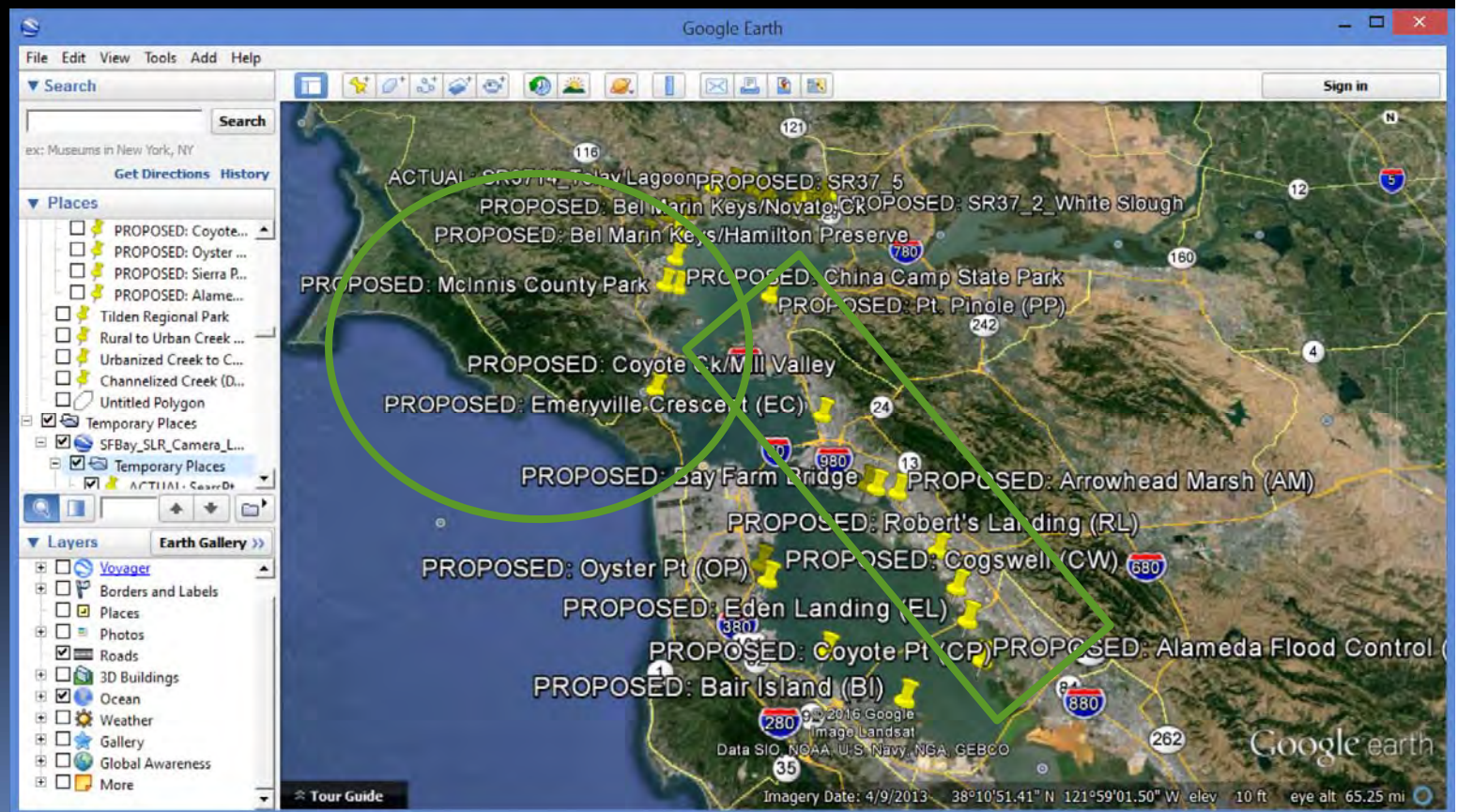
Second, climate change beliefs have only a small to moderate effect on the extent to which people are willing to act in climate-friendly ways. (Hornsey et al., 2016; Nature Climate Change)

PID, EIR/S

Studies: 1) Depth to bedrock, 2) actual berm/levee elevations, 3) stay in front of the curve nationally, 4) consider ALL options, 5) monitor shoreline/infrastructure

New Study: Sea Level Rise Monitoring

<http://sealevelrisemonitor.org>





More Information

<http://hwy37.ucdavis.edu>

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