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The North End Wetlands Enhancement and Sea Level Rise Adaptation Project

May 23, 2017

Coastal Conservancy

GREATER FARALLONES ASSOCIATION

NATIONAL PARK SERVICE

CARING FOR WHAT WE HAVE · 2012-2021 ·

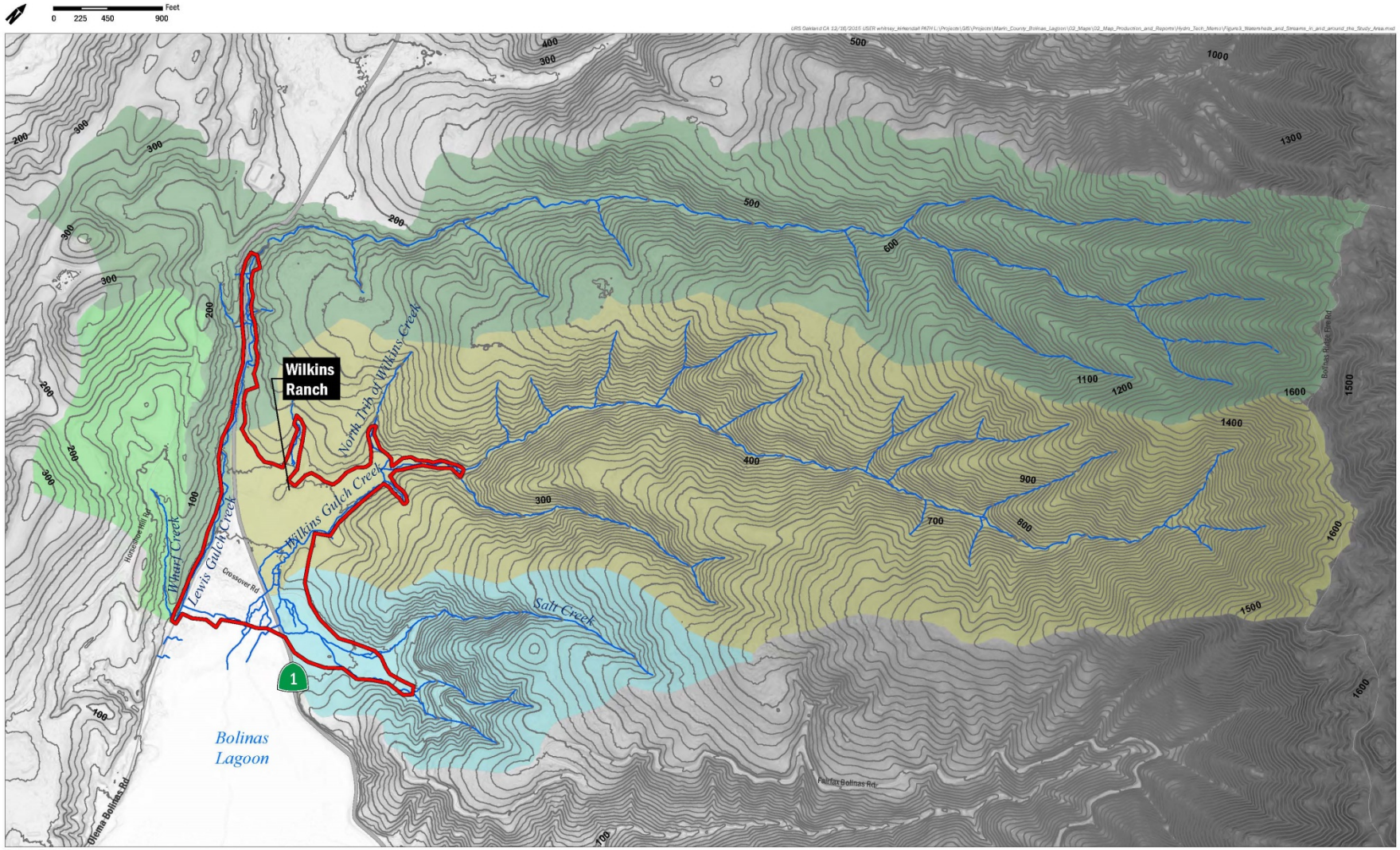
NATIONAL MARINE SANCTUARIES
GREATER FARALLONES

BACKGROUND

- Joint Partnership with GFNMS, PRNS, GGNRA, and the communities of Stinson Beach and Bolinas
- 2015 North End Project, Phase I and II :
  - Project Goals: improve the function of Lewis Gulch and Wilkins Gulch Creek, enhance riparian and wetland habitats, allow for future expansion of Bolinas Lagoon as SLR, and alleviate roadway hazards.


North End Project Area
Sources: Esri, DeLorme, USGS, NPS, Sources: Esri, USGS, NOAA
Wilkins Gulch Creek
Fairfax Bolinas Road
Salt Creek
Wilkins Ranch
SR1
SR1
Connector Road
Lewis Gulch Creek
Olema Bolinas Road
Warf Creek
Google earth

WATERSHEDS



AECOM
Marin County
Bolinas Lagoon Restoration

Data Sources:
1. Contours, ARRA Golden Gate LiDAR, USGS, 2010
2. Streams, Watersheds, AECOM, 2015

FIGURE 3
Watersheds and Streams In and Around the Study Area

PHASE 1: SITE CONDITIONS REPORT

- Hydrology and Geomorphology
- Biological Resources
- Cultural Resources
- Traffic
- Additional Studies
- Regulatory Environment
- Land Ownership and Utilities

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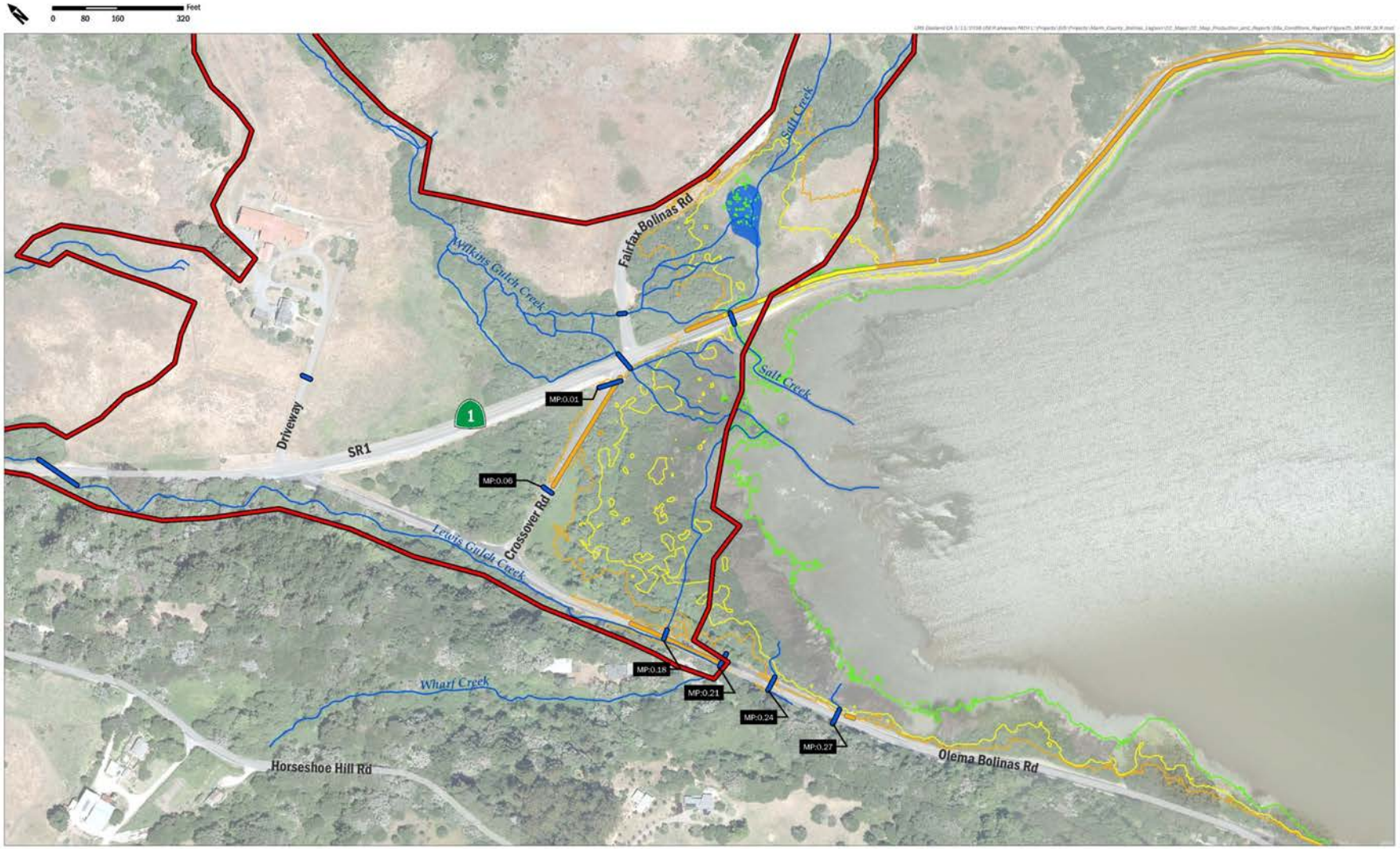
SLR PROJECTIONS



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Study Area
Water Feature
Culvert
Mean Higher-High Water (MHHW), 5.60 Ft
Mid-Century Sea Level Rise (MHHW + 3 Ft), 8.60 Ft
End-of-Century Sea level Rise (MHHW + 5.5 Ft), 11.1 Ft
Roads Impacted by Sea Level Rise
Mid-Century Scenario
End-of-Century Scenario

Data Sources:
Elevation, San Francisco Bay LiDAR, USGS, 2010-2011
Sea Level Rise Data: Projections from Our Coast; Our Future (2015)

FIGURE 25
Sea Level Rise Projections for Mean Higher-High Water

CONCEPTUAL DESIGN ALTERNATIVES DEVELOPMENT

Based on:

- Phase 1 Site Conditions Report
- Partner input (BLAC, stakeholders, public)
- Technical expertise

Commonalities:

- Removing cross-over road
- Reconfiguring the intersection at Hwy 1 and Olema Bolinas Road
- Elevating Hwy 1, Olema Bolinas Road and Fairfax-Bolinas Road
- Upgrading culverts that are fish passage barriers
- Lewis Gulch Creek riparian corridor enhancement
- Vegetated shoreline
- Reactivate Wilkins Gulch Creek alluvial fan

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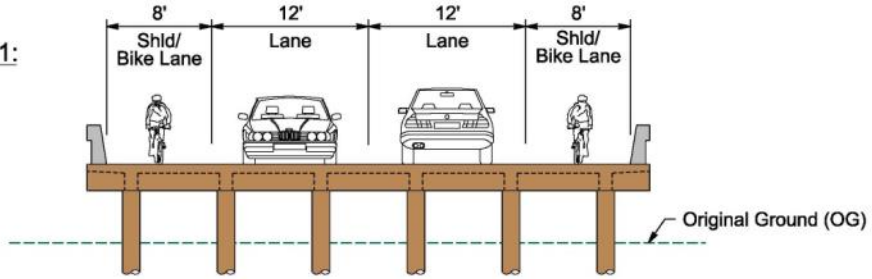
VEGETATED SHORELINE PROTECTION

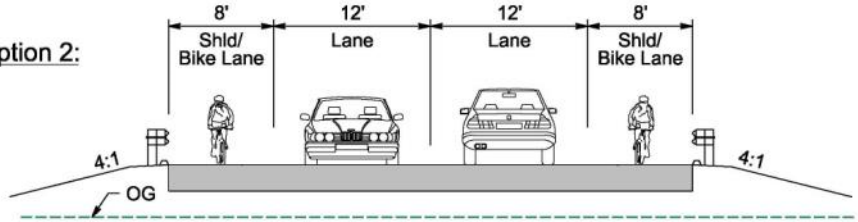
- Ecologically-based approach
- Reduces reliance on hard-engineered approaches
- Wave attenuation and wave runup height reduction during extreme high winter tides and onshore winds

Option 1:



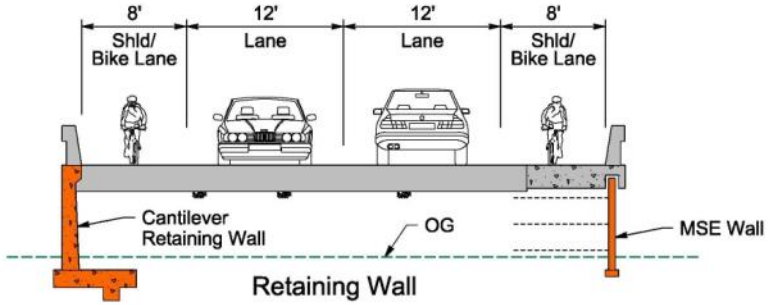
Causeway (Bridge)

Option 2:



Embankment

Option 3:



Retaining Wall

Typical Sections for Hwy 1 or Olema-Bolinas Rd

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Bolinas Lagoon
North End Restoration Project


STOP
STOP
0ft
30
60 ft

Alternative 1

Draft Conceptual
Not to Scale

Phase 1

- Crossover Road Removed
- Reconfigure Intersection

Phase 2

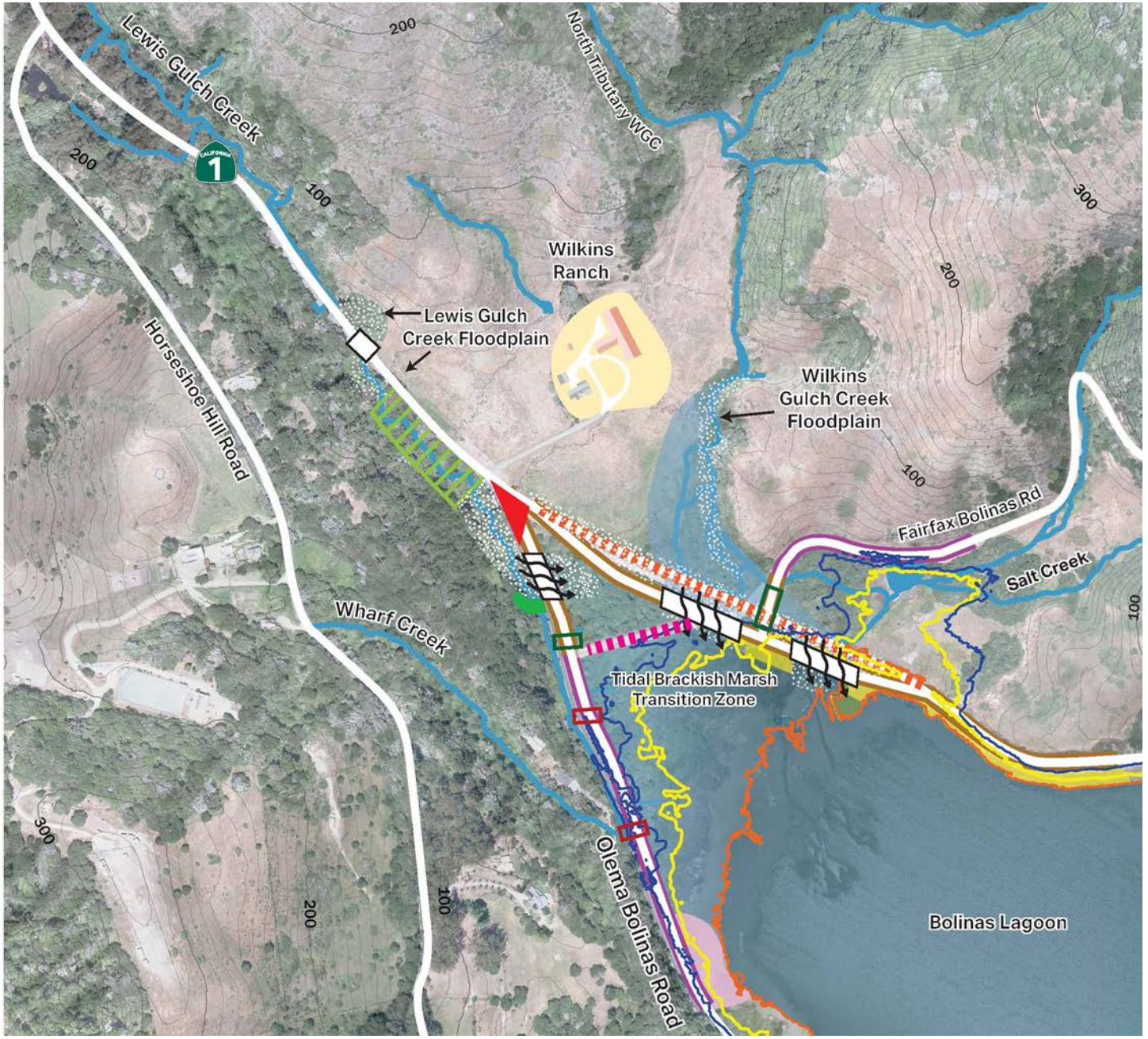
- Reactivate LGC Alluvial Fan and WGC Alluvial Fan
- Add Bridge/Causeway
- Raise Roadway
- Decommission Rd
- Vegetated Berm (Lewis Gulch Creek)
- Surface Water Flow
- Sub Surface Water Flow
- Vegetated Shoreline/ Soft Erosion Protection
- Floodplain Grading
- Upgrade/Add Culvert

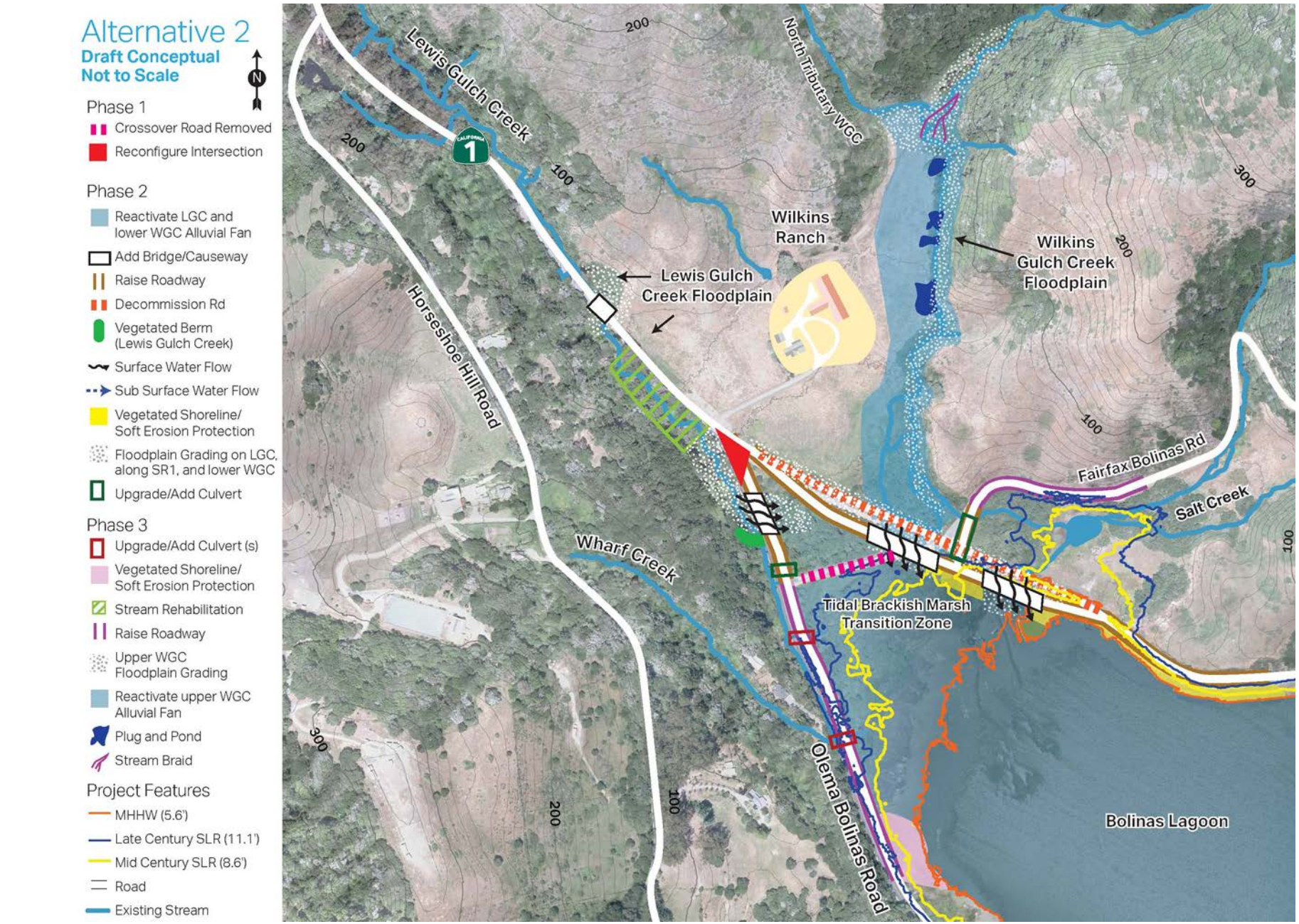
Phase 3

- Upgrade/Add Culvert (s)
- Vegetated Shoreline/ Soft Erosion Protection
- Stream Rehabilitation
- Raise Roadway

Project Features

- MHHW (5.6')
- Late Century SLR (11.1')
- Mid Century SLR (8.6')
- Road
- Existing Stream




Alternative 2
Draft Conceptual
Not to Scale
N
Phase 1
Crossover Road Removed
Reconfigure Intersection
Phase 2
Reactivate LGC and lower WGC Alluvial Fan
Add Bridge/Causeway
Raise Roadway
Decommission Rd
Vegetated Berm (Lewis Gulch Creek)
Surface Water Flow
Sub Surface Water Flow
Vegetated Shoreline/ Soft Erosion Protection
Floodplain Grading on LGC, along SR1, and lower WGC
Upgrade/Add Culvert
Phase 3
Upgrade/Add Culvert (s)
Vegetated Shoreline/ Soft Erosion Protection
Stream Rehabilitation
Raise Roadway
Upper WGC Floodplain Grading
Reactivate upper WGC Alluvial Fan
Plug and Pond
Stream Braid
Project Features
MHHW (5.6')
Late Century SLR (11.1')
Mid Century SLR (8.6')
Road
Existing Stream
Lewis Gulch Creek
North Tributary WGC
Wilkins Ranch
Wilkins Gulch Creek Floodplain
Lewis Gulch Creek Floodplain
Horseshoe Hill Road
Fairfax Bolinas Rd
Salt Creek
Wharf Creek
Tidal Brackish Marsh Transition Zone
Olema Bolinas Road
Bolinas Lagoon
200
100
300

Alternative 3

Draft Conceptual
Not to Scale

Phase 1

- Crossover Road Removed
- Reconfigure Intersection

Phase 2

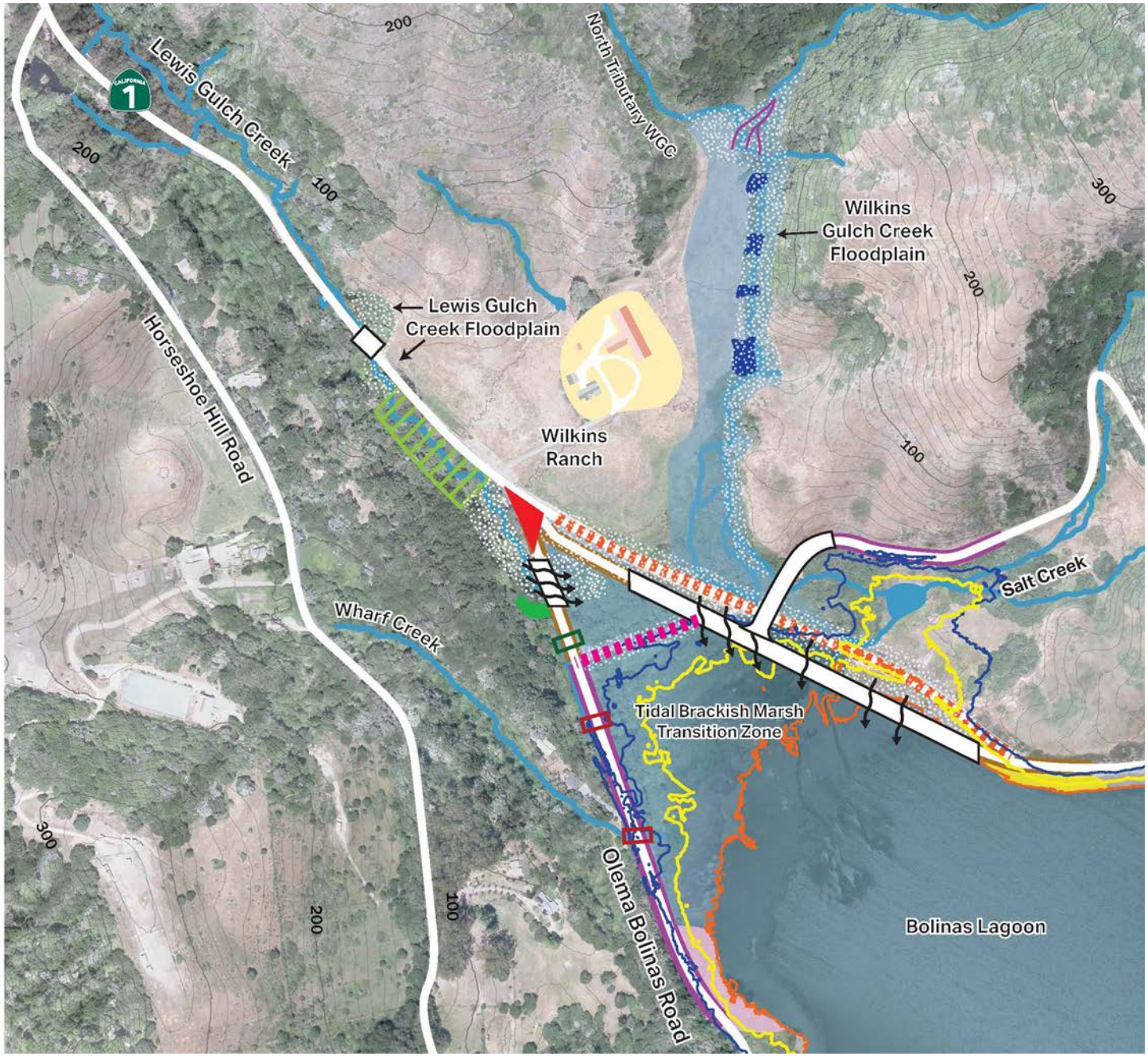
- Add Bridge/Causeway
- Raise Roadway
- Decommission Rd
- Vegetated Shoreline/ Soft Erosion Protection
- Reactivate LGC and lower WGC alluvial fan
- Floodplain Grading
- Add Culvert
- Surface Water Flow

Phase 3

- Install Vegetated Berm
- Raise Roadway
- Stream Rehabilitation
- Vegetated Shoreline/ Soft Erosion Protection
- Reactivate upper WGC Alluvial Fan
- Add Culvert
- Floodplain Grading
- Plug and Pond
- Stream Braid

Project Features

- MHHW (5.6')
- Late Century SLR (11.1')
- Mid Century SLR (8.6')
- Road
- Existing Stream



ALTERNATIVES SUMMARY TABLE

Alternative	Floodplain Connectivity		Roadway Raising			Reconfigure Wye	Vegetated Shoreline Resilience	Lewis Gulch Creek Culvert Upgrade
	Wilkins Gulch Cr	Lewis Gulch Cr	Highway 1 Causeway	Fairfax-Bolinas Rd	Olema Bolinas Rd			
1	Lower	✓	Double	Fill	Fill/Bridge	✓	✓	✓
2	Partial	✓	Double	Fill	Fill/Bridge	✓	✓	✓
3	Partial	✓	Single Long-span	Causeway	Fill/Bridge	✓	✓	✓

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WHERE ARE WE NOW

- Conceptual design revisions
- Opportunities and Constraints
- Geotechnical Investigation
- BLAC special meeting
- Board of Supervisors

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NEXT STEPS

- Secure additional funding for Phase 1
- CEQA/NEPA
- Define designs
- Acquire private parcel

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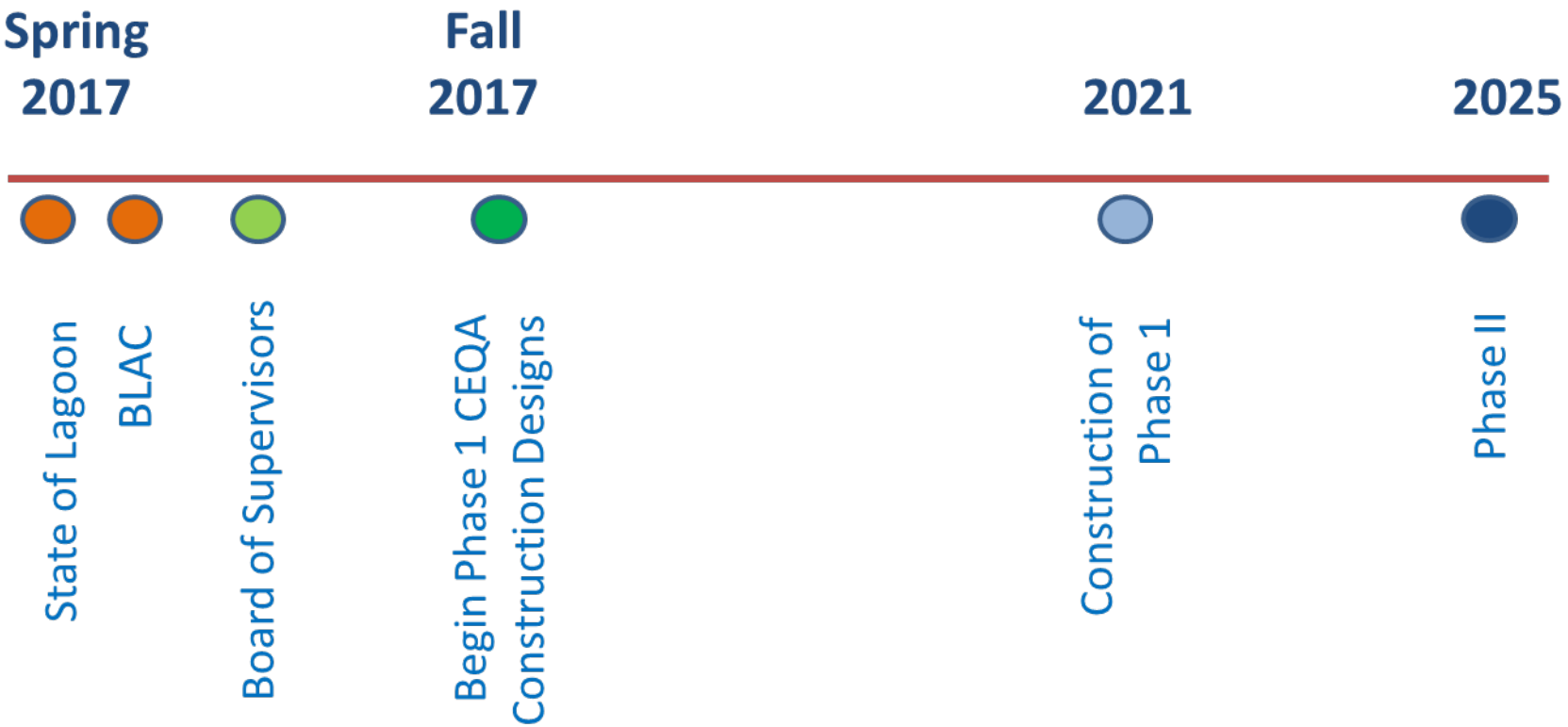
THE NORTH END PROJECT
2017 AND BEYOND



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QUESTIONS

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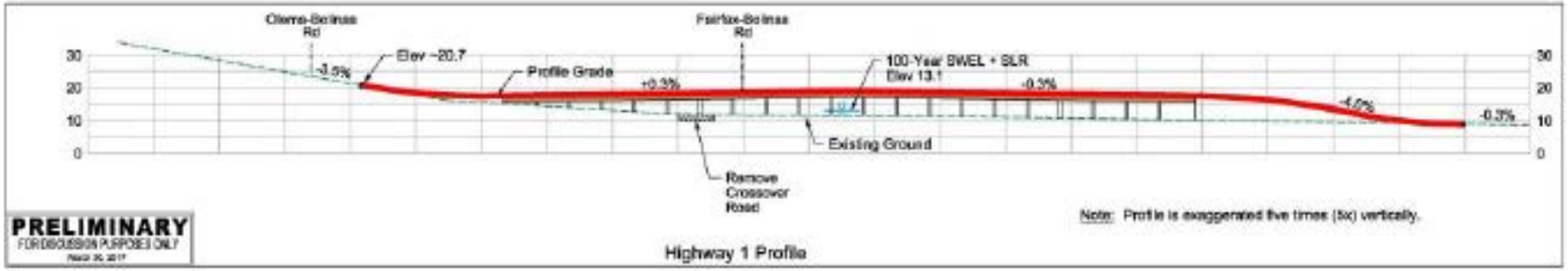
Plan



PRELIMINARY
FOR DISCUSSION PURPOSES ONLY

Highway 1 Profile

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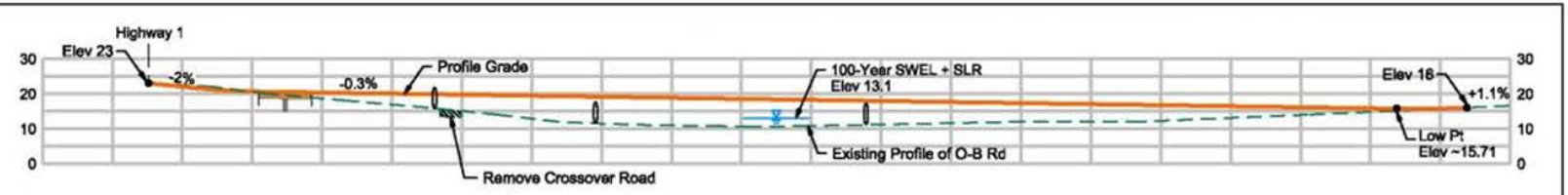
Highway 1 Plan and Profile Conceptual Design



PRELIMINARY
FOR DISCUSSION PURPOSES ONLY
February 9, 2016

Olema-Bolinas Rd Profile

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Olema-Bolinas Road Conceptual Design Alternatives