Urban Water Institute
2024 Spring Water Conference

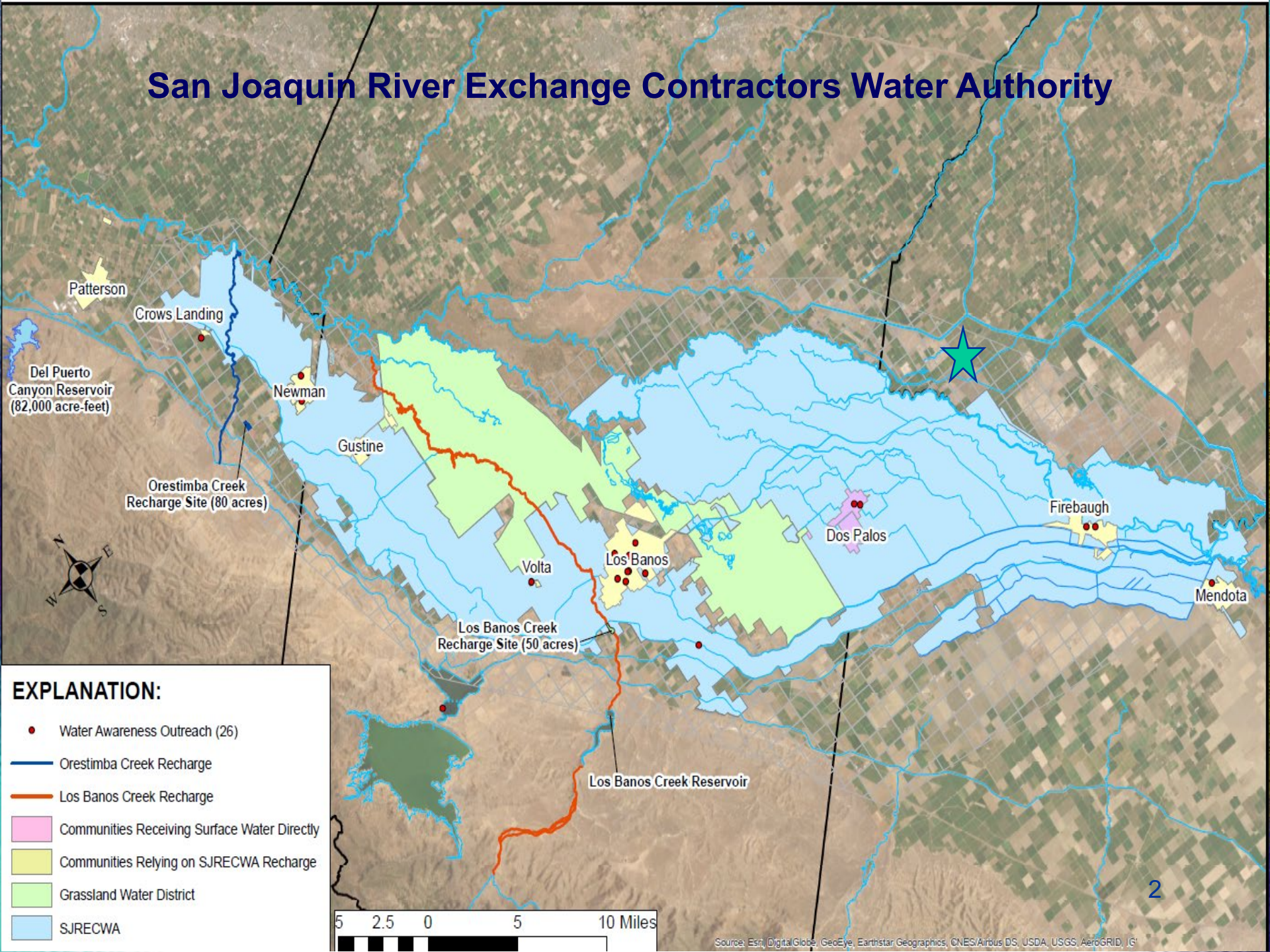
Subsidence Response in the Red Top Area

A Local Perspective

Presented by Chris White,
Executive Director

February 21, 2024

San Joaquin River Exchange Contractors Water Authority

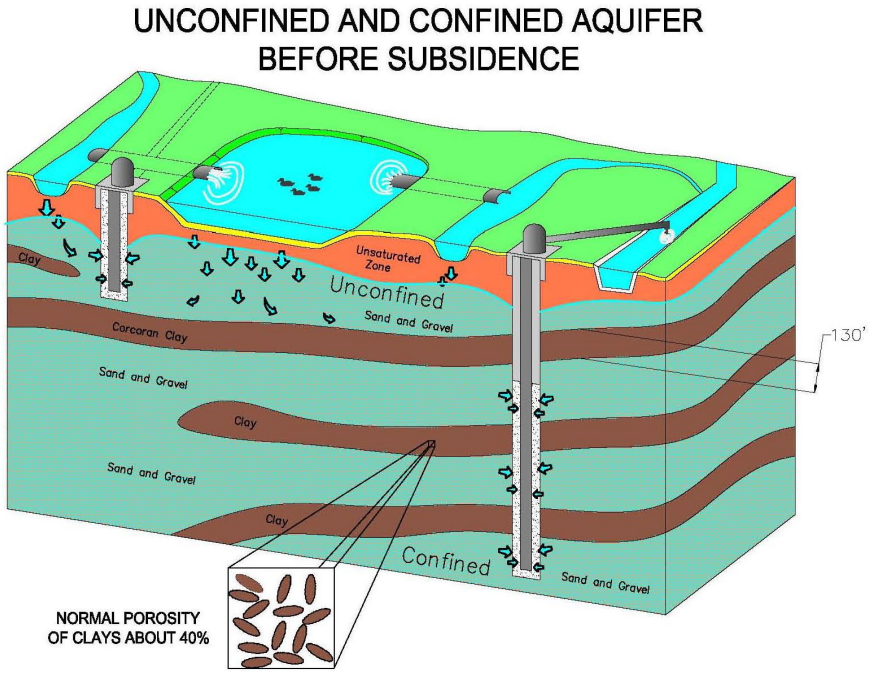


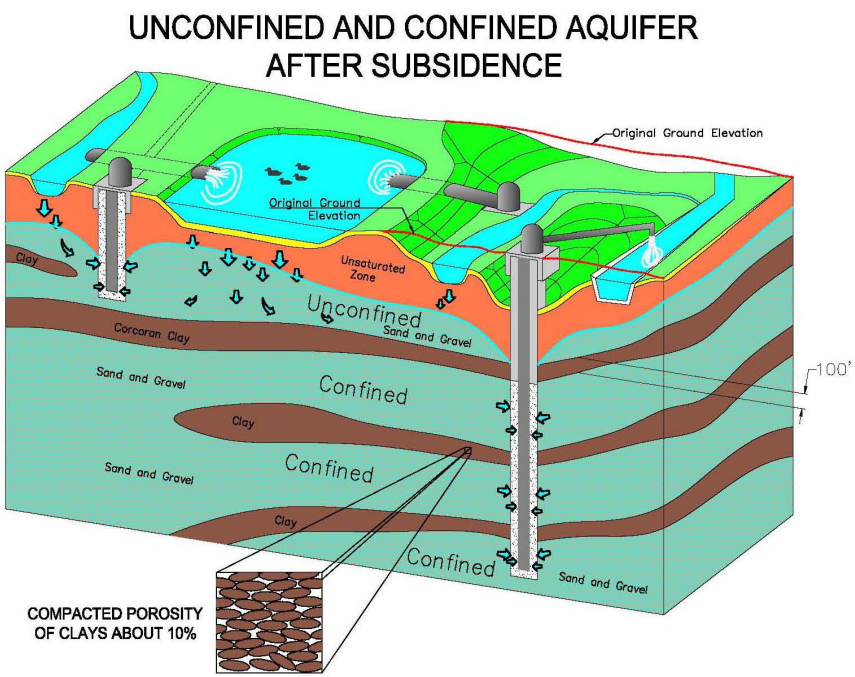
Federal Facilities
State Facilities

1960s

Subsidence Monitoring

Document the Signs





Redtop Gas Well

Redtop water well

EST. 1968
PROVOST& PRITCHARD
CONSULTING GROUP
An Employee Owned Company

Subsidence on the West Side

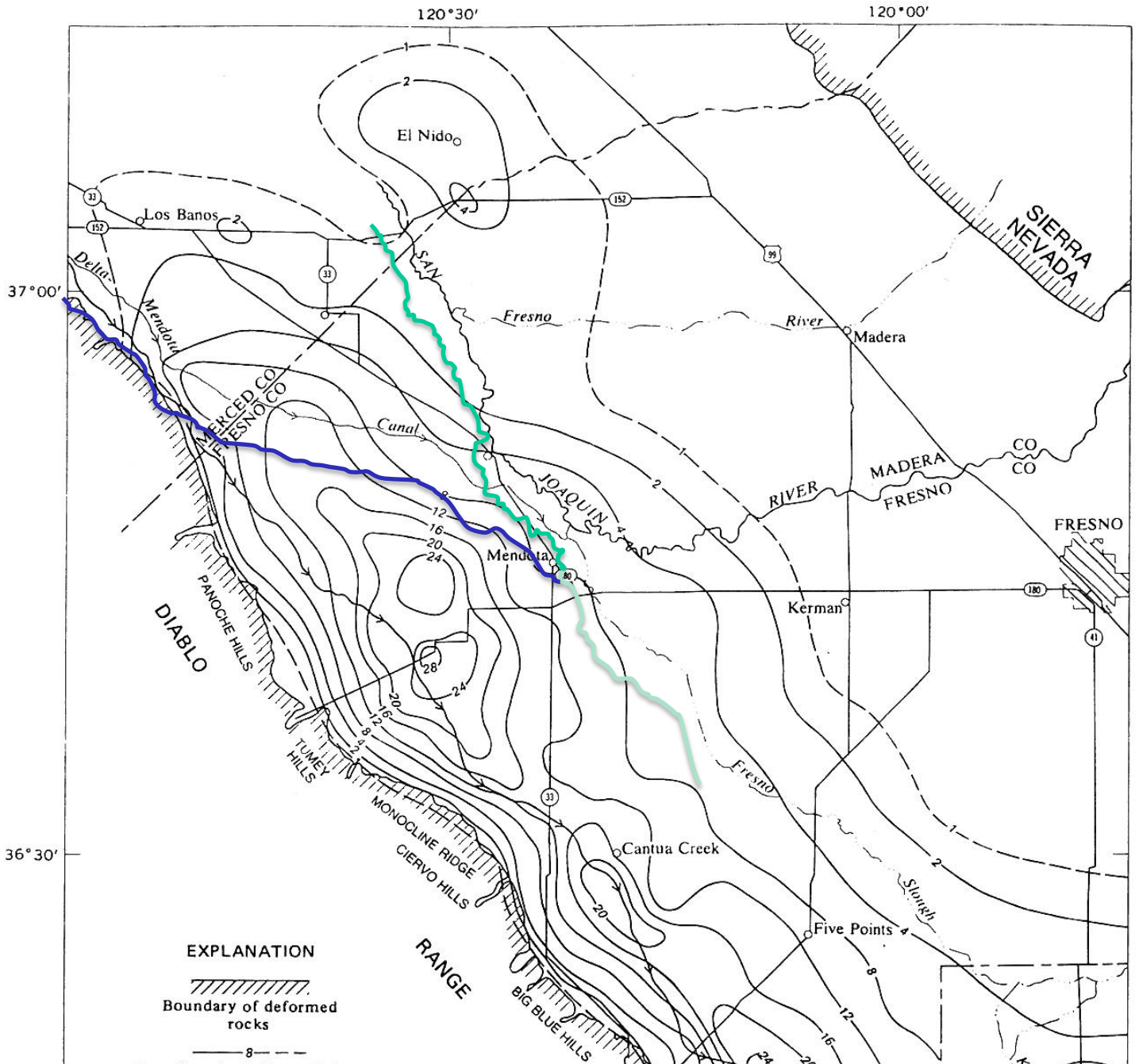
- 1925 to 1977 Subsidence
  - 1951 Delta-Mendota Canal
  - 1967 San Luis Unit
    - San Luis Reservoir
    - California Aqueduct
- 1990 to Present Subsidence
  - Degradation of the Reliability of the State and Federal Water Projects
- Red Top Area Subsidence – A template for solutions.

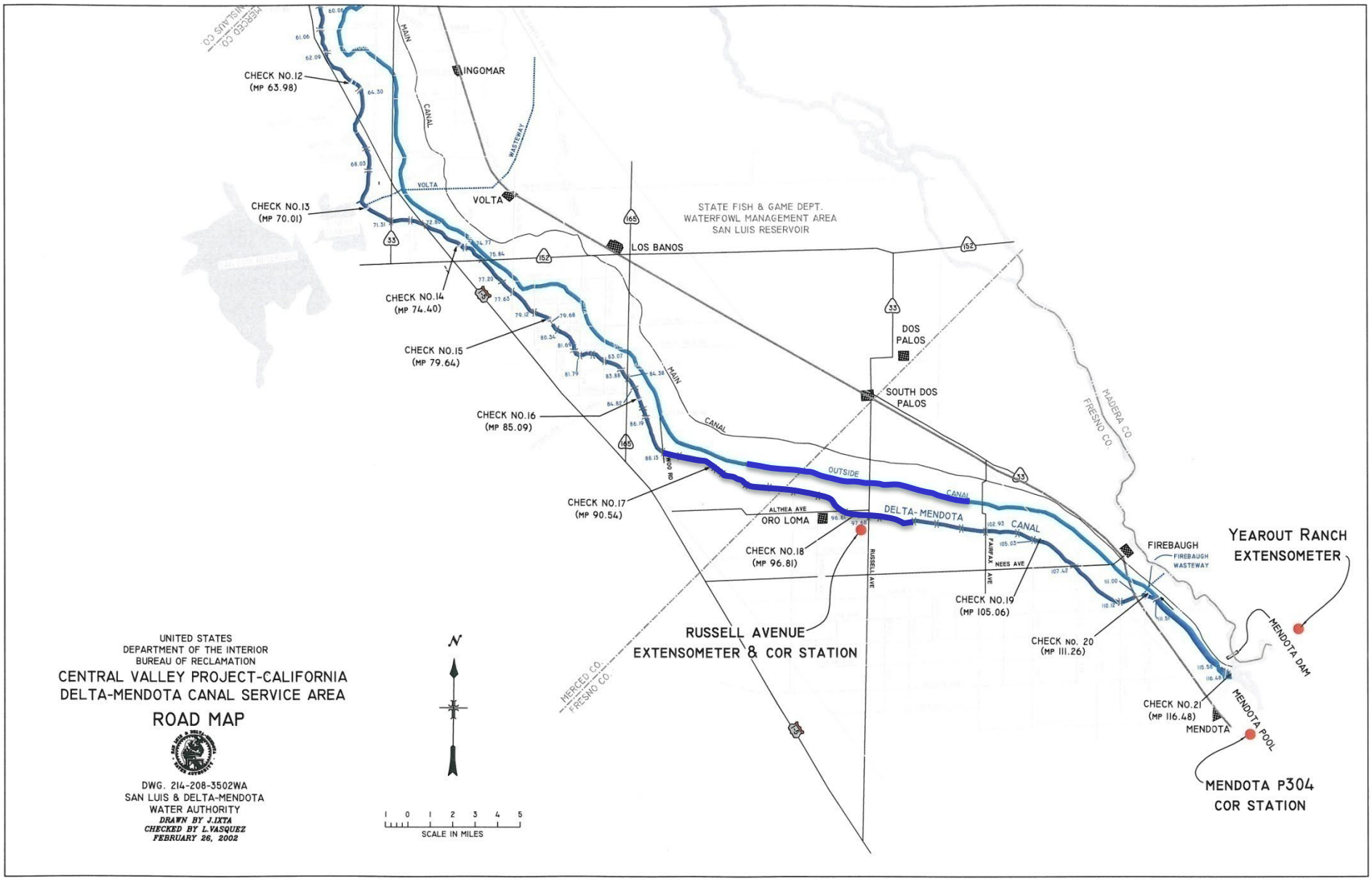
1925 Through 1977 Subsidence Era

- **How bad can it get?**

  Approximate location of maximum subsidence in the United States identified by research efforts of Dr. Joseph F. Poland (pictured). Signs on pole show approximate altitude of land surface in 1925, 1955, and 1977. (28 feet in 50 years, .56 feet/year)

  The site is in the San Joaquin Valley southwest of Mendota, California.


120°30′
120°00′
37°00′
36°30′
El Nido
Los Banos
SIERRA NEVADA
Delta-Mendota Canal
SAN JOAQUIN RIVER
Fresno River
Madera
MADERA CO
FRESNO CO
MERCED CO
FRESNO
Mendota
Kerman
DIABLO RANGE
PANOCHE HILLS
TUMEY HILLS
MONOCLINE RIDGE
CIERVO HILLS
BIG BLUE HILLS
Cantua Creek
Five Points
Fresno Slough
EXPLANATION
Boundary of deformed rocks
8

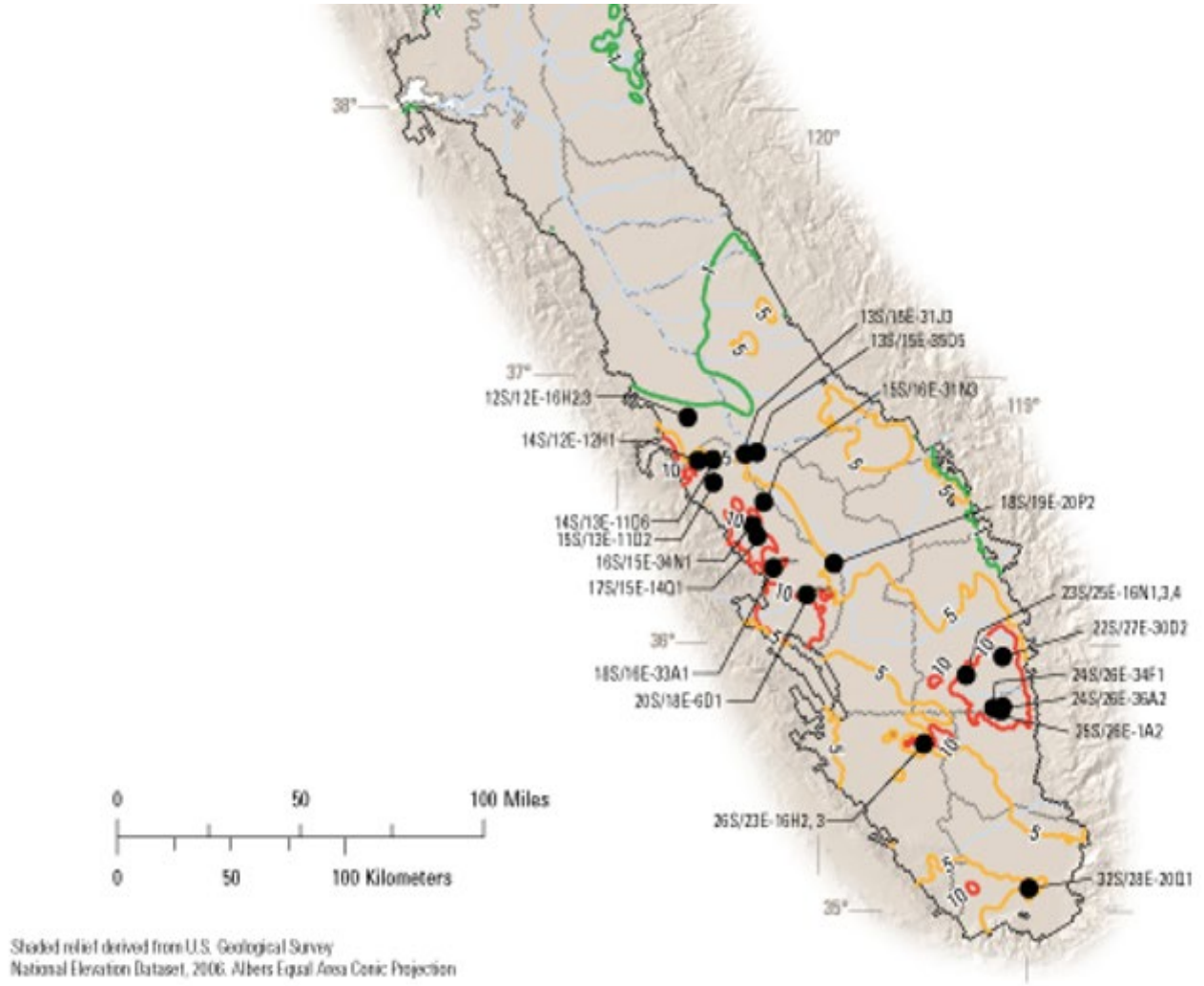


UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

CENTRAL VALLEY PROJECT-CALIFORNIA
DELTA-MENDOTA CANAL SERVICE AREA
ROAD MAP

DWG. 214-208-3502WA
SAN LUIS & DELTA-MENDOTA
WATER AUTHORITY
DRAWN BY J.IXTA
CHECKED BY L.VASQUEZ
FEBRUARY 26, 2002

Extensometer Network

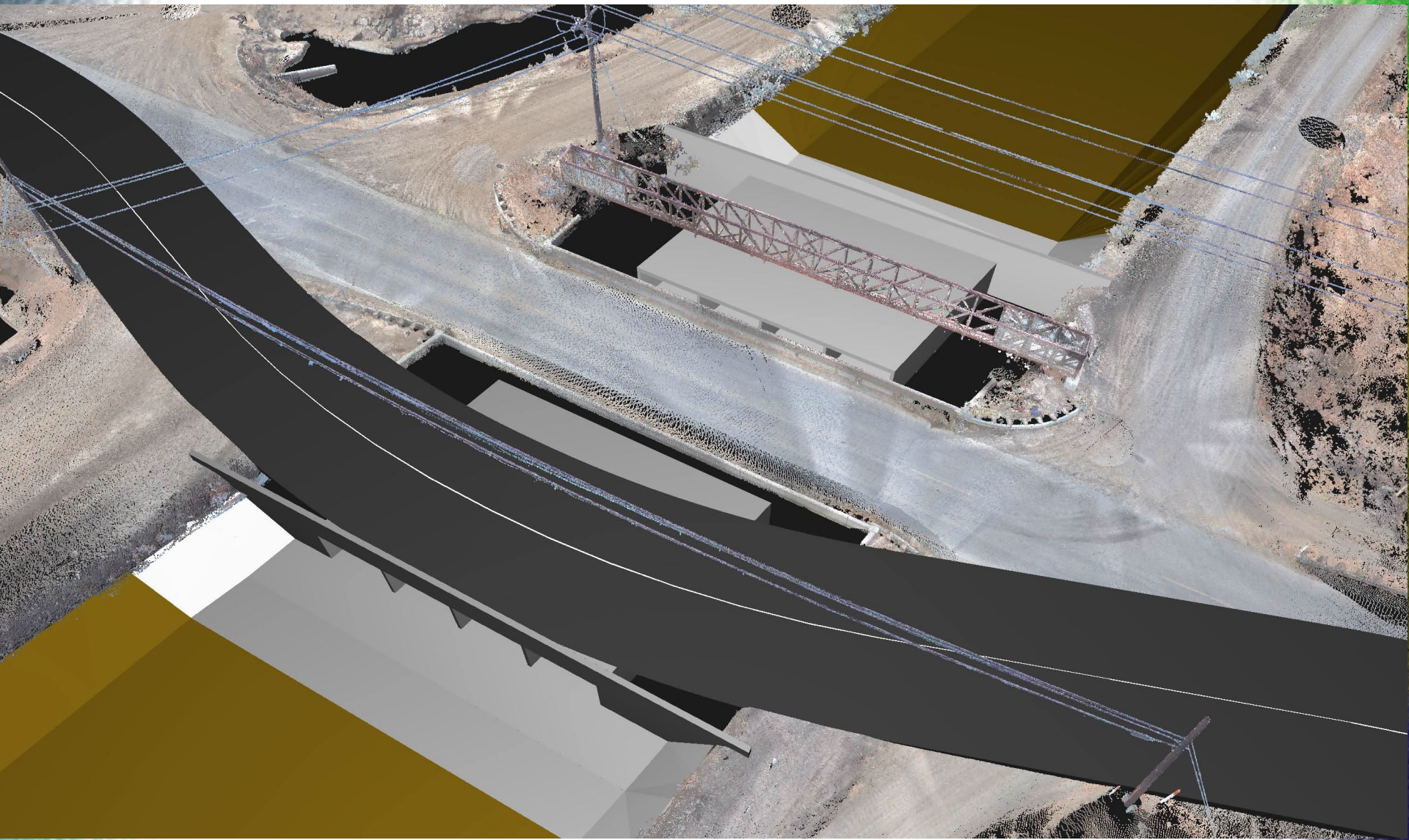


Installed in the 1950's; abandoned in the 1980's; re-discovered in the early 2000's


10/09/2009 15:29

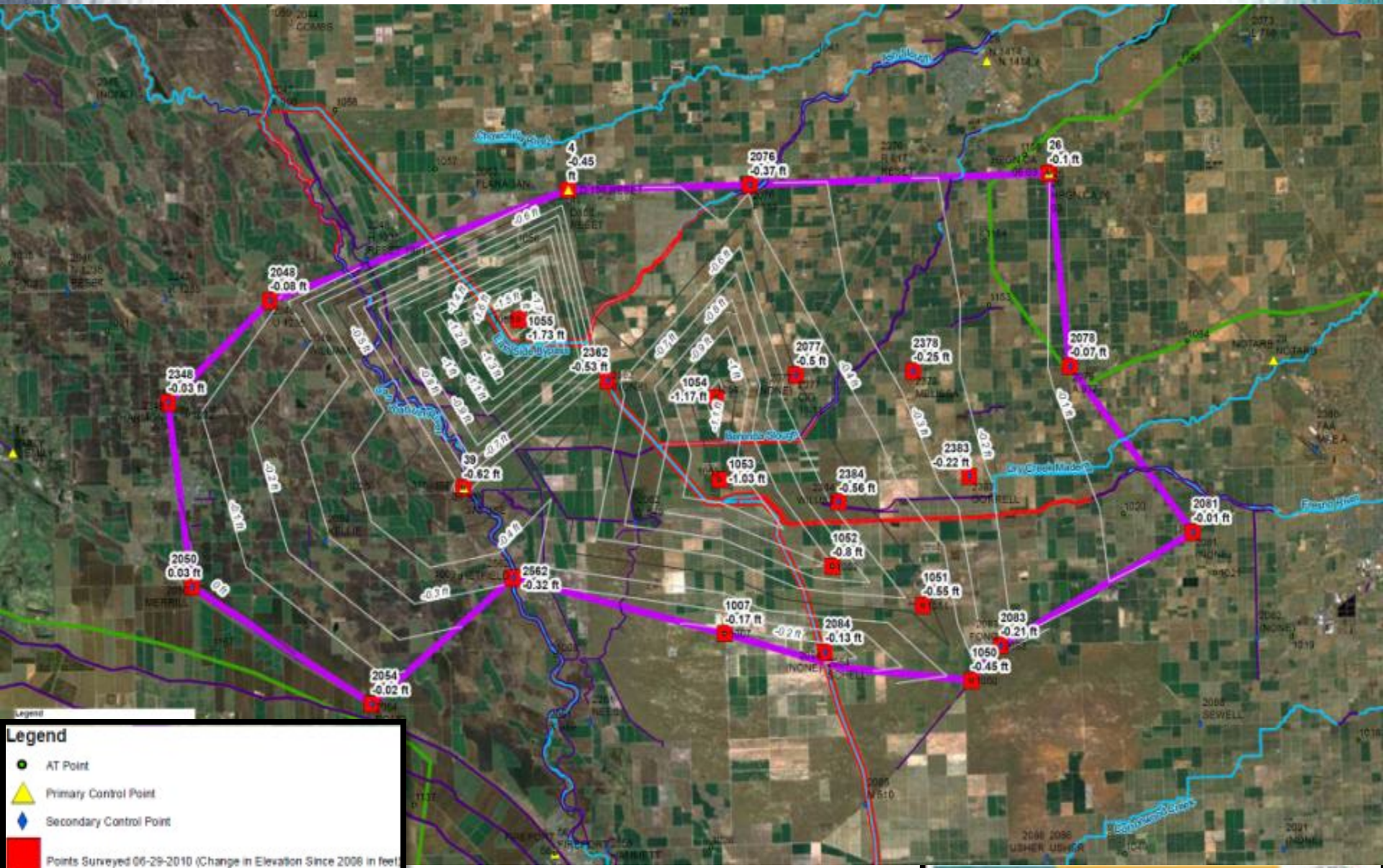

10/09/2009 15:30

$3 Million Russell Ave Bridge

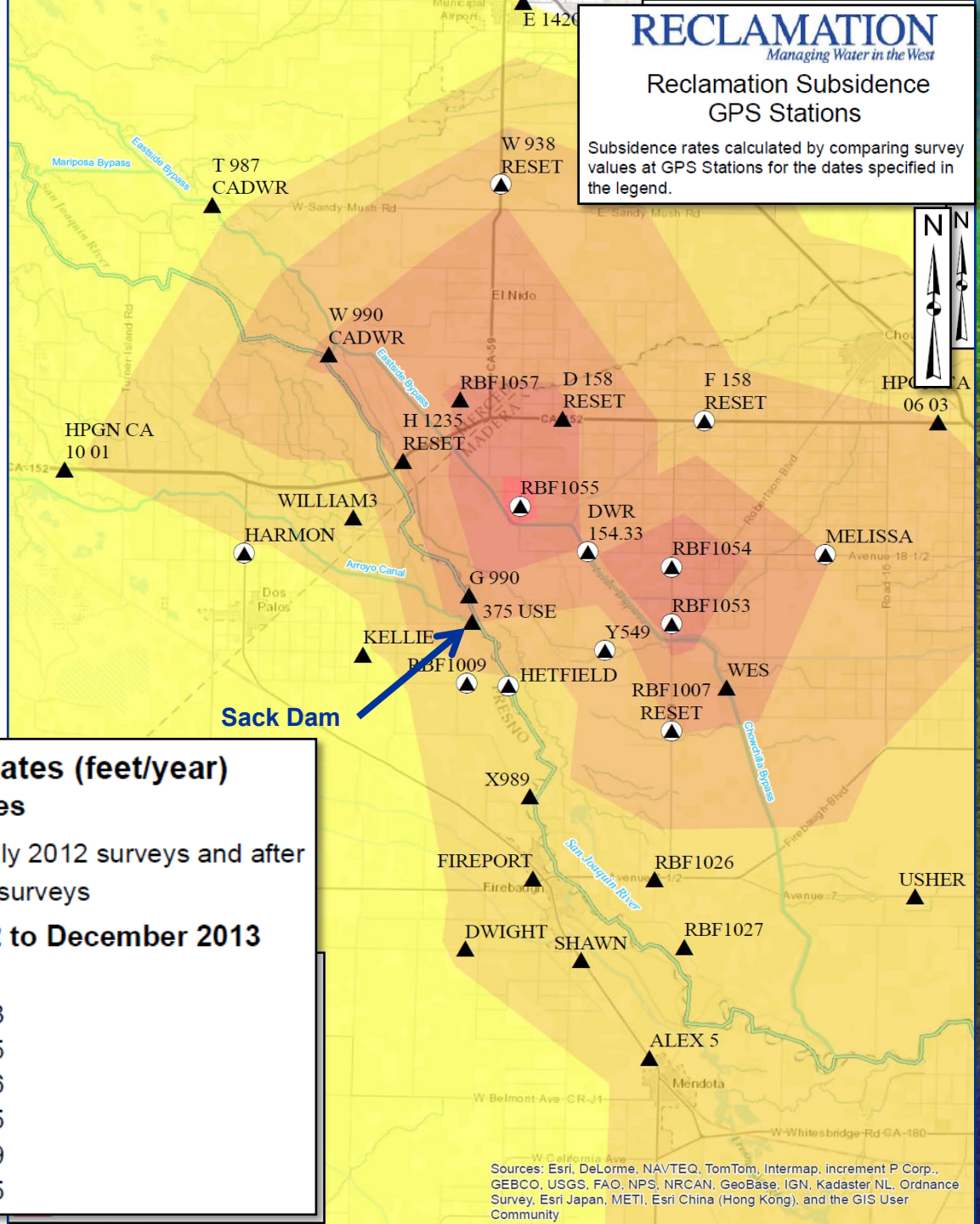


Subsidence

- **Red Top Area Subsidence Solution**


4
-0.45 ft
2076
-0.37 ft
26
-0.1 ft
2048
-0.08 ft
1055
-1.73 ft
2362
-0.53 ft
2077
-0.5 ft
2378
-0.25 ft
2078
-0.07 ft
2348
-0.03 ft
1054
-1.17 ft
39
-0.62 ft
1053
-1.03 ft
2384
-0.56 ft
2383
-0.22 ft
2081
-0.01 ft
1052
-0.8 ft
2050
0.03 ft
2362
-0.32 ft
1051
-0.55 ft
1007
-0.17 ft
2084
-0.13 ft
2083
-0.21 ft
1050
-0.45 ft
2054
-0.02 ft
Legend
AT Point
Primary Control Point
Secondary Control Point
Points Surveyed 06-29-2010 (Change in Elevation Since 2006 in feet)
DWR Levees
(Category 1) State-Federal Project Levee
(Category 2) Non-State-Federal Project Levee - Connected
Streams in Hydraulic Model
Limit of 2010 Subsidence Investigation
RBF Study Area
FloodSAFE
CALIFORNIA
Prepared By: JC
Figure: 1
Job No.: 60100317
Date: July 13, 2010

US Bureau of Reclamation's monitoring showed that the subsidence rate in vicinity of Sack Dam from December 2012 to December 2013 was about 0.6 feet.



Process to Define Problem, Monitor, Formulate Hypothesis and Develop Solutions

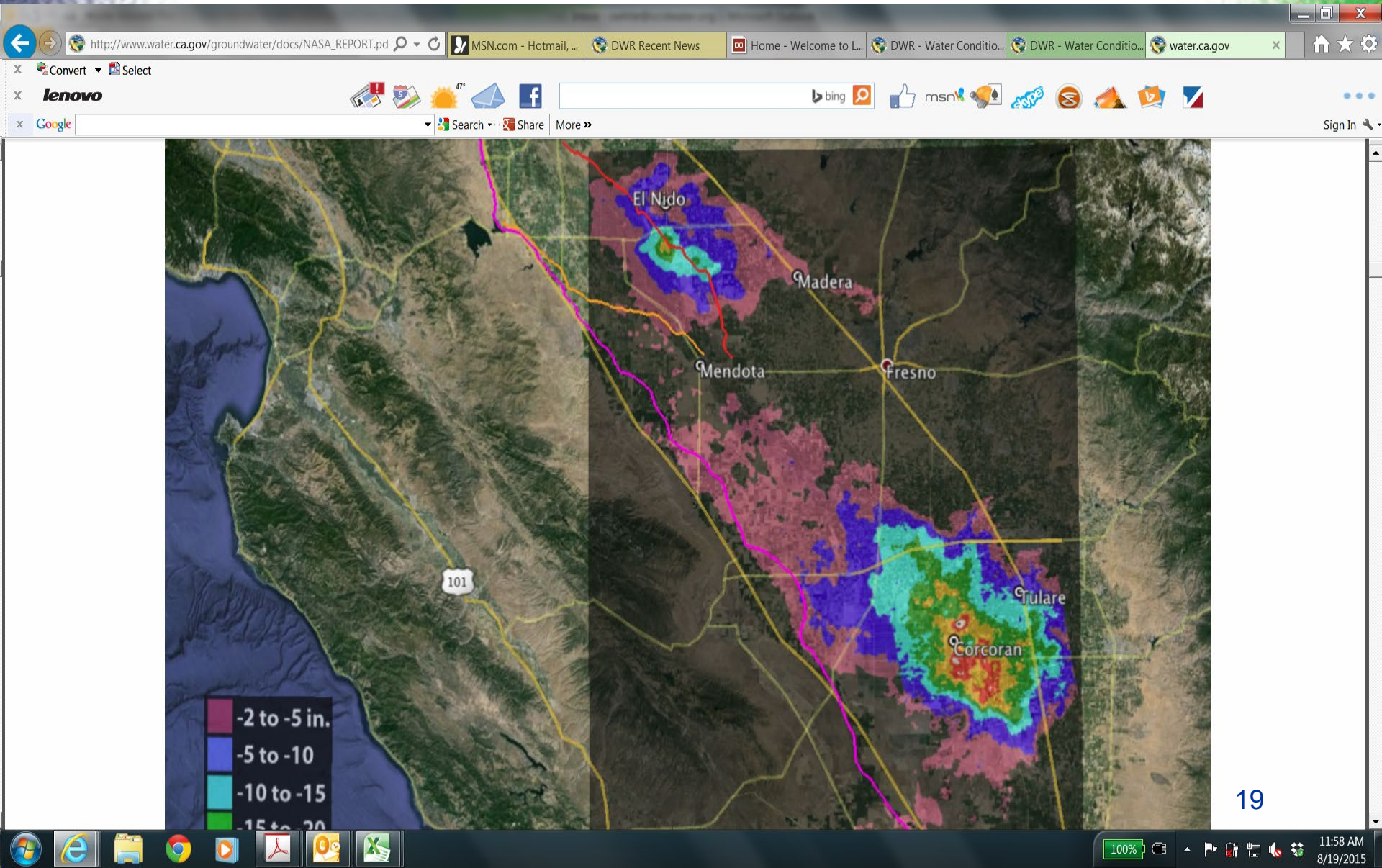
- Spring 2012 – Exchange Contractors contacted by U.S. Bureau of Reclamation of a “potential” subsidence issue which they initially thought was a bust in the survey.
- The Exchange Contactors helped verify that subsidence was the issue.
- Reclamation became concerned that San Joaquin Restoration Program capital improvements would be impacted by subsidence
- Additional Land Elevation Surveys Conducted

Process to Define Problem, Monitor, Formulate and Develop Solutions

- Met with growers in areas that seemed to be sinking to start dialogue as to what might be happening
- Growers formed committee, invited Madera County and Merced County
- Growers assess themselves to define problem and develop solutions
  - Both counties and Exchange Contractors contribute funds, monitoring and time.
- Measure ground surface changes; regionally, along canals, channels and levees

Proactive approach to avoid future cost

Recent NASA Data



Subsidence, if not stopped, would…

- Cause flooding in Western Madera & Merced Counties
  - Highway 152
  - Elementary school
  - City of Dos Palos
  - Valuable farmland and dairies
- Jeopardize water supply of neighboring districts – up to 20% reduction in water district conveyance capacity
  - Central California Irrigation District
  - San Luis Canal Company
- Jeopardize the San Joaquin River Restoration Program

Groundwater Level Changes

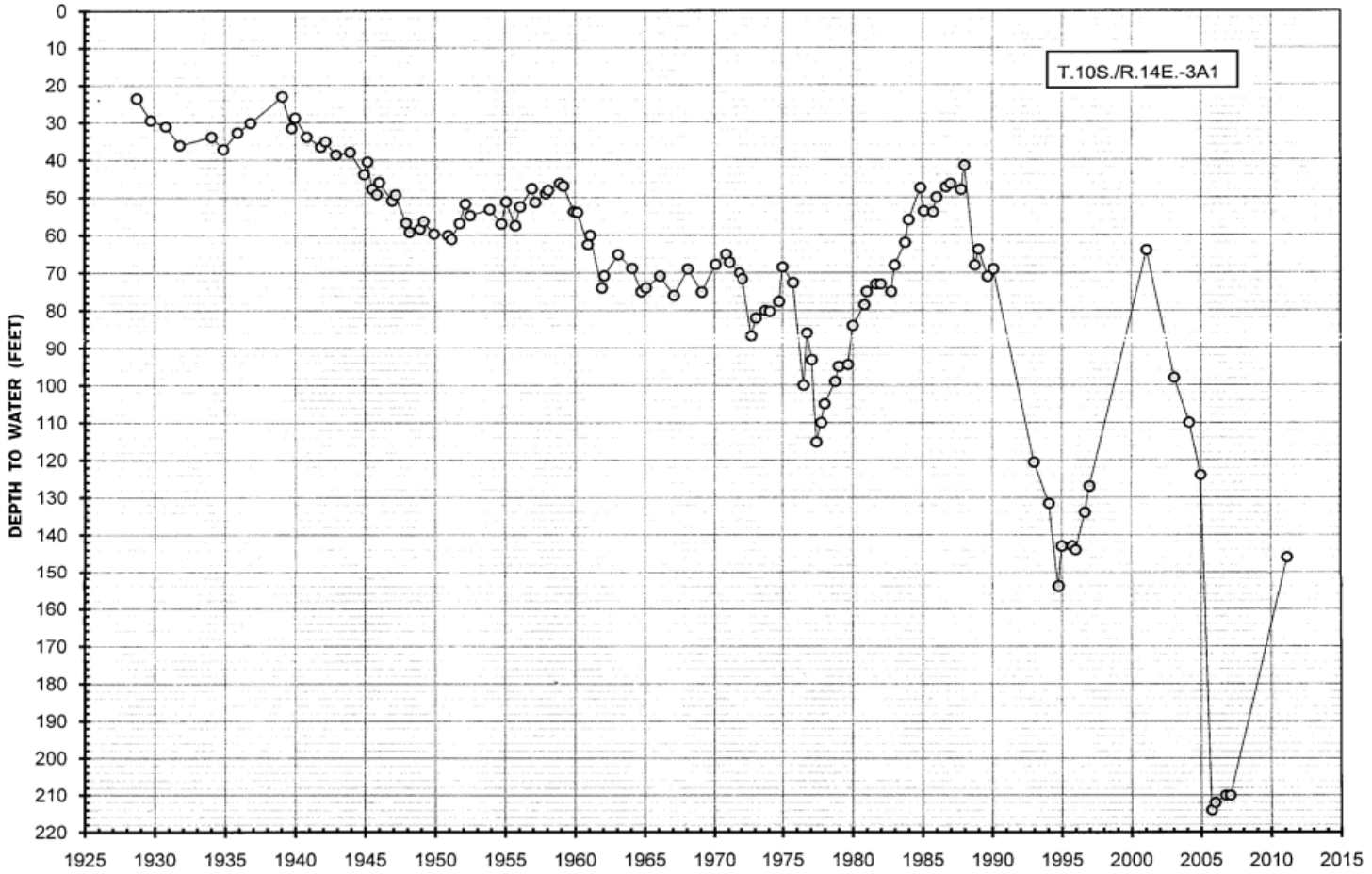
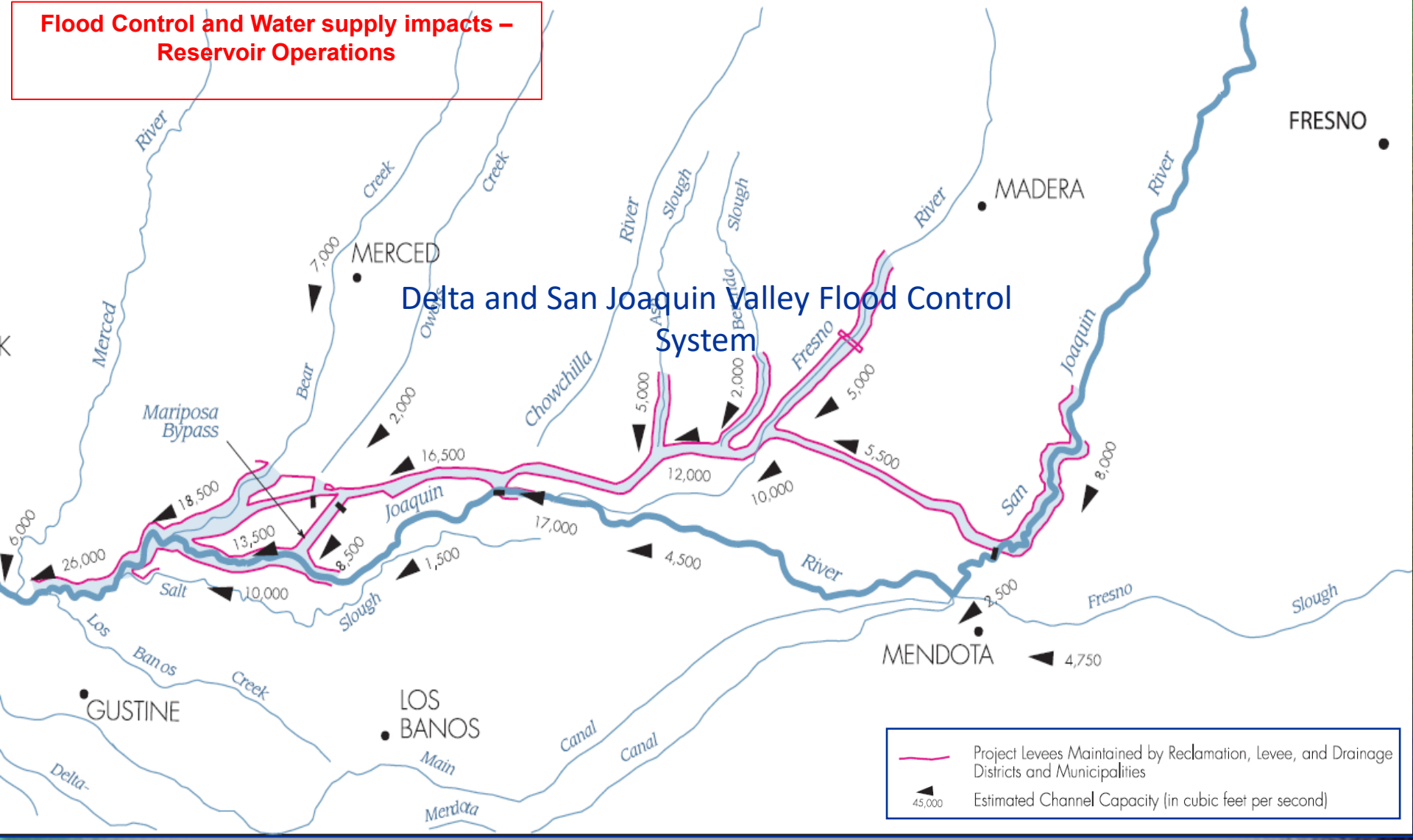


FIGURE 14 - REPRESENTATIVE WATER-LEVEL HYDROGRAPHS FOR LOWER AQUIFER WELLS

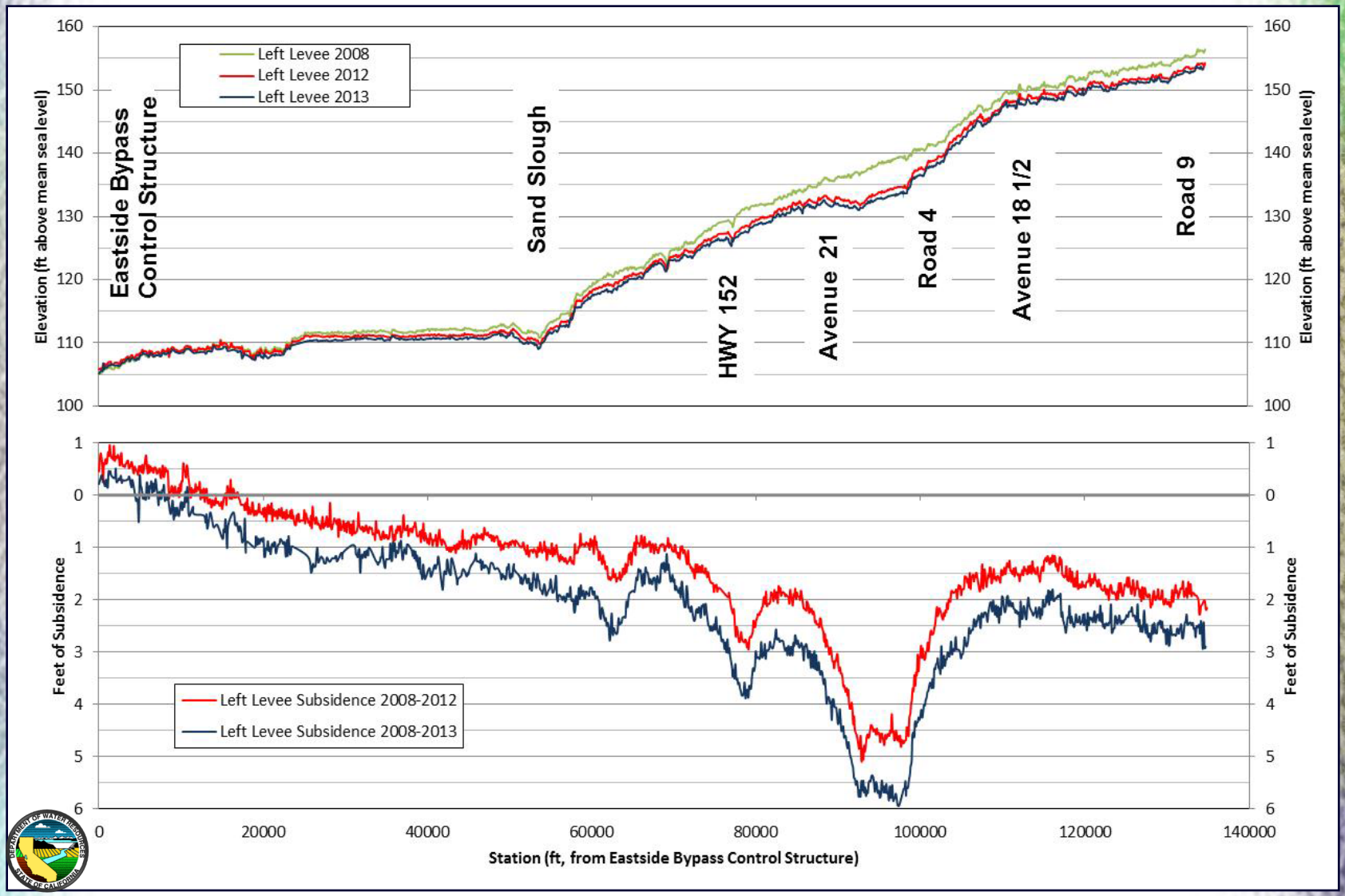
(Continued:)

Delta and San Joaquin Valley Flood Control System

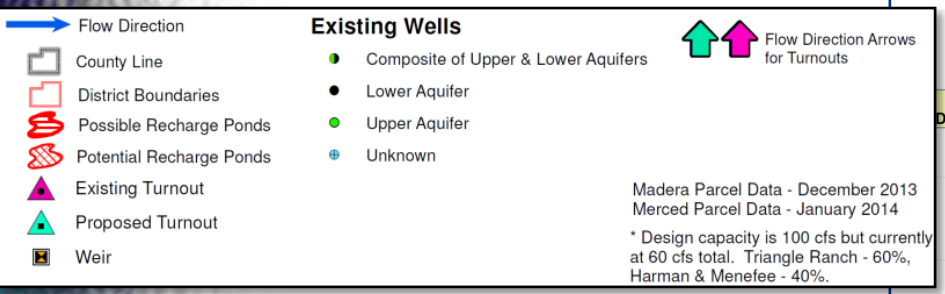
Flood Control and Water supply impacts – Reservoir Operations

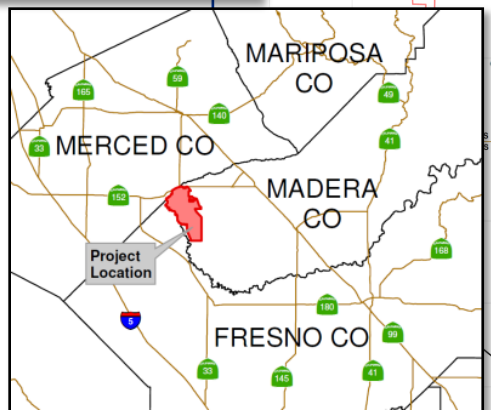


Ground Subsidence along the left levee in the Upper and Middle Eastside Bypasses



Solutions based on mature cropping demand, availability of flood flows, transfers, and aquifer characteristics. (Landowner Gaming Session)
$15M + water costs.

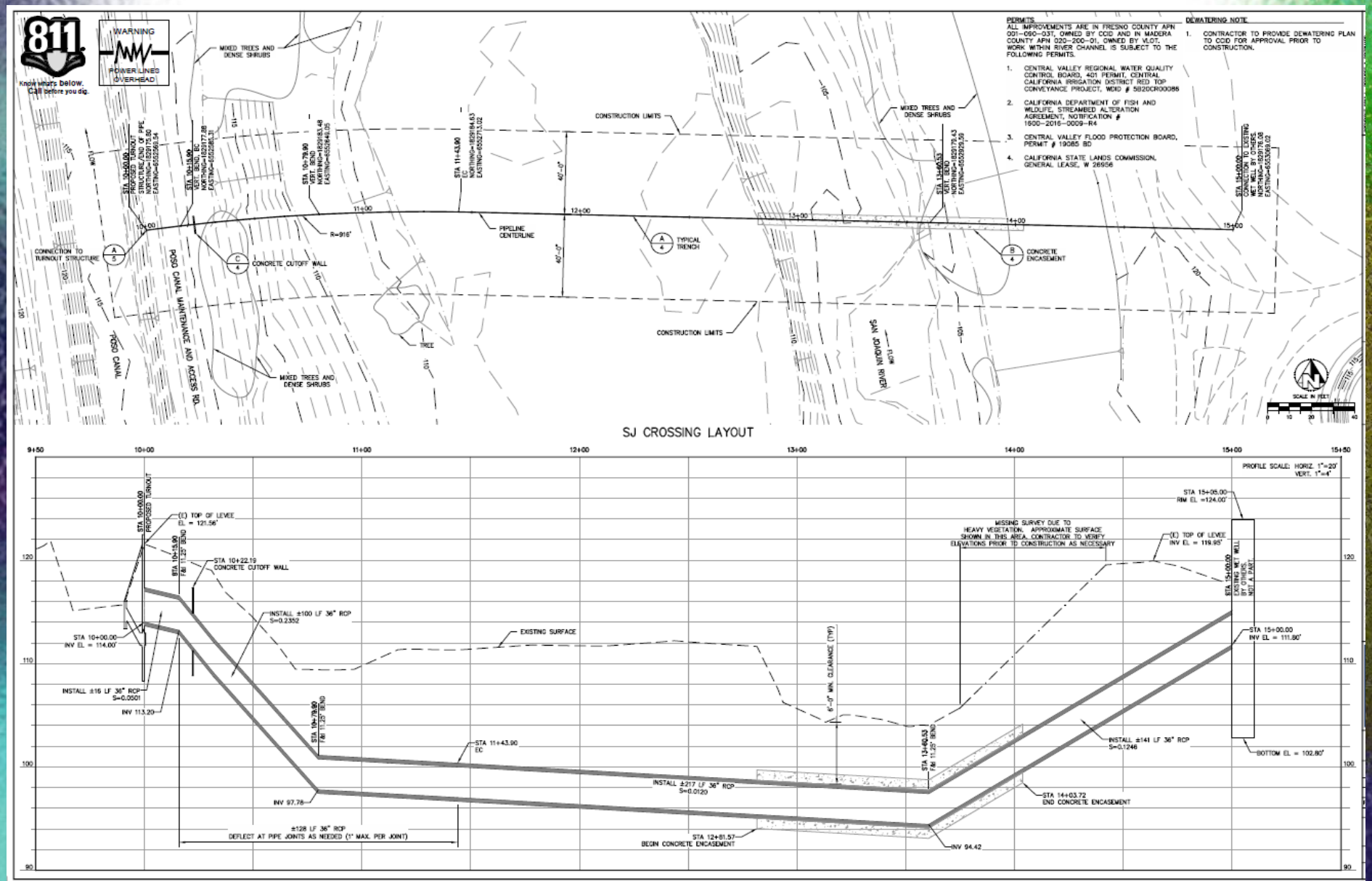




Red Top Pipeline Crossing

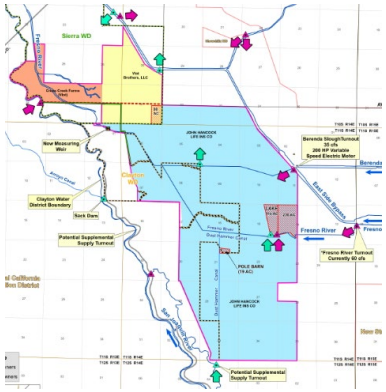
EST. 1968
PROVOST& PRITCHARD
CONSULTING GROUP
An Employee Owned Company

Red Top Pipeline Crossing



Red Top Area - Long Term Solutions

- **Subsidence Control Measures Agreement between the Exchange Contractors and Triangle T Landowners - 2018**
  - **Wheeling agreement and import water through Red Top Pipeline, outlines projects for recharge and recovery, sets limits on lower aquifer pumping, and sets aside areas for recharge basins.**
- **Recharge basins constructed.**
- **Provides Redtop landowners a path to SGMA compliance.**



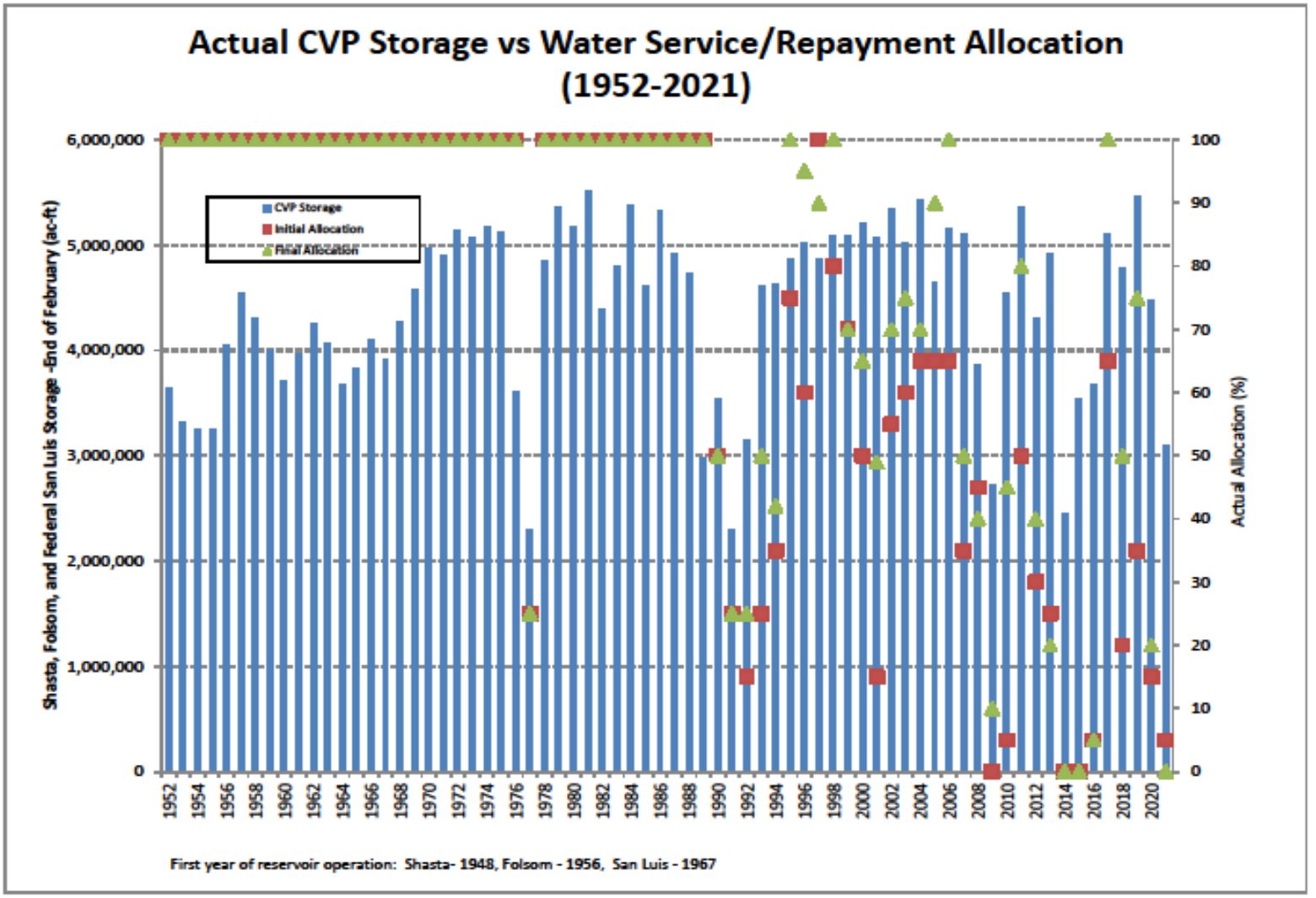
Progress on Solution

- Triangle T (Tri T) is a 12,000-acre property, with 11,300 acres planted to Almonds and Pistachios. 530 acres are farmed to dryland crops in dry years, and groundwater recharge in wet years.
- In 2017, approximately 37,000 acre-feet of surface water was recharged in Triangle T; groundwater level (gwl) rise of 60 feet at ponds
- Just as importantly, flood water was used to irrigate the almond and pistachio orchards, offsetting 10,000 acre-feet of groundwater pumping; regional gwl rise 20 feet.
- In 2017, it is estimated that 65,000 acre-feet of recharge occurred in the Eastside Bypass from Road 9 to Hwy 152, while running for 192 days.
- These results replicated in 2019 and 2023 during San Joaquin River Flood Flows. (36,477 acre-feet recharged in 2023)

Annual Monitoring, Technical Review and Pumping Program

- The Subsidence Control Measures Agreement established a Joint Exchange Contractors/ Triangle T Technical Committee to monitor the pumping and subsidence and recommend the next years pumping/transfer program.
- The program has been successful in dramatically reducing subsidence near Sack Dam from 6” per year to less then 2” per year.
- The Triangle T District is currently annexing neighbors who wish to be a part of the program.

1990 through Present Subsidence Era



Prepared by Westlands Water District (T. Boardman)
1/27/2022

West Side Ag Service Allocations

Actual Water Allocations Received By West Side Agricultural Contractors In Recent Years

2013	20%
2014	0%
2015	0%
2016	5%*
2017	100%
2018	50%
2019	75%
2020	20%
2021	0%**
2022	0%
2023	100%

*Water was not allowed to be used until after the water year, so in effect the allocation for the year was 0%.

**The allocation started at 5% in February but was reclaimed by Reclamation in May, making it 0%.

Decline of the Water Project Yields

- In response, the Exchange Contactors are working jointly with our neighbors and communities on local, regional water supply reliability projects.
  - Del Puerto Canyon Reservoir Project
  - Los Banos Creek Reservoir project
  - Los Banos Creek Water Banking Project
  - Orestimba Creek Water Banking Project
- Support for the efforts such as the Water Blueprint

Contact Information

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