Ross Valley Flood Protection & Watershed Program

Flood Zone 9 Advisory Board Meeting

May 23, 2019, 6:30 pm

Larkspur City Hall

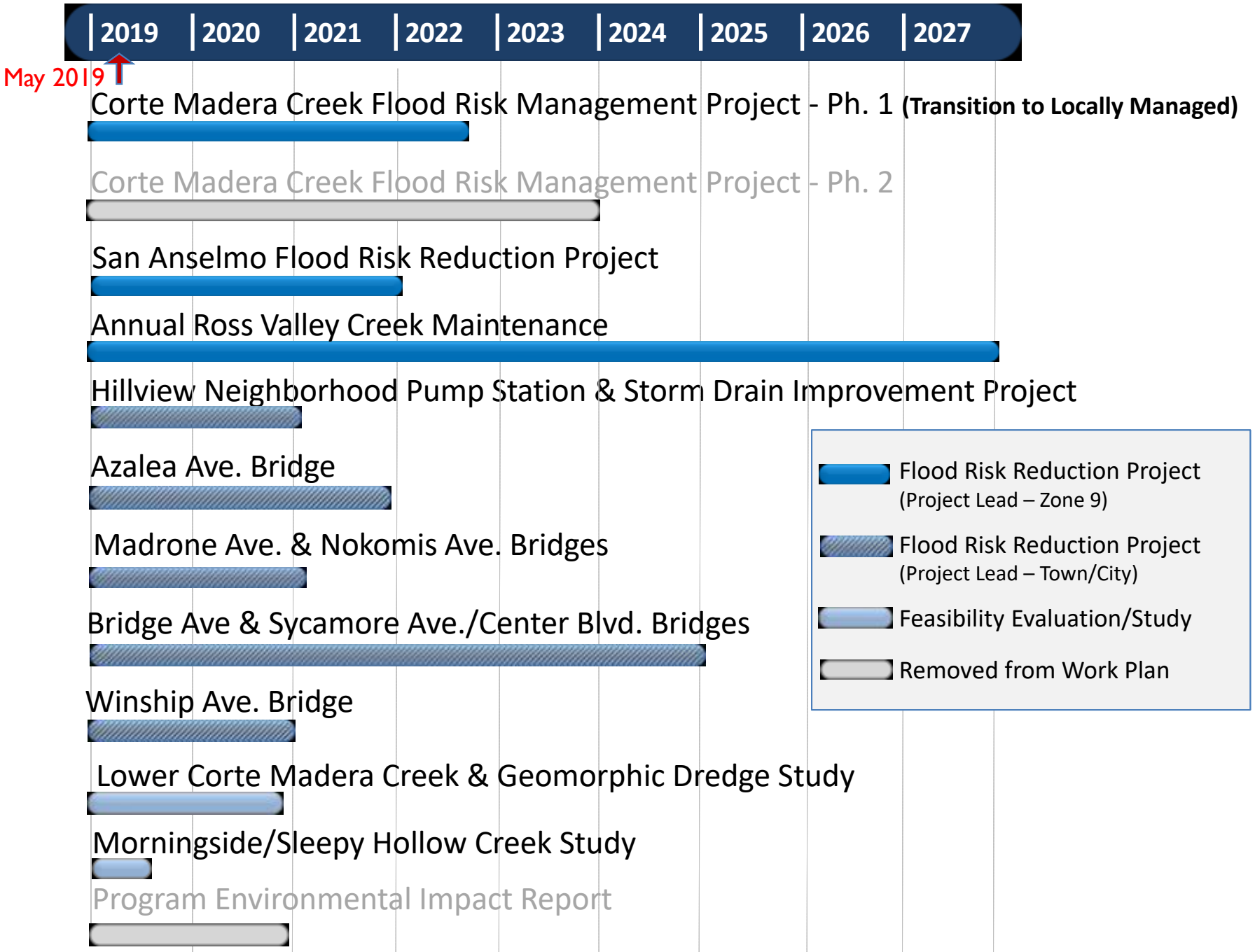
Presentation Agenda

1. Program Work Plan Update

2. Lower Corte Madera Creek Program Activities

3. Corte Madera Creek Flood Risk Management Project Update

2019 – 2027 Project/Study Work Plan Timeline



Lower Corte Madera Creek - Program Activities

1. Hydraulics Overview & Dredging Analysis Findings James Reilly (Stetson Engineers)

2. Geomorphic Dredge Study Update
   Roger Leventhal (FC District)

3. Lower CMC Improvement Study Update
   Hugh Davis (FC District)

4. Hillview Pump Station & Stormdrainage Project Update
   Julian Skinner (Larkspur)

Lower Corte Madera Creek

MARIN COUNTY FLOOD CONTROL

Flood Mitigation Activities in Lower Corte Madera Creek

- **Dredging Not a Sustainable Measure Considering**;
  - Sedimentation rates are high (results temporary)
  - Re-occurring costs without secure funding source
  - Rigorous environmental regulatory permitting
  - Limited dredge material disposal options
  - Sea level rise
- **Planning Underway to Evaluate Flood Mitigation Opportunities;**
  - Levees/berms, tides gates and other restoration
  - Alternatives to traditional dredge – geomorphic dredge
  - Regional sea level rise adaptation planning

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Hydraulics of Corte Madera Creek

- James Reilly presents hydraulic modeling video of watershed and Lower Corte Madera Creek

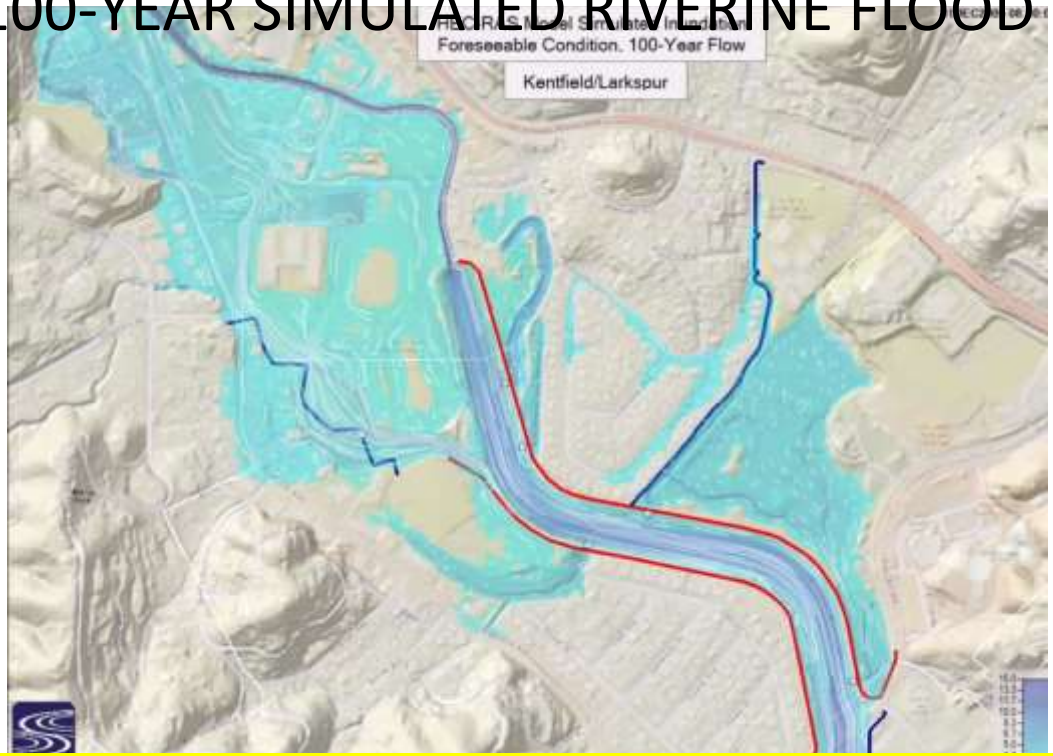
Hydraulics of Corte Madera Creek

VIDEO ONE OF TWO – FORSEABLE PROJECT CONDITIONS (UPSTREAM PLANNED PROJECTS IN PLACE) – 100-YEAR SIMULATED RIVERINE FLOOD EVENT

Click on image above or go to: https://vimeo.com/338332202

Hydraulics of Corte Madera Creek

VIDEO TWO OF TWO (ZOOMED IN ON KENTFIELD/LARKSPUR)– FORSEABLE PROJECT CONDITIONS (UPSTREAM PLANNED PROJECTS IN PLACE AND LOCAL LEVEE EVALUTION FOCUS AREAS) – 100-YEAR SIMULATED RIVERINE FLOOD EVENT



Click on image above or go to: https://vimeo.com/338301439

Plan View - Bathymetric Surveys (2004-2018)

Profile of Bottom of Earthen Channel

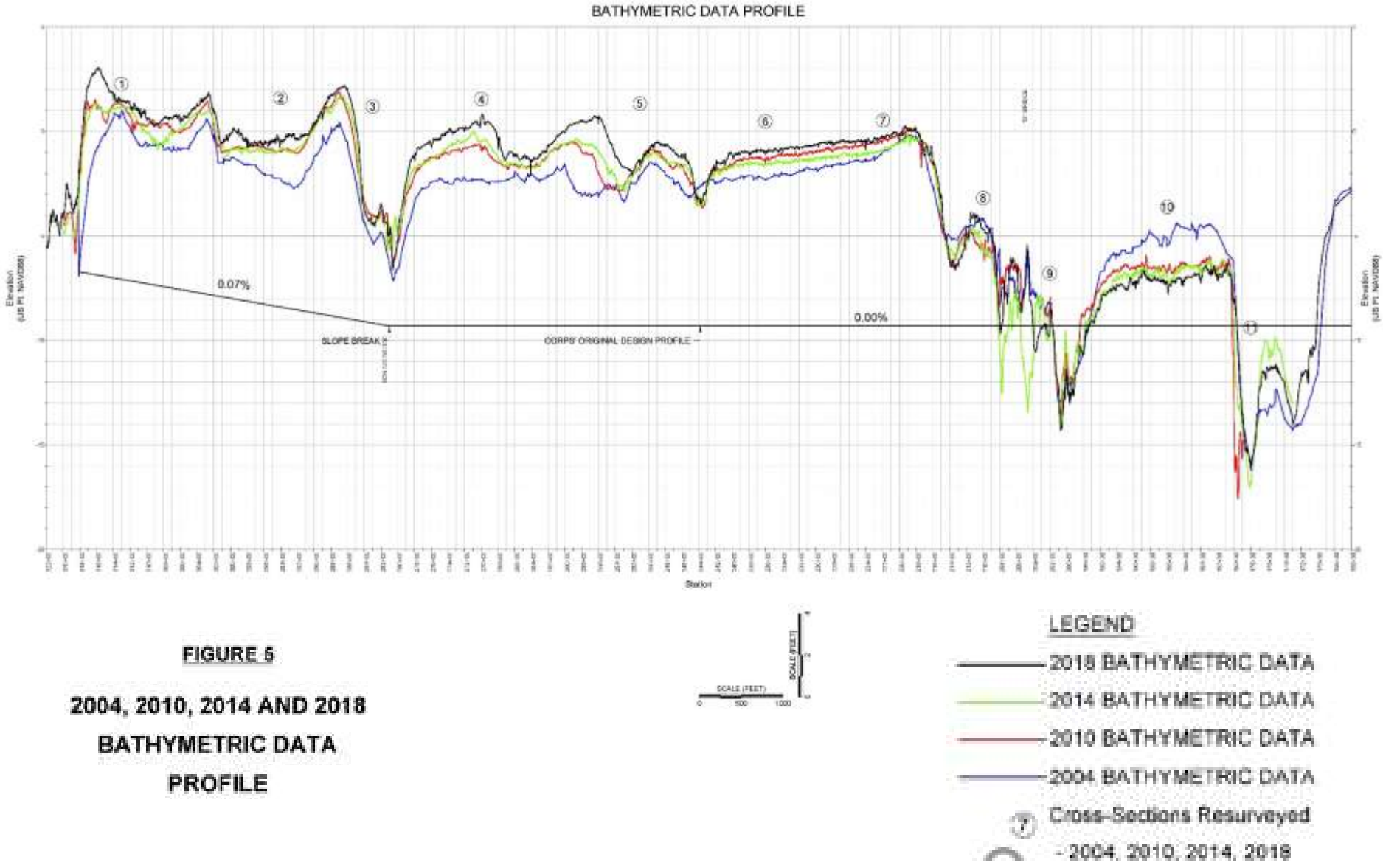


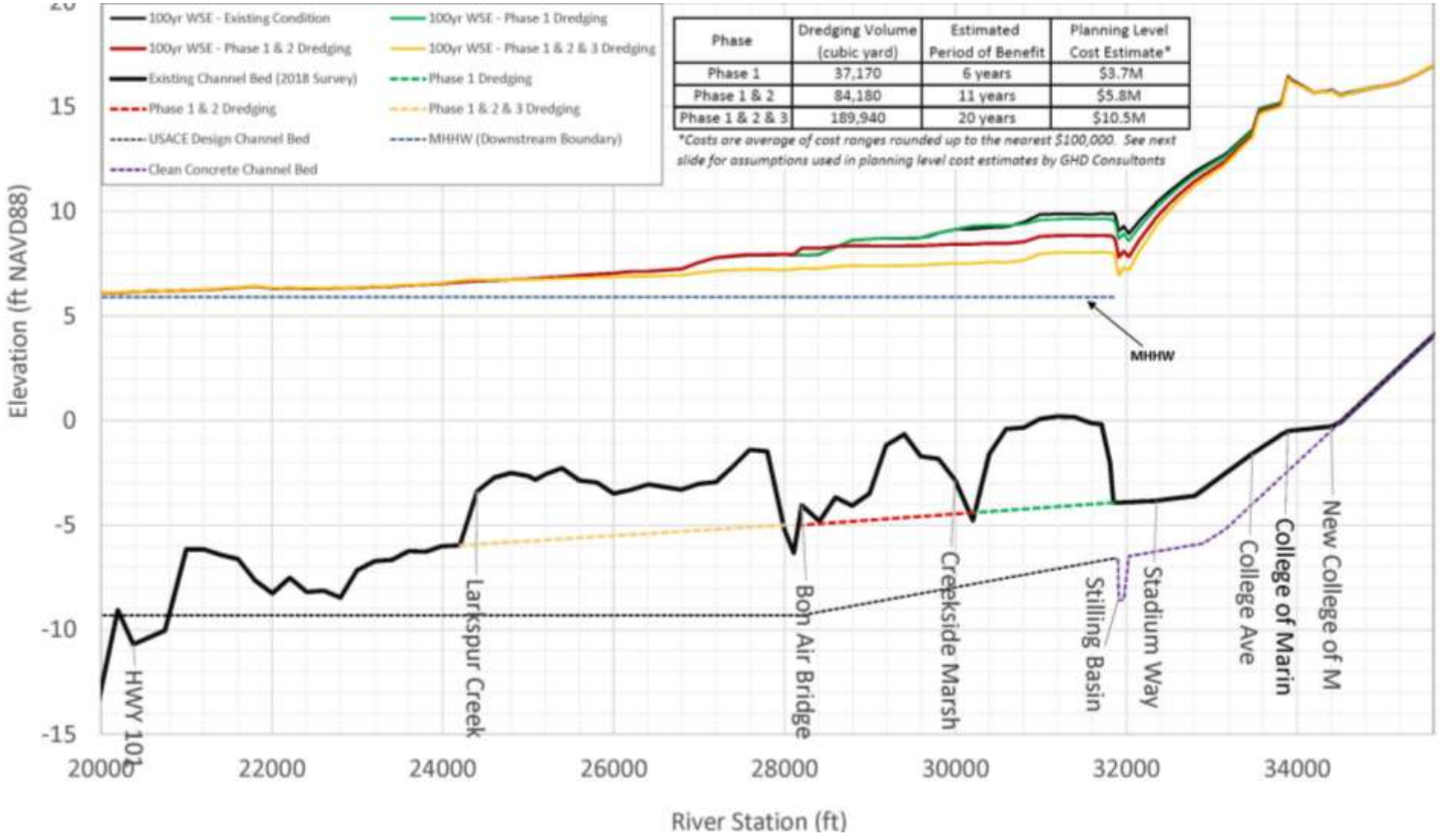
FIGURE 5

2004, 2010, 2014 AND 2018

BATHYMETRIC DATA

PROFILE

Simulated 100-yr Water Surface Elevation of Dredging in Lower Corte Madera Creek



Phase	Dredging Volume (cubic yard)	Estimated Period of Benefit	Planning Level Cost Estimate*
Phase 1	37,170	6 years	$3.7M
Phase 1 & 2	84,180	11 years	$5.8M
Phase 1 & 2 & 3	189,940	20 years	$10.5M

**Costs are average of cost ranges rounded up to the nearest $100,000. See next slide for assumptions used in planning level cost estimates by GHD Consultants*

REFERENCE: Range of Probable Costs for Dredging Analysis

Dredge Option	Quantity	~Cost*	Estimate Dredge Frequency
Phase 1 End of concrete channel to north-end of Creekside Marsh	**37,170 cy** (cubic yards)	**$3.1M to $4.2M**	**6 year**
$500k CEQA/permitting/Engineering, $360k for Construction Management + other assumptions/costs below			
Phase 1 + 2 End of concrete channel to Bon Air Rd Bridge	**84,180 cy**	**$4.5M to $7M**	**11 year**
$575k CEQA/permitting/Engineering, $540k for Construction Management + other assumptions/costs below			
Phase 1 + 2 + 3 End of concrete channel to Larkspur Creek	**189,940 cy**	**$7.7M to $13.2M**	**20 year**
$650k CEQA/permitting/Engineering, $960k for Construction Management + other assumptions/costs below			

*Assumptions are preliminary. Constructability constraints and associated costs not fully explored under conceptual design and may impact final costs.

(1) Assumes 2019 construction year, 25% contingency

(2) Costs include design, permitting, $1M mobilization/demobilization, construction management (no construction and/or post-construction monitoring costs included). Actual costs may vary substantially under future bidding conditions

(3) Assumes $20 to $40 per cy sediment removal and that dredge sediments are suitable for disposal off-shore at DODS. Dredging is assumed as clamshell and barge. Hydraulic dredging and local disposal option costs may be very different. Barge access may impact costs.

Lower Corte Madera Creek - Program Activities

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The "*Geomorphic Dredge Design*" Approach to Channel Maintenance Dredging Applied to Corte Madera Creek

Roger Leventhal, P.E.
Senior Engineer
DPW Flood Control

Laurel Collins
Watershed
Sciences

COUNTY OF MARIN
marinwatersheds.org

Presentation to the Zone 9
AG May 23, 2019

Bay Dredging Realities 2019

- Costs for dredging and disposal have increased substantially in SF Bay since the 60s and 80s
- No local upland fill disposal sites (like in 1960s)
- In-bay disposal sites (SF10/11) not likely available for large projects
- Permit fees exploding
  - Novato RWQCB dredge fees = $5,000 (2012) $60,000 (2016) and expected to be over $100k in 2020 (*just one agency example*)
- Permitting now requires expensive mitigation (costs for impacts to the environment)
- Barge access issues may impact costs

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Current Creek Dredge and Disposal Costs

- Costs now likely in the $30 to $70/cubic yard range (highly variable)
  - Original Corps volume (1966)~ 675,000cy
  - Reset Dredge (1986) ~ 450,000cy
  - Stilling Basin (1998) ~ 22,000cy
- Benefits don't last – sometimes just a few years
- The original design approach for channel dredging may be cost-prohibitive

✓ Interest in alternative design approaches led to the "*geomorphic dredge design*" approach for consideration tonight

MARIN COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT

Goals of the *Geomorphic Design Approach*

- A lower total life-cycle cost (capital plus maintenance) – more self-sustaining
- Provide some flood and navigation benefits
- No degradation of existing conditions and no adverse impacts to existing users
- Work with natural forces to maintain
- Provide sustainable deeper water to allow extension of pipe outfalls – may help with drainage
- Lower permitting and mitigation costs
- Set-up potential grant funding opportunities

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One sentence summary of “geomorphic dredge” design approach

“A dredging plan developed for tidal creek channels designed to be in equilibrium with the available areas of connected tidal marsh (tidal prism)…
…and thus intended to work with the natural forces of the tides to transport sediment and maintain itself over time”

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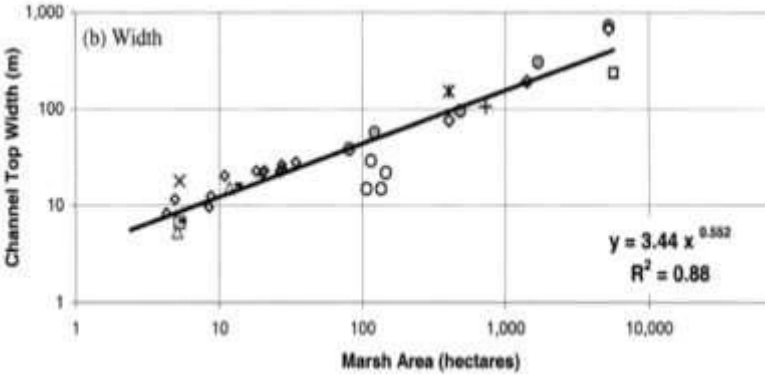
What it is….

- *A "design with nature" approach to managing tidal channels. Uses the daily tides (generated by the sun and moon) to maintain the channel geometry*

- Developed from analyzing other <u>*natural*</u> tidal marsh systems around the Bay (field data) - into design curves that relate width, depth, area to connected tidal marsh (tidal hydraulic geometry)



Typical curve of equilibrium tidal hydraulic geometry

What it is (#2)….

- Not the solution to all problems; provide some flooding or navigation benefits but not primary design goals
- It's a pilot proposal . Based on sound science and supported by the permitting agencies (big plus) - but required new dataset for larger channels which was focus of project work with uncertainties
- Applicable where tides are the dominant channel forming and maintaining process
- Not a total restoration – designed into existing creek ROW
- ✓ *Primary design focus is channel sustainability over time (= less dredging and costs)*

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Natural Tidal Channels w/Connected Marsh Don't Need Dredging

Special to the Chronicle / Scott Hess

Petaluma Creek tidal channels

In the 1800s Barges Sailed Up CM Creek

"Fifteen upright saws cut the logs into lumber that was hauled on wagons to Ross Landing and loaded on scow schooners or barges, then floated down Corte Madera Creek to the bay.

Eventually most of the men who worked at the mill left for the gold fields, and by 1850 the old redwoods and oaks were gone anyway."

From "A History of Corte Madera" Haehl 2002

Ross Landing in Corte Madera Creek

Cooly Landing
Eden Landing
Roberts Landing
Petaluma etc…

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Silted Channels of East Marin and Sonoma

Petaluma River dredge protect (above)

San Rafael Canal dredge protest (right)

Main Reason for Channel Siltation …

Loss of Tidal Wetlands (primary reason and focus of the geomorphic dredge approach)

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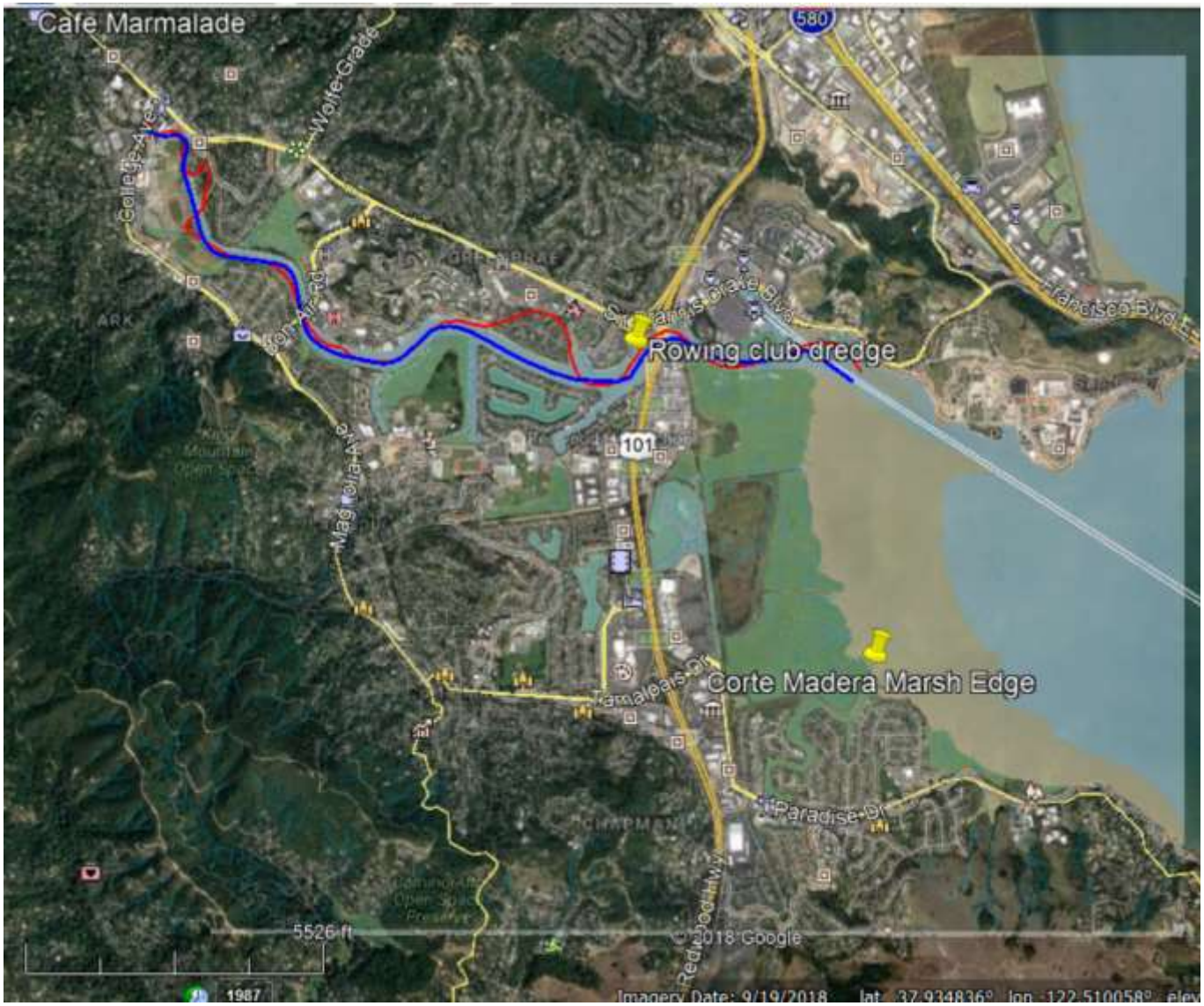
Historic marsh areas 1850 – SFEI EcoAtlas



Modern connected tidal marsh areas – much less so channel is adjusting naturally

Corte Madera Creek Changes

Historic/Modern	Marsh Area (acres)	Channel Length (ft)	Sinuosity
Historic	900	19,214	1.24
Modern	274	17,132	1.15
Change from Historic	Loss of 70% to 80%	Loss of approx. 2,000 lf	

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Original Corps Channel Design …

1. Straightened, deepened and widened the channel
2. Relied on inexpensive dredging to maintain flood capacity
3. Based on earlier understandings of sediment transport and before computer models

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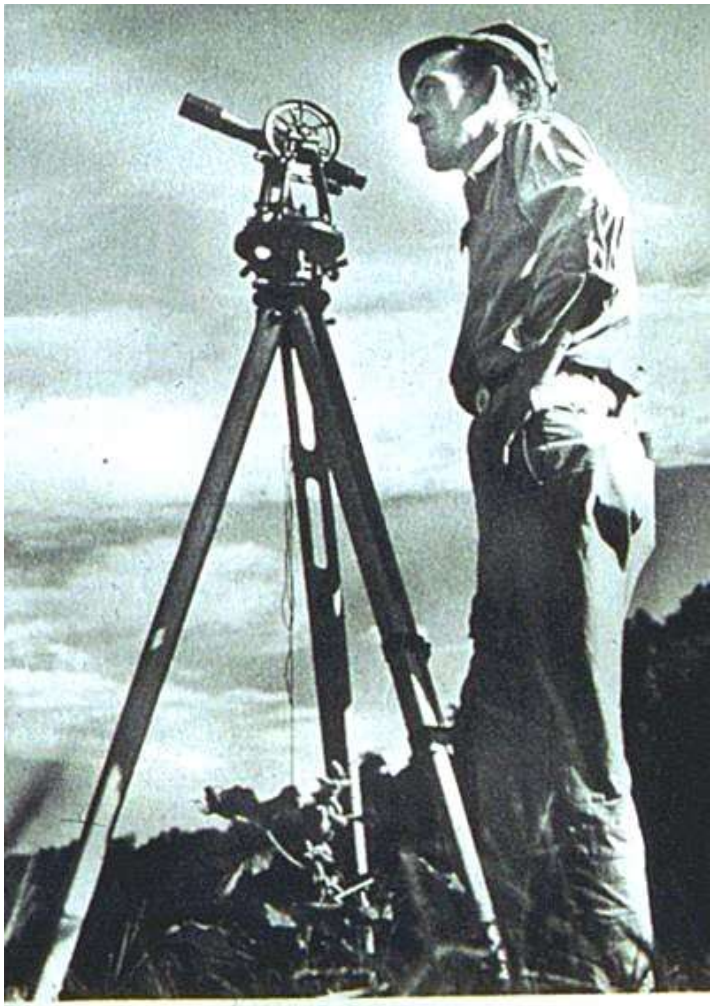
Evolution in Water Engineering …



Engineer, enemy of error.

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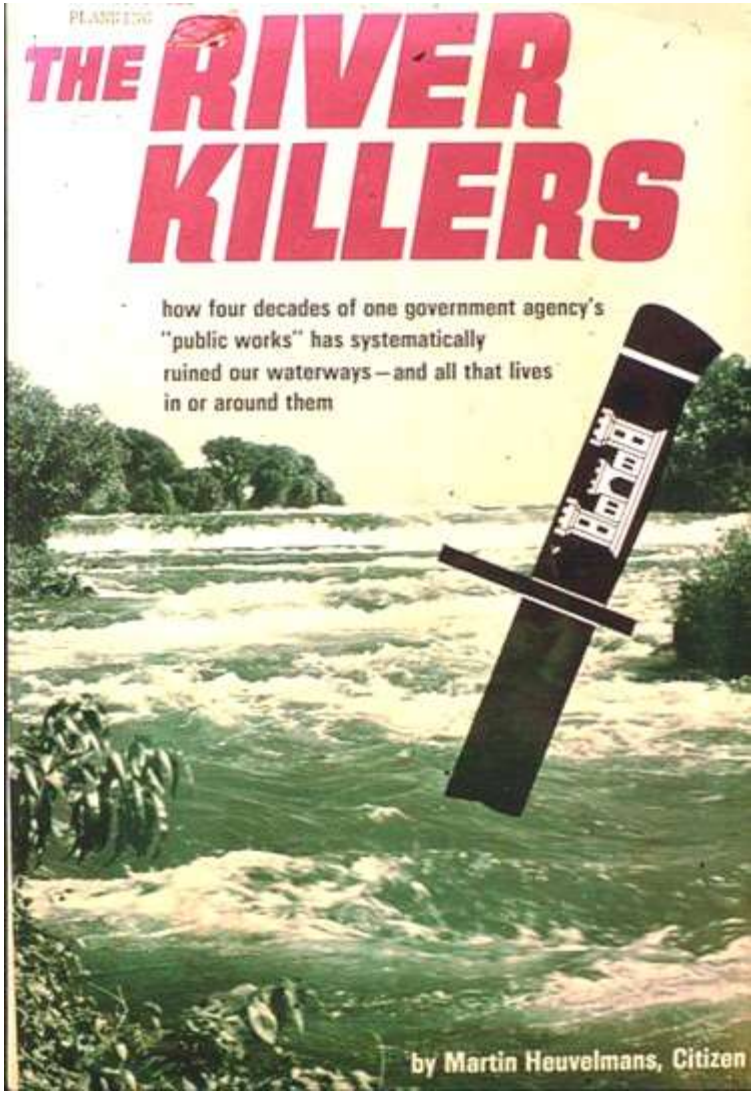
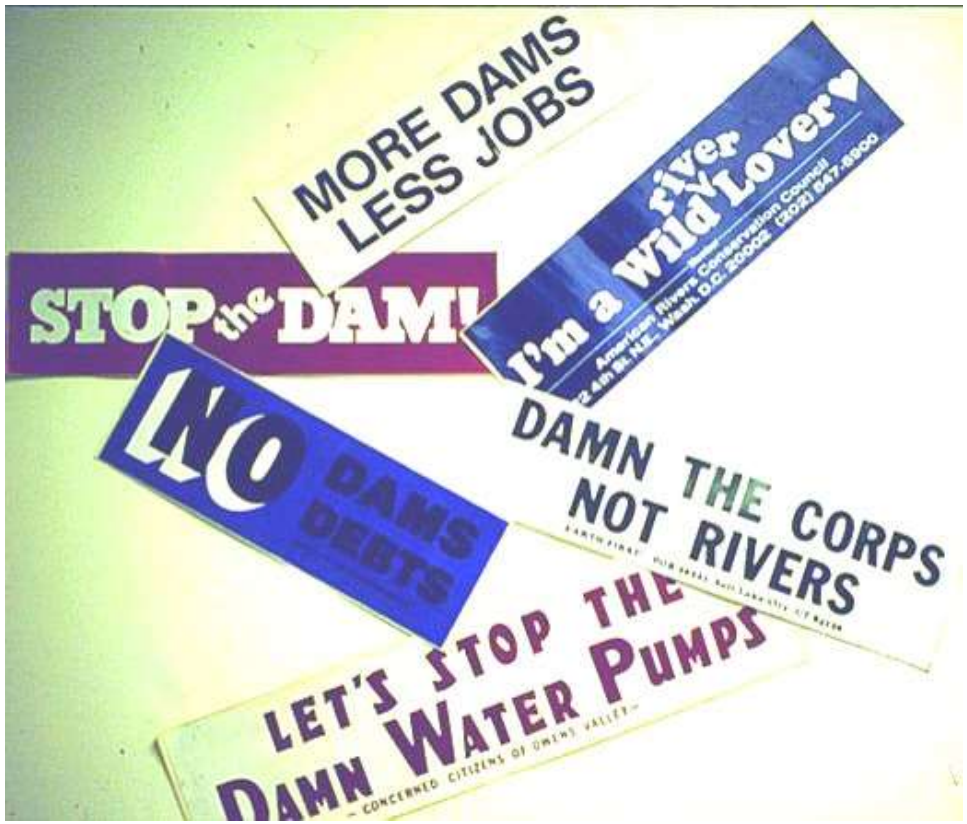
Started to Change in the 1960s and 70s





Modern Engineering – Work with Natural Forces Where Possible

EWN
Engineering With Nature

EWN Initiative + | Proving Grounds | Projects + | Resources + | NNBF +

What is Engineering With Nature?

The U.S. Army Corps of Engineers (USACE) Engineering With Nature (EWN) Initiative enables more sustainable delivery of economic, social, and environmental benefits associated with water resources infrastructure. EWN is the intentional alignment of natural and engineering processes to efficiently and sustainably deliver economic, environmental, and social benefits through collaborative processes. EWN is a cross-cutting program of activities resulting from collaborations among multiple Civil Works Research, Development and Technology programs and non-USACE partners.

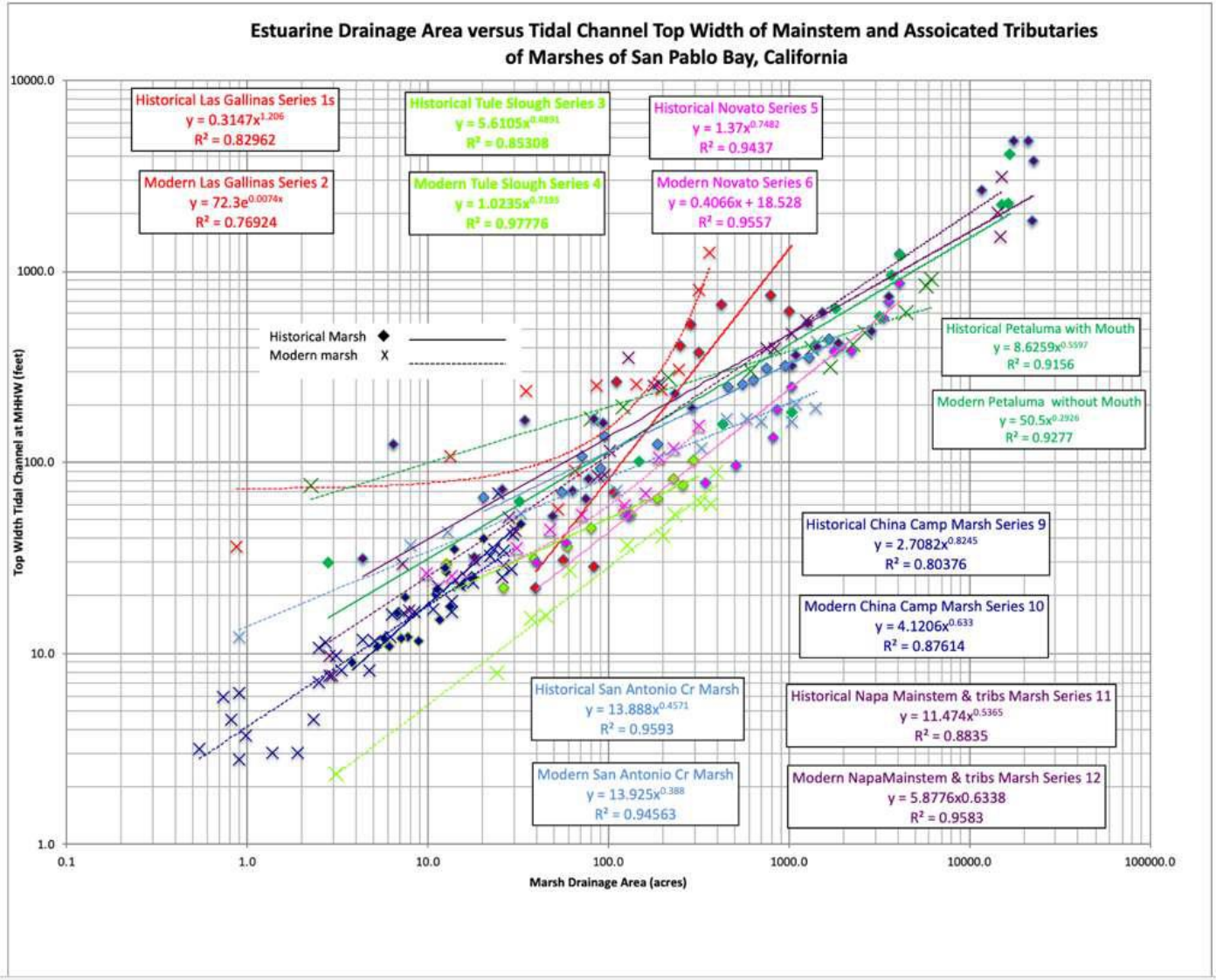
https://ewn.el.erdc.dren.mil/

Science Based Design
The Geodredge Updated Design Curves…

- Series of plots of width, depth and area to connected tidal marsh area (tidal prism)
- Prior plots developed in 2002 and lumped all types of marshes into single plots
- Marin geodredge project spent two years developing new plots in great detail for large fluvial-tidal channels – the ones that get dredged (*Coyote, ACMdP, CM, SR Canal, Gallinas, Novato…)*

MARIN COUNTY FLOOD CONTROL

One of Many New Design Curves



Channel Low Tide Video

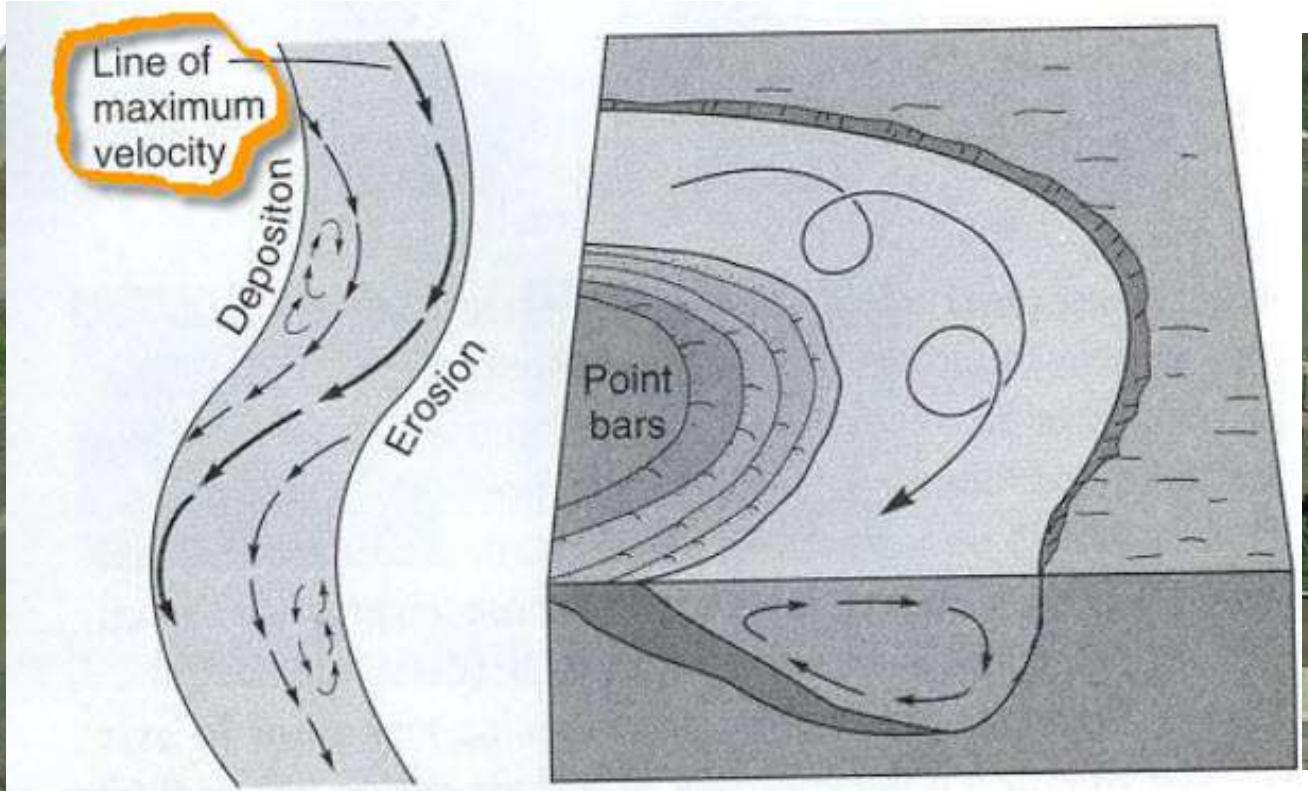
See https://vimeo.com/338094636 to view video

MARIN COUNTY FLOOD CONTROL

Applied to Corte Madera Creek

Draft geomorphic dredge concept design for Corte Madera Creek (inner green lines)

Why There Is Deeper Water At The Inside of Channel Bends



Helical flow in a meander.

ncy of
e inner
deeper
part of creek at outer part of the bend

Range of Conceptual Design Construction Costs ($) – Geomorphic Dredge (Earthen Channel to Bay)

Dredge Option	Quantity	Unit Cost	Cost (2019 $)	Notes
Geomorphic Dredge of Corte Madera Creek Channel	90,000 cubic yards (note: high end estimate of volume)	~$35/cubic yards (low end) to ~$60/cubic yard (high end)	~$3.15M (low end) to ~$5.4M (high end	Assumes the higher quantity geodredge option with dredging occurring from about Lot 13 (College of Marin parking) down to the Bay (Drakes Cove Road). Includes overdredge volume of approximately 26,000cy for constructability side slopes and one foot overdepth

Costs are preliminary and for comparison between alternatives. Constructability constraints and associated costs not fully explored under conceptual design and may impact final costs.

(1) Unit Costs includes design, permitting, mob/demob, construction monitoring and a 25% contingency. Actual costs may vary substantially under future bidding conditions

(2) Assumes dredge sediments are suitable for disposal off-shore at DODS. Dredging is assumed as clamshell and barge. Hydraulic dredging and local disposal option costs may be very different. Barge access may significantly impact costs.

Summary - Why consider a geomorphic approach to dredge design?

1. Channel should be more self-sustaining and require less frequent dredging
2. Easier to permit and less mitigation costs
3. Possible grant funding opportunities? (unknown)
4. Less volume = less often = less costly lifecycle

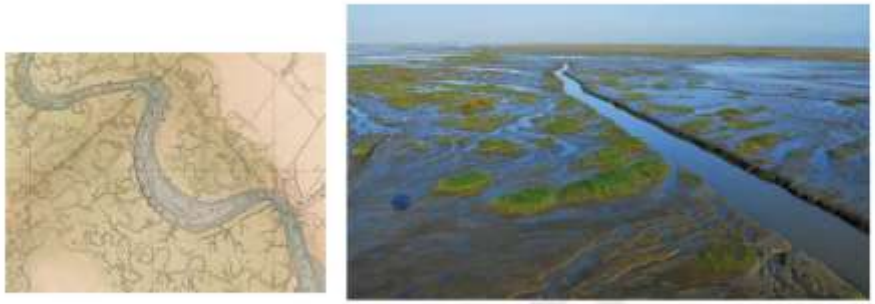
However the trade-off is *less* depth and width and may not dredge next to structures – flood protection and navigation are not specific design goals – may not meet community goals for a dredging project

MARIN COUNTY FLOOD CONTROL

Next Steps…

- Further develop concept plans
- Prepare grant ask for Measure AA in Fall?
- RWQCB is supportive of combined geodredge with beneficial reuse project – grant funding?

INCOMPLETE DRAFT- NOT AVAILABLE



Updated Hydraulic Geometry for North and Central SF Bay Tidal Channels: Application to the Geomorphic Dredge and Tidal Channel Restoration Design

DRAFT NOT AVAILABLE

xxxxx 24, 2018

Roger Leventhal, P.E.
County of Marin
San Rafael, CA

Laurel Collins
Watershed Sciences
Seattle, WA

Title Page of Not Yet Completed Report

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Lower Corte Madera Creek Improvement Study

Goals:

1. Evaluate current flood capacity and assess need for improvements
2. Based on need, develop potential scenarios for improved capacity that consider future sea level rise

Lower Corte Madera Creek

MARIN COUNTY FLOOD CONTROL

Lower Corte Madera Creek Improvement Study

Completed:

- Bathymetric Survey
- Updated Hydraulic Modeling
- Geotechnical Exploration
- Levee Assessment

In Process:

- Develop and Evaluate Alternatives for Flood Mitigation Improvements

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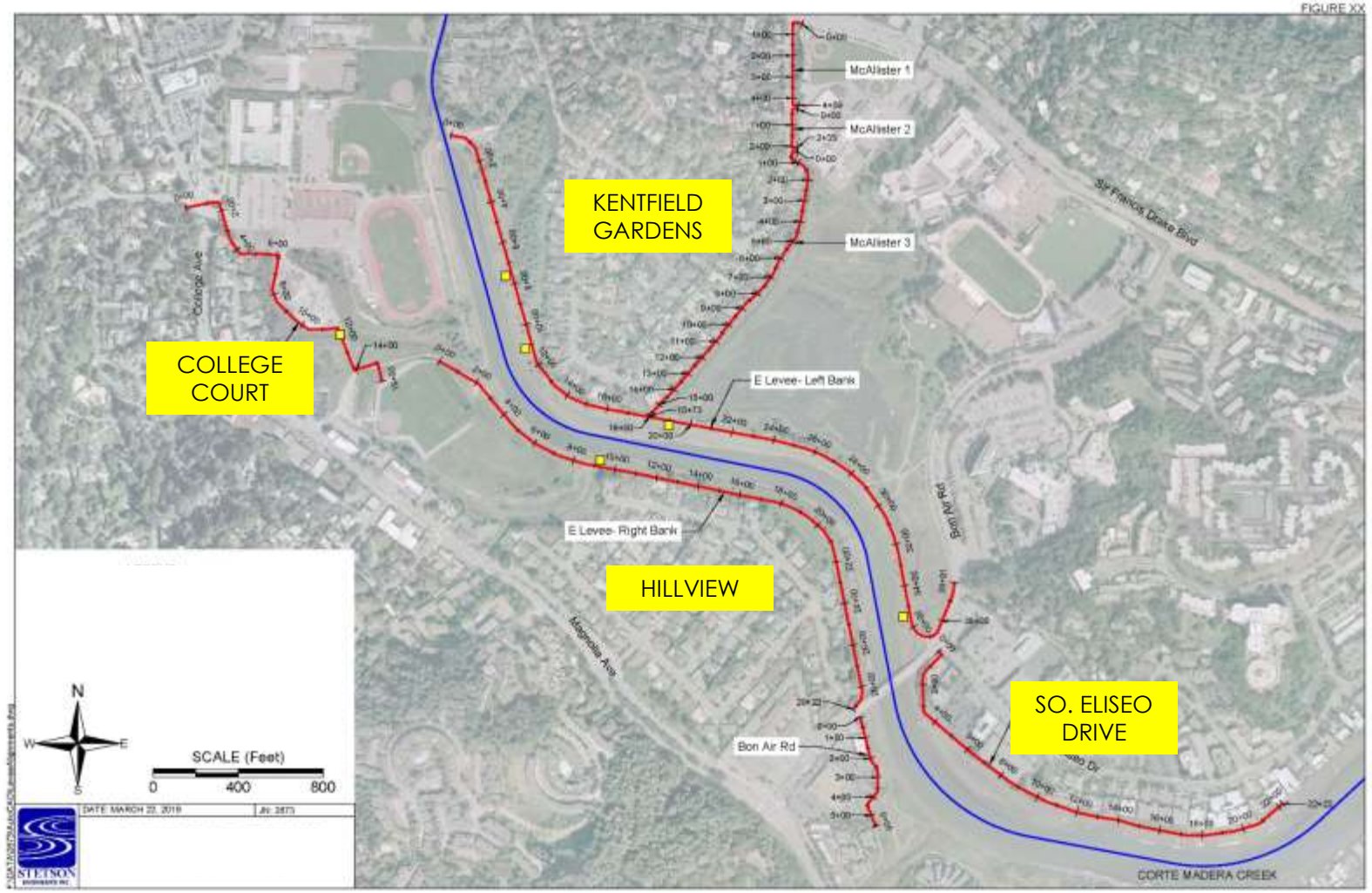
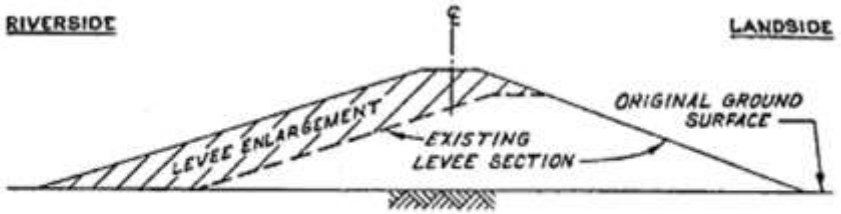
Alignments for Analysis



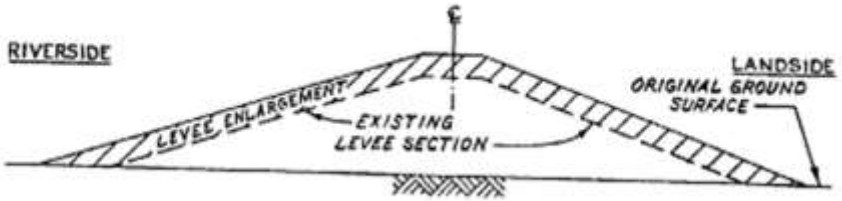
MARIN COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT

Potential Flood Mitigation

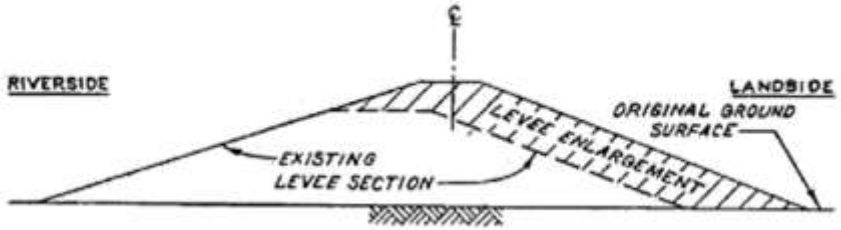
Levee Enlargement



a. Riverside levee enlargement



b. Straddle levee enlargement



c. Landside levee enlargement

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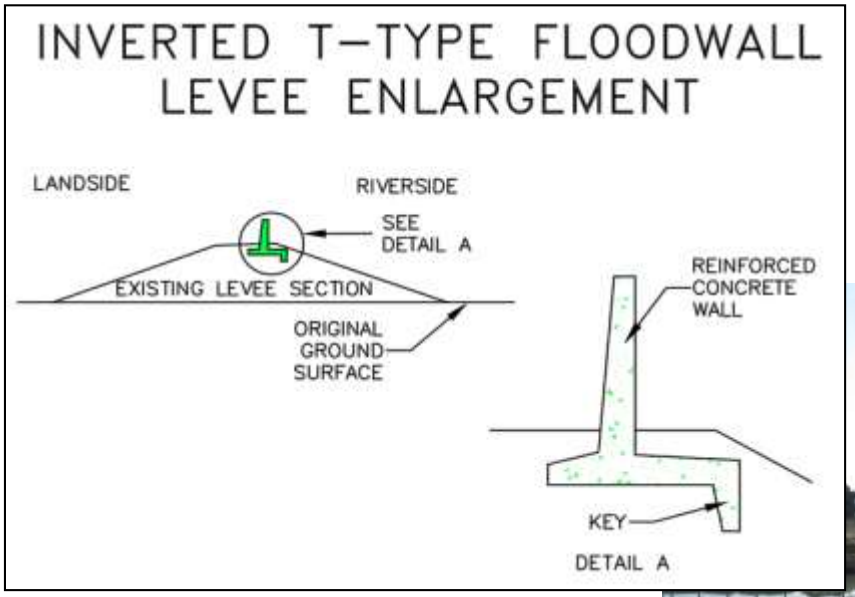
Potential Mitigation

Examples of Concrete Flood Walls



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Potential Flood Mitigation

Examples of Sheet Pile Flood Walls

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Next Steps

- Complete alternatives assessment
- Present to community in workshop setting
- Publish study
- Seek grant funding to implement

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Hillview Pump Station & Stormdrainage Project

- Portion of neighborhood in 100-year flood plain (FEMA Zone AE)
- Existing system is gravity drained and during high tides reverses flow (drains back towards homes)
- Outfalls in Corte Madera Creek subject to sedimentation

Harvard Dr, Larkspur, 2017

- Options to improve/reduce in-creek maintenance?

MARIN COUNTY FLOOD CONTROL

Hillview Outfalls

Hillview Outfalls

Hillview Alternatives Evaluated/Studied:

Alternative 1

- Eliminates most outfalls to Corte Madera Creek
- Redirects portion of 10-year storm flows including from Skylark Dr to pump station

Alternative 2

- Similar to Alternative 1 except redirects all 10-year storm flows to new Bon Air Rd pump station (Skylark drainage line remains as is),
- Drainage lines extended on Dartmouth and Tulane to Harvard Dr

Alternative 3

- Adds proposed new storm drainage line within creek bank behind backyards of Harvard Drive homes
- Avoids street impacts, likely triggers environmental complications / added costs from creek impacts & future monitoring

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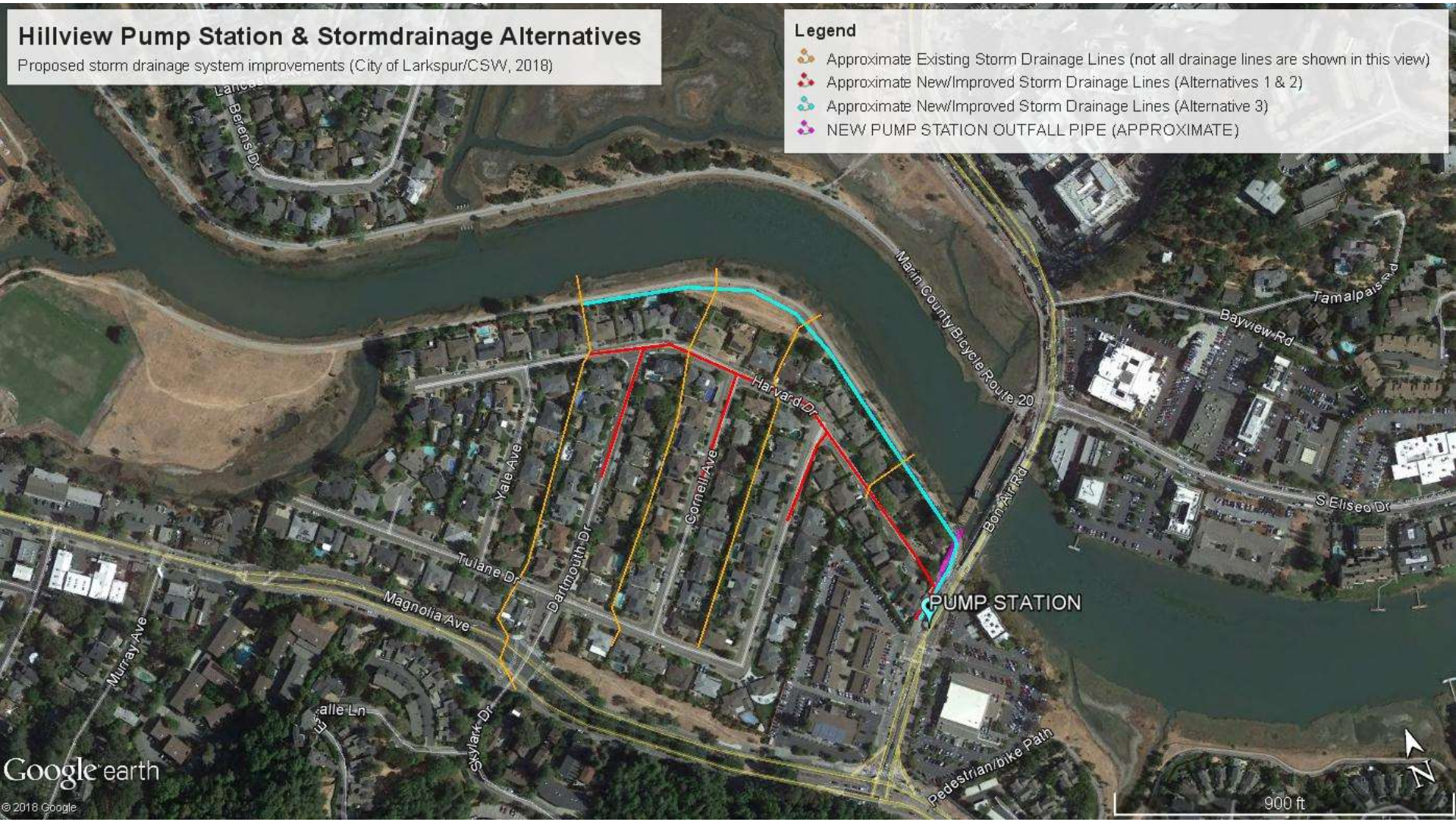
Hillview Pump Station & Stormdrainage Project



Hillview Pump Station & Stormdrainage Project

Budget/Schedule

- Zone9 FY 19/20 approved up to $910k through construction planning (initial concept/study funded in part by Zone 9 up to $42,000)
- City funded portions including through FHWA Bridge funding administered through Caltrans and future paving following project
- Complete PS&E in FY 19/20, construct FY 20/21

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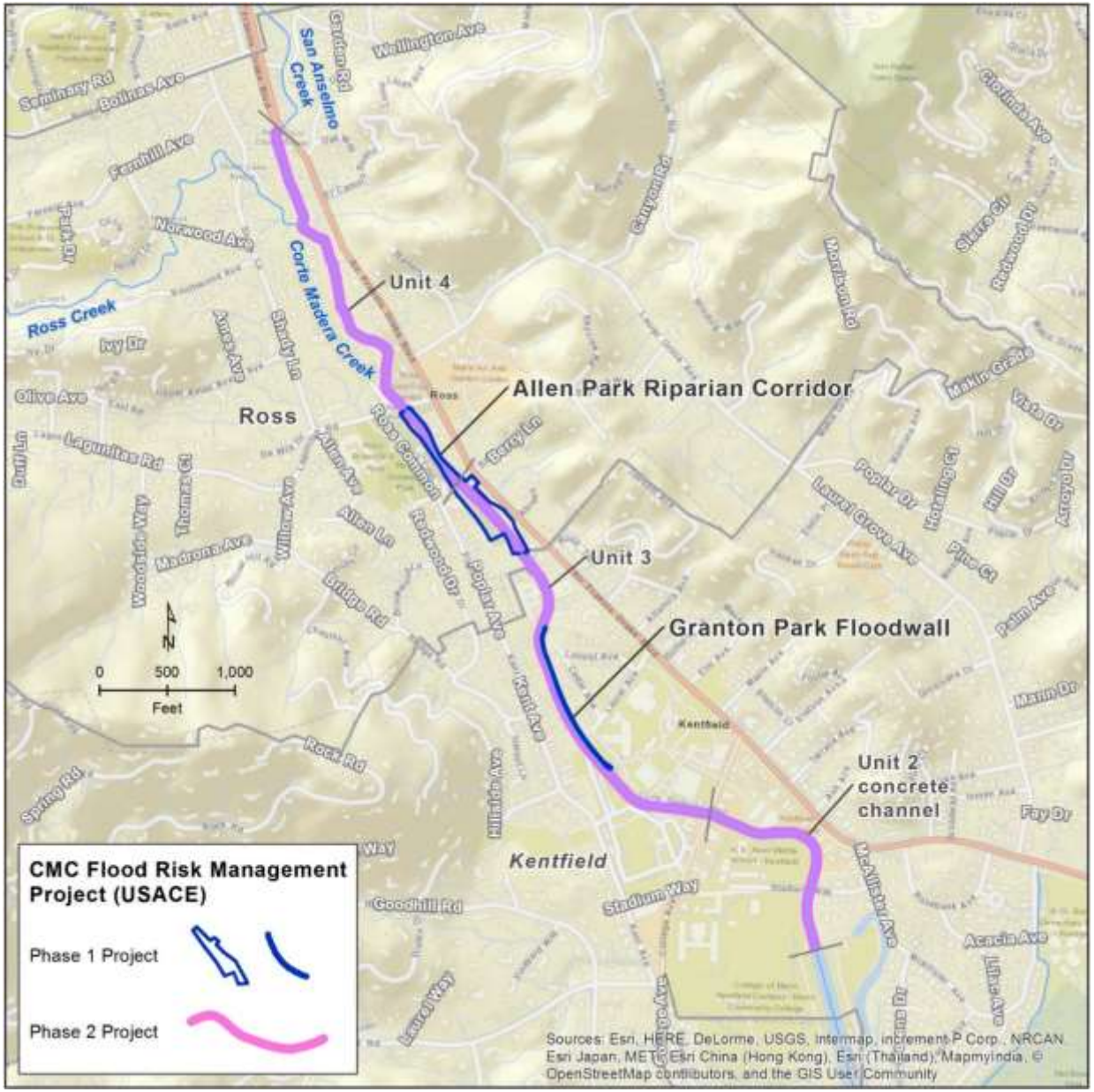
Corte Madera Creek Flood Risk Management Project



Corte Madera Creek Flood Risk Management Project

Next Steps Underway

1. Since March 2019 AB recommendation, District staff working with USACE to suspend feasibility cost share agreement.
    - Staff will present at June/July District Board of Supervisor meeting to finalize action.
2. Working with Town of Ross, environmental resource agencies and other stakeholders to develop refined project concept and tentative schedule including new CEQA process.
    - Conducting technical analysis to support project description.

Technical Studies Underway

1. Concrete Channel Condition Assessment

   April 2019 – June 2019

2. Property Boundary Survey

   May 2019 – July 2019

3. Technical Analysis and Alternatives Evaluation

   June 2019 – Sept 2019

Tentative Project Schedule (Date Subject to Change)

June/July 2019	Formalize Suspension of USACE-District Feasibility Cost Share Agreement at District BOS
Sept 2019	Project Description Developed (Preliminary Technical Studies Complete)
Sept - Oct 2019	Present Project Description at Community Meetings & MOA with Town of Ross for Ongoing Collaboration
Oct - Dec 2019	Project EIR – Notice of Preparation, Scoping Period & Public Hearing
Apr - May 2020	Draft EIR Complete, Public Comment Period & Public Hearing
Aug - Sept 2020	Final EIR Complete, Public Comment Period, Public Hearing and Certification
Oct 2020	Final Design Contract &Construction Agreements with Town of Ross
Sept 2020 - Apr 2021	Final Design & Permitting
Oct 2021 - Oct 2022	Construction

Questions

Sign up for email alerts about meetings and program updates at **www.RossValleyWatershed.org**