CORTE MADERA CREEK
FLOOD RISK MANAGEMENT
PROJECT

Public Meeting

Marin County Flood Control District
and U.S. Army Corps of Engineers,
San Francisco District
August 22, 2016
Meeting Agenda

1. Presentation
2. Questions
3. One-on-One at Displays
4. Ways to comment during or after this meeting
   - Submit a comment card at this and future community meetings.
   - Submit written comments by mail to:
     Kelly Janes, Project Planner
     Department of the Army, U.S. Army Corps of Engineers, San Francisco District
     1455 Market Street, 17th Floor, San Francisco, CA 94103
   - Submit written comments by fax to (415) 503-6692
   - Submit written comments electronically to:
     Kelly Janes, Corps Project Planner: kelly.a.janes@usace.army.mil
     Hugh Davis, Marin County Flood Control & Water Conservation District Project Manager: hdavis@marincounty.org
THE PROGRAM

MULTIPLE BENEFITS

• REDUCE FLOOD RISK
  – Support safer, healthier, and more resilient communities
  – Maintain access to essential services during and after storms

• IMPROVE COMMUNITY ASSETS
  – Enhance recreational access
  – New pathways and trails

• ENHANCE THE ENVIRONMENT
  – Creek and wetland habitat
  – Fish passage
  – Water quality

• BUILD PARTNERSHIPS
ROSS VALLEY FLOODING: WHAT WE ARE DOING ABOUT IT

POSSIBLE TOOLS TO REDUCE FLOODING

**Reduce Flow**
- Detention
- Green Infrastructure

**Increase Capacity**
- Flood Flow Containment
- Bridge Replacements
- Channel Maintenance

**Prepare for Flooding**
- Community Rating System
- And Local Hazard Mitigation Planning
FLOOD PROTECTION PROGRAM ELEMENTS

WHICH PROJECTS HAVE WE IDENTIFIED TO REDUCE FLOOD RISK?
What We Have Heard

**NEIGHBORHOOD CONCERNS:**

- **Dredging**
- **Tidal effects**
- **Loss of vegetation**
- **Sea level rise**
- **Access to creek**
- **Natural channel**
- **Floodwall heights**
- **Detention basins**
- **Interior drainage**
- **Operation and maintenance**
KEYTAKE AWAYS

1. Problem: Breakout Flooding in Ross, Larkspur, of Kentfield and Greenbrae

2. Project Goals:
   - Reduce risk to human life and safety
   - Reduce damages due to flooding

3. Not a piecemeal project. Using a Watershed Approach, meaning this project is one interdependent piece.

4. Collaborating with the Resource Agencies for an environmentally-sensitive project.

5. The Corps is providing a large portion of the funds to study and construct.

6. The Corps has a very regimented process to identify the project with the HIGHEST NET BENEFITS = measures the total Federal Investment.

7. We can choose a LOCALLY PREFERRED PLAN that your input can help create.

8. The Public is a part of the project process, and we want your input.
**CORPS PROJECT PROCESS**

**We are HERE**

- Compare alternative conceptual plans
- Identify the basis for federal investment (National Economic Development Plan = NED and)
  - any Locally Preferred Plan (LPP)
- Select a plan

- Refine the designs for the selected plan

- The Corps pays up to 65% of the cost

- 100% local costs

Congress must Authorize project construction and provide Appropriations to build

COUNTY OF

MARIN
THE PROBLEM: FLOODING IMPACTS OUR COMMUNITIES

~20,000 people at risk of being flooded

Over 400 structures at risk worth total value of ~$300M

Inundation due to creek overflow

<table>
<thead>
<tr>
<th>Number of Inundated Parcels</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Corte Madera</td>
<td>0</td>
</tr>
<tr>
<td>Fairfax</td>
<td>162</td>
</tr>
<tr>
<td>Greenbrae</td>
<td>8</td>
</tr>
<tr>
<td>Kentfield</td>
<td>128</td>
</tr>
<tr>
<td>Larkspur</td>
<td>59</td>
</tr>
<tr>
<td>Ross</td>
<td>224</td>
</tr>
<tr>
<td>San Anselmo</td>
<td>579</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1160</strong></td>
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</table>
POSSIBLE TOOLS FOR FLOOD REDUCTION

This study is focusing on

Reduce Flow
- Detention
- Green Infrastructure

Increase Capacity
- Flood Flow Containment
- Bridge Replacements
- Channel Maintenance

Prepare for Flooding
- Community Rating System
- And Local Hazard Mitigation Planning

And Local Hazard Mitigation Planning
FEMA Floodway (2016)
FEMA 100-Year Flood Plain (2016)
(Special Flood Hazard Area)
Creek
PROJECT CONSTRAINTS:
DEVELOPMENT ON THE BANKS OF THE CREEK
PROJECT CONSTRAINTS:
FLOW CAPACITY AT LAGUNITAS BRIDGE (CFS)

5,500 cfs capacity (4% ACE) was identified by the community as able to meet their concerns.

Old

5,400 cfs capacity (4% ACE) was identified by the community as able to meet their concerns.

New

>6,900

>6,900

5,500 cfs

~4,000

~4,000

>6,900

Corte Madera Creek Federal Flood Risk Management Study Area
OBJECTIVES

To reduce the consequences of flooding on human life and safety

To reduce the risk of flood damages, including critical infrastructure

- Towns of Corte Madera and Ross
- City of Larkspur
- Unincorporated communities of Kentfield and Greenbrae, and
- Other surrounding unincorporated lands.
LOCAL GOALS

Implement environmentally-sustainable flood features consistent with natural geomorphic processes and ecological functions.

Develop flood features which minimize environmental impacts from future O&M actions.
CORPS PLANNING PROCESS

25 structural; 7 non-structural

Measures Screening

13 structural; 5 non-structural

Measure: feature (ex. floodwall) or an activity (ex. evacuation) that can be implemented at a specific geographic site to address flood risk

Measure Screening Criteria:
How well measure achieves objectives?

How costly is the measure?

Is the measure Acceptable under environmental laws and regulations?
NON-STRUCTURAL MEASURES

Flood proof structures

- Waterproof coatings and coverings to ensure water cannot soak through external walls
- Movable barrier to seal openings such as doors
- Other openings such as windows elevated above flood level

Raise structures

- Elevate all activities which are not compatible with water above flood elevation
- Living area elevated above design flood
- Properly anchor all foundations to prevent flood water washing them out and also to avoid flotation of the structure if the flood waters get too high
- Provide openings or break-away wall sections to allow free passage of water

- Real estate acquisition & relocation
- Emergency warning system
- Flood insurance
- Floodplain management (ex. zoning)
<table>
<thead>
<tr>
<th>Measure</th>
<th>Reasoning for Screening OUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bypass channel/Subsurface culvert</td>
<td>Cost: impacts to utilities and infrastructure</td>
</tr>
<tr>
<td>Dams</td>
<td>No viable opportunities in the study area</td>
</tr>
<tr>
<td>Detention basins</td>
<td>Outside the project area</td>
</tr>
<tr>
<td>Remove concrete &amp; widen channel</td>
<td>Cost: requires a tremendous amount of real estate.</td>
</tr>
<tr>
<td></td>
<td><strong>Not feasible</strong>: impacts to public and private infrastructure</td>
</tr>
<tr>
<td>Sediment traps</td>
<td>High environmental impacts</td>
</tr>
<tr>
<td></td>
<td>Cost: High O&amp;M costs</td>
</tr>
<tr>
<td>Change channel alignment</td>
<td>Cost: high real estate costs</td>
</tr>
<tr>
<td></td>
<td>High environmental impacts</td>
</tr>
<tr>
<td>Interior drainage</td>
<td>Does not address breakout flow</td>
</tr>
</tbody>
</table>
RETAINED: STRUCTURAL MEASURES

RAISE EXISTING CONCRETE CHANNEL WALL
RETAINED: STRUCTURAL MEASURES

ROSS COMMON SIDE

BARRIER TO CONTAIN FLOOD WATER

EXISTING EARTHEN CHANNEL

BARRIERS AT TOP OF BANK

EXISTING HOME

BARRIER TO CONTAIN FLOOD WATER

SIR FRANCIS DRAKE BLVD SIDE
RETAINED: STRUCTURAL MEASURES

FLOODWALLS VARIETIES

Concept drawing of removable flood barrier . . .

...and an example of installation

Example of permanent flood wall with access opening that could be closed prior to flood events
RETAINED: STRUCTURAL MEASURES

- **WIDEN FLOODPLAIN AT BIKEPATH**
- **BARRIER TO CONTAIN FLOOD WATER**
- **LOWER EXISTING BIKEPATH**
- **EXISTING CONCRETE CHANNEL**
- **NEW RETAINING WALL**
- **NEW BIKE PATH**

MARIN BUILDING STRONG®
RETAINED: STRUCTURAL MEASURES

CHANNEL WIDENING

BARRIER TO CONTAIN FLOOD WATER

WIDEN EARTHEN CHANNEL

EXISTING EARTHEN CHANNEL

BARRIER TO CONTAIN FLOOD WATER
RETAINED: STRUCTURAL MEASURES

NEW BERM

OFFSET FLOODWALL MAY BE CONSIDERED INSTEAD OF OFFSET BERM
OFFSET BARRIER
(shown in combination with raising / floodproofing homes)

- BARRIER TO CONTAIN FLOOD WATER
- RAISE HOME ABOVE FLOODPLAIN /
  FLOODPROOF
- RAISE HOME ABOVE FLOODPLAIN /
  FLOODPROOF
- EXISTING EARTHEN CHANNEL
- SYLVAN LANE
- SIR FRANCIS DRAKE BOULEVARD

COUNTY OF MARIN

BUILDING STRONG®
## RETAINED: STRUCTURAL MEASURES

<table>
<thead>
<tr>
<th>Action</th>
<th>Action</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remove fish ladder – make smooth transition</td>
<td>Bridge raises</td>
<td>Change bank slope &amp; armor banks</td>
</tr>
<tr>
<td>Remove obstructions (trees, etc.)</td>
<td>Deepen channel</td>
<td>Widen channel (with no added barriers)</td>
</tr>
<tr>
<td>Operations and Maintenance</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COUNTY OF MARIN**

**BUILDING STRONG®**
CORPS PLANNING PROCESS

25 structural; 7 non-structural

Measures Screening

13 structural; 5 non-structural

Formulate Alternatives

10 Alternatives in Initial Array

Screen Initial Array

5 Alternatives Focused Array

Screen Focused Array

National Economic Development Plan
OR Locally Preferred Plan

We are here
STRUCTURAL ALTERNATIVES FORMULATED FOR

Unit 4:
- Upstream of Lagunitas Bridge
- Downstream of Lagunitas Bridge

Units 2-3: concrete channel only
Units 4
(upstream of Lagunitas Bridge)
Widening Alternative

Widen

Legend
- Unit 4 Channel Centerline
- Widening

Section A-A

COUNTY OF MARIN
Units 4 (upstream of Lagunitas Bridge)
Setback Flood Wall Alternative

Off Set Floodwall

FEMA Floodplain

Top of Bank Floodwall

Possibly Raise, Flood-proof, or Buy Out homes in Floodway

Legend
- Unit 4 Channel Centerline
- Offset FW
- Stelson Measure 5 - Widen Channel
- Bridge Transitions
- Existing Sheet Pile
Units 4
(upstream of Lagunitas Bridge)
Top of Bank Flood Wall Alternative

Top of Bank Floodwalls

Legend
- Top of Bank FW
- Unit 4 Channel Centerline
- Bridge Transitions
- Stetson Measure 5 - Widen Channel
- Existing Sheet Pile
- Stetson Measure 4 - Lower Channel Bed

BARRIERS AT TOP OF BANK

ROSS COMMON SIDE

| EXISTING HOME |
| SIR FRANCIS DRAKE |
| BLYD SIDE |

COUNTY OF MARIN

BUILDING STRONG®
STRUCTURAL ALTERNATIVES FORMULATED FOR

Unit 4:
- Upstream of Lagunitas Bridge
- Downstream of Lagunitas Bridge

Units 2-3: concrete channel only
UNIT 4 (downstream of Lagunitas Bridge)
Select Widening and Deepening Alternative

Smooth transition to replace fish ladder

Legend
- Unit 4 Channel Carcature
- Stream Measure 4 - Lower Channel Bed
- Stream Measure 2 & 5 - Upper Channel Bed

Widen
Deepen

Historic Post Office
Corte Madera Creek Flood Control Study

Sections A & B
Section C & C

Building Strong®
34
Unit 4
(downstream of Lagunitas Bridge)
Setback Floodwalls and select Widening Alternative

Top of Bank Floodwalls
Widen

Deepen
Widen/Lower Floodplain

Smooth transition to replace fish ladder

Legend
- Top of Bank FW
- Unit 4 Channel Centerline
- Stetson Measure 4 - Lower Channel Bed
- Stetson Measure 3 - Modify Channel Transition
- Stetson Measure 2 & 5 - Widen Channel

CHANNEL WIDENING

BARRIER TO CONTAIN FLOOD WATER

WIDEN EARTHEN CHANNEL

EXISTING EARTHEN CHANNEL
STRUCTURAL ALTERNATIVES FORMULATED FOR

Unit 4:
- Upstream of Lagunitas Bridge
- Downstream of Lagunitas Bridge

Units 2-3: concrete channel only
Smooth transition to replace fish ladder.

Units 2 & 3: Bench Excavation Alternative.
Smooth transition to replace fish ladder

Top of Bank Floodwall

Units 2 & 3: Flood Wall Alternative

RAISE EXISTING CONCRETE CHANNEL WALL

Barrier to contain flood water

Existing bike path

Offset floodwall may be considered instead of offset berm

NEW BERM
Units 2 & 3: Bench Excavation and Setback Floodwalls Alternative

Top of Bank Floodwall

Bank Excavation and Widening

Legend:
- Unit 3
- Unit 2 Upper
- Retaining / Offset FW
- Top Bank FW
- Offset FW
- Bridge Transitions
- Bike Lane Widening & Deepening
- Sewer Line

WIDEN FLOODPLAIN AT BIKEPATH

BARRIER TO CONTAIN FLOOD WATER

LOWER EXISTING BIKEPATH

EXISTING CONCRETE CHANNEL

NEW RETAINING WALL

NEW BIKE PATH

NEW BIKE PATH

NEW RETAINING WALL
RETAINED ALTERNATIVES

Unit 4:
• Top of bank floodwalls
• Select Setback floodwalls along Sylvan Lane
• Select Widening/Floodplain Lowering

Units 2&3:
• Raise existing floodwalls along entire concrete channel
• Combined raised floodwalls and bank excavation/lowering bike path
• Offset flood barriers in select locations
TIMELINE FOR PUBLIC INVOLVEMENT

**Alternatives Formulation and Comparison**

**Select Plans (NED/LPP)**

**Targeted Stakeholder meetings, creek walks, town halls, etc.:** Public provides informal input on proposed alternatives as they get fleshed out and help identify key issues.

**Public Review of Draft Environmental Document**

**Community Meeting:** inform the community on the feasibility study process and conceptual alternatives.

**Community Meeting:** Results of Targeted Meetings

**Town Hall with Congressman Huffman**

**We are HERE**

**Key:**
- Black = Informal consultation with the Public
- Green = Formal consultation required by NEPA & other environmental regulations

* Public Involvement continues during the design and construction phases.
Presentation and Meeting Materials will be provided on Project website:
http://www.marinwatersheds.org/documents_and_reports/USACECorteMad
eraCreekProject.html

WAYS TO COMMENT

• Submit a comment card at this and future community meetings.
• Submit written comments by mail to:
  Kelly Janes, Project Planner
  Department of the Army, U.S. Army Corps of Engineers, San Francisco
  District 1455 Market Street, 17th Floor, San Francisco, CA 94103
• Submit written comments by fax to (415) 503-6692
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  Hugh Davis, Marin County Flood Control & Water Conservation District
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