Hydrology and Hydraulics Technical Memorandum for the North Delta Legacy Communities of Hood, Courtland, Locke, Walnut Grove (East), Ryde/Walnut Grove (West), and Isleton

Sacramento County & City of Isleton

October 2020

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1.0 Introduction

Sacramento County (County) and the City of Isleton in coordination with the California Department of Water Resources (DWR) are conducting feasibility planning studies to identify structural and non-structural alternatives to reduce the risk of flooding for the Small Delta Legacy Communities of Hood, Courtland, Locke, Walnut Grove (East), Ryde/Walnut Grove (West), and the City of Isleton. These communities are protected by the Lower Sacramento River non-urban State Plan of Flood Control (SPFC) levee system between Freeport at its upstream end to its downstream confluence with the Yolo Bypass near Rio Vista (inclusive of Steamboat and Georgiana Sloughs) and the non-SPFC west levee system and former railroad embankments along Snodgrass Slough, which are connected to the Cosumnes and Mokelumne River systems. **Figure 1-1** shows the locations of the six Delta Legacy Communities in the North Delta which are the focus of this hydrologic and hydraulic evaluation.

The hydrologic and hydraulic evaluation included in this report focuses on the potential impacts from the 200-year (0.5 percent change flood), 100-year (1 percent change flood), 50-year (2 percent change flood, 10-year (10 percent change flood), and 2-year (50 percent chance) storm frequencies. The hydraulic model results are based on information from the Central Valley Hydrology Study (CVHS), the DWR Central Valley Flood Evaluation and Delineation (CVFED) Sacramento River hydraulic modeling project, and Sacramento County's and DWR North Delta Cosumnes/Mokelumne River watershed model. This Technical Memorandum (TM) incorporates supporting information from the DWR Non-Urban Levee Evaluation (NULE) and Sacramento County's Emergency Safety Plans developed for the Delta Reclamation Districts (RDs).

1.1 Scope

The following are included and utilized in this TM:

1) DWR's CVFED hydraulic models for existing conditions to develop 200-,100-, 50-, 10-, and 2-year water surface (WSEL) profiles for the Lower Sacramento River and distributaries adjacent to the subject small Delta Legacy Communities downstream of Freeport.
2) Sacramento County's North Delta hydraulic model to develop existing condition 200- and 100-year WSEL profiles for the portion of the Mokelumne River and Snodgrass Slough adjacent to the small Delta Legacy Communities of Hood, Courtland, Locke and East Walnut Grove.
3) The CVFED and North Delta hydraulic models from items 1 and 2 above to develop 200- and 100-year WSEL profiles using climate change factors and Seal Level Rise (SLR) adjustments previously developed by DWR.

4) Develop 200- and 100-year WSEL profiles for the Lower Sacramento River system based on the 2017 Central Valley Flood Protection Plan (CVFPP) and supporting Basinwide Feasibility Study (BWFS) future improvements.

5) Review model performance and validation of model based on high-water marks collected in 2019 along the Lower Sacramento River and compared to 1997 high-water marks and flow values.

6) Present hypothetical levee failure flood impacts for the six North Delta Legacy Communities of Hood, Courtland, Locke, Walnut Grove (East), Ryde/Walnut Grove (West), and the City of Isleton.

7) Discuss differences between effective Federal Emergency Management Agency (FEMA) profiles and DWR CVFED hydraulic models.

8) Discuss channel capacity, flood frequency and recommendations.

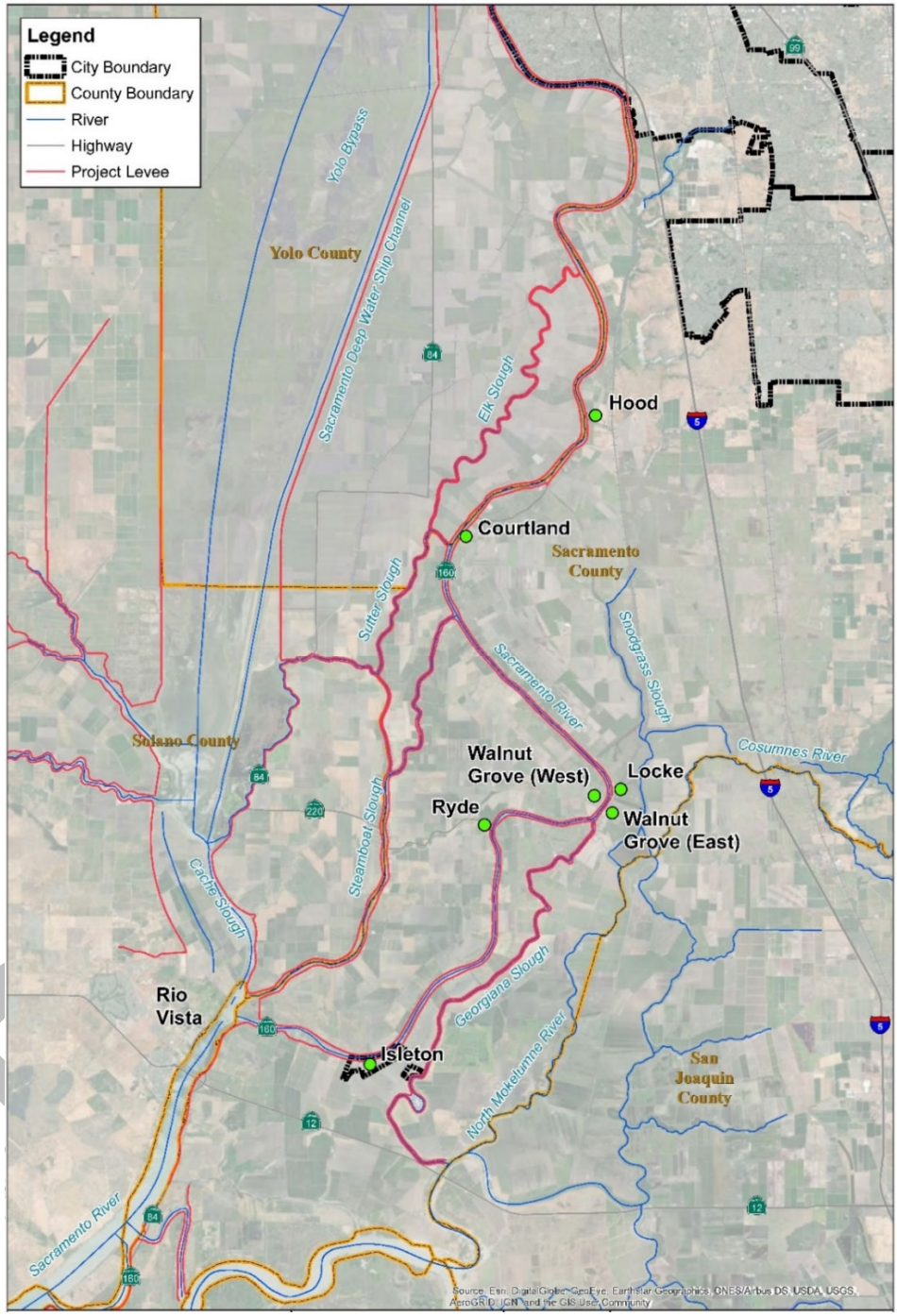

Figure 1-1: North Delta Legacy Communities Location Map

1.2 Background

1.2.1 Sacramento River System Model

The DWR CVFED hydraulic model consists of approximately 900 miles of the upper and lower Sacramento River and tributaries was provided for public use in 2015. The DWR hydraulic model was calibrated to the 1997 flood event and validated the model results with the 2006 storm event

data. However, levee setback projects on the Feather River since 2009 and the reoperation of the Folsom Reservoir in 2017 have changed the timing of the system. Therefore, to validate the hydraulic models, GEI collected high-water marks in 2019 along the Lower Sacramento River downstream of I Street and compared the hydraulic models to gage data. The validation discussion is presented in Section 4.2. **Figure 1-2** presents the model extents for the Sacramento River system model. The system model includes flows from all the major upstream reservoirs (Shasta, Oroville, New Bullards Bar, Camp Far West, and Folsom), which is routed through the Lower Sacramento River system. This is the only section of the Lower Sacramento River system in which all the reservoirs in the system could have an impact on the routing of flows releases on the SPFC levees adjacent to the six subject Delta Legacy Communities.

1.2.2 North Delta Hydraulic Model

Figure 1-3 presents the North Delta 1Dimensional (1D) and 2D model extents. The North Delta hydraulic model provided by Sacramento County includes the Cosumnes and Mokelumne Rivers and the Snodgrass Slough study boundary.

1.3 Topographic Data

The hydraulic model geometries are reported in North American Vertical Datum 1988 (NAVD 88).

The CVFED existing condition hydraulic model geometry was developed based on the Light Detection and Ranging (LiDAR) and bathymetry collected in 2008.

The North Delta model (inclusive of the Cosumnes and Mokelumne Rivers and Snodgrass Slough) was developed from Sacramento County and DWR LiDAR and bathymetry dated 2007.

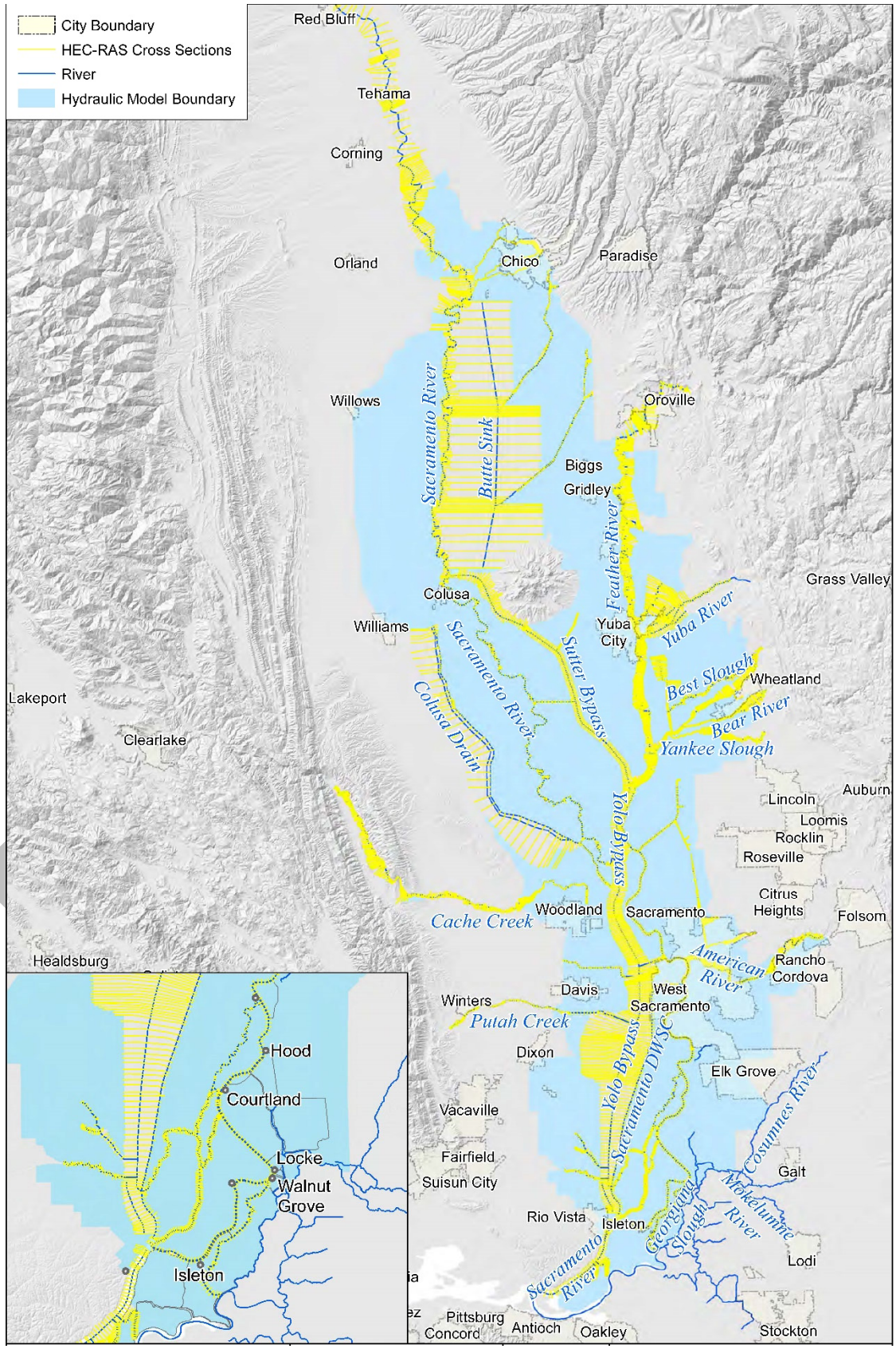

Figure 1-2: Sacramento River System Model Schematic

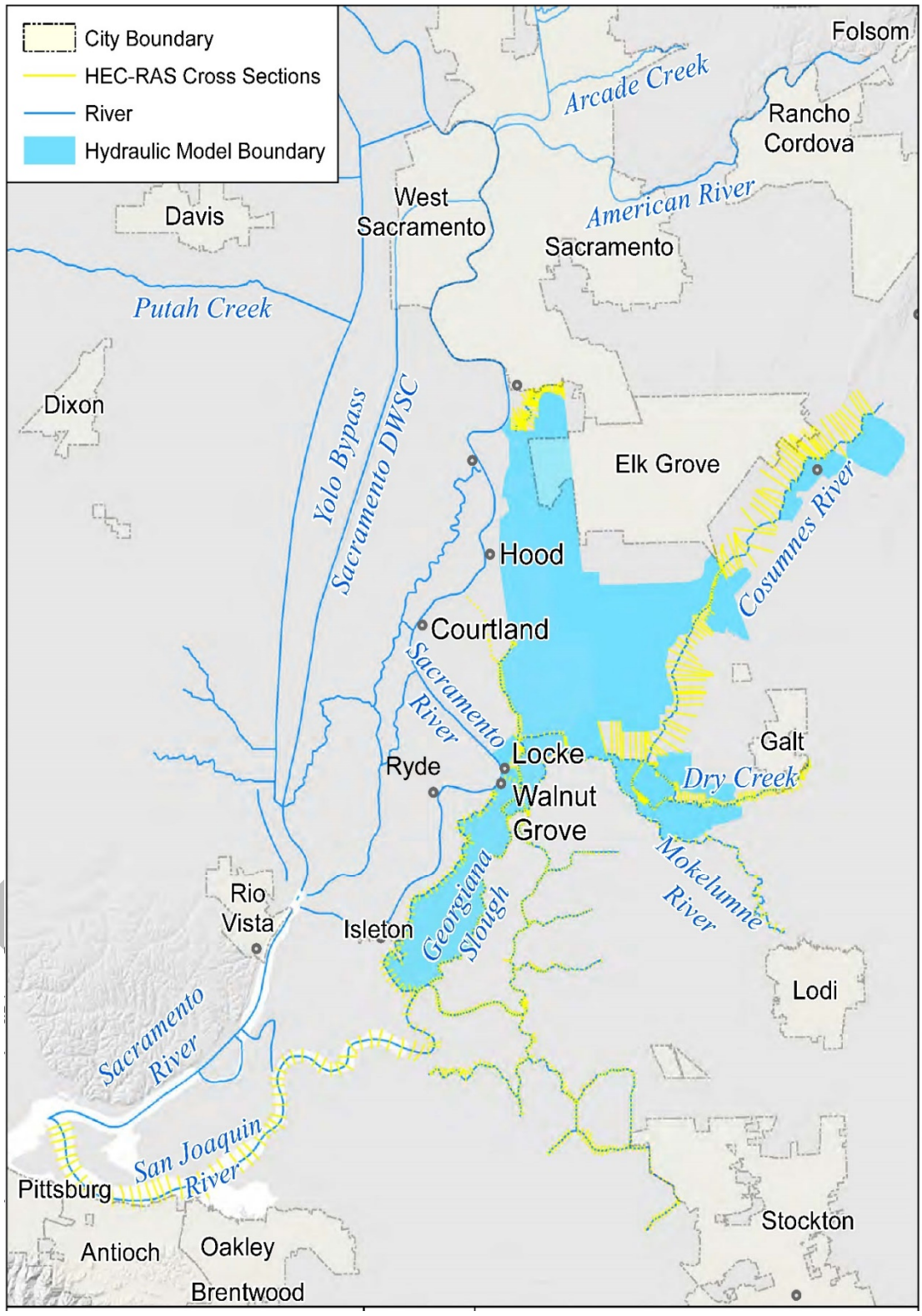

Figure 1-3: North Delta System Model Schematic

2.0 Hydrology

2.1 General

The system hydrology used to produce the WSEL profiles for both the Sacramento River and the North Delta systems are discussed within Sections 2.2 through 2.6. The hydraulic evaluations are presented in Section 3.0.

2.2 Watersheds

The Sacramento River drains north to south, and flows are regulated by four major upstream reservoirs, namely Shasta, Oroville, New Bullards Bar, and Folsom. The upstream Yolo Bypass and Sacramento Bypass channels are currently designed and operated to divert as much as 75 percent of the total flood flows from the Lower Sacramento River.

The high flood stages which backwater into Snodgrass Slough are due to lack of conveyance from the lower Mokelumne River and high tide conditions. Snodgrass Slough discharges into the North and South Forks of the Mokelumne River just east of Walnut Grove and is normally isolated from the Lower Sacramento River system near Walnut Grove during the flood season when the Delta Cross Channel (DCC) Gates are closed.

Figure 2-1 presents the overall watersheds which flow through the Delta and the black dashed line shown on **Figure 2-2** presents the separation between the Sacramento River watershed and the North Delta watershed consisting of the smaller Morrison Creek, Cosumnes and Mokelumne River watersheds. This division in watersheds is critical to show how the North Delta Legacy Communities are impacted by two, separate major watersheds. The following are the size of the major watersheds impacting the legal Delta boundary:

- Sacramento River watershed is approximately 27,500 square miles
- Cosumnes River watershed is approximately 724 square miles
- Mokelumne River watershed is approximately 2,143 square miles
- San Joaquin River watershed is approximately 31,800 square miles

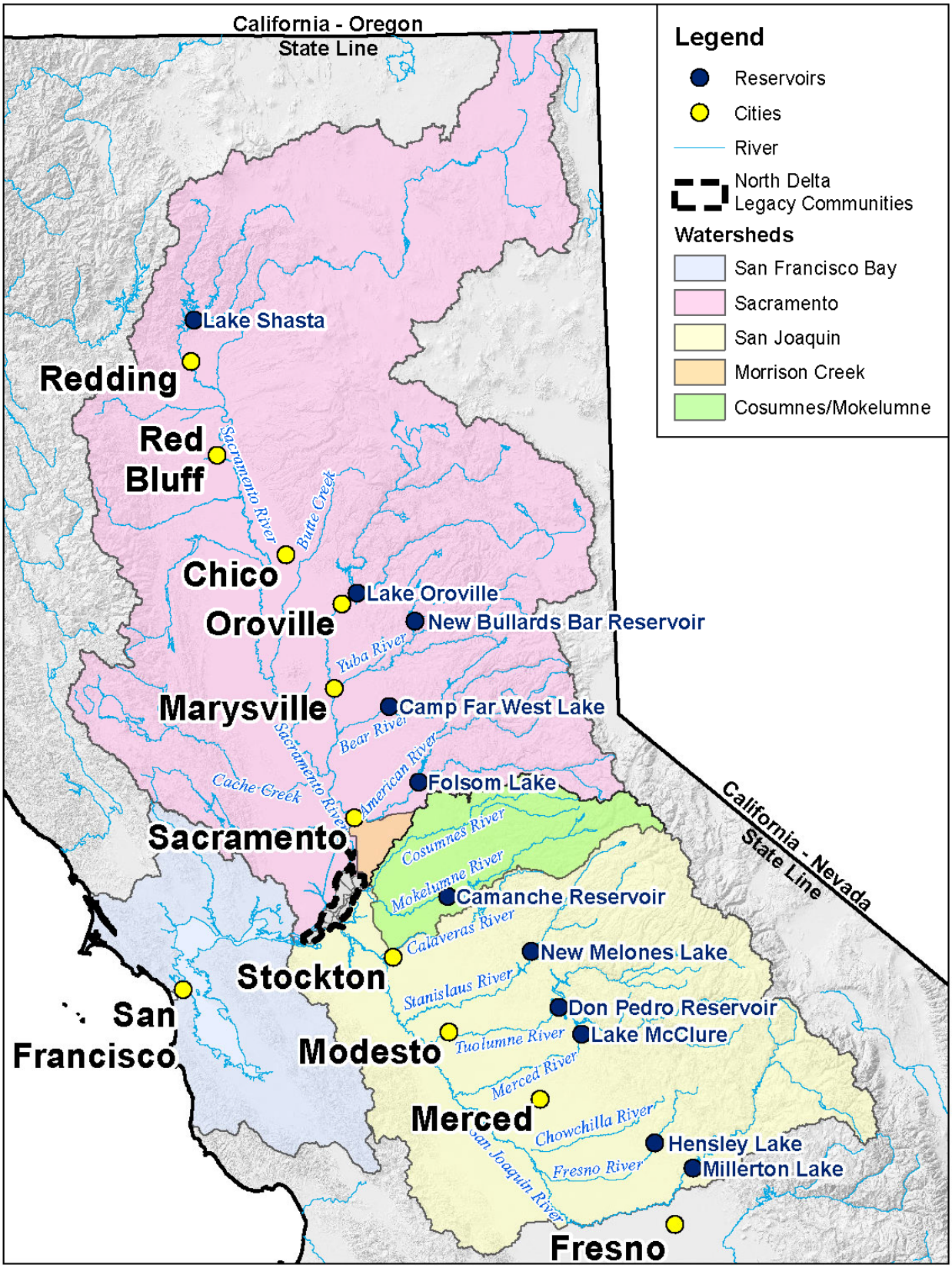

Figure 2-1: Watersheds

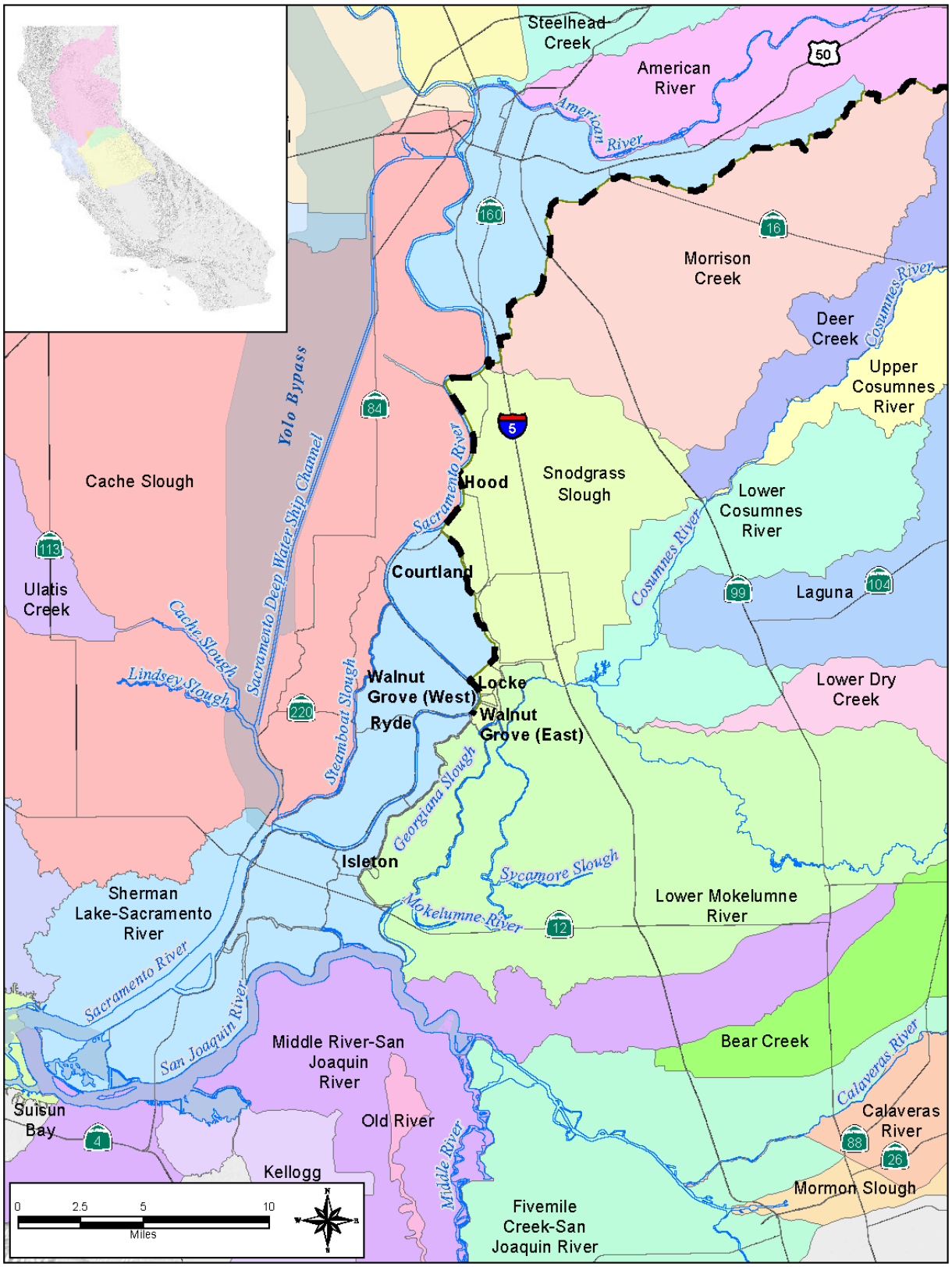

Figure 2-2: Watersheds Impacting Water Stages in North Delta

2.3 Sacramento River System Hydrology

2.3.1 Existing Condition Hydrology

The CVHS flow hydrographs developed by the U. S. Army Corps of Engineers (USACE) was utilized in the CVFED hydraulic model to develop the WSEL profiles. The CVHS hydrology was based on historical flood events from 1956, 1965, 1986, and 1997, but this TM utilizes the 1997 distribution due to the following:

1) The hydraulic models were calibrated on the 1997 flood event.
2) The flow releases were adjusted based on the constructed Folsom Reservoir Joint Federal Project (JFP) completed in 2015. The Folsom reservoir 100- and 200-year peak flow releases were adjusted from pre-JFP flows of 145,000 cubic feet per second (cfs) and 238,000 cfs, to the lower post-JFP flows of 115,000 cfs and 160,000 cfs, respectively. An approximate flow reduction of 20 percent for the 100-year and 32 percent for the 200-year is significant because the new 200-year flow reduction will stay within the flood control system and will not exceed the American River channel capacity of approximately 180,000 cfs.

A Technical Memorandum (TM) from David Ford Consulting Engineers (Ford), dated May 22, 2015, titled "Engineer's Work Product – DWR Channel Capacity Atlas Support, Task 2 and 3 Deliverable" utilized the CVHS to establish the recommended 100- and 200-year frequency peak flows for the Sacramento River and tributary systems. The CVHS flow estimates were also used for both the Basinwide Feasibility Study (BWFS) to establish the 100- and 200-year WSELs presented in the DWR Sacramento River Basin Channel Capacity Atlas, dated December 2016. Based on the summary table included in the referenced TM of May 22, 2015, the 100- and 200-year storm frequency events establishes a high and low range for the Lower Sacramento River reach. GEI reviewed the Ford TM and determined the 1997 90 percent and 100 percent scaled events could be used to establish the estimated 100- and 200-year WSEL profiles. The CVHS hydrology used for this evaluation is consistent with the flows published in the DWR Sacramento River Basin Channel Capacity Atlas, dated December 2016.

Table 2-1 provides a comparison of the CVFED Sacramento River system hydraulic model peak flows results compared to the CVHS 100- and 200-year frequency peak flows presented in the Ford TM. The purpose of this comparison is to show the CVFED hydraulic models are routing the flows consistent with the CHVS analysis points. The CVHS analysis point locations for the comparison are presented in **Figure 2-3.** The flow hydrograph boundary condition locations for the CVFED Sacramento River system model are presented in **Figure 2-4**.

Section 4.0 presents the hydraulic model peak flow and WSEL profile summaries for the Lower Sacramento River and distributaries used for the North Delta Legacy Community evaluations.

Table 2-1: Comparison of CVHS Evaluation vs. CVFED Hydraulic Models

CVHS Hydrology TM dated 2015			CVFED Hydraulic Model 2015				
Analysis Point	1997 100yr (Lower)	1997 200yr (Lower)	CVFED HEC-RAS XS	97 90% 100yr	% Difference	97 100% 200yr	% Difference
AMR-14	115,000	160,000	AME R01 14.842	115,000	0.0	160,000	0.0
SAC-57	114,899	117,956	SAC R08 57.568	113,989	0.8	125,263	6.0
YUB-14	171,043	210,695	YUB R02 13.84	171,043	0.0	211,622	0.4
FTH-ORO	150,000	160,296	FEA R05 152.431	150,000	0.0	165,000	2.9
SAC-199	147,543	153,435	SAC R12 200.782	136,349	7.9	143,218	6.9

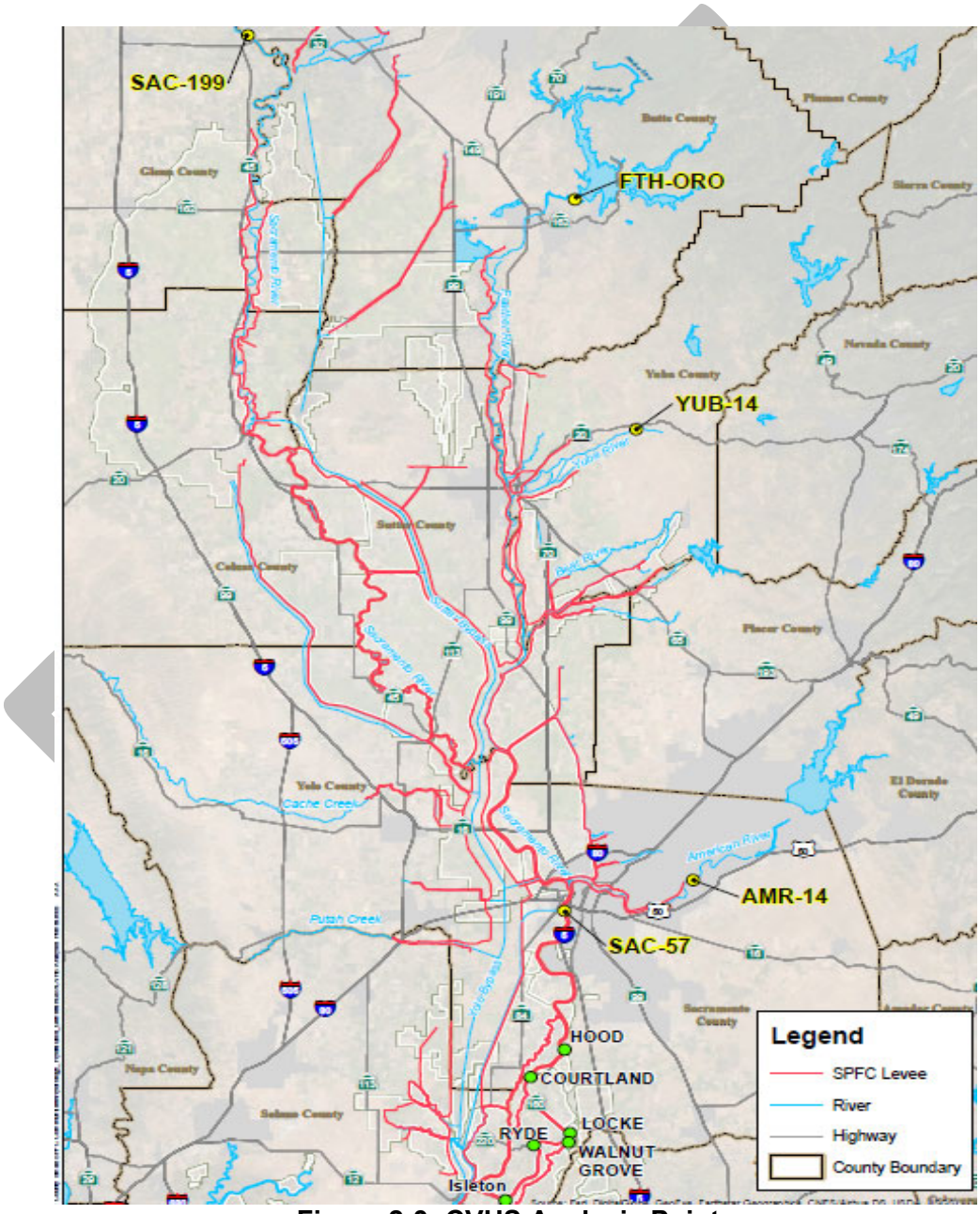

Figure 2-3: CVHS Analysis Points

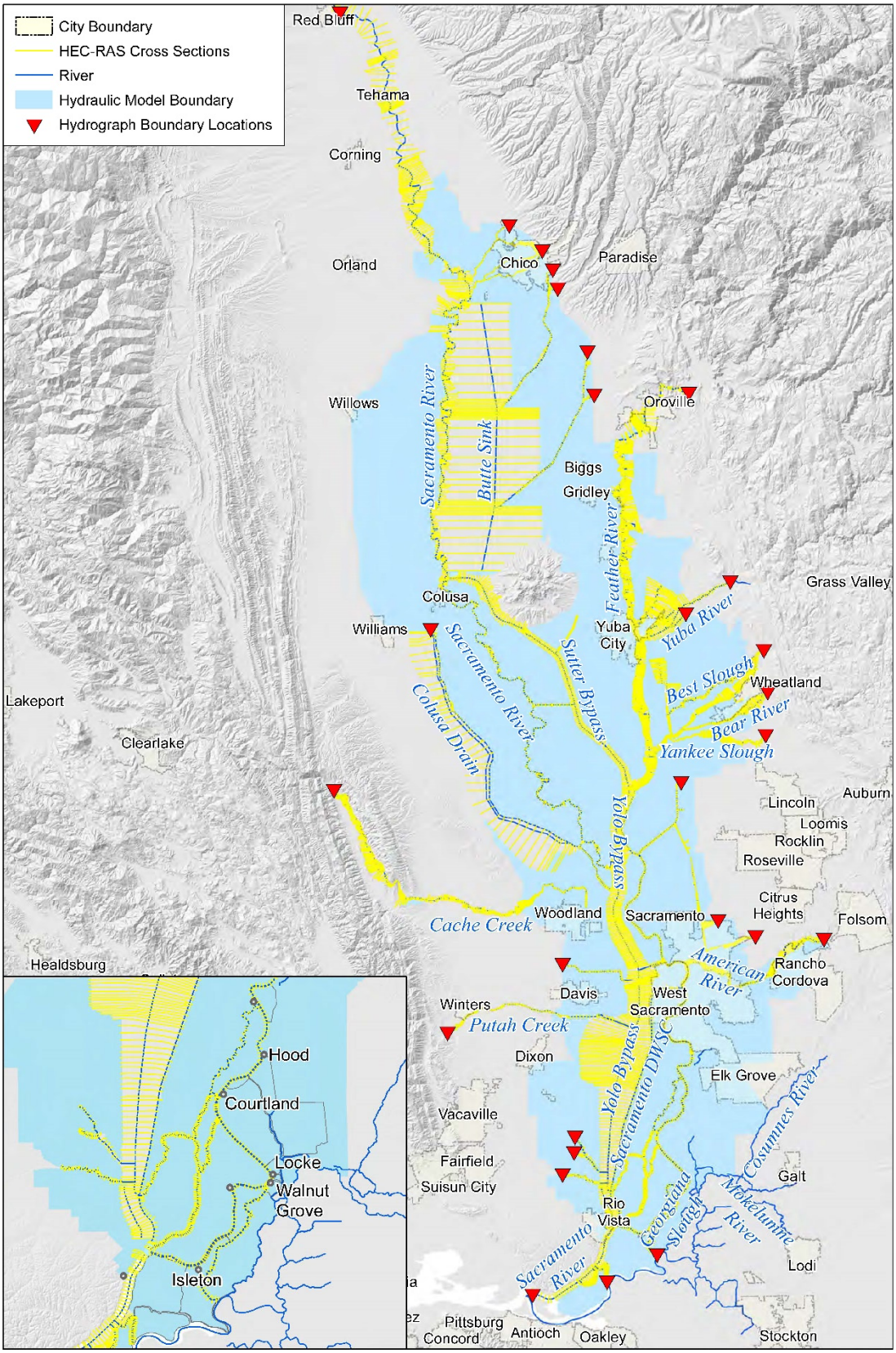

Figure 2-4: Flow Hydrograph Boundary Conditions for the Sacramento River System

2.3.2 Climate Change Hydrology

The draft "2017 CVFPP Update-Climate Change Analysis Technical Memorandum", dated March 2017, established the recommended climate change multiplying factors for the CVFPP hydraulic models.

The recommended multiplying factors are applied at the inflow hydraulic model boundary conditions to estimate the potential flow and stage impact compared to existing conditions. DWR was tasked to complete a phased process for assessing potential changes in future climatic conditions in the Central Valley for the BWFS. Phase 1, completed in 2013, included a pilot study that evaluated the sensitivity of the Feather-Yuba watershed and Oroville operations to a range of changes in flood volumes. Phase II expanded the analyses to provide information about potential climate vulnerabilities for the BWFS. Phase II was broken up into Phase IIA and Phase IIB. Phase IIA, completed in 2014, was a set of adjustments to historical flow volume-frequency curves that could be used as a preliminary assessment of the effects of climate change in the Central Valley Flood Management Planning Program planning area. Phase IIB work continued in parallel to BWFS development. Phase IIB provided updated estimates of potential changes in unregulated flows throughout the Central Valley based on newer climate projections and refined hydrologic modeling. Changes in unregulated flow volumes were estimated by applying climate scenarios (temperature and precipitation projections) to historical variability in climate and simulating the hydrologic responses.

Phase IIA provided estimates of potential changes in unregulated flows throughout the Central Valley based on available climate projections and coarse-scale hydrologic modeling. Changes in historical unregulated flow volumes were derived through hydrologic modeling of the Central Valley watersheds. Unregulated flows under projected climate change conditions were computed to the current simulation run for more than 80-years. The climate change results were compared to the current climate results to compute climate change factors. A climate change factor is calculated by dividing an unregulated volume-frequency curve from the climate change simulations by an unregulated volume-frequency curve from the historical simulations.

Phase IIB used newer climate projections for the analyses. The approach used climate change factors for each annual exceedance probability at each analysis point to adjust historical events. Uniformed changes to scaled historical events increased the hydrograph volumes, but did not change other characteristics of the hydrographs, such as duration and spatial correlation.

Table 2-2 compares the unregulated stream flow climate change factors used for the evaluation.

The results show that the 100-year peak flows and volumes increased between 20 to 30 percent throughout the Sacramento River system.

Table 2-2: Projected 100-Year Unregulated Flow Climate Change Factors

Location	Climate Change Factors (Phase IIB)	Climate Change Factors (Phase IIA)	Difference (IIB minus IIA in %)
Sacramento River at Shasta Dam	1.28	1.11	18
Feather River at Oroville Dam	1.25	1.20	5
Yuba River at Smartsville	1.18	1.07	12
American River at Folsom Dam	1.22	1.24	-2
Cosumnes River at Michigan Bar	1.25	1.11	13

2.4 North Delta System Hydrology

The hydrology for the North Delta hydraulic model was based on the Sacramento County report entitled "Cosumnes and Mokelumne River watersheds – Design storm runoff analysis" dated February 6, 2004. The study performed by David Ford Consulting Engineers provided the hydrologic models which produced the storm frequency hydrographs for the hydraulic model developed presented in Section 3.0. **Table 2-3** presents the 10-, 25-, 50-, 100-, and 200-year peak flows generated from the hydrologic models. **Figure 2-5** presents where the flow hydrographs were placed in the North Delta hydraulic models to develop the WSELs for Snodgrass Slough and the tributaries bordering the small communities.

Table 2-3: Cosumnes River System Peak Flows

ID No	Location	10-year Peak Flow (cfs)	25-year Peak Flow (cfs)	50-year Peak Flow (cfs)	100-year Peak Flow (cfs)	200-year Peak Flow (cfs)
1	Cosumnes River at Michigan Bar	40,846	53,865	60,400	73,022	82,340
2	Mokelumne River at Woodbridge	5,000	5,000	5,000	5,000	5,000
3	Dry Creek at Galt	17,253	22,577	25,495	31,113	35,294
4	Deer Creek at Sloughhouse	2,691	3,537	3,959	4,779	5,388
5	Morrison Creek at UPRR	7,414	8,896	9,577	10,684	11,475

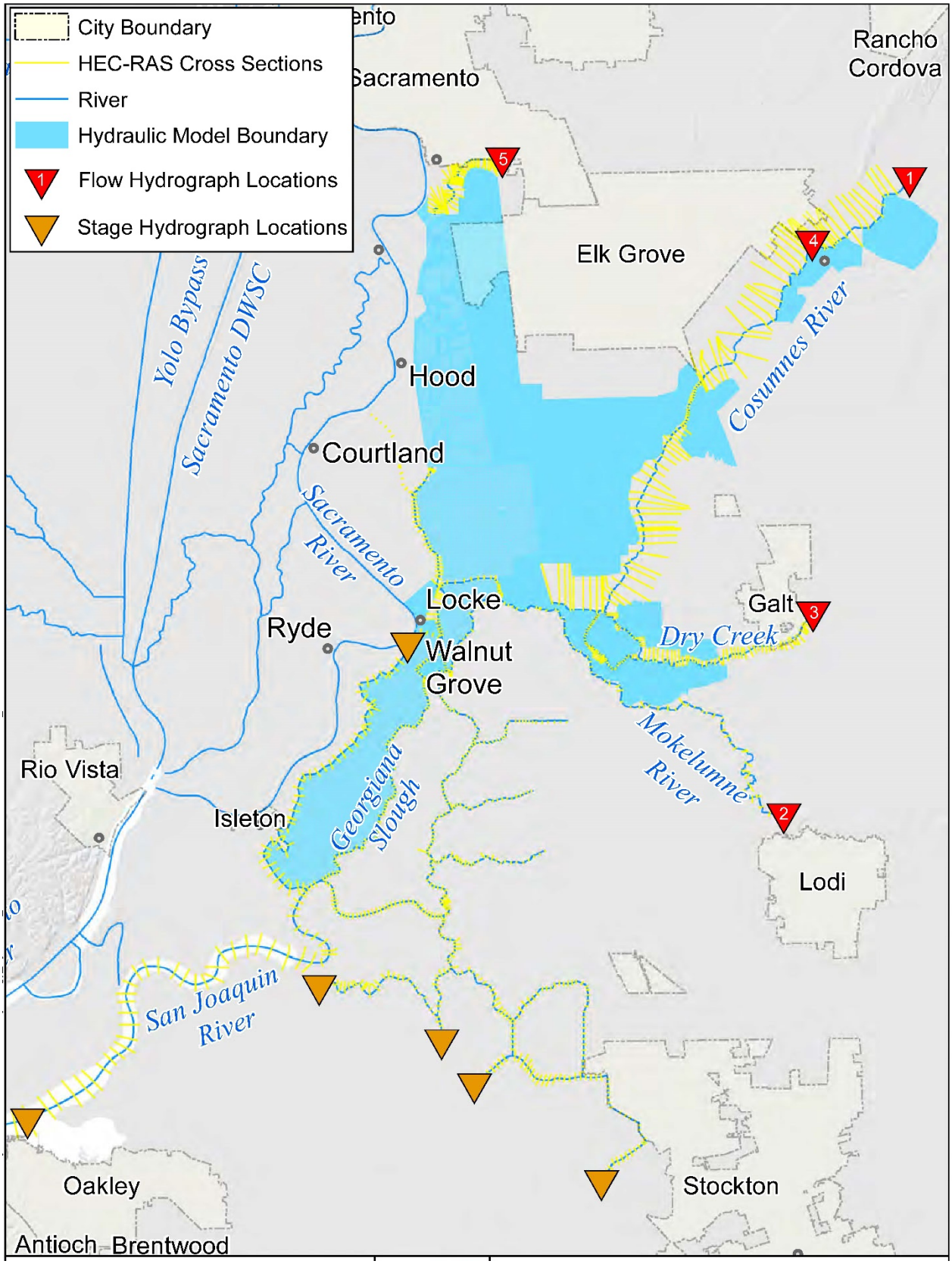

Figure 2-5: Boundary Locations on the North Delta System

2.5 Developing Flow Frequency Estimates for the Lower Sacramento River

The purpose for developing additional flood profiles (Section 3.0) for the 2-, 5-, 10-, 25-, 50- and 200-year storm events in addition to the 1 percent chance storm (100-year) for the lower Sacramento River between Georgiana Slough and the American River confluence is to estimate which flood frequency stage the levee(s) could potentially fail. The elevation of potential levee failures will be based on future review of geotechnical fragility curves which are not part of this TM. The effective FEMA Flood Insurance Study (FIS) report and Flood Insurance Rate Maps (FIRMs) only included the 100-year flow and Base Flood Elevations (BFEs) for the Lower Sacramento River study reach. Therefore, this feasibility report expands the scope to include the additional profiles to review the levee integrity.

The flow frequency estimates were based on two gages located on the Lower Sacramento River reach; one located at the I Street bridge, and the other located near Freeport. The DWR I Street gage has 36-years of available records between 1984 to 2019, and the U. S. Geological Survey (USGS) Freeport gages has 68-years of available records dating from 1949 to 2019. The flow frequency estimates presented below for the DWR I Street gage using the Hydrologic Engineering Center Statistical Software Package (HEC-SSP) Version 2.1.1, and the flow frequency estimates for the Freeport gage were developed using the PeakFQ version 7.2 program from USGS. The regional skew was consistent for both evaluations, but there is a wide discrepancy for the 2- thru 50-year storm frequencies.

Table 2-4 presents the flow frequencies at I Street gage (1996 through 2018) from HEC-SSP and **Table 2-5** presents the flow frequencies at the Freeport gage (1949 through 2017) from PeakFQ. **Table 2-6** shows the percent difference of flows between the two gages. The discrepancy for the lower stages is likely due to the tidal influences on the Freeport gage, which is located closer to the Yolo Bypass. The flow frequency estimates for the I Street gage is located just downstream of the American River confluence and has less impact from tidal influences compared to the Freeport gage location.

The 100- and 200-year flow frequency estimates for the Freeport gage compared closer to the CVHS peak flows shown in **Table 2-1**. Future review of the fragility curves will determine the estimated flow frequency the levees will support before failure.

Table 2-4: HEC-SSP Flow Frequency (cfs) at I ST Gage & NAVD 88 Stage (ft)

2-year (cfs)	5-year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)	200-year (cfs)	500-year (cfs)
54,748	70,699	80,430	89,253	100,089	107,874	115,407	125,079
2-year (ft)	**5-year (ft)**	**10-year (ft)**	**25-year (ft)**	**50-year (ft)**	**100-year (ft)**	**200-year (ft)**	**500-year (ft)**
19.01	23.39	25.94	28.18	30.89	32.84	> 31.00	> 31.00

Table 2-5: PeakFQ Flow Frequency at Freeport Gage

2-year (cfs)	5-year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)	200-year (cfs)	500-year (cfs)
76,660	92,860	100,500	107,900	112,220	115,600	118,400	121,500

Table 2-6: Percent Difference between I ST & Freeport

Frequency	I ST Flow (cfs)	Freeport Flow (cfs)	% Difference
2-year	54,748	76,660	33.3
5-year	70,699	92,860	27.1
10-year	80,430	100,500	22.2
25-year	89,253	107,900	18.9
50-year	100,089	112,220	11.4
100-year	107,874	115,600	6.9
200-year	115,407	118,400	2.6
500-year	125,079	121,500	2.9

2.6 Flow Duration on the Lower Sacramento River Levee System

The basin bottom elevations of the North Delta Islands are located below the normal tidal elevations in the river conveyance. Therefore, it is critical to understand how long of a duration the Lower Sacramento River levee systems are seasonally loaded most years under high flow conditions. The hydraulic model results presented in Section 4.0 shows flows above 30,000 to 50,000 cfs in the lower Sacramento River begin to load and impact the levee systems. **Table 2-7** presents the estimated duration between the years of 1984 to 2018 that the WSEL flow is above 50,000 cfs, which is significant because the impact could range from several weeks to months in 19 of the 35 years of recent record.

Table 2-7: Flows above 50k cfs at I Street Gage

Year	Days >50k cfs	% of the Year	Year	Days >50k cfs	% of the Year	Year	Days >50k cfs	% of the Year
1984	20	5.5	1996	88 (2.9 months)	24.1	2008	0	0.0
1985	0	0.0	1997	48 (1.6 months)	13.2	2009	0	0.0
1986	52 (1.7 months)	14.2	1998	133 (4.4 months)	36.4	2010	25	6.8
1987	0	0.0	1999	0	0.0	2011	36 (1.2 months)	9.9

Year	Days >50k cfs	% of the Year	Year	Days >50k cfs	% of the Year	Year	Days >50k cfs	% of the Year
1988	0	0.0	2000	0	0.0	2012	17	4.7
1989	13	3.6	2001	0	0.0	2013	0	0.0
1990	0	0.0	2002	13	3.6	2014	8	2.2
1991	0	0.0	2003	29	7.9	2015	0	0.0
1992	0	0.0	2004	30	8.2	2016	31	8.5
1993	47 (1.5 months)	12.9	2005	0	0.0	2017	129 (4.3 months)	35.3
1994	0	0.0	2006	121 (4 months)	33.2	2018	12	3.3
1995	109 (3.6 months)	29.9	2007	0	0.0			

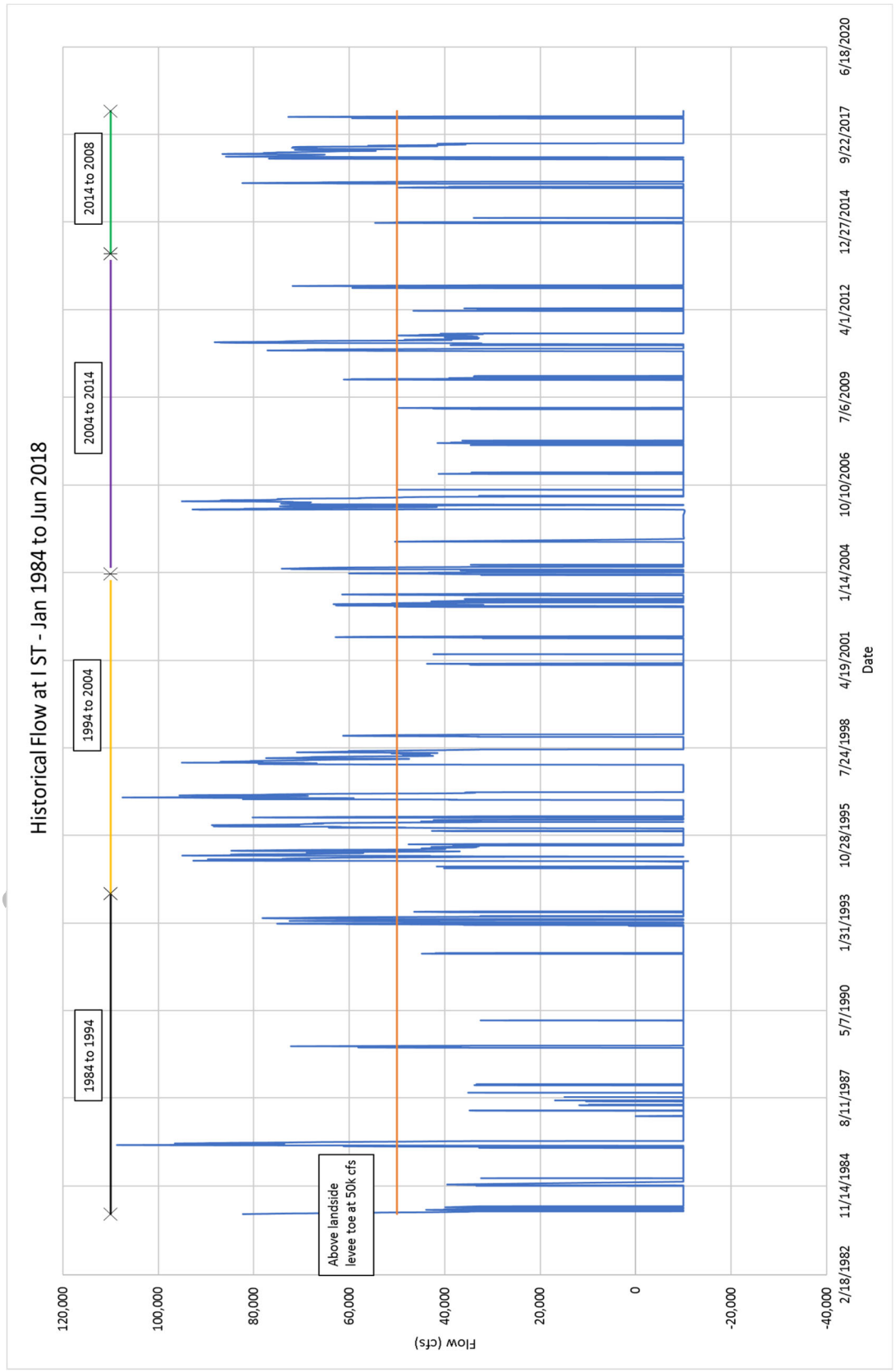

Figure 2-6: Boundary Locations on the North Delta System

3.0 Hydraulic Model Development

3.1 General

Section 3.0 discusses the hydraulic model development for existing and future conditions, which establishes the assumptions and the water surface profiles surrounding the North Delta Legacy Communities presented in Section 4.0. The future improvements for the Sacramento River system intended to improve the channel capacity of the collective Sacramento Weir and Yolo Bypass systems identified in the 2017 CVFPP are in the early implementation stages, and as such, the hydraulic models within this TM incorporate the system-wide weir/bypass improvements into "Future Conditions" as noted below in Section 3.2.1 and in Figure 3-2 – Future System Improvements. The figures located in **Appendix A** provide the Lower Sacramento River system hydraulic model stations (inclusive of Steamboat and Georgiana Sloughs) and coinciding levee stationing for all of the State Plan of Flood Control (SPFC) and DWR Non-Urban Levee Evaluation (NULE) levee segments protecting the North Delta Legacy Communities in Sacramento County between Freeport and Isleton.. **Appendix B** presents the Sacramento County and DWR North Delta hydraulic model stationing for the non-SPFC levee segment water surface profiles and coinciding stationing of select non-SPFC NULE levee segments. The hydraulic model evaluation used the Hydrologic Engineering Center River Analysis System program (HEC-RAS) Version 5.0.3, dated September 2016.

3.2 Model Development

3.2.1 General

Existing Condition:

The Sacramento River system CVFED model includes 42 study streams, approximately 800 miles of study system reaches, over 300 bridges, and 600 miles of levees. The hydraulic model utilized one-dimensional (1D) cross sections contained by levees connected to either urban or rural overland areas. From the CVFED full system existing condition model, a separate single reach model was created for the lower SPFC Sacramento River system between the American River and the downstream Yolo Bypass confluence to perform hypothetical breach scenarios for the North Delta Legacy Communities to reduce run times for each of the scenarios. The single reach hydraulic model included two-dimensional (2D) grids for each of the North Delta islands. **Figure 3-1** presents the clipped model of the Lower Sacramento River system.

The North Delta hydraulic model includes major streams of the Cosumnes River, Snodgrass and Georgiana Sloughs, Dry Creek, and the Mokelumne and San Joaquin Rivers. The study reaches used 1D model cross sections and 2D grids in the area of Tyler Island, Locke, Walnut Grove, and the Glanville Tract near Point Pleasant, south of Elk Grove.

Future Condition Hydraulic Model:

The Sacramento River system, as proposed in the 2017 CVFPP Update, is scheduled to have significant setback levee improvements in the collective Sacramento and Yolo Weir/Bypass systems which will improve the hydraulic conveyance and ultimately reduce the impact of climate change and sea-level rise in the Lower Sacramento River system adjoining the North Delta Legacy Communities. **Figure 3-2** presents the setback levee locations that were evaluated in the Sacramento River system hydraulic model. The Lower Sacramento system is not considered part of the proposed weir and by pass widening improvements, but the future setback improvements in the system will benefit the Lower Sacramento River future condition by lowering the 100-year water surface elevations by as much as two feet near Freeport and just under a foot near Locke and Walnut Grove compared to current conditions. The proposed improvements include levee setbacks on the Yolo Bypass, Fremont and Sacramento Weirs and the Sacramento Bypass. The WSEL profiles based on the future improvements are included in **Appendices D and E.**

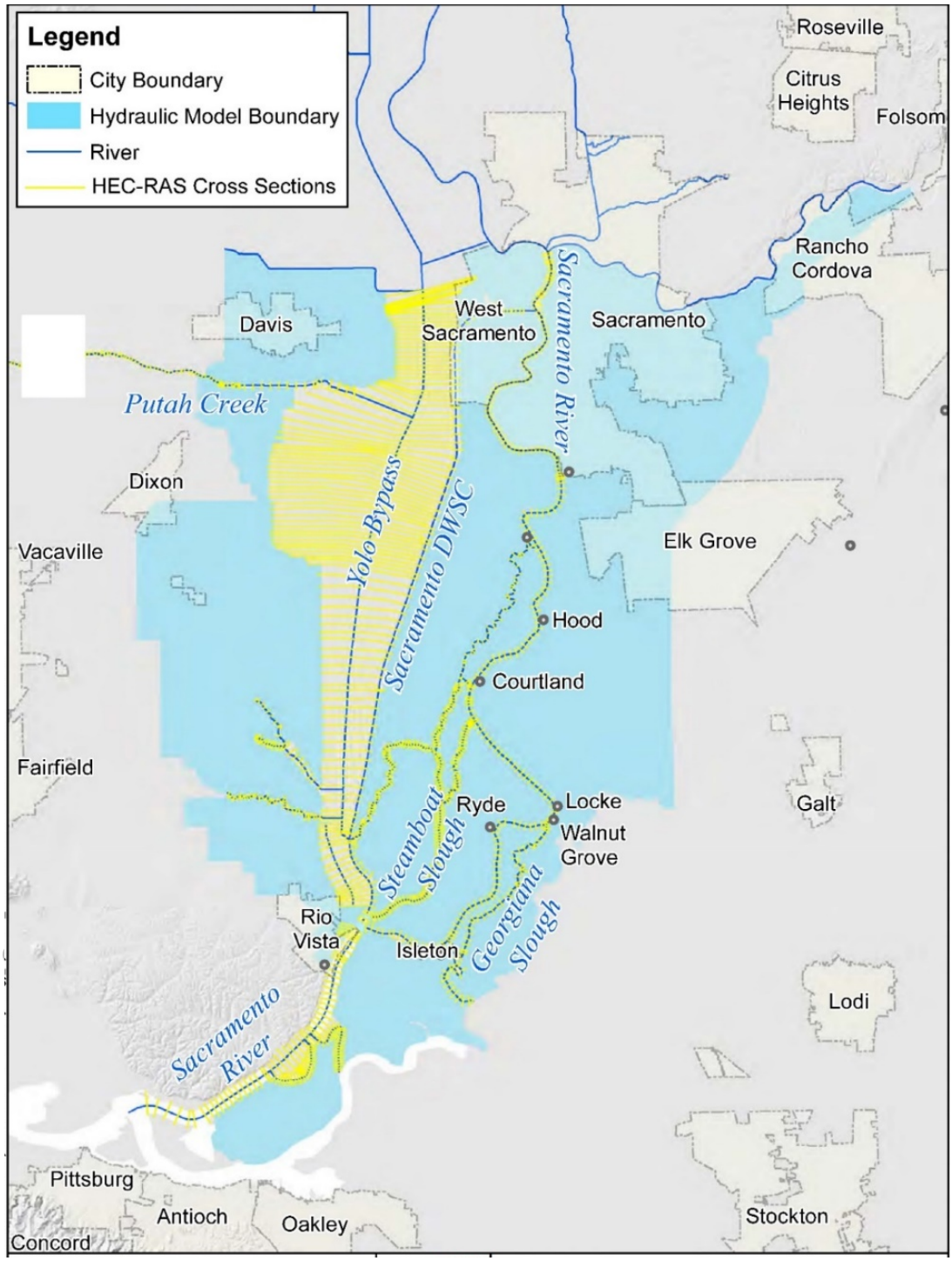

Figure 3-1: Lower Sacramento River Clipped Model

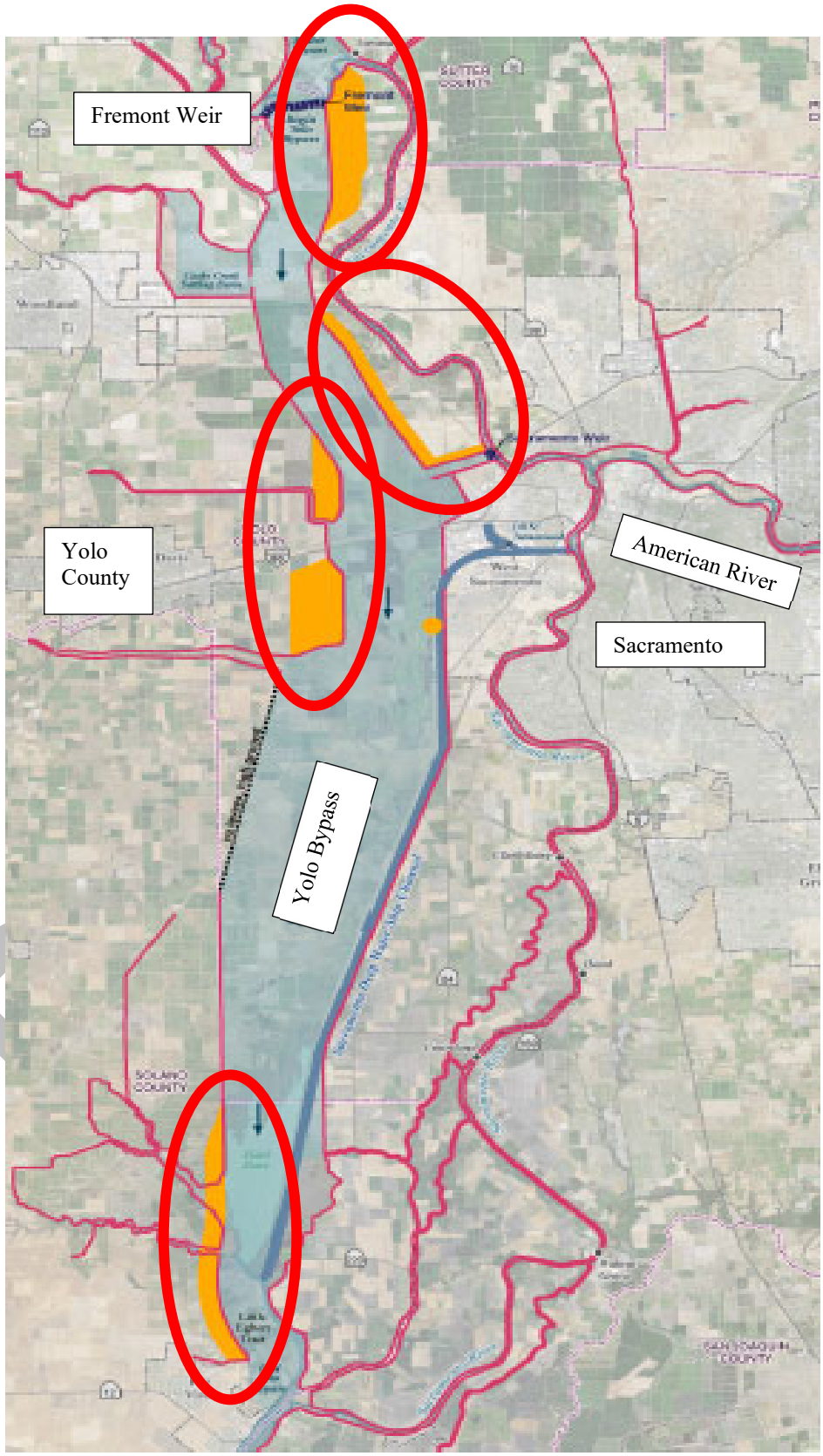

Figure 3-2: Future System Improvements

3.2.2 Upstream Boundary Conditions

The upstream boundary condition hydrographs for the Sacramento and North Delta system models were discussed above in Section 2.0.

Georgiana Slough is unique because both separate hydraulic models include this study reach. The Sacramento River at Walnut Grove disperses flow through one of its distributaries, Georgiana Slough to the lower, downstream portion of the North Mokelumne River. In the Sacramento River system model, Georgiana Slough utilized a downstream boundary condition from the North Delta model at the downstream confluence of Georgiana Slough with the Lower Mokelumne River, whereas Georgiana Slough at its confluence with the Sacramento River in the North Delta hydraulic model utilized an upstream boundary flow hydrograph from the Sacramento River system model.

3.2.3 Downstream Boundary Conditions

The downstream boundary condition for both the Sacramento River and the North Delta hydraulic models are influenced by tidal conditions from the San Francisco Bay. **Table 3-1** presents the recorded tidal conditions from the 1986, 1997, 2017, and 2018 storm events. The WSELs presented from the California Nevada River Forecast Center (CNRFC) website for the 1986 and 1997 events should be verified because the listed data was not available on the California Data Exchange Center (CDEC) website.

The downstream boundary conditions for the Sacramento River system base model used three Delta gages. The distributions assigned a stage based on the best available DWR and USGS gage information. These downstream boundary reaches are based on the Sacramento River at Rio Vista, Three-Mile Slough at San Joaquin River, and Georgiana Slough at Mokelumne River. The downstream boundary conditions for the North Delta system was based on five Delta gages. **Table 3-2** and **Table 3-3** presents the downstream boundary conditions for both the Sacramento River and the North Delta hydraulic models.

Table 3-1: Historical Recorded Tidal Conditions

Location (shown in ft)	**1986**	**1997**	**2017**	**2018**
Sacramento River at Rio Vista	11.50	11.18	9.79	7.78
Three-mile Slough at San Joaquin River	-----	8.68	8.26	7.46
Georgiana Slough at Mokelumne River	-----	9.34	10.06	7.66

Table 3-2: Downstream Boundary Conditions for the Sacramento River System

Location	**100-Year Peak Stage (ft)**	**200-Year Peak Stage (ft)**
Sacramento River at Rio Vista	9.8	10.33
Three-mile Slough at San Joaquin River	8.68	8.68
Georgiana Slough at Mokelumne River	10.42	9.34

Table 3-3: Downstream Boundary Conditions for the North Delta - Cosumnes River System

Location	100-Year Peak Stage (ft)	200-Year Peak Stage (ft)
San Joaquin River at Antioch	9.8	10.33
Fourteen Mile Slough, San Joaquin River at Rindge Pump	8.72	8.72
Potato Slough at Old River	8.95	8.95
Disappointment Slough, San Joaquin River at Venice Island	8.8	8.8
Connection Slough, San Joaquin River at Venice Island	8.8	8.8

3.2.4 Sea Level Rise (SLR)

Sea-level rise estimates have been shown in several studies to vary from 0.5 feet. to 5.0 feet., but there is no exact answer. For this evaluation a sea level rise (SLR) estimate of 0.8 feet was applied to both the CVFED Sacramento River model and the North Delta-Cosumnes River System model based on the DWR document called "2017 CVFPP Update – Technical Analyses Summary Expanded Report", dated 2017. The SLR was added to the tidal hydrographs for the downstream boundary conditions.

Based on historical data from tidal gages, there has been a steady rate of SLR in the 20th century as the earth warms. Sea levels are rising mainly because ocean water expands as it warms, and water from melting glaciers and ice sheets flow into the ocean. To incorporate SLR into coastal planning, the National Research Council (NRC) of the National Academics made projections of SLR for the years 2030, 2050, and 2100, taking into account regional factors that affect sea level. From the NRC study, they found that sea level along the U.S. west coast differs from global mean SLR because of local steric contributions, dynamic height difference caused primarily by changes in winds, gravitational and deformational effects of modern land ice melting, and vertical land motions along the coast.

In the CVFPP 2017 update, DWR used NRC's projections based on the elevation from the San Francisco Bay interpolated to Rio Vista.

Figure 3-3 shows the tidal gage comparison between the 1997 event, the 2017 event and the increase in tidal elevation assuming the SLR is 0.8 ft. at the Sacramento River at Rio Vista. **Table 3-4** and **Table 3-5** presents the elevations used for the downstream boundaries in the hydraulic models. The measured 1997 tidal elevations were recorded lower that the 2017 tidal elevation. The 2017 tidal elevations were considered a King Tide condition, therefore, the SLR of 0.8 ft. was added to the 2017 recorded data.

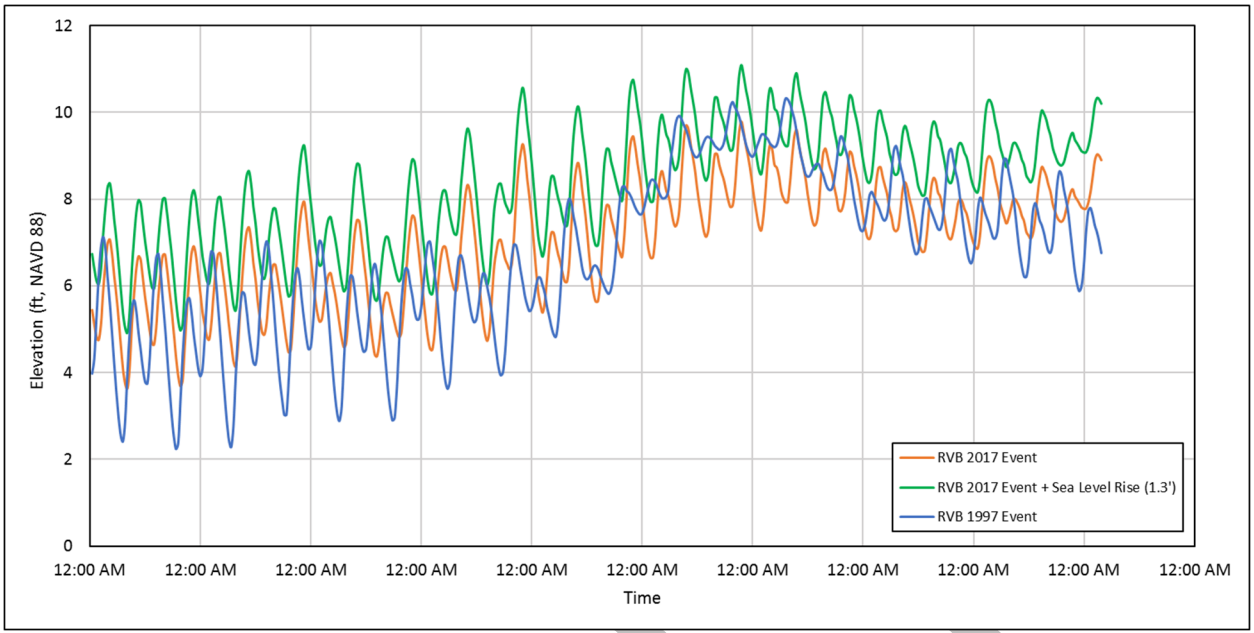

Figure 3-3: Sacramento River at Rio Vista, 1997 vs. 2017 vs. SLR (0.8')

Table 3-4: Estimated Downstream Boundary Conditions with SLR for the Sacramento River System

Location	100-Year Peak Stage (ft)	100-Year with SLR Peak Stage (ft)
Sacramento River at Rio Vista	9.8	10.6
Three-mile Slough at San Joaquin River	8.68	9.48
Georgiana Slough at Mokelumne River	10.42	11.28

Table 3-5: Downstream Boundary Conditions with SLR for the Mokelumne/Cosumnes River System

Location	100-Year Peak Stage (ft)	100-Year with SLR Peak Stage (ft)
San Joaquin River at Antioch	9.8	10.6
Fourteen Mile Slough, San Joaquin River at Rindge Pump	8.72	9.52
Potato Slough at Old River	8.95	9.75
Disappointment Slough, San Joaquin River at Venice Island	8.8	9.6
Connection Slough, San Joaquin River at Venice Island	8.88	10.18

3.2.5 Roughness Coefficients

Roughness coefficients (n-values) used in the CVFED hydraulic model were established based on model calibration from the 1997 storm event and verification from the 2006 high water event. Utilization of the CNRFC was also used in the hydraulic models to provide a validation the n-values are acceptable. The results from the 2019 hydraulic model validation by GEI is also presented in Section 4.0. Following the review of the 1997 and 2019 high-water marks and model

validation of 2019 presented below in Section 4.2 no changes in the Lower Sacramento River model roughness coefficients were warranted.

3.2.6 Sacramento Weir Gates

The operation of the Sacramento Weir gates is a critical feature in evaluating the WSELs for the Lower Sacramento River reach. The Sacramento Weir has a total of 48 gates. Flow releases from the Folsom Reservoir in combination with the timing of peak flows from the Sacramento and Feather Rivers will determine how many Sacramento Weir gates will be open to allow flow into the Sacramento Bypass and ultimately into the Yolo Bypass away for the Lower Sacramento River. The operational rule to begin opening the number of Sacramento Weir gates is when the elevation in the Sacramento River at the I Street bridge reaches El. 30.0 feet (NAVD 88), which is a flow of approximately 93,000 cfs in the Sacramento River. **Figure 3-4** presents the stage vs. flow rating curve at I street from the base hydraulic model. The approximate flow of 93,000 cfs was estimated to be a 25-year storm frequency based on the flood frequency analysis summarized in Section 2.0. This is significant because a flow closer to 50,000 cfs at the I Street bridge will begin to produce stages higher than the land-side toe of the levees protecting the downstream North Delta Legacy Communities.

The DWR fact sheet entitled "Sacramento River Flood Protection System Weirs and Flood Relief Structures", dated October 2012 indicates the Sacramento Weir gates have been opened 20 times to divert high flows into the Sacramento and Yolo Bypass' between the 79 years of 1934 through 2012. The 1997 flood event required all 48 gates to open based on 115,000 cfs being released into the American River from Folsom Reservoir. In 2006, a smaller storm event required only 20 of the 48 gates to be opened. The January 2017 event started with the opening of only six gates, but flow increases from Folsom Reservoir necessitated opening 35 of the 48 gates. In February 2017, additional storms required 35 of the 48 gates to open. **Table 3-6** below is a guide based on flow from the American and Sacramento Rivers for the number of gates that will be open on the Sacramento Weir to manage and reduce the flows into the Lower Sacramento River. This table assists flood emergency managers in determining the estimated frequency to expect in the Lower Sacramento River and estimate how long the levees will be loaded for potential failure.

Note: The number of Sacramento Weir gates to open are only recommendations based on historical data. The number of gates to open will vary based on timing of peak flows and volume from the Sacramento and the American River at the Sacramento Bypass. The goal is to keep the Sacramento River stage below El. 30.0 feet (NAVD 88) at RS 59.646 (I Street gage).

Table 3-6: Guide for Opening Sacramento Weir Gates

Sac Weir Gates Open	Approx. Flow (cfs) at the Verona Gage (Sac RS 78.741) on the Sacramento River	Folsom Reservoir Flow Releases (cfs)
0	60,960	30,000
6	62,000	40,000
13	64,800	50,000
20	65,300	60,000
35	68,300	80,000
48	>69,000	>100,000

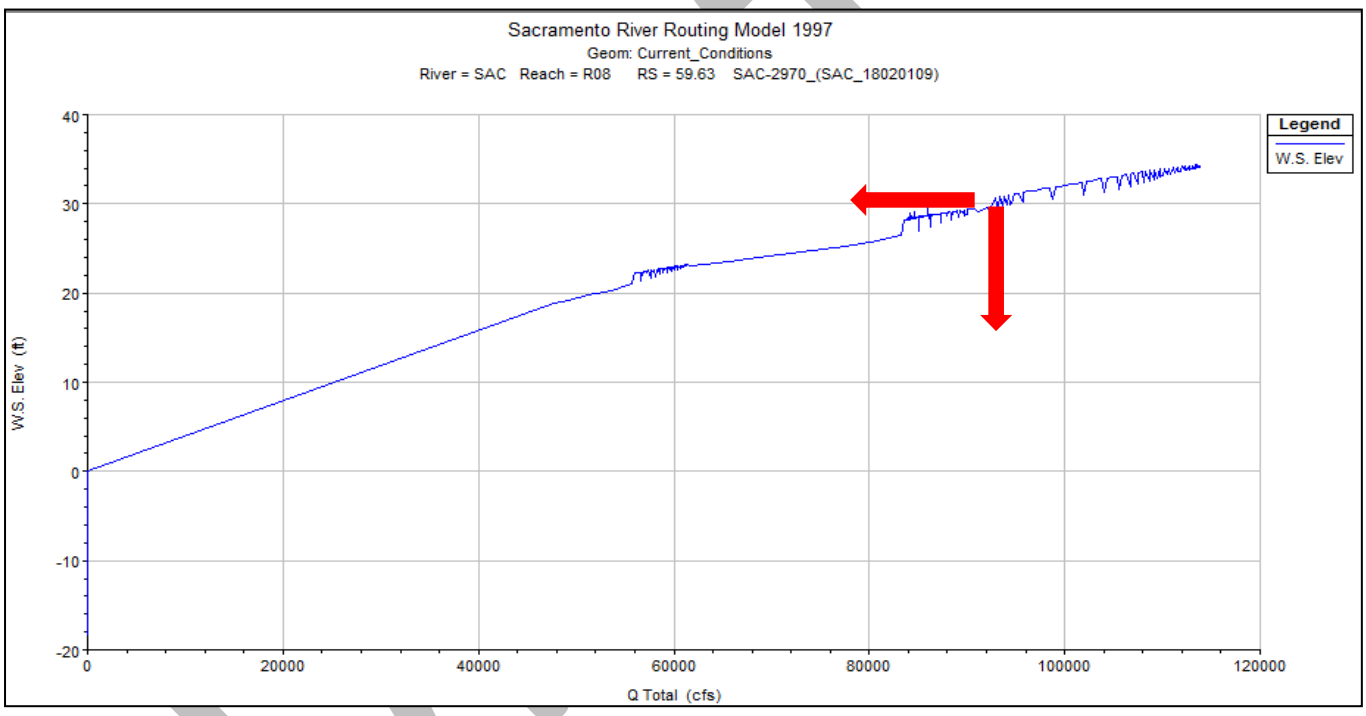

Figure 3-4: Hydraulic Model Rating Curve at I Street

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4.0 Results and Findings

Section 4.0 discusses the model results and findings that impacts the conveyance systems adjacent to the North Delta Legacy Communities. **Appendices C-1 through C-3** include the model result summary flow and WSEL tables for existing and future conditions with SLR and Climate Change for the Lower Sacramento River SPFC leveed reaches (including Steamboat and Georgian Sloughs); and Appendix C-4 includes flows and WSEL tables for existing and future conditions with SLR and Climate Change for the non-SPFC leveed reaches along Snodgrass Slough derived from Sacramento County's North Delta model. **Figure 4-1** presents the key focus locations for the result discussion relative to the SPFC reaches in the Lower Sacramento River system.

Appendix C Tables:

Appendix C-1 Lower Sacramento River flow and stage summary (SPFC levee segments)

Appendix C-2 Georgiana Slough flow and stage summary (SPFC levee segments)

Appendix C-3 Steamboat Slough flow and stage summary (SPFC levee segments)

Appendix C-4 Snodgrass Slough flow and stage summary (non-SPFC levee segments)

The summary tables provided in **Appendix C** presents the hydraulic model results for the lower Sacramento River and Georgiana and Steamboat Sloughs. The summary tables include the100-year and 200-year peak flow and stages results for existing conditions and future conditions with climate change and SLR for all the hydraulic model cross sections for the study reach, reclamation district locations for the cross sections, corresponding NULE stationing for the geotechnical investigations, top of levee and freeboard elevations, and the 1957 design flows and profile values. The future condition values for the Sacramento River system also include the stage reduction system-wide benefits of collectively widening of the Sacramento and Yolo Bypass/Weirs identified in the 2017 CVFPP Update.

Appendix D includes the WSEL profile results for existing and future conditions with the Sacramento and Yolo Bypass/Weir improvements, climate change and SLR adjustments, all identified in the 2017 CVFPP Update for the study streams protecting the Legacy Communities, inclusive of both the SPFC and non-SPFC levee reaches. Below is a listing of the WSEL Profiles provided in Appendix D for the Lower Sacramento River System and the North Delta System.

Appendix D – Lower Sacramento River System and North Delta System WSEL Profiles

- Appendix D-1 Lower Sacramento River Real-Time Model Validation: February and March 2019High-Water Marks (HWMs) and Profiles compared to 1997 Event HWMs and 1957 Design Profile Between Sacramento Weir and Garcia Bend/Pocket Area
- Appendix D-2 Lower Sacramento River 100- and 200-Year WSEL Profiles for Existing and Future Conditions with 2017 CVFPP System Improvements, Climate Change and Sea Level Rise Compared to the 1957 Design Profile
- Appendix D-3 Lower Sacramento River Flood Frequency WSEL Profiles for the 2-Year through 200-Year Flow Events

- Appendix D-4 Georgiana Slough 100- and 200-Year WSEL Profiles compared to 1957 Design Profile
- Appendix D-5 Yolo Bypass 100- and 200- Year WSEL Profiles compared to 1957 Design Profile
- Appendix D-6 Snodgrass Slough Flood Frequency WSEL Profiles for 10-Year through 200-Year events
- Appendix D-7 North Mokelumne River 100- and 200-Year WSEL Profiles
- Appendix D-8 Lower San Joaquin and Mokelumne River 100- and 200-Year WSEL Profiles

Appendix E (E-1 through E-6) provides community-specific WSEL tables and profiles for each of the channels and corresponding NULE levee segments adjoining each of the community-specific study areas:

- Appendix E-1: Hood
- Appendix E-2: Courtland – RDs 551 and 755
- Appendix E-3: Locke – RD 369
- Appendix E-4: East Walnut Grove RD 554 and northerly, upstream portion of RD 563
- Appendix E-5: West Walnut Grove/Ryde – Grand Island
- Appendix E-6: City of Isleton – Brannan Andrus Levee Maintenance District (BALMD)

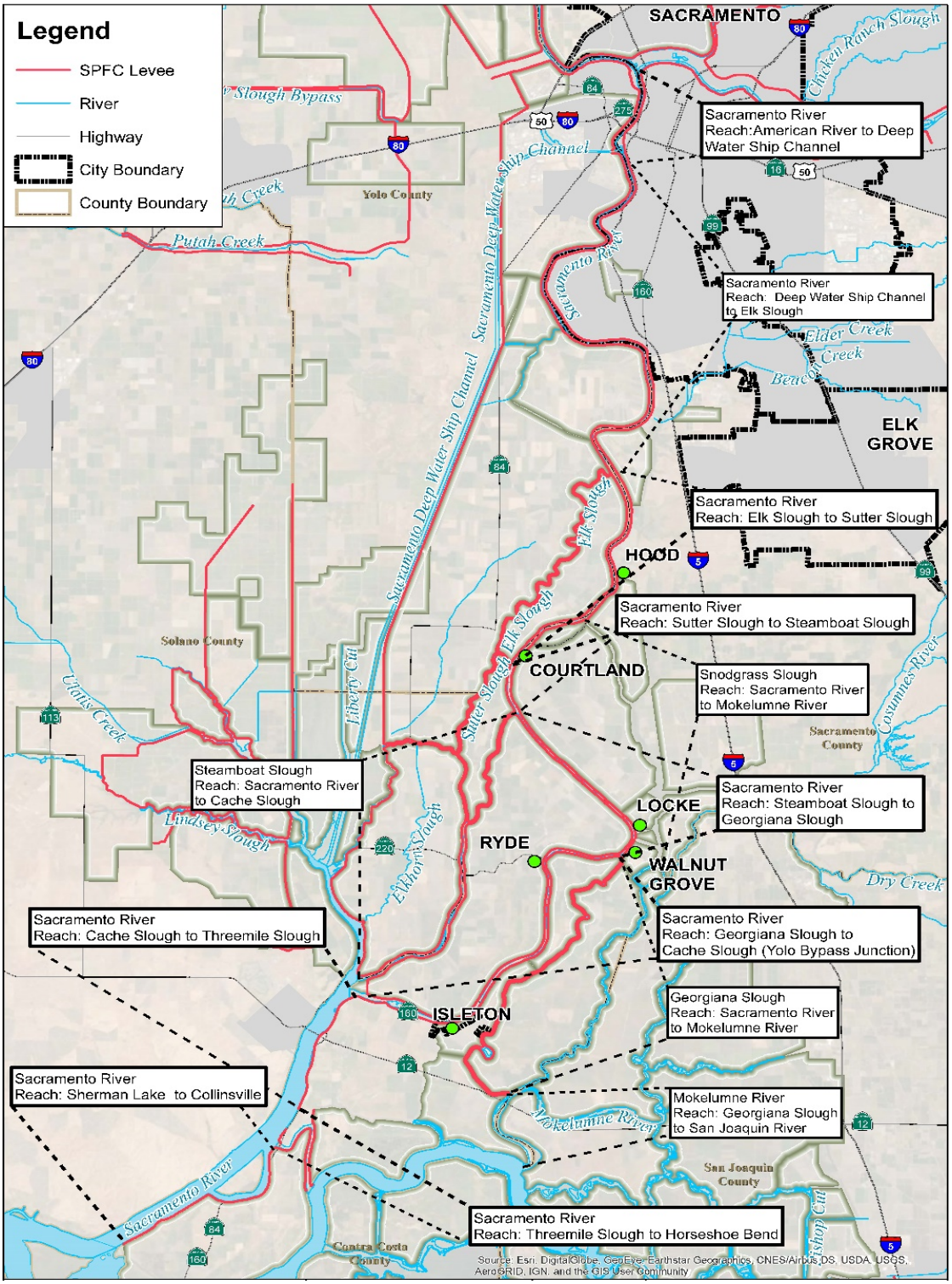

Figure 4-1: Key Locations for the Sacramento River Model Results for SPFC Levee reaches

4.1 Sacramento River and North Delta Model System Findings

Lower Sacramento River

As previously discussed, the Lower Sacramento River levees can be under prolonged, frequently loaded conditions for weeks or months at a time because this section of river receives flow from all the reservoirs in the watershed and several river reaches upstream of the Delta Cross Channel serve as the fresh water conveyance corridor conveying fresh water through the Delta to southern California. In addition, existing tidal conditions and future SLR will also continue to impact water stages. **Figure 4-2** presents the 100-year and 200-year hydraulic model flow results compared to the USACE 1957 design flows for locations within the Lower Sacramento River. It should be noted that the existing 100-year and 100-year with future conditions WSELs are both higher than USACE 1957 design profile between the communities of Hood and Rio Vista (between River Mile 39 at Hood and River Mile 13 near Rio Vista). The hydraulic models also indicate the downstream stages in the Lower Sacramento River study reach downstream of Walnut Grove and Ryde are largely controlled by downstream tidal stage conditions. The base 200-year peak flow is approximately 10 percent higher than the base 100-year. Adding the climate change factors increases the peak flow approximately 4 percent for the 100-year and 2.3 percent for the 200-year. The existing baseline 100-year WSEL profiles are favorably located at or below freeboard approximately 3.5 feet below top of levee for the Lower Sacramento River, but there are isolated locations along the reach that the profile begins to encroach into freeboard for both the base 200-year and climate change scenarios. Each of these base and climate change 100- and 200-scenarios do not show the projected water surface would overtop the levees.

Fremont Weir/Yolo Bypass and Sacramento Weir/Bypass Widening

The Fremont Weir is a significant critical structure that is located upstream of the Lower Sacramento River and the Sacramento Weir. This location diverts high-stage flows into the Yolo Bypass and away from entering the Lower Sacramento River reach. The design capacity of the Fremont Weir is estimated at 343,000 cfs, and at design flow the Fremont Weir conveys approximately 76 percent of the total Sacramento River system discharge to the Yolo Bypass. The fraction of flow entering the Yolo Bypass decreases at lower flows, falling to zero at a total discharge of approximately 55,000 cfs because the river stage upstream of the Sacramento Weir lies below the crest elevation of 33.5 feet United States Engineering Datum (USED), or approximately 36.0 feet (NAVD 88).

For future CVFPP conditions, the Fremont Weir is proposed to be widened approximately 1.5 miles, which will divert additional flow from the Sacramento River to the Yolo Bypass. The results indicate the future 100-year WSELs will be reduced form zero to 2 feet in the Lower Sacramento after the CVFPP future improvements are implemented with the largest stage reduction upstream near the communities of Freeport and Hood and the smallest stage reduction approaching zero near the City of Isleton

See **Figure 4-3** below Excerpted from the 2017 BWFS and 2017 CVFPP Update that shows the hydraulic benefits via reduction in stage values in the Lower Sacramento River form the system-

wide improvements proposed for the Sacramento and Yolo Bypass/Weir improvements described above and as previously depicted in **Figure 3-2** – Future System Improvements.

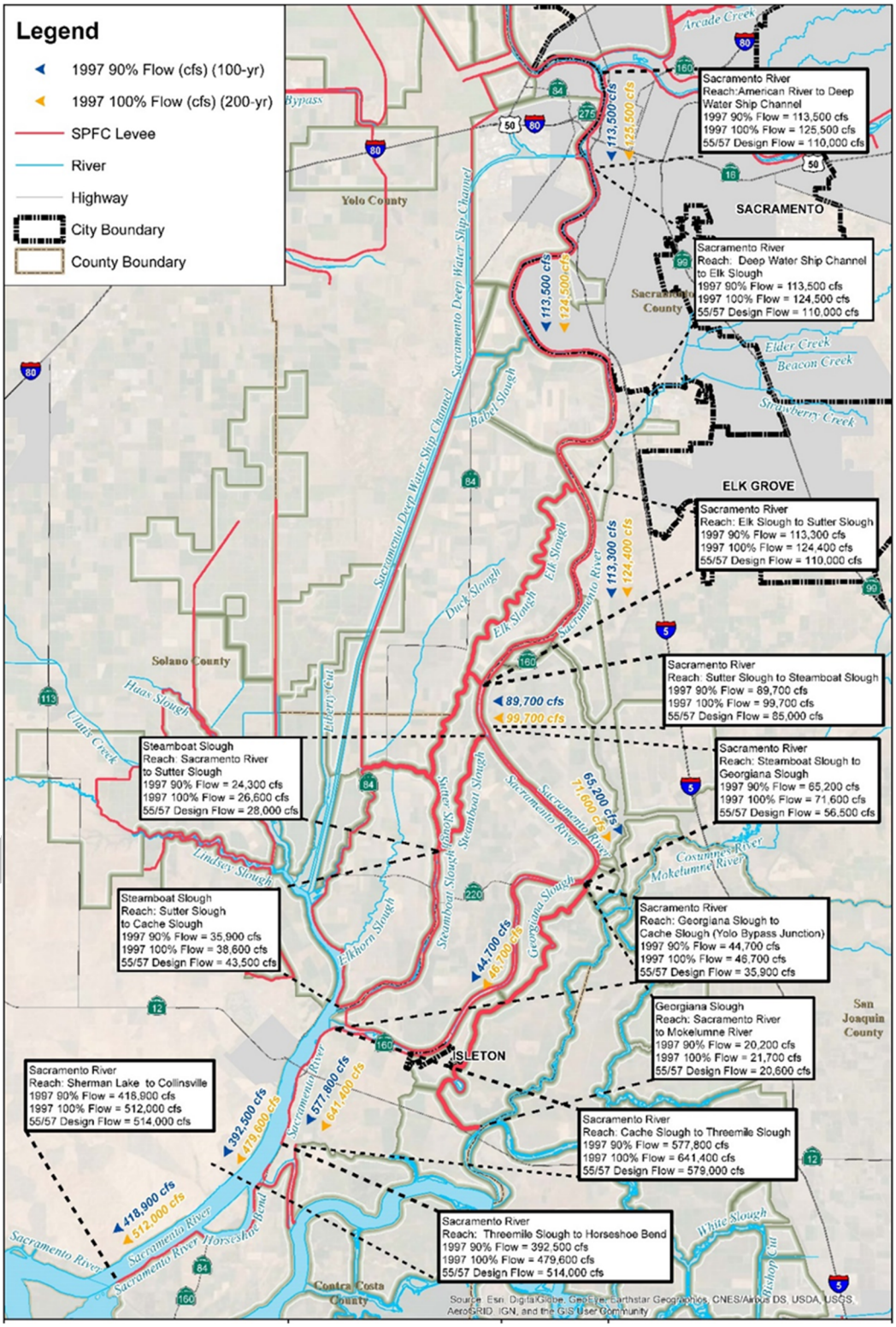

Figure 4-2: Lower Sacramento River Hydraulic Model Results Compared to the Design Flows

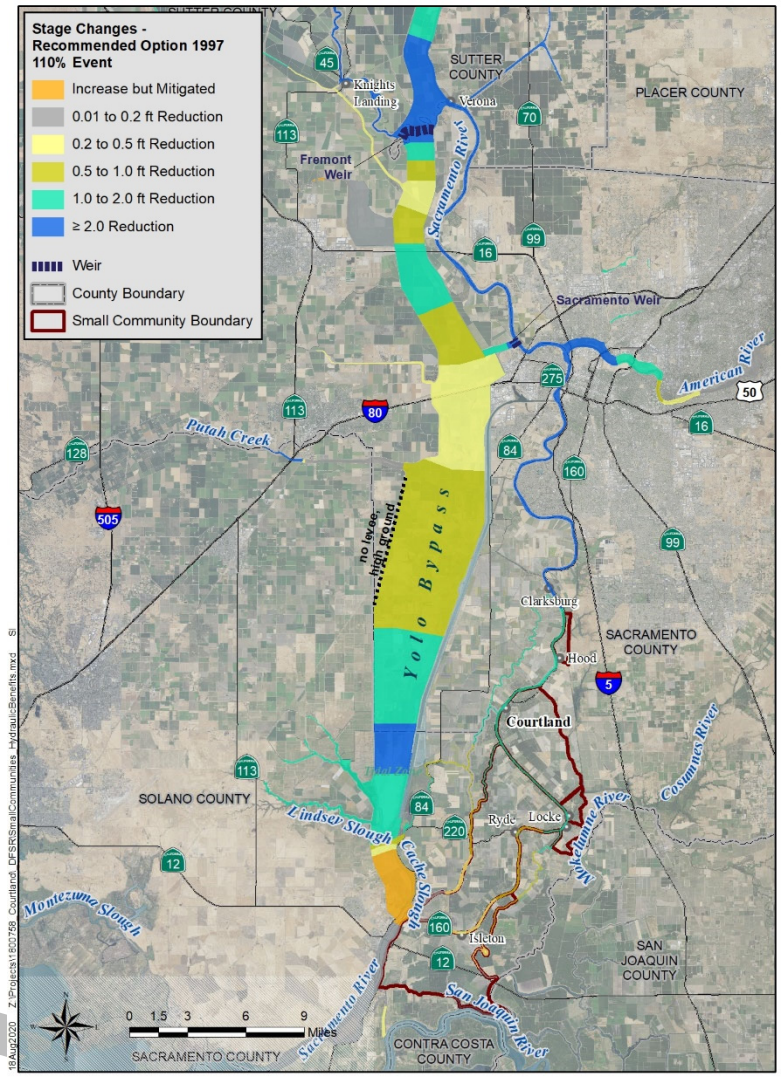

Figure 4-3: Stage Reduction Hydraulic Benefits of 2017 CVFPP System-Wide Bypass Improvements to Delta Legacy Communities of Sacramento County

Feather River Setback

Between the years of 2008 and2010, levee setback projects on the Feather River at Star Bend, Shanghai Bend, and TRLIA, between the Bear and Yuba River confluence, increased the channel conveyance capacity. The Feather River setback projects are located approximately 60 miles upstream of the North Delta Legacy Communities. Based on the 100-year comparison for pre- and post-project conditions, the timing of flow appears to be similar, and the difference in WSEL at the I Street bridge indicates an increase in stage of only approximately 0.02 feet.

North Delta Model

The west or right-bank levees along Snodgrass Slough partially protect the small communities of Hood, Courtland, Locke, and East Walnut Grove from flooding. Flows enter the Snodgrass Slough from the north. Significant flows, as shown on **Figure 4-4** and **Figure 4-5**, illustrate the largest flood inundation in the last 25-years were from the 1997 and 2017 flood events. The Cosumnes

River is an unregulated 724 square mile watershed which produced approximately 110,000 cfs in 1997 and 46,000 cfs in 2017, which is the range of a 100-year and 25-year storm frequency, respectively.

Flows can enter Snodgrass Slough from the Morrison Creek watershed, acknowledging the Morrison Creek flows are regulated with large retention basins, whereas flows are largely unregulated from the larger drainages sheds of the Cosumnes River and Dry Creek.

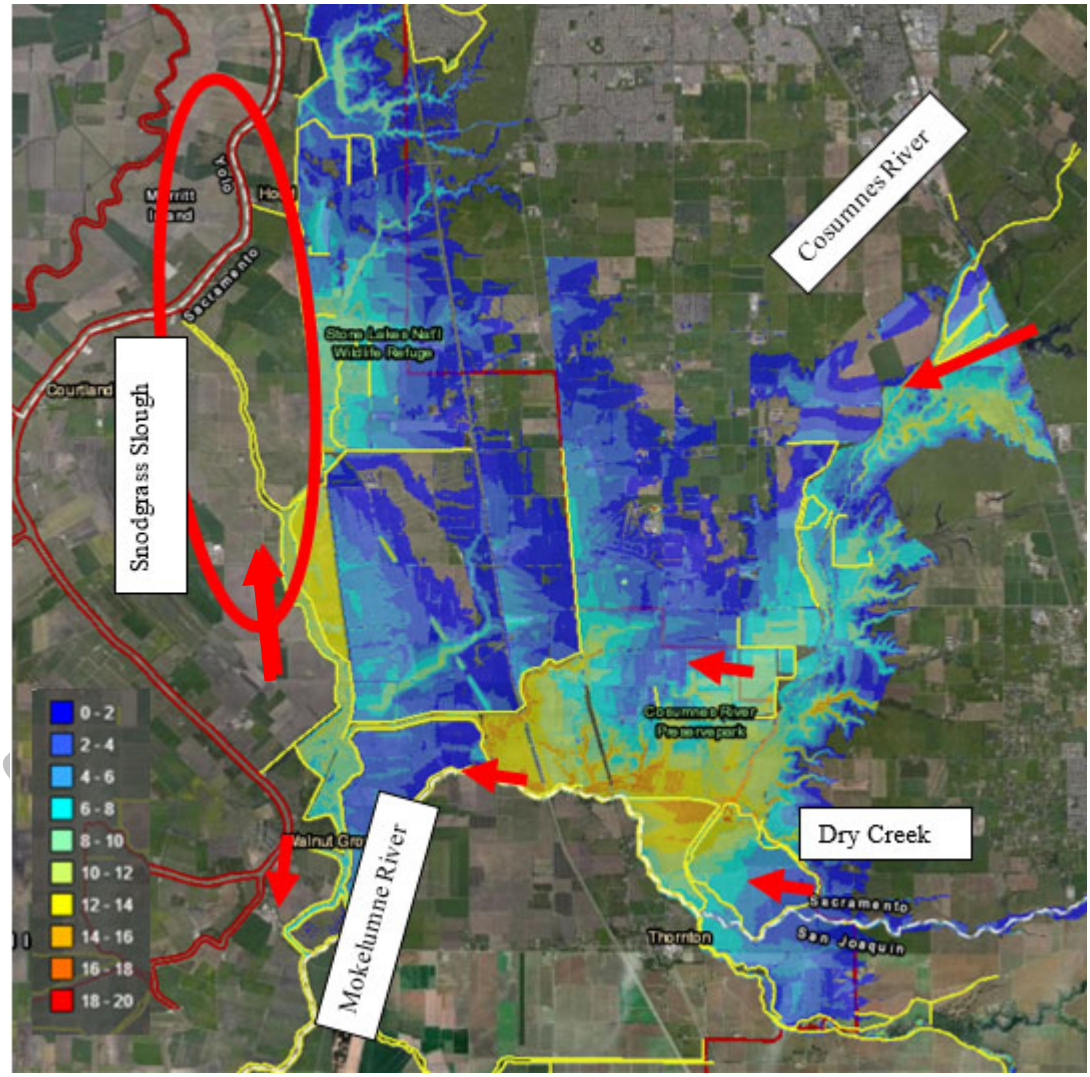

Figure 4-4: 1997 Storm Event North Delta Hydraulic Model Results

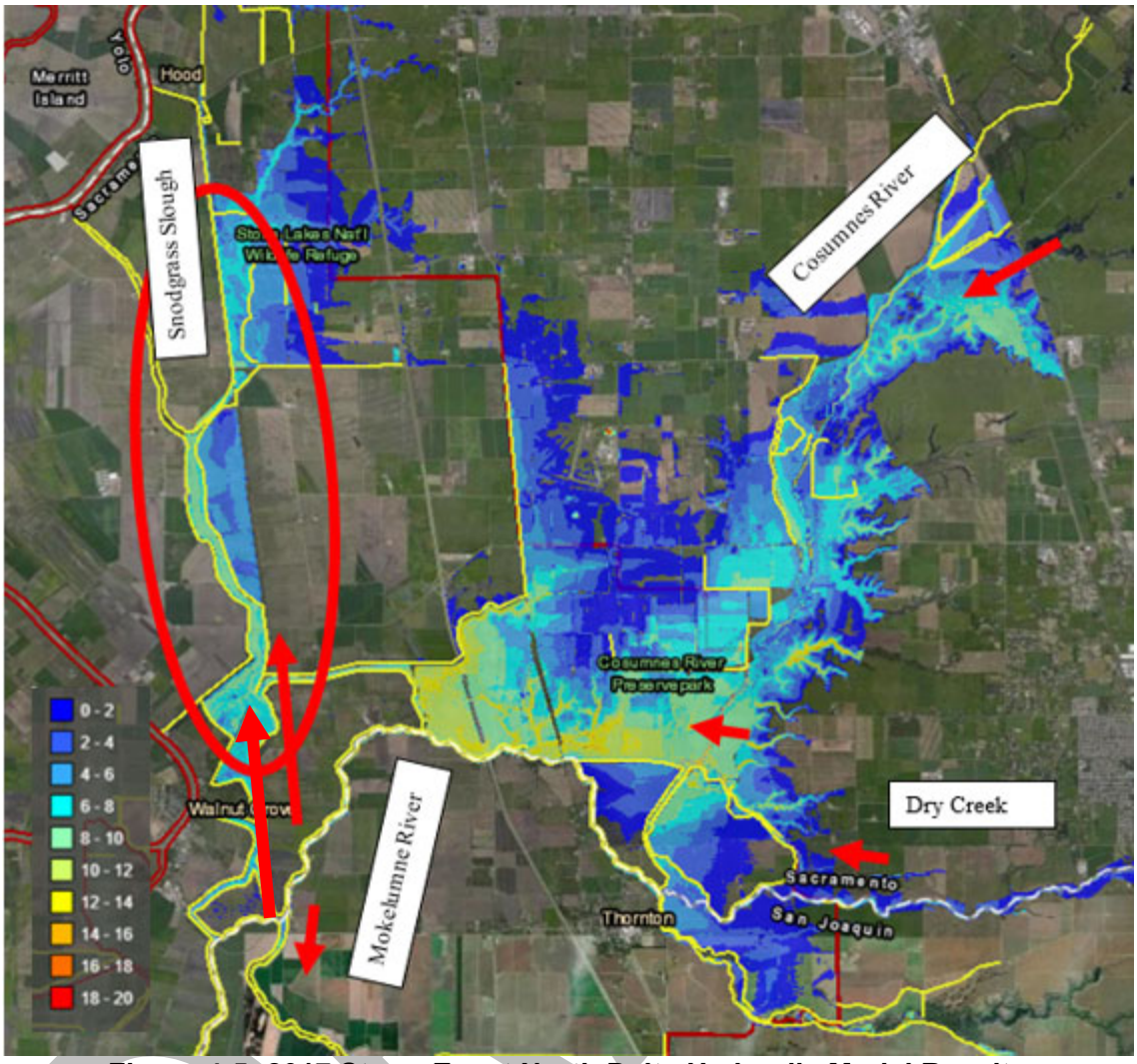

Figure 4-5: 2017 Storm Event North Delta Hydraulic Model Results

4.2 Model Perfomance

The purpose of this section is to show that the Sacramento River hydraulic model performed well in real-time using the CNRFC gage data and validating the model results with recent high-water marks collected in 2019 by GEI. Storm events in 2017, 2018, and 2019 resulted in significant releases from Shasta, Oroville, New Bullards Bar, and Folsom Reservoirs, causing the rivers to rise. This allowed GEI the opportunity to collect high-water marks on the American and Sacramento Rivers. February and March 2019 produced flows in the range of 60,000 to 77,000 cfs in the lower Sacramento River, downstream of the American River, allowing the Sacramento River I Street gage to reach monitoring stage. The stage did not reach El. 30.0 feet (NAVD 88) and the Sacramento Weir gates were not required to be open. **Figure 4-6** to **Figure 4-8** shows a comparison between collected high-water marks and the hydraulic models at the three locations to validate the model performance:

1) Between the I Street bridge and the Tower bridge on the right bank of the Sacramento River across the river from Old Sacramento: High water data was collected on February 27, 2019 at 14:00 at location 1. The I Street gage was reading a flow of 75,243 cfs and a stage of 26.02 feet.

2) At Garcia Bend on the left bank of the Sacramento River in the Greenhaven Pocket Area of South Sacramento, upstream of Freeport: High water data was collection was on March 1, 2019 at 10:00 at location 2. The I Street gage was reading a flow of 77,282 cfs and a stage of 26.71 feet.

3) Clarksburg Boat Launch on the right bank of the Sacramento River: High water data was collection was on March 13, 2019 at 10:00 at location 1, 2 and 3. The I Street gage was reading a flow of 70,335 cfs and a stage of 24.37 feet.

Table 4-1 to **Table 4-3** shows the comparison at I Street between the HEC-RAS model, CNRFC, and the CDEC gage for flow and stage. **Figure 4-9** to **Figure 4-13** show the high-water marks collected and compares it to the HEC-RAS models using the real-time flow hydrographs.

The comparisons show the hydraulic models results and the high-water marks performed within a reasonable tolerance of 1-1.5 feet. Therefore, the hydraulic models can be used with a high-level of confidence to forecast stages using the 5-Day flow hydrographs from CNRFC. There are a few locations where the high-water marks do not line up but that can be attributed to discrepancies in the LiDAR.

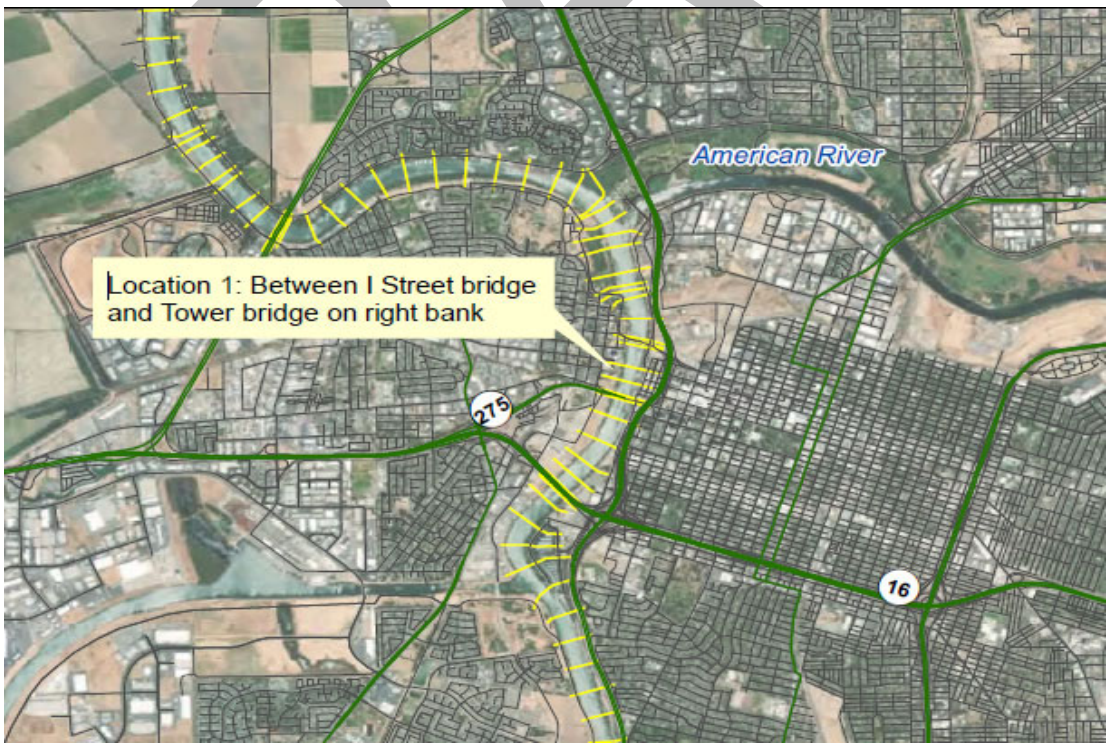

Figure 4-6: High-Water Mark Location 1

Figure 4-7: High-Water Mark Location 2

Figure 4-8: High-Water Mark Location 3

Table 4-1: Flow & Stage Comparison at I St. on February 27, 2019 at 14:00

I Street Gage	Date/Time	Flow (cfs)	Stage (ft)
HEC-RAS RM 59.63	27FEB2019 1400	79,305	27.38
CNRFC (SACC1)	27FEB2019 1400	N/A	25.90
CDEC (IST)	27FEB2019 1400	75,243	26.02

Table 4-2: Flow & Stage Comparison at I St. on March 1, 2019 at 10:00

I Street Gage	Date/Time	Flow (cfs)	Stage (ft)
HEC-RAS RM 59.63	01MAR2019 1000	75,094	26.69
CNRFC (SACC1)	01MAR2019 1000	N/A	26.60
CDEC (IST)	01MAR2019 1000	77,282	26.71

Table 4-3: Flow & Stage Comparison at I St. on March 13, 2019 at 10:00

I Street Gage	Date/Time	Flow (cfs)	Stage (ft)
HEC-RAS RM 59.63	13MAR2019 1000	67,740	24.98
CNRFC (SACC1)	13MAR2019 1000	N/A	24.40
CDEC (IST)	13MAR2019 1000	70,335	24.37

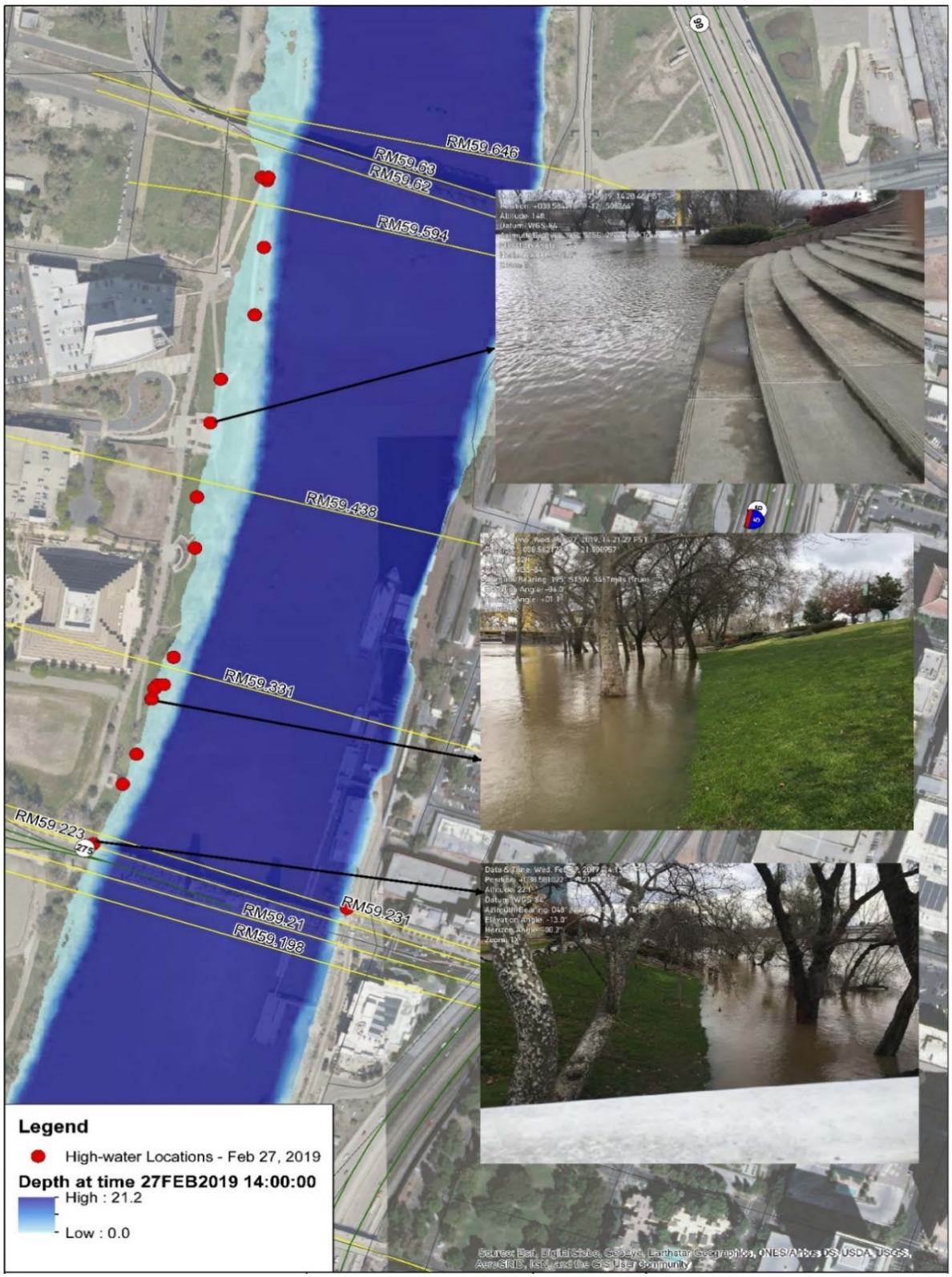

Figure 4-9: High-water Marks at Location 1, Feb 27, 2019 at 14:00

Figure 4-10: High-water Marks at Location 2, Mar 1, 2019 at 10:00

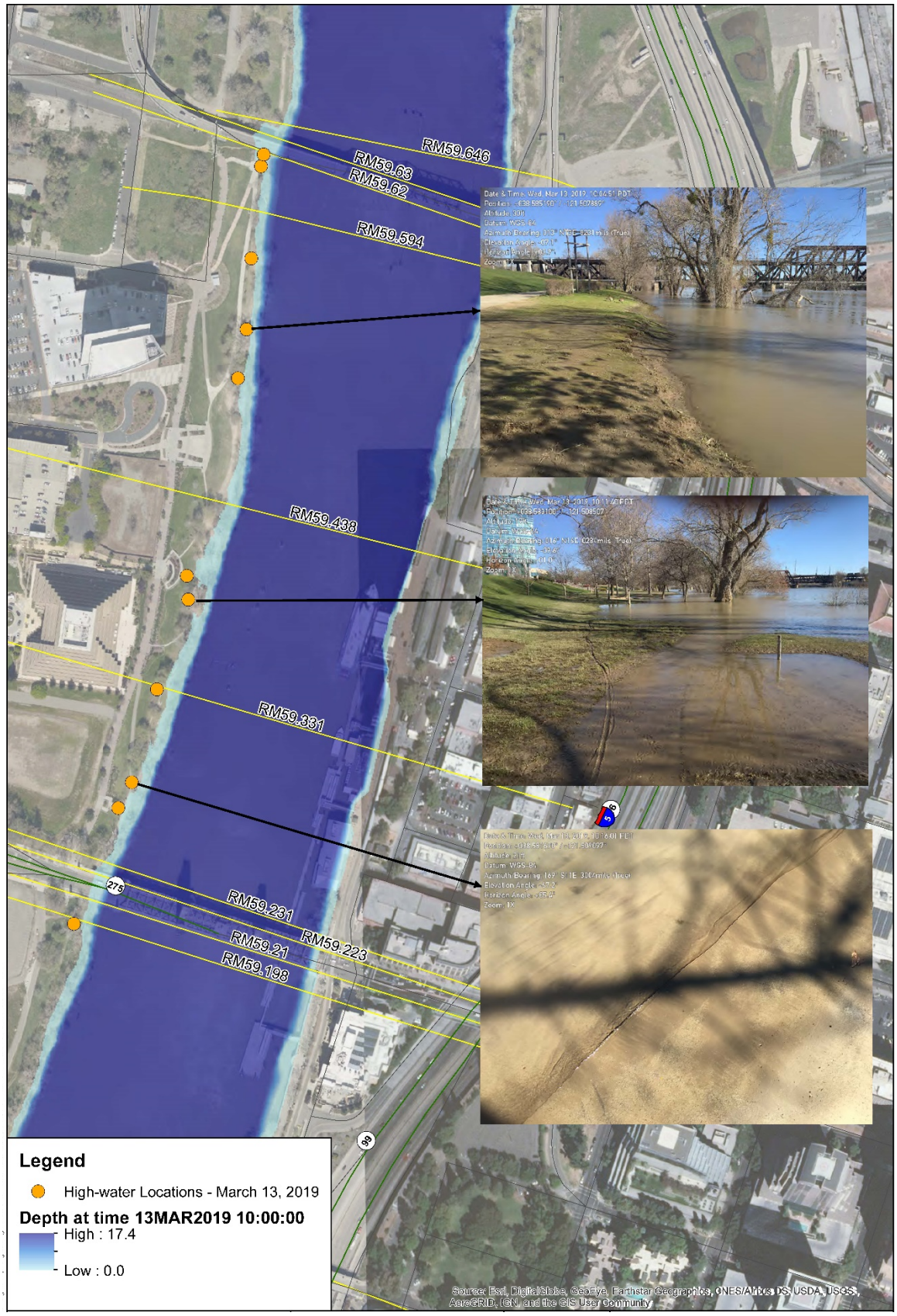

Figure 4-11: High-water Marks at Location 1, Mar 13, 2019 at 10:00

Figure 4-12: High-water Marks at Location 2, Mar 13, 2019 at 10:00

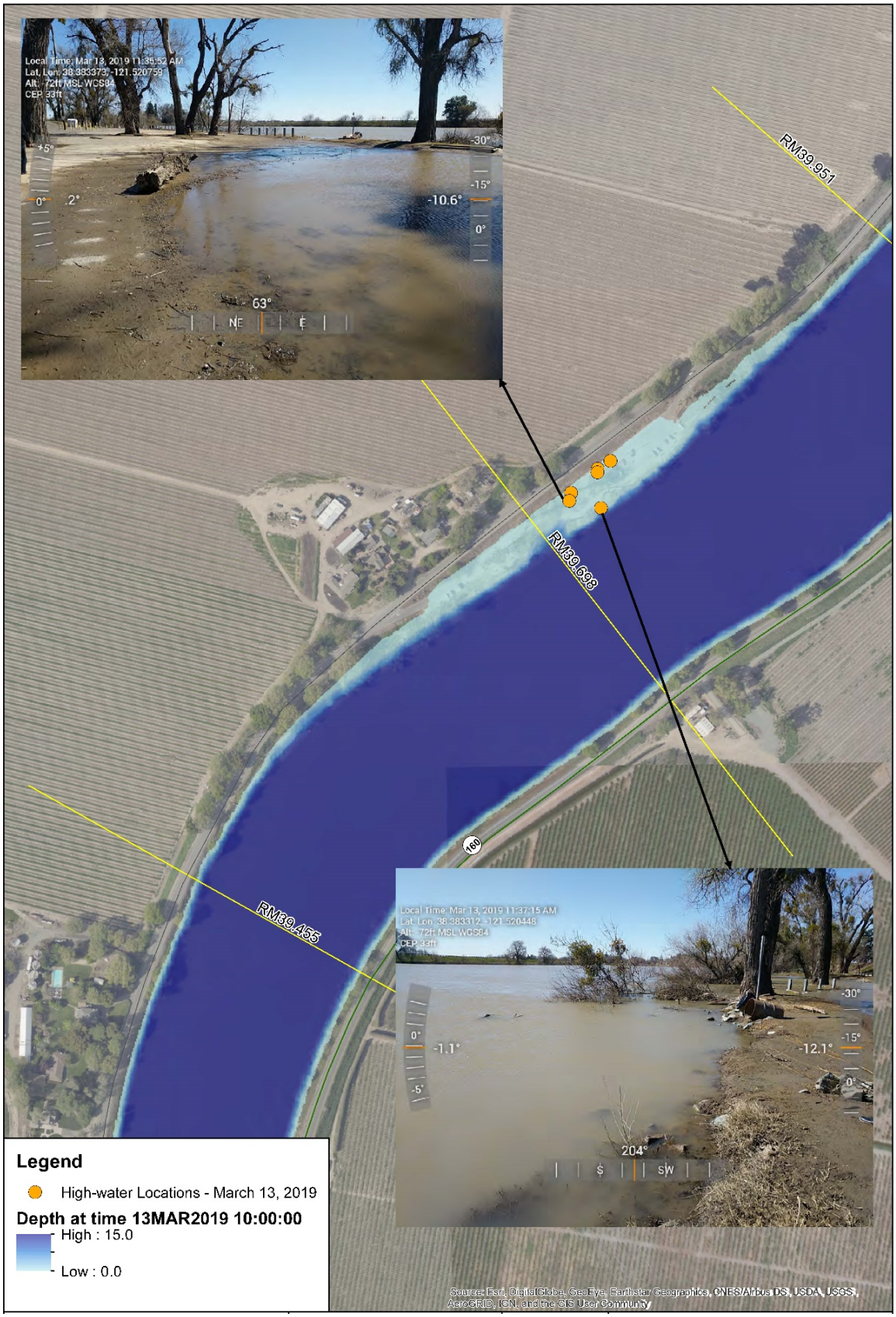

Figure 4-13: High-water Marks at Location 3, Mar 13, 2019 at 10:00

4.3 Lower Sacramento River High Water Events and Channel Capacity Estimates

Figure 4-14 through **Figure 4-19** present the 100-year WSELs in the Sacramento River at the North Delta Legacy Communities when the stage reaches the landside levee toe elevation. The stage in the river rises above the landside levee toe when the flow in the river reaches approximately 50,000 cfs near Hood and Courtland, and approximately 30,000 cfs near Locke downstream of the distributary channels of Sutter and Steamboat Sloughs. This is significant because the flow in this location can be above 30,000 cfs for months at a time during high-water years as noted in the figures below.

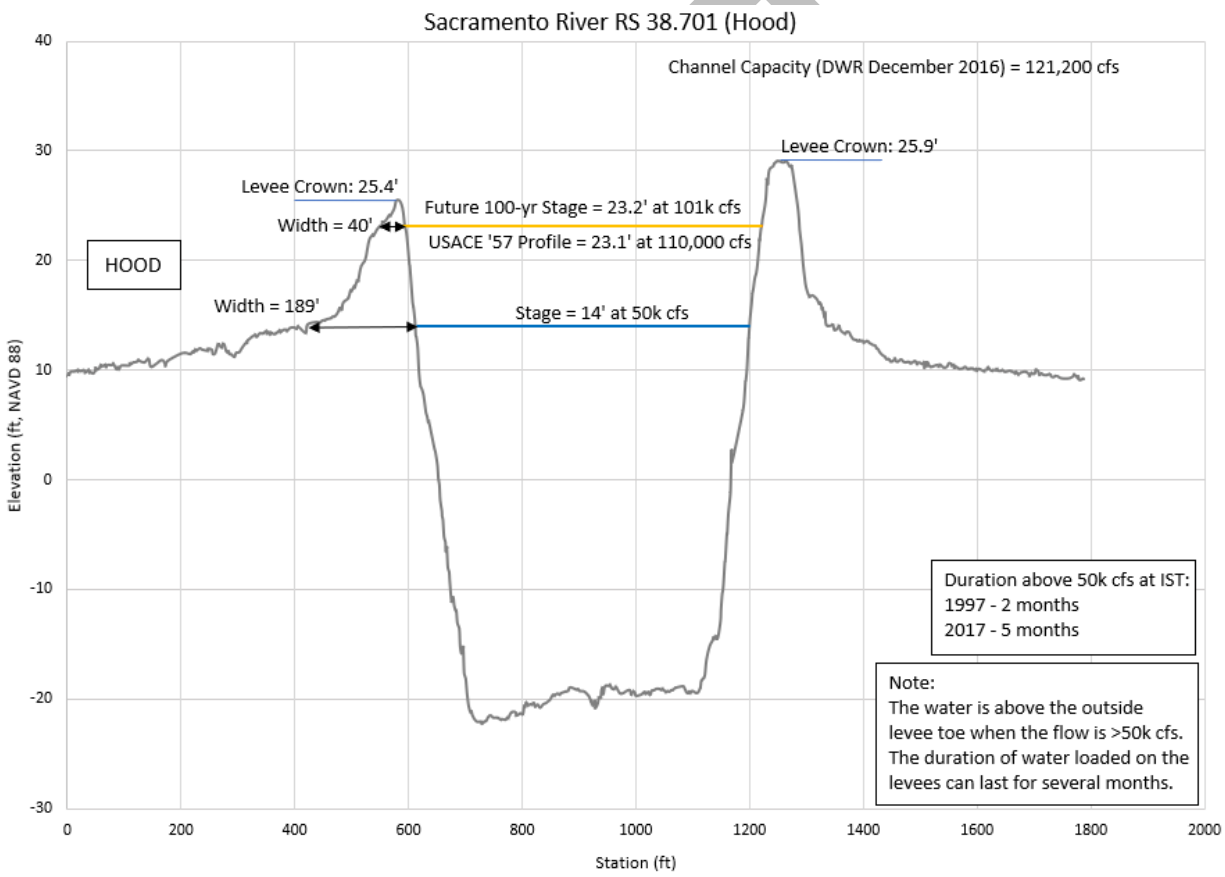

Figure 4-14: Cross Section Sta. 38.701 at Hood Viewing Downstream

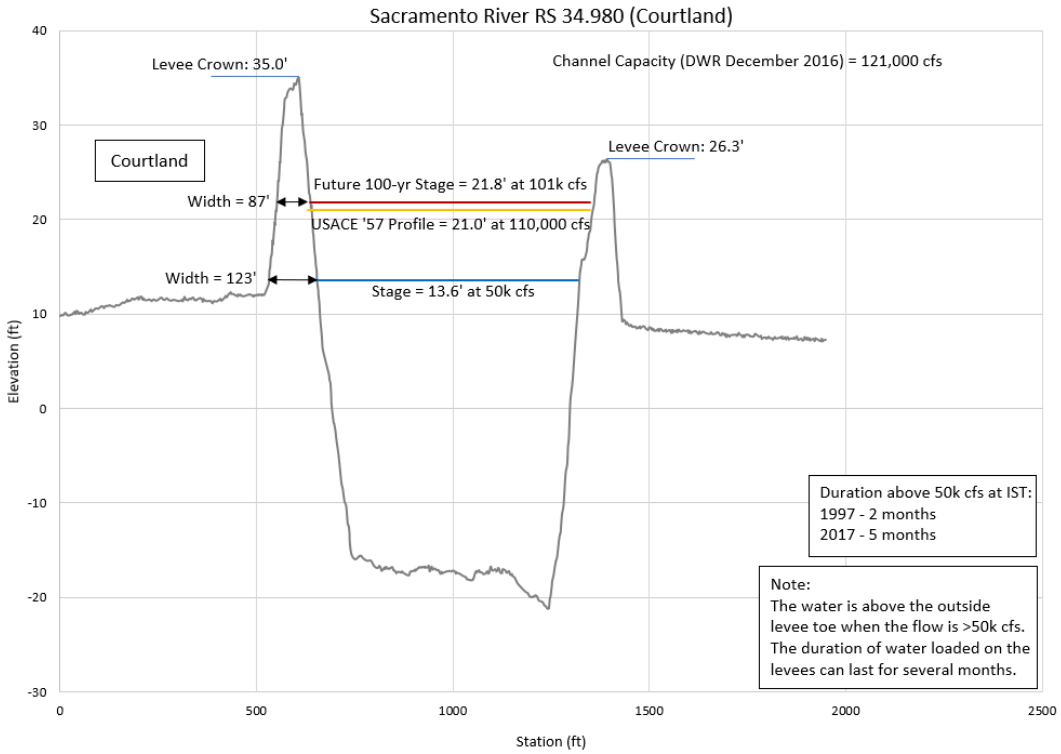

Figure 4-15: Cross Section Sta. 34.980 at Courtland Viewing Downstream

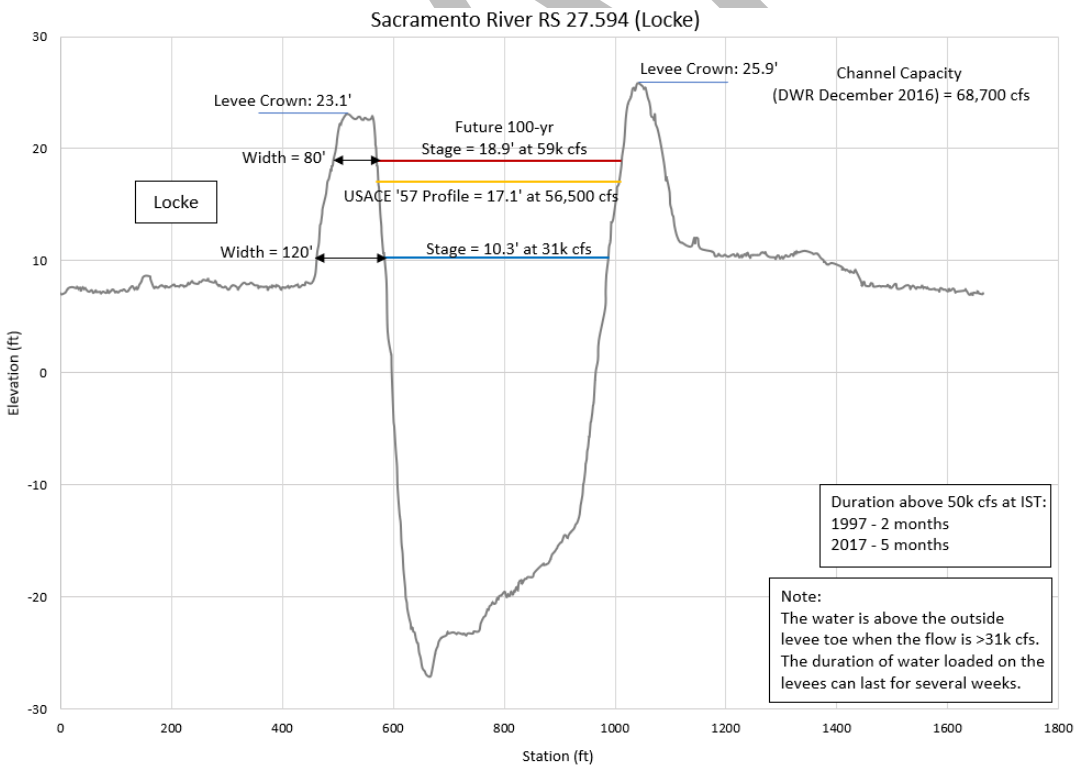

Figure 4-16: Cross Section Sta. 27.594 at Locke Viewing Downstream

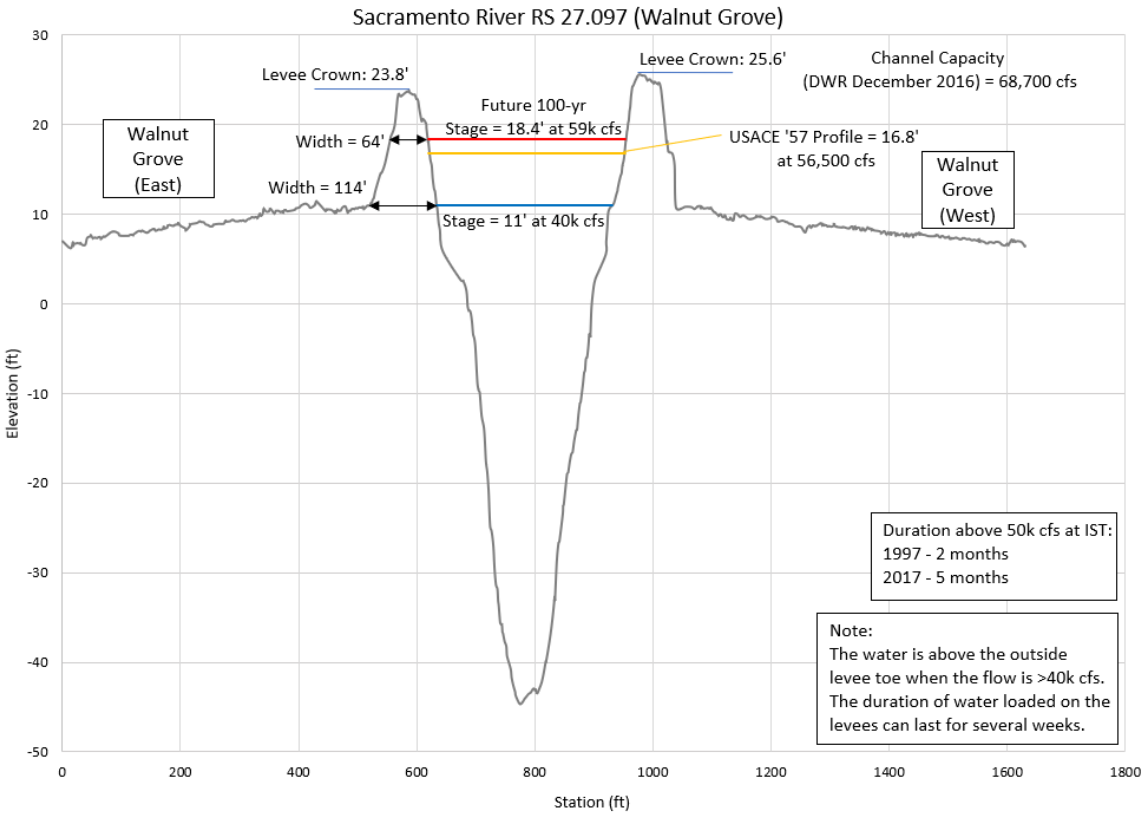

Figure 4-17: Cross Section Sta. 27.097 at Walnut Grove Viewing Downstream

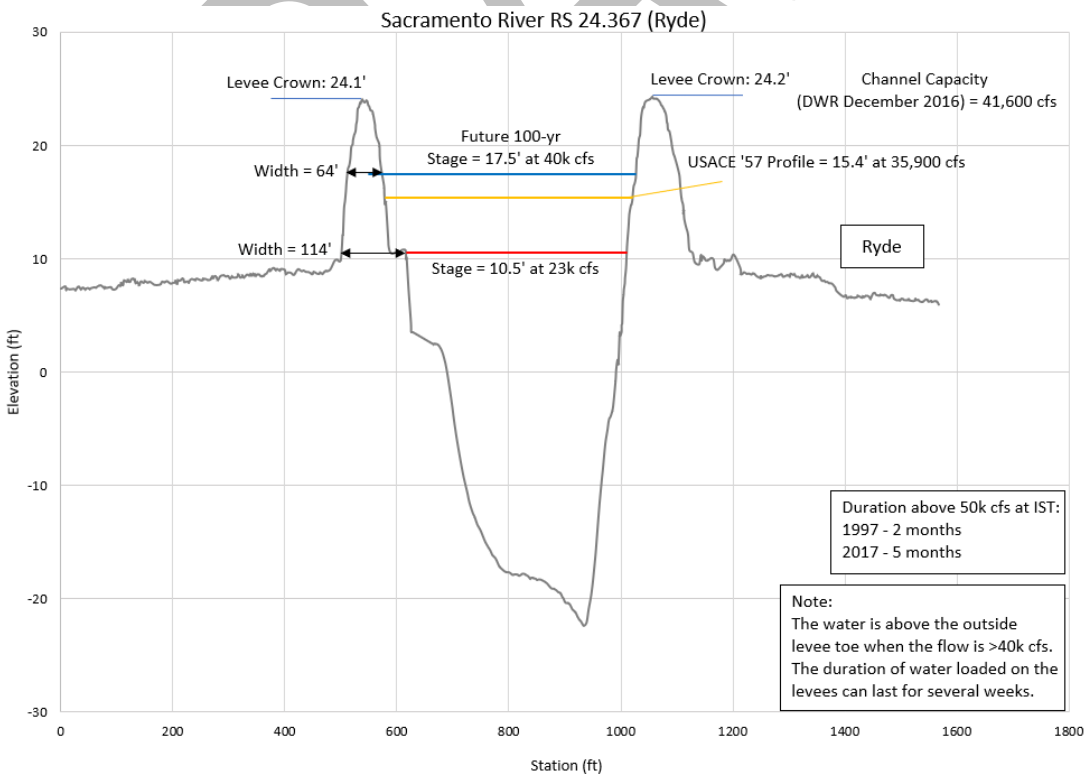

Figure 4-18: Cross Section Sta. 24.367 at Ryde Viewing Downstream

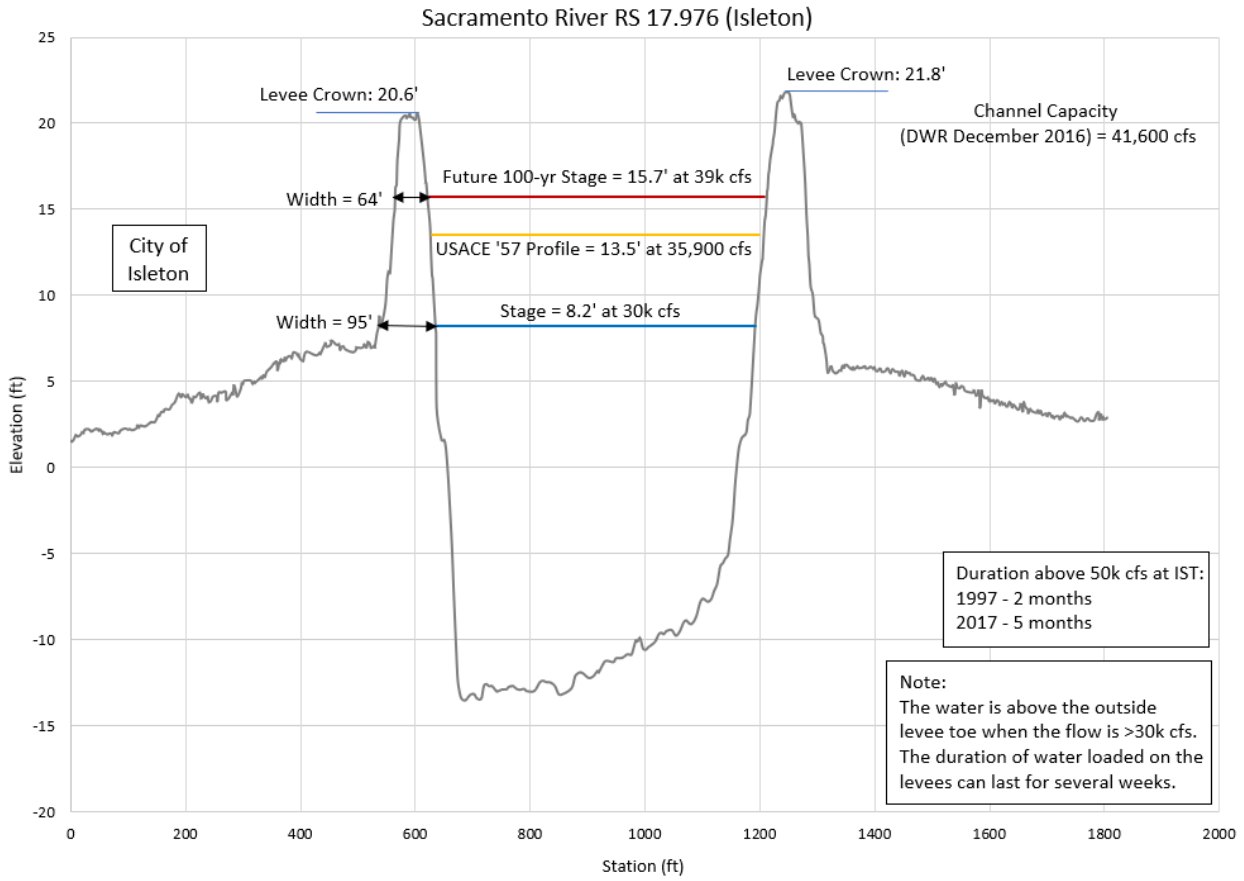

Figure 4-19: Cross Section Sta. 17.976 at Isleton Viewing Downstream

4.4 Climate Change Adjustments

Throughout the Lower Sacramento River there is an average stage increase of approximately 1.0 feet due to the climate change adjustments made consistent with the DWR CVFPP 2017, but these climate change adjustments are significantly diminished by the upstream system-wide improvements identified and described above in Sections 3.2.1 and 4.1 and in **Figure 3-2** and **Figure 4-3**. The system-wide bypass and weir improvements proposed in the 2017 CVFPP Update upstream of the Lower Sacramento River allow most all of the climate change increases in flow to be diverted into the improved widened bypasses in lieu of additional water being routed down into the Lower Sacramento River system, downstream of the I Street bridge. Essentially the improved upstream weirs and bypasses will shunt all excess water away from the Lower Sacramento River, allowing the flexibility to meter out or control releases into the Lower Sacramento River during high runoff/stage conditions. The greatest risk exposure to climate change is in the uncontrolled, unregulated basin(s) of the North Delta east side drainages consisting of the Cosumnes River, Dry Creek, Morrison Creek and Snodgrass Slough that pose the greatest risks to the communities of East Walnut Grove, Locke and to a lesser degree Courtland and Hood. There is a higher difference in WSEL downstream of Walnut Grove between the confluence with Georgiana Slough and Collinsville caused by SLR versus relative to climate change as discussed in further detail above

in Section 3.2.4 and **Table 3-4** and **Table 3-5**. **Table 4-4** presents the incremental WSEL difference for the Sacramento River between the existing baseline conditions and future 100- and 200-year model results with climate change adjustments.

Table 4-4: 100-year & 200-year Incremental WSEL Difference in Lower Sacramento River Without Upstream System-Wide Sacramento and Yolo Bypass/Weir Improvements

Sacramento River Location	100-yr WSEL (ft) Climate Change vs. Base Condition	200-yr WSEL (ft) Climate Change vs. Base Condition
American River to Deep Water Ship Channel	1.04	0.48
Deep Water Ship Channel to Elk Slough	1.05	0.52
Elk Slough to Sutter Slough	1.11	0.6
Sutter Slough to Steamboat Slough	1.12	0.66
Steamboat Slough to Georgiana Slough	1.12	0.71
Georgiana Slough to Cache Slough	1.57	1.08
Cache Slough to Three-mile Slough	1.89	1.41
Three-mile Slough to Horseshoe Bend	1.82	1.51
Horseshoe Bend to Sherman Lake	1.71	1.55

4.5 Delta Cross Channel System Results and Findings

This section provides the 100-year water surface elevation results from the CVFED hydraulic models and the Sacramento County DWR North Delta hydraulic model for the Lower Sacramento River, Georgiana and Snodgrass Sloughs, and the Delta Cross Channel (DCC) bordering East Walnut Grove. The computed water surface elevations were compared to the USACE 1957 design and the 2016 FEMA BFEs in both National Geodetic Vertical Datum (NGVD) 1929 and (NAVD 88) datum.

Figure 4-20 presents the hydraulic model cross sections and stationing corresponding to the profile summary tables provided herein. Also circled on Figure 4-20 is the evaluation for the existing Delta Cross Channel Gates located north and upstream of East Walnut Grove. When the subject gates are opened and operated by the U. S. Bureau of Reclamation (USBR), they allow flows from the Sacramento River to enter the Delta Cross Channel and flow southeasterly into the North Fork of the Mokelumne River via Snodgrass Slough and Dead Horse Cut and eventually towards the South Delta pumps near Tracy. Consistent with the State Water Resources Control Board (SWRCB) Decision 1641 (March 2000) the USBR Cross Channel Gates are normally operational and open during lower-flow seasonal conditions (late spring through early fall) and are normally closed during high flow seasonal conditions, (November 1st through May 20th every year) particularly when flows in the Sacramento River near Locke are greater than 20,000 to 25,000 cfs. To model high-flow and high-water stage conditions in the North Delta the CVFED hydraulic model was deployed by GEI, assuming the Delta Cross Channel Gates separating the Sacramento River from the Delta Cross Channel were closed. Therefore, no flows were diverted from the Sacramento River into the Delta Cross Channel.

Table 4-5 through **Table 4-8** presents comparisons between the CVFED hydraulic model results and the 2016 FEMA BFEs. Note the FEMA BFEs (NAVD 88) datum are approximately 2.0 feet lower on the Sacramento River downstream of the Delta Cross Channel compared to the CVFED model results, but the FEMA BFEs are approximately 2.0 higher in the Delta Cross Channel compared to the CVFED models. Therefore, it appears the FEMA BFE results are assuming the DCC gates are not normally closed during the flood season and/or when flows in the Sacramento River are greater than 20,000 to 25,00 cfs at near Locke. The FEMA BFE results indicate diversions are taking place from the Sacramento River through the Delta Cross Canal. Unfortunately, the FEMA FIS information does not provide any documentation how the results were developed.

To date, the effective FEMA FIS documentation requested by GEI to determine how the BFEs were developed has not been received.

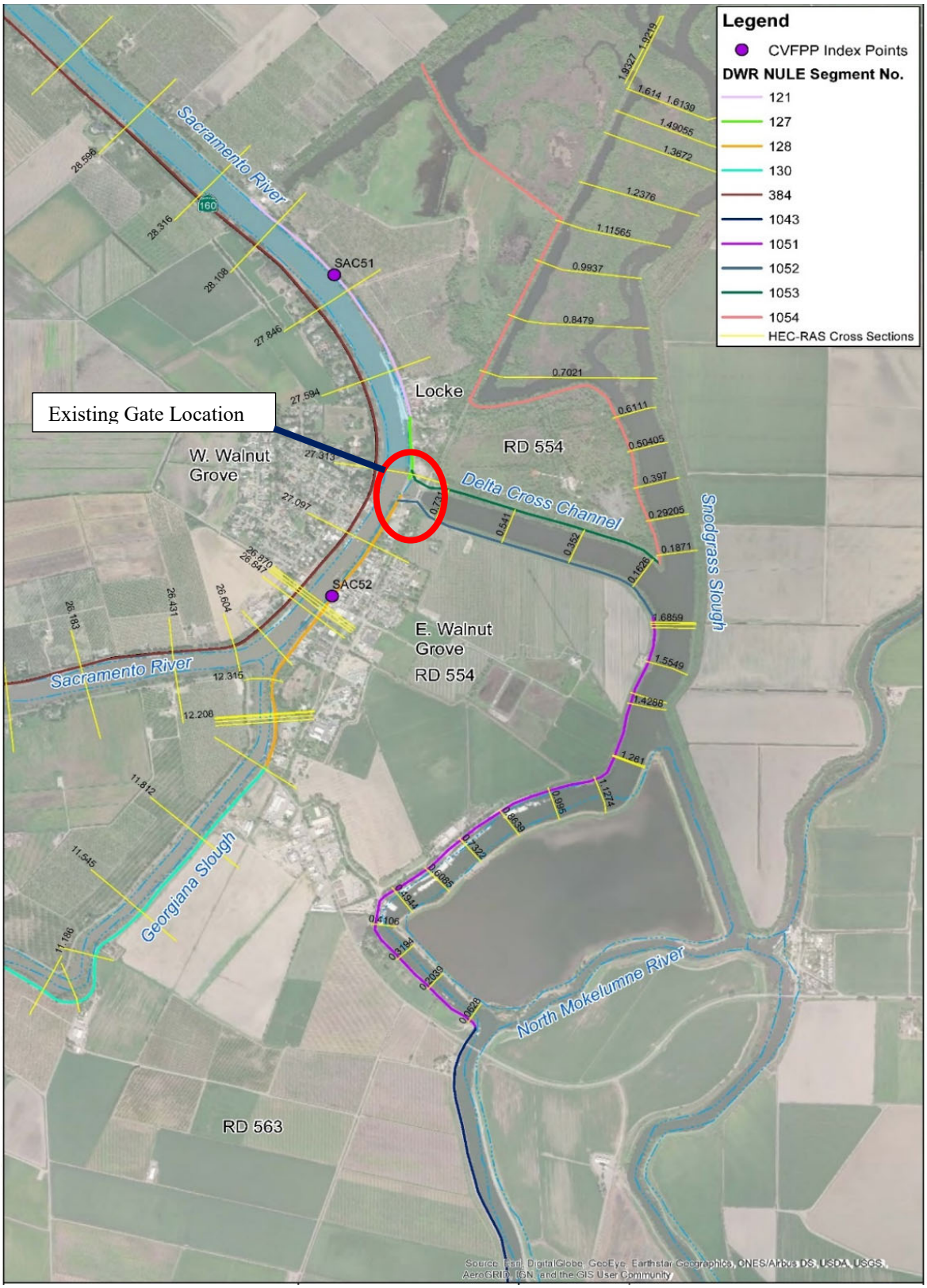

Figure 4-20: East Walnut Grove CVFED Cross-Section & NULE Reach Map

Table 4-5: 2016 FEMA FIS vs. Current CVFED Model WSELs

Sacramento River at East Walnut Grove

(from Delta Cross Channel to Georgiana Slough)

Sacramento River Stations	2016 FEMA FIS: 100-yr WSEL		DWR CVFED 100-yr WSEL	1957 Design WSEL
mile	ft, NGVD 29	ft, NAVD 88	ft, NAVD 88	ft, NAVD 88
SAC_R06_27.097	13.57	16.00	18.22	16.77
SAC_R06_26.888	13.57	16.00	18.30	16.63
SAC_R06_26.879	13.57	16.00	18.34	16.62
SAC_R06_26.87	13.57	16.00	18.32	16.61
SAC_R06_26.847	13.57	16.00	18.26	16.60
SAC_R06_26.712	13.57	16.00	18.11	16.60

Table 4-6: 2016 FEMA FIS vs. Current CVFED Model WSELs

Georgiana Slough at East Walnut Grove

(Sacramento River at Walnut Grove to 1.2 miles downstream, btwn Tyler and Upper Andrus)

Georgiana Slough River Station	2016 FEMA FIS: 100-yr WSE		DWR CVFED 100-yr WSE	1957 Design WSE
mile	ft, NGVD 29	ft, NAVD 88	ft, NAVD 88	ft, NAVD 88
GEO_R01_12.315	13.57	16.00	18.07	16.89
GEO_R01_12.211	13.48	15.91	18.05	16.84
GEO_R01_12.208	13.39	15.82	18.06	16.84
GEO_R01_12.198	13.30	15.73	18.03	16.83
GEO_R01_12.187	13.21	15.64	18.02	16.83
GEO_R01_12.07	13.12	15.55	17.93	16.76
GEO_R01_11.812	13.02	15.45	17.77	16.61
GEO_R01_11.545	12.93	15.36	17.63	16.46
GEO_R01_11.348	12.84	15.27	17.63	16.35
GEO_R01_11.249	12.75	15.18	17.60	16.29

Table 4-7: 2016 FEMA FIS vs. Current CVFED Model WSE

Snodgrass Slough at East Walnut Grove

(from Delta Cross Channel to North Fork Mokelumne River)

Snodgrass River Station	2016 FEMA FIS: 100-yr WSE		DWR CVFED 100-yr WSE	1957 Design WSE
mile	ft, NGVD 29	ft, NAVD 88	ft, NAVD 88	ft, NAVD 88
SNOG_R2_1.6859	14.57	17.00	13.44	N/A – (Non-Project Levee)
SNOG_R2_1.6804	14.57	17.00	13.44	N/A – (Non-Project Levee)
SNOG_R2_1.6701	14.57	17.00	13.43	N/A – (Non-Project Levee)
SNOG_R2_1.5549	14.57	17.00	13.41	N/A – (Non-Project Levee)
SNOG_R2_1.4515	14.57	17.00	13.33	N/A – (Non-Project Levee)
SNOG_R2_1.4288	14.57	17.00	13.33	N/A – (Non-Project Levee)
SNOG_R1_1.265	14.57	17.00	13.33	N/A – (Non-Project Levee)
SNOG_R1_1.261	14.57	17.00	13.32	N/A – (Non-Project Levee)
SNOG_R1_1.1274	14.57	17.00	13.31	N/A – (Non-Project Levee)
SNOG_R1_0.995	14.57	17.00	13.25	N/A – (Non-Project Levee)
SNOG_R1_0.8639	14.24	16.67	13.20	N/A – (Non-Project Levee)
SNOG_R1_0.7322	13.90	16.33	13.16	N/A – (Non-Project Levee)
SNOG_R1_0.6085	13.57	16.00	13.09	N/A – (Non-Project Levee)
SNOG_R1_0.4944	13.24	15.67	13.06	N/A – (Non-Project Levee)
SNOG_R1_0.4106	12.90	15.33	12.97	N/A – (Non-Project Levee)
SNOG_R1_0.3194	12.57	15.00	12.86	N/A – (Non-Project Levee)
SNOG_R1_0.2039	12.07	14.50	12.78	N/A – (Non-Project Levee)
SNOG_R1_0.0628	11.57	14.00	12.72	N/A – (Non-Project Levee)

Table 4-8: 2016 FEMA FIS vs. Current CVFED Model WSE

Delta Cross Channel at East Walnut Grove

(from Sacramento River Cross Channel Gates to Snodgrass Slough)

Delta Cross River Station	2016 FEMA FIS: 100-yr WSE		DWR CVFED 100-yr WSE	1957 Design WSE
mile	ft, NGVD 29	ft, NAVD 88	ft, NAVD 88	ft, NAVD 88
DCC_0.731	14.57	17.00	13.44	N/A – (Non-Project Levee)
DCC_0.541	14.57	17.00	13.44	N/A – (Non-Project Levee)
DCC_0.352	14.57	17.00	13.44	N/A – (Non-Project Levee)
DCC_0.1626	14.57	17.00	13.44	N/A – (Non-Project Levee)

4.6 FEMA Flood Insurance Study (FIS)

This section further discusses the discrepancy between the effective FEMA FIS and the CVFED hydraulic model results. **Table 4-9** to **Table 4-14** provides the comparison for the base 100-year which shows the effective FEMA FIS profiles are approximately 2.5 feet lower compared to the hydraulic model results using the CVFED models. GEI developed a steady flow model which showed the WSEL results compared closely to the CADWR CVFED hydraulic model results. Therefore, the results indicate the CVFED models provide acceptable results, suggesting that the FEMA FIS WSELs could be uniformly set about 2.5 feet too low.

Table 4-9: 2016 FEMA FIS vs. CVFED: Sacramento River at Hood

Sacramento River at Hood			
River Station	**FEMA FIS: 100-yr WSEL**	**CVFED: 100-yr WSEL**	**Difference**
mile	ft	ft	ft
SAC_R08_40.946	22.57	25.19	2.62
SAC_R08_40.447	22.29	24.92	2.63
SAC_R08_40.197	22.14	24.78	2.64
SAC_R08_39.951	22.00	24.64	2.64
SAC_R08_39.698	22.00	24.46	2.46
SAC_R08_39.455	22.00	24.39	2.39
SAC_R08_39.193	22.00	24.22	2.22
SAC_R08_38.945	21.86	24.08	2.22
SAC_R08_38.701	21.71	24.04	2.33
SAC_R08_38.448	21.57	23.94	2.37
CVFED 100-yr is approximately 2.5' higher than 2016 FEMA FIS 100-yr			

Table 4-10: 2016 FEMA FIS vs. CVFED: Sacramento River at Courtland

Sacramento River at Courtland			
River Station	**FEMA FIS: 100-yr WSEL**	**CVFED: 100-yr WSEL**	**Difference**
mile	ft	ft	ft
SAC_R08_36.73	20.67	23.14	2.47
SAC_R08_35.73	20.22	22.62	2.40
SAC_R07_34.162	19.82	21.87	2.05
SAC_R07_33.61	19.55	21.58	2.03
SAC_R07_32.667	18.71	21.06	2.35
SAC_R06_32.098	18.29	20.79	2.50
SAC_R06_31.846	18.14	20.65	2.51
SAC_R06_30.839	17.57	20.22	2.65
SAC_R06_29.845	17.00	19.79	2.79
SAC_R06_28.316	16.33	19.16	2.83
CVFED 100-yr is approximately 2.4' higher than 2016 FEMA FIS 100-yr			

Table 4-11: 2016 FEMA FIS vs. CVFED: Sacramento River at Locke

Sacramento River at Locke			
River Station	**FEMA FIS: 100-yr WSEL**	**CVFED: 100-yr WSEL**	**Difference**
mile	ft	ft	ft
SAC_R06_28.108	16.22	19.04	2.82
SAC_R06_27.846	16.11	18.95	2.84
SAC_R06_27.594	16.00	18.79	2.79
SAC_R06_27.313	16.00	18.63	2.63
CVFED 100-yr is approximately 2.7' higher than 2016 FEMA FIS 100-yr			

Table 4-12: 2016 FEMA FIS vs. CVFED: Sacramento River at Walnut Grove

Sacramento River at Walnut Grove			
River Station	**FEMA FIS: 100-yr WSEL**	**CVFED: 100-yr WSEL**	**Difference**
mile	ft	ft	ft
SAC_R06_27.097	16.0	18.22	2.22
SAC_R06_26.888	16.0	18.30	2.30
SAC_R06_26.879	16.0	18.34	2.34
SAC_R06_26.87	16.0	18.32	2.32
SAC_R06_26.847	16.0	18.26	2.26
SAC_R06_26.712	16.0	18.11	2.11
CVFED 100-yr is approximately 2.3' higher than 2016 FEMA FIS 100-yr			

Table 4-13: 2016 FEMA FIS vs. CVFED: Sacramento River at Isleton

Sacramento River at Isleton			
River Station	**FEMA FIS: 100-yr WSEL**	**CVFED: 100-yr WSEL**	**Difference**
mile	ft	ft	ft
SAC_R05_18.475	11.58	14.64	3.06
SAC_R05_18.224	11.50	14.52	3.02
SAC_R05_17.976	11.42	14.44	3.02
SAC_R05_17.729	11.33	14.36	3.03
SAC_R05_17.485	11.25	14.29	3.04
SAC_R05_17.234	11.17	14.22	3.05
CVFED 100-yr is approximately 3.0' higher than 2016 FEMA FIS 100-yr			

Table 4-14: 2016 FEMA FIS vs. CVFED: Georgiana Slough Between Walnut Grove & Isleton

Georgiana Slough Between Walnut Grove & Isleton			
River Station	**FEMA FIS: 100-yr WSEL**	**CVFED: 100-yr WSEL**	**Difference**
mile	ft	ft	ft
GEO_R01_0.037	10.00	9.34	-0.66
GEO_R01_0.948	10.00	10.21	0.21
GEO_R01_1.197	10.00	10.45	0.45
GEO_R01_1.857	10.67	10.98	0.31
GEO_R01_2.949	11.00	11.89	0.89
GEO_R01_3.810	11.27	12.63	1.36
GEO_R01_4.681	11.91	13.17	1.26
GEO_R01_5.432	12.33	13.77	1.44
GEO_R01_6.061	12.83	14.21	1.38
GEO_R01_7.307	13.20	15.14	1.94
GEO_R01_8.312	14.00	15.83	1.83
GEO_R01_9.337	14.22	16.41	2.19
GEO_R01_10.962	15.00	17.44	2.44
GEO_R01_11.249	15.18	17.60	2.42
GEO_R01_12.070	15.55	17.93	2.38
GEO_R01_12.315	16.00	18.07	2.07
CVFED 100-yr is approximately 1.5’ higher than 2016 FEMA FIS 100-yr			

5.0 Hypothetical Failure Mapping Impacts for Legacy Communities

5.1 General

The flood inundation mapping for each of the six North Delta Legacy Communities of Hood, Courtland, Locke, Walnut Grove (East), Ryde/Walnut Grove (West), and the City of Isleton are presented in this section. The inundation maps were initially developed ped in May 2017 for Sacramento County OES and are based on hypothetical levee failures located along the banks of the Sacramento River portraying the maximum flood depths. The inundation maps were developed as a key component of the County's Flood Emergency Safety Plans (ESPs) developed for each of the RDs or Maintenance Areas where the subject Delta Legacy Communities reside.

If a levee were to fail, relief cuts are a potential way to reduce flood water depths, particularly in large basins that have a sizeable water surface elevation gradient greater than 5 feet between its upstream and downstream river stages. Generally deployed at the lowest downstream end of each respective Reclamation District (RD) basin, the existing top of levee is lowered to an elevation to allow floodwater to be lowered by a few feet, that normally equates to the available freeboard at its lowest downstream levee section. Pumps will also likely be needed in addition a relief cut to fully dewater and recover the basin. Recovery after a breach is important to be able to remove the flood waters out of the island and back into the main channels. Pump rating curves are provided separately in the ESPs as a guide to determine the duration to dewater the island for the separate RDs associated with each subject North Delta Legacy Community.

5.2 Hypothetical Levee Failure near Hood Study Area in RD 744

The community of Hood and its larger study area is located south of RD 744 and is located on the left side of the Sacramento River within DWR Maintenance Area No.9 between the HEC-RAS river cross sections 40.946 to 38.448. This is approximate station 3234+00 to 3101+00 in the NULE segment number 106 coinciding with the Hood study area. The existing condition stage and flow comparison between the 100- and 200-year base vs. climate change and SLR is presented in **Appendix C-1**. **Appendix E-1** presents the WSEL profiles for a 100--year event under current and future conditions.

If a breach was to occur upstream from Hood and within RD 744, the community of Hood could be inundated with flood waters up to a depth of approximately 15 feet. Based on the LiDAR topography, the existing RD 744 cross levee at El. 21 feet (located at the north, upstream of the project study area is approximately five feet lower compared to the south former railroad embankment immediately south of Hood at El. 25 feet. Therefore, flood water would enter from the north levee due to the elevation discrepancy and likely inundate the entire community of Hood. **Figure 5-1** shows the maximum flood inundation from the breach upstream within RD 744 without implementing a relief cut.

If a breach were to occur south of Hood within RD 813, the community of Hood would not be impacted due to the higher south levee (former railroad spur embankment) at El. 25 feet, and the surrounding railroad embankment south o and east of Hood would protect the community if there is no failure to the embankment. The flood water would backwater up to the cross levee immediately then into Stone Lakes National Wildlife Refuge area. **Figure 5-2** shows the maximum flood inundation from a potential breach within RD 813 without implementing a relief cut.

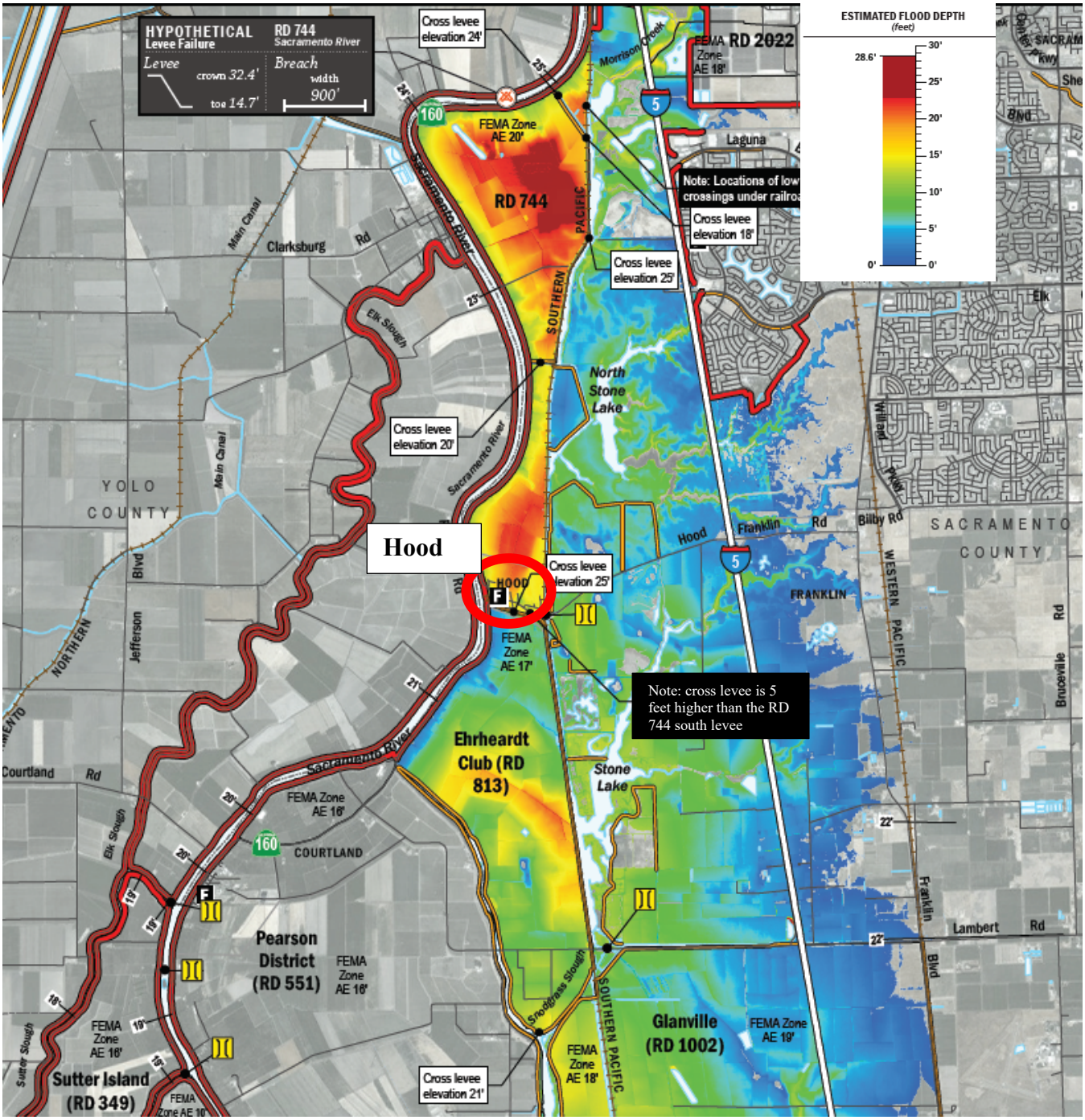

Figure 5-1: Maximum Flood Depths in Hood and Surrounding Areas from Levee Breach Occurring Upstream in RD 744, North of Hood

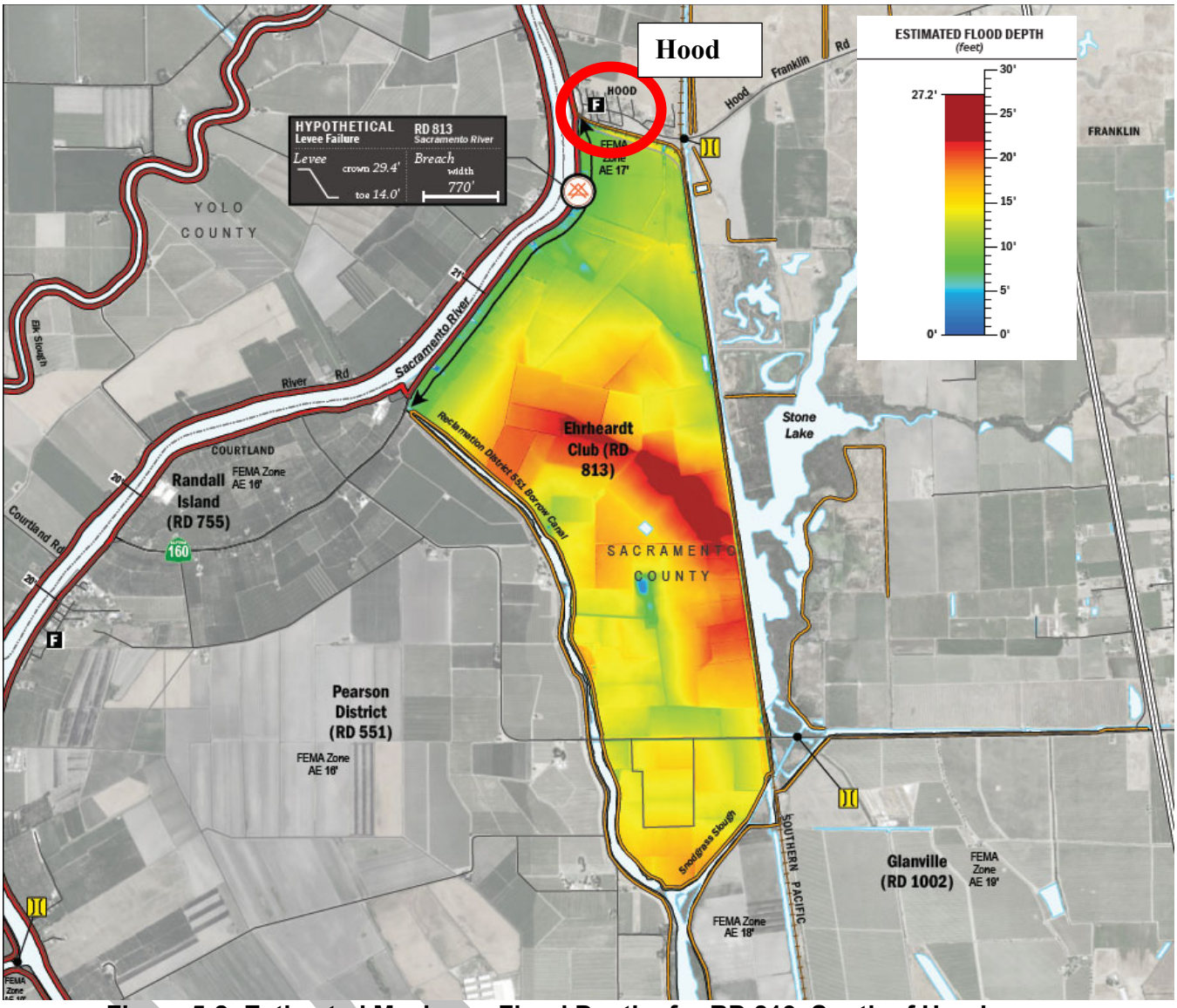

Figure 5-2: Estimated Maximum Flood Depths for RD 813, South of Hood

5.3 Hypothetical Levee Failure near Courtland in RDs 755 and 551

Courtland is south of Hood within RD 551 (Pearson District) on the east Sacramento River between the HEC-RAS cross sections 34.98 to 32.667. This is approximate station 2910+00 to 2791+00 in the NULE segment number 126. The existing condition stage and flow comparison between the 100- and 200-year base vs. climate change and SLR can be found in **Appendix C-1**. **Appendix E-2** includes the WSEL tables and profiles for the 100-year event under existing and future conditions.

If a levee failure were to occur on the Sacramento River north of Courtland in the neighboring RD 755, the community of Courtland could be inundated with flood waters to a maximum depth of approximately 15 feet. The estimated time to fill the RD 551 basin to a maximum depth is approximately 3 days. **Figure 5-3** shows the maximum flood inundation from the breach originating within RD 755 without implementing a relief cut at the lower, downstream end of RD 551.

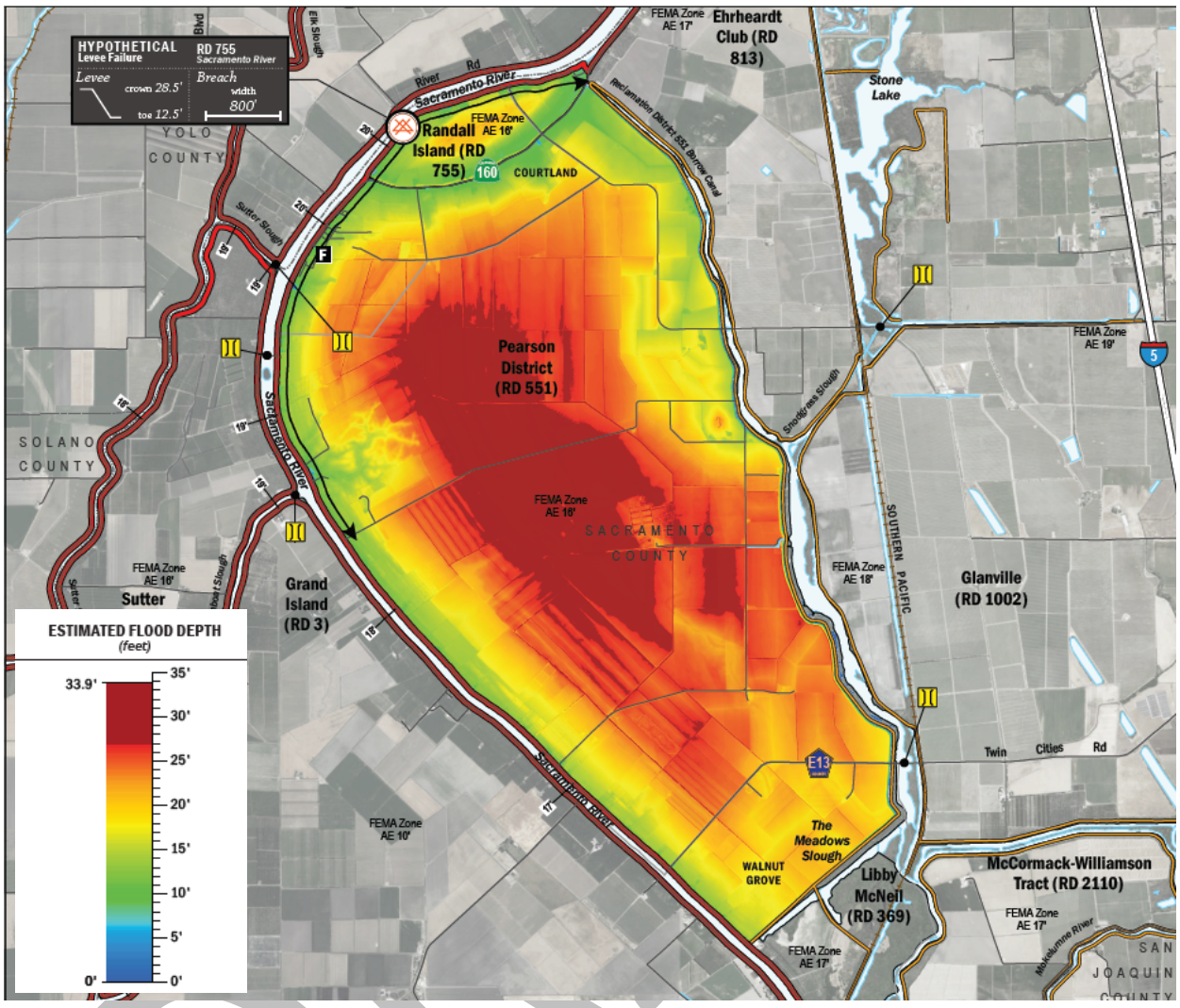

Figure 5-3: Estimated Maximum Flood Depths for RDs 551 & 755, Courtland

5.4 Hypothetical Levee Failure at Locke in RD 369

The Town of Locke is south of Courtland within RD 369 (Libby McNeil) on the left side of the Sacramento River between the HEC-RAS cross sections 28.108 to 27.313. This is approximate station 2551+00 to 2507+00 in NULE segment numbers 121 and 127. The existing condition stage and flow comparison between the 100- and 200-year base model vs. the hydraulic models that includes both climate change and SLR are presented on **Appendix C-1**. **Appendix E-3** includes the lower Sacramento River WSEL tables and profiles for the 100-year event under existing and future conditions adjacent to Locke.

If a breach were to occur within RD 369, the community of Locke would be inundated with flood waters with a maximum depth of approximately 12 to 14 feet without implementing a relief cut. Since this RD is one of the smaller islands, it will require only 8 hours to fully inundate the area. **Figure 5-4** shows the maximum flood inundation from the breach within RD 369 without implementing a relief cut.

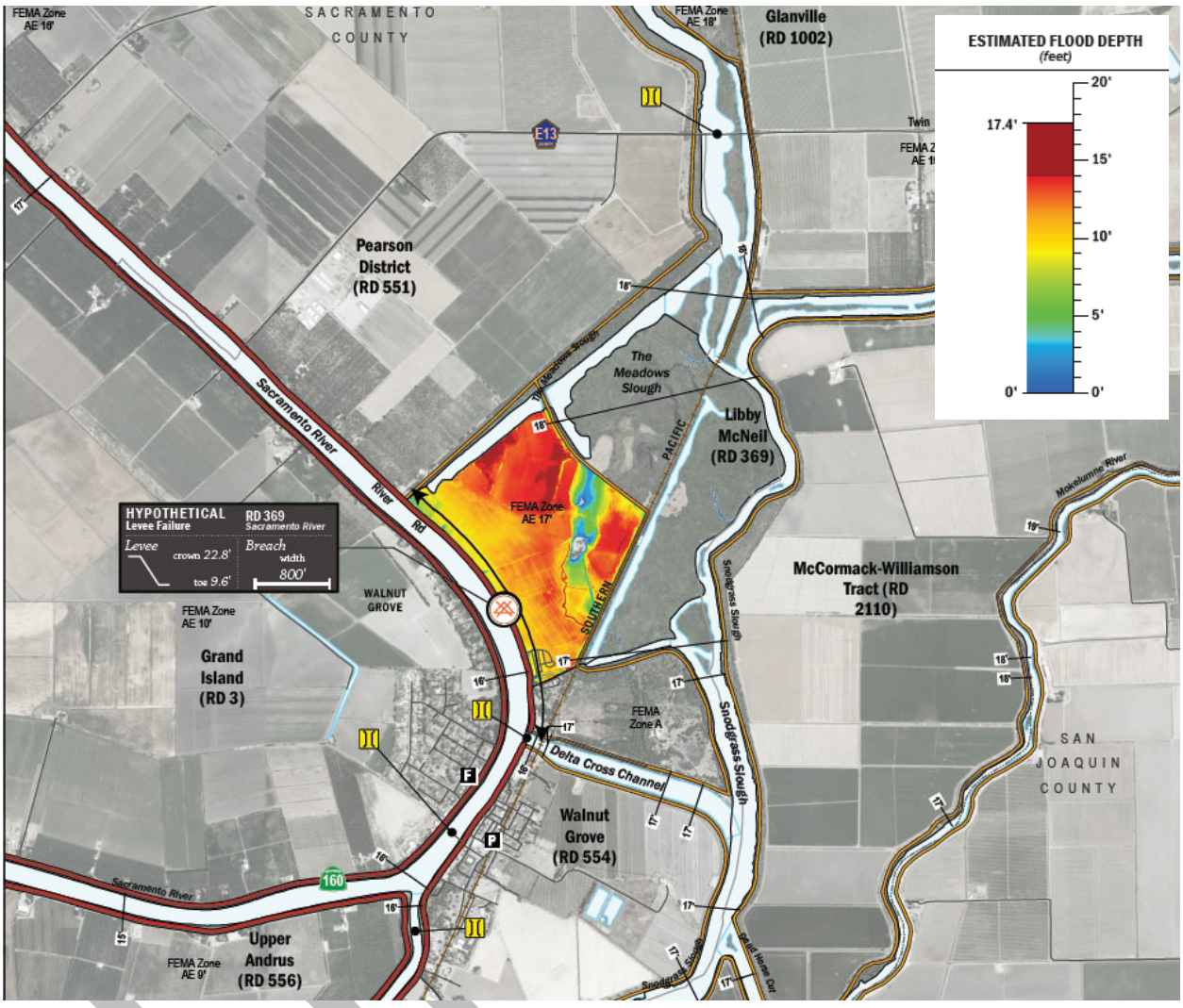

Figure 5-4: Estimated Maximum Flood Depths for RD 369, Locke

5.5 Hypothetical Levee Failure at East walnut Grove in RD 554

The Delta Legacy Community of Walnut Grove (East) is south of Locke within RD 554 (Walnut Grove) on the left side of the Sacramento River between the HEC-RAS cross sections 27.097 to 26.712. This is approximately from station 2495+00 to 2473+00 in the NULE segment number 128. The existing condition stage and flow comparison between the 100- and 200-year base vs. climate change and SLR can be found in **Appendix C-1**. **Appendix E-4** includes the WSEL tables and profiles for the 100-year event under existing and future conditions for the study streams adjacent to Walnut Grove (East).

If a breach were to occur within RD 554 south of the Delta Cross Channel, the community of East Walnut Grove would be inundated with flood waters up to a maximum depth of approximately 10 to 12 feet without implementing a relief cut. RD 554 has a similar volume size to RD 369, and it

would only require only 10 hours to fully inundate the area. **Figure 5-5** shows the maximum flood inundation depths from the breach within RD 554 without implementing a relief cut.

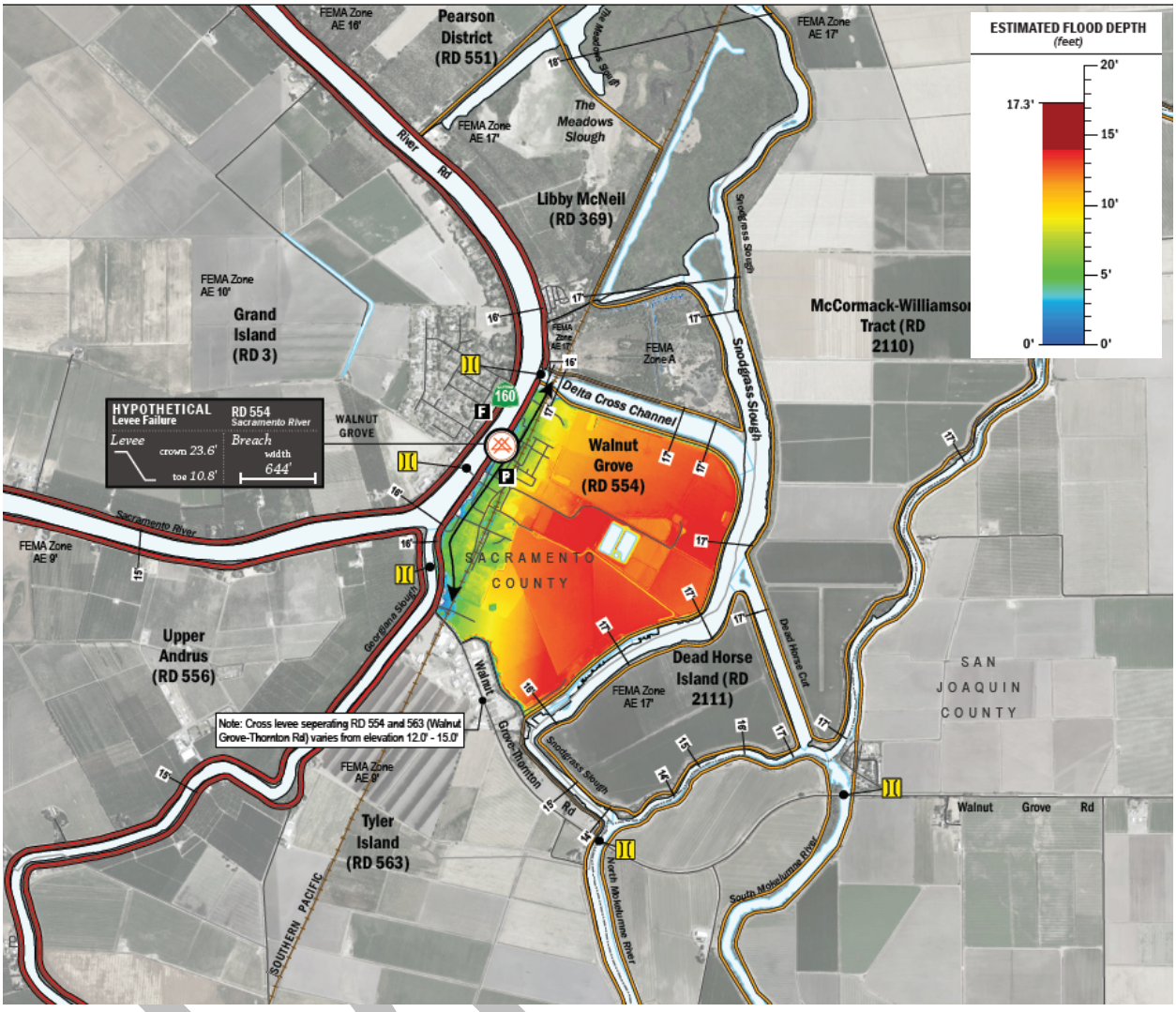

Figure 5-5: Estimated Maximum Flood Depths for RD 554, Walnut Grove (East)

5.6 Hypothetical Levee Failure in RD 3

The Delta Legacy Communities of Ryde/Walnut Grove (West) are within RD 3 (Grand Island) on the right side of the Sacramento River between the HEC-RAS cross sections 27.594 to 26.712, and 24.585 to 23.851. This is approximately from station 2495+00 to 2297+00 in the NULE segment number 384. The existing condition stage and flow comparison between the 100- and 200-year base vs. climate change and SLR can be found in **Appendix C-1 for the Sacramento River and Appendix C-3 for Steamboat Slough**. **Appendix E-5** also has the WSEL tables and profiles for the 100-year event under existing and future conditions.

If a breach were to occur within RD 3 along the upstream portion of Steamboat Slough, the communities of Ryde/Walnut Grove (West) would be inundated with flood waters up to a

maximum depth of approximately 15 to 18 feet without implementing a relief cut. Since Ryde/Walnut Grove (West) are on the opposite side of the hypothetical breach location on Grand Island, it will take over 24 hours for the flood waters to reach the communities and approximately 3 days to reach the maximum flood depths. **Figure 5-6** shows the maximum flood inundation from the breach within RD 3 without implementing a relief cut. By implementing a relief cut in the lower downstream portion of RD 3 along Steamboat Slough it is estimated that the maximum flood depths indicated in Figure 5-6 could be reduced by as much as 5 feet.

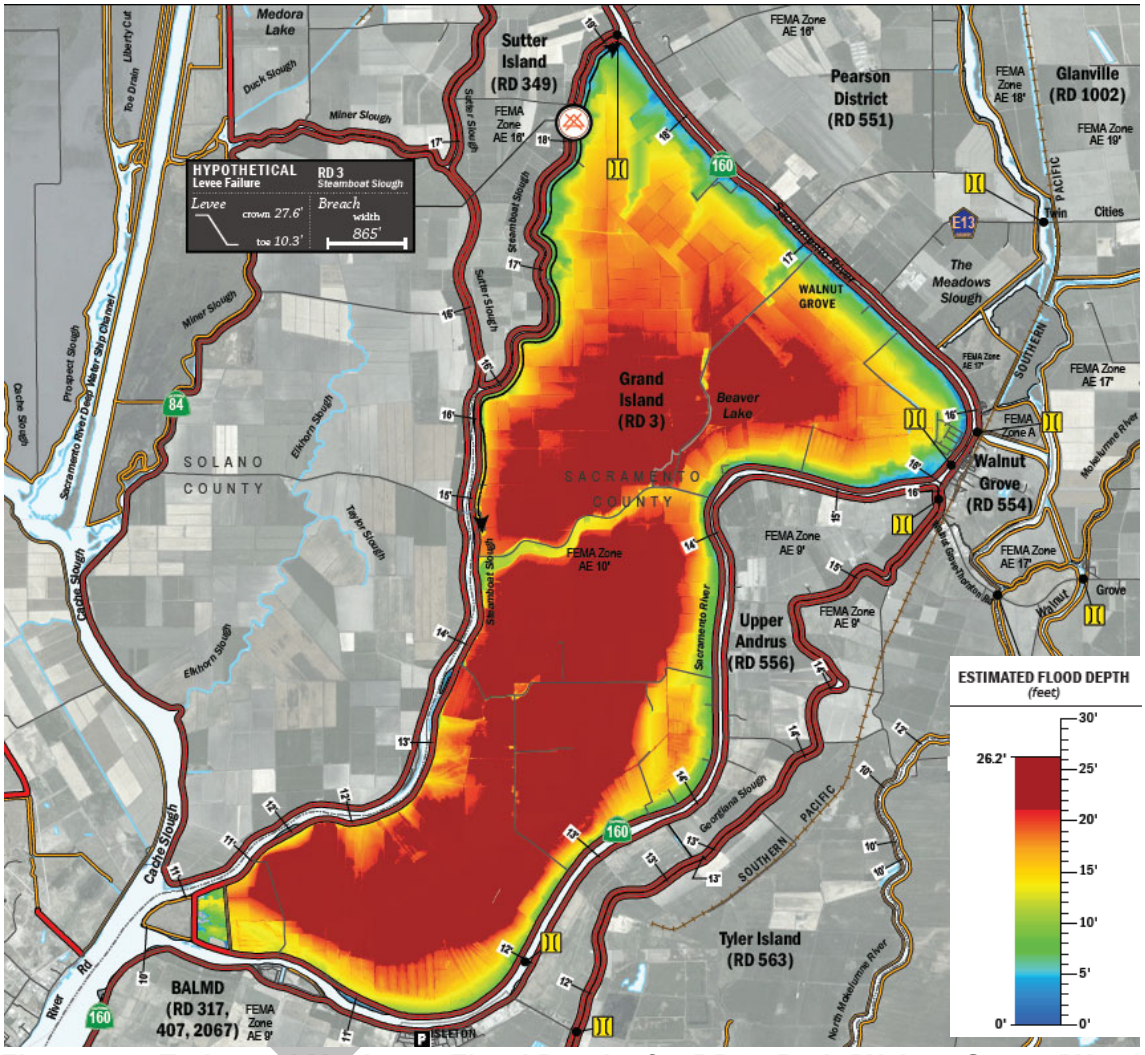

Figure 5-6: Estimated Maximum Flood Depths for RD 3, Ryde/Walnut Grove (West)

5.7 Hypothetical Levee Failure near Isleton in RD 2067/Brannan Andrus Levee Maintenance District (BALMD)

The North Delta Legacy Community of Isleton is located within the Brannan-Andrus Levee Maintenance District (BALMD) on the left side of the Sacramento River between the HEC-RAS cross sections 18.475 to 17.234. This is approximately station 2039+00 to 1669+00 in the NULE segment number 378. The BALMD basin reaches a minimum elevation of EL. -24 feet which is

approximately 38 feet below the base 100-year WSEL of 14 feet in the Sacramento River. The existing condition stage and flow comparison between the 100- and 200-year base vs. climate change and SLR can be found in **Appendix C-1 for the Sacramento River and Appendix C-2 for Georgiana Slough. Appendix E-6** also has the WSEL tables and profiles for the 100-year event under existing and future conditions.

Hypothetical levee failures on the Sacramento River were included to evaluate the potential impact to the BALMD basin and the City of Isleton. The results indicate the City can be inundated with flood waters up to a maximum depth of approximately 8 to 10 feet without implementing a relief cut. Isleton is on higher ground compared to the middle of the island where Highway 12 traverses across and allows the flood water to pool in the middle before it reaches the community after 3 days. **Figure 5-7** shows the maximum flood inundation from a breach on the Sacramento River across from Rio Vista and into BALMD without implementing a relief cut. By implementing a potential relief cut along the San Joaquin River east and upstream of Sevenmile Slough it is estimated that the maximum flood depts indicated in **Figure 5-7** could be lowered by as much as two feet.

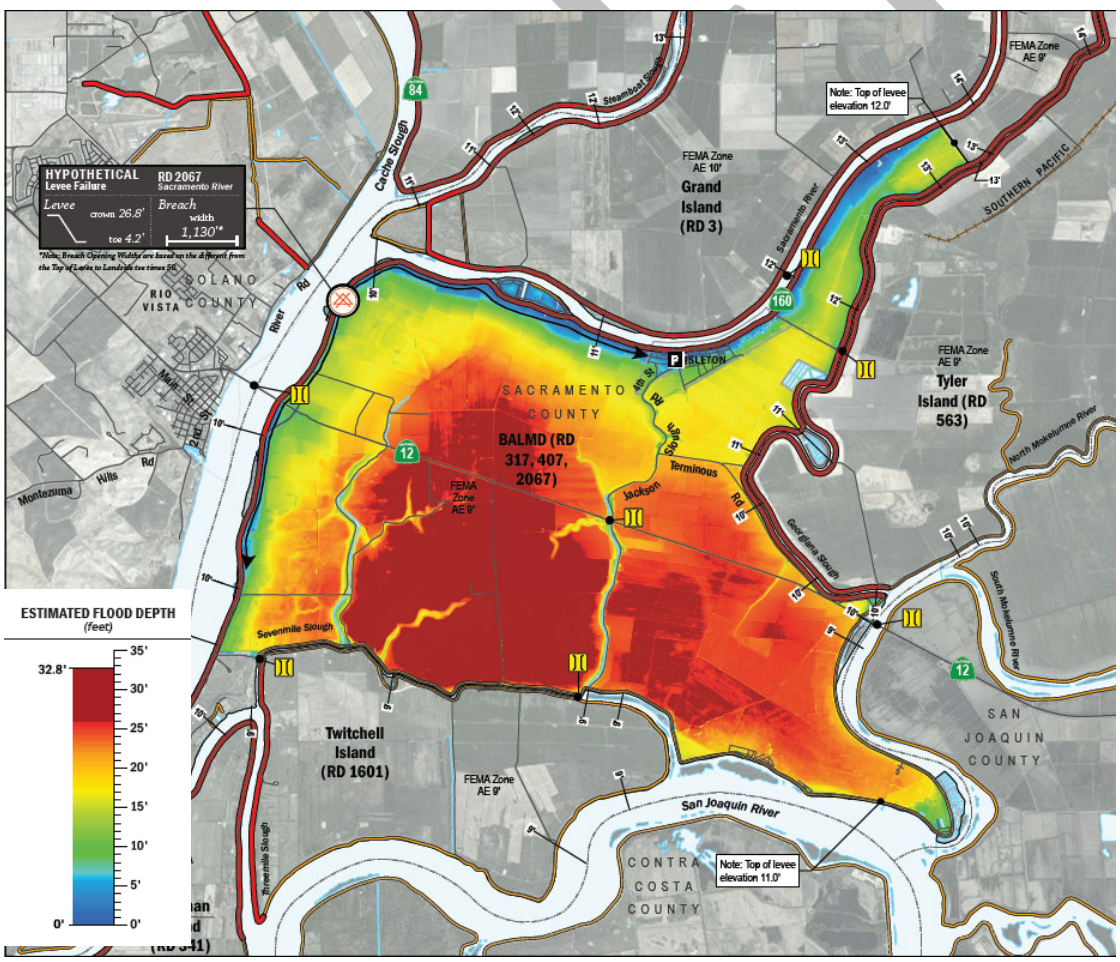

Figure 5-7: Estimated Maximum Flood Depths for BALMD, City of Isleton

6.0 Conclusion

The six North Delta Legacy Communities of Hood, Courtland, Locke, Walnut Grove (East), Ryde/ Walnut Grove (West), and the City of Isleton are surrounded and protected by levees on the Lower Sacramento River and Snodgrass, Steamboat, and Georgiana Sloughs. The section of the Lower Sacramento River adjacent to the North Delta Legacy Communities is unique because this section of the river receives flows from all the major reservoirs of Shasta, Oroville, New Bullards Bar, Camp Far West and Folsom. Model results have shown flows of 50,000 cfs at the Sacramento I Street bridge will produce river stages high enough to rise on the levees to elevations greater than the landward levee toe adjoining the subject Delta legacy Communities. Collected gage data has been shown this can occur frequently for long periods of time compared to other levees in the Sacramento River Flood Control Project (SRFCP), resulting in frequently loaded levee conditions. Conversely, the Snodgrass Slough levee segments only become loaded on an intermittently basis when high flows from the Cosumnes River and Dry Creek flood flows backwater into Snodgrass Slough. The hydraulic model evaluations for both systems indicate that the 100- and 200-year water surface profiles established on the adjacent waterways have the potential to impact the life and performance on the levees. Therefore, the results from this evaluation in combination with the geotechnical findings should be used to support existing and future flood damage economic modeling for planning and designing flood risk reduction measures.

Figure 6-1 presents a sample of one levee performance curve developed for the NULE program at segment number 106 at Index Point SAC 44 and 45 near Hood on the Lower Sacramento River. The performance curve was prepared by URS Corporation (URS) and Kleinfelder for DWR in 2011 to support the 2012 CVFPP and the Flood System Repair Project (FSRP). The intent of the performance curve developed throughout various locations of the Sacramento River system was to estimate the probability of failure for a given WSEL. The probability of failure is defined as a levee breach in which water from the water side of the levee is allowed to flow in an uncontrolled manner to the landside of the levee.

Figure 6-1 presents various frequency WSELs that can be plotted to estimate the probability of failure at one location. The 100- and 200-year results show that climate change with added SLR adjustments could increase the probability of failure from 20 to 50 percent. Subsequent evaluations may include the development of additional geotechnical information to verify if the levee performance is consistent for the existing and/or improved levee improvements that are required to further reduce flood risks amongst the North Delta Legacy Communities.

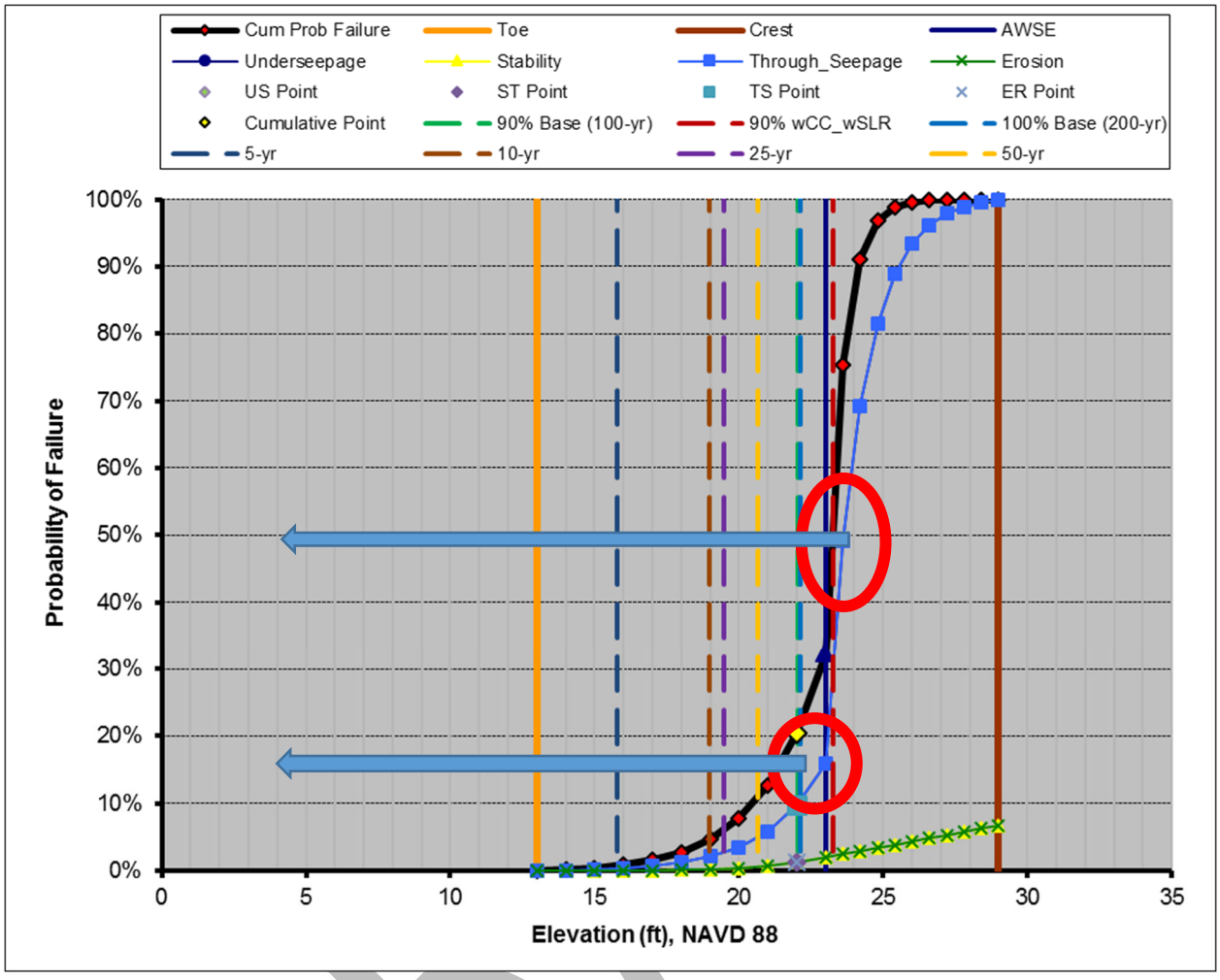

Figure 6-1: Fragility Curve vs. Estimated Flood Depths at Hood

7.0 Hydraulic Model Files

1997 Base Climate Change Model Plan Names: (Sacramento River System)

1. SRR 1997 90%
2. SRR 1997 100%
3. SRR 1997 90% CC_SLR
4. SRR 1997 100% CC_SLR

North Delta Cosumnes Model Plan Names: (Cosumnes River System)

1. North Delta_Feb 2017
2. North Delta_1997
3. North Delta_100yr
4. North Delta_50yr
5. North Delta_25yr
6. North Delta_10yr
7. North Delta_200yr
8. North Delta_1997_ClimateChange
9. North Delta_1997_ClimateChange_Morrison
10. North Delta_100yr_CC_SLR
11. North Delta_200yr_CC_SLR

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8.0 References

CADWR, 2013 Pre-Feasibility Cost Estimate Report. Attachment: Levee Repair Benefits for Leveed Area. July 2013

CADWR, 2014 Sacramento River Basin-Wide Feasibility Study Technical appendix. Attachment A: Index Point Specific In-Channel Frequency Curves and Levee Fragility Curves for Evaluation Scenarios. February 2014

CADWR, 2016 Basin-Wide Feasibility Studies Sacramento River Basin: Climate Change. March 2016

CADWR, 2017 Draft: 2017 CVFED Update – Climate Change Analysis Technical Memorandum. March 2017

CADWR, 2017 Draft: 2017 CVFED Update – Technical Analyses Summary Expanded Report. Appendix D: Flow and Stage Frequency Curves. July 2017

David Ford, 2015. Engineer's Work Product – DWR Channel Capacity Atlas support, Task 2 and 3 Deliverables – Updated p=0.01 and p=0.005 regulated flows based on CVFED HEC-RAS system model and selected events at analysis points. May 2015

GEI, 2017. Sacramento County Delta Flood Emergency Safety Plan. June 2017

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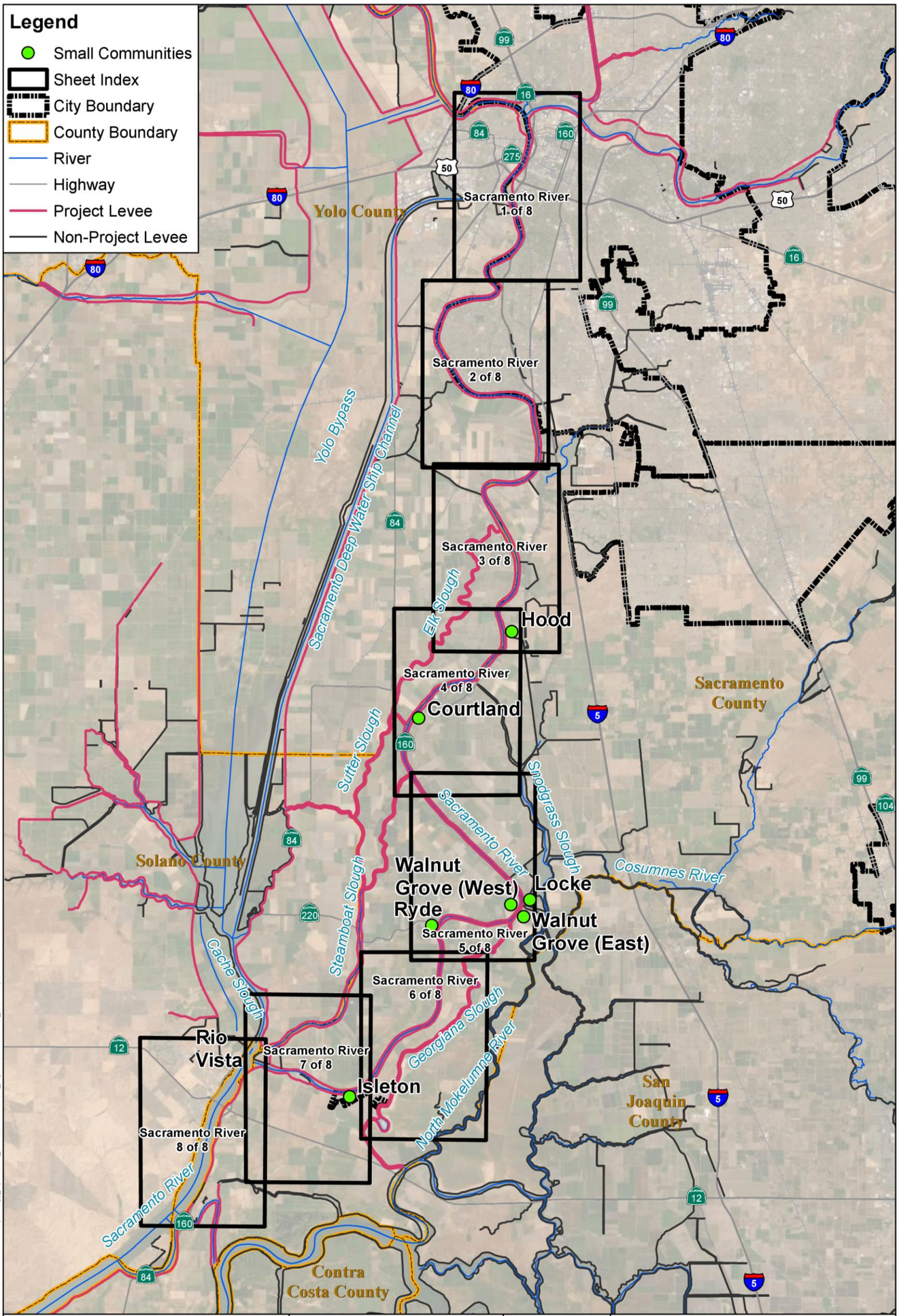
Appendix A - Lower Sacramento River System and Tributaries Levee Stationing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County Boundary
River
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Project Levee
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Sacramento River 3 of 8
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Sacramento River 7 of 8
Sacramento River 8 of 8
Yolo County
Solano County
Sacramento County
San Joaquin County
Contra Costa County
Yolo Bypass
Sacramento Deep Water Ship Channel
Elk Slough
Sutter Slough
Steamboat Slough
Cache Slough
Sacramento River
Spoodgrass Slough
Cosumnes River
Georgiana Slough
North Mokelumne River
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Locke
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DELTA LEGACY SMALL COMMUNITIES
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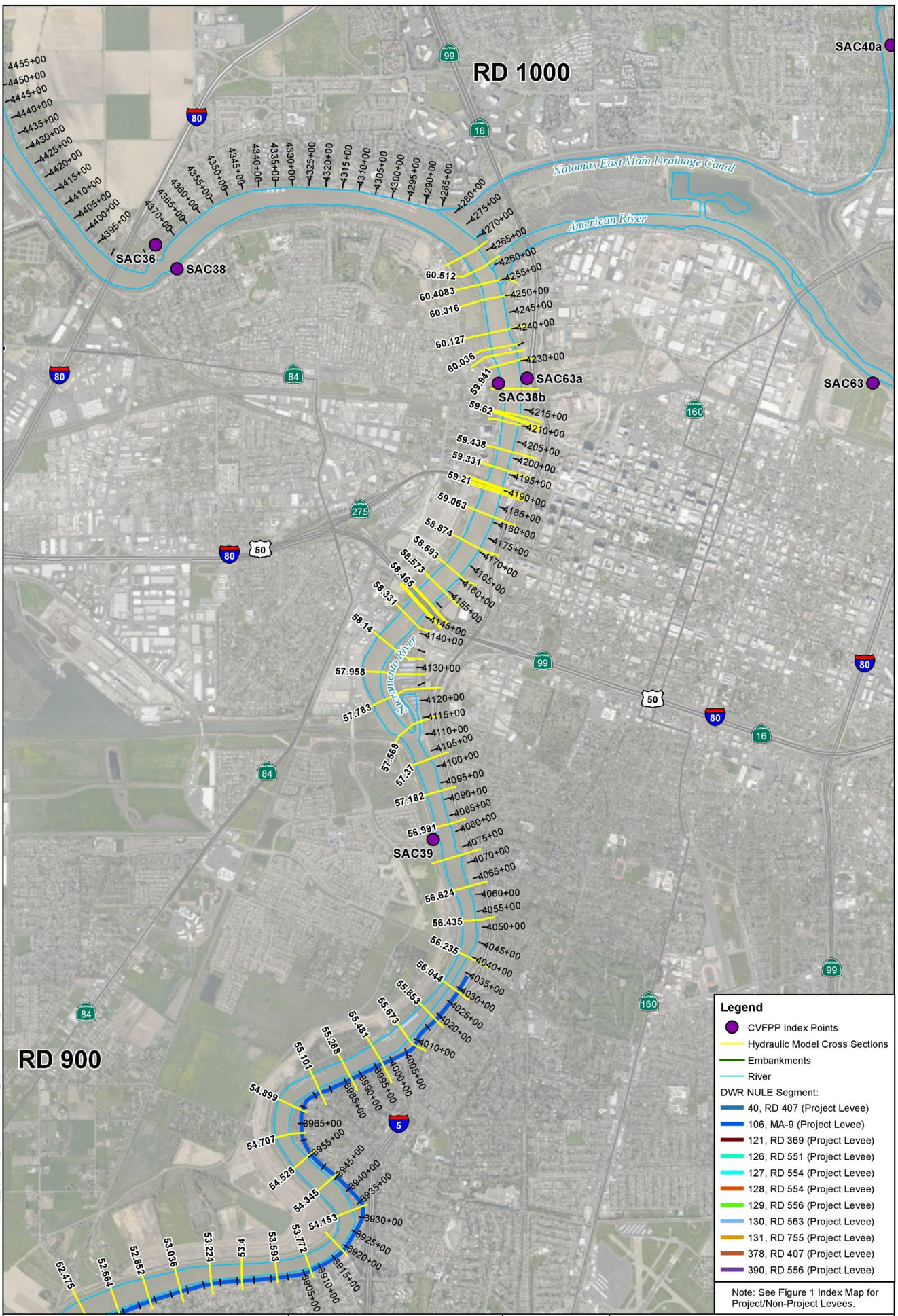
APPENDIX A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RD 900
Natomas East Main Drainage Canal
American River
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Note: See Figure 1 Index Map for Project/Non-Project Levees.
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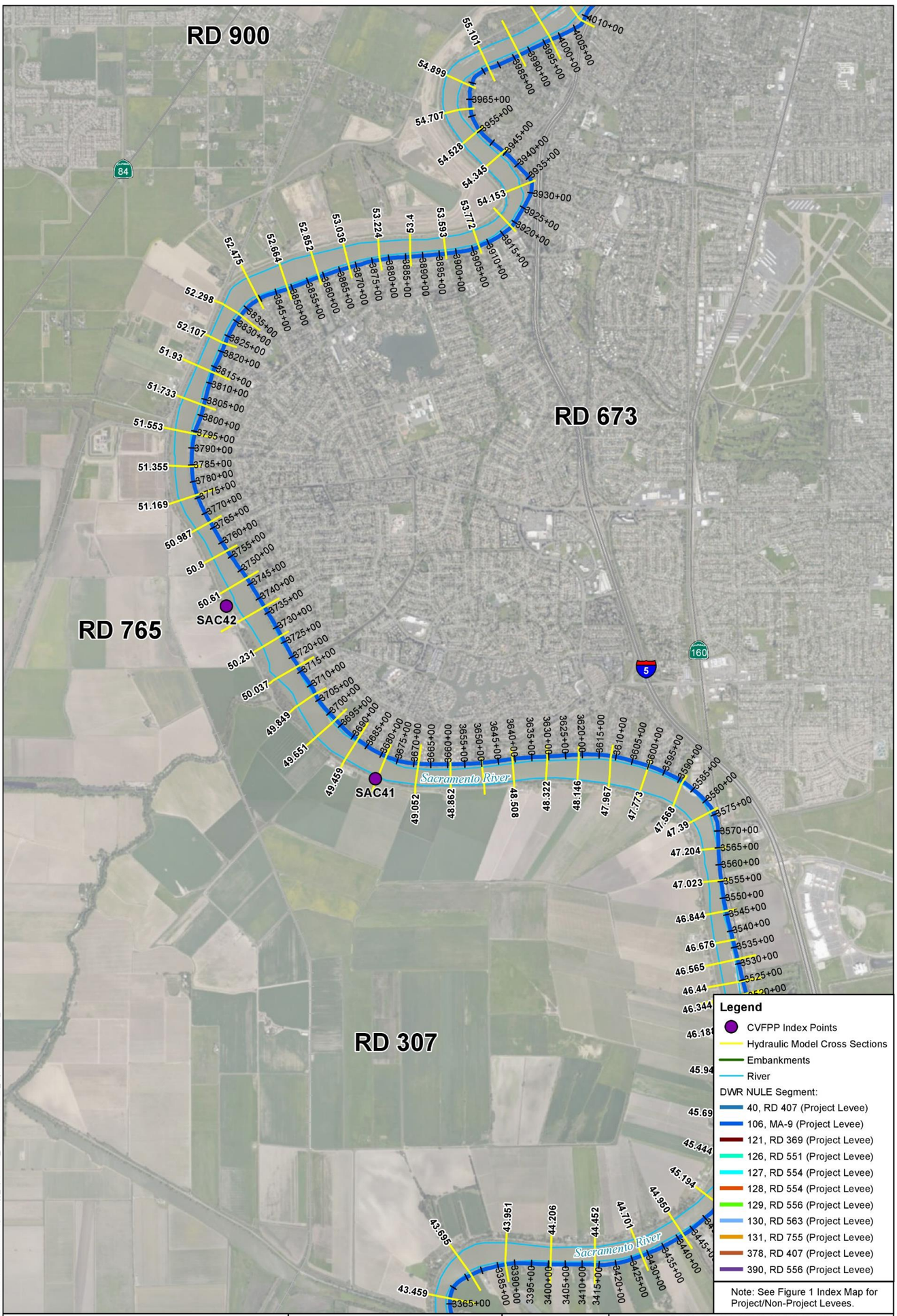
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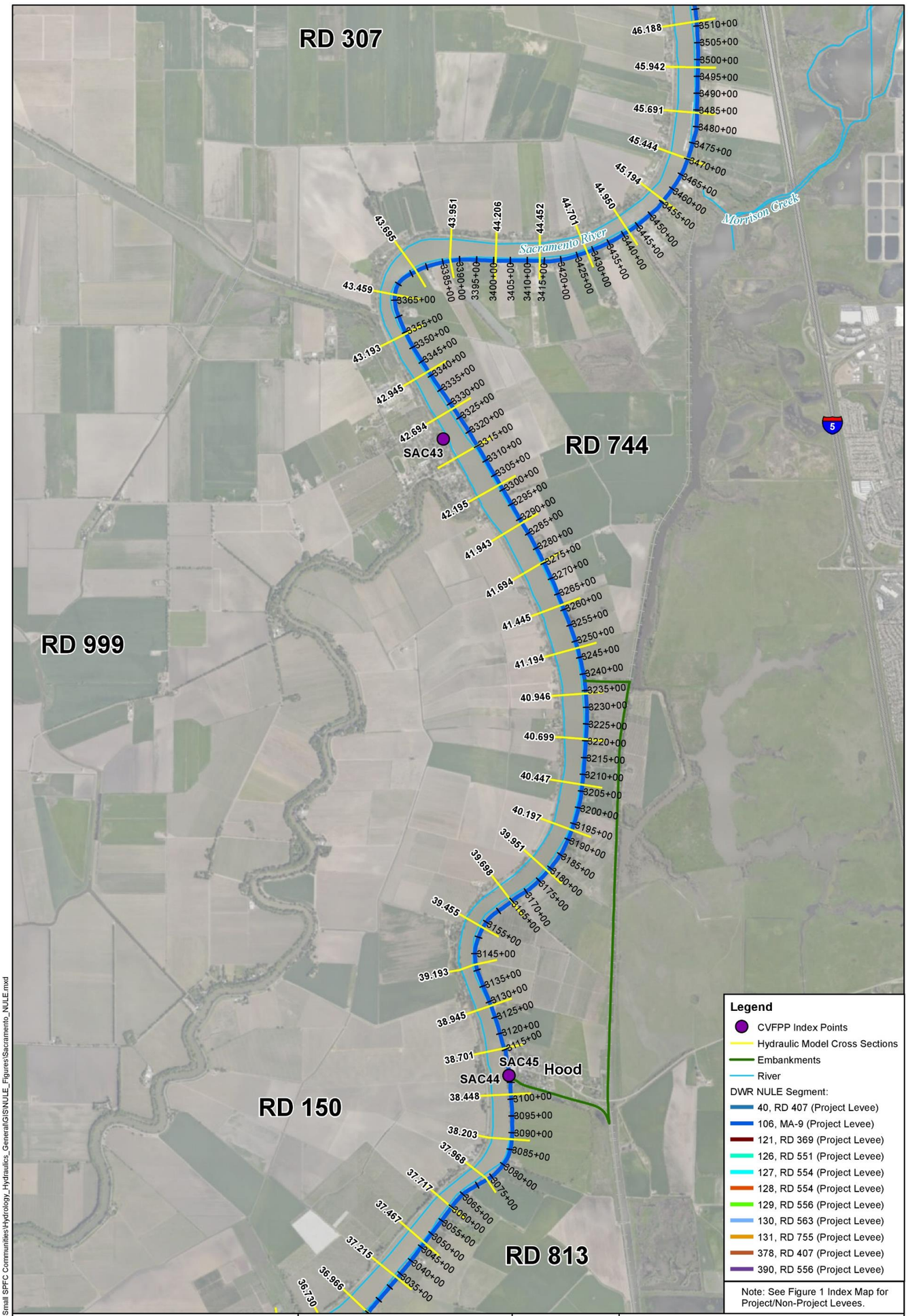
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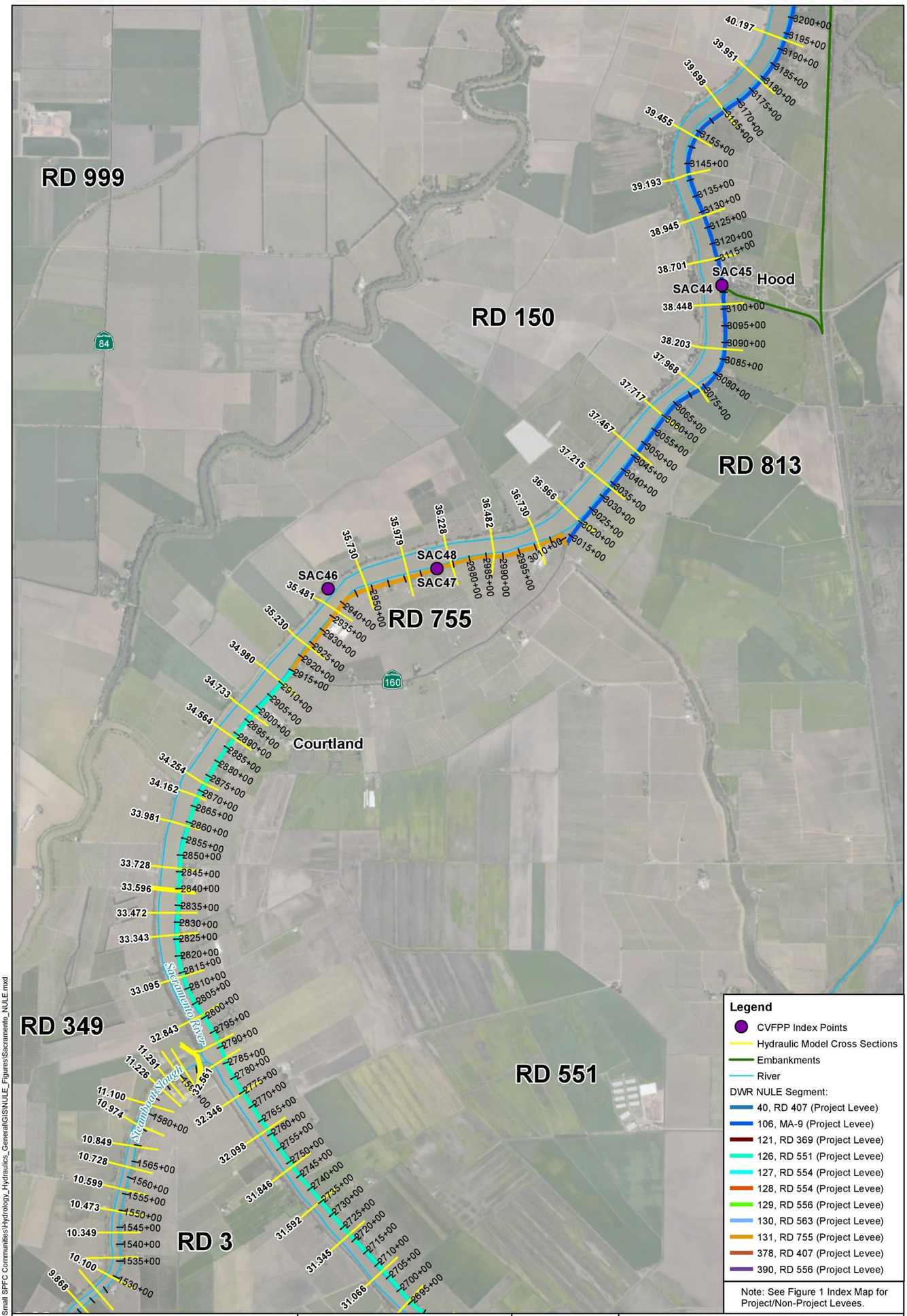
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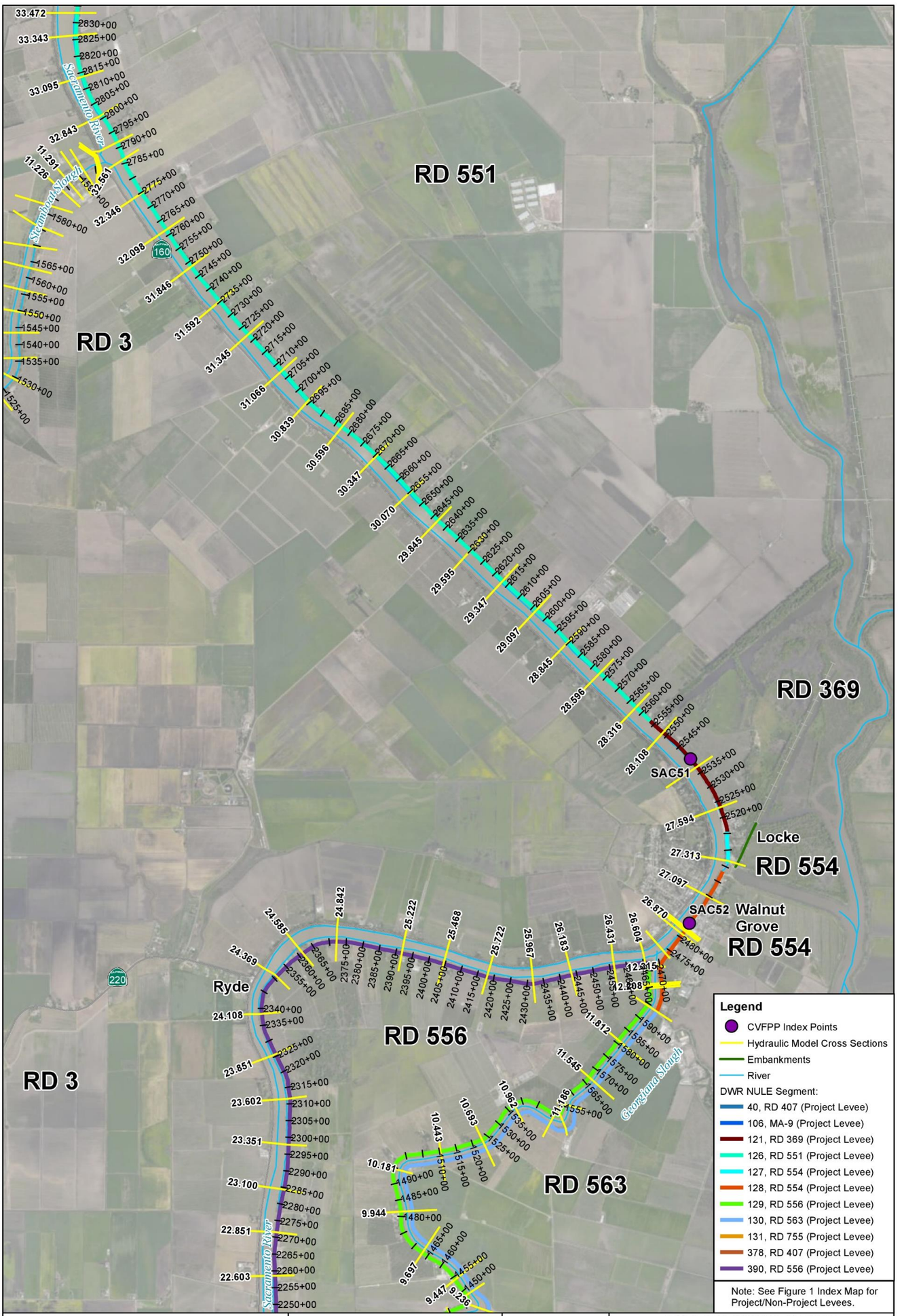
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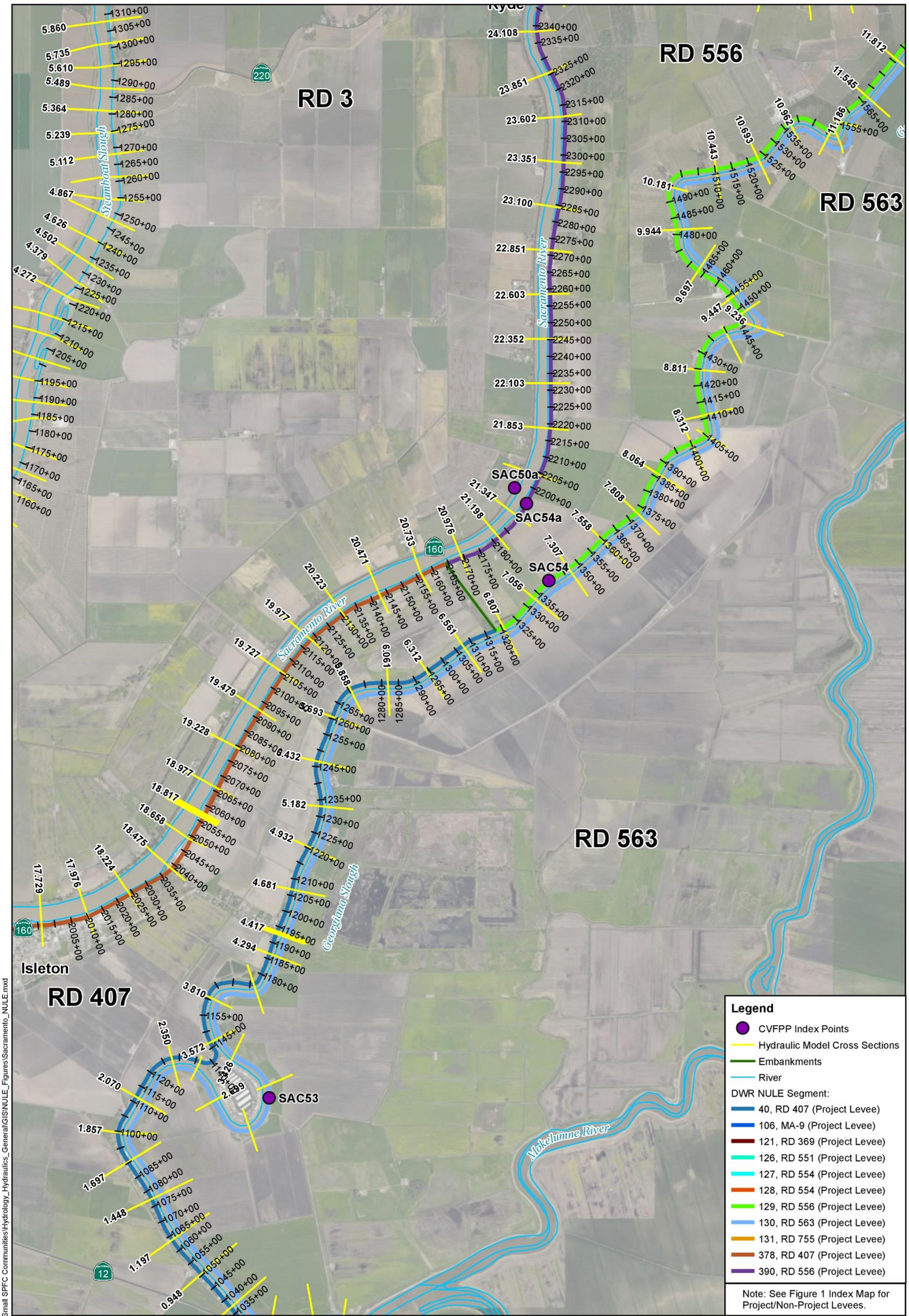
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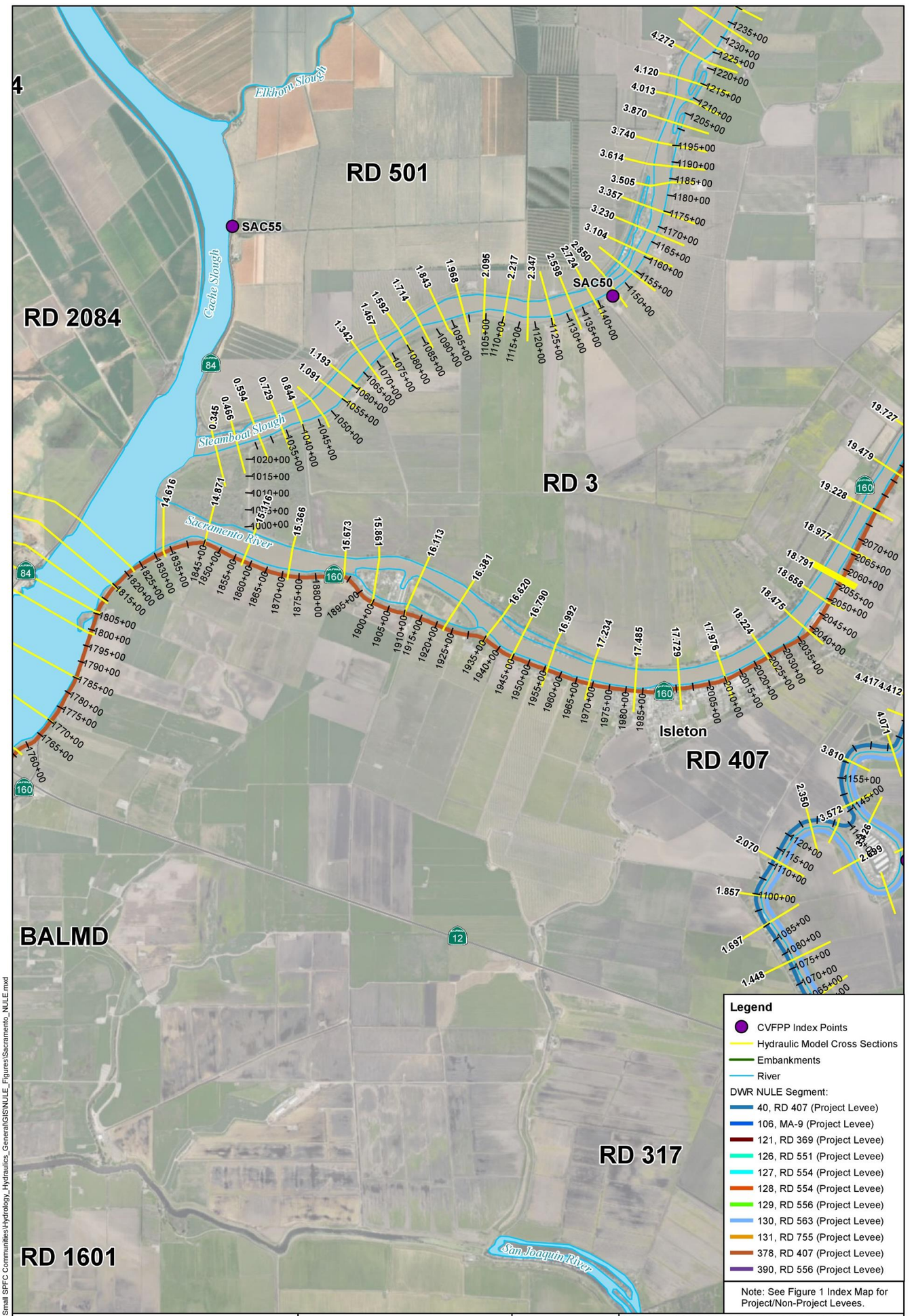

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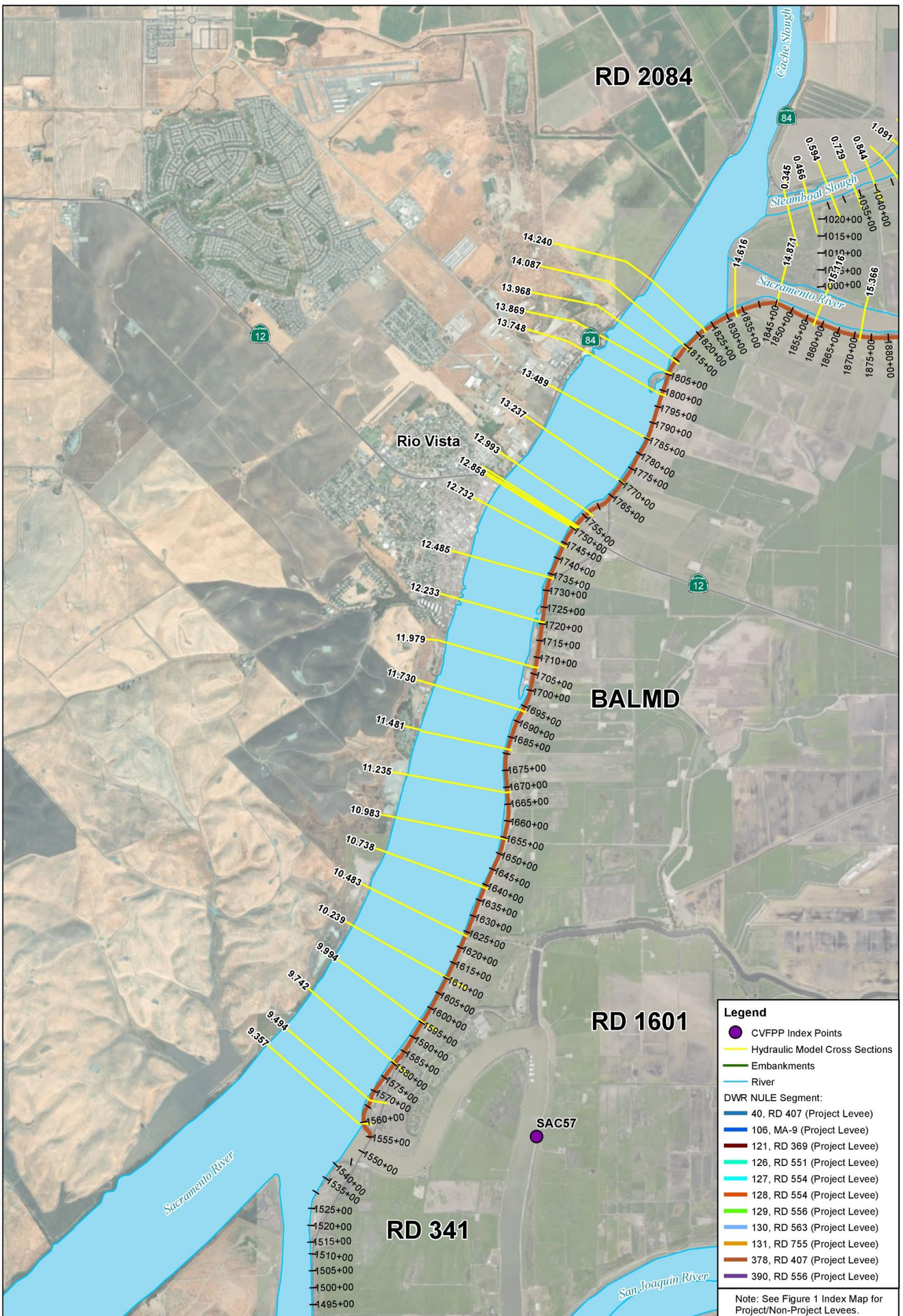
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BALMD
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RD 341
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JANUARY 2020
SACRAMENTO RIVER 8 OF 8
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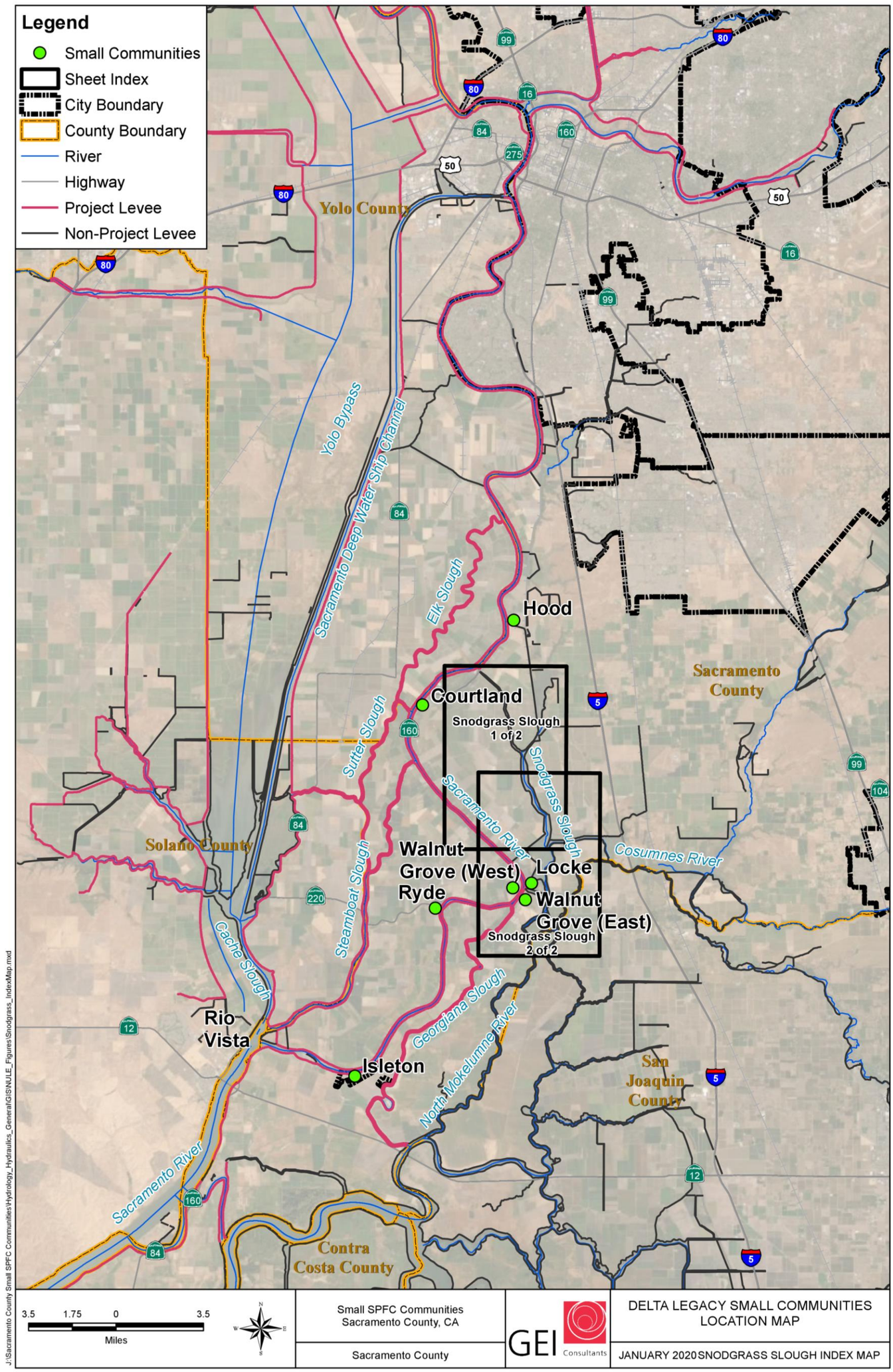
APPENDIX A

Appendix B - North Delta/Snodgrass Slough System Levee Stationing


Legend
Small Communities
Sheet Index
City Boundary
County Boundary
River
Highway
Project Levee
Non-Project Levee
Yolo County
Solano County
Sacramento County
Contra Costa County
San Joaquin County
Yolo Bypass
Sacramento Deep Water Ship Channel
Elk Slough
Sutter Slough
Steamboat Slough
Cache Slough
Sacramento River
Snodgrass Slough
Cosumnes River
Georgiana Slough
North Mokelumne River
Hood
Courtland
Snodgrass Slough 1 of 2
Walnut Grove (West)
Ryde
Locke
Walnut Grove (East)
Snodgrass Slough 2 of 2
Rio Vista
Isleton
3.5 1.75 0 3.5
Miles
Small SPFC Communities
Sacramento County, CA
Sacramento County
GEI Consultants
DELTA LEGACY SMALL COMMUNITIES
LOCATION MAP
JANUARY 2020 SNODGRASS SLOUGH INDEX MAP
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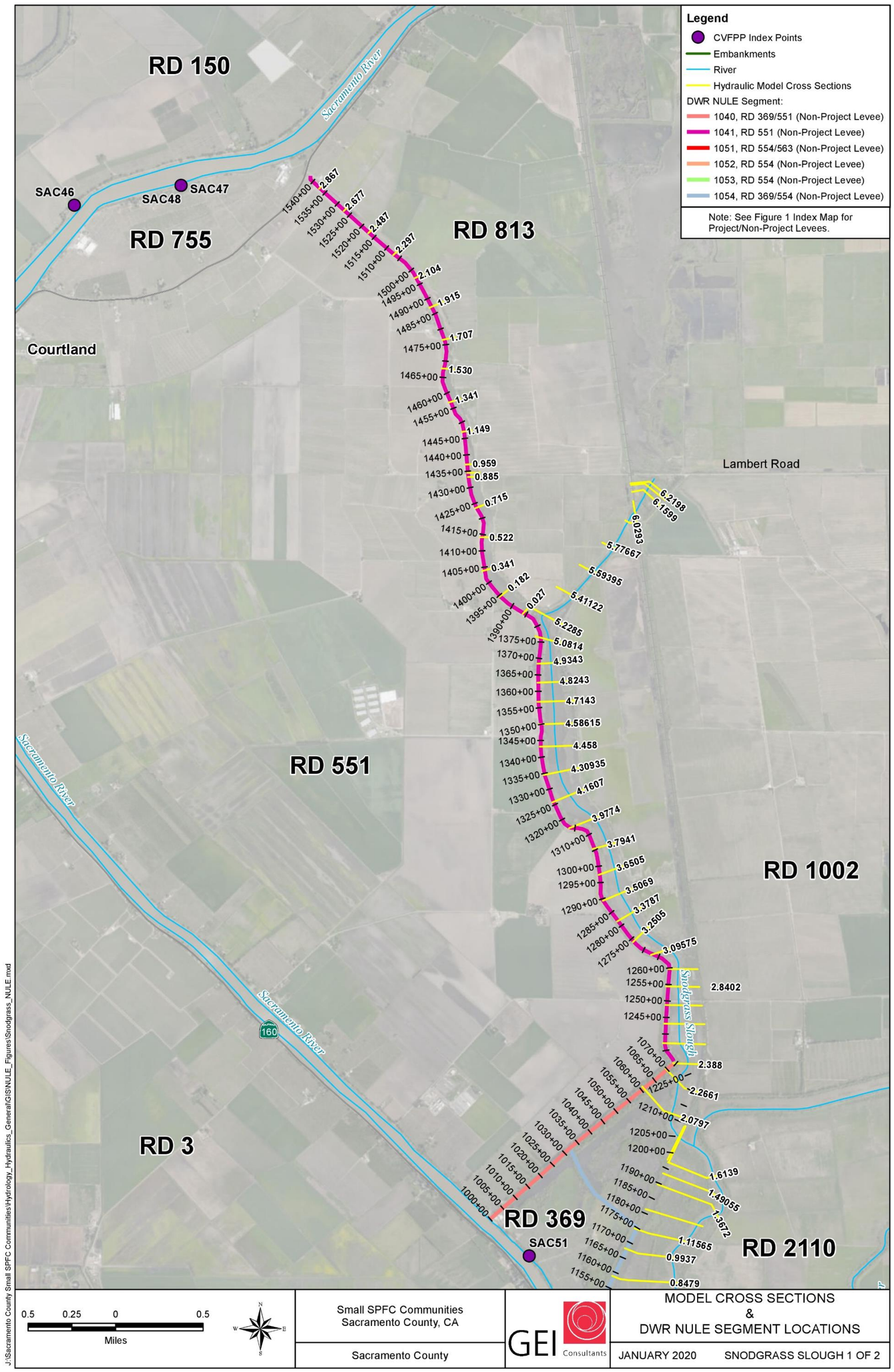
APPENDIX B


Legend
CVFPP Index Points
Embankments
River
Hydraulic Model Cross Sections
DWR NULE Segment:
1040, RD 369/551 (Non-Project Levee)
1041, RD 551 (Non-Project Levee)
1051, RD 554/563 (Non-Project Levee)
1052, RD 554 (Non-Project Levee)
1053, RD 554 (Non-Project Levee)
1054, RD 369/554 (Non-Project Levee)
Note: See Figure 1 Index Map for Project/Non-Project Levees.
RD 150
RD 755
RD 813
RD 551
RD 1002
RD 3
RD 369
RD 2110
Courtland
Lambert Road
Sacramento River
Snodgrass Slough
SAC46
SAC47
SAC48
SAC51
160
0.5 0.25 0 0.5
Miles
Small SPFC Communities
Sacramento County, CA
Sacramento County
GEI Consultants
MODEL CROSS SECTIONS
&
DWR NULE SEGMENT LOCATIONS
JANUARY 2020
SNODGRASS SLOUGH 1 OF 2
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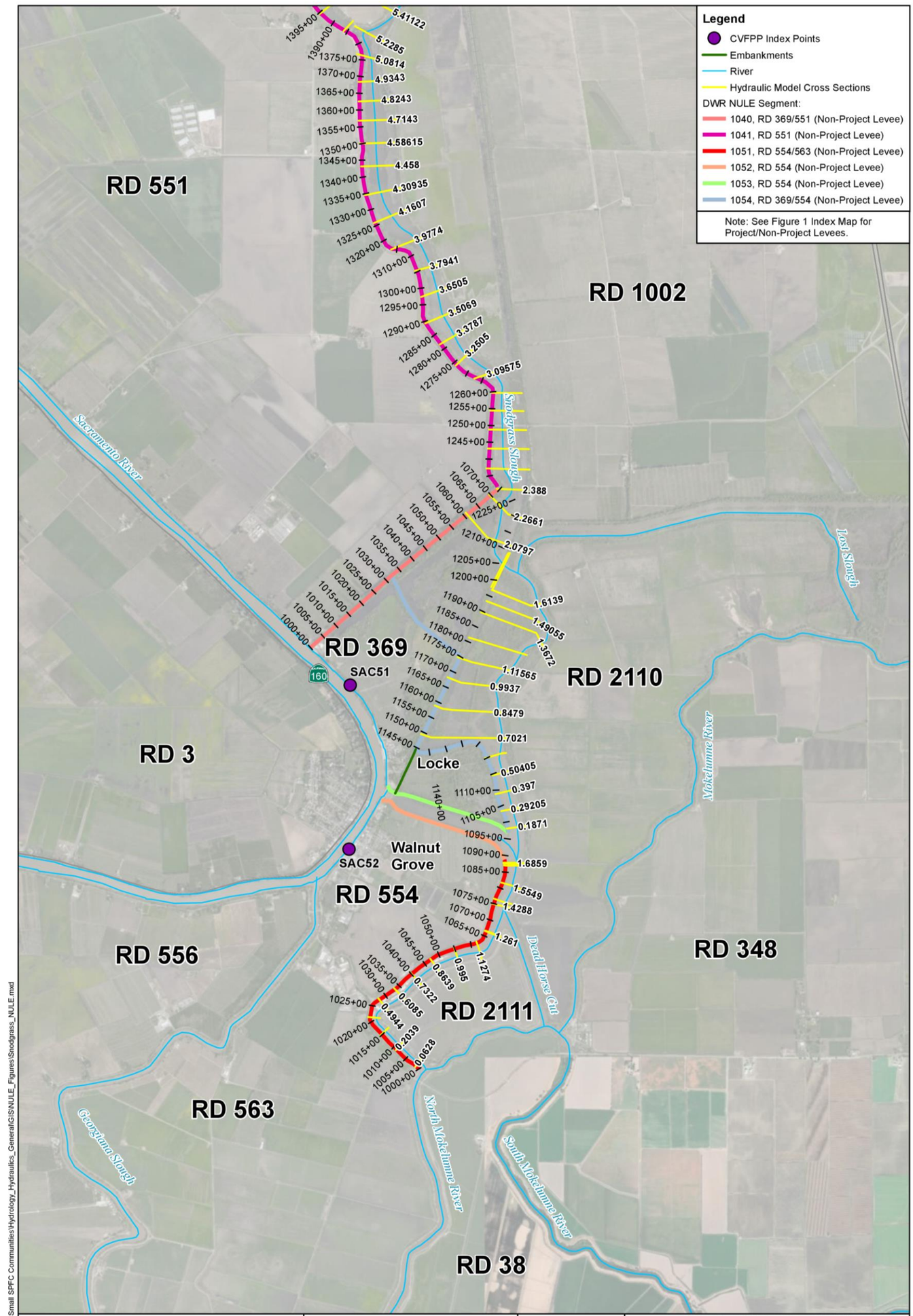
APPENDIX B



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	Small SPFC Communities Sacramento County, CA	GEI Consultants	MODEL CROSS SECTIONS & DWR NULE SEGMENT LOCATIONS
	Sacramento County		JANUARY 2020 SNODGRASS SLOUGH 2 OF 2

APPENDIX B

Appendix C - Hydraulic Model Summary Water Surface Elevation Table Results

Delta Legacy Small Communities

Sacramento River

Existing and Future 100-Year Stage and Flow Results (Datum: NAVD 88)

October 2020

HEC-RAS Cross Section	Reclamation District	NULE Left (L) Right (R) Levee	NULE Segment No.	NULE Station	Top of Levee Elevation		Freeboard Elevation Subtracted from Top of Levee		Existing 100-Year (CVHS Model, 1997 90%)		Future 100-Year w/CC + SLR (CVHS Model, 1997 90%)		1955/1957 Stage	1955/1957 Design Flows	O&M Design Flows	Notes
					Left	Right	Left	Right	Stage	Flow	Stage	Flow	Stage	Flow	Flow	
					Ft.	Ft.	Ft.	Ft.	Ft.	cfs	Ft.	cfs	Ft.	cfs	cfs	
Sacramento River: American River to Deep Water Ship Channel																
SAC_R08_60.4083	N/A	N/A	N/A	N/A	41.20	39.06	38.20	36.06	34.89	113,312	32.71	101,250	33.95	110,000	110,000	
SAC_R08_60.316	N/A	N/A	N/A	N/A	41.84	41.12	38.84	38.12	34.77	113,312	32.60	101,222	33.91	110,000	110,000	
SAC_R08_60.127	N/A	N/A	N/A	N/A	40.45	39.60	37.45	36.60	34.69	113,312	32.52	101,211	33.86	110,000	110,000	
SAC_R08_60.036	N/A	N/A	N/A	N/A	41.67	39.48	38.67	36.48	34.62	113,309	32.46	101,197	33.84	110,000	110,000	
SAC_R08_59.996	N/A	N/A	N/A	N/A	45.39	38.94	42.39	35.94	34.61	113,309	32.44	101,187	33.81	110,000	110,000	
SAC_R08_59.941	N/A	N/A	N/A	N/A	40.61	42.12	37.61	39.12	34.58	113,309	32.42	101,187	33.73	110,000	110,000	
SAC_R08_59.789	N/A	N/A	N/A	N/A	37.24	40.42	34.25	37.42	34.47	113,307	32.31	101,173	33.66	110,000	110,000	
SAC_R08_59.646	N/A	N/A	N/A	N/A	36.78	38.37	33.78	35.37	34.33	113,303	32.18	101,147	33.65	110,000	110,000	
SAC_R08_59.63	N/A	N/A	N/A	N/A	38.42	38.40	35.42	35.40	34.33	113,303	32.18	101,144	33.65	110,000	110,000	I Street Bridge
SAC_R08_59.62	N/A	N/A	N/A	N/A	38.30	37.21	35.30	34.21	33.96	113,298	32.05	101,119	33.65	110,000	110,000	
SAC_R08_59.594	N/A	N/A	N/A	N/A	36.77	39.96	33.77	36.96	33.99	113,298	32.08	101,122	33.56	110,000	110,000	
SAC_R08_59.438	N/A	N/A	N/A	N/A	36.57	39.41	33.57	36.41	33.85	113,298	31.95	101,093	33.51	110,000	110,000	
SAC_R08_59.331	N/A	N/A	N/A	N/A	36.71	39.51	33.71	36.51	33.83	113,296	31.94	101,087	33.46	110,000	110,000	
SAC_R08_59.231	N/A	N/A	N/A	N/A	38.08	40.42	35.08	37.42	33.78	113,296	31.89	101,073	33.45	110,000	110,000	
SAC_R08_59.223	N/A	N/A	N/A	N/A	35.63	41.61	32.63	38.61	33.78	113,296	31.89	101,067	33.45	110,000	110,000	
SAC_R08_59.21	N/A	N/A	N/A	N/A	36.40	41.41	33.40	38.41	33.43	113,293	31.56	101,048	33.44	110,000	110,000	Tower Bridge
SAC_R08_59.198	N/A	N/A	N/A	N/A	36.42	39.45	33.42	36.45	33.49	113,293	31.61	101,064	33.38	110,000	110,000	
SAC_R08_59.063	N/A	N/A	N/A	N/A	38.13	36.45	35.13	33.45	33.43	113,293	31.55	101,042	33.30	110,000	110,000	
SAC_R08_58.874	N/A	N/A	N/A	N/A	35.99	40.11	32.99	37.11	33.30	113,290	31.44	101,027	33.23	110,000	110,000	
SAC_R08_58.693	N/A	N/A	N/A	N/A	38.64	39.79	35.64	36.79	33.21	113,290	31.35	100,996	33.18	110,000	110,000	
SAC_R08_58.573	N/A	N/A	N/A	N/A	38.67	37.37	35.67	34.37	33.15	113,290	31.29	100,983	33.13	110,000	110,000	
SAC_R08_58.472	N/A	N/A	N/A	N/A	38.62	39.16	35.62	36.16	33.05	113,288	31.20	100,955	33.13	110,000	110,000	
SAC_R08_58.465	N/A	N/A	N/A	N/A	38.84	39.93	35.84	36.93	33.05	113,290	31.20	100,955	33.12	110,000	110,000	I-80/US 50 Bridge
SAC_R08_58.431	N/A	N/A	N/A	N/A	39.17	39.76	36.17	36.76	33.07	113,288	31.22	100,968	33.11	110,000	110,000	
SAC_R08_58.42	N/A	N/A	N/A	N/A	39.00	39.53	36.00	36.53	33.07	113,288	31.22	100,962	33.07	110,000	110,000	
SAC_R08_58.331	N/A	N/A	N/A	N/A	38.36	36.37	35.36	33.37	33.05	113,287	31.21	100,955	32.99	110,000	110,000	
SAC_R08_58.14	N/A	N/A	N/A	N/A	40.14	36.51	37.14	33.51	32.92	113,285	31.09	100,927	32.92	110,000	110,000	
SAC_R08_57.958	N/A	N/A	N/A	N/A	42.92	43.33	39.92	40.33	32.80	113,282	30.96	100,897	32.84	110,000	110,000	
SAC_R08_57.783	N/A	N/A	N/A	N/A	42.25	42.54	39.25	39.54	32.54	113,279	30.73	100,853	32.75	110,000	110,000	

Delta Legacy Small Communities
Sacramento River
Existing and Future 100-Year Stage and Flow Results (Datum: NAVD 88)

HEC-RAS Cross Section	Reclamation District	NULE Left (L) Right (R) Levee	NULE Segment No.	NULE Station	Top of Levee Elevation		Freeboard Elevation Subtracted from Top of Levee		Existing 100-Year (CVHS Model, 1997 90%)		Future 100-Year w/CC + SLR (CVHS Model, 1997 90%)		1955/1957 Stage	1955/1957 Design Flows	O&M Design Flows	Notes
					Left	Right	Left	Right	Stage	Flow	Stage	Flow	Stage	Flow	Flow	
					Ft.	Ft.	Ft.	Ft.	Ft.	cfs	Ft.	cfs	Ft.	cfs	cfs	
Sacramento River: Deep Water Ship Channel to Elk Slough																
SAC_R08_57.568	N/A	N/A	N/A	N/A	42.24	37.50	39.24	34.50	32.37	113,277	30.59	100,832	32.67	110,000	110,000	
SAC_R08_57.37	N/A	N/A	N/A	N/A	42.97	39.64	39.97	36.64	32.48	113,279	30.68	100,844	32.59	110,000	110,000	
SAC_R08_57.182	N/A	N/A	N/A	N/A	43.02	40.10	40.02	37.10	32.34	113,277	30.55	100,827	32.51	110,000	110,000	
SAC_R08_56.991	N/A	N/A	N/A	N/A	42.86	39.54	39.86	36.54	32.33	113,277	30.54	100,824	32.43	110,000	110,000	
SAC_R08_56.804	N/A	N/A	N/A	N/A	42.33	40.65	39.33	37.65	32.25	113,277	30.46	100,816	32.36	110,000	110,000	
SAC_R08_56.624	N/A	N/A	N/A	N/A	43.10	40.44	40.10	37.44	32.16	113,274	30.38	100,810	32.28	110,000	110,000	
SAC_R08_56.435	N/A	N/A	N/A	N/A	43.54	41.84	40.54	38.84	32.06	113,274	30.29	100,800	32.19	110,000	110,000	
SAC_R08_56.235	N/A	N/A	N/A	N/A	43.05	40.15	40.05	37.15	31.89	113,272	30.14	100,778	32.12	110,000	110,000	
SAC_R08_56.044	MA 9	SACR-L	106	402888	41.15	40.92	38.15	37.92	31.82	113,269	30.08	100,776	32.04	110,000	110,000	
SAC_R08_55.853	MA 9	SACR-L	106	401830	39.93	41.74	36.93	38.74	31.79	113,269	30.05	100,771	31.96	110,000	110,000	
SAC_R08_55.673	MA 9	SACR-L	106	400834	41.45	38.74	38.45	35.74	31.82	113,269	30.06	100,773	31.88	110,000	110,000	
SAC_R08_55.481	MA 9	SACR-L	106	399716	40.04	39.91	37.04	36.91	31.65	113,269	29.91	100,761	31.80	110,000	110,000	
SAC_R08_55.288	MA 9	SACR-L	106	398683	39.24	40.80	36.24	37.80	31.59	113,267	29.86	100,761	31.72	110,000	110,000	
SAC_R08_55.101	MA 9	SACR-L	106	397680	42.48	40.45	39.48	37.45	31.56	113,267	29.83	100,758	31.64	110,000	110,000	
SAC_R08_54.899	MA 9	SACR-L	106	396894	40.09	41.62	37.09	38.62	31.62	113,267	29.89	100,761	31.56	110,000	110,000	
SAC_R08_54.707	MA 9	SACR-L	106	396220	41.11	39.87	38.11	36.87	31.47	113,267	29.75	100,753	31.48	110,000	110,000	
SAC_R08_54.528	MA 9	SACR-L	106	395536	41.66	41.06	38.66	38.06	31.39	113,265	29.68	100,749	31.40	110,000	110,000	
SAC_R08_54.345	MA 9	SACR-L	106	394568	40.10	40.37	37.10	37.37	31.31	113,265	29.61	100,742	31.32	110,000	110,000	
SAC_R08_54.153	MA 9	SACR-L	106	393338	37.38	40.65	34.38	37.65	31.29	113,264	29.59	100,744	31.24	110,000	110,000	
SAC_R08_53.964	MA 9	SACR-L	106	391835	38.04	42.84	35.04	39.84	31.10	113,262	29.43	100,730	31.16	110,000	110,000	
SAC_R08_53.772	MA 9	SACR-L	106	390707	37.94	40.02	34.94	37.02	30.98	113,260	29.32	100,726	31.09	110,000	110,000	
SAC_R08_53.593	MA 9	SACR-L	106	389686	36.21	40.41	33.21	37.41	30.87	113,260	29.22	100,721	31.01	110,000	110,000	
SAC_R08_53.4	MA 9	SACR-L	106	388638	36.67	40.27	33.67	37.27	30.86	113,260	29.21	100,721	30.93	110,000	110,000	
SAC_R08_53.224	MA 9	SACR-L	106	387731	35.77	39.91	32.77	36.91	30.84	113,260	29.19	100,719	30.85	110,000	110,000	
SAC_R08_53.036	MA 9	SACR-L	106	386796	35.67	39.29	32.67	36.29	30.83	113,260	29.17	100,719	30.77	110,000	110,000	
SAC_R08_52.852	MA 9	SACR-L	106	385847	35.51	39.84	32.51	36.84	30.79	113,260	29.13	100,715	30.70	110,000	110,000	
SAC_R08_52.664	MA 9	SACR-L	106	384864	35.51	39.27	32.51	36.27	30.73	113,258	29.08	100,713	30.62	110,000	110,000	
SAC_R08_52.475	MA 9	SACR-L	106	383940	36.17	37.44	33.17	34.44	30.64	113,258	29.00	100,711	30.54	110,000	110,000	
SAC_R08_52.298	MA 9	SACR-L	106	383225	36.13	37.99	33.13	34.99	30.48	113,256	28.85	100,705	30.46	110,000	110,000	
SAC_R08_52.107	MA 9	SACR-L	106	382270	34.76	38.72	31.76	35.72	30.32	113,256	28.72	100,699	30.39	110,000	110,000	
SAC_R08_51.93	MA 9	SACR-L	106	381336	35.35	38.33	32.35	35.33	30.28	113,256	28.68	100,695	30.30	110,000	110,000	
SAC_R08_51.733	MA 9	SACR-L	106	380314	34.51	38.91	31.51	35.91	30.29	113,254	28.68	100,697	30.23	110,000	110,000	
SAC_R08_51.553	MA 9	SACR-L	106	379423	34.14	36.03	31.14	33.03	30.22	113,254	28.62	100,695	30.14	110,000	110,000	
SAC_R08_51.355	MA 9	SACR-L	106	378450	34.32	36.00	31.32	33.00	30.09	113,254	28.50	100,689	30.06	110,000	110,000	
SAC_R08_51.169	MA 9	SACR-L	106	377588	34.94	37.24	31.94	34.24	30.04	113,254	28.46	100,689	29.99	110,000	110,000	
SAC_R08_50.987	MA 9	SACR-L	106	376693	34.50	34.92	31.50	31.92	29.84	113,253	28.29	100,684	29.91	110,000	110,000	
SAC_R08_50.8	MA 9	SACR-L	106	375703	34.05	33.51	31.05	30.51	29.88	113,253	28.32	100,684	29.83	110,000	110,000	
SAC_R08_50.61	MA 9	SACR-L	106	374705	34.21	33.80	31.21	30.80	29.88	113,252	28.31	100,686	29.75	110,000	110,000	
SAC_R08_50.421	MA 9	SACR-L	106	373699	34.04	33.31	31.04	30.31	29.83	113,252	28.26	100,684	29.66	110,000	110,000	

Delta Legacy Small Communities
Sacramento River
Existing and Future 100-Year Stage and Flow Results (Datum: NAVD 88)

HEC-RAS Cross Section	Reclamation District	NULE Left (L) Right (R) Levee	NULE Segment No.	NULE Station	Top of Levee Elevation		Freeboard Elevation Subtracted from Top of Levee		Existing 100-Year (CVHS Model, 1997 90%)		Future 100-Year w/CC + SLR (CVHS Model, 1997 90%)		1955/1957 Stage	1955/1957 Design Flows	O&M Design Flows	Notes
					Left	Right	Left	Right	Stage	Flow	Stage	Flow	Stage	Flow	Flow	
					Ft.	Ft.	Ft.	Ft.	Ft.	cfs	Ft.	cfs	Ft.	cfs	cfs	
SAC_R08_50.231	MA 9	SACR-L	106	372705	33.85	32.69	30.85	29.69	29.78	113,252	28.22	100,684	29.60	110,000	110,000	
SAC_R08_50.037	MA 9	SACR-L	106	371672	35.07	34.88	32.07	31.88	29.72	113,251	28.16	100,680	29.56	110,000	110,000	
SAC_R08_49.849	MA 9	SACR-L	106	370699	34.09	34.93	31.09	31.93	29.64	113,251	28.09	100,679	29.53	110,000	110,000	
SAC_R08_49.651	MA 9	SACR-L	106	369720	33.56	34.73	30.56	31.73	29.53	113,251	27.99	100,677	29.48	110,000	110,000	
SAC_R08_49.459	MA 9	SACR-L	106	368840	34.17	33.37	31.17	30.37	29.44	113,251	27.91	100,675	29.35	110,000	110,000	
SAC_R08_49.258	MA 9	SACR-L	106	367855	34.07	33.05	31.07	30.05	29.35	113,251	27.84	100,672	29.23	110,000	110,000	
SAC_R08_49.052	MA 9	SACR-L	106	366867	33.85	33.52	30.85	30.52	29.26	113,249	27.75	100,672	29.11	110,000	110,000	
SAC_R08_48.862	MA 9	SACR-L	106	365917	33.96	33.58	30.96	30.58	29.14	113,249	27.65	100,669	28.99	110,000	110,000	
SAC_R08_48.679	MA 9	SACR-L	106	364991	33.12	32.65	30.12	29.65	29.11	113,249	27.62	100,669	28.88	110,000	110,000	
SAC_R08_48.508	MA 9	SACR-L	106	364078	34.27	33.32	31.27	30.32	29.07	113,249	27.58	100,668	28.77	110,000	110,000	
SAC_R08_48.322	MA 9	SACR-L	106	363045	34.07	32.92	31.07	29.92	29.00	113,249	27.51	100,668	28.66	110,000	110,000	
SAC_R08_48.146	MA 9	SACR-L	106	362110	33.69	34.05	30.69	31.05	28.98	113,249	27.50	100,668	28.55	110,000	110,000	
SAC_R08_47.967	MA 9	SACR-L	106	361146	33.50	34.62	30.50	31.62	28.94	113,248	27.46	100,668	28.42	110,000	110,000	
SAC_R08_47.773	MA 9	SACR-L	106	359998	33.04	34.43	30.04	31.43	28.87	113,248	27.39	100,667	28.30	110,000	110,000	
SAC_R08_47.568	MA 9	SACR-L	106	358878	33.90	32.77	30.90	29.77	28.78	113,248	27.32	100,665	28.18	110,000	110,000	
SAC_R08_47.39	MA 9	SACR-L	106	357637	33.47	33.24	30.47	30.24	28.66	113,248	27.21	100,663	28.07	110,000	110,000	
SAC_R08_47.204	MA 9	SACR-L	106	356490	32.79	33.31	29.79	30.31	28.48	113,248	27.06	100,661	27.95	110,000	110,000	
SAC_R08_47.023	MA 9	SACR-L	106	355532	33.02	32.08	30.02	29.08	28.39	113,248	26.98	100,660	27.84	110,000	110,000	
SAC_R08_46.844	MA 9	SACR-L	106	354609	32.55	32.29	29.55	29.29	28.34	113,247	26.94	100,659	27.74	110,000	110,000	
SAC_R08_46.676	MA 9	SACR-L	106	353727	31.69	32.14	28.69	29.14	28.34	113,247	26.93	100,660	27.67	110,000	110,000	
SAC_R08_46.565	MA 9	SACR-L	106	353143	31.57	33.26	28.57	30.26	28.32	113,247	26.91	100,660	27.59	110,000	110,000	
SAC_R08_46.44	MA 9	SACR-L	106	352470	32.62	32.04	29.62	29.04	28.27	113,247	26.87	100,660	27.54	110,000	110,000	
SAC_R08_46.37	MA 9	SACR-L	106	352084	33.33	33.54	30.33	30.54	28.25	113,247	26.85	100,659	27.54	110,000	110,000	
SAC_R08_46.357	MA 9	SACR-L	106	352046	34.11	33.97	31.11	30.97	28.26	113,247	26.86	100,660	27.54	110,000	110,000	Freeport Bridge
SAC_R08_46.344	MA 9	SACR-L	106	351974	32.21	34.07	29.21	31.07	27.67	113,247	26.27	100,659	27.53	110,000	110,000	
SAC_R08_46.188	MA 9	SACR-L	106	351131	32.16	33.73	29.16	30.73	27.60	113,247	26.21	100,659	27.43	110,000	110,000	
SAC_R08_45.944	MA 9	SACR-L	106	349769	32.14	33.96	29.14	30.96	27.44	113,247	26.15	100,658	27.29	110,000	110,000	
SAC_R08_45.942	MA 9	SACR-L	106	349769	32.14	33.96	29.14	30.96	27.44	113,247	26.15	100,658	27.29	110,000	110,000	
SAC_R08_45.691	MA 9	SACR-L	106	348419	30.20	33.51	27.20	30.51	27.38	113,247	26.09	100,657	27.15	110,000	110,000	
SAC_R08_45.444	MA 9	SACR-L	106	347006	34.84	33.42	31.84	30.42	27.26	113,247	25.99	100,656	27.02	110,000	110,000	
SAC_R08_45.194	MA 9	SACR-L	106	345574	34.33	33.23	31.33	30.23	27.08	113,247	25.84	100,656	26.88	110,000	110,000	
SAC_R08_44.95	MA 9	SACR-L	106	344178	33.85	33.91	30.85	30.91	26.93	113,247	25.71	100,655	26.75	110,000	110,000	
SAC_R08_44.701	MA 9	SACR-L	106	342810	33.32	34.31	30.32	31.31	26.83	113,246	25.62	100,655	26.61	110,000	110,000	
SAC_R08_44.452	MA 9	SACR-L	106	341372	32.68	33.10	29.68	30.10	26.67	113,246	25.48	100,654	26.48	110,000	110,000	
SAC_R08_44.206	MA 9	SACR-L	106	340066	32.70	33.11	29.70	30.11	26.59	113,246	25.41	100,654	26.35	110,000	110,000	
SAC_R08_43.951	MA 9	SACR-L	106	338725	32.23	32.56	29.23	29.56	26.56	113,246	25.38	100,654	26.21	110,000	110,000	
SAC_R08_43.695	MA 9	SACR-L	106	337661	32.20	32.59	29.20	29.59	26.46	113,246	25.29	100,653	26.07	110,000	110,000	
SAC_R08_43.459	MA 9	SACR-L	106	336664	31.82	31.82	28.82	28.82	26.20	113,246	25.08	100,652	25.94	110,000	110,000	
SAC_R08_43.193	MA 9	SACR-L	106	335445	31.27	33.08	28.27	27.08	26.08	113,246	24.97	100,652	25.80	110,000	110,000	
SAC_R08_42.945	MA 9	SACR-L	106	334151	31.75	32.29	28.75	26.29	26.02	113,246	24.91	100,652	25.66	110,000	110,000	

Delta Legacy Small Communities

Sacramento River

Existing and Future 100-Year Stage and Flow Results (Datum: NAVD 88)

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HEC-RAS Cross Section	Reclamation District	NULE Left (L) Right (R) Levee	NULE Segment No.	NULE Station	Top of Levee Elevation		Freeboard Elevation Subtracted from Top of Levee		Existing 100-Year (CVHS Model, 1997 90%)		Future 100-Year w/CC + SLR (CVHS Model, 1997 90%)		1955/1957 Stage	1955/1957 Design Flows	O&M Design Flows	Notes
					Left	Right	Left	Right	Stage	Flow	Stage	Flow	Stage	Flow	Flow	
					Ft.	Ft.	Ft.	Ft.	Ft.	cfs	Ft.	cfs	Ft.	cfs	cfs	
SAC_R08_42.694	MA 9	SACR-L	106	332823	30.78	30.40	27.78	24.40	25.96	113,246	24.86	100,652	25.52	110,000	110,000	
SAC_R08_42.446	MA 9	SACR-L	106	331504	31.58	30.12	28.58	24.12	25.90	113,246	24.80	100,652	25.39	110,000	110,000	
SAC_R08_42.195	MA 9	SACR-L	106	330175	31.06	30.87	28.06	27.87	25.81	113,246	24.73	100,652	25.25	110,000	110,000	
Sacramento River: Elk Slough to Sutter Slough																
SAC_R08_41.943	MA 9	SACR-L	106	328855	32.98	29.18	29.98	26.18	25.66	113,246	24.60	100,652	25.12	110,000	110,000	
SAC_R08_41.694	MA 9	SACR-L	106	327533	31.91	29.48	28.91	26.48	25.56	113,246	24.51	100,652	24.98	110,000	110,000	
SAC_R08_41.445	MA 9	SACR-L	106	326150	30.38	29.43	27.38	26.43	25.45	113,246	24.42	100,652	24.85	110,000	110,000	
SAC_R08_41.194	MA 9	SACR-L	106	324790	31.74	29.28	28.74	26.28	25.32	113,246	24.30	100,652	24.71	110,000	110,000	
SAC_R08_40.946	MA 9	SACR-L	106	323409	31.11	28.34	28.11	25.34	25.21	113,246	24.21	100,652	24.57	110,000	110,000	
SAC_R08_40.699	MA 9	SACR-L	106	322050	31.17	28.42	28.17	25.42	25.06	113,245	24.08	100,652	24.44	110,000	110,000	
SAC_R08_40.447	MA 9	SACR-L	106	320693	30.89	29.82	27.89	26.82	24.94	113,245	23.98	100,652	24.24	110,000	110,000	
SAC_R08_40.197	MA 9	SACR-L	106	319310	30.10	28.61	27.10	25.61	24.80	113,245	23.86	100,652	24.00	110,000	110,000	
SAC_R08_39.951	MA 9	SACR-L	106	317882	30.16	29.84	27.16	26.84	24.67	113,245	23.74	100,652	23.85	110,000	110,000	
SAC_R08_39.698	MA 9	SACR-L	106	316479	30.76	28.79	27.76	25.79	24.48	113,245	23.59	100,652	23.70	110,000	110,000	
SAC_R08_39.455	MA 9	SACR-L	106	315310	30.39	28.54	27.39	25.54	24.41	113,245	23.53	100,652	23.55	110,000	110,000	
SAC_R08_39.193	MA 9	SACR-L	106	314174	30.46	30.42	27.46	27.42	24.24	113,245	23.39	100,652	23.40	110,000	110,000	
SAC_R08_38.945	MA 9	SACR-L	106	312872	31.25	29.76	28.25	26.76	24.10	113,245	23.27	100,652	23.25	110,000	110,000	
SAC_R08_38.701	MA 9	SACR-L	106	311539	25.08	28.93	22.08	25.93	24.06	113,245	23.23	100,652	23.10	110,000	110,000	Community of Hood
SAC_R08_38.448	813/MA 9	SACR-L	106	310142	29.44	29.39	26.44	26.39	23.96	113,244	23.15	100,651	22.95	110,000	110,000	Index Point: SAC 44/45
SAC_R08_38.203	813/MA 9	SACR-L	106	308807	29.01	29.06	26.01	26.06	23.89	113,244	23.09	100,651	22.80	110,000	110,000	
SAC_R08_37.968	813/MA 9	SACR-L	106	307342	29.11	28.75	26.11	25.75	23.70	113,243	22.93	100,651	22.66	110,000	110,000	
SAC_R08_37.717	813/MA 9	SACR-L	106	305992	29.69	29.52	26.69	26.52	23.61	113,243	22.85	100,651	22.51	110,000	110,000	
SAC_R08_37.467	813/MA 9	SACR-L	106	304666	27.47	28.99	24.47	25.99	23.55	113,243	22.80	100,651	22.36	110,000	110,000	
SAC_R08_37.215	813/MA 9	SACR-L	106	303348	28.90	28.96	25.90	25.96	23.43	113,243	22.70	100,651	22.21	110,000	110,000	
SAC_R08_36.966	813/MA 9	SACR-L	106	302005	27.18	28.85	24.18	25.85	23.32	113,241	22.61	100,651	22.06	110,000	110,000	
SAC_R08_36.73	755	SACR-L	131	300114	29.49	26.45	26.49	23.45	23.17	113,241	22.48	100,650	21.92	110,000	110,000	
SAC_R08_36.482	755	SACR-L	131	298732	29.50	28.10	26.50	25.10	22.98	113,240	22.33	100,650	21.77	110,000	110,000	
SAC_R08_36.228	755	SACR-L	131	297452	28.73	27.28	25.73	24.28	22.92	113,240	22.28	100,650	21.62	110,000	110,000	Index Point: SAC 47/48
SAC_R08_35.979	755	SACR-L	131	296121	27.30	25.92	24.30	22.92	22.82	113,238	22.20	100,649	21.47	110,000	110,000	
SAC_R08_35.73	755	SACR-L	131	294843	27.94	26.82	24.94	23.82	22.65	113,237	22.05	100,649	21.32	110,000	110,000	
SAC_R08_35.481	755	SACR-L	131	293712	28.05	25.73	25.05	22.73	22.42	113,233	21.86	100,648	21.17	110,000	110,000	
SAC_R08_35.23	755	SACR-L	131	292365	28.48	26.66	25.48	23.66	22.38	113,235	21.83	100,648	21.03	110,000	110,000	
SAC_R08_34.98	551	SACR-L	126	291023	33.45	25.88	30.45	22.88	22.33	113,233	21.78	100,647	20.95	110,000	110,000	RD 551
SAC_R08_34.733	551	SACR-L	126	289744	30.93	25.33	27.93	22.33	22.16	113,229	21.65	100,646	20.87	110,000	110,000	Community of Courtland
SAC_R08_34.564	551	SACR-L	126	288855	31.28	24.95	28.28	21.95	22.04	113,229	21.55	100,646	20.81	110,000	110,000	
SAC_R08_34.254	551	SACR-L	126	287240	31.13	27.59	28.13	24.59	21.90	113,225	21.43	100,645	20.71	110,000	110,000	

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October 2020

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					Left	Right	Left	Right	Stage	Flow	Stage	Flow	Stage	Flow	Flow	
					Ft.	Ft.	Ft.	Ft.	Ft.	cfs	Ft.	cfs	Ft.	cfs	cfs	
Sacramento River: Sutter Slough to Steamboat Slough																
SAC_R07_34.162	551	SACR-L	126	286815	32.24	26.20	29.24	23.20	21.89	91,265	21.43	100,645	20.68	85,000	85,000	Community of Courtland
SAC_R07_33.981	551	SACR-L	126	285885	32.23	25.89	29.23	22.89	21.73	91,260	21.43	81,040	20.63	85,000	85,000	
SAC_R07_33.728	551	SACR-L	126	284597	31.29	26.73	28.29	23.73	21.61	91,255	21.43	81,041	20.54	85,000	85,000	
SAC_R07_33.61	551	SACR-L	126	283972	31.21	27.93	28.21	24.93	21.59	91,257	21.30	81,038	20.50	85,000	85,000	
SAC_R07_33.606	551	SACR-L	126	283952	31.15	28.28	28.15	25.28	21.61	91,257	21.20	81,037	20.50	85,000	85,000	
SAC_R07_33.601	551	SACR-L	126	283922	31.42	28.31	28.42	25.31	21.59	91,257	21.19	81,035	20.50	85,000	85,000	River Road Bridge
SAC_R07_33.596	551	SACR-L	126	283895	31.24	28.14	28.24	25.14	21.61	91,257	21.20	81,037	20.50	85,000	85,000	
SAC_R07_33.472	551	SACR-L	126	283282	31.25	27.83	28.25	24.83	21.56	91,257	21.16	81,035	20.46	85,000	85,000	
SAC_R07_33.343	551	SACR-L	126	282625	32.19	27.91	29.19	24.91	21.46	91,252	21.08	81,035	20.40	85,000	85,000	
SAC_R07_33.095	551	SACR-L	126	281375	29.48	27.64	26.48	24.64	21.24	91,247	20.90	81,032	20.29	85,000	85,000	
SAC_R07_32.843	551	SACR-L	126	280091	29.70	27.22	26.70	24.22	21.03	91,239	20.73	81,029	20.17	85,000	85,000	
SAC_R07_32.667	551	SACR-L	126	279160	29.45	28.62	26.45	25.62	21.05	91,239	20.75	81,028	20.09	85,000	85,000	
Sacramento River: Steamboat Slough to Georgiana Slough																
SAC_R06_32.561	551	SACR-L	126	278628	29.26	25.30	26.26	22.30	21.04	66,293	20.74	59,162	20.04	56,500	56,500	
SAC_R06_32.346	551	SACR-L	126	277477	30.68	27.61	27.68	24.61	20.84	65,176	20.57	59,161	19.93	56,500	56,500	
SAC_R06_32.098	551	SACR-L	126	276168	28.90	28.34	25.90	25.34	20.78	65,170	20.52	59,160	19.81	56,500	56,500	
SAC_R06_31.846	551	SACR-L	126	274847	28.51	28.43	25.51	25.43	20.64	65,163	20.40	59,159	19.69	56,500	56,500	
SAC_R06_31.592	551	SACR-L	126	273515	28.80	26.61	25.80	23.61	20.54	65,157	20.32	59,158	19.57	56,500	56,500	
SAC_R06_31.345	551	SACR-L	126	272216	28.80	26.47	25.80	23.47	20.44	65,157	20.23	59,158	19.45	56,500	56,500	
SAC_R06_31.066	551	SACR-L	126	270749	28.56	28.43	25.56	25.43	20.36	65,150	20.17	59,157	19.31	56,500	56,500	
SAC_R06_30.839	551	SACR-L	126	269567	28.54	28.88	25.54	25.88	20.21	65,144	20.05	59,156	19.20	56,500	56,500	
SAC_R06_30.596	551	SACR-L	126	268295	28.63	29.46	25.63	26.46	20.07	65,139	19.92	59,153	19.08	56,500	56,500	
SAC_R06_30.347	551	SACR-L	126	266961	28.85	28.43	25.85	25.43	20.01	65,139	19.87	59,153	18.96	56,500	56,500	
SAC_R06_30.07	551	SACR-L	126	265486	28.32	27.41	25.32	24.41	19.93	65,139	19.80	59,152	18.80	56,500	56,500	
SAC_R06_29.845	551	SACR-L	126	264308	28.20	26.64	25.20	23.64	19.79	65,133	19.69	59,150	18.64	56,500	56,500	
SAC_R06_29.595	551	SACR-L	126	262997	27.68	26.96	24.68	23.96	19.72	65,133	19.64	59,149	18.47	56,500	56,500	
SAC_R06_29.347	551	SACR-L	126	261683	27.72	26.82	24.72	23.82	19.61	65,128	19.54	59,147	18.30	56,500	56,500	
SAC_R06_29.097	551	SACR-L	126	260361	27.66	27.39	24.66	24.39	19.50	65,128	19.45	59,146	18.13	56,500	56,500	
SAC_R06_28.845	551	SACR-L	126	259029	28.17	27.59	25.17	24.59	19.37	65,123	19.34	59,146	17.96	56,500	56,500	
SAC_R06_28.596	551	SACR-L	126	257713	27.72	27.45	24.72	24.45	19.24	65,118	19.23	59,143	17.79	56,500	56,500	
SAC_R06_28.316	551	SACR-L	126	256235	27.33	27.07	24.33	24.07	19.16	65,118	19.17	59,141	17.60	56,500	56,500	
SAC_R06_28.108	369	SACR-L	121	255141	23.17	26.33	20.17	23.33	19.04	65,118	19.07	59,139	17.46	56,500	56,500	
SAC_R06_27.846	369	SACR-L	121	253700	22.52	26.64	19.52	23.64	18.95	65,114	19.00	59,138	17.28	56,500	56,500	Index Point: SAC 51
SAC_R06_27.594	369	SACR-L	121	252311	22.60	25.69	19.60	22.69	18.79	65,114	18.86	59,134	17.11	56,500	56,500	Community of Locke
SAC_R06_27.313	554	SACR-L	127	250682	22.80	26.02	19.80	23.02	18.63	65,114	18.73	59,132	16.92	56,500	56,500	
SAC_R06_27.097	554	SACR-L	128	249470	23.66	25.37	20.66	22.37	18.22	65,103	18.41	59,125	16.77	56,500	56,500	Near Delta Cross Channel
SAC_R06_26.888	554	SACR-L	128	248328	26.16	25.49	23.16	22.49	18.30	65,110	18.47	59,125	16.63	56,500	56,500	Index Point: SAC 52
SAC_R06_26.879	554	SACR-L	128	248281	26.06	25.53	23.06	22.53	18.34	65,110	18.50	59,127	16.62	56,500	56,500	Walnut Grove Bridge

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					Left	Right	Left	Right	Stage	Flow	Stage	Flow	Stage	Flow	Flow	
					Ft.	Ft.	Ft.	Ft.	Ft.	cfs	Ft.	cfs	Ft.	cfs	cfs	
SAC_R06_26.87	554	SACR-L	128	248226	25.26	25.78	22.26	22.78	18.32	65,110	18.48	59,128	16.61	56,500	56,500	
SAC_R06_26.847	554	SACR-L	128	248110	23.97	25.55	20.97	22.55	18.26	65,110	18.44	59,127	16.60	56,500	56,500	Community of Walnut Grove
SAC_R06_26.712	554	SACR-L	128	247346	22.87	25.82	19.87	22.82	18.11	65,103	18.32	59,123	16.60	56,500	56,500	
Sacramento River: Georgiana Slough to Cache Slough																
SAC_R05_26.604	556	SACR-L	390	246543	24.67	26.07	21.67	23.07	18.06	45,205	18.30	39,065	16.51	35,900	35,900	
SAC_R05_26.431	556	SACR-L	390	245633	24.62	25.72	21.62	22.72	18.01	45,204	18.17	39,056	16.43	35,900	35,900	
SAC_R05_26.183	556	SACR-L	390	244355	24.24	25.95	21.24	22.95	17.93	45,203	18.12	39,053	16.43	35,900	35,900	
SAC_R05_25.967	556	SACR-L	390	243182	24.17	26.00	21.17	23.00	17.79	45,203	18.02	39,046	16.31	35,900	35,900	
SAC_R05_25.722	556	SACR-L	390	241790	24.20	26.30	21.20	23.30	17.69	45,203	17.94	39,044	16.14	35,900	35,900	
SAC_R05_25.468	556	SACR-L	390	240452	24.21	26.80	21.21	23.80	17.59	45,203	17.87	39,039	16.00	35,900	35,900	
SAC_R05_25.222	556	SACR-L	390	239178	23.81	26.10	20.81	23.10	17.53	45,201	17.83	39,036	15.83	35,900	35,900	
SAC_R05_24.842	556	SACR-L	390	237211	24.21	26.19	21.21	23.19	17.36	45,201	17.70	39,025	15.74	35,900	35,900	
SAC_R05_24.585	556	SACR-L	390	236133	24.24	25.88	21.24	22.88	17.23	45,199	17.61	39,011	15.67	35,900	35,900	
SAC_R05_24.369	556	SACR-L	390	235096	23.83	23.94	20.83	20.94	17.08	45,199	17.51	38,986	15.56	35,900	35,900	
SAC_R05_24.108	556	SACR-L	390	233837	23.83	24.25	20.83	21.25	16.82	45,197	17.33	38,967	15.48	35,900	35,900	
SAC_R05_23.851	556	SACR-L	390	232562	23.52	25.62	20.52	22.62	16.72	45,194	17.25	38,960	15.42	35,900	35,900	
SAC_R05_23.602	556	SACR-L	390	231158	23.29	25.01	20.29	22.01	16.61	45,194	17.18	38,953	15.34	35,900	35,900	
SAC_R05_23.351	556	SACR-L	390	229780	23.04	25.80	20.04	22.80	16.48	45,191	17.09	38,946	15.27	35,900	35,900	
SAC_R05_23.1	556	SACR-L	390	228437	23.42	24.51	20.42	21.51	16.39	45,191	17.03	38,942	15.20	35,900	35,900	
SAC_R05_22.851	556	SACR-L	390	227148	23.68	25.13	20.68	22.13	16.27	45,188	16.95	38,931	15.12	35,900	35,900	
SAC_R05_22.603	556	SACR-L	390	225853	23.79	25.08	20.79	22.08	16.14	45,187	16.86	38,923	15.05	35,900	35,900	
SAC_R05_22.352	556	SACR-L	390	224525	23.54	26.40	20.54	23.40	16.05	45,184	16.80	38,919	14.98	35,900	35,900	
SAC_R05_22.103	556	SACR-L	390	223204	23.75	24.29	20.75	21.29	15.94	45,184	16.72	38,908	14.91	35,900	35,900	
SAC_R05_21.853	556	SACR-L	390	221861	23.73	23.19	20.73	20.19	15.87	45,180	16.68	38,904	14.83	35,900	35,900	
SAC_R05_21.592	556	SACR-L	390	220420	22.26	23.26	19.26	20.26	15.74	45,179	16.59	38,896	14.76	35,900	35,900	
SAC_R05_21.347	556	SACR-L	390	219041	22.17	23.62	19.17	20.62	15.65	45,175	16.53	38,888	14.69	35,900	35,900	Index Point: SAC 54a
SAC_R05_21.198	556	SACR-L	390	218188	21.68	23.71	18.68	20.71	15.56	45,175	16.47	38,880	14.61	35,900	35,900	
SAC_R05_20.976	556	SACR-L	390	216925	21.85	23.61	18.85	20.61	15.42	45,170	16.38	38,872	14.54	35,900	35,900	Cross Levee
SAC_R05_20.733	BALMD	SACR-L	378	215646	21.98	23.63	18.98	20.63	15.40	45,170	16.37	38,867	14.49	35,900	35,900	
SAC_R05_20.471	BALMD	SACR-L	378	214263	22.23	23.96	19.23	20.96	15.34	45,164	16.33	38,863	14.43	35,900	35,900	
SAC_R05_20.223	BALMD	SACR-L	378	213041	22.14	23.76	19.14	20.76	15.22	45,164	16.26	38,855	14.36	35,900	35,900	
SAC_R05_19.977	BALMD	SACR-L	378	211824	22.47	24.05	19.47	21.05	15.10	45,158	16.17	38,846	14.28	35,900	35,900	
SAC_R05_19.727	BALMD	SACR-L	378	210542	22.61	24.47	19.61	21.47	14.97	45,151	16.10	38,833	14.21	35,900	35,900	
SAC_R05_19.479	BALMD	SACR-L	378	209241	22.66	24.27	19.66	21.27	14.89	45,151	16.04	38,824	14.13	35,900	35,900	
SAC_R05_19.228	BALMD	SACR-L	378	207948	22.62	23.94	19.62	20.94	14.81	45,144	15.99	38,814	14.05	35,900	35,900	
SAC_R05_18.977	BALMD	SACR-L	378	206610	21.99	24.64	18.99	21.64	14.72	45,136	15.93	38,800	13.98	35,900	35,900	
SAC_R05_18.817	BALMD	SACR-L	378	205766	21.87	25.05	18.87	22.05	14.67	45,136	15.91	38,790	13.90	35,900	35,900	
SAC_R05_18.81	BALMD	SACR-L	378	205732	21.50	24.11	18.50	21.11	14.67	45,136	15.91	38,790	13.83	35,900	35,900	
SAC_R05_18.8	BALMD	SACR-L	378	205676	22.15	23.61	19.15	20.61	14.69	45,144	15.92	38,800	13.78	35,900	35,900	River Road Bridge
SAC_R05_18.791	BALMD	SACR-L	378	205630	21.93	23.73	18.93	20.73	14.68	45,144	15.92	38,795	13.78	35,900	35,900	

Delta Legacy Small Communities
Sacramento River
Existing and Future 100-Year Stage and Flow Results (Datum: NAVD 88)

HEC-RAS Cross Section	Reclamation District	NULE Left (L) Right (R) Levee	NULE Segment No.	NULE Station	Top of Levee Elevation		Freeboard Elevation Subtracted from Top of Levee		Existing 100-Year (CVHS Model, 1997 90%)		Future 100-Year w/CC + SLR (CVHS Model, 1997 90%)		1955/1957 Stage	1955/1957 Design Flows	O&M Design Flows	Notes
					Left	Right	Left	Right	Stage	Flow	Stage	Flow	Stage	Flow	Flow	
					Ft.	Ft.	Ft.	Ft.	Ft.	cfs	Ft.	cfs	Ft.	cfs	cfs	
SAC_R05_18.658	BALMD	SACR-L	378	204893	22.18	23.61	19.18	20.61	14.60	45,136	15.86	38,779	13.78	35,900	35,900	
SAC_R05_18.475	BALMD	SACR-L	378	203859	20.77	22.62	17.77	19.62	14.55	45,136	15.83	38,768	13.78	35,900	35,900	City of Isleton
SAC_R05_18.224	BALMD	SACR-L	378	202406	22.28	22.17	19.28	19.17	14.42	45,127	15.76	38,745	13.74	35,900	35,900	
SAC_R05_17.976	BALMD	SACR-L	378	201006	20.60	21.69	17.60	18.69	14.35	45,117	15.71	38,732	13.69	35,900	35,900	
SAC_R05_17.729	BALMD	SACR-L	378	199608	17.96	21.28	14.96	18.28	14.26	45,117	15.66	38,719	13.62	35,900	35,900	
SAC_R05_17.485	BALMD	SACR-L	378	198270	22.67	22.20	19.67	19.20	14.19	45,107	15.62	38,706	13.55	35,900	35,900	
SAC_R05_17.234	BALMD	SACR-L	378	196887	22.33	27.84	19.33	24.84	14.12	45,106	15.58	38,699	13.47	35,900	35,900	
SAC_R05_16.992	BALMD	SACR-L	378	195582	22.44	26.59	19.44	23.59	14.02	45,095	15.51	38,677	13.40	35,900	35,900	
SAC_R05_16.79	BALMD	SACR-L	378	194465	23.17	26.48	20.17	23.48	13.96	45,083	15.48	38,670	13.33	35,900	35,900	
SAC_R05_16.62	BALMD	SACR-L	378	193503	22.00	25.65	19.00	22.65	13.91	45,083	15.45	38,662	13.26	35,900	35,900	
SAC_R05_16.381	BALMD	SACR-L	378	192249	21.90	23.92	18.90	20.92	13.83	45,069	15.41	38,646	13.20	35,900	35,900	
SAC_R05_16.113	BALMD	SACR-L	378	191010	22.62	24.71	19.62	21.71	13.73	45,054	15.35	38,628	13.16	35,900	35,900	
SAC_R05_15.861	BALMD	SACR-L	378	189982	22.75	24.52	19.75	21.52	13.64	45,037	15.30	38,610	13.09	35,900	35,900	
SAC_R05_15.673	BALMD	SACR-L	378	188825	24.80	25.55	21.80	22.55	13.55	45,020	15.24	38,591	13.01	35,900	35,900	
SAC_R05_15.366	BALMD	SACR-L	378	187170	23.48	27.49	20.48	24.49	13.53	45,020	15.23	38,591	12.94	35,900	35,900	
SAC_R05_15.116	BALMD	SACR-L	378	185761	23.47	28.37	20.47	25.37	13.47	45,019	15.20	38,571	12.88	35,900	35,900	
SAC_R05_14.871	BALMD	SACR-L	378	184512	24.50	0.00	21.50	0.00	13.30	44,981	15.10	38,541	12.80	35,900	35,900	
SAC_R05_14.616	BALMD	SACR-L	378	183261	28.10	0.00	25.10	0.00	13.34	44,981	15.13	38,551	12.72	35,900	35,900	
Sacramento River: Cache Slough to Threemile Slough																
SAC_R04_14.087	BALMD	SACR-L	378	181473	27.68	0.00	24.68	0.00	13.32	579,547	15.13	711,521	12.58	579,000	579,000	
SAC_R04_13.968	BALMD	SACR-L	378	180948	27.33	0.00	24.33	0.00	13.24	582,915	15.05	711,308	12.38	579,000	579,000	
SAC_R04_13.869	BALMD	SACR-L	378	180551	26.81	0.00	23.81	0.00	13.36	582,256	15.22	711,629	12.34	579,000	579,000	
SAC_R04_13.748	BALMD	SACR-L	378	179885	26.35	0.00	23.35	0.00	13.33	580,680	15.17	711,521	12.29	579,000	579,000	
SAC_R04_13.489	BALMD	SACR-L	378	178508	20.43	0.00	17.43	0.00	13.35	576,953	15.20	711,521	12.19	579,000	579,000	
SAC_R04_13.237	BALMD	SACR-L	378	177008	19.55	0.00	16.55	0.00	13.19	576,280	14.99	710,977	12.09	579,000	579,000	
SAC_R04_12.993	BALMD	SACR-L	378	175663	21.16	0.00	18.16	0.00	13.10	580,948	14.90	710,650	11.99	579,000	579,000	
SAC_R04_12.884	BALMD	SACR-L	378	175129	24.34	0.00	21.34	0.00	13.04	582,979	14.82	710,541	11.95	579,000	579,000	
SAC_R04_12.87	BALMD	SACR-L	378	175060	24.42	0.00	21.42	0.00	13.15	583,155	14.97	710,760	11.95	579,000	579,000	HWY 12 Bridge
SAC_R04_12.858	BALMD	SACR-L	378	174998	24.28	0.00	21.28	0.00	13.08	583,155	14.87	710,541	11.94	579,000	579,000	
SAC_R04_12.732	BALMD	SACR-L	378	174402	20.99	0.00	17.99	0.00	12.96	582,978	14.72	710,216	11.92	579,000	579,000	
SAC_R04_12.485	BALMD	SACR-L	378	173392	21.49	0.00	18.49	0.00	12.82	582,798	14.53	709,891	11.87	579,000	579,000	
SAC_R04_12.233	BALMD	SACR-L	378	172047	20.36	0.00	17.36	0.00	12.64	582,433	14.31	709,459	11.82	579,000	579,000	

Delta Legacy Small Communities
Sacramento River
Existing and Future 100-Year Stage and Flow Results (Datum: NAVD 88)

HEC-RAS Cross Section	Reclamation District	NULE Left (L) Right (R) Levee	NULE Segment No.	NULE Station	Top of Levee Elevation		Freeboard Elevation Subtracted from Top of Levee		Existing 100-Year (CVHS Model, 1997 90%)		Future 100-Year w/CC + SLR (CVHS Model, 1997 90%)		1955/1957 Stage	1955/1957 Design Flows	O&M Design Flows	Notes
					Left	Right	Left	Right	Stage	Flow	Stage	Flow	Stage	Flow	Flow	
					Ft.	Ft.	Ft.	Ft.	Ft.	cfs	Ft.	cfs	Ft.	cfs	cfs	
SAC_R04_11.979	BALMD	SACR-L	378	170699	19.17	0.00	16.17	0.00	12.55	582,431	14.19	709,243	11.77	579,000	579,000	
SAC_R04_11.73	BALMD	SACR-L	378	169344	18.32	0.00	15.32	0.00	12.40	582,054	13.99	708,918	11.72	579,000	579,000	
SAC_R04_11.481	BALMD	SACR-L	378	168135	20.53	0.00	17.53	0.00	12.28	581,860	13.84	708,593	11.67	579,000	579,000	
SAC_R04_11.235	BALMD	SACR-L	378	166849	19.26	0.00	16.26	0.00	12.18	581,859	13.72	708,377	11.63	579,000	579,000	
SAC_R04_10.983	BALMD	SACR-L	378	165457	17.83	0.00	14.83	0.00	12.06	581,661	13.58	708,052	11.58	579,000	579,000	
SAC_R04_10.738	BALMD	SACR-L	378	163904	19.52	0.00	16.52	0.00	11.87	581,257	13.34	707,510	11.53	579,000	579,000	
SAC_R04_10.483	BALMD	SACR-L	378	162379	19.48	0.00	16.48	0.00	11.75	581,049	13.18	707,072	11.48	579,000	579,000	
SAC_R04_10.239	BALMD	SACR-L	378	161022	0.00	0.00	0.00	0.00	11.62	580,838	13.02	706,739	11.43	579,000	579,000	
SAC_R04_9.994	BALMD	SACR-L	378	159524	0.00	0.00	0.00	0.00	11.52	580,835	12.90	706,513	11.40	579,000	579,000	
SAC_R04_9.742	BALMD	SACR-L	378	158019	0.00	0.00	0.00	0.00	11.41	580,616	12.75	706,283	11.38	579,000	579,000	
SAC_R04_9.494	BALMD	SACR-L	378	156700	0.00	0.00	0.00	0.00	11.30	580,392	12.62	706,050	11.36	579,000	579,000	
SAC_R04_9.357	BALMD	SACR-L	378	155955	0.00	0.00	0.00	0.00	11.40	580,616	12.75	706,166	11.34	579,000	579,000	
Sacramento River: Threemile Slough to Horseshoe Bend																
SAC_R03_9.139	341	SACR-L	387	154129	17.80	0.00	14.80	0.00	11.44	473,692	12.81	573,969	11.32	514,000	514,000	
SAC_R03_8.984	341	SACR-L	387	153296	22.40	0.00	19.40	0.00	11.40	473,689	12.77	573,829	11.31	514,000	514,000	
Sacramento River: Within Horseshoe Bend																
SAC_R02_8.741	341	N/A	387	N/A	0.00	0.00	0.00	0.00	11.25	441,704	12.55	535,014	11.29	514,000	514,000	
SAC_R02_8.492	341	N/A	387	N/A	0.00	0.00	0.00	0.00	11.14	441,522	12.42	535,317	11.26	514,000	514,000	
SAC_R02_8.245	341	N/A	387	N/A	0.00	0.00	0.00	0.00	11.09	441,252	12.35	535,185	11.24	514,000	514,000	
SAC_R02_7.993	341	N/A	387	N/A	0.00	0.00	0.00	0.00	11.00	440,978	12.23	534,919	11.21	514,000	514,000	
SAC_R02_7.743	341	N/A	387	N/A	0.00	0.00	0.00	0.00	10.92	440,974	12.13	534,651	11.19	514,000	514,000	
SAC_R02_7.488	341	N/A	387	N/A	0.00	0.00	0.00	0.00	10.85	440,696	12.04	534,383	11.17	514,000	514,000	
SAC_R02_7.24	341	N/A	387	N/A	0.00	0.00	0.00	0.00	10.79	440,416	11.96	534,117	11.14	514,000	514,000	
SAC_R02_7.001	341	N/A	387	N/A	0.00	0.00	0.00	0.00	10.75	440,412	11.90	533,853	11.12	514,000	514,000	
Sacramento River: Horseshoe Bend to Sherman Lake																
SAC_R01_6.738	341	SACR-L	387	136474	16.42	0.00	13.42	0.00	10.71	471,826	11.85	571,427	11.10	514,000	514,000	
SAC_R01_6.618	341	SACR-L	387	135856	15.64	0.00	12.64	0.00	10.67	471,497	11.80	571,272	11.09	514,000	514,000	
SAC_R01_6.245	341	SACR-L	387	133754	14.82	0.00	11.82	0.00	10.62	471,162	11.73	570,966	11.05	514,000	514,000	
SAC_R01_5.998	341	SACR-L	387	132448	15.83	0.00	12.83	0.00	10.57	471,155	11.67	570,811	11.03	514,000	514,000	
SAC_R01_5.742	341	SACR-L	387	131074	14.30	0.00	11.30	0.00	10.52	470,812	11.60	570,654	11.00	514,000	514,000	
SAC_R01_5.499	341	SACR-L	387	129799	15.65	0.00	12.65	0.00	10.47	470,803	11.54	570,494	10.98	514,000	514,000	
SAC_R01_5.247	341	SACR-L	387	128474	15.28	0.00	12.28	0.00	10.41	422,166	11.45	570,330	10.96	514,000	514,000	
SAC_R01_4.995	341	SACR-L	387	127225	14.06	0.00	11.06	0.00	10.37	422,161	11.39	526,625	10.93	514,000	514,000	
SAC_R01_4.749	341	SACR-L	387	125854	12.40	0.00	9.40	0.00	10.33	421,819	11.34	526,534	10.91	514,000	514,000	
SAC_R01_4.496	341	SACR-L	387	124504	13.60	0.00	10.60	0.00	10.29	421,811	11.27	526,436	10.88	514,000	514,000	
SAC_R01_4.246	341	SACR-L	387	123173	12.61	0.00	9.61	0.00	10.22	421,451	11.18	526,331	10.86	514,000	514,000	
SAC_R01_4.0	341	SACR-L	387	121828	11.52	0.00	8.52	0.00	10.17	421,445	11.11	526,328	10.84	514,000	514,000	

Delta Legacy Small Communities
Georgiana Slough
Existing and Future 100-Year Stage and Flow Results (Datum: NAVD 88)

HEC-RAS Cross Section	Reclamation District	NULE Left (L) Right (R) Levee	NULE Segment No.	NULE Station	Top of Levee Ground Elevation		Freeboard Elevation Subtracted from Top of Levee		Existing 100-Year (CVHS Model, 1997 90%)		Future 100-Year w/CC + SLR (CVHS Model, 1997 90%)		1955/1957 Stage	1955/1957 Design Flows	O&M Design Flows	Notes
					Left	Right	Left	Right	Stage	Flow	Stage	Flow	Stage	Flow	Flow	
					Ft.	Ft.	Ft.	Ft.	Ft.	cfs	Ft.	cfs	Ft.	cfs	cfs	
Georgiana Slough: Sacramento River to North Mokelumne River																
GEO_R01_12.315	556	GGAS-R	129	160649	22.02	23.50	19.02	20.50	18.06	19,901	18.30	20,054	16.89	20,600	20,000	
GEO_R01_12.211	556	GGAS-R	129	160097	24.63	23.57	21.63	20.57	18.05	19,901	18.29	20,054	16.84	20,600	20,000	
GEO_R01_12.208	556	GGAS-R	129	160084	24.90	23.63	21.90	20.63	18.05	19,901	18.29	20,054	16.84	20,600	20,000	
GEO_R01_12.198	556	GGAS-R	129	160032	24.82	23.61	21.82	20.61	18.02	19,901	18.27	20,054	16.83	20,600	20,000	
GEO_R01_12.187	556	GGAS-R	129	159973	24.36	22.89	21.36	19.89	18.01	19,901	18.26	20,053	16.83	20,600	20,000	
GEO_R01_12.07	556	GGAS-R	129	159442	21.26	20.46	18.26	17.46	17.93	19,897	18.18	20,053	16.76	20,600	20,000	
GEO_R01_11.812	556	GGAS-R	129	158092	20.34	19.41	17.34	16.41	17.78	19,888	18.03	20,052	16.61	20,600	20,000	
GEO_R01_11.545	556	GGAS-R	129	156688	19.63	19.07	16.63	16.07	17.64	19,880	17.89	20,052	16.46	20,600	20,000	
GEO_R01_11.348	556	GGAS-R	129	155565	19.73	18.72	16.73	15.72	17.64	19,884	17.89	20,052	16.35	20,600	20,000	
GEO_R01_11.249	556	GGAS-R	129	155235	19.50	19.72	16.50	16.72	17.62	19,880	17.87	20,051	16.29	20,600	20,000	
GEO_R01_11.186	556	GGAS-R	129	155069	18.63	19.61	15.63	16.61	17.53	19,876	17.78	20,051	16.25	20,600	20,000	
GEO_R01_10.962	556	GGAS-R	129	153730	19.38	18.03	16.38	15.03	17.46	19,872	17.71	20,051	16.12	20,600	20,000	
GEO_R01_10.693	556	GGAS-R	129	152309	19.00	18.79	16.00	15.79	17.25	19,861	17.51	20,051	15.97	20,600	20,000	
GEO_R01_10.443	556	GGAS-R	129	151034	17.60	18.79	14.60	15.79	17.07	19,853	17.33	20,051	15.83	20,600	20,000	
GEO_R01_10.181	556	GGAS-R	129	149452	18.94	18.47	15.94	15.47	17.06	19,853	17.32	20,050	15.68	20,600	20,000	
GEO_R01_9.944	556	GGAS-R	129	148143	18.08	18.83	15.08	15.83	16.88	19,845	17.14	20,050	15.54	20,600	20,000	
GEO_R01_9.697	556	GGAS-R	129	146679	18.73	18.16	15.73	15.16	16.70	19,838	16.96	20,050	15.40	20,600	20,000	
GEO_R01_9.447	556	GGAS-R	129	145407	18.46	18.39	15.46	15.39	16.58	19,838	16.84	20,050	15.26	20,600	20,000	
GEO_R01_9.337	556	GGAS-R	129	144839	18.14	18.52	15.14	15.52	16.49	19,835	16.75	20,050	15.19	20,600	20,000	
GEO_R01_9.236	556	GGAS-R	129	144581	17.13	19.26	14.13	16.26	16.58	19,837	16.84	20,031	15.14	20,600	20,000	
GEO_R01_9.07	556	GGAS-R	129	143976	16.95	18.06	13.95	15.06	16.40	19,831	16.67	20,031	15.04	20,600	20,000	
GEO_R01_8.811	556	GGAS-R	129	142474	17.68	16.88	14.68	13.88	16.24	19,828	16.50	20,031	14.89	20,600	20,000	
GEO_R01_8.561	556	GGAS-R	129	141102	17.21	17.76	14.21	14.76	16.09	19,823	16.35	20,031	14.75	20,600	20,000	
GEO_R01_8.425	556	GGAS-R	129	140508	17.20	18.00	14.20	15.00	16.05	19,820	16.31	20,031	14.67	20,600	20,000	
GEO_R01_8.312	556	GGAS-R	129	140005	17.80	17.76	14.80	14.76	15.94	19,814	16.21	20,031	14.61	20,600	20,000	
GEO_R01_8.064	556	GGAS-R	129	138605	18.05	16.46	15.05	13.46	15.80	19,811	16.07	20,019	14.47	20,600	20,000	
GEO_R01_7.808	556	GGAS-R	129	137290	16.68	17.28	13.68	14.28	15.59	19,806	15.86	20,019	14.32	20,600	20,000	
GEO_R01_7.558	556	GGAS-R	129	135981	18.29	16.42	15.29	13.42	15.46	19,806	15.74	20,019	14.18	20,600	20,000	
GEO_R01_7.307	556	GGAS-R	129	134684	17.70	16.86	14.70	13.86	15.30	19,805	15.58	20,018	14.03	20,600	20,000	
GEO_R01_7.056	556	GGAS-R	129	133310	17.39	16.20	14.39	13.20	15.14	19,803	15.42	20,018	13.89	20,600	20,000	Index Point: SAC 54
GEO_R01_6.807	556	GGAS-R	129	132055	16.88	16.58	13.88	13.58	14.97	19,803	15.25	20,017	13.75	20,600	20,000	DR 556 - Cross Levee

Delta Legacy Small Communities
Georgiana Slough
Existing and Future 100-Year Stage and Flow Results (Datum: NAVD 88)

October 2020

HEC-RAS Cross Section	Reclamation District	NULE Left (L) Right (R) Levee	NULE Segment No.	NULE Station	Top of Levee Ground Elevation		Freeboard Elevation Subtracted from Top of Levee		Existing 100-Year (CVHS Model, 1997 90%)		Future 100-Year w/CC + SLR (CVHS Model, 1997 90%)		1955/1957 Stage	1955/1957 Design Flows	O&M Design Flows	Notes
					Left	Right	Left	Right	Stage	Flow	Stage	Flow	Stage	Flow	Flow	
					Ft.	Ft.	Ft.	Ft.	Ft.	cfs	Ft.	cfs	Ft.	cfs	cfs	
GEO_R01_6.561	BALMD	GGAS-R	40	130736	16.08	15.76	13.08	12.76	14.82	19,801	15.10	20,017	13.61	20,600	20,000	
GEO_R01_6.312	BALMD	GGAS-R	40	129425	16.08	15.76	13.08	12.76	14.64	19,801	14.93	20,016	13.46	20,600	20,000	
GEO_R01_6.061	BALMD	GGAS-R	40	128189	15.87	15.41	12.87	12.41	14.44	19,800	14.73	20,016	13.32	20,600	20,000	
GEO_R01_5.858	BALMD	GGAS-R	40	127053	16.51	13.96	13.51	10.96	14.32	19,671	14.63	19,694	13.20	20,600	20,000	
GEO_R01_5.693	BALMD	GGAS-R	40	126056	18.46	18.22	15.46	15.22	14.23	19,178	14.56	18,763	13.11	20,600	20,000	
GEO_R01_5.432	BALMD	GGAS-R	40	124660	16.10	14.82	13.10	11.82	14.06	19,176	14.40	18,757	12.96	20,600	20,000	
GEO_R01_5.182	BALMD	GGAS-R	40	123310	15.49	15.82	12.49	12.82	13.89	19,157	14.24	18,694	12.82	20,600	20,000	
GEO_R01_4.932	BALMD	GGAS-R	40	122041	15.09	15.69	12.09	12.69	13.73	19,157	14.10	18,693	12.67	20,600	20,000	
GEO_R01_4.681	BALMD	GGAS-R	40	120678	16.33	15.52	13.33	12.52	13.55	19,157	13.93	18,693	12.53	20,600	20,000	
GEO_R01_4.428	BALMD	GGAS-R	40	119362	16.35	15.71	13.35	12.71	13.40	19,157	13.80	18,691	12.38	20,600	20,000	
GEO_R01_4.426	BALMD	GGAS-R	40	119349	16.19	15.75	13.19	12.75	13.42	19,157	13.81	18,691	12.38	20,600	20,000	Tyler Island Road Bridge
GEO_R01_4.417	BALMD	GGAS-R	40	119302	16.21	18.14	13.21	15.14	13.37	19,157	13.78	18,692	12.38	20,600	20,000	
GEO_R01_4.412	BALMD	GGAS-R	40	119273	16.21	15.70	13.21	12.70	13.36	19,157	13.77	18,692	12.37	20,600	20,000	
GEO_R01_4.294	BALMD	GGAS-R	40	118653	16.40	15.52	13.40	12.52	13.27	19,157	13.70	18,691	12.31	20,600	20,000	
GEO_R01_4.071	BALMD	GGAS-R	40	117616	14.05	15.97	11.05	12.97	13.15	19,157	13.59	18,689	12.18	20,600	20,000	Isleton Sewage Ponds
GEO_R01_3.81	BALMD	GGAS-R	40	116074	15.73	14.20	12.73	11.20	13.08	19,157	13.52	18,688	12.03	20,600	20,000	
GEO_R01_3.572	BALMD	GGAS-R	40	114661	15.31	14.21	12.31	11.21	12.86	19,156	13.33	18,686	11.89	20,600	20,000	
GEO_R01_3.426	BALMD	N/A	130	N/A	15.48	14.14	12.48	11.14	12.75	19,156	13.23	18,685	11.81	20,600	20,000	Oxbow Marina
GEO_R01_3.188	BALMD	N/A	130	N/A	13.48	14.23	10.48	11.23	12.60	19,156	13.09	18,684	11.67	20,600	20,000	
GEO_R01_2.949	BALMD	N/A	130	N/A	13.08	13.88	10.08	10.88	12.45	19,155	12.96	18,682	11.54	20,600	20,000	
GEO_R01_2.699	BALMD	N/A	130	N/A	13.81	13.59	10.81	10.59	12.28	19,098	12.82	18,327	11.39	20,600	20,000	
GEO_R01_2.488	BALMD	GGAS-R	40	113626	14.15	13.57	11.15	10.57	12.15	19,098	12.72	18,325	11.27	20,600	20,000	
GEO_R01_2.35	BALMD	GGAS-R	40	112775	14.27	13.77	11.27	10.77	12.07	19,098	12.64	18,324	11.19	20,600	20,000	
GEO_R01_2.07	BALMD	GGAS-R	40	111161	14.21	13.67	11.21	10.67	11.87	19,096	12.47	18,322	11.03	20,600	20,000	
GEO_R01_1.857	BALMD	GGAS-R	40	109974	14.01	13.18	11.01	10.18	11.70	19,095	12.34	18,319	10.91	20,600	20,000	
GEO_R01_1.697	BALMD	GGAS-R	40	109030	14.17	13.39	11.17	10.39	11.62	19,095	12.26	18,317	10.82	20,600	20,000	
GEO_R01_1.448	BALMD	GGAS-R	40	107728	13.90	13.53	10.90	10.53	11.45	19,092	12.12	18,315	10.68	20,600	20,000	
GEO_R01_1.197	BALMD	GGAS-R	40	106373	13.88	12.98	10.88	9.98	11.28	19,088	11.98	18,312	10.53	20,600	20,000	
GEO_R01_0.948	BALMD	GGAS-R	40	105043	14.02	12.59	11.02	9.59	11.09	19,087	11.83	18,309	10.39	20,600	20,000	
GEO_R01_0.698	BALMD	GGAS-R	40	103721	12.28	13.77	9.28	10.77	10.93	19,082	11.70	18,305	10.25	20,600	20,000	
GEO_R01_0.446	BALMD	GGAS-R	40	102283	13.53	11.96	10.53	8.96	10.71	19,080	11.51	18,301	10.10	20,600	20,000	
GEO_R01_0.194	BALMD	GGAS-R	40	100905	12.83	12.11	9.83	9.11	10.52	19,073	11.36	18,293	9.96	20,600	20,000	
GEO_R01_0.037	BALMD	GGAS-R	40	100131	0.00	0.00	0.00	0.00	10.42	19,070	11.28	18289.8	9.87	20,600	20,000	

Delta Legacy Small Communities

Steamboat Slough

Existing and Future 100-Year Stage and Flow Results (Datum: NAVD 88)

October 2020

HEC-RAS Cross Section	Reclamation District	NULE Left (L) Right (R) Levee	NULE Segment No.	NULE Station	Top of Levee Elevation		Freeboard Elevation Subtracted from Top of Levee		Existing 100-Year (CVHS Model, 1997 90%)		Future 100-Year w/CC + SLR (CVHS Model, 1997 90%)		1955/1957 Stage	1955/1957 Design Flows	O&M Design Flows	Notes
					Left	Right	Left	Right	Stage	Flow	Stage	Flow	Stage	Flow	Flow	
					Ft.	Ft.	Ft.	Ft.	Ft.	cfs	Ft.	cfs	Ft.	cfs	cfs	
Steamboat Slough: Sacramento River to Sutter Slough																
STM_R02_11.5	3	SMTS-L	113	N/A	28.33	28.67	25.33	25.67	21.04	24,945	20.74	21,867	19.93	28,000	28,000	
STM_R02_11.495	3	SMTS-L	113	160137	28.49	28.76	25.49	25.76	21.03	24,945	20.73	21,867	19.93	28,000	28,000	
STM_R02_11.488	3	SMTS-L	113	160101	27.88	28.08	24.88	25.08	20.94	24,416	20.66	21,866	19.93	28,000	28,000	
STM_R02_11.483	3	SMTS-L	113	160068	27.60	27.83	24.60	24.83	20.91	24,416	20.64	21,866	19.92	28,000	28,000	
STM_R02_11.4	3	SMTS-L	113	159684	27.73	26.47	24.73	23.47	20.78	24,415	20.53	21,865	19.88	28,000	28,000	
STM_R02_11.356	3	SMTS-L	113	159458	27.53	25.59	24.53	22.59	20.69	24,413	20.46	21,863	19.85	28,000	28,000	
STM_R02_11.291	3	SMTS-L	113	159136	27.52	25.52	24.52	22.52	20.62	24,413	20.40	21,862	19.82	28,000	28,000	
STM_R02_11.226	3	SMTS-L	113	158823	29.06	26.09	26.06	23.09	20.52	24,412	20.32	21,861	19.78	28,000	28,000	
STM_R02_11.1	3	SMTS-L	113	158260	28.42	25.93	25.42	22.93	20.29	24,410	20.13	21,859	19.72	28,000	28,000	
STM_R02_10.974	3	SMTS-L	113	157568	27.25	26.01	24.25	23.01	20.13	24,410	20.00	21,857	19.65	28,000	28,000	
STM_R02_10.849	3	SMTS-L	113	156960	26.69	24.80	23.69	21.80	20.05	24,410	19.93	21,856	19.59	28,000	28,000	
STM_R02_10.728	3	SMTS-L	113	156303	26.34	24.98	23.34	21.98	19.97	24,409	19.86	21,856	19.52	28,000	28,000	
STM_R02_10.599	3	SMTS-L	113	155621	26.47	24.40	23.47	21.40	19.85	24,408	19.77	21,854	19.45	28,000	28,000	
STM_R02_10.473	3	SMTS-L	113	154965	27.27	24.92	24.27	21.92	19.71	24,407	19.66	21,852	19.39	28,000	28,000	
STM_R02_10.349	3	SMTS-L	113	154345	27.31	24.92	24.31	21.92	19.64	24,407	19.60	21,851	19.32	28,000	28,000	
STM_R02_10.207	3	SMTS-L	113	153600	25.44	24.19	22.44	21.19	19.49	24,407	19.48	21,849	19.25	28,000	28,000	
STM_R02_10.1	3	SMTS-L	113	152943	26.57	24.88	23.57	21.88	19.33	24,406	19.35	21,849	19.19	28,000	28,000	
STM_R02_9.988	3	SMTS-L	113	152286	25.96	24.99	22.96	21.99	19.22	24,406	19.26	21,847	19.13	28,000	28,000	
STM_R02_9.868	3	SMTS-L	113	151658	25.48	25.04	22.48	22.04	19.15	24,406	19.21	21,846	19.07	28,000	28,000	
STM_R02_9.71	3	SMTS-L	113	150939	25.30	24.33	22.30	21.33	19.04	24,405	19.12	21,845	18.99	28,000	28,000	
STM_R02_9.6	3	SMTS-L	113	150370	25.71	25.36	22.71	22.36	18.90	24,405	19.02	21,844	18.93	28,000	28,000	
STM_R02_9.478	3	SMTS-L	113	149732	24.99	26.33	21.99	23.33	18.82	24,405	18.95	21,842	18.86	28,000	28,000	
STM_R02_9.35	3	SMTS-L	113	148974	26.09	25.39	23.09	22.39	18.70	24,405	18.86	21,841	18.80	28,000	28,000	
STM_R02_9.174	3	SMTS-L	113	148215	28.47	25.75	25.47	22.75	18.55	24,405	18.74	21,839	18.70	28,000	28,000	
STM_R02_8.963	3	SMTS-L	113	147093	26.15	26.71	23.15	23.71	18.43	24,404	18.65	21,838	18.59	28,000	28,000	
STM_R02_8.85	3	SMTS-L	113	146380	26.62	26.56	23.62	23.56	18.34	24,405	18.58	21,837	18.53	28,000	28,000	
STM_R02_8.727	3	SMTS-L	113	145812	27.19	24.26	24.19	21.26	18.23	24,404	18.49	21,836	18.47	28,000	28,000	
STM_R02_8.615	3	SMTS-L	113	145271	25.87	24.58	22.87	21.58	18.10	24,404	18.39	21,834	18.41	28,000	28,000	
STM_R02_8.502	3	SMTS-L	113	144654	24.99	27.11	21.99	24.11	17.97	24,404	18.29	21,832	18.35	28,000	28,000	
STM_R02_8.359	3	SMTS-L	113	143858	24.27	27.67	21.27	24.67	17.87	24,404	18.21	21,831	18.27	28,000	28,000	
STM_R02_8.227	3	SMTS-L	113	143097	24.27	27.85	21.27	24.85	17.74	24,404	18.12	21,828	18.20	28,000	28,000	
STM_R02_8.147	3	SMTS-L	113	142595	25.13	28.25	22.13	25.25	17.64	24,404	18.04	21,826	18.16	28,000	28,000	

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					Left	Right	Left	Right	Stage	Flow	Stage	Flow	Stage	Flow	Flow	
					Ft.	Ft.	Ft.	Ft.	Ft.	cfs	Ft.	cfs	Ft.	cfs	cfs	
STM_R02_7.99	3	SMTS-L	113	141659	24.71	26.92	21.71	23.92	17.54	24,404	17.97	21,825	18.08	28,000	28,000	
STM_R02_7.859	3	SMTS-L	113	141098	25.22	25.52	22.22	22.52	17.44	24,404	17.89	21,823	18.01	28,000	28,000	
STM_R02_7.708	3	SMTS-L	113	140463	23.87	26.06	20.87	23.06	17.22	24,404	17.72	21,818	17.93	28,000	28,000	
STM_R02_7.611	3	SMTS-L	113	139935	23.03	25.61	20.03	22.61	17.18	24,404	17.69	21,818	17.88	28,000	28,000	
STM_R02_7.477	3	SMTS-L	113	139142	23.43	25.86	20.43	22.86	16.98	24,404	17.55	21,812	17.81	28,000	28,000	
STM_R02_7.36	3	SMTS-L	113	138477	23.09	25.84	20.09	22.84	16.90	24,404	17.50	21,810	17.75	28,000	28,000	
STM_R02_7.176	3	SMTS-L	113	137412	22.46	28.19	19.46	25.19	16.71	24,404	17.35	21,803	17.65	28,000	28,000	
Steamboat Slough: Sutter Slough to Cache Slough																
STM_R01_7.107	3	SMTS-L	113	137156	24.01	27.45	21.01	24.45	16.71	36,057	17.35	32,419	17.61	43,500	43,500	
STM_R01_6.972	3	SMTS-L	113	136581	24.58	25.61	21.58	22.61	16.52	36,057	17.21	32,407	17.53	43,500	43,500	
STM_R01_6.859	3	SMTS-L	113	136071	24.15	25.44	21.15	22.44	16.49	36,057	17.18	32,407	17.45	43,500	43,500	
STM_R01_6.727	3	SMTS-L	113	135386	23.69	26.05	20.69	23.05	16.41	36,055	17.13	32,401	17.37	43,500	43,500	
STM_R01_6.609	3	SMTS-L	113	134777	25.72	26.45	22.72	23.45	16.38	36,054	17.11	32,398	17.30	43,500	43,500	
STM_R01_6.485	3	SMTS-L	113	134084	25.79	27.27	22.79	24.27	16.31	36,054	17.06	32,396	17.22	43,500	43,500	
STM_R01_6.361	3	SMTS-L	113	133385	22.98	28.21	19.98	25.21	16.30	36,054	17.05	32,393	17.14	43,500	43,500	
STM_R01_6.236	3	SMTS-L	113	132708	21.55	28.84	18.55	25.84	16.22	36,052	17.00	32,390	17.06	43,500	43,500	
STM_R01_6.11	3	SMTS-L	113	132025	21.72	27.48	18.72	24.48	16.06	36,052	16.88	32,381	16.98	43,500	43,500	
STM_R01_6.003	3	SMTS-L	113	131505	22.56	26.83	19.56	23.83	16.03	36,052	16.86	32,378	16.91	43,500	43,500	
STM_R01_5.86	3	SMTS-L	113	130794	24.54	25.67	21.54	22.67	15.97	36,048	16.82	32,375	16.82	43,500	43,500	
STM_R01_5.735	3	SMTS-L	113	130136	24.53	25.08	21.53	22.08	15.89	36,048	16.76	32,371	16.74	43,500	43,500	
STM_R01_5.61	3	SMTS-L	113	129475	21.85	26.56	18.85	23.56	15.81	36,048	16.71	32,365	16.66	43,500	43,500	
STM_R01_5.489	3	SMTS-L	113	128753	20.35	26.84	17.35	23.84	15.76	36,045	16.67	32,362	16.58	43,500	43,500	
STM_R01_5.364	3	SMTS-L	113	128088	22.82	26.78	19.82	23.78	15.72	36,045	16.64	32,358	16.50	43,500	43,500	
STM_R01_5.239	3	SMTS-L	113	127463	24.14	25.99	21.14	22.99	15.56	36,041	16.54	32,352	16.42	43,500	43,500	
STM_R01_5.112	3	SMTS-L	113	126815	24.66	24.45	21.66	21.45	15.54	36,041	16.52	32,348	16.34	43,500	43,500	
STM_R01_4.99	3	SMTS-L	113	126131	24.28	24.17	21.28	21.17	15.45	36,041	16.46	32,345	16.26	43,500	43,500	
STM_R01_4.867	3	SMTS-L	113	125439	22.19	24.71	19.19	21.71	15.39	36,036	16.42	32,342	16.18	43,500	43,500	
STM_R01_4.771	3	SMTS-L	113	124773	21.07	25.22	18.07	22.22	15.35	36,036	16.39	32,338	16.12	43,500	43,500	
STM_R01_4.626	3	SMTS-L	113	123998	19.74	25.86	16.74	22.86	15.21	36,031	16.30	32,331	16.03	43,500	43,500	
STM_R01_4.502	3	SMTS-L	113	123313	20.31	26.06	17.31	23.06	15.15	36,031	16.25	32,327	15.95	43,500	43,500	
STM_R01_4.379	3	SMTS-L	113	122649	21.44	24.66	18.44	21.66	15.12	36,031	16.24	32,324	15.87	43,500	43,500	
STM_R01_4.272	3	SMTS-L	113	122149	21.26	22.47	18.26	19.47	15.04	36,026	16.18	32,320	15.80	43,500	43,500	
STM_R01_4.12	3	SMTS-L	113	121473	21.91	24.54	18.91	21.54	15.01	36,025	16.17	32,316	15.71	43,500	43,500	
STM_R01_4.013	3	SMTS-L	113	120886	23.87	24.55	20.87	21.55	14.96	36,025	16.13	32,312	15.64	43,500	43,500	
STM_R01_3.87	3	SMTS-L	113	120134	24.64	23.48	21.64	20.48	14.83	36,019	16.04	32,305	15.55	43,500	43,500	
STM_R01_3.74	3	SMTS-L	113	119494	24.78	23.81	21.78	20.81	14.77	36,019	16.00	32,301	15.46	43,500	43,500	
STM_R01_3.614	3	SMTS-L	113	118868	23.79	24.73	20.79	21.73	14.79	36,019	16.02	32,301	15.38	43,500	43,500	

Delta Legacy Small Communities

Steamboat Slough

Existing and Future 100-Year Stage and Flow Results (Datum: NAVD 88)

October 2020

HEC-RAS Cross Section	Reclamation District	NULE Left (L) Right (R) Levee	NULE Segment No.	NULE Station	Top of Levee Elevation		Freeboard Elevation Subtracted from Top of Levee		Existing 100-Year (CVHS Model, 1997 90%)		Future 100-Year w/CC + SLR (CVHS Model, 1997 90%)		1955/1957 Stage	1955/1957 Design Flows	O&M Design Flows	Notes
					Left	Right	Left	Right	Stage	Flow	Stage	Flow	Stage	Flow	Flow	
					Ft.	Ft.	Ft.	Ft.	Ft.	cfs	Ft.	cfs	Ft.	cfs	cfs	
STM_R01_3.505	3	SMTS-L	113	118395	21.90	25.57	18.90	22.57	14.74	36,012	15.99	32,297	15.31	43,500	43,500	
STM_R01_3.357	3	SMTS-L	113	117454	19.36	25.01	16.36	22.01	14.64	36,012	15.92	32,289	15.22	43,500	43,500	
STM_R01_3.23	3	SMTS-L	113	116774	18.74	24.89	15.74	21.89	14.50	36,004	15.83	32,276	15.14	43,500	43,500	
STM_R01_3.104	3	SMTS-L	113	116095	19.09	25.27	16.09	22.27	14.48	36,004	15.82	32,276	15.06	43,500	43,500	
STM_R01_2.981	3	SMTS-L	113	115382	20.61	25.45	17.61	22.45	14.43	35,996	15.79	32,268	14.98	43,500	43,500	
STM_R01_2.85	3	SMTS-L	113	114611	20.39	26.05	17.39	23.05	14.36	35,996	15.74	32,259	14.89	43,500	43,500	Index Point: SAC 50
STM_R01_2.724	3	SMTS-L	113	113916	19.51	27.15	16.51	24.15	14.29	35,987	15.69	32,245	14.81	43,500	43,500	
STM_R01_2.598	3	SMTS-L	113	113220	19.42	26.69	16.42	23.69	14.23	35,987	15.66	32,235	14.73	43,500	43,500	
STM_R01_2.477	3	SMTS-L	113	112542	20.55	27.03	17.55	24.03	14.17	35,977	15.62	32,225	14.66	43,500	43,500	
STM_R01_2.347	3	SMTS-L	113	111768	22.03	26.98	19.03	23.98	14.15	35,977	15.60	32,225	14.57	43,500	43,500	
STM_R01_2.217	3	SMTS-L	113	111025	20.58	26.90	17.58	23.90	14.07	35,977	15.56	32,208	14.49	43,500	43,500	
STM_R01_2.095	3	SMTS-L	113	110434	23.05	24.84	20.05	21.84	14.01	35,967	15.52	32,196	14.41	43,500	43,500	
STM_R01_1.968	3	SMTS-L	113	109883	23.78	25.31	20.78	22.31	13.98	35,967	15.50	32,190	14.33	43,500	43,500	
STM_R01_1.843	3	SMTS-L	113	109296	27.68	22.56	24.68	19.56	13.93	35,956	15.47	32,184	14.25	43,500	43,500	
STM_R01_1.714	3	SMTS-L	113	108635	30.00	23.21	27.00	20.21	13.85	35,956	15.42	32,165	14.17	43,500	43,500	
STM_R01_1.592	3	SMTS-L	113	108017	30.01	23.75	27.01	20.75	13.73	35,944	15.34	32,144	14.09	43,500	43,500	
STM_R01_1.467	3	SMTS-L	113	107380	28.66	25.99	25.66	22.99	13.71	35,944	15.33	32,144	14.01	43,500	43,500	
STM_R01_1.342	3	SMTS-L	113	106740	23.13	25.74	20.13	22.74	13.69	35,932	15.32	32,137	13.93	43,500	43,500	
STM_R01_1.193	3	SMTS-L	113	106066	23.24	24.07	20.24	21.07	13.63	35,931	15.28	32,130	13.84	43,500	43,500	
STM_R01_1.091	3	SMTS-L	113	105528	23.09	22.83	20.09	19.83	13.60	35,931	15.26	32,123	13.77	43,500	43,500	
STM_R01_0.958	3	SMTS-L	113	104698	23.04	24.22	20.04	21.22	13.52	35,918	15.21	32,107	13.69	43,500	43,500	
STM_R01_0.844	3	SMTS-L	113	104003	21.09	24.20	18.09	21.20	13.45	35,904	15.17	32,099	13.61	43,500	43,500	
STM_R01_0.729	3	SMTS-L	113	103397	20.29	22.11	17.29	19.11	13.40	35,904	15.14	32,092	13.54	43,500	43,500	
STM_R01_0.594	3	SMTS-L	113	102683	21.99	22.89	18.99	19.89	13.37	35,890	15.12	32,092	13.45	43,500	43,500	
STM_R01_0.466	3	N/A	113	N/A	0.00	22.70	0.00	19.70	13.27	35,890	15.06	32,075	13.37	43,500	43,500	
STM_R01_0.345	3	N/A	113	N/A	0.00	24.45	0.00	21.45	13.24	35,874	15.05	32,067	13.29	43,500	43,500	

Delta Legacy Small Communities
Snodgrass Slough Existing and
Future 100-Year
Stage and Flow Results (Datum: NAVD 88)

HEC-RAS Cross Section	Reclamation District	NULE Left (L) Right (R) Levee	NULE Segment No.	NULE Station	Top of Levee Elevation		Freeboard Elevation Subtracted from Top of Levee		Existing 100-Year		Future 100-Year w/CC + SLR		1955/1957 Stage	1955/1957 Design Flows	O&M Design Flows	Notes
					Left	Right	Left	Right	Stage	Flow	Stage	Flow	Stage	Flow	Flow	
					Ft.	Ft.	Ft.	Ft.	Ft.	cfs	Ft.	cfs	Ft.	cfs	cfs	
Snodgrass Slough: Lambert Road to Delta Meadows Slough																
SNOG_R4_6.2198	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	15.51	10	15.90	12	N/A	N/A	N/A	
SNOG_R4_6.1951	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	15.51	10	15.90	12	N/A	N/A	N/A	
SNOG_R4_6.1599	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	15.51	-315	15.90	-475	N/A	N/A	N/A	
SNOG_R4_6.0293	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	15.51	-2,344	15.89	-3,417	N/A	N/A	N/A	
SNOG_R4_5.9594	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	15.51	-4,357	15.89	-6,233	N/A	N/A	N/A	
SNOG_R4_5.77667	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	15.60	-4,357	16.07	-6,233	N/A	N/A	N/A	
SNOG_R4_5.59395	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	15.62	-3,831	16.11	-5,165	N/A	N/A	N/A	
SNOG_R4_5.41122	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	15.63	-3,683	16.13	-4,898	N/A	N/A	N/A	
SNOG_R4_5.2285	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	15.64	-3,591	16.13	-4,693	N/A	N/A	N/A	
SNOG_R4_5.0814	551	SDSS-R	1041	137631	N/A	N/A	N/A	N/A	15.64	-3,580	16.14	-4,672	N/A	N/A	N/A	
SNOG_R4_4.9343	551	SDSS-R	1041	136843	N/A	N/A	N/A	N/A	15.64	-3,578	16.14	-4,669	N/A	N/A	N/A	
SNOG_R4_4.8243	551	SDSS-R	1041	136263	N/A	N/A	N/A	N/A	15.64	-3,579	16.14	-4,670	N/A	N/A	N/A	
SNOG_R4_4.7143	551	SDSS-R	1041	135684	N/A	N/A	N/A	N/A	15.64	-3,580	16.14	-4,674	N/A	N/A	N/A	
SNOG_R4_4.58615	551	SDSS-R	1041	135003	N/A	N/A	N/A	N/A	15.64	-3,585	16.14	-4,678	N/A	N/A	N/A	
SNOG_R4_4.458	551	SDSS-R	1041	134320	N/A	N/A	N/A	N/A	15.64	-3,594	16.14	-4,697	N/A	N/A	N/A	
SNOG_R4_4.30935	551	SDSS-R	1041	133457	N/A	N/A	N/A	N/A	15.64	-3,603	16.14	-4,720	N/A	N/A	N/A	
SNOG_R4_4.1607	551	SDSS-R	1041	132594	N/A	N/A	N/A	N/A	15.64	-3,609	16.15	-4,741	N/A	N/A	N/A	
SNOG_R4_3.9774	551	SDSS-R	1041	131632	N/A	N/A	N/A	N/A	15.64	-3,629	16.15	-4,789	N/A	N/A	N/A	
SNOG_R4_3.7941	551	SDSS-R	1041	130548	N/A	N/A	N/A	N/A	15.64	-3,641	16.15	-4,825	N/A	N/A	N/A	
SNOG_R4_3.6505	551	SDSS-R	1041	129751	N/A	N/A	N/A	N/A	15.65	-3,682	16.15	-4,919	N/A	N/A	N/A	
SNOG_R4_3.5069	551	SDSS-R	1041	128936	N/A	N/A	N/A	N/A	15.65	-3,758	16.16	-5,068	N/A	N/A	N/A	
SNOG_R4_3.3787	551	SDSS-R	1041	128177	N/A	N/A	N/A	N/A	15.65	-3,868	16.16	-5,281	N/A	N/A	N/A	
SNOG_R4_3.2505	551	SDSS-R	1041	127402	N/A	N/A	N/A	N/A	15.65	-3,983	16.16	-5,488	N/A	N/A	N/A	
SNOG_R4_3.09575	551	SDSS-R	1041	126694	N/A	N/A	N/A	N/A	15.66	-4,220	16.16	-5,929	N/A	N/A	N/A	
SNOG_R4_2.941	551	SDSS-R	1041	125972	N/A	N/A	N/A	N/A	15.66	-4,416	16.17	-6,302	N/A	N/A	N/A	
SNOG_R4_2.8402	551	SDSS-R	1041	125440	N/A	N/A	N/A	N/A	15.66	-4,437	16.18	-6,311	N/A	N/A	N/A	
SNOG_R4_2.7335	551	SDSS-R	1041	124877	N/A	N/A	N/A	N/A	15.67	-4,459	16.18	-6,336	N/A	N/A	N/A	
SNOG_R4_2.6268	551	SDSS-R	1041	124314	N/A	N/A	N/A	N/A	15.67	-4,459	16.18	-6,345	N/A	N/A	N/A	
SNOG_R4_2.5128	551	SDSS-R	1041	123718	N/A	N/A	N/A	N/A	15.67	-4,470	16.19	-6,345	N/A	N/A	N/A	

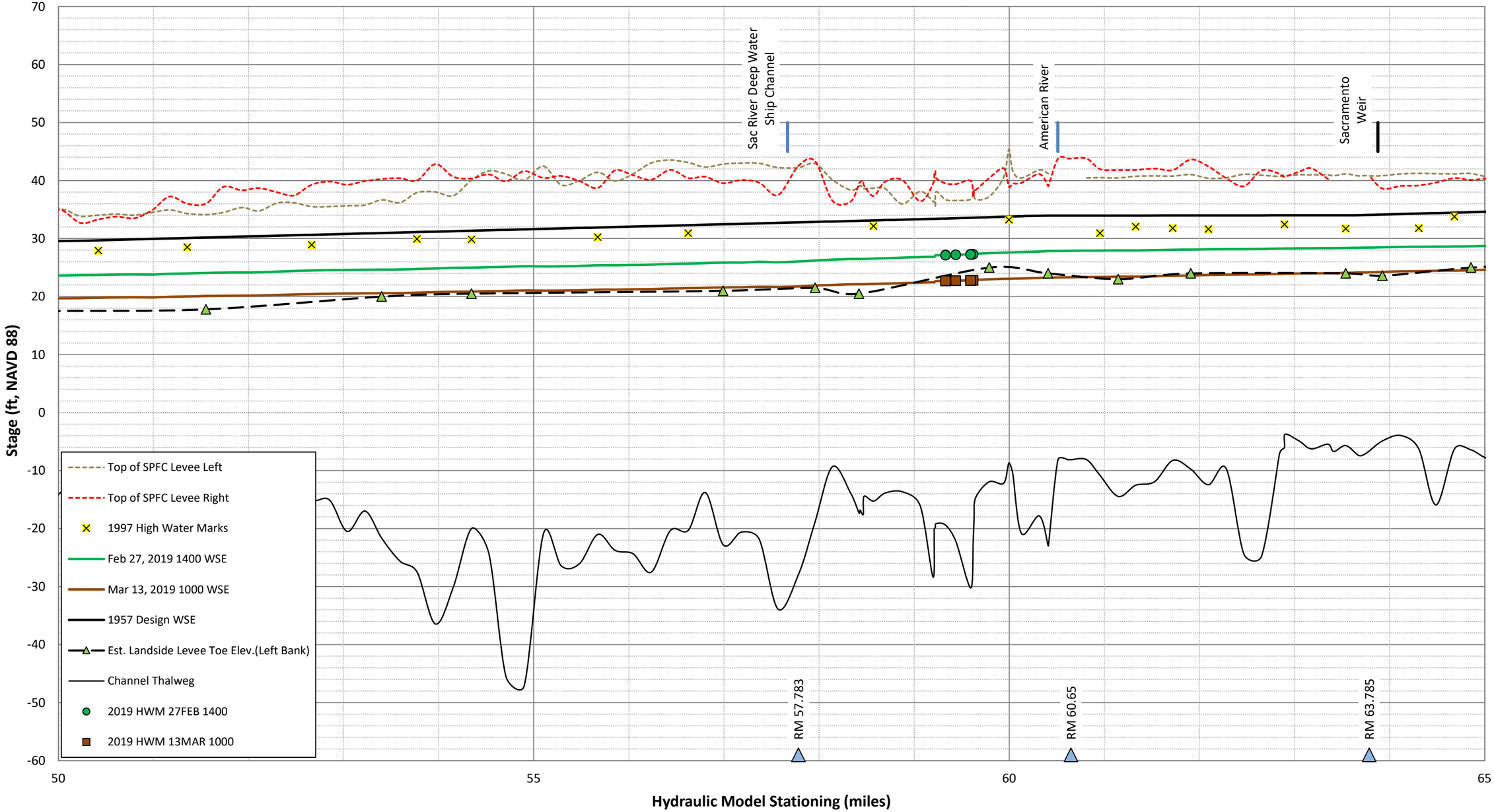
Delta Legacy Small Communities
Snodgrass Slough Existing and
Future 100-Year
Stage and Flow Results (Datum: NAVD 88)

HEC-RAS Cross Section	Reclamation District	NULE Left (L) Right (R) Levee	NULE Segment No.	NULE Station	Top of Levee Elevation		Freeboard Elevation Subtracted from Top of Levee		Existing 100-Year		Future 100-Year w/CC + SLR		1955/1957 Stage	1955/1957 Design Flows	O&M Design Flows	Notes
					Left	Right	Left	Right	Stage	Flow	Stage	Flow	Stage	Flow	Flow	
					Ft.	Ft.	Ft.	Ft.	Ft.	cfs	Ft.	cfs	Ft.	cfs	cfs	
Snodgrass Slough: Upstream of RD 551 Gate Structure to RD 755 (RD 551 Borrow Canal)																
0.027	551	N/A	1041		N/A	N/A	N/A	N/A	15.64	-3,580	16.14	-4,672	N/A	N/A	N/A	
0.182	551	N/A	1041		N/A	N/A	N/A	N/A	15.64	-3,580	16.14	-4,672	N/A	N/A	N/A	
0.341	551	N/A	1041		N/A	N/A	N/A	N/A	15.64	-3,580	16.14	-4,672	N/A	N/A	N/A	
0.522	551	N/A	1041		N/A	N/A	N/A	N/A	15.64	-3,580	16.14	-4,672	N/A	N/A	N/A	
0.715	551	N/A	1041		N/A	N/A	N/A	N/A	15.64	-3,580	16.14	-4,672	N/A	N/A	N/A	
0.885	551	N/A	1041		N/A	N/A	N/A	N/A	15.64	-3,580	16.14	-4,672	N/A	N/A	N/A	
0.959	551	N/A	1041		N/A	N/A	N/A	N/A	15.64	-3,580	16.14	-4,672	N/A	N/A	N/A	
1.149	551	N/A	1041		N/A	N/A	N/A	N/A	15.64	-3,580	16.14	-4,672	N/A	N/A	N/A	
1.341	551	N/A	1041		N/A	N/A	N/A	N/A	15.64	-3,580	16.14	-4,672	N/A	N/A	N/A	
1.53	551	N/A	1041		N/A	N/A	N/A	N/A	15.64	-3,580	16.14	-4,672	N/A	N/A	N/A	
1.707	551	N/A	1041		N/A	N/A	N/A	N/A	15.64	-3,580	16.14	-4,672	N/A	N/A	N/A	
1.915	551	N/A	1041		N/A	N/A	N/A	N/A	15.64	-3,580	16.14	-4,672	N/A	N/A	N/A	
2.104	551	N/A	1041		N/A	N/A	N/A	N/A	15.64	-3,580	16.14	-4,672	N/A	N/A	N/A	
2.297	551	N/A	1041		N/A	N/A	N/A	N/A	15.64	-3,580	16.14	-4,672	N/A	N/A	N/A	
2.487	551	N/A	1041		N/A	N/A	N/A	N/A	15.64	-3,580	16.14	-4,672	N/A	N/A	N/A	
2.677	551	N/A	1041		N/A	N/A	N/A	N/A	15.64	-3,580	16.14	-4,672	N/A	N/A	N/A	
2.867	551	N/A	1041		N/A	N/A	N/A	N/A	15.64	-3,580	16.14	-4,672	N/A	N/A	N/A	

Appendix D - Hydraulic Model Lower Sacramento River System and North Delta System Water Surface Elevation Profiles

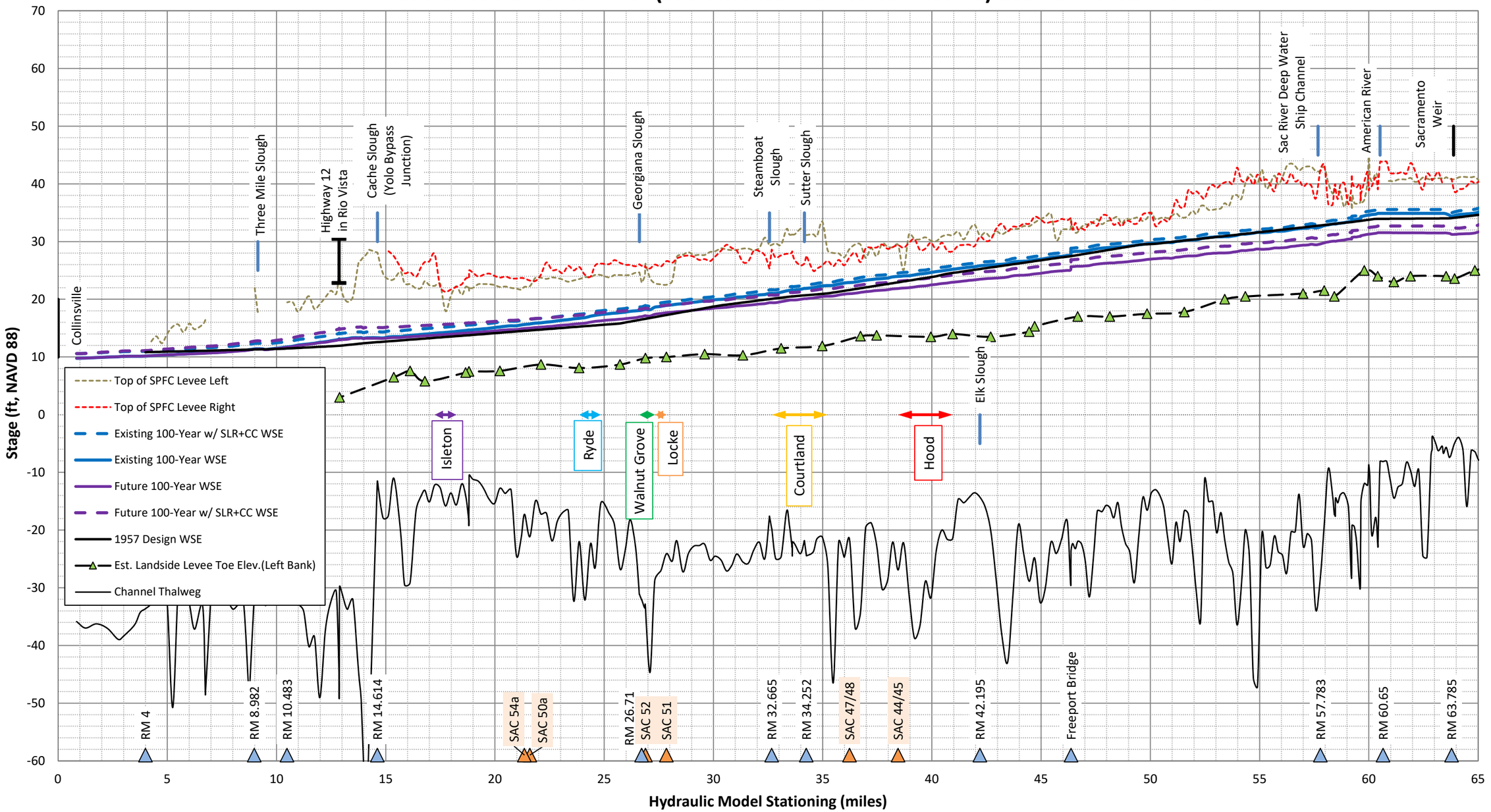
October 2020

Sacramento County
Delta Legacy Small Communities
Lower Sacramento River (Sacramento Weir to Garcia Bend Park) February 27 & March 2019 Validation Model



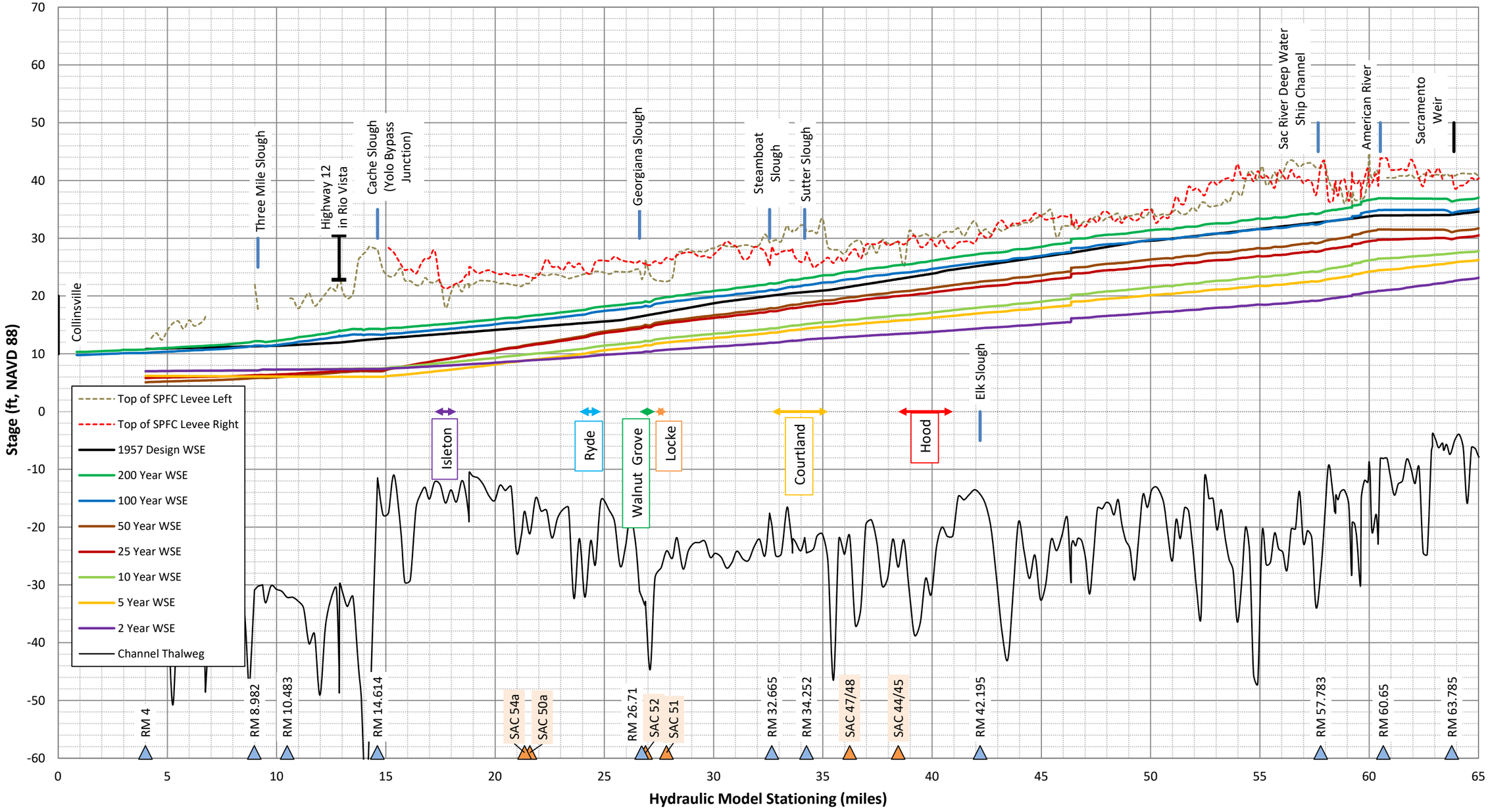
October 2020

Sacramento County
Delta Legacy Small Communities
Lower Sacramento River (Sacramento Weir to Collinsville) 100-Year WSE Profile



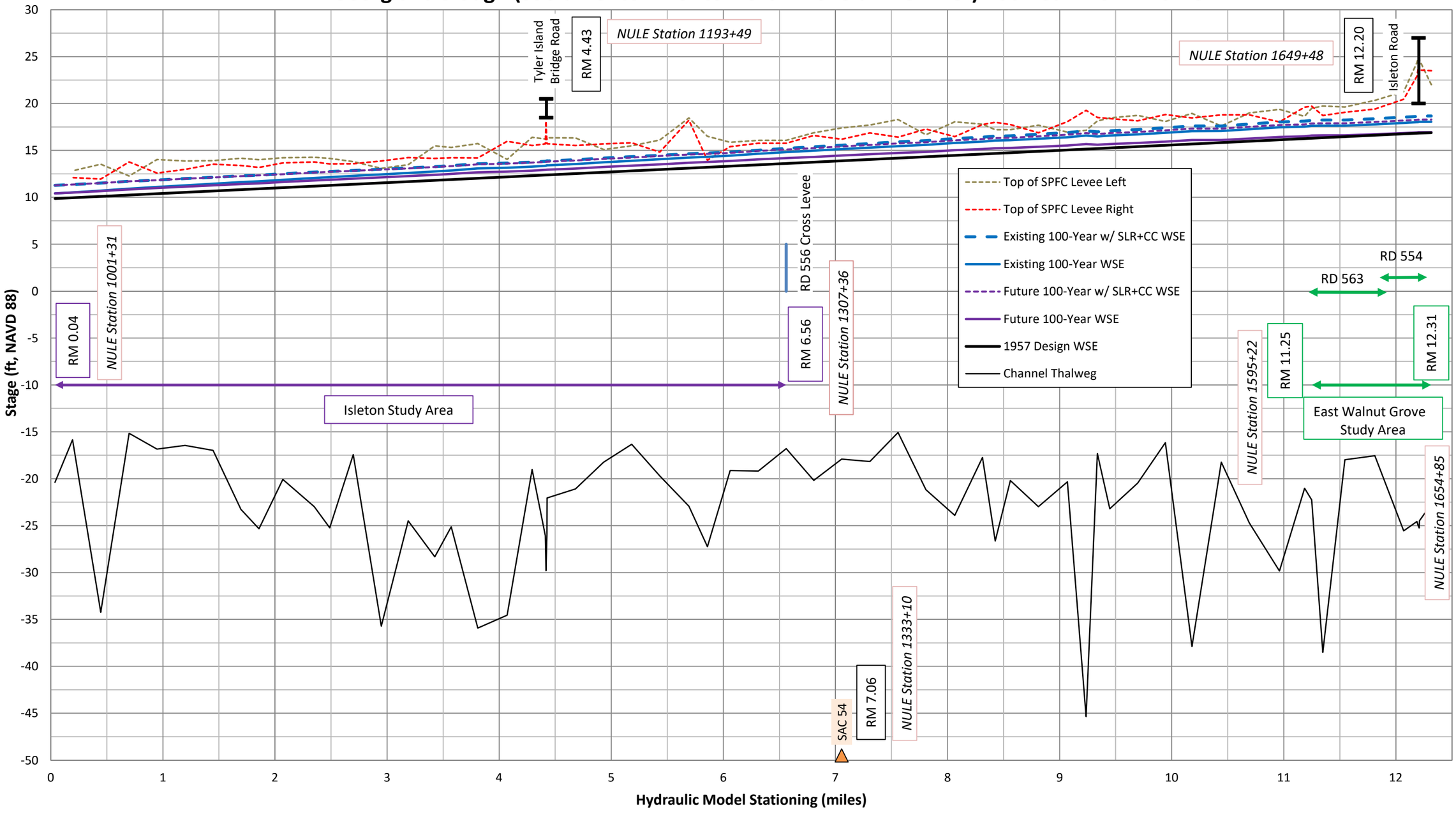
October 2020

Sacramento County
Delta Legacy Small Communities
Lower Sacramento River (Sacramento Weir to Collinsville) Existing WSE Profiles



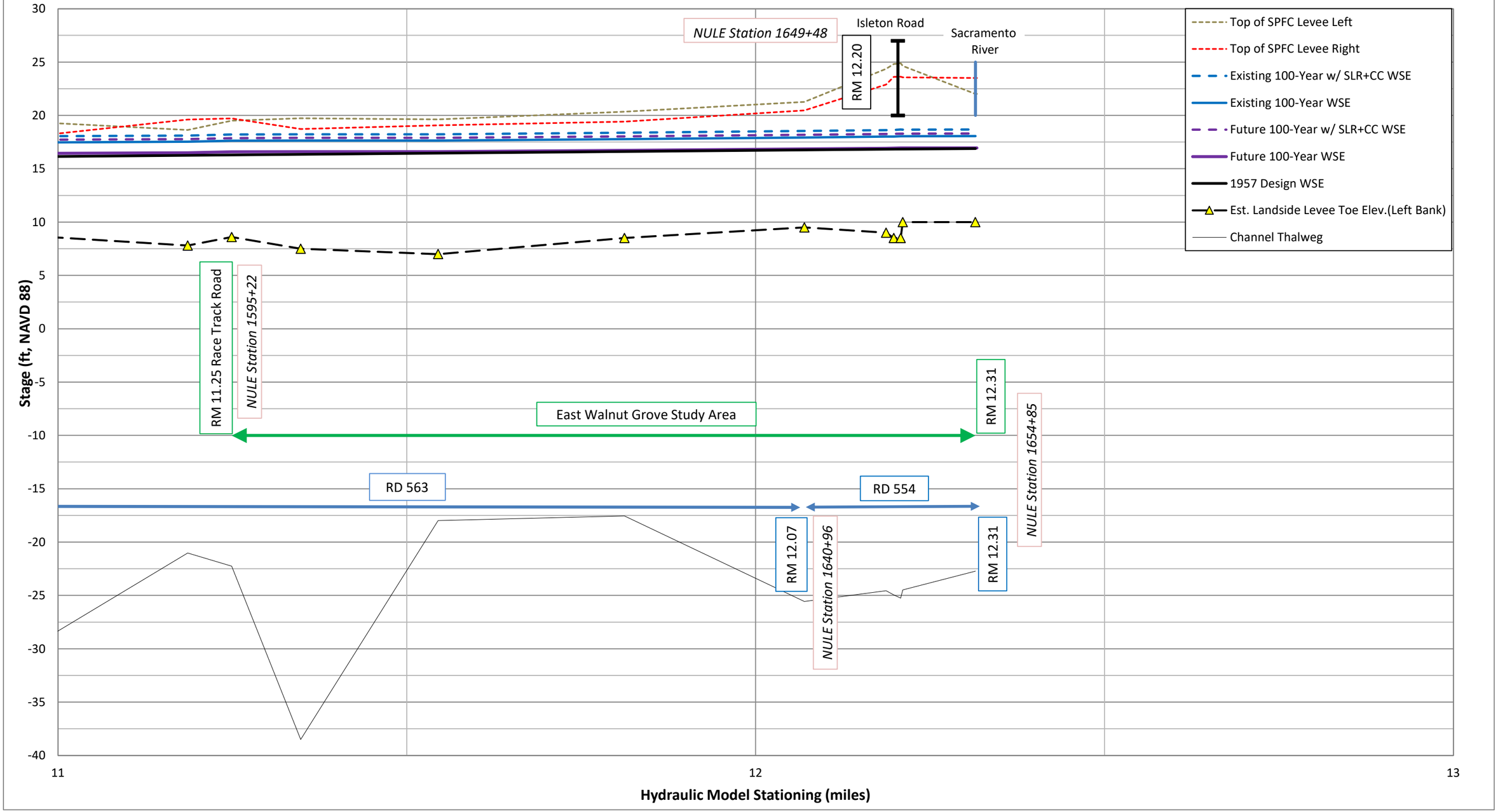
October 2020

Sacramento County
Delta Legacy Small Communities
Georgiana Slough (Sacramento River to North Mokelumne River) 100-Year WSEL Profile



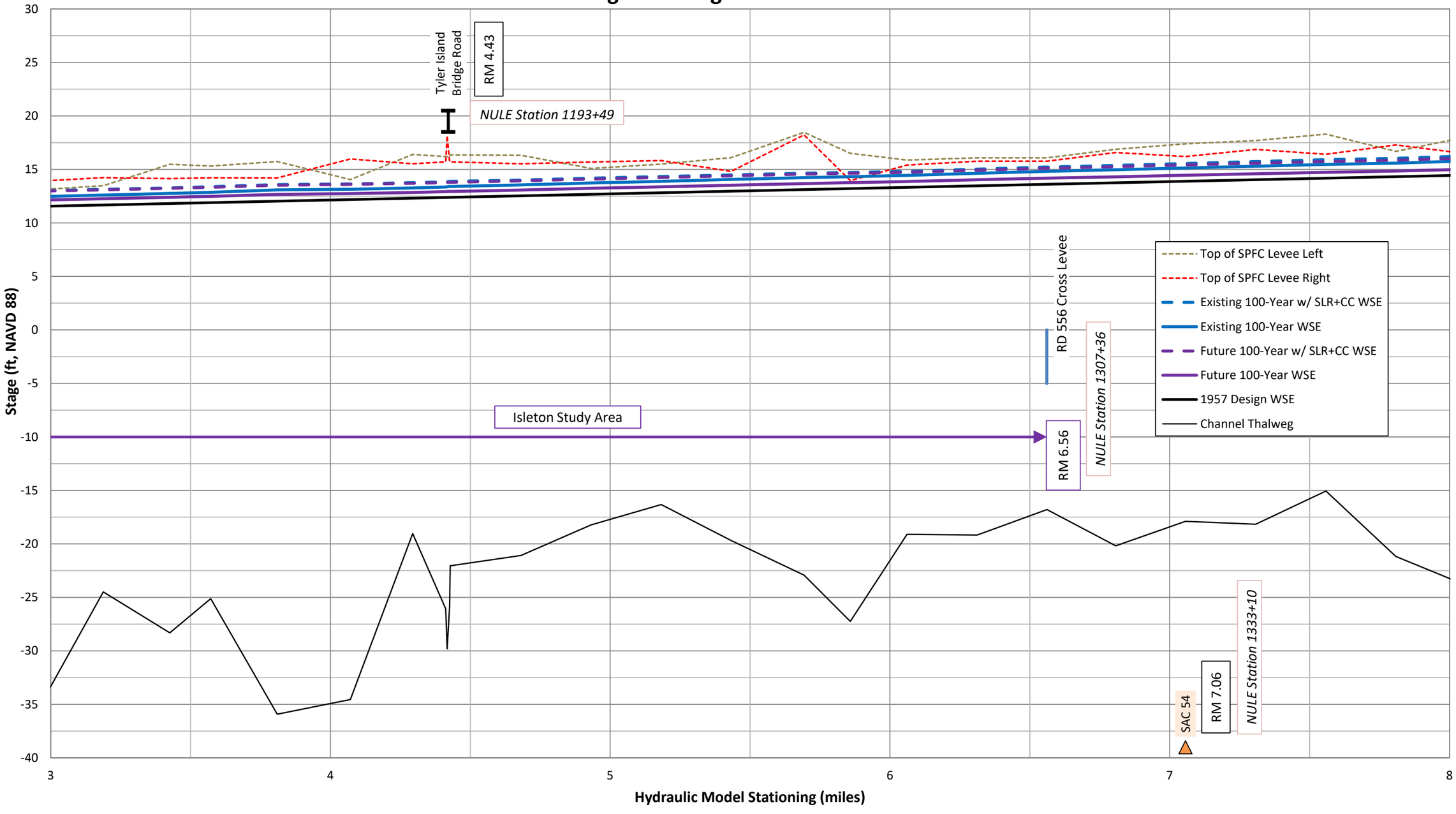
October 2020

Sacramento County
Delta Legacy Small Community of East Walnut Grove
Georgiana Slough 1957 & 100-Year WSEL Profile



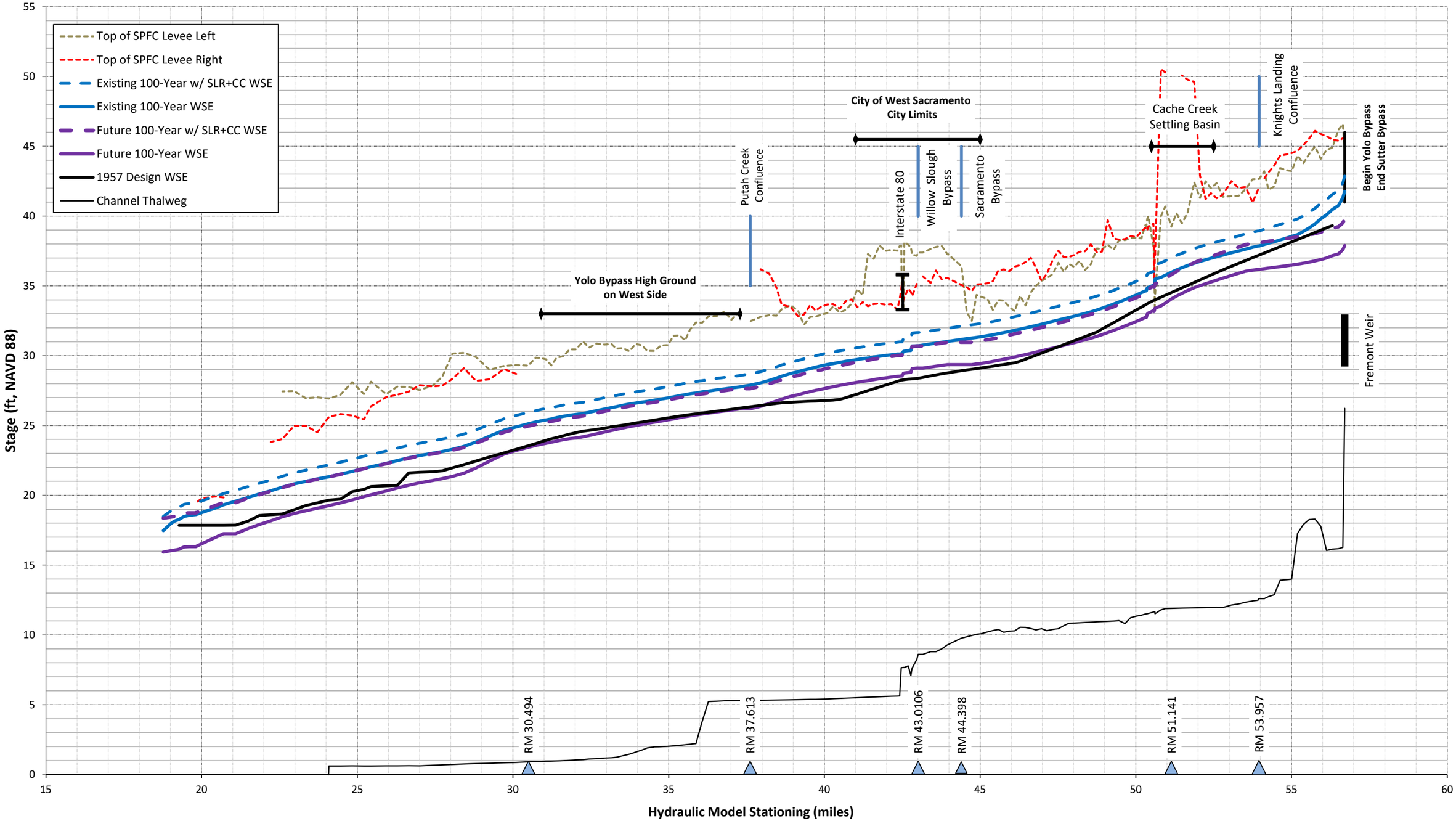
October 2020

Sacramento County
Delta Legacy Small Community of Isleton
Georgiana Slough 100-Year WSEL Profile



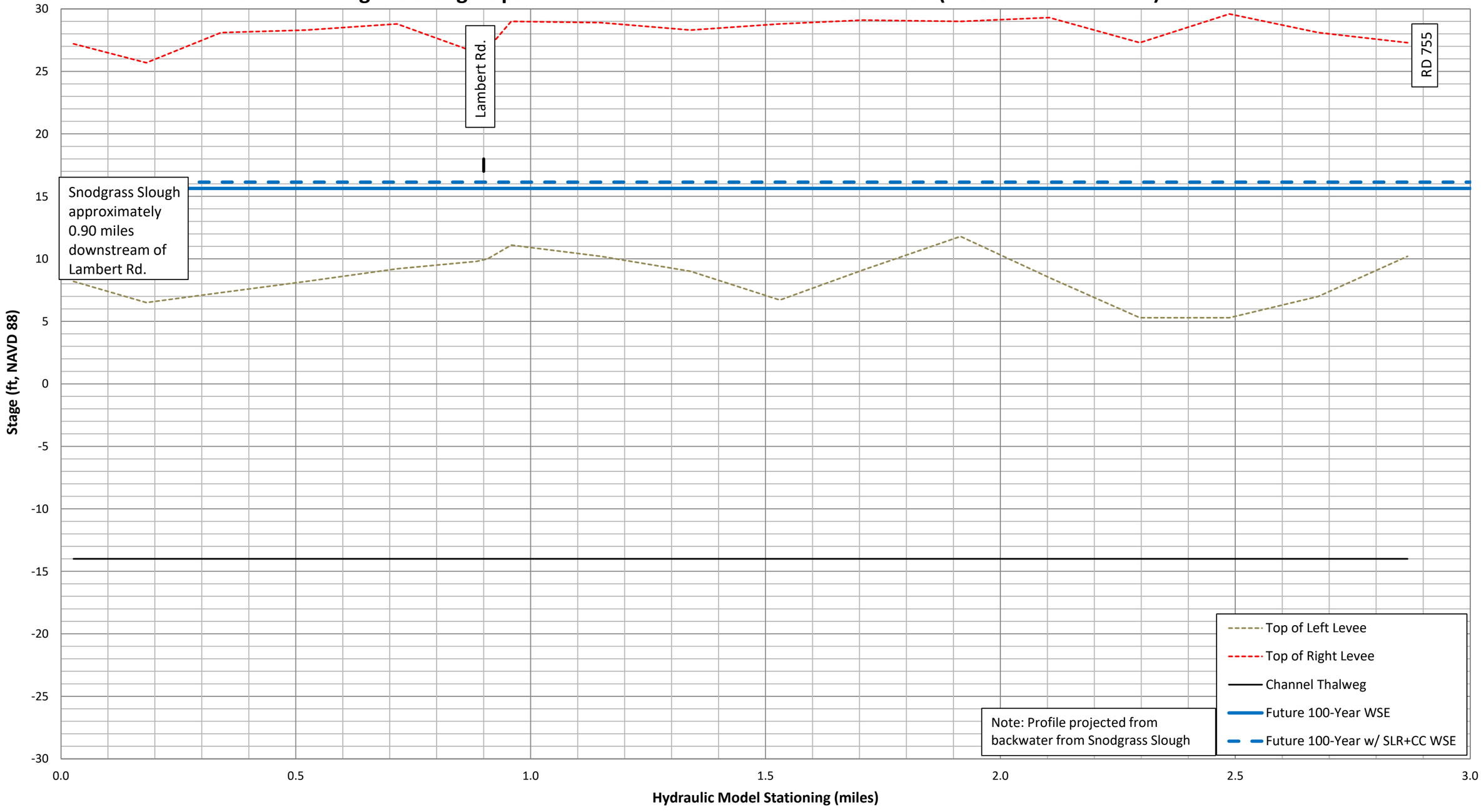
October 2020

Sacramento County
Small SPFC Communities
Yolo Bypass 100-Year



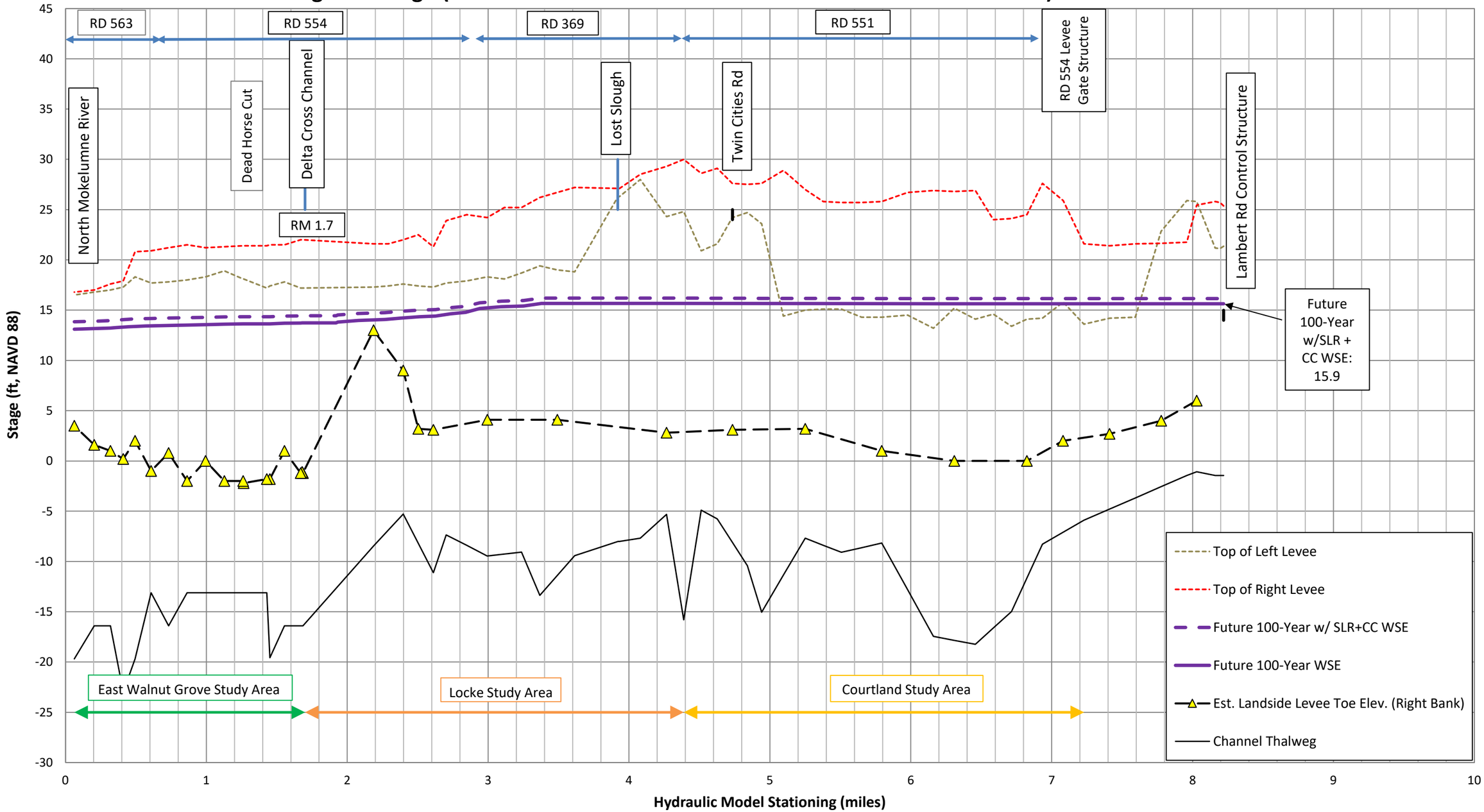
October 2020

Sacramento County
Delta Legacy Small Communities
Extension of Snodgrass Slough Upstream of RD 551 Gate Structure to RD 755 (RD 551 Borrow Canal) 100-Year WSE Profile



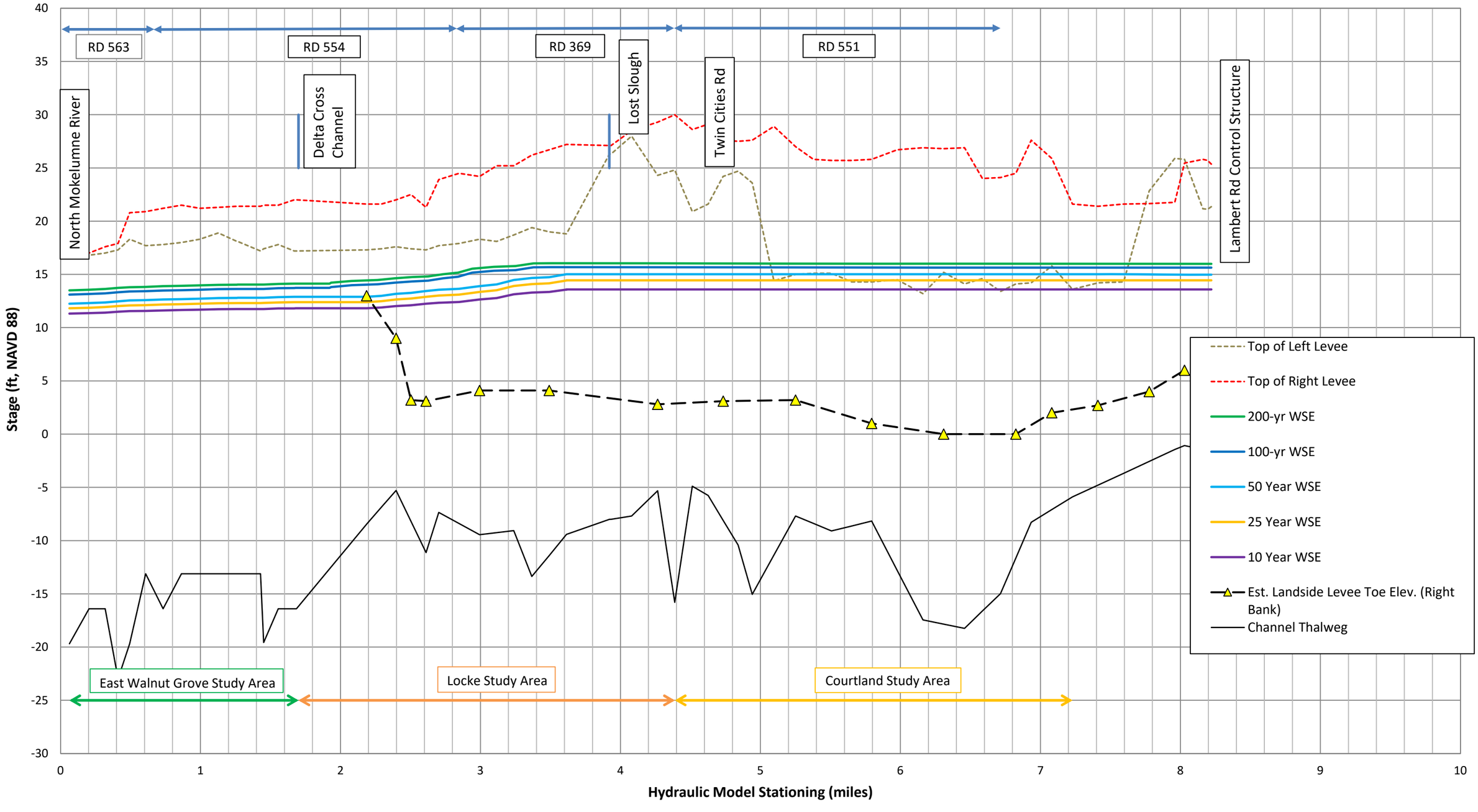
October 2020

Sacramento County
Delta Legacy Small Communities of East Walnut Grove, Locke & Courtland
Snodgrass Slough (North Mokelumne River to Lambert Road Control Structure) 100-Year WSE Profile



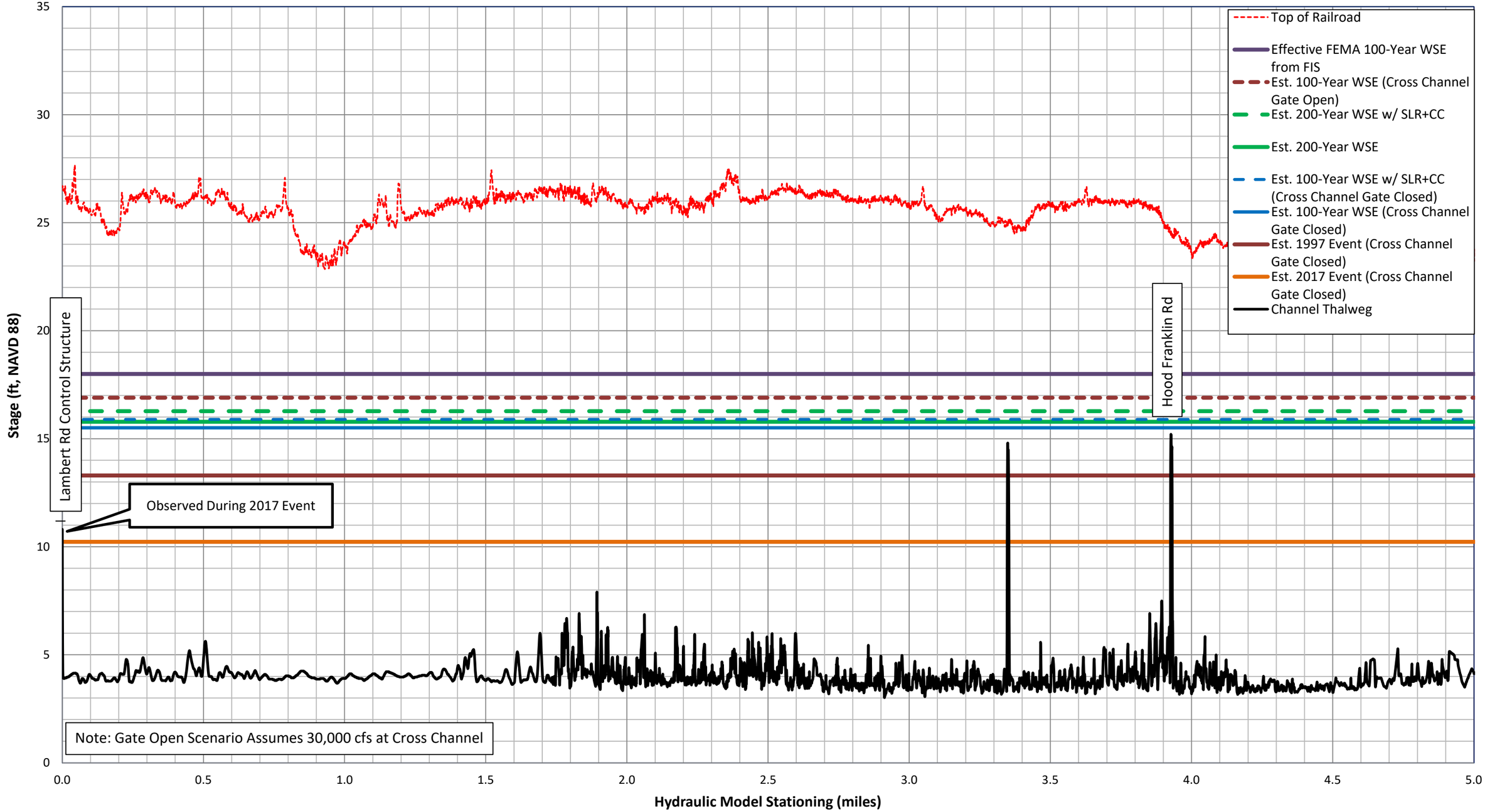
October 2020

Sacramento County
Delta Legacy Small Communities
Snodgrass Slough (Lambert Road Control Structure to Confluence of North Mokelumne River) Existing WSE Profiles



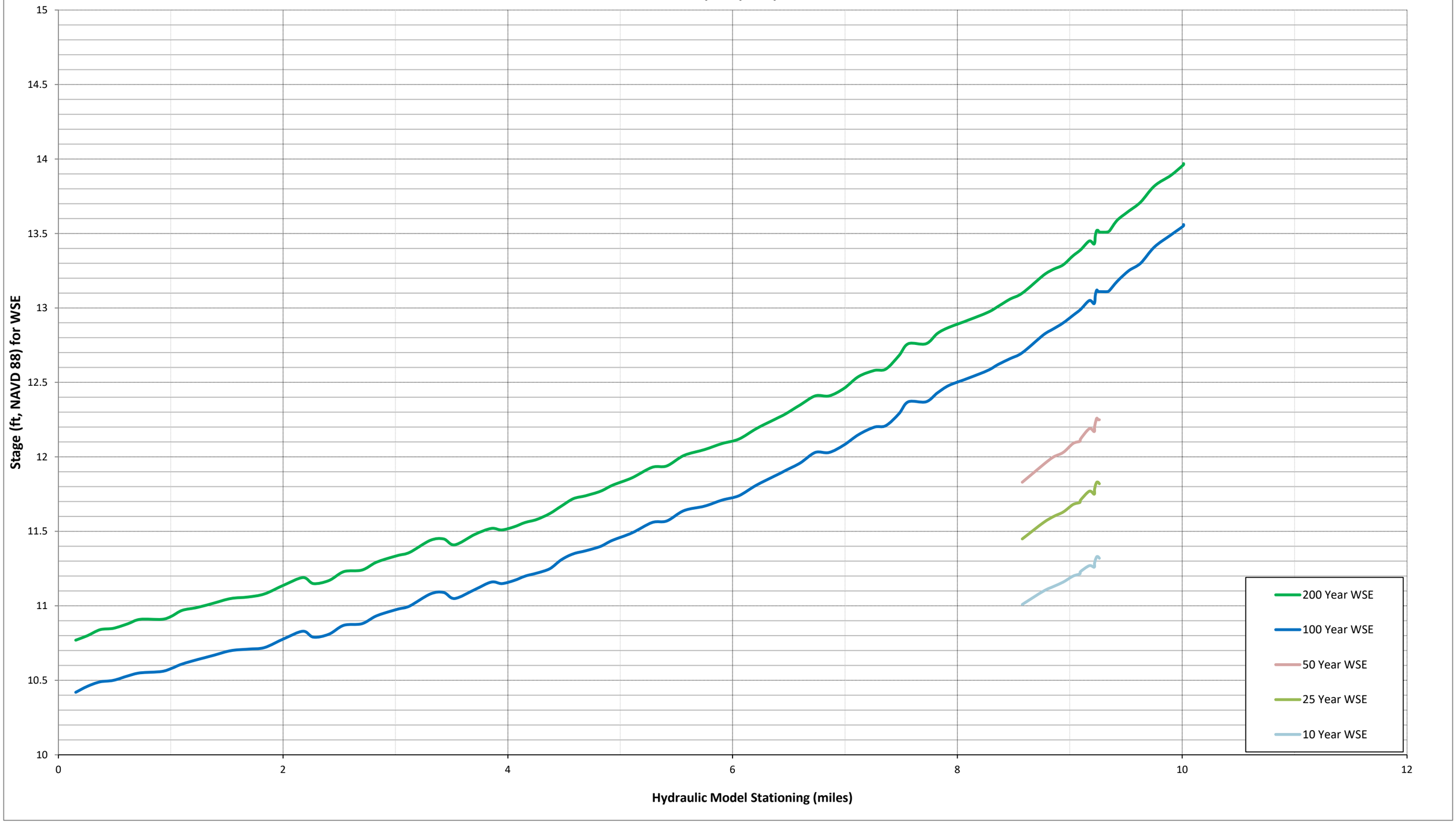
October 2020

Sacramento County
Delta Legacy Small Communities
Snodgrass Slough - Lambert Road Control Structure to Railroad Embankment east of Hood



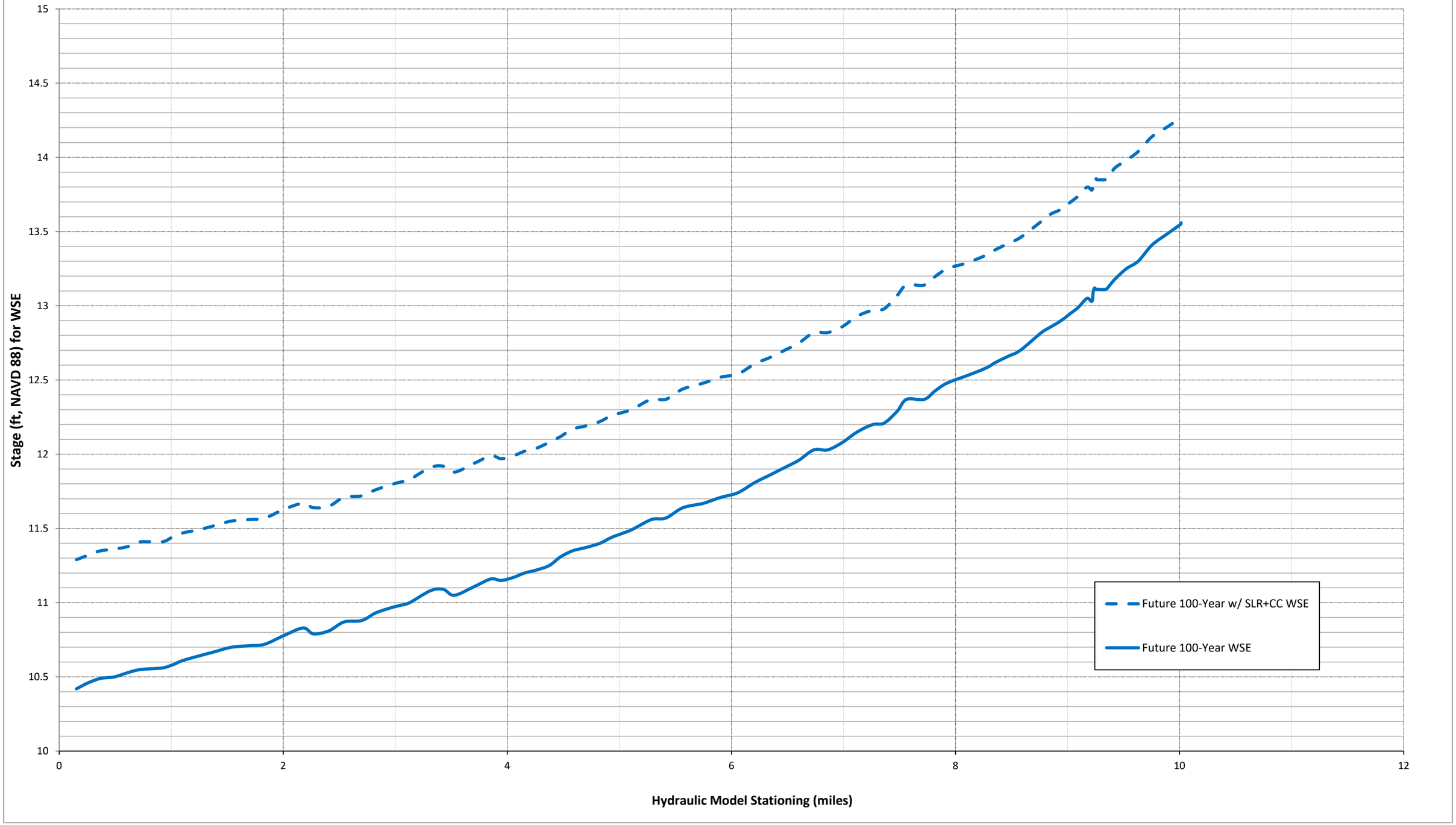
October 2020

Sacramento County
Delta Legacy Small Community of East Walnut Grove
North Fork Mokelumne 10, 25, 50, 100 & 200-Year WSE Profiles



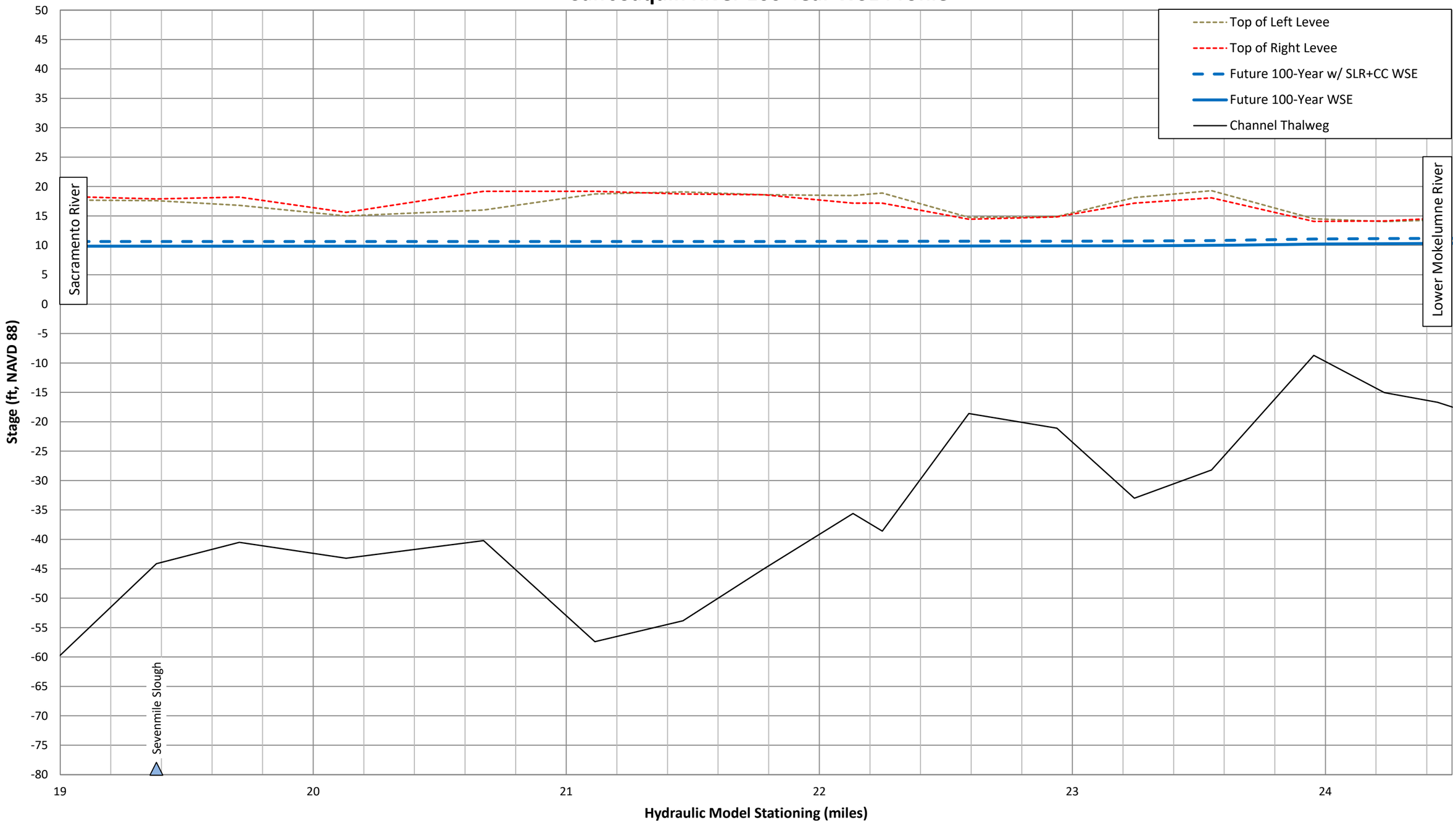
October 2020

Sacramento County
Delta Legacy Small Community of East Walnut Grove
North Fork Mokelumne 100-Year WSE Profile



October 2020

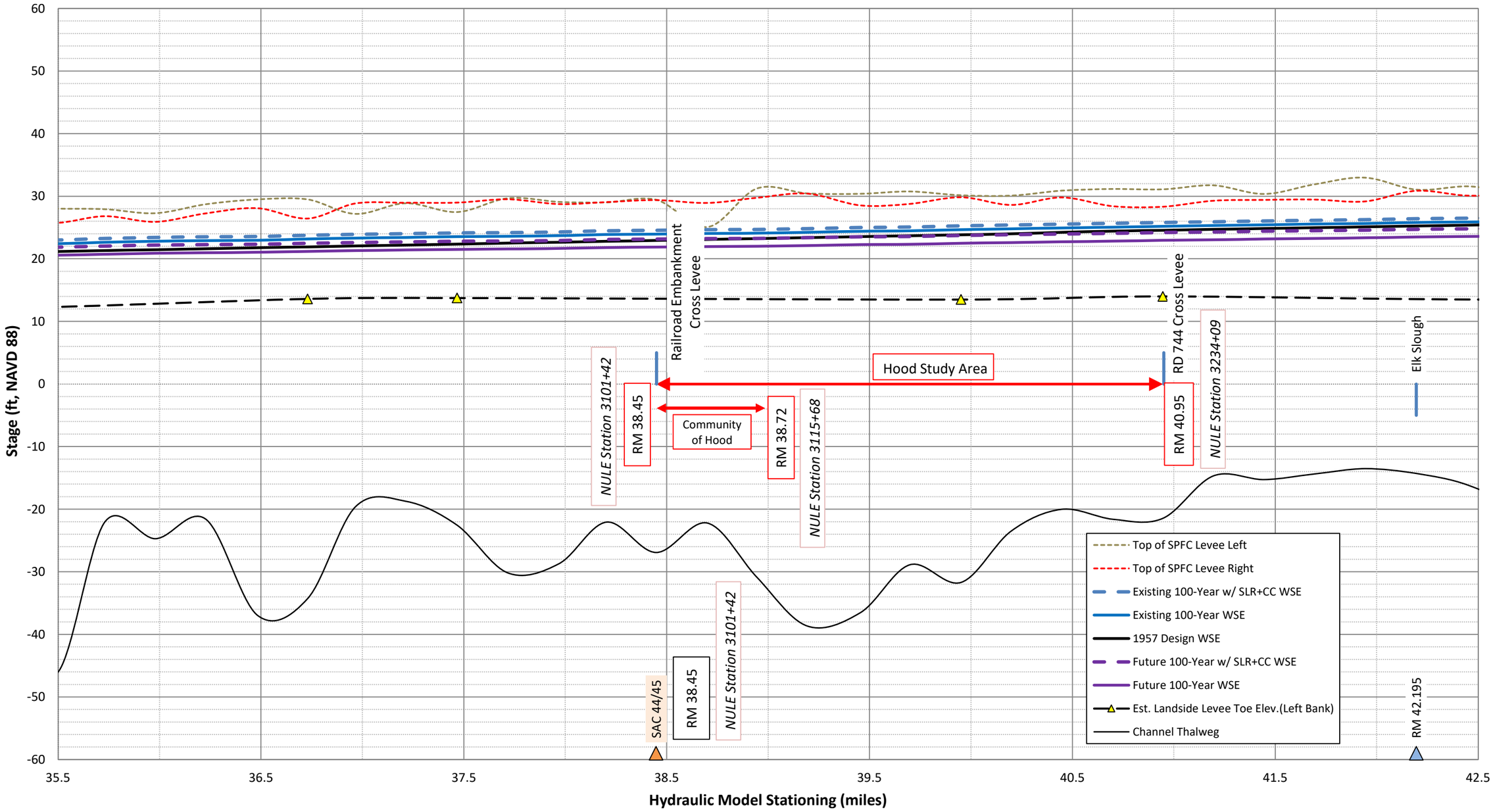
Sacramento County
Delta Legacy Small Communities
San Joaquin River 100-Year WSE Profile



Appendix E – Community-Specific Water Surface Elevation Tables and Profiles

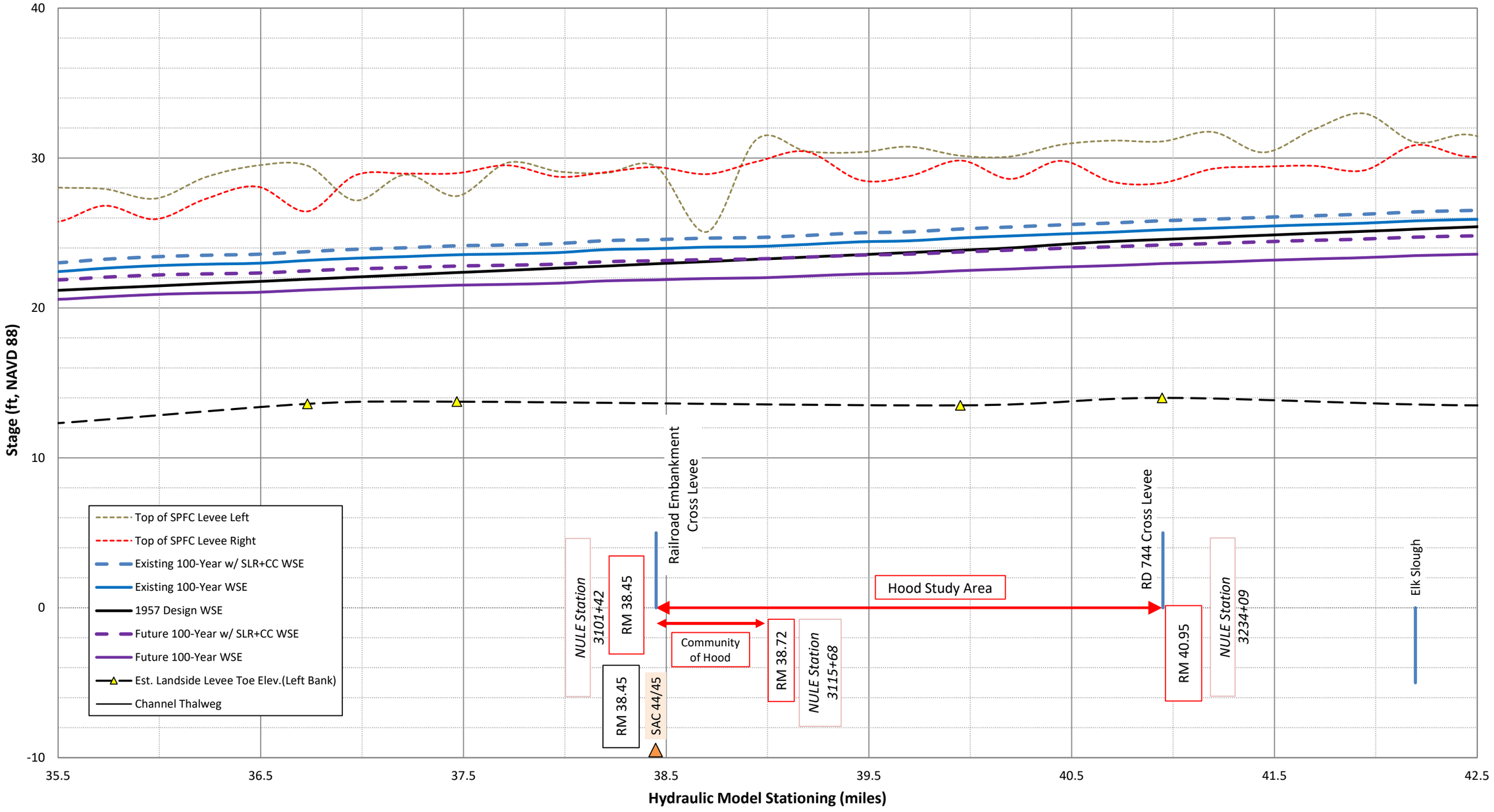
October 2020

Sacramento County
Delta Legacy Small Community of Hood
Lower Sacramento River 100-Year WSEL Profile



October 2020

Sacramento County
Delta Legacy Small Community of Hood
Lower Sacramento River 100-Year WSEL Profile



Delta Legacy Small Communities
Hood
Existing and Future 100-Year
Stage and Flow Results (Datum: NAVD 88)

October 2020

HEC-RAS Cross Section	Reclamation District	NULE Left (L) Right (R) Levee	NULE Segment No.	NULE Station	Top of Levee Elevation		Freeboard Elevation Subtracted from Top of Levee		Existing 100-Year (CVHS Model, 1997 90%)		Future 100-Year w/CC + SLR (CVHS Model, 1997 90%)		1955/1957 Stage	1955/1957 Design Flows	O&M Design Flows	Notes
					Left	Right	Left	Right	Stage	Flow	Stage	Flow	Stage	Flow	Flow	
					Ft.	Ft.	Ft.	Ft.	Ft.	cfs	Ft.	cfs	Ft.	cfs	cfs	
Sacramento River: RD 744 Cross Levee to RD 755																
SAC_R08_41.943	MA 9	SACR-L	106	328855	32.98	29.18	29.98	26.18	25.66	113,246	24.60	100,652	25.12	110,000	110,000	
SAC_R08_41.694	MA 9	SACR-L	106	327533	31.91	29.48	28.91	26.48	25.56	113,246	24.51	100,652	24.98	110,000	110,000	
SAC_R08_41.445	MA 9	SACR-L	106	326150	30.38	29.43	27.38	26.43	25.45	113,246	24.42	100,652	24.85	110,000	110,000	
SAC_R08_41.194	MA 9	SACR-L	106	324790	31.74	29.28	28.74	26.28	25.32	113,246	24.30	100,652	24.71	110,000	110,000	
SAC_R08_40.946	MA 9	SACR-L	106	323409	31.11	28.34	28.11	25.34	25.21	113,246	24.21	100,652	24.57	110,000	110,000	
SAC_R08_40.699	MA 9	SACR-L	106	322050	31.17	28.42	28.17	25.42	25.06	113,245	24.08	100,652	24.44	110,000	110,000	
SAC_R08_40.447	MA 9	SACR-L	106	320693	30.89	29.82	27.89	26.82	24.94	113,245	23.98	100,652	24.24	110,000	110,000	
SAC_R08_40.197	MA 9	SACR-L	106	319310	30.10	28.61	27.10	25.61	24.80	113,245	23.86	100,652	24.00	110,000	110,000	
SAC_R08_39.951	MA 9	SACR-L	106	317882	30.16	29.84	27.16	26.84	24.67	113,245	23.74	100,652	23.85	110,000	110,000	
SAC_R08_39.698	MA 9	SACR-L	106	316479	30.76	28.79	27.76	25.79	24.48	113,245	23.59	100,652	23.70	110,000	110,000	
SAC_R08_39.455	MA 9	SACR-L	106	315310	30.39	28.54	27.39	25.54	24.41	113,245	23.53	100,652	23.55	110,000	110,000	
SAC_R08_39.193	MA 9	SACR-L	106	314174	30.46	30.42	27.46	27.42	24.24	113,245	23.39	100,652	23.40	110,000	110,000	
SAC_R08_38.945	MA 9	SACR-L	106	312872	31.25	29.76	28.25	26.76	24.10	113,245	23.27	100,652	23.25	110,000	110,000	
SAC_R08_38.701	MA 9	SACR-L	106	311539	25.08	28.93	22.08	25.93	24.06	113,245	23.23	100,652	23.10	110,000	110,000	Community of Hood
SAC_R08_38.448	813 / MA 9	SACR-L	106	310142	29.44	29.39	26.44	26.39	23.96	113,244	23.15	100,651	22.95	110,000	110,000	Index Point: SAC 44/45
SAC_R08_38.203	813 / MA 9	SACR-L	106	308807	29.01	29.06	26.01	26.06	23.89	113,244	23.09	100,651	22.80	110,000	110,000	
SAC_R08_37.968	813 / MA 9	SACR-L	106	307342	29.11	28.75	26.11	25.75	23.70	113,243	22.93	100,651	22.66	110,000	110,000	
SAC_R08_37.717	813 / MA 9	SACR-L	106	305992	29.69	29.52	26.69	26.52	23.61	113,243	22.85	100,651	22.51	110,000	110,000	
SAC_R08_37.467	813 / MA 9	SACR-L	106	304666	27.47	28.99	24.47	25.99	23.55	113,243	22.80	100,651	22.36	110,000	110,000	
SAC_R08_37.215	813 / MA 9	SACR-L	106	303348	28.90	28.96	25.90	25.96	23.43	113,243	22.70	100,651	22.21	110,000	110,000	
SAC_R08_36.966	813 / MA 9	SACR-L	106	302005	27.18	28.85	24.18	25.85	23.32	113,241	22.61	100,651	22.06	110,000	110,000	