

Tide Gates As SLR Barriers: Promise and Realities



*Thames Barrier,
England*

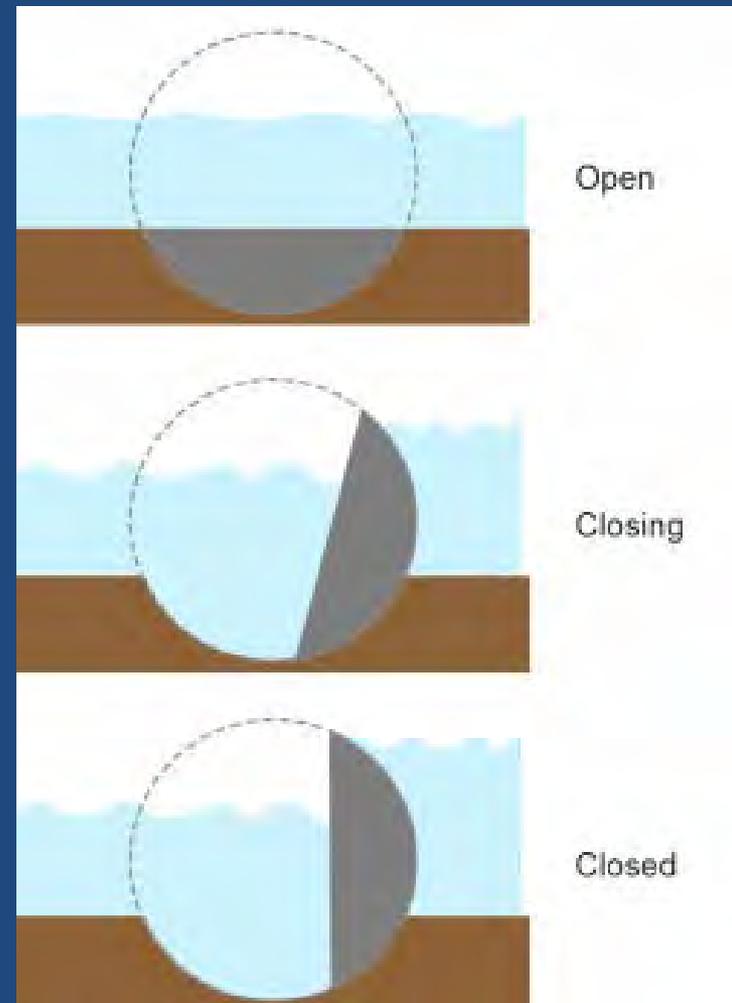
Roger Leventhal, P.E.
Senior Engineer
Marin County Flood Control
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Ryan Creek Tide Gate, Marin County

What are Tide Gates?

- Structures that block the high tides and not the low tides
- Range from large structures to small inlet creek structures
- Many different types...gates, inflatables, screw and float culverts



Large Gates - Rivers and Bays

Thames

- 1700 feet
- Construction cost = 1.3 billion pounds (2001 prices)



Mastererling

- 1,300 feet
- Construction cost = 450 million euros in 1991 dollars



Smaller Gates on Creeks

- Requires upstream storage
- Impacts fish passage
- WQ impacts
- Costs



What we hear about tide gates at the local level?

- *“A single flood gate can solve the problem, its easy and obvious”*
- *“Only activated at extreme high tides so no impacts”*
- *“Its what they do in Europe to solve the problem”*

At BCDC level, GG Bridge Tide Gate barrier
– partner with the Dutch

Adaptation Choice - Going Dutch



FOLDING WATER: A VENTILATED LEVEE FOR A LIVING ESTUARY

Bay Conservation and Development Commission



Behind Walls, Need Pumps

- Need to pump stormflows from behind walls/levees
- Per gallon, pumping is a very expensive solution
- Requires maintenance and electricity to work



Recent Mission Creek Report

FIG 5-6: CREEK CONCEPT 3 DEVELOPMENT VISION



Holland and Germany...



Heavy reliance on
tide gates

Is Europe Re-Thinking Its Reliance on Tide Gates?

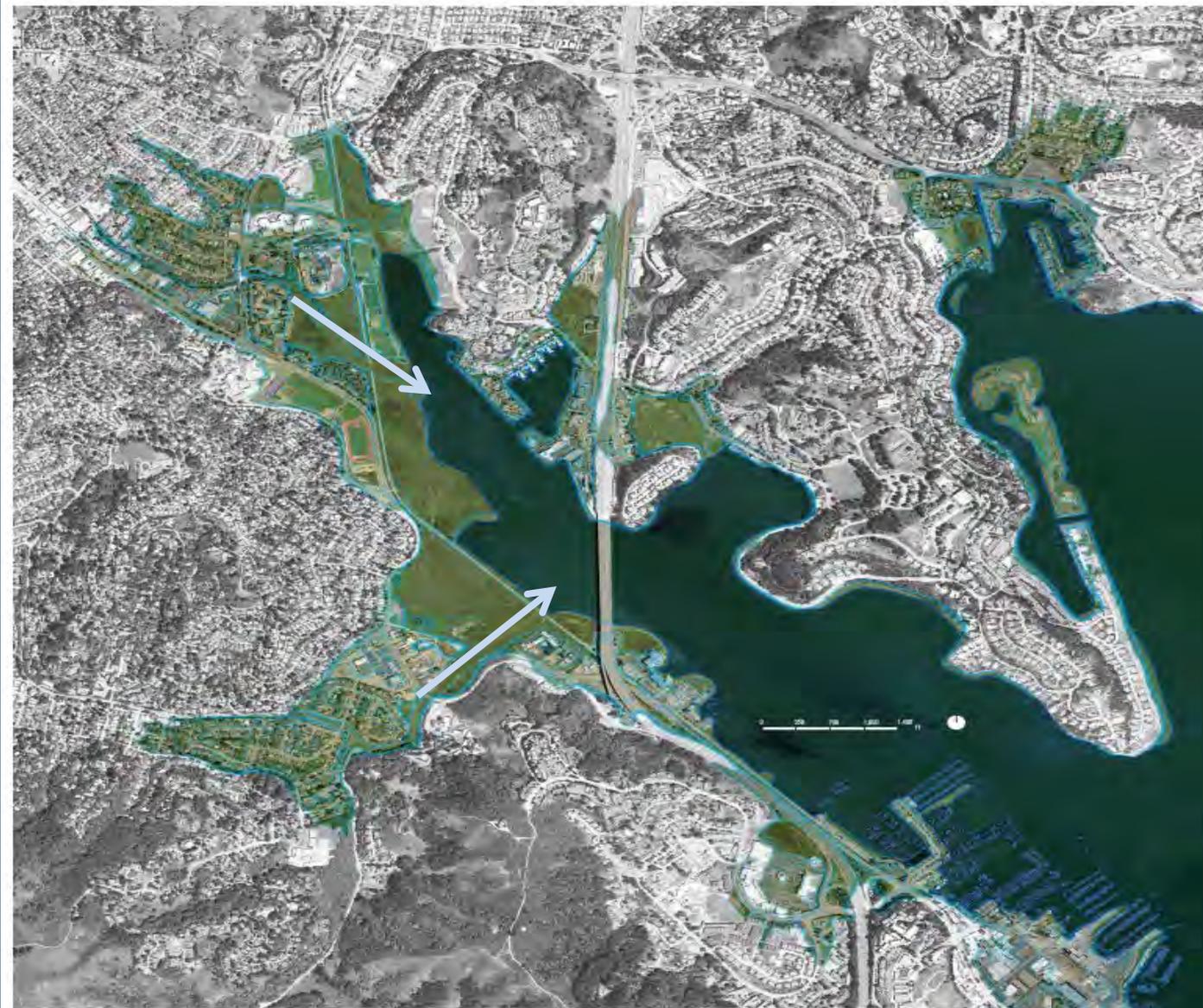
- Yes, realizing the costs are very large (*Working Together with Water - 2008 report*)
 - Looking at more nature based solutions
 - But maintaining large hard engineering in north and for urban areas
- Less options, county is below sea level

Marin County and SLR

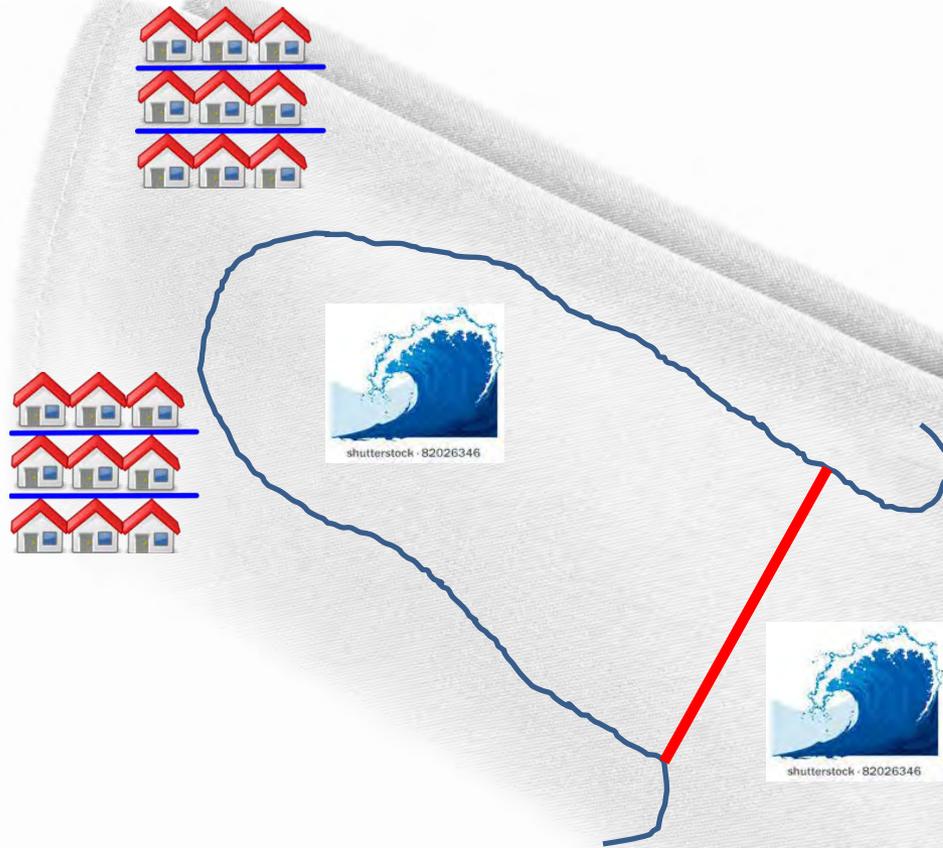
- low elevation along eastern County edge
- Steep watersheds and headlands with narrow inlets
- Most people living on floodplain along historic river valleys



Richardson Bay, Marin County



The Napkin "Solution" is the Bay Inlet Scale Tide Gates





101

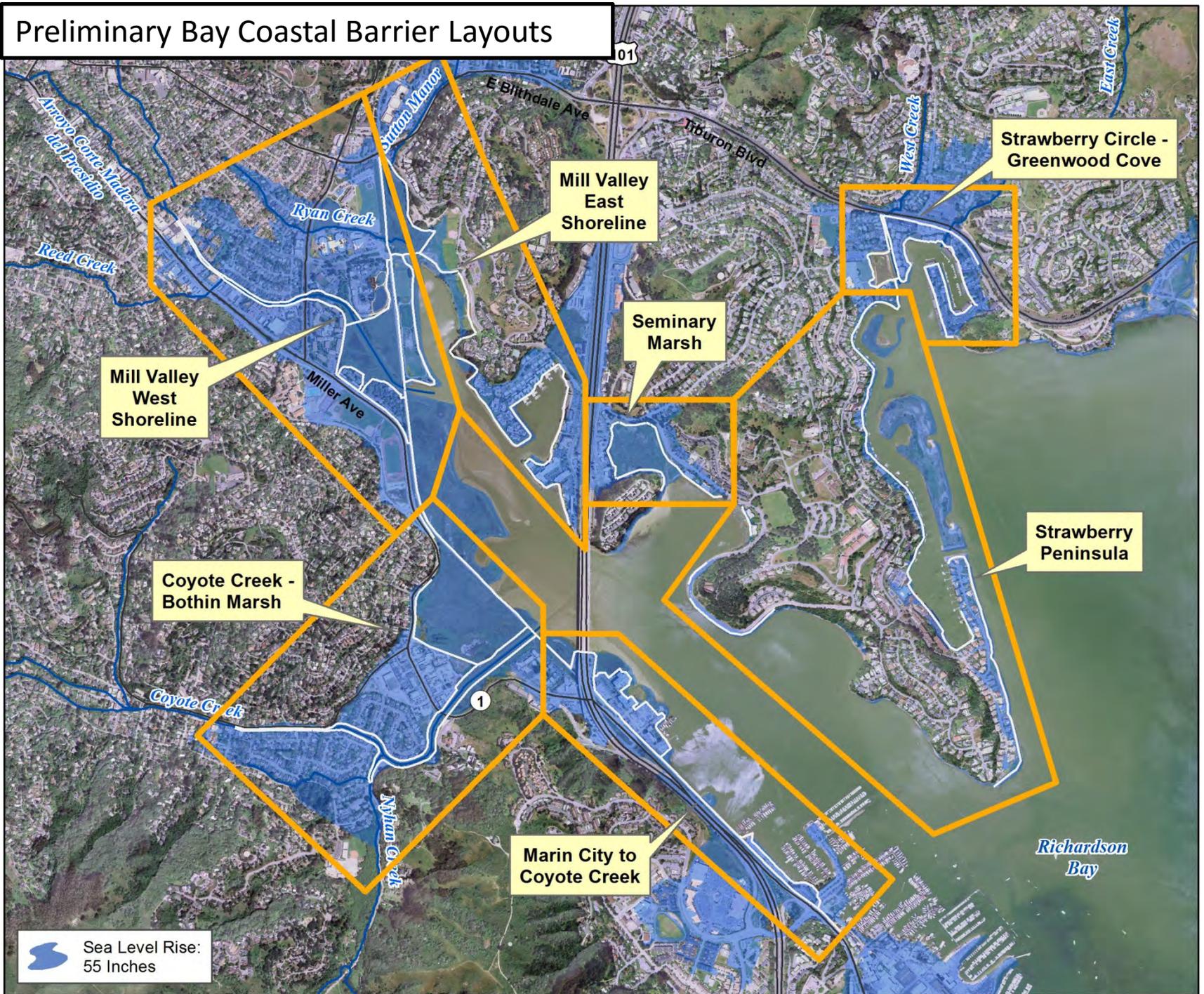
"Lyon's Gate"

*Richardson
Bay*

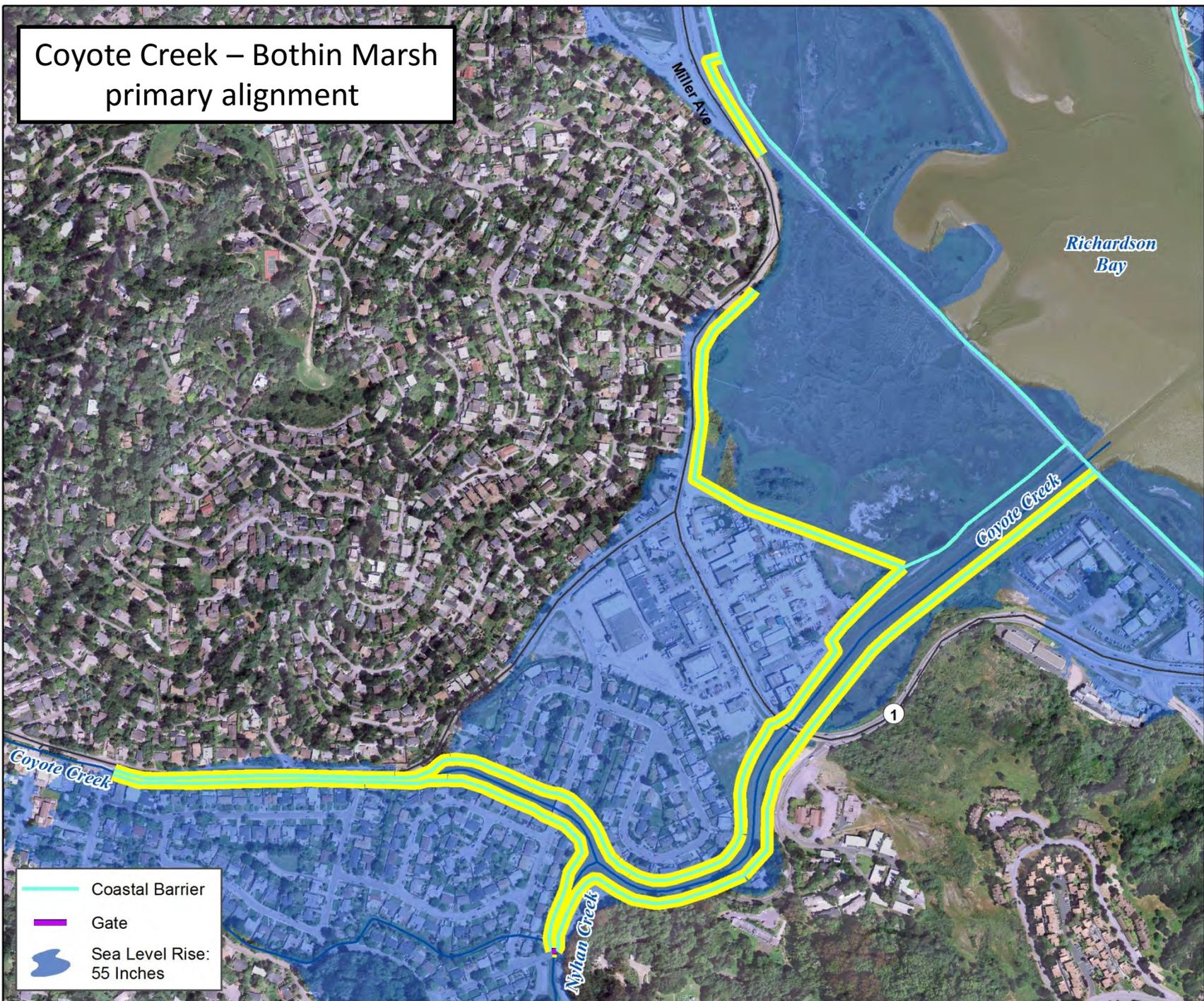
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"Folding Water™"

Preliminary Bay Coastal Barrier Layouts



Coyote Creek – Bothin Marsh
primary alignment



Richardson Bay

Coyote Creek

Coyote Creek

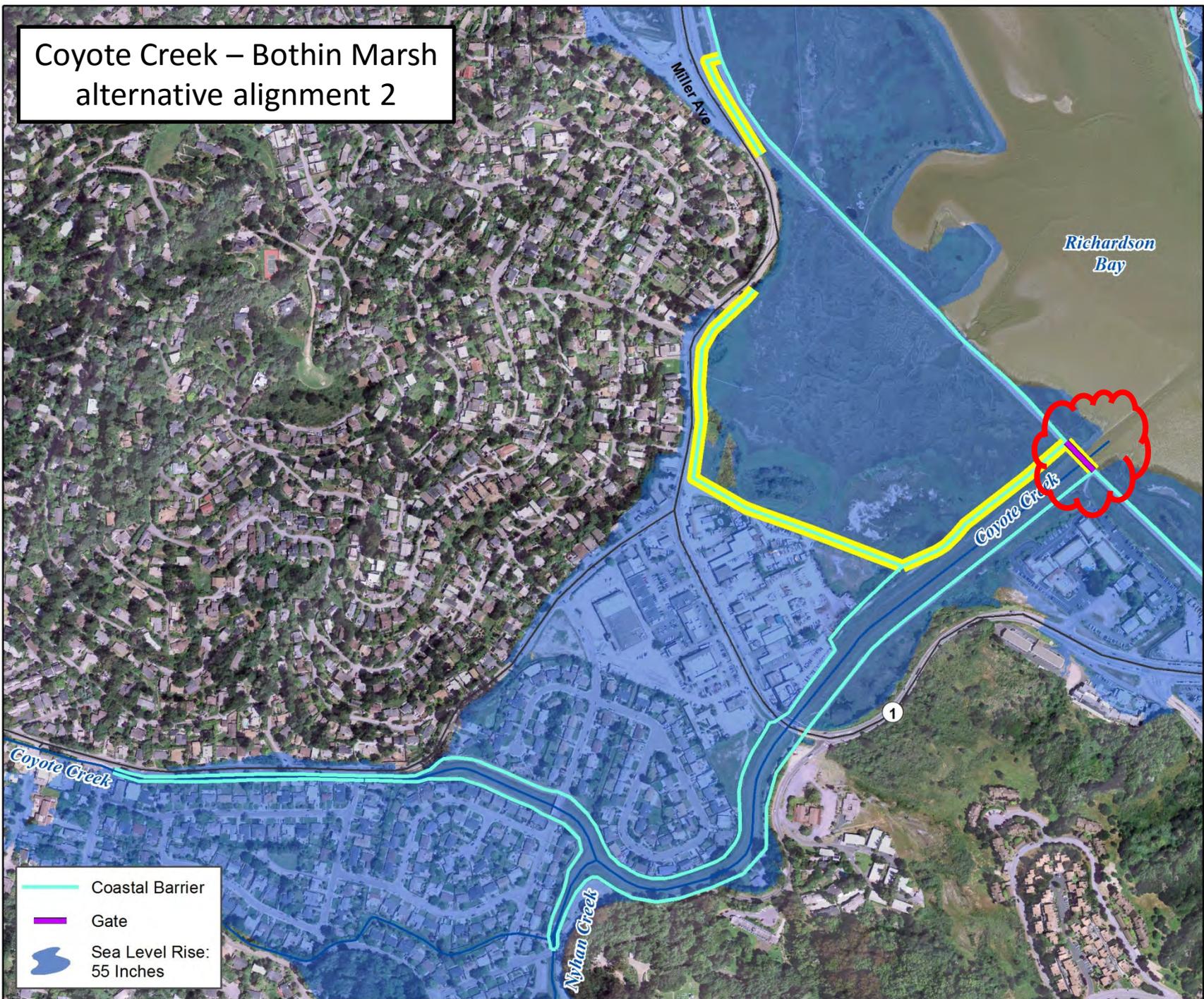
Nylan Creek

Miller Ave

1

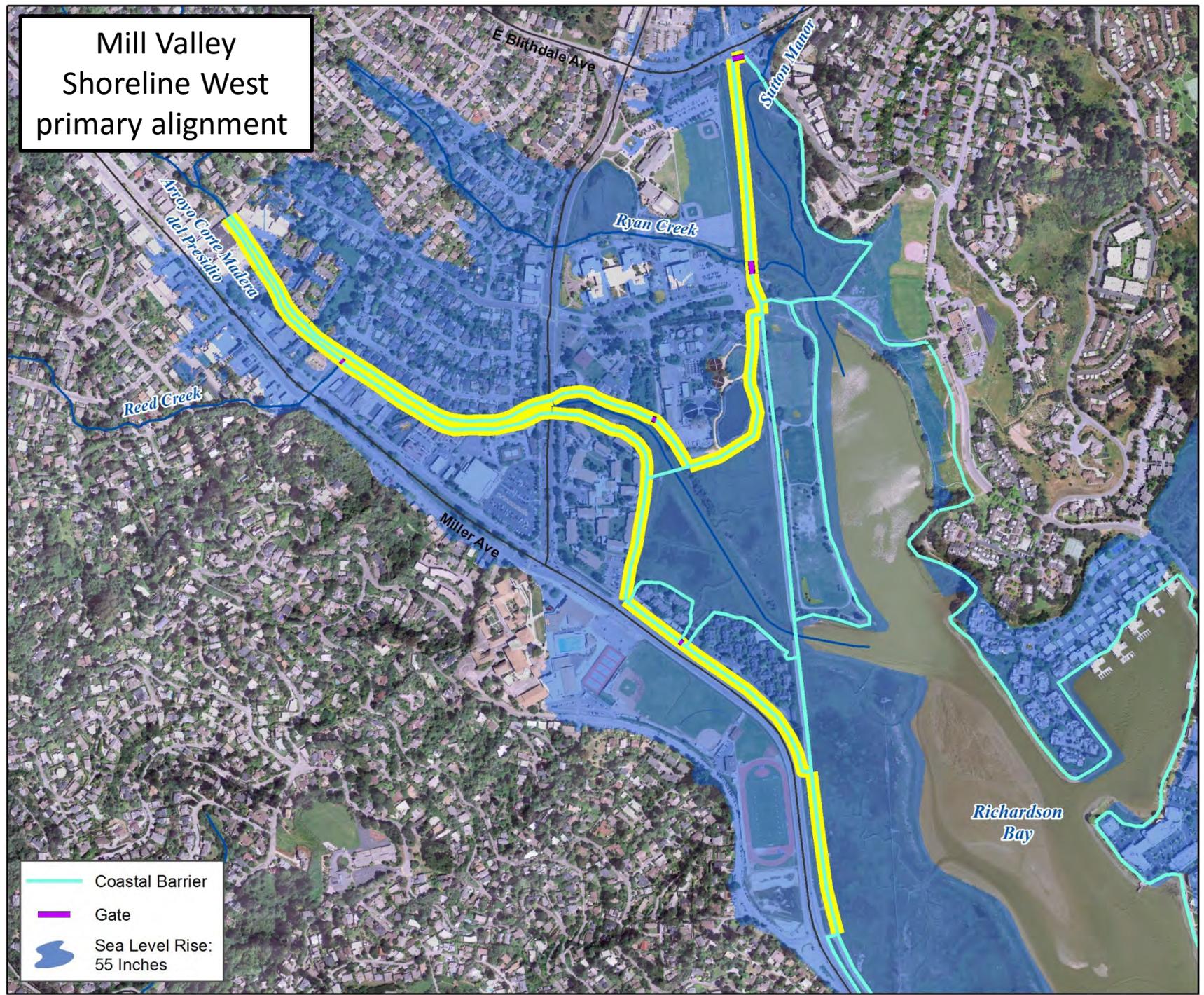
-  Coastal Barrier
-  Gate
-  Sea Level Rise: 55 Inches

Coyote Creek – Bothin Marsh
alternative alignment 2



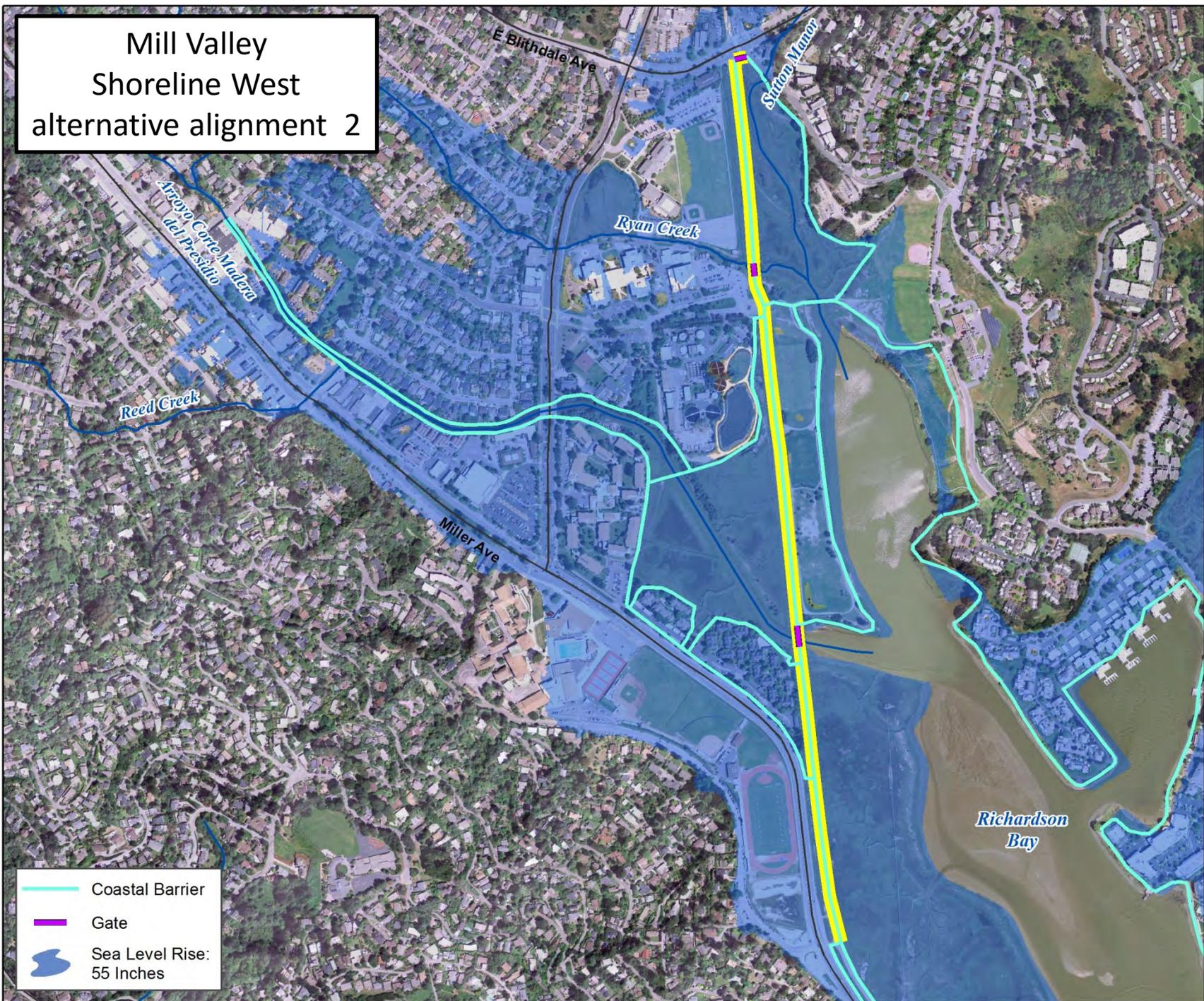
- Coastal Barrier
- Gate
- Sea Level Rise:
55 Inches

Mill Valley
Shoreline West
primary alignment



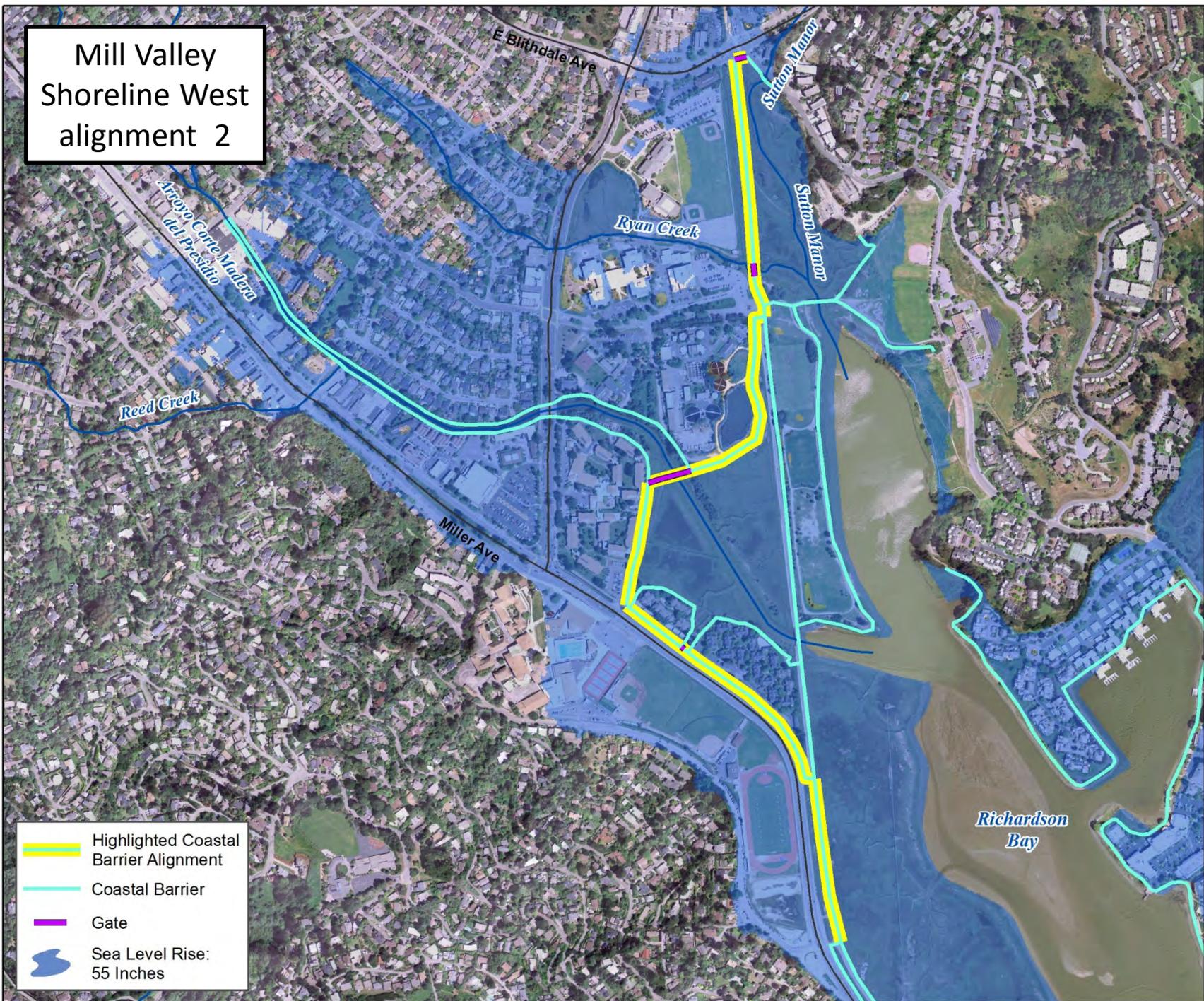
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Mill Valley
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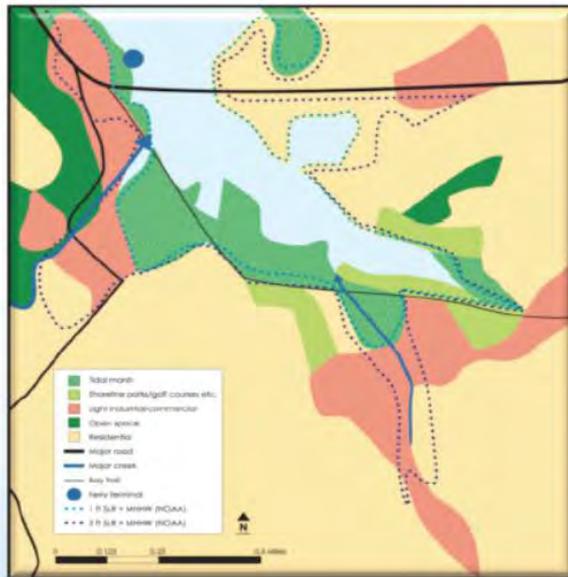
- Coastal Barrier
- Gate
- Sea Level Rise: 55 Inches

Mill Valley
Shoreline West
alignment 2



BCDC Bay Fill Policies

Case Study – Shoreline Community



Scenario

Number of tide gate closures per year (tides above 7 ft. NAVD88)*

Existing conditions	33
12-inches SLR	249
24-inches SLR	569
36-inches SLR	718

- How to weigh long term potential public benefits over short-term impacts?
- How should mitigation be evaluated for sea level rise adaptation projects?

Existing Marin Tide Gates

- Not designed for SLR



Take Away Summary #1

Pros

- A single structure may greatly reduce barrier wall length
- May avoid private property issues (need for eminent domain)
- May in some cases be less expensive
- Nature based solutions do not address up the creek flooding – may be only option other than retreat

Take Away Summary #2

Cons

- What happens to structure as SLR high tides keep getting higher – needs to close more often
- Sets up moral hazard conditions- once you start can never stop as people rely on the barrier
- Costs are very high
- Failure may be deadly
- Habitat, water quality, sediment, looks, and fish passage issues
- Need to have flood storage capacity behind barrier





Failed “razor dike,”
New Orleans (2005)