WOODARD &CURRAN

Upper Petaluma Flood Control Project

SCWA Flood Control Zone 2A Update

January 10, 2019

SONOMA COUNTY WATER AGENCY

Balance Hydrologics, Inc.

COMMITMENT & INTEGRITY DRIVE RESULTS

Agenda

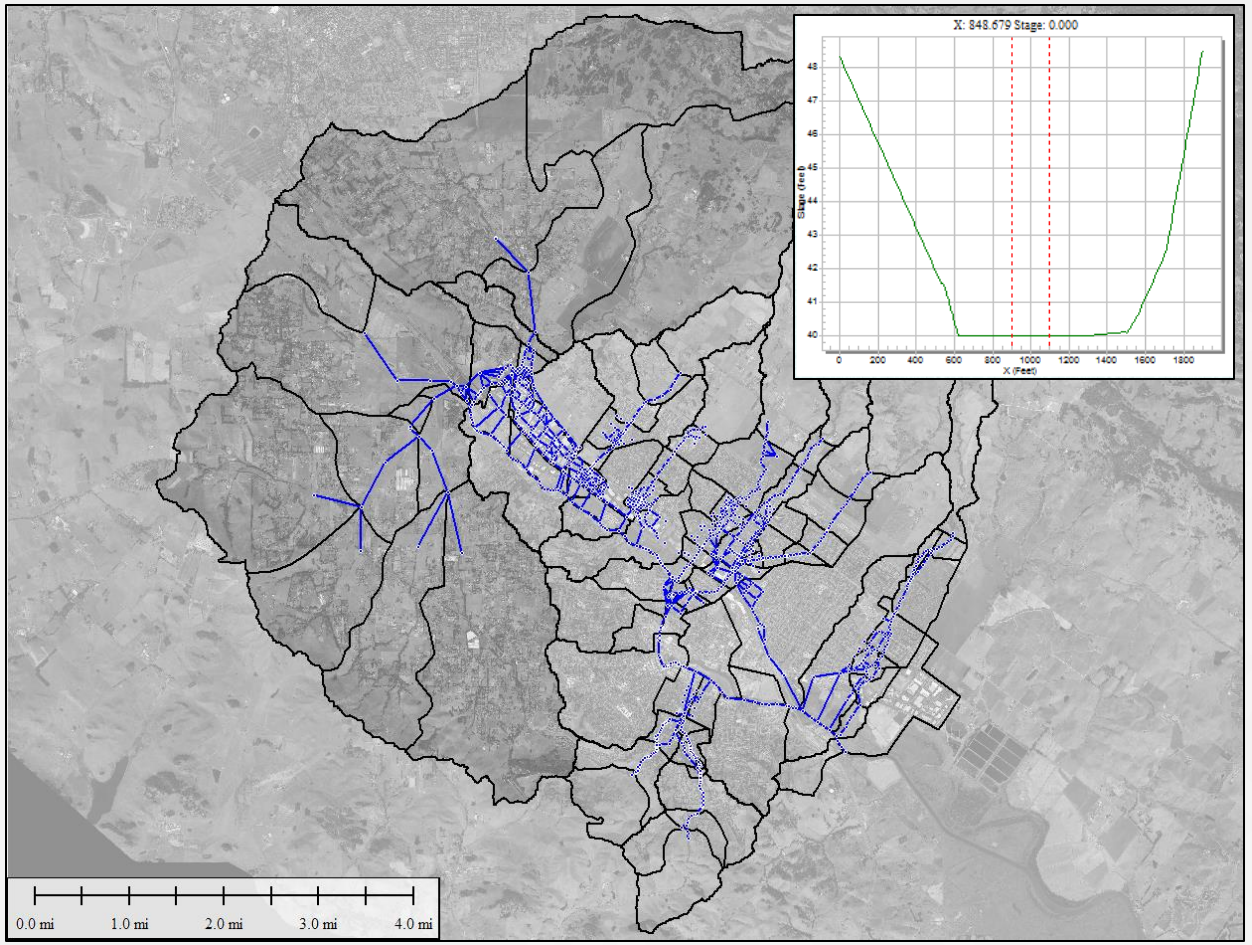
- Project Background
- Model Build and Calibration Overview
- Basin Selection for Concept Screening
- Next Steps

Project Background

- Overall goal of building and calibrating a refined hydrologic/hydraulic model of the upper Petaluma River watershed
  - Improve spatial resolution and level of detail
  - Maintain consistency with past work by the City and the currently-effective FEMA modeling approach
- Use the refined model to screen flood control concepts
  - Identify tributaries to compare and contrast concept effectiveness (on going)
  - Complete screening runs and concept scoring (next step)

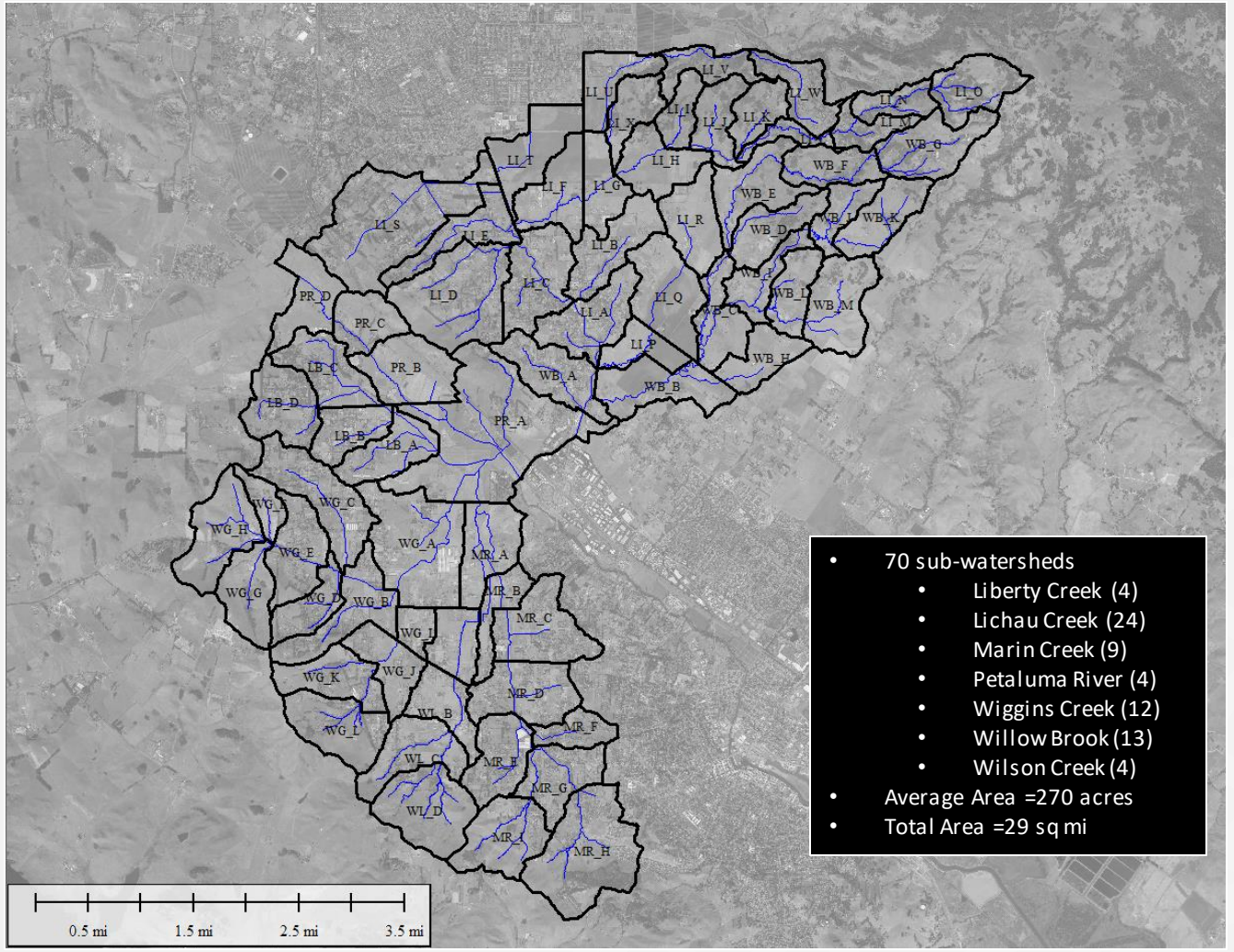
Project Background

- Existing model
  - XPStorm platform
  - Limited number of upstream sub-watersheds
  - Limited upstream channel length
  - Channels actually represent floodplains



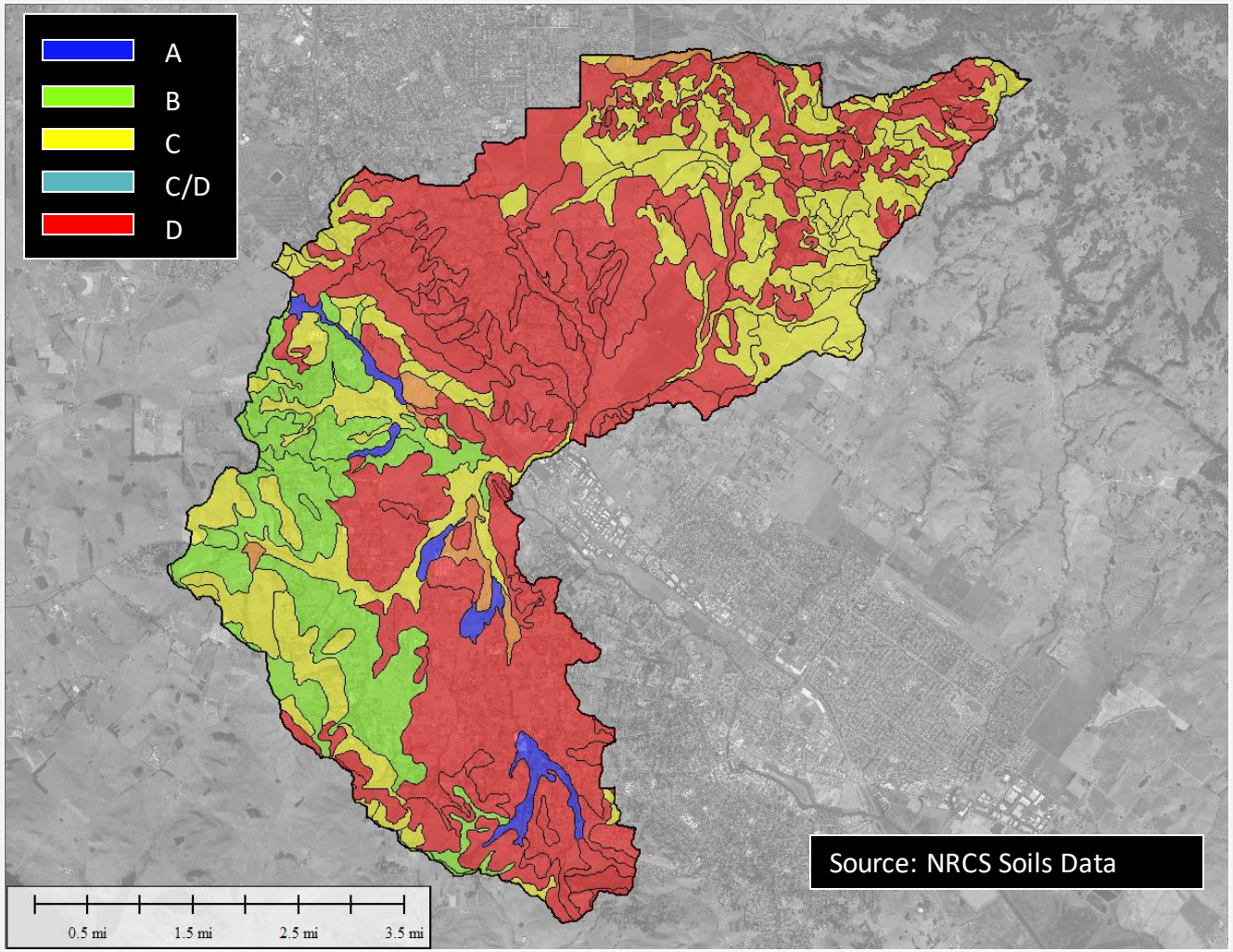
Project Background

- Hydrology
  - Significantly more sub-watersheds
  - More uniform size
  - Capture key points of flow concentration
  - Use same design and calibration storms as FEMA modeling



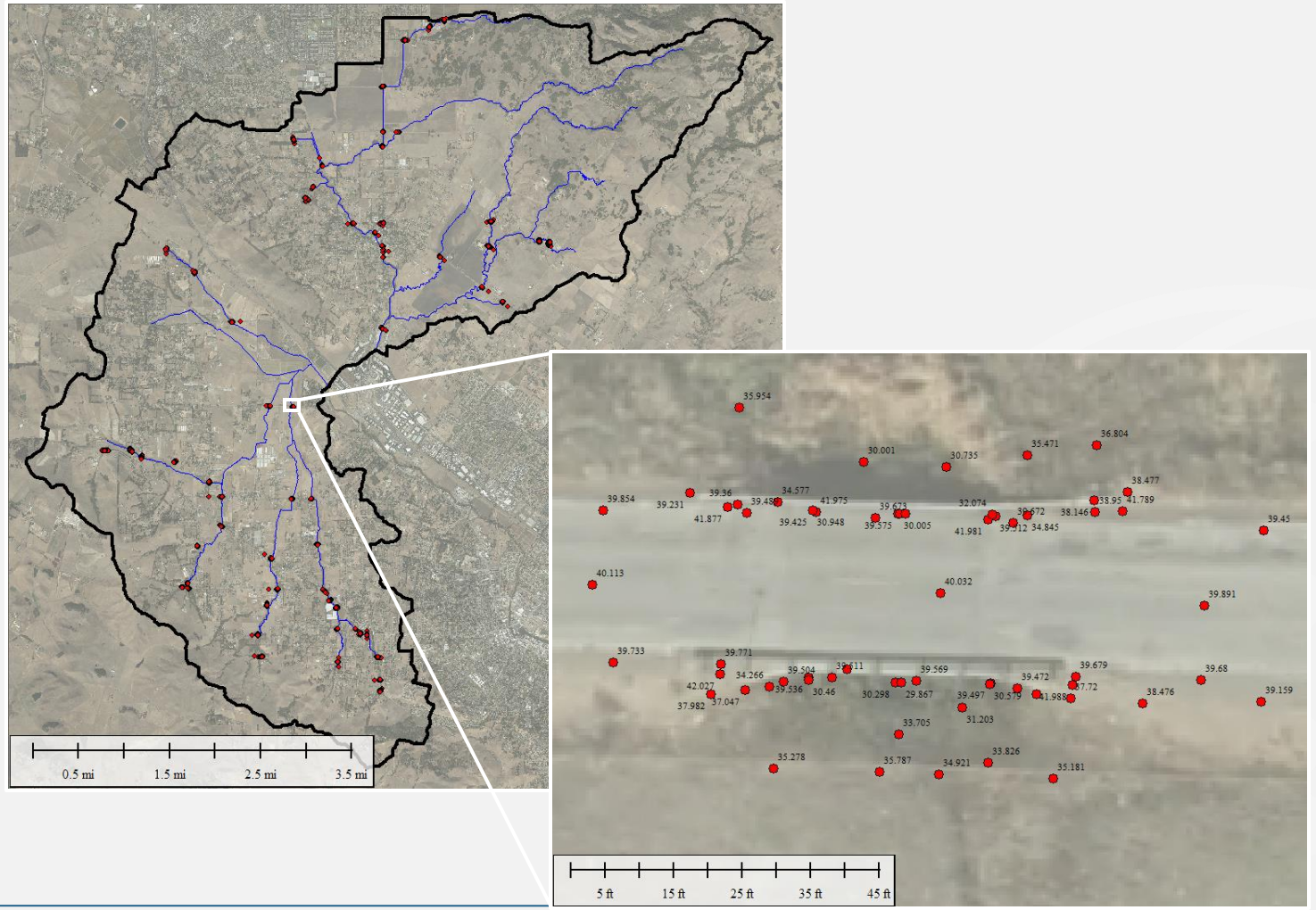
Project Background

- Hydrologic parameters
  - Soil group
  - Land use
  - Impervious cover



Project Background

- Survey work
  - Extensive supplemental work at crossings
  - High-definition representation of flow barriers

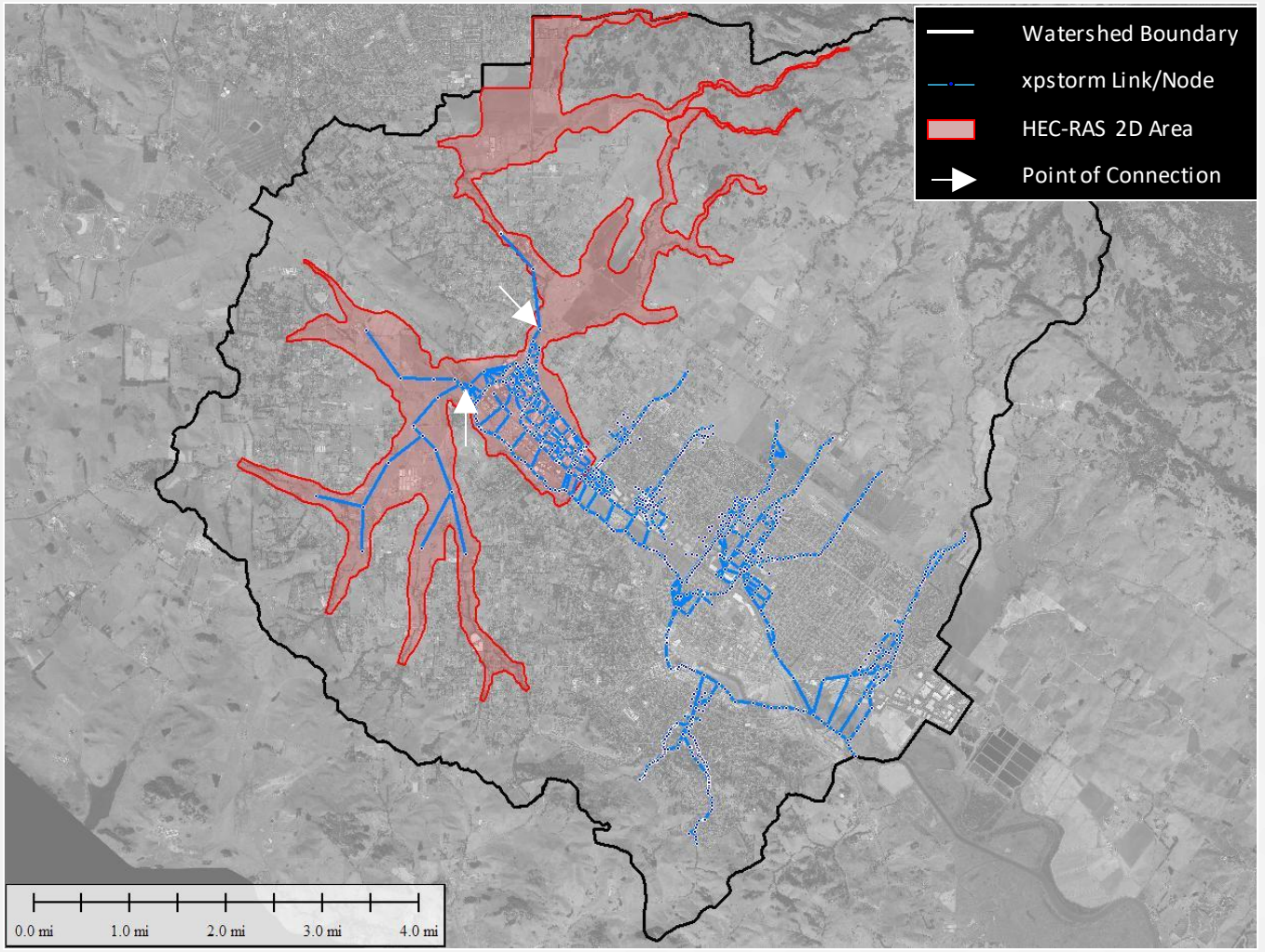


Model Build and Calibration Overview

- Hydraulic modeling using U.S Army Corps HEC-RAS
  - Develop digital elevation model
  - 2-d model build
  - Boundary conditions for continuity with downstream modeling
- Calibration runs
  - Use same calibration storms as with City/FEMA modeling
  - Compared peak flow, total volume, and timing of peak

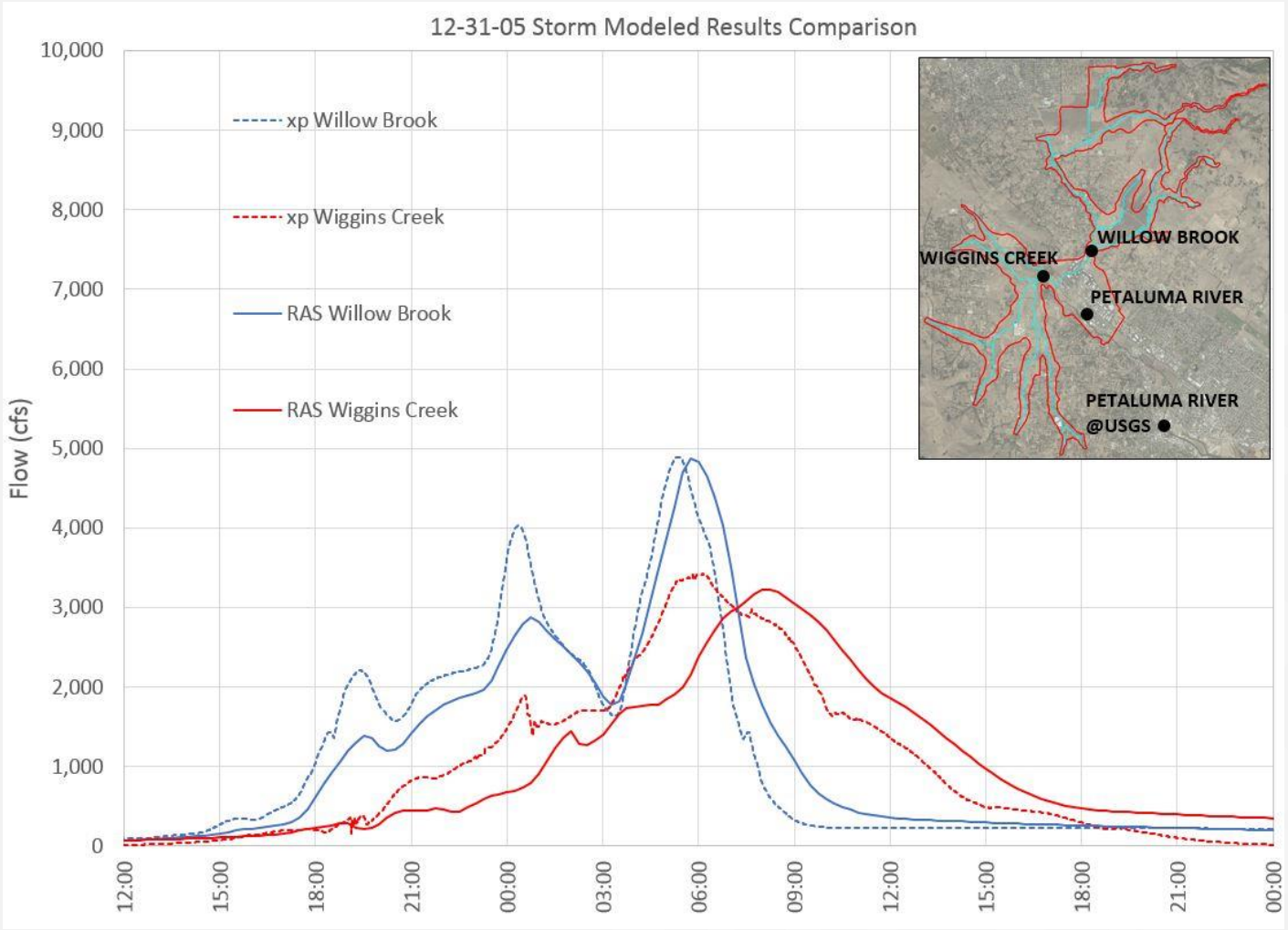
Model Build and Calibration Overview

- HEC-RAS model
  - Extensive 2-d grid covering all major channels and floodplains
  - Points of connection to the existing downstream model for both the north and south tributaries
  - Overlap with the downstream model for connection point fidelity



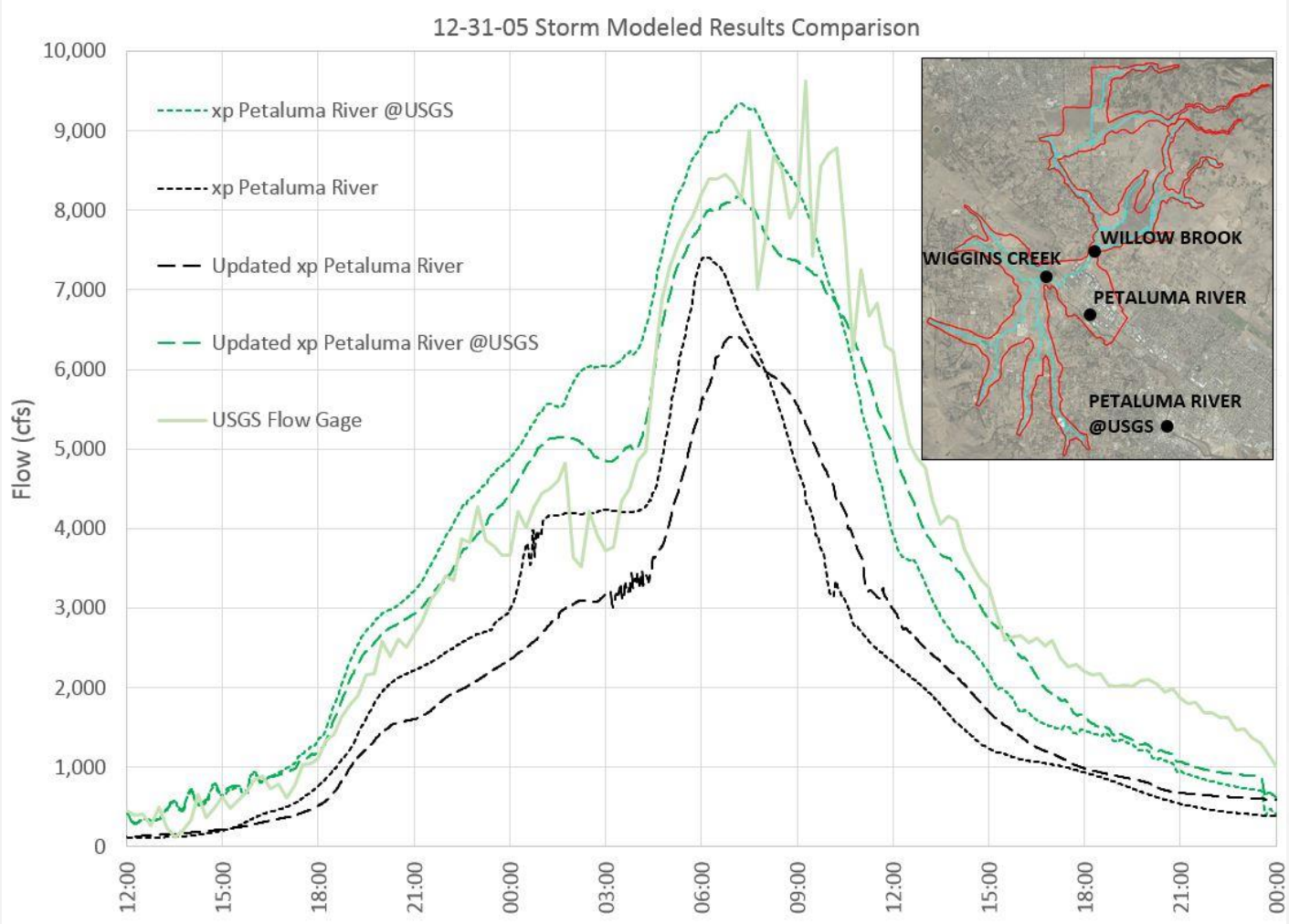
Model Build and Calibration Overview

- Model comparisons
  - North side: similar peak flow and timing, but less early storm flow
  - South side: significantly greater existing floodplain storage results in lower peak and markedly different time of peak



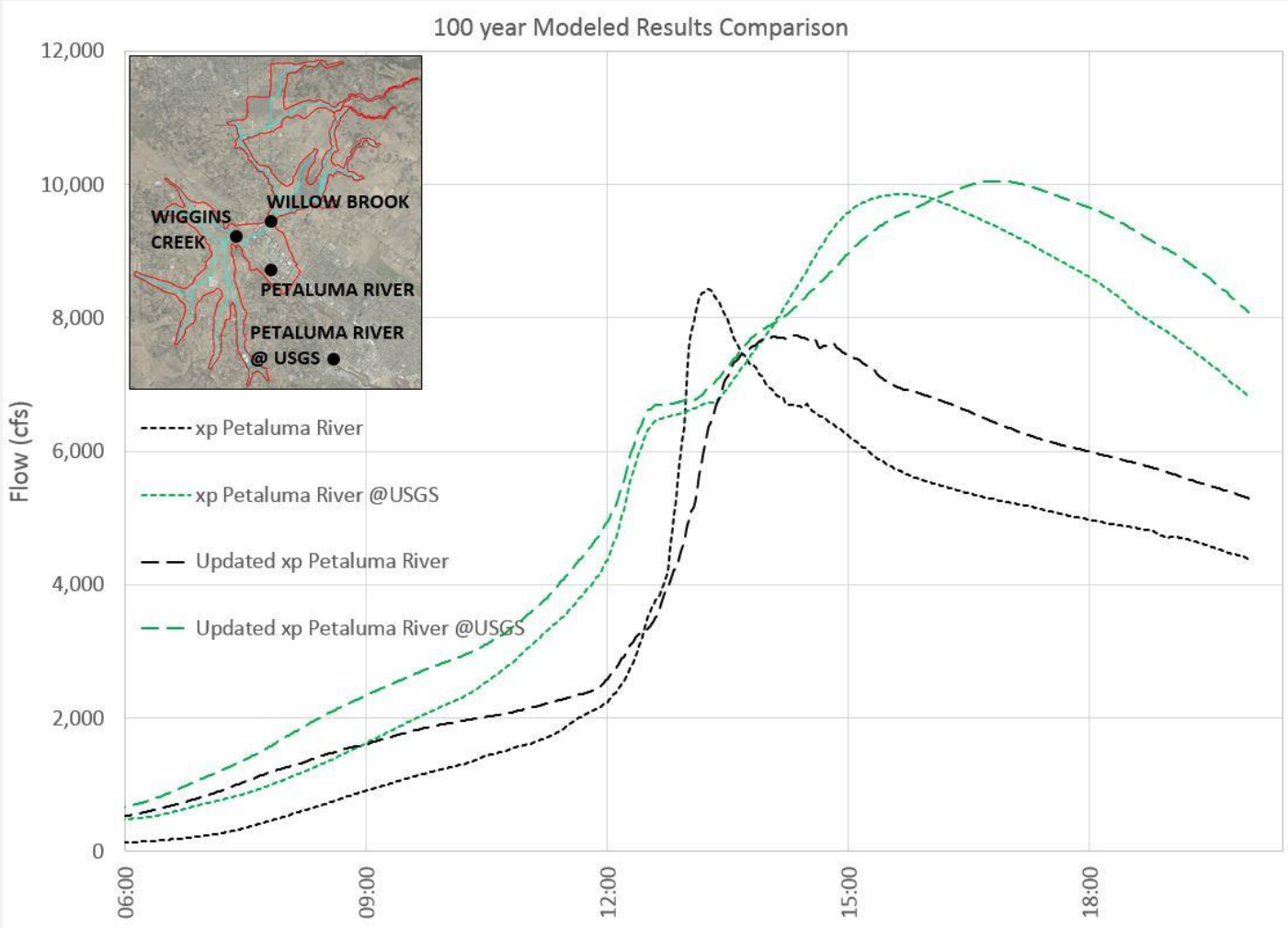
Model Build and Calibration Overview

- Downstream calibration
  - Upper mainstem: significantly lower peak, later peak and longer peak
  - Mainstem at USGS: generally good overall fit to observed 12-31-2005, closer rising and falling limb match underscores importance of flow phasing and floodplain storage



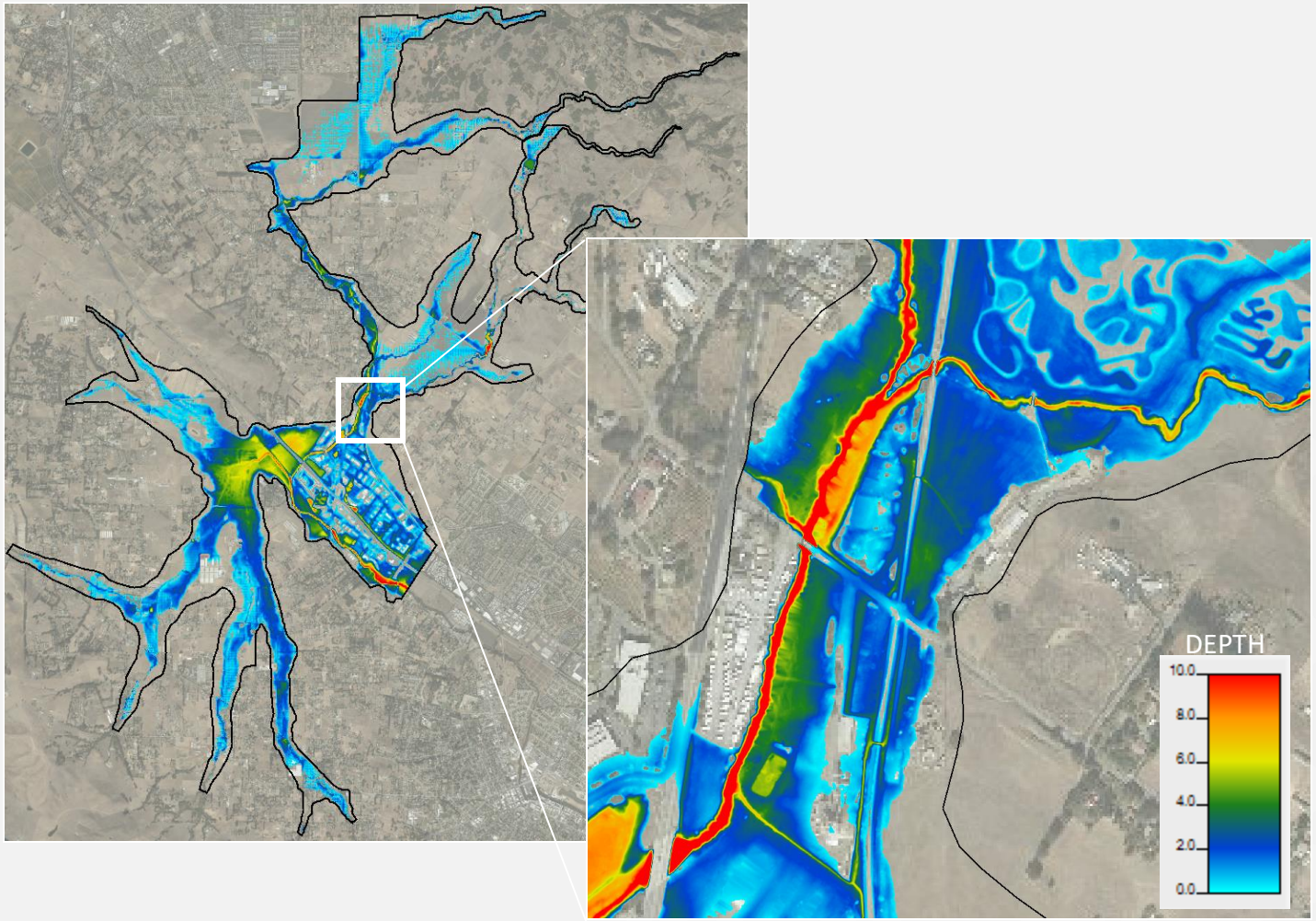
Model Build and Calibration Overview

- 100-year design flood
  - Upper mainstem: considerably lower peak flow and markedly later timing
  - Mainstem at USGS: comparable peak flow and much later time of peak



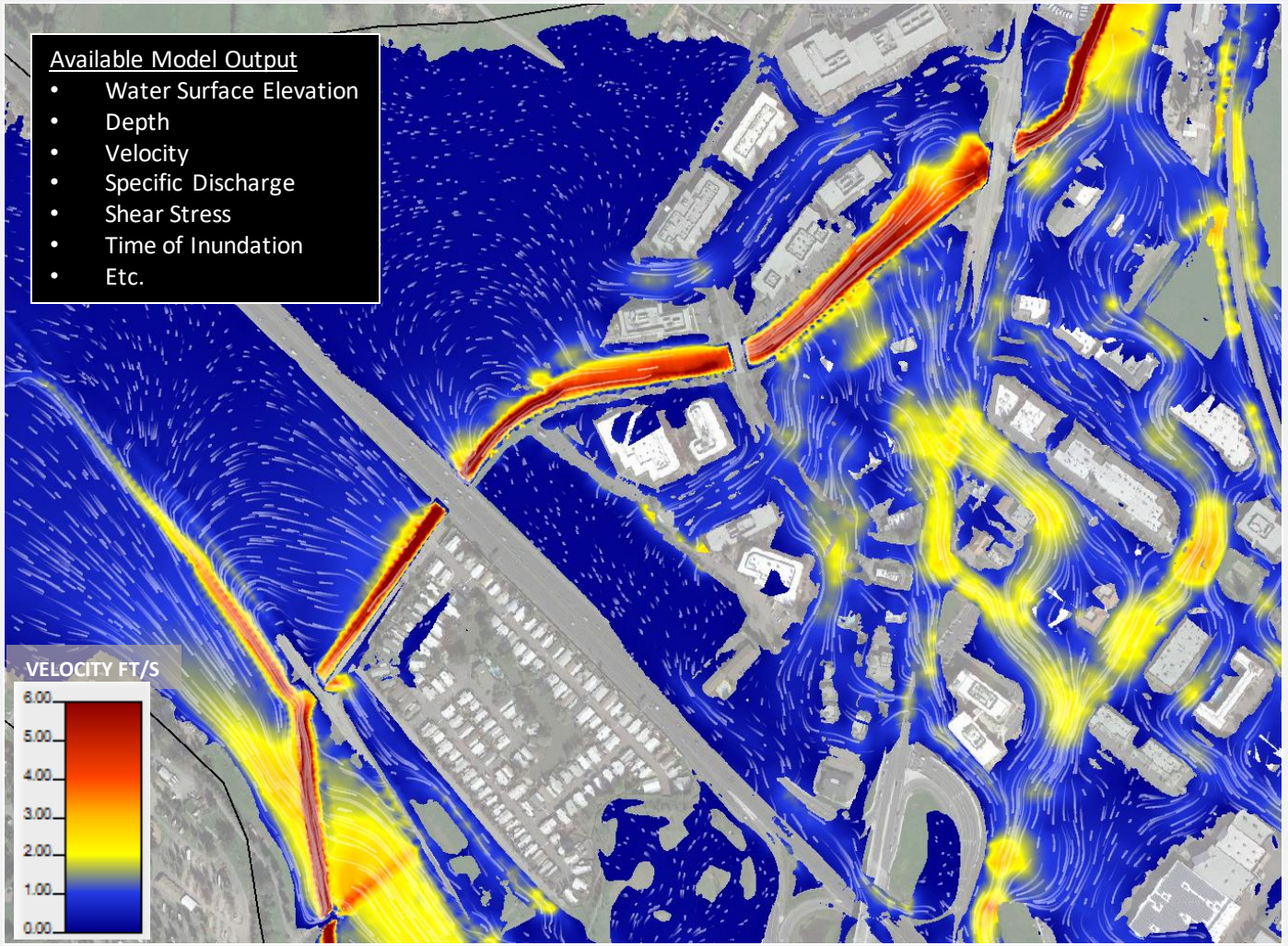
Model Build and Calibration Overview

- Model results
  - High resolution flood boundaries and depths
  - Clear definition of break-out points
  - Dynamic modeling captures impacts of existing floodplain storage and flow barriers



Model Build and Calibration Overview

- Additional output
  - Overland flow velocities
  - Time of inundation for flood damage assessments



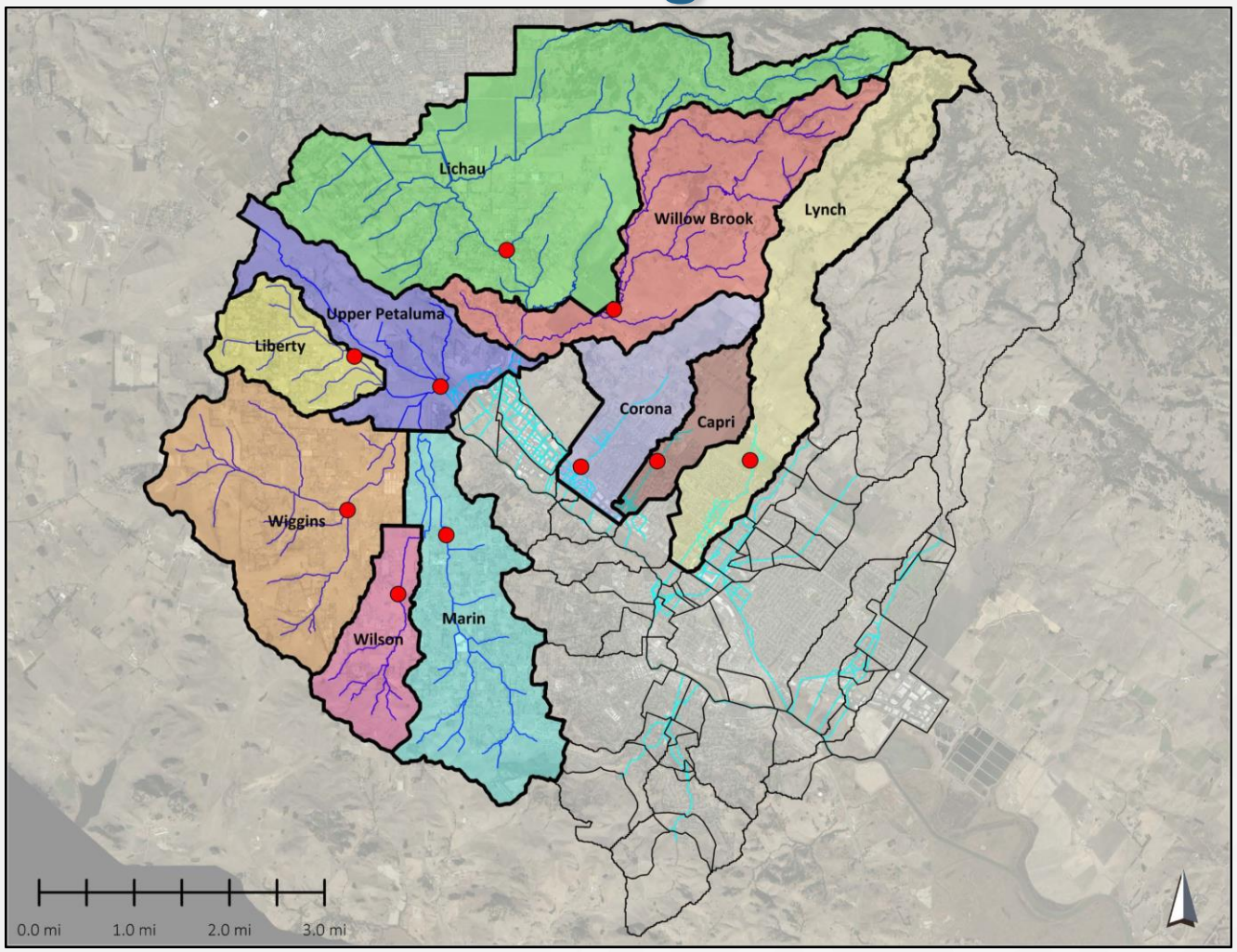
Selection of Tributaries for Screening

- Tributary parameters and model output inform the selection process
  - Overall objective of selecting 5 tributaries with contrasting hydrologic and hydraulic characteristics
  - Model output considerations include peak flow and hydrograph shape
  - Will target measures at or near the point representing 80% of each tributary area

- Preliminary selection includes Lichau, Willow Brook, Liberty, Lynch, and Marin Creeks

Selection of Tributaries for Screening

- Tributary overview and characterization
  - Diverse size and shapes at the tributary scale
  - Red markers show point of 80% tributary area



Next Steps

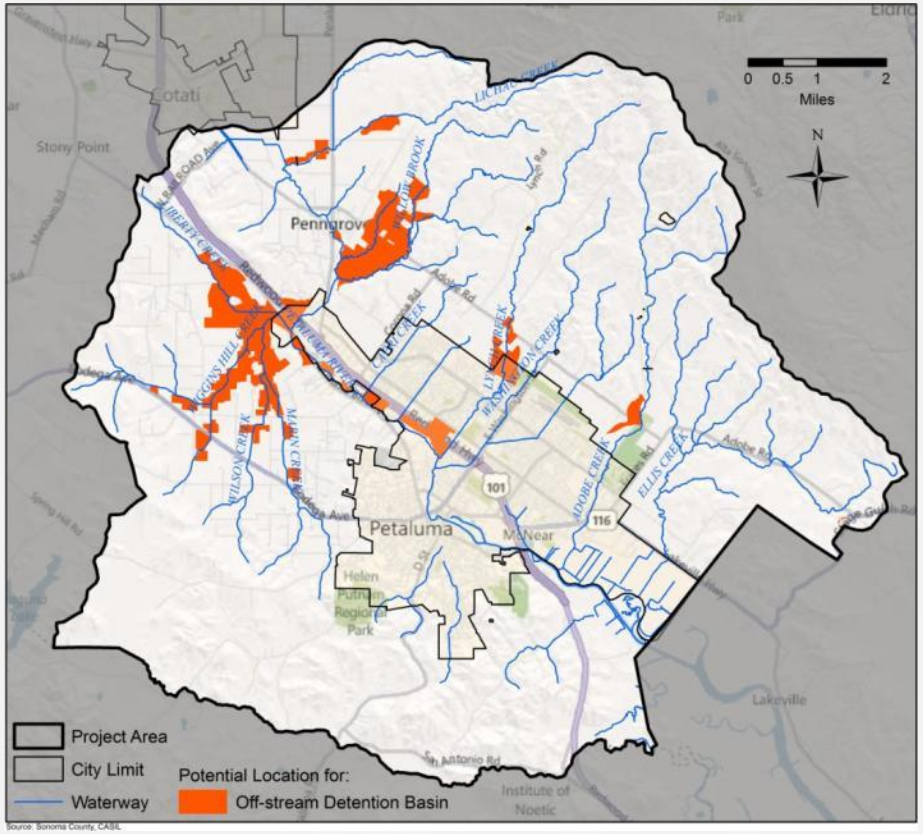
- Concept screening
  - 3 concepts
    - Detention
    - Floodplain modification
    - Channel modification
  - 5 locations (5 basins selected for screening)
- Score/Rank/Prioritize concept alternatives
- Scope a Feasibility Study for more in-depth analysis of preferred concept alternatives

Extra

Concept 1A: Off-stream Detention

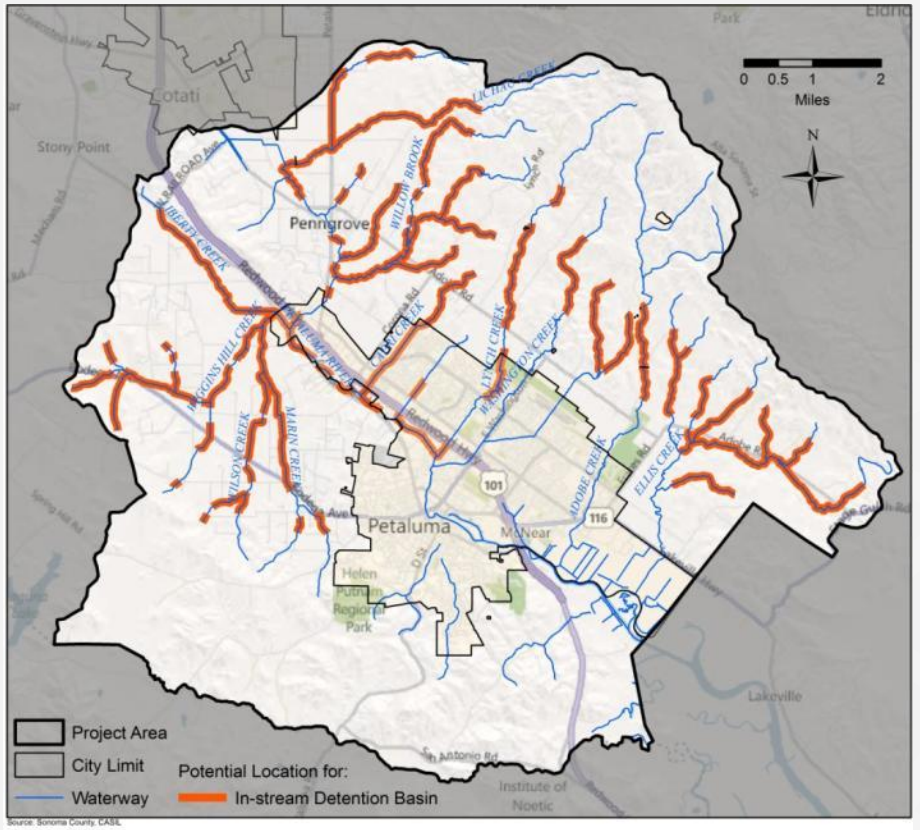
- **Goal:** Divert high flows to temporary holding ponds for flood reduction and recharge

Concept keeps low flows in the channel to maintain environmental sediment-carrying conditions



Concept 1B: In-stream Detention

- **Goal:** Detain high flows for flood reduction and recharge using the existing stream as a basis

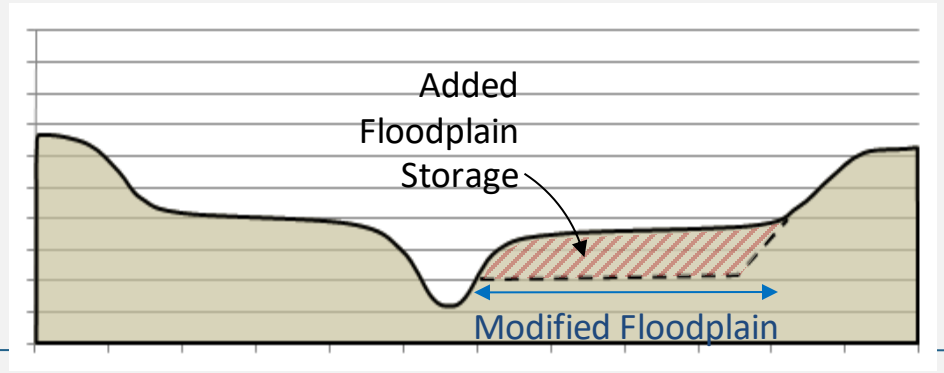


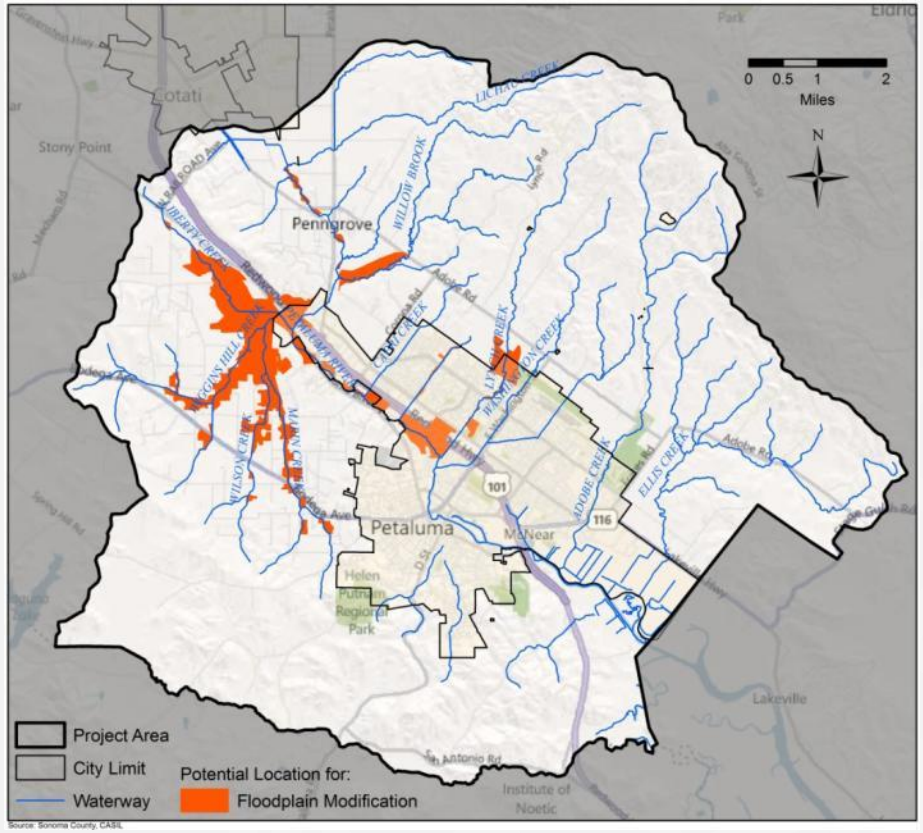
Concept can integrate local topography to reduce costs

Concept 2: Floodplain Modification

- **Goal:** Create additional storage volume and potential recharge area using existing floodplains as a basis

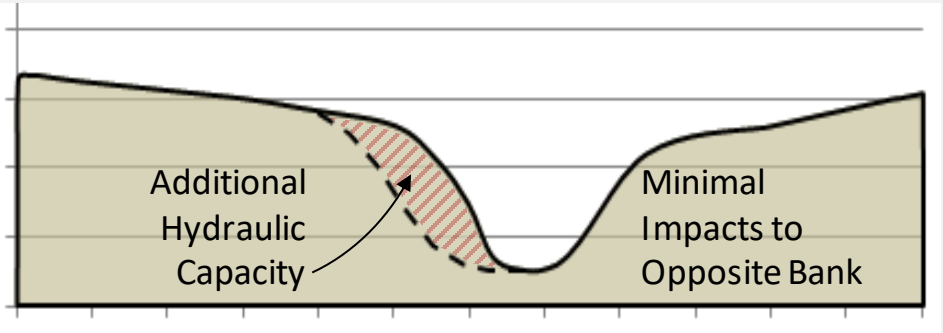
Same concept as Petaluma's Denman Terracing Project

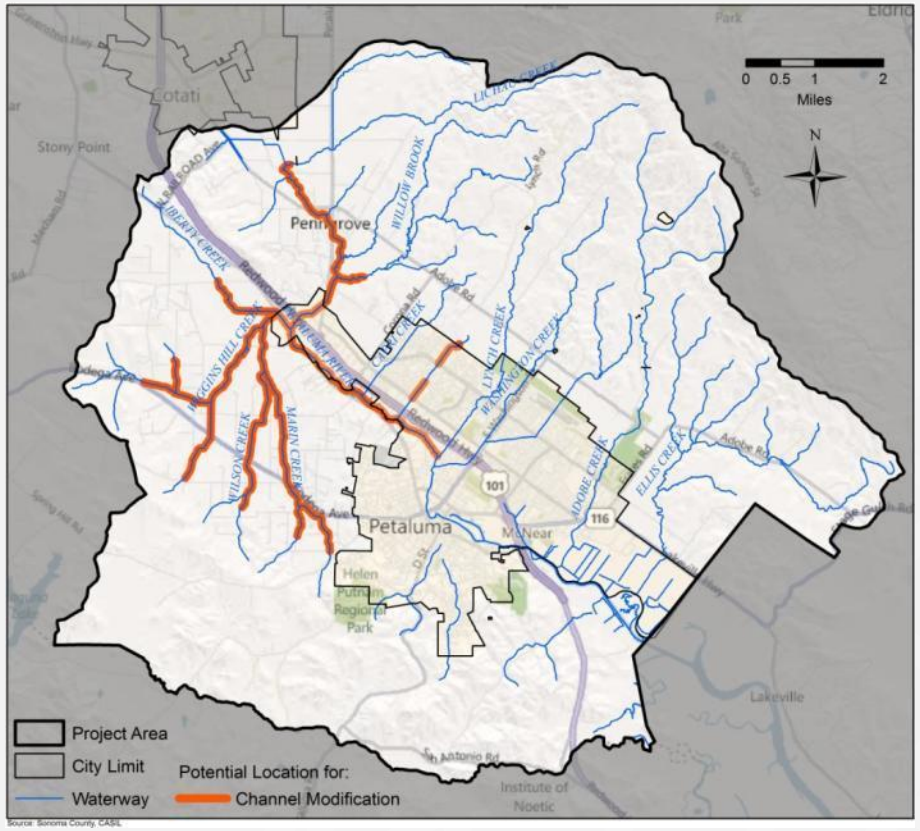




Concept 3: Channel Modification

- **Goal:** Reshape channel section for increased capacity and recharge area





Project impact area directly correlated with benefit area