



**SMITH CANAL CLOSURE STRUCTURE
EARLY IMPLEMENTATION PROGRAM
PROJECT REPORT**

February 2011

TABLE OF CONTENTS

1. Proposal Cover Sheet	1
2. Executive Summary.....	3
3. Background.....	6
3.1 Setting	6
3.2 History.....	6
3.3 Involved Public Agencies.....	7
3.3.1 Local Agencies.....	7
3.3.2. State Agencies.....	7
3.3.3. Federal Agencies	8
4. Project Description.....	11
4.1 Project Need	11
4.2 Project Design Water Surface Elevations	11
4.3 Project Site Selection	14
4.4 Smith Canal Closure Structure	14
5. Project Alternatives	20
5.1 Fix-In-Place Levee Improvements Alternative	20
5.2 Sheet Pile Wall Alternative	23
5.3 Alternate Location for Closure Structure.....	25
6. Area Plan	30
6.1 Area Project 2.....	30
7. Improvement Project Findings.....	37
8. Economic Feasibility	40
9. Most Cost Effective Alternative	43
10. Financial Plan	44
11. Recommended Cost-Share	46
12. Work Plan	47
Task 1.0 Program Management.....	47
Task 2.0 Engineering Design	47
Task 3.0 Independent Review.....	48
Task 4.0 CEQA/NEPA Compliance and Permitting.....	48
Task 5.0 Real Estate Acquisition Plan.....	54
Task 6.0 Public Outreach.....	54
13. Schedule	55

List of Figures

Figure 1 - Vicinity Map.....	2
Figure 2 - Closure Structure Site Map	4
Figure 3 - Lower San Joaquin River Feasibility Study Area	10
Figure 4 - Flood Depths	12
Figure 5 - Gage Station Locations.....	13
Figure 6 - Closure Structure Layout.....	15
Figure 7 - Cross Section Through Dual Sheet Pile Wall	17
Figure 8 - Cross Section Through Gate	18
Figure 9 - Fix-in-Place Alternative.....	21
Figure 10 - Sheet Pile Wall Alternative	24
Figure 11 - 'Adjacent to Atherton Island' Alternative.....	26
Figure 12 - 'Upstream of Atherton Island' Alternative	28
Figure 13 - Central Stockton Area Plan.....	31
Figure 14 - Area Project No. 2	34

List of Tables

Table 1 - Closure Structure Cost Estimate.....	19
Table 2 - Fix-In-Place Levee Improvements Alternative Cost Estimate.....	22
Table 3 - Sheet Pile Alternative Cost Estimate	23
Table 4. Adjacent to Atherton Island Alternative Cost Estimate.....	25
Table 5. Upstream of Atherton Island Alternative Cost Estimate	27
Table 6. Alternatives Cost Comparison	29
Table 7. Project Alternatives Implementation Issue Matrix.....	29
Table 8. 100 & 200-Year Flows for Stockton Diverting Canal and Lower Calaveras River	32
Table 9. Hypothesized annual probability of flooding and associated elevation	41
Table 10. IR benefit for the Smith Canal closure structure considering 5 hypothetical without-project conditions.....	42
Table 11. Alternatives Cost Comparison	43
Table 12. Summary of Project Costs by Phase	45
Table 13. Design Costs Breakdown: Credit Eligible Costs and Future Costs	45
Table 14. Summary of Cost-Sharing Recommendations.....	46

February 2010

ENGINEER'S SIGNATURE PAGE

This report for the San Joaquin Area Flood Control Agency entitled "The Smith Canal Closure Structure Early Implementation Program Project Report" has been prepared by or under the direct supervision of the following registered Civil Engineers:



Finbarr J O'Regan
2/10/2011

1. Proposal Cover Sheet

This report has been developed in response to the State's Project Solicitation Proposal (PSP) inviting local agencies to submit projects for Early Implementation Program Funding.

Proposed Project: The proposed project is the design of a closure structure at the mouth of Smith Canal on the San Joaquin River/Stockton Deep Water Ship Channel, in Stockton (see Figure 1). The closure structure is needed because the existing levees along Smith Canal do not meet FEMA or State standards for levees, placing approximately 7,800 homes at risk from flooding. A detailed project description of the proposed project can be found in Section 4.

Project Applicant: The Project Applicant is the San Joaquin Area Flood Control Agency (SJAFCA). The PSP Applicant Statement forms are included in Appendix 1.

Funding Amount Request: SJAFCA is initially requesting EIP funding in the amount of \$2,412,500 (50% of the project design phase costs).

Project Alternatives: An evaluation of Project Alternatives can be found in Section 5.

Area Plan: A description of the Area Plan can be found in Section 6. The Area Plan consists of two Area Projects, one of which is the Smith Canal Closure Structure. Implementation of the Area Plan by 2025 is feasible.

SB 5 Findings: The Smith Canal Closure Structure is considered an improvement project under EIP Guidelines which requires specific findings to be made before funding is made available. Section 7 provides a statement from the Applicant regarding the required Findings.

Economic Feasibility: An inundation reduction analysis was conducted which concluded that the Project is economically feasible. See Section 8 for a summary and Appendix 7 for the inundation reduction analysis report.

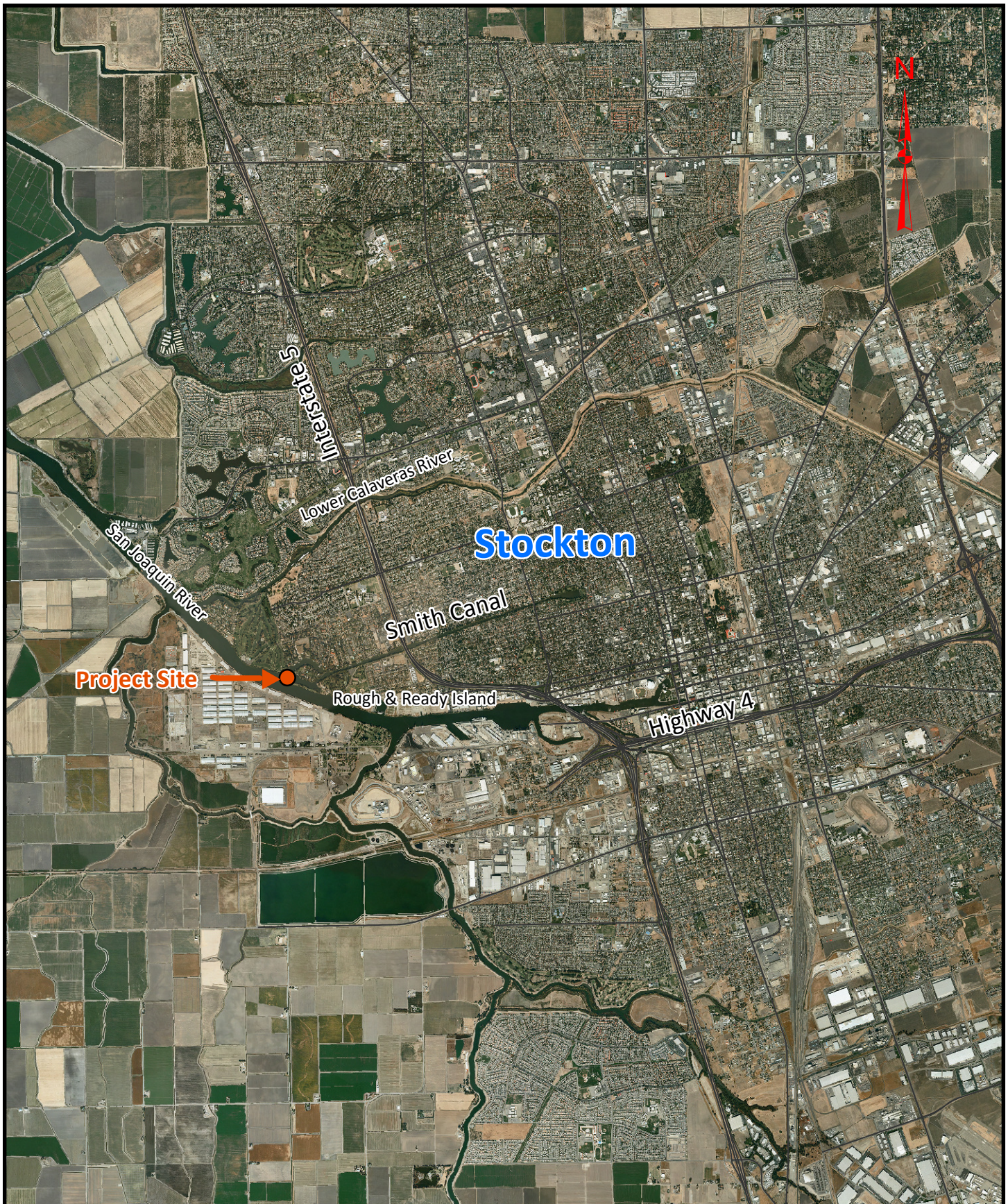
Most Cost Effective Alternative: The alternatives analysis discussed in Section 5 demonstrates that the closure structure is the most cost effective alternative.

Financial Plan: A financial plan was prepared and can be found in Appendix 8.

Cost Share Recommendation: SJAFCA is requesting a 50% cost share for the design phase of the project. SJAFCA's Cost Share recommendation can be found in Section 11.

Work Plan: A work plan for the work proposed to be conducted under this EIP funding application can be found in Section 12.

Schedule: SJAFCA has already been engaged on this project since 2008 and is ready to initiate the next elements of the design phase in September 2011. SJAFCA hopes to complete the design/environmental review phase by July 2013, following right of way acquisition, and beginning construction in July 2014.



2. Executive Summary

Smith Canal is a man-made backwater slough of the San Joaquin River adjacent to the Sacramento-San Joaquin Delta (Delta) and is located in the city of Stockton, just north of the Deep Water Ship Channel. Smith Canal is leveed to prevent back-flooding from the Delta. The Smith Canal levees are heavily encroached upon and cannot be certified as meeting FEMA standards or the State's Interim Levee Design Criteria. When it became evident that the Smith Canal levees would lose their FEMA accreditation, the San Joaquin Area Flood Control Agency (SJAFCA) partnered with the Smith Canal levee owners, Reclamation District 1614 (north bank levee) and Reclamation District 828 (south bank levee), and took the lead in evaluating options for restoring flood protection to the Smith Canal area.

A number of alternatives for restoring flood protection to the area were evaluated. In-place rehabilitation of the levees was determined to be economically infeasible and the preferred alternative was determined to be constructing a closure structure at the mouth of Smith Canal. The proposed closure structure will consist of a fixed sheet pile wall structure with an opening gate structure to allow for navigation and tidal movement of water in Smith Canal. The structure will extend from the tip of Dad's Point Levee, an existing land bar separating the Louis Park boat launch area from the San Joaquin River, northerly across open water to connect with the San Joaquin River right bank levee (see Figure 2).

The fixed segment of the structure will consist of a dual sheet pile wall filled with granular material. The opening portion of the closure structure will be an "Obermeyer" type gate structure, consisting of a stainless steel gate which will be raised and lowered by inflating and deflating a rubber bladder. The Smith Canal Closure Structure is to be operated at the mouth of Smith Canal during tide events forecasted to approach or exceed the design operating water surface elevation. The closure structure would remain open at all other times to allow for navigation and tidal movement of water in Smith Canal.

The Smith Canal design water surface elevations are determined by Delta water surface elevations which are elevated when high tides combine with high flows on the Sacramento and San Joaquin Rivers. These conditions typically occur between November 1st and April 30th. The Smith Canal Closure Structure would be operated as needed during these times to prevent high tidal flows from entering into Smith Canal. The closure gate would be activated when tide forecasts predict high tides that could approach or exceed the design water surface elevation. The gate would be raised at the lowest tide prior to the high tide, and remain closed until the high tide begins to recede. The gate would then be opened to allow any interior drainage that accumulated in Smith Canal during the closure period, to flow out.

SJAFCA has had extensive discussions with FEMA on the use of a closure structure as a method of providing flood protection for the Smith Canal area. SJAFCA prepared 30%



engineering design plans of the closure structure and submitted a request to FEMA for a Conditional Letter of Map Revision (CLOMR). FEMA recently completed their review of SJAFCA's CLOMR request and concurred that the closure structure meets FEMA standards for providing at least 100-Year flood protection.

At their January 26, 2011 Board meeting, the SJAFCA Board of Directors entered into a partnership and cost sharing agreement with RD 1614 and RD 828 to facilitate continued collaboration between all parties as they work to improve flood protection for the Smith Canal area. With this partnership and cost sharing agreement in place, the SJAFCA Board elected to move forward with the formation of a capital and operation & maintenance (O&M) benefit assessment district to finance the local share of the project's design, capital and O&M costs. Formation of the assessment district will be subject to a Proposition 218 election which SJAFCA expects to hold in early summer 2011. SJAFCA is holding the Proposition 218 election early in the project development process so that DWR has certainty that local funds will be available to match EIP funds, and that there will be sufficient local funding for all phases of the project.

The total project cost is estimated to be \$30M. An economic feasibility analysis was undertaken and shows that the closure structure has a positive cost/benefit ratio. SJAFCA is initially requesting EIP funding for the project design phase. Design phase costs are estimated to be \$4,825,000, and SJAFCA is requesting EIP funding in the amount \$2,412,500 (50% of the design phase costs). SJAFCA hopes to begin final engineering design and the environmental review work in 2011 and begin construction in 2013/14 with the goal of having the closure structure operational in late 2015/early 2016.

3. Background

3.1 Setting

The Smith Canal is a backwater slough of the Sacramento-San Joaquin Delta (Delta) and is located in the city of Stockton, just north of the Deep Water Ship Channel and south of the Calaveras River (see Figure 1). It is a man-made, navigable urban waterway that extends from the San Joaquin River, 2.5 miles inland to Yosemite Lake. Smith Canal is leveed to prevent back-flooding from the Delta. The Smith Canal levees are heavily encroached upon and it is not economically feasible to accredit the levees as meeting FEMA standards or the State's Interim Levee Design Criteria.

The predominant land use within the Smith Canal area is single-family residential development, with some commercial and institutional land uses. The enclosed DVD includes a Google Earth aerial tour of Smith Canal.

3.2 History

Smith Canal is named for Mr. J.C. Smith, a prominent landowner in Stockton during the late 1800's, whose land abutted the canal. While it is reported that some form of drainage ditch/canal was dug in the late 1800's to drain Mr. Smith's land, it appears "Smith Canal" was formally initiated in 1887, when the State of California enacted Chapter XCIII (See Appendix 2) to provide for the construction and maintenance of an open canal as a westerly extension to the North Street Canal. The North Street Canal was used by the State Insane Asylum for sanitary and drainage purposes, and in 1889 the Board of Directors for the State Asylum reported an open canal was to be built (Smith Canal) to discharge storm water and sewage from the State Asylum to the Delta "so as to improve relationships with local asylum neighbors offended by hospital sewage". The State appropriated \$40,000 to the State Insane Asylum "for the construction and maintenance of levees and embankments" along what is now Smith Canal.

Smith Canal was identified on a City/County survey map of 1894 although the exact completion date is not clearly documented in maps from the 1890's. As Stockton expanded northwards portions of the North Street Canal were filled in and replaced with underground pipes but the Smith Canal extension to the Delta remained. Reclamation District No. 1614 (RD 1614) and Reclamation District No. 828 (RD 828) were formed to maintain area levees. At some unknown point in time the north bank levee of Smith Canal came to be maintained by RD 1614 and the south bank levee maintained by RD 828.

3.3 Involved Public Agencies

3.3.1 Local Agencies

Reclamation District No. 1614 & Reclamation District No. 828

Reclamation District No. 1614 (RD 1614) and Reclamation District No. 828 (RD 828) were formed to maintain area levees, and in RD 1614's case to provide for drainage as well. The north bank levee of Smith Canal is maintained by RD 1614 and the south bank levee is maintained by RD 828. Both reclamation districts are organized under provisions of the California Water Code for the purpose of providing a means of flood control to the lands they encompass.

San Joaquin Area Flood Control Agency

The San Joaquin Area Flood Control Agency (SJAFC) is a Joint Powers Authority that was created in May 1995 between the City of Stockton, San Joaquin County and the San Joaquin County Flood Control and Water Conservation District for the purpose of addressing flood protection for the City of Stockton and surrounding unincorporated county areas. SJAFC has a four member Board of Directors with two members from the Stockton City Council and two members from the San Joaquin County Board of Supervisors. When it became evident that the Smith Canal levees would lose their FEMA accreditation, SJAFC partnered with RD 1614 and RD 828 and took the lead in evaluating options for restoring flood protection to the Smith Canal area.

City of Stockton & San Joaquin County

The Smith Canal area includes areas within the City of Stockton city limits and areas which lie within unincorporated San Joaquin County.

3.3.2. State Agencies

State of California Department of Water Resources

The passage of the Disaster Preparedness and Flood Prevention Bond Act of 2006 (Proposition 1E) and the Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006 (Proposition 84), authorized the Department of Water Resources (DWR) to make funds available to Local Agencies for, among other things, flood protection work.

In 2007, new State legislation (SB 5) was enacted to guide flood management strategies and action within the Central Valley. A key component of this legislation is the requirement that DWR develop a Central Valley Flood Protection Plan. This plan will require urban areas in the Central Valley to develop and implement a plan for providing 200-year flood protection by 2025.

February 2010

SB 5 also provides guidance on how DWR should make Proposition 1E and Proposition 84 funding available to local agencies through the Early Implementation Program (EIP) in advance of adoption of the Central Valley Flood Protection Plan. Therefore SJAFCA is seeking to partner with DWR to utilize EIP funds to improve flood protection for the Smith Canal area.

3.3.3. Federal Agencies

Federal Emergency Management Agency

In the wake of Hurricane Katrina the Federal Emergency Management Agency (FEMA) began to update Flood Insurance Rate Maps (FIRMs) across the nation. Known as the Map Modernization Program, these new FIRMs have replaced the previous paper flood maps for many communities including the City of Stockton and San Joaquin County. Since the Smith Canal levees could not be certified as meeting FEMA standards for providing protection against the 100-Year base flood event, the new FEMA FIRMs discredited the Smith Canal levees and placed the Smith Canal area within the FEMA 100-Year floodplain.

SJAFCA has had extensive discussions with FEMA on the use of a closure structure as a method of providing flood protection for the Smith Canal area. SJAFCA prepared 30% engineering design plans of the closure structure and submitted a request to FEMA for a Conditional Letter of Map Revision (CLOMR). FEMA recently completed their review of SJAFCA's CLOMR request and concurred that the closure structure meets FEMA standards for providing at least 100-Year flood protection (see Appendix 4).

United States Army Corps of Engineers

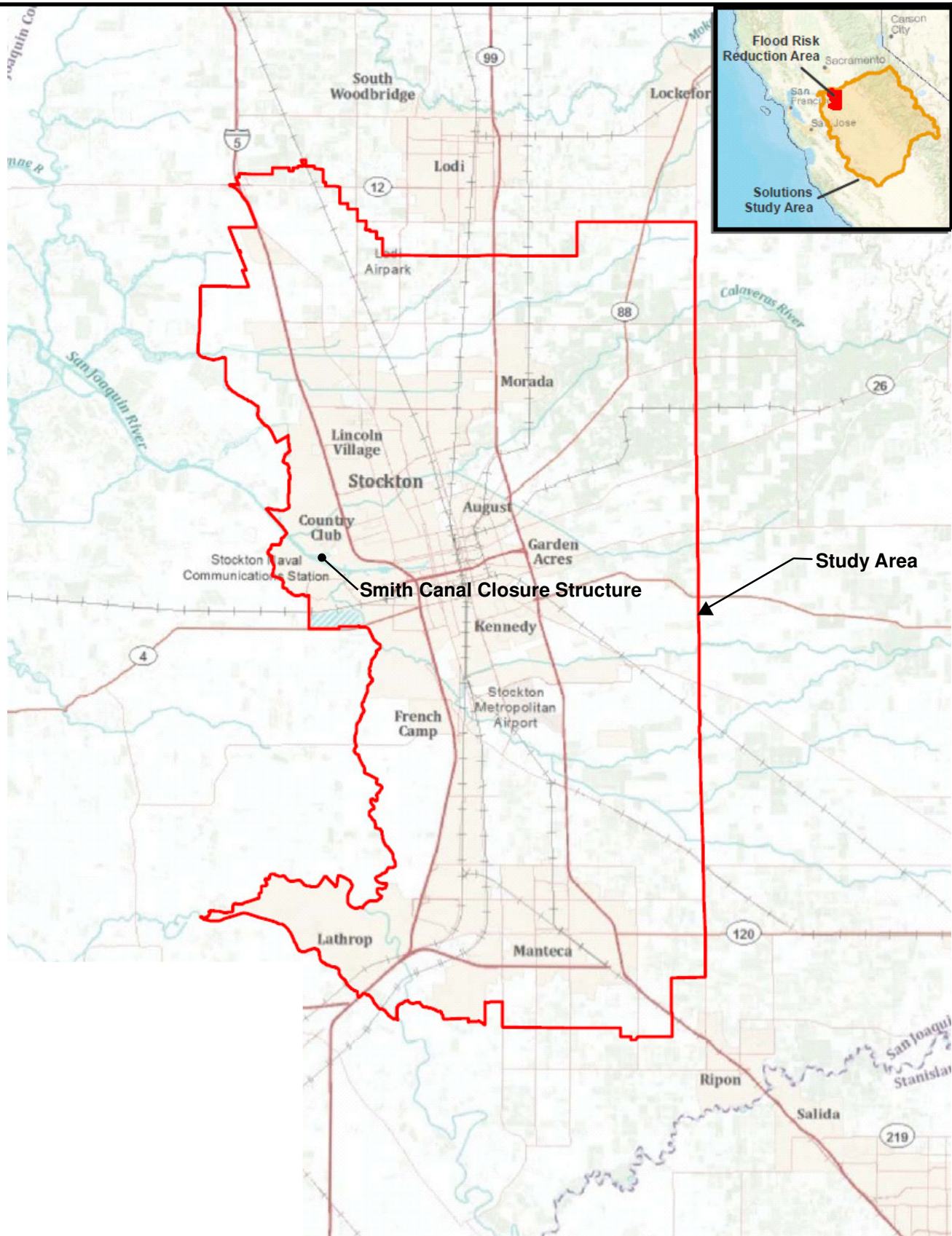
The United States Army Corps of Engineers (USACE) Sacramento District completed a Section 905(b) Analysis (reconnaissance study) of flood damage reduction and ecosystem restoration improvement along the Lower San Joaquin River in September 2004. Based significantly on the findings of the earlier Sacramento-San Joaquin Basins Comprehensive Study (Comp Study), the Corps concluded that the Lower San Joaquin River system cannot safely convey the flows that it was formerly considered capable of accommodating. The reconnaissance report included a letter dated 20 September 2004 from DWR agreeing to participate in the study with the Corps as the non-federal sponsor. However, coordination with the local sponsor at the time (South Delta Water Agency), failed to generate sufficient interest to continue with completing the Project Management Plan (PMP) and Feasibility Cost Sharing Agreement (FCSA) required for the feasibility study. Accordingly, efforts to continue into the feasibility phase faded.

In early 2007, SJAFCA approached the USACE to assess opportunities for achieving increased levels of flood control within the region. It was concluded to use the approved reconnaissance report for the Lower San Joaquin River as the vehicle for continuing with the feasibility study. In November 2007, the State issued a letter of intent to the Corps to be the non-federal sponsor for the Lower San Joaquin River Feasibility Investigation.

February 2010

The USACE completed the PMP in 2008, and an FCSA with local interests was executed by SJAFCA and USACE in February 2009. The Central Valley Flood Protection Board signed onto the agreement in 2010 on behalf of the State.

The LSJRFSS study area will reach to the southern part of San Joaquin County along the San Joaquin River up to and through Stockton. In addition, the study includes the watersheds east of Stockton, and covers nearly 140 miles of levees (see Figure 3). The Smith Canal area is included within the feasibility study area. The results of the feasibility study will help determine needed improvements for future flood protection systems in an effort to reach or exceed a 200-year level of flood protection for the region. The feasibility study is expected to be completed by 2017 and will provide the avenue for recouping the federal share of the Smith Canal work. SJAFCA has already submitted a Section 104 Credit Eligibility Request to USACE for the Smith Canal Closure Structure.



4. Project Description

4.1 Project Need

The Smith Canal levees lost their FEMA accreditation in 2009 due to extensive encroachments onto the levees, primarily from residential structures. The loss of FEMA accreditation has initially placed approximate 5,000 properties in the FEMA 100-Year floodplain. New LiDAR topographical data recently developed by DWR indicates that the original FEMA floodplain was incorrectly delineated and should in fact extend further eastward. Using this new data FEMA has begun a floodplain remapping effort and an additional 2,800 homes are expected to be placed in the FEMA 100-Year floodplain within the next 12-18 months. Figure 4 shows the entire 100-Year floodplain based upon the latest DWR LiDAR data and revised FEMA floodplain delineation analysis.

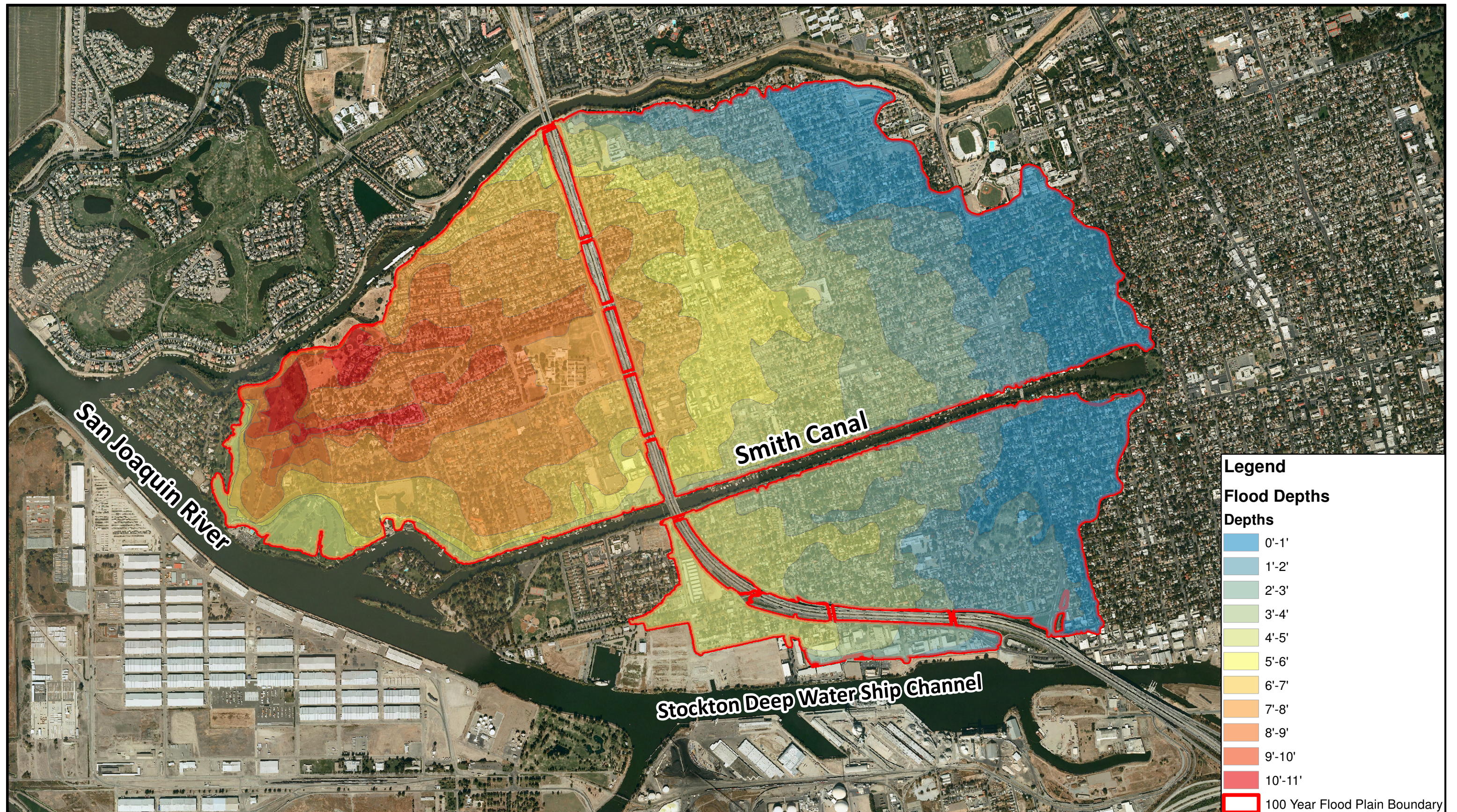
When it became evident that the Smith Canal levees would lose their FEMA accreditation, SJAFCA partnered with RD 1614 and RD 828, and took the lead in evaluating options for restoring flood protection to the Smith Canal area. A number of alternatives for restoring flood protection to the area were evaluated. In-place rehabilitation of the levees has been determined to be economically infeasible and the preferred alternative was determined to be a closure structure constructed at the mouth of Smith Canal.

In addition to restoring 100-Year flood protection, the closure structure will also be the first Area Project of the Central Stockton Area Plan which is been developed with the goal of providing the central Stockton area with 200-Year flood protection by 2025. The Area Plan is discussed in more detail in Section 6 of this report.

4.2 Project Design Water Surface Elevations

To determine the height of the closure structure, water surface elevations within Smith Canal had to be analyzed. Water surface elevations within Smith Canal design are determined by Delta water surface elevations which are elevated when high tides combine with high flows on the Sacramento and San Joaquin Rivers. These conditions typically occur between November 1st and April 30th.

The FEMA Flood Insurance Rate Maps for the Stockton area reflect 100-Year base flood elevations (BFEs) developed in 1978 by the United States Army Corps of Engineers (USACE). The BFEs were developed from stage frequency analyses from tidal gage data collected in the Delta. The USACE updated these analyses in 1982 and 1992, but FEMA mapping remained tied to the 1978 study. Therefore in 2010 SJAFCA, using a grant from FEMA, commissioned a study to update the 1992 stage-frequency analysis at two gage stations near Stockton: San Joaquin River at Rindge Pump (Rindge Pump) Gage, and Stockton Ship Channel at Burns Cutoff (Burns Cutoff) Gage. The Burns Cutoff Gage is located on the San Joaquin River near the mouth of Smith Canal, and therefore provides excellent information on water surface elevations within Smith Canal (see Figure 5).



**SMITH CANAL
FLOOD DEPTHS FROM 100 YEAR EVENT**



0 500 1,000 2,000
Feet

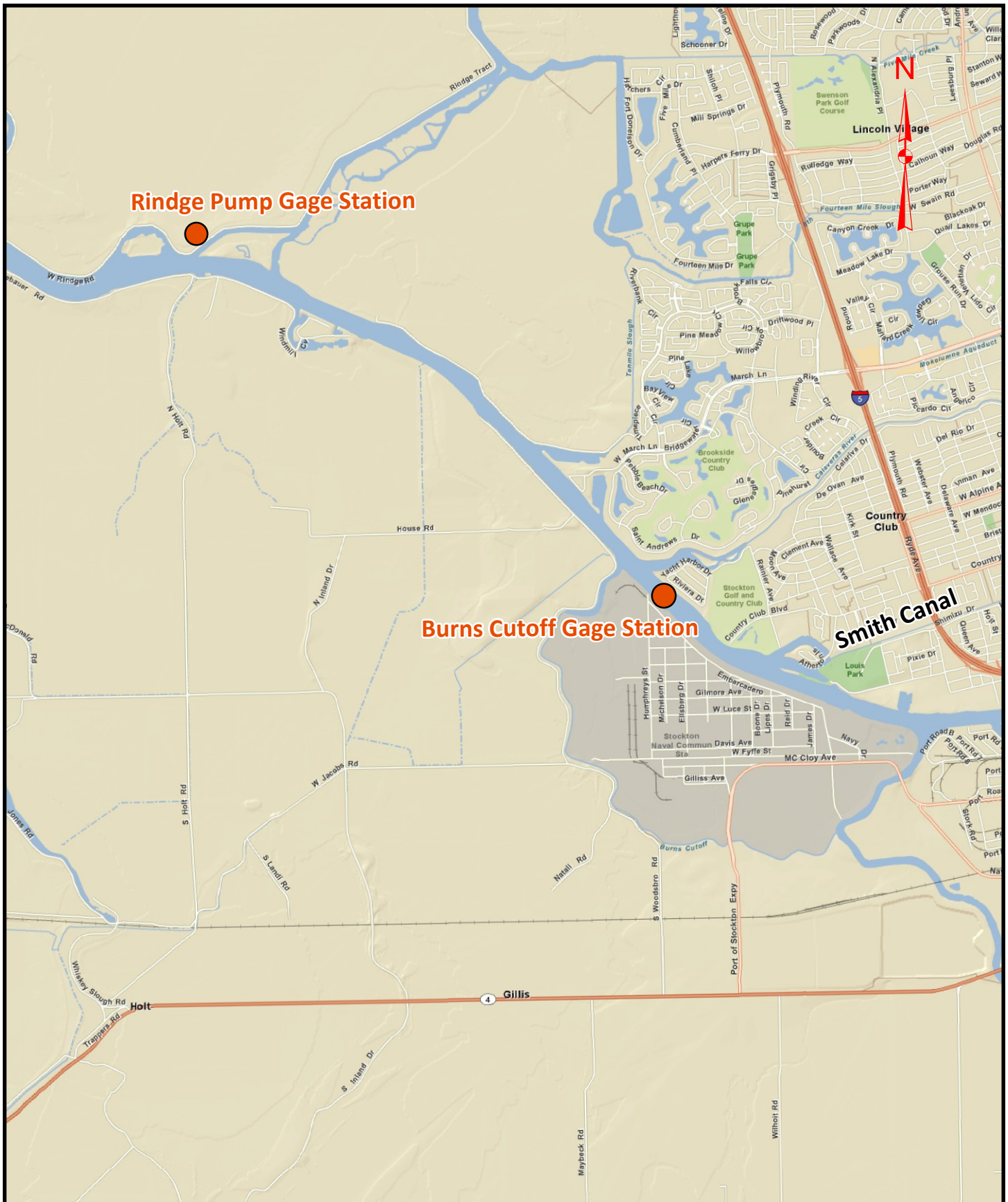
FEBRUARY 2011

PETERSON . BRUSTAD . INC
ENGINEERING . CONSULTING

1180 Iron Point Rd., Suite 260
Folsom, CA 95630

Phone: (916) 608-2212
Fax: (916) 608-2232

Figure 4



This stage-frequency analysis update determined that based upon Burns Cutoff Gage data, the 100-Year water surface elevation for Smith Canal is 9.4 feet NAVD and the 200-Year water surface elevation 9.5 feet NAVD (See Appendix 5). Therefore the closure structure will be designed, constructed and operated to provide protection up to the 200-Year event.

4.3 Project Site Selection

The structure will extend from the tip of the Dad's Point Levee, an existing land bar separating the Louis Park boat launch area from the San Joaquin River, northerly across open water to connect with the San Joaquin River right bank levee (see Figure 2). This location was chosen so the closure structure can tie into existing levees and high ground.

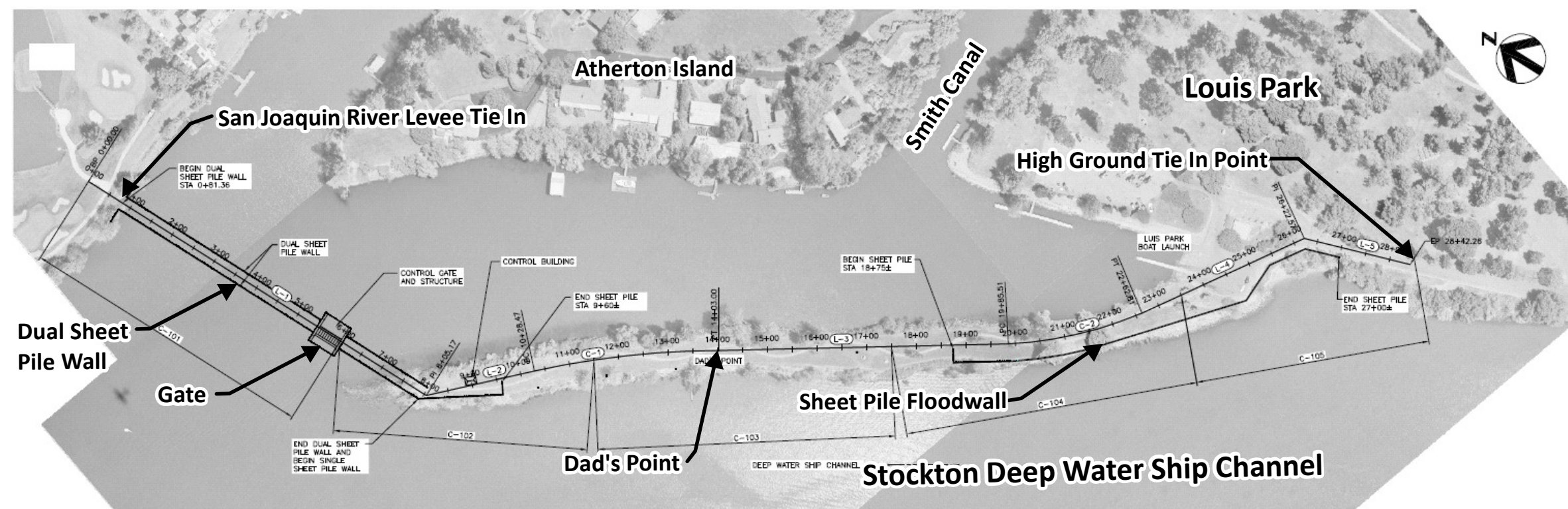
The San Joaquin River right bank levee was recently recertified by SJAFCA and reaccredited by FEMA as meeting their standards for providing a 100-Year level of protection. Given the very minor stage difference between 100-Year and 200-Year water surface elevations, the San Joaquin River right bank levee can also provide protection up to the 200-Year level.

A geotechnical evaluation of the Dad's Point levee was conducted as part of the Smith Canal CLOMR evaluation and it was shown to meet FEMA geotechnical levee standards (see Appendix 6). Again, given the very minor stage difference between 100-Year and 200-Year water surface elevations, the Dad's Point levee can also meet geotechnical standards for a 200-Year level of protection. The southern portion of Dad's Point does have a freeboard deficiency. Therefore, as part of the Smith Canal closure structure project, approximately 825 feet of sheet pile floodwall will be installed from Dad's Point to the high-ground tie-in at Louis Park (see Figure 6) to correct the freeboard deficiency.

4.4 Smith Canal Closure Structure

The proposed closure structure will consist of a fixed sheet pile wall structure with an opening gate structure to allow for navigation. The concept is for the Smith Canal closure structure to be closed during tide events forecasted to approach or exceed the design operating water surface elevation. The Smith Canal closure structure would be operated as needed during these times to prevent high flows entering into Smith Canal. The gate would be raised at the lowest tide prior to the forecasted high tide, and remain closed until the high tide begins to recede. The gate would then be opened to allow any interior drainage that accumulated in Smith Canal during the closure period, to flow out.

SJAFCA has had extensive discussions with FEMA on the use of a closure structure to provide flood protection for the Smith Canal area. SJAFCA has prepared 30% engineering design plans and geotechnical evaluation of the closure structure (see Appendix 3) and submitted a request to FEMA for a Conditional Letter of Map Revision (CLOMR). FEMA recently completed their review of SJAFCA's CLOMR request and concurred that the closure structure meets FEMA standards (see Appendix 4).



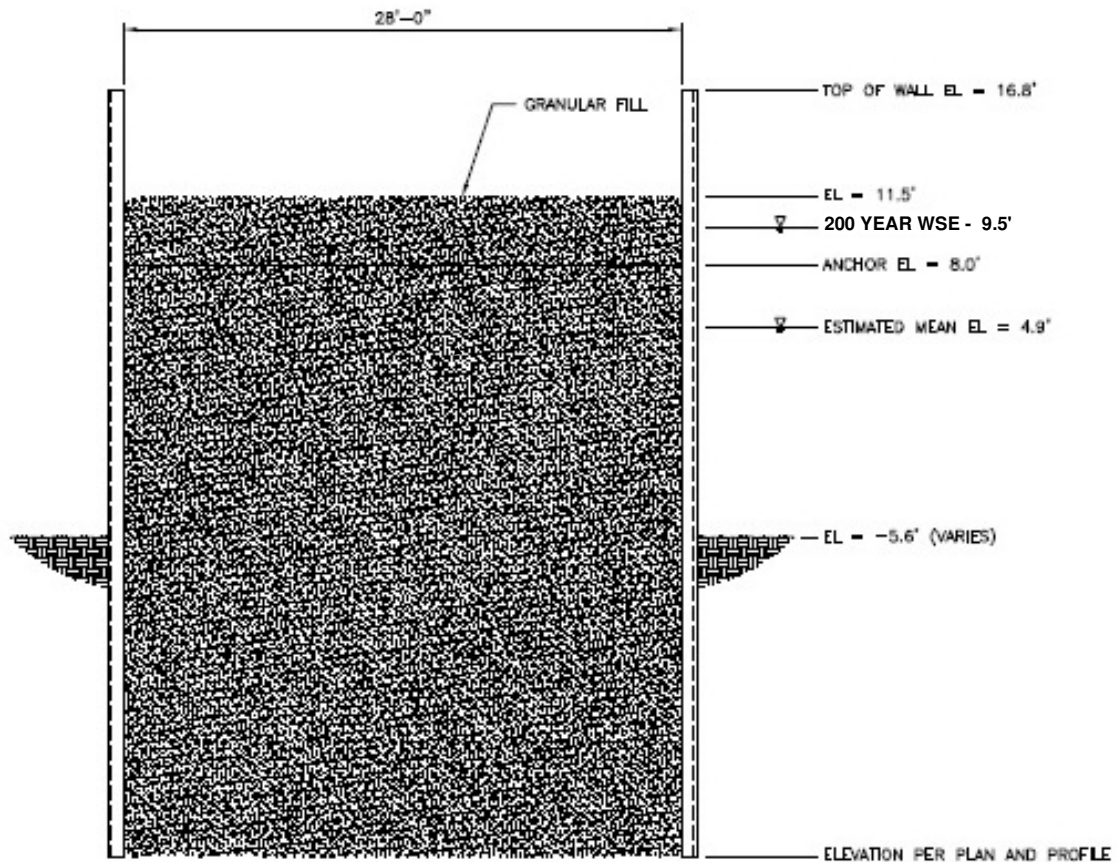
February 2010

The fixed segment of the closure structure will consist of a dual sheet pile wall filled with granular material (see Figure 7). The opening portion of the closure structure will be an “Obermeyer” type gate structure, consisting of a 50-foot wide stainless steel gate panel which will be raised and lowered by inflating and deflating rubber air bladders (see Figure 8). The gate panel and air bladders will be attached to a concrete foundation using stainless steel anchor bolts. The gate will operate between stainless steel abutment plates attached to a sheet pile wall structure. At each abutment, a rubber wiper-type seal will be affixed to the gate panel edge. This seal will ride up and down the stainless steel abutment plate as the gate is closed, keeping abutment plate seepage to a minimum. The gate system will be designed so it can be operated manually, using programmable preset operating controls, or remotely via a SCADA system.

The gate panels will be made from stainless steel. The gates will be curved to allow space for the deflated air bladder when the gate panel is fully lowered. This will prevent the air bladders from being damaged by boat anchors, etc. when the gate is open to navigation.

The air bladders will be designed and manufactured by methods similar to those used in the manufacture of automotive tires. A Butyl rubber inner liner will provide the needed air retention characteristics. A section of high tensile strength rubber compounds containing multiple layers of polyester or arimid, e.g. duPont Kevlar® tire, cord reinforcement will provide the mechanical strength needed to contain the internal pressure. A cover compound utilizing aging and ozone resistant polymers is used to protect the bladder from wear and weathering.

The air bladders will be inflated using air compressors housed in an equipment room which will be built directly adjacent to the closure structure. The equipment room will also house the back-up power generator, operating system and the various control valves. The total project cost has been estimated to be \$30M. Table 1 contains a cost summary for the closure structure. A detailed cost estimate can be found in Appendix 9.



TYPICAL DUAL SHEET PILE
NTS



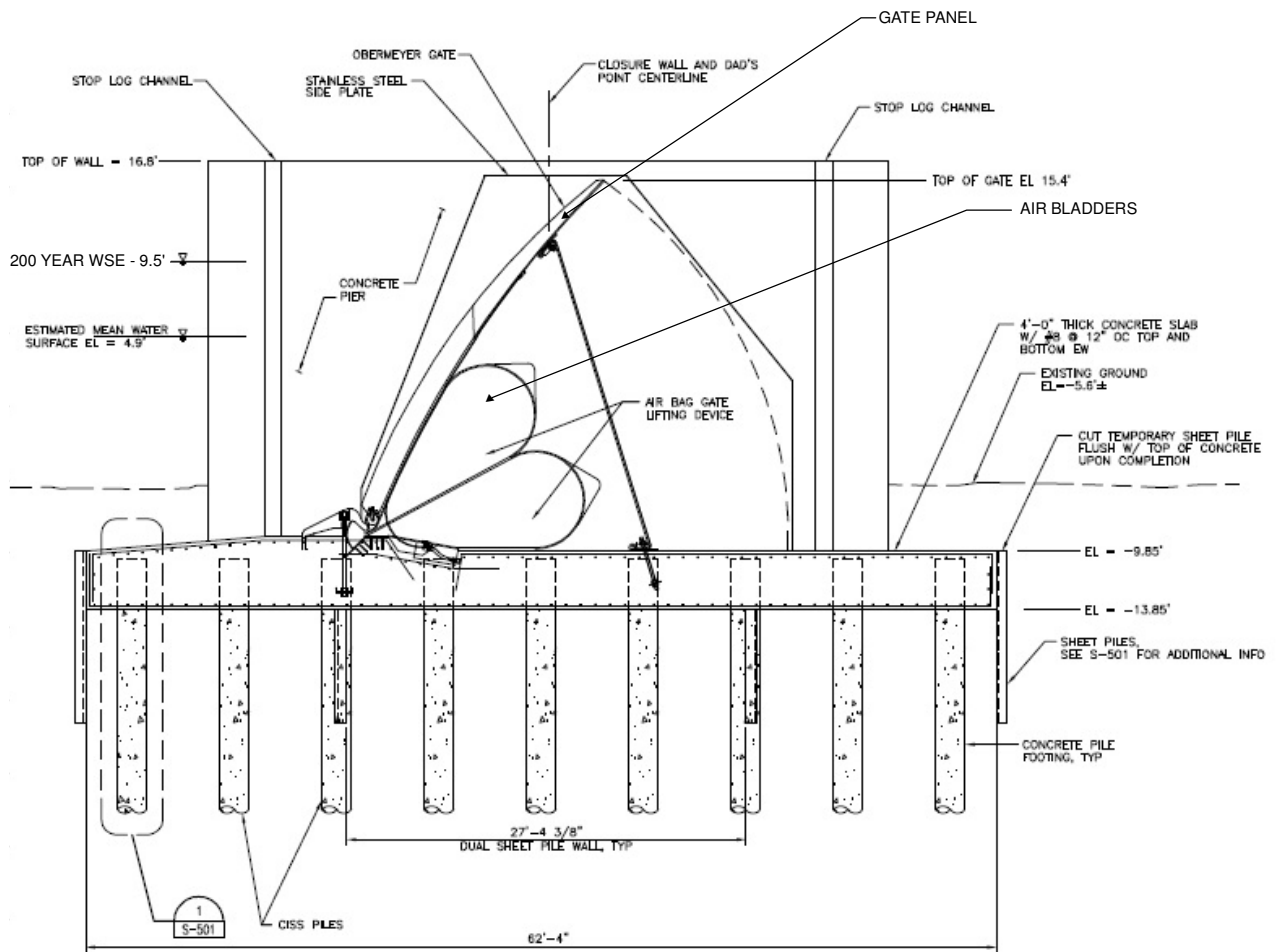


Table 1 - Closure Structure Cost Estimate

Description	Quantity	Unit	Unit Cost	Total Cost
Misc. Site Prep	1	LS	\$ 727,800	\$728,000
Obermeyer Gate	1	LS	\$ 7,076,000	\$7,076,000
Dual Sheet pile Wall	650	LF	\$ 6,996	\$4,548,000
Sheet pile Floodwall	825	LF	\$ 2,430	\$2,005,000
Control Building	1	LS	\$ 143,000	\$143,000
Misc Equipment	1	LS	\$ 415,000	\$415,000
			Subtotal	\$14,915,000
General Requirements			15%	\$2,240,000
			Subtotal	\$17,155,000
Contingency			30%	\$4,475,000
			Subtotal	\$21,630,000
Program/Soft Costs			38%	\$8,300,000.00
			Total	\$30,000,000

5. Project Alternatives

5.1 Fix-In-Place Levee Improvements Alternative

An alternative to the closure structure is to fix-in-place the existing levees. This would involve removing encroachments from the levee, restoring levee geometry, providing a levee maintenance access road, and obtaining sufficient right-of-way to allow for ongoing operations and maintenance.

Properties adjacent to the canal consist mostly of single-family residences. A paved levee road, Shimizu Drive, (see Figure 9) makes up the majority of the south levee. For purposes of developing a fix-in-place cost estimate, adjacent parcels that encroach onto Smith Canal levees were divided into two categories: 'Fully Impacted Parcels' and 'Partially Impacted Parcels'. The categorizing of parcels was based upon a review of aerial photography.

'Fully Impacted Parcels' were determined to contain houses within $\pm 15'$ of the landside levee toe. For the 'Fully Impacted Parcels', it was assumed that each of the parcels would be purchased and the entire house and backyard would be demolished. Purchase price was based on the 2009 assessed value plus 15%. The total purchase price for all 95 parcels was estimated to be \$38,410,500 which results in an average purchase price of \$404,321 per parcel. Relocation and legal expenses were considered to be 15% of the purchase price. Levee improvements, consisting primarily of waterside riprap and an aggregate base levee crown road, would be constructed.

Houses on 'Partially Impacted Parcels' are located further than $\pm 15'$ from the landside levee toe, but still contain backyard encroachments to the levee such as landscaping, patios, decks, docks, etc. For the 'Partially Impacted Parcels', it was assumed that each property owner would maintain ownership of their parcel, and the house would remain. However, backyard encroachments would be demolished, and severance damages would be negotiated with the property owner. For the purposes of this estimate it was assumed that severance damages would average \$100,000. Legal expenses were estimated to be 15% of the severance damages. Levee improvements, consisting primarily of waterside riprap and an aggregate base levee crown road, would be constructed.

Since the portion of the south levee along Shimizu Drive contains no encroachments, no property acquisition or structure demolition work would be necessary. Levee improvements, consisting primarily of waterside riprap, would be constructed. Table 2 contains a cost summary of the fix-in-place alternative.



Table 2 - Fix-In-Place Levee Improvements Alternative Cost Estimate

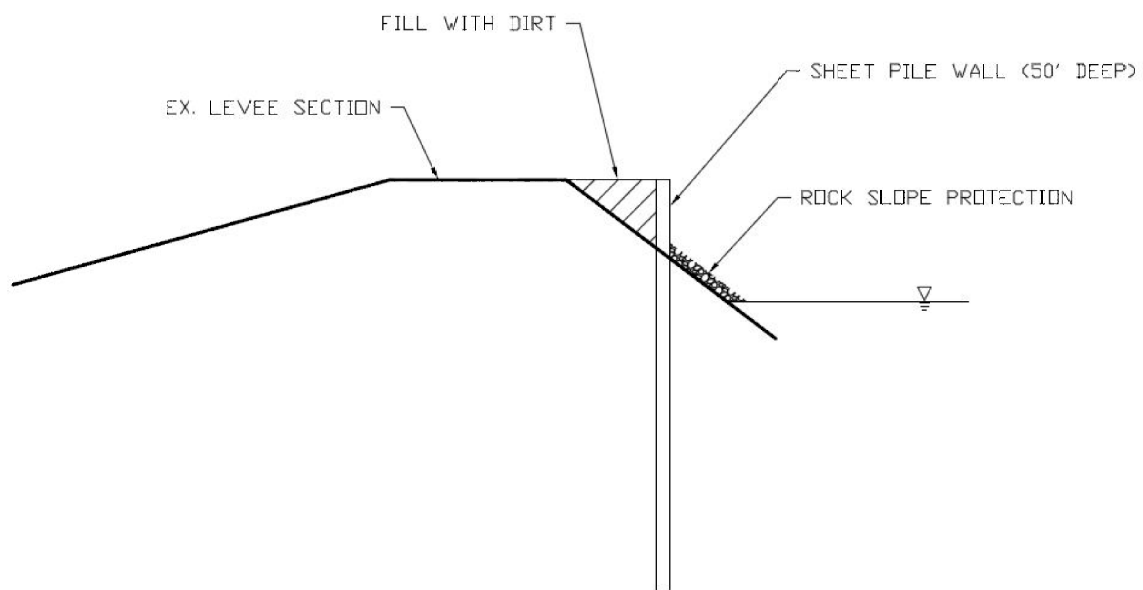
DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
Purchase Full Parcel	95	EA	\$404,321	\$ 38,411,000
Severance Damage For Partial Purchase	90	EA	\$100,000	\$ 9,000,000
Relocation & Legal Expenses	1	%	15%	\$ 7,112,000
			Subtotal	\$ 54,523,000
Demolish House & Yard	95	EA	\$40,000	\$ 3,800,000
Demolish Backyard only	90	EA	\$10,000	\$ 900,000
Levee Improvements	21,000	LF	\$1,000	\$ 21,000,000
			Subtotal	\$ 25,700,000
General Requirements	1	LS	15%	\$ 3,150,000
			Subtotal	\$ 28,850,000
Construction Contingency	1	LS	30%	\$ 8,655,000
			Subtotal	\$ 37,505,000
Program/Soft Costs	1	%	38%	\$ 14,252,000
				\$ 51,757,000
TOTAL				\$ 106,280,000

5.2 Sheet Pile Wall Alternative

Another alternative would be to install a sheet pile wall along the water side of the existing levee (see Figure 10). The sheet-pile wall would replace the existing levee as the flood control structure so existing levee encroachments would be allowed to remain. The sheet pile wall would be constructed from the waterside minimizing disruptions to adjacent properties. It was assumed that backyard improvements and boat docks would need to be temporarily removed during construction and replaced after the sheet pile wall was installed. Since the portion of south levee consisting of Shimizu Drive contains no encroachments and it readily accessible, it was assumed that this portion of the levee could be restored without the need for a sheet pile wall. Table 3 contains a cost summary of the sheet pile wall alternative.

Table 3 - Sheet Pile Alternative Cost Estimate

DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
Demolish Backyard	185	EA	\$10,000	\$1,850,000
Construct Sheet Pile Wall	14,800	LF	\$2,100	\$31,080,000
Reconstruct Back Yard	185	EA	\$60,000	\$11,100,000
Temp Const. Easements	185	EA	\$10,000	\$1,850,000
Levee Improvements	21,000	LF	\$500	<u>\$10,500,000</u>
			SUBTOTAL	\$56,380,000
General Requirements	1	LS	15%	<u>\$8,457,000</u>
			SUBTOTAL	\$64,837,000
Construction Contingency	1	LS	30%	<u>\$19,451,100</u>
Construction Total				\$84,288,100
Program/Soft Costs	1	%	38%	<u>\$32,100,000</u>
			TOTAL	\$116,400,000



5.3 Alternate Location for Closure Structure

As discussed in Section 4.3 the proposed closure structure location was chosen so the closure structure can tie into existing levees/high ground and become a certifiable barrier to back-flooding from the Delta. Two alternate locations for the closure structure were also considered.

5.3.1 Adjacent to Atherton Island. At this location (see Figure 11), the north and south ends of the closure structure would tie into high ground at Atherton Island and Louis Park. However, a second structure would be required to close off the mouth of the Atherton Island inlet, tying into the San Joaquin River right bank levee on the north. The need for 2 structures with 2 separate gates would increase the cost of the facility. In addition, right-of-way and access would be difficult due to the need to construct the Atherton Island portions on private residential properties. Also as there would be two gates the operation and maintenance effort would be doubled. Table 4 contains a cost summary of the 'Adjacent to Atherton Island' alternative.

Table 4. Adjacent to Atherton Island Alternative Cost Estimate

Description	Quantity	Unit	Unit Cost	Total Cost
Misc. Site Prep	1	LS	\$550,000	\$550,000
Obermeyer Gate	2	LS	\$7,076,000	\$14,152,000
Dual Sheet pile Wall	350	LF	\$6,996	\$2,448,600
Control Building	1	LS	\$143,000	\$143,000
Misc. Equipment	1	LS	\$622,500	\$622,500
			Subtotal	\$17,917,000
General Requirements			15%	\$2,688,000
			Subtotal	\$20,605,000
Contingency			30%	\$5,376,000
			Subtotal	\$25,981,000
Easement Acq & Legal	3	EA	\$250,000	\$750,000
Program/Soft Costs			38%	\$10,001,000
			Total	\$37,000,000



5.3.2 Upstream of Atherton Island. At this location (see Figure 12), the south end of the structure would be tied into high ground at Louis Park, and the north end would be tied into the existing Smith Canal north bank levee. However, significant residential encroachment exists along the Smith Canal north bank levee between the tie-in and the certified levee to the west which prevents that section of levee from receiving FEMA accreditation. A sheet pile wall would have to be installed along at that location as discussed in Section 5.2. Table 5 contains a cost summary of the 'Upstream of Atherton Island' alternative.

Table 5. Upstream of Atherton Island Alternative Cost Estimate

Description	Quantity	Unit	Unit Cost	Total Cost
Misc. Site Prep	1	LS	\$500,000	\$500,000
Obermeyer Gate	1	LS	\$7,076,000	\$7,076,000
Dual Sheet pile Wall	220	LF	\$6,996	\$1,539,200
Demolish Structures	11	EA	\$50,000	\$550,000
Reconstruct Properties	11	EA	\$150,000	\$1,650,000
Sheetpile Floodwall	2300	LF	\$2,430	\$5,589,000
Control Building	1	LS	\$143,000	\$143,000
Misc. Equipment	1	LS	\$415,000	\$415,000
			Subtotal	\$17,462,200
General Requirements			15%	\$2,620,000
			Subtotal	\$20,082,200
		Contingency	30%	\$5,238,660
			Subtotal	\$25,400,000
Easement Acq & Legal	11	EA	\$250,000	\$2,750,000
		Program/Soft Costs	38%	\$9,800,000
		Total		\$38,000,000



As Table 6 shows, the cost of the proposed closure structure alternative is significantly less expensive than the other project alternatives evaluated.

Table 6. Alternatives Cost Comparison

Alternatives Evaluated	Cost	% Cost Difference
Smith Canal Closure Structure	\$ 30,000,000	0
Fix-in-place Alternative	\$ 106,280,000	254%
Sheet pile Floodwall Alternative	\$ 116,400,000	288%
Adjacent to Atherton Island Closure Structure	\$ 37,000,000	23%
Upstream of Atherton Island Closure Structure	\$ 38,000,000	27%

Also the other alternatives have significant implementation issues as they would have major impacts to private property. These implementation issues add significant risk to both the project schedule and project costs, and would complicate project operations and maintenance functions after project construction. Table 7 presents a matrix of the implementation issues evaluated during the project alternatives selection process.

Table 7. Project Alternatives Implementation Issue Matrix

Alternatives Evaluated	Will involve private property acquisition	Will involve private property structure removal	Will involve residential relocations	Will require access through private property for O&M
Smith Canal Closure Structure	No	No	No	No
Fix-in-place Alternative	Yes	Yes	Yes	Yes
Sheet pile Floodwall Alternative	Yes	Yes	No	Yes
Adjacent to Atherton Island Closure Structure	Yes	No	No	Yes
Upstream of Atherton Island Closure Structure	Yes	Yes	No	Yes

Therefore because of cost, and implementation feasibility reasons, the Smith Canal Closure Structure at the mouth of Smith Canal was chosen as the preferred alternative.

6. Area Plan

EIP Guidelines require funding applicants to develop an *Area Plan* which describes how a specific level of flood protection will be provided for an Area. Per EIP Guidelines, for Urban Areas, “the Area Plan must provide at least 200-year protection”.

With the passage of SB5 and the mandate for urban areas to have at least a 200-year level of flood protection by 2025, SJAFCA partnered with the USACE and the State to study the feasibility of enhancing flood protection for the Stockton metropolitan area, including the central Stockton area. This feasibility study effort, known as the Lower San Joaquin River Feasibility Study (LSJRFS), is ongoing and will evaluate a number of alternatives that can provide a 200-year level of flood protection for the central Stockton area, including the Smith Canal area. These alternatives include:

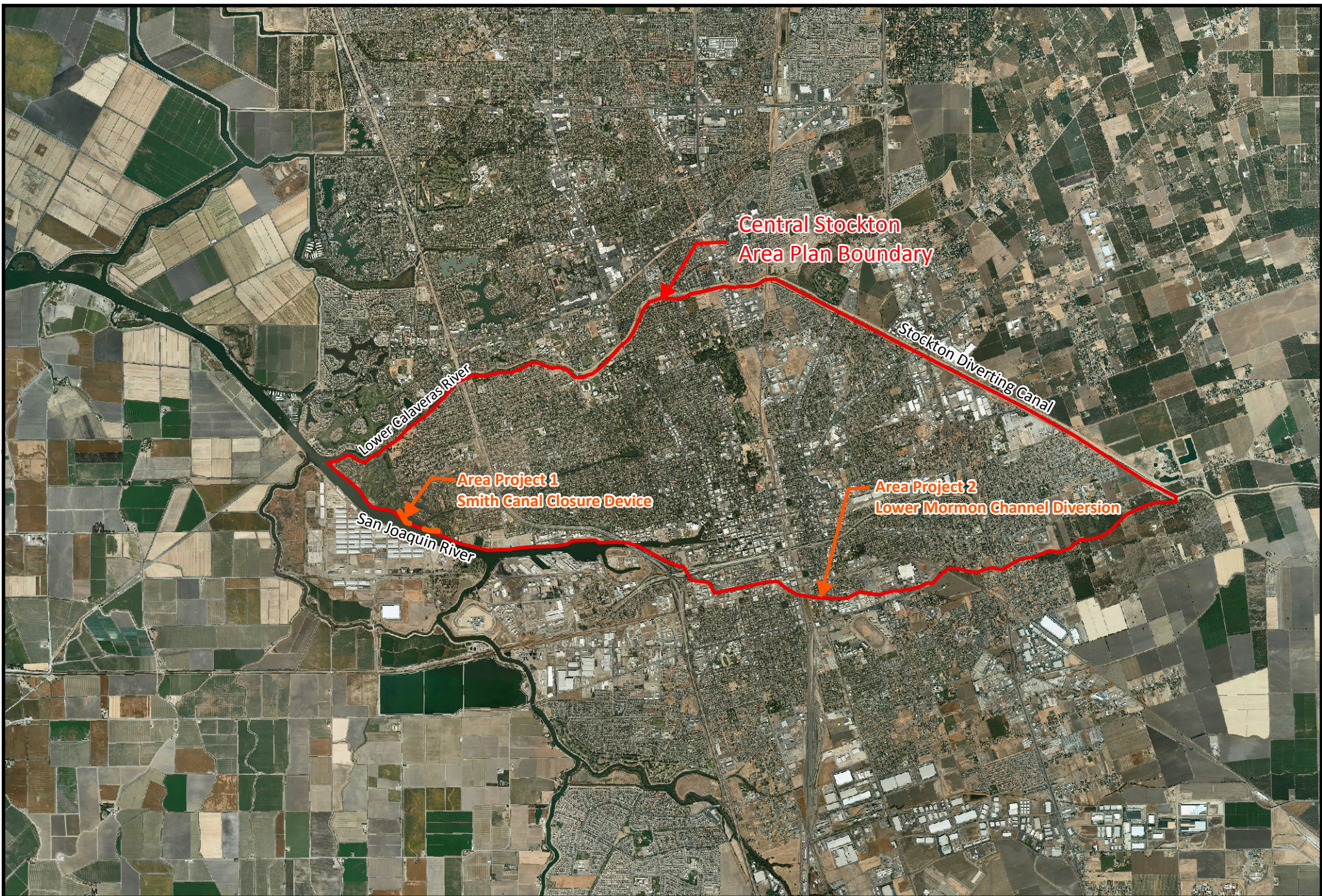
- Flow Diversion from Mormon Slough to Lower Mormon Channel
- New Hogan Dam & Reservoir Reoperation and/or enlargement
- Levee Raising along the Stockton Diverting Canal and the Lower Calaveras River

Providing the central Stockton area, including the Smith Canal area, with a 200-Year level of flood protection can be accomplished with the implementation of two Area Projects. The first Area Project will involve constructing the Smith Canal closure structure as described earlier. The second Area Project will likely be the *Flow Diversion from Mormon Slough to Lower Mormon Channel* alternative being analyzed as part of the LSJRFS. This and the other alternatives for Area Project 2 are discussed further below.

6.1 Area Project 2

Flow Diversion from Mormon Slough to Lower Mormon Channel

The Smith Canal area lies within the central Stockton area. As well as the levees along Smith Canal, the Smith Canal area is also protected from flooding by levees along the left banks of the Stockton Diverting Canal and the Lower Calaveras River (see Figure 13). The Stockton Diverting Canal and the Lower Calaveras River are the lower reaches of a flood control system which conveys runoff from the Sierra foothills through eastern San Joaquin county and central Stockton, to the San Joaquin River and the San Joaquin-Sacramento Delta. This flood control system begins at New Hogan Reservoir which regulates flows to the Calaveras River. The Calaveras River then flows through eastern San Joaquin County to Bellota where flows are diverted to Mormon Slough. Mormon Slough flows westward to the eastern edge of Stockton where flows are diverted to the Lower Calaveras River via the Stockton Diverting Canal. At the western edge of Stockton, just north of Smith Canal, the Lower Calaveras River flows into the San Joaquin River.



Historically, Mormon Slough flowed through what is now south central Stockton via the Lower Mormon Channel. Beginning in 1902, the U.S. Army Corps undertook a series of actions that resulted in the diversion of Mormon Slough flows from the Lower Mormon Channel to the Lower Calaveras River via the Stockton Diverting Canal. The original diversion was constructed to prevent sediment from being deposited within the Stockton Deep Water Ship Channel and interfering with navigation. In the mid 1960's USACE undertook a flood control project which increased the flood flow conveyance capacity of Mormon Slough and the Diverting Canal, and which completely shut off flows from Mormon Slough into the Lower Mormon Channel. Since then the Lower Mormon Channel has been used to convey local drainage flows only.

In 1996 SJAFCA undertook detailed hydrologic and hydraulic studies of the Mormon Slough, Diverting Canal and Lower Calaveras River system and determined the 100-Year and 200-Year flows and for the Stockton Diverting Canal and the Lower Calaveras River to be as shown in Table 8 below.

Table 8. 100 & 200-Year Flows for Stockton Diverting Canal and Lower Calaveras River

	100-Year Flow	200-Year Flow
Stockton Diverting Canal (at Main Street)	15,022 cfs	15,471 cfs
Lower Calaveras River (at confluence with Diverting Canal)	15,682 cfs	16,731 cfs

Based upon their studies, SJAFCA undertook a levee raising project along Mormon Slough and the Stockton Diverting Canal so these channels could convey the 100-Year flow with at least 3-feet of freeboard. Along the Diverting Canal, the majority of the levee raising work was along the right bank as the left bank already had sufficient freeboard to convey the 100-year flow, as had the Lower Calaveras River levees. The Stockton Diverting Canal levee raising project was completed in 1998 and certified by the USACE as providing at least a 100-Year levee of protection. In 2010, as part of the FEMA Map Modernization process, SJAFCA reconfirmed that the Lower Calaveras River also provides at least a 100-Year levee of protection and the levee has been reaccredited by FEMA.

In 2002, SJAFCA and the USACE completed evaluations of a number of alternatives aimed at improving flood protection for the Stockton area¹. One of the alternatives evaluated the feasibility of diverting flood flows into a restored Lower Mormon Channel during large flood events. The project would have two goals; restore Lower Mormon Channel and enhance its habitat value, and provide at least 200-Year flood protection for the central Stockton area by diverting Mormon Slough flows in excess of the 100-

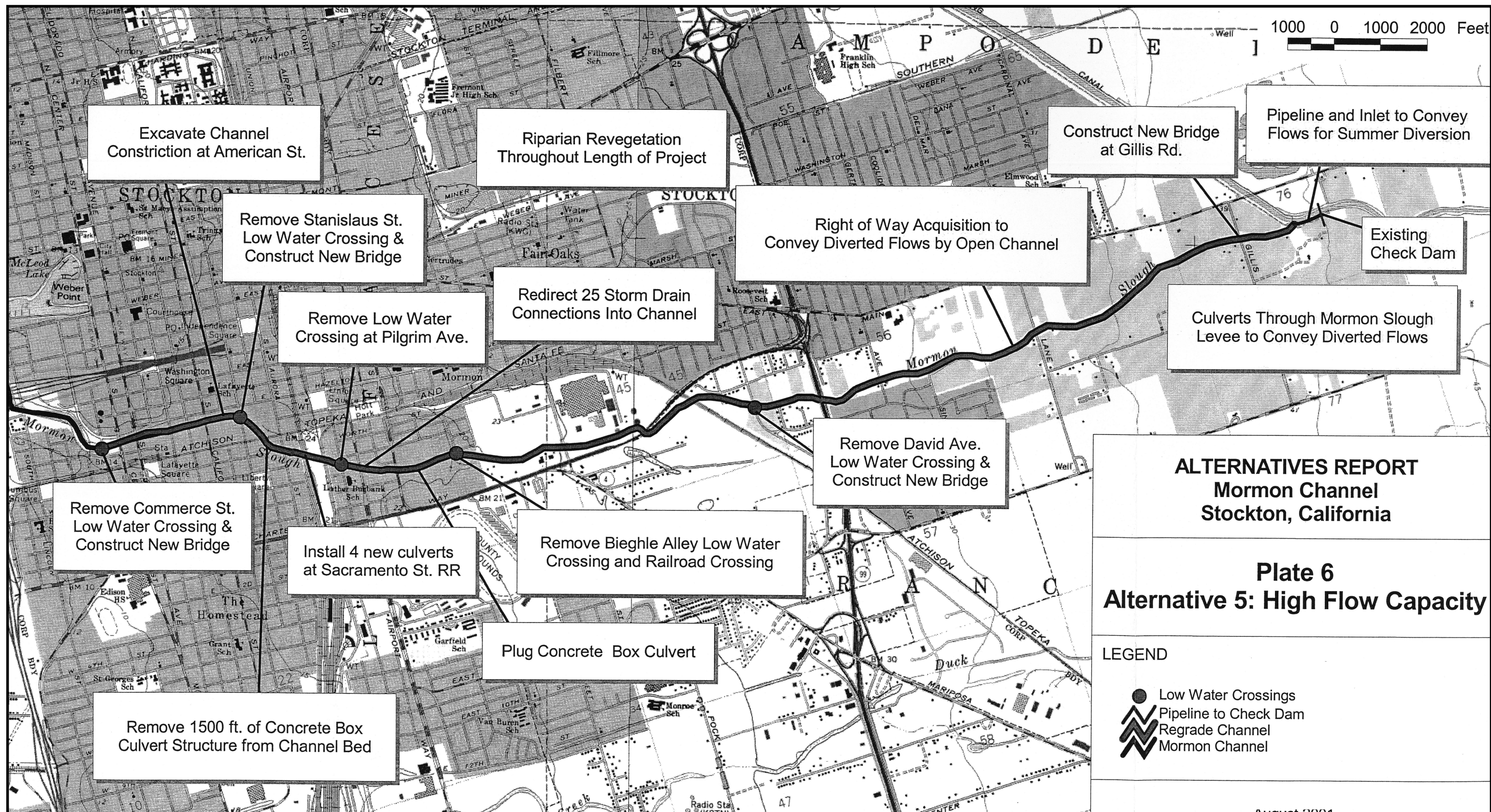
¹U.S. Corps of Engineers Stockton Metropolitan Area, California Phase II Flood Control Alternatives Report, April 2002 & Mormon Channel Section 1135 Restoration Alternatives Report, 2002

February 2010

year flow into the Lower Mormon Channel. SJAFCA's 1996 hydrologic and hydraulic studies indicated that 200-Year protection for central Stockton could be achieved by diverting approximately 1,000 cfs from Mormon Slough into the Lower Mormon Channel.

The Lower Mormon Channel is approximately 6 miles long from the beginning of the Stockton Diverting Canal west to the Stockton Deep Water Ship Channel. Since construction of Stockton Diverting Canal in the early 1900's, Lower Mormon Channel has been extensively modified. In some areas, the channel has been partially filled in and the channel bottom is being used for agriculture. In the lower reaches, some roads cross the channel as low water crossings. The Lower Mormon Channel has 20 bridges crossings and five low water crossings. The existing channel conveys the 100-year discharge from local drainage runoff. Based on the 1989 FEMA Flood Insurance Study of the Lower Mormon Channel, the 100-year discharge from local runoff is 20 cfs at the upstream end and 520 cfs at its confluence with Stockton Deep Water Ship Channel. The 2002 alternatives analysis evaluated improving the Lower Mormon Channel up to a carrying capacity of up to 2,000 cfs to accommodate local drainage and flood flow diversions from Mormon Slough. The *U.S. Corps of Engineers Stockton Metropolitan Area, California Phase II Flood Control Alternatives Report* estimated the cost improving the Lower Mormon Channel at \$16M. Using the ENR index to adjust this cost for inflation results in an estimated project cost of approximately \$23M in today's dollars. As shown on Figure 14 components of the project would include:

- Remove the Commerce Street low water crossing and construct a new bridge
- Remove the Stanislaus Street low water crossing and construct a new bridge
- Remove 1500 feet of concrete box culvert structure from the channel bed
- Remove the Pilgrim Avenue low water crossing
- Install new culverts at the Sacramento Street railroad crossing
- Remove Bieghle Alley low water crossing and railroad crossing
- Remove David Avenue low water crossing and construct new bridge
- Construct new bridge at Gillis Road
- Construct flow diversion structure at confluence of Mormon Slough and Lower Mormon Channel



Based upon the 2002 evaluation by the USACE, the *Flow Diversion from Mormon Slough to Lower Mormon Channel* alternative appears to be a feasible and relatively low cost project, and in conjunction with the Smith Canal Closure Structure would constitute a reasonable approach to achieving a 200-Year level of protection for the Central Stockton area by 2025. A schedule for its completion could be:

- Complete LSJRFs 2017
- Design & Environmental Review 2017-2019
- Right of Way Acquisition 2019-2020
- Construction 2020-2024

Project financing for the *Flow Diversion from Mormon Slough to Lower Mormon Channel* project would be through a combination of Local, State and Federal funding. Local funding could be generated by a local assessment district financing structure similar to the method being used to finance the local share of the Smith Canal Closure Structure.

6.2 Area Project No.2 - Alternatives

As stated earlier, the LSJRFs will evaluate a number of alternatives to improving flood protection of the central Stockton area. In addition to the *Lower Mormon Flow Diversion* alternative, these alternatives will include:

New Hogan Dam & Reservoir Reoperation and/or enlargement Alternative

Construction of New Hogan Reservoir was completed in 1964 and is designed to control the Standard Project Flood (SPF). The SPF has a peak inflow of 66,000 cfs and a 7-day average inflow of 22,000 cfs. The recurrence interval of the SPF has been estimated to be greater than 500 years.² And while the LSJRFs have still to evaluate if New Hogan Dam and reservoir could be reoperated and/or enlarged to afford downstream areas with a greater level of flood protection, early indications are that reoperation/enlargement of New Hogan alone would not provide the central Stockton area with a 200-Year level of flood protection. This is because runoff from unregulated streams that enter the river below New Hogan has the potential to exceed the rated capacity of downstream levee during a 200-Year storm event.

Levee Raising along the Stockton Diverting Canal and the Lower Calaveras River Alternative

Raising the left bank levees along the Stockton Diverting Canal and the Lower Calaveras River could provide the Smith Canal area with 200-Year protection.

² U.S. Corps of Engineers Stockton Metropolitan Area, California Phase II Flood Control Alternatives Report, April 2002

However, the Stockton Diverting Canal and the Lower Calaveras River run through highly urbanized areas with urban development directly adjacent to the left bank levees for their entirety. Raising the levees by traditional means would require extensive right-of-way acquisition, removal of structures, and the relocation of businesses and residents. In addition, there are 17 bridge crossings of the Lower Calaveras River and Stockton Diverting Canal, many of which might require alteration to pass a 200-year flow. It may be possible to use flood walls to achieve the necessary levee height but flood wall construction tends to be significantly more expensive than earthen levee raising. The scope and cost of levee raising along the Stockton Diverting Canal and the Lower Calaveras River needed to reach a 200-Year level of protection will be fully evaluated in the LSJRFs.

Therefore, while the LSRFS will not be completed until 2017, based upon the available alternatives, it would appear that *Flow Diversion from Mormon Slough to Lower Mormon Channel* project is the most feasible alternative for completing the Area Plan by 2025.

7. Improvement Project Findings

Per the EIP Guidelines, EIP applicants must provide information for DWR to make the findings required by SB 5 and codified at Cal. Water Code Section 9613.

- ***Finding 1:** The improvements are necessary and need State funding before the completion of the Central Valley Flood Protect Plan prepared pursuant to Section 9612 because;*
 - ✓ The Smith Canal levees currently do not meet FEMA standards for levees nor the State's Interim Levee Design Criteria.
 - ✓ A significant area of central Stockton is currently at risk from flooding should these substandard levees fail.
 - ✓ This request is for design/environmental planning funding only. The design and environmental phase will not be completed until 2013 therefore actual construction will not occur before the completion of the Central Valley Flood Protection Plan.
 - ✓ Given the time required to complete the environmental review and permitting tasks it is critical to begin the process as soon as possible and not delay it until after the completion of the Central Valley Flood Protection Plan.
 - ✓ The cost to design and construct the closure structure exceeds SJAFCA's financial capability to fund the work without State funding.
 - ✓ SJAFCA will need to form a benefit assessment district to fund the local share of the project costs. Even assuming a State cost share, the property assessments will be as much as \$400 per year for some single family homes.
 - ✓ For a 1,500 square foot home, with a 6 foot flooding depth, the annual assessment will be over \$200. Without State cost share annual assessment would be more than double that amount.
 - ✓ Some of the neighborhoods within the Smith Canal area have median household incomes which are less than half of the State median. Therefore without State funding assistance the project would be unaffordable for area residents.
- ***Finding 2:** The improvements will reduce or avoid risk to human life in one or more Urban Areas.*
 - ✓ The Smith Canal levees provide protection to over 7,800 homes and approximately 24,000 people in central Stockton.

- ✓ Levee failure could result in flood depths of up to 10 feet, resulting in significant risk to human life.
 - ✓ Approximately 5,800 homes and 18,000 people are at risk from flooding depths of great than 3 feet.
 - ✓ There are 4 elementary schools within the flood hazard area:
 - ✓ Hoover Elementary School
 - ✓ Madison Elementary School
 - ✓ Tyler Skills Elementary School
 - ✓ Victory Elementary School
 - ✓ There are at least three elderly care facilities within the flood hazard area.
 - ✓ Stockton Fire Station No. 6 is located within the flood hazard area.
- *Finding 3: The improvements will not impair or impede future changes to regional flood protection or the Central Valley Flood Protect Plan.*
 - ✓ Smith Canal is an isolated backwater slough of the San Joaquin River and Delta system. The Smith Canal Closure Structure will not impair or impede regional flood protection or the Central Valley Flood Protect Plan.
 - *Finding 4: The improvements will be maintained by a local agency that has committed sufficient funding to maintain both the existing and improved facilities of the State Plan of Flood Control.*
 - ✓ SJAFCA intends to form a benefit assessment district to fund the maintenance and operation of the closure structure. At their January 26, 2011 Board meeting, the SJAFCA Board of Directors elected to move forward with the formation of a capital and operation & maintenance (O&M) benefit assessment district to finance the local share of the project's design, capital and O&M costs. Formation of the assessment district will be subject to a Proposition 218 election which SJAFCA expects to hold in early summer 2011. SJAFCA is holding the Proposition 218 election early in the project development process so that DWR has certainty that local funds are available to match EIP funds, and that there is sufficient local funding for all phases of the project.
 - *Finding 5: The affected cities, counties and other public agencies will have sufficient revenue resources for the operation and maintenance of the facility.*
 - ✓ SJAFCA intends to form a benefit assessment district to fund the maintenance and operation of the closure structure. At their January 26, 2011 Board meeting, the SJAFCA Board of Directors elected to move forward with the formation of a capital and operation & maintenance (O&M) benefit assessment district to finance the local share of the

project's design, capital and O&M costs. Formation of the assessment district will be subject to a Proposition 218 election which SJAFCA expects to hold in early summer 2011. SJAFCA is holding the Proposition 218 election early in the project development process so that DWR has

- *Finding 6: Upon allocation of funds for a Project, the proposed Project is ready for implementation.*
 - ✓ SJAFCA is requesting design funding and is ready to proceed with design and environmental review of the project. SJAFCA has already completed a 30% level of design and has selected a design consultant team to complete the project design.
- *Finding 7: The improvements comply with existing law.*
 - ✓ SJAFCA is not aware of any laws with which the project does not comply.

8. Economic Feasibility

David Ford, Consulting Engineers (DFCE) completed an economic feasibility analysis of the Smith Canal Closure Structure. A copy of their report can be found in Appendix 7. In conducting the inundation-reduction (IR) benefit analysis, DFCE gathered the following data and information:

- A structure inventory with parcel elevations
- A water surface elevation (stage)-frequency function from the Burns Cutoff gage station which was used as the Smith Canal floodplain stage-frequency function.
- Floodplain stage-damage functions for the study area.

DFCE followed State and USACE economic analysis procedures, incorporating uncertainty analysis, using the best-available information, and;

- Identified the requirements and conditions of the IR benefit analysis, including 5 hypothetical without-project conditions (representing no improvement) and the with-project condition (representing completion of the closure structure and a $p=0.01$ level of protection).
- Configured the computer program HEC-FDA to use the assembled economic and hydraulic information.
- Computed expected annual damage (EAD) for without-project and with project conditions.
- Using the State's discount rate (6.0%) and a 50-year analysis period beginning in the base year 2010, DFCE computed 5 values (1 for each hypothetical existing level of protection) for the present value total IR benefit and the annual IR benefit of the proposed project.

8.1 Hypotheses used in this analysis

Without-project and with-project condition

This IR benefit analysis used readily available information only and includes assumptions on annual probabilities of flooding. While the study was based on a detailed hydraulic and economic analysis, sufficient geotechnical data about the existing Smith Canal levees were not available to fully define the without-project condition. Instead, DFCE selected 5 different floodplain flood frequencies to represent 5 hypothetical without-project conditions:

- $p=0.93$: represents a condition in which the existing levee provides no protection for the interior floodplain as water rises in the canal.
- $p=0.20$: existing levees provide protection against all floods less than those with a 1 in 5 chance of occurring each year.
- $p=0.10$: existing levees provide protection against all floods less than those with a 1 in 10 chance of occurring each year.

- $p=0.04$: existing levees provide protection against all floods less than those with a 1 in 25 chance of occurring each year.
- $p=0.02$: existing levees provide protection against all floods less than those with a 1 in 50 chance of occurring each year.

DFCE used a $p=0.01$ level of protection for the with-project condition.

Table 9. Hypothesized annual probability of flooding and associated elevation

Hypothesized annual probability of flooding	Levee point of failure elevation (ft NAVD88)
Without-project condition	
0.93	5.50
0.20	8.33
0.10	8.93
0.04	9.24
0.02	9.39
With-project condition	
0.01	9.50

Results

Using a 50-year period of economic analysis and the current State discount rate of 6%, DFCE calculated the present value of the IR benefit, which is the accrued benefit over the life of the project. The present value IR benefit of the project ranges from \$51.4 million to \$3.69 billion, depending on the current without-project annual exceedence probability (AEP) (which has not been determined as levee fragility curves have not yet been developed).

DFCE also calculated the annual IR benefit, which is the difference between with- and without-project EAD. The annual IR benefit of the project ranges from \$3 million to \$234 million, depending on the current without-project AEP. The annual IR benefit and present value of the IR benefit are shown in Table 1 for the 5 hypothetical without-project conditions.

Table 10. IR benefit for the Smith Canal closure structure considering 5 hypothetical without-project conditions

Hypothesized without project condition(existing annual probability of flooding)¹	Levee point of failure elevation (ft NAVD88)	Annual value IR benefit	Present value IR benefit²
0.93 ³	5.50	\$234,289,000	\$3,692,831,000
0.20	8.33	\$61,305,000	\$966,285,000
0.10	8.93	\$30,146,000	\$475,162,000
0.04	9.24	\$10,3270,000	\$162,780,000
0.02	9.39	\$3,262,000	\$51,422,000

1. With-project annual probability of flooding is 0.01.

2. Present value computed using the current state discount rate of 6.0% and a 50-year project life.

3. AEP = 0.93 (1-year event) represents the no levee condition.

Table 10 shows that even a failure at elevation 9.39 would result in damages with a present value of over \$51 M which is approximately 1.7 times the \$30M cost of the closure structure.

9. Most Cost Effective Alternative

As described in Section 4, the cost of the Smith Canal Closure Structure has been estimated at \$30M. As described in Section 5, the other alternatives to the closure structure range between approximately \$37M and \$116M. Therefore the Smith Canal Closure Structure is the most cost effective alternative to providing the needed flood protection for the Smith Canal area.

Table 11. Alternatives Cost Comparison

Alternatives Evaluated	Cost	% Cost Difference
Smith Canal Closure Structure	\$ 30,000,000	0
Fix-in-place Alternative	\$ 106,280,000	254%
Sheet pile Floodwall Alternative	\$ 116,400,000	288%
Adjacent to Atherton Island Closure Structure	\$ 37,000,000	23%
Upstream of Atherton Island Closure Structure	\$ 38,000,000	27%

10. Financial Plan

Capitol Public Finance Group, LLC (Capitol PFG) has prepared a preliminary Financial Plan for the Smith Canal Closure Structure (see Appendix 8). SJAFCA's share of the project costs will be funded through formation of a new benefit assessment district. The new benefit assessment district would impose an assessment on approximately 7,800 parcels benefitting from the flood protection provided by the closure structure. The new property assessments that would provide sufficient funding for the following;

- The design and permitting of the project (through pay-as-you-go assessments);
- The construction of the project (through the issuance of various assessment bonds);
- In perpetuity, the ongoing Operations and Maintenance of the facility.

Table 12 below provides a summary of the estimated project costs by phase. Design costs have been estimated to be \$4,825,000. With this application, SJAFCA is requesting a 50% EIP cost share of the design funds. For the design costs, Table 13 shows the breakdown between credit eligible costs and future costs. SJAFCA has spent approximately \$497,000 to date in eligible costs and will request a credit in this amount at the applicable cost share ratio.

Table 12. Summary of Project Costs by Phase

Design Phase Costs	
Program Management (Design Phase)	\$ 709,000
Engineering Design	\$ 2,250,000
Independent Review	\$ 300,000
Environmental Review & Permitting	\$ 1,375,000
Real Estate Planning & Acquisition (30% of Total)	\$ 141,000
Public Outreach (50% of Total)	\$ 50,000
Design Phase Total	\$ 4,825,000
Construction Phase Costs	
Construction (Less General Requirements) Subtotal	\$ 14,914,000
(Additive For) General Requirements	\$ 2,240,000
SUBTOTAL	\$ 17,154,000
CONTINGENCY (30%)	\$ 4,476,000
SUBTOTAL	\$ 21,630,000
Program Management (Construction Phase)	\$ 191,000
Real Estate Planning & Acquisition (70% of Total)	\$ 329,000
Public Outreach (50% of Total)	\$ 50,000
Construction Management	\$ 1,750,000
Financing	\$ 600,000
Environmental Mitigation	\$ 625,000
Construction Phase Total	\$ 25,175,000
Project Total	\$ 30,000,000

Table 13. Design Costs Breakdown: Credit Eligible Costs and Future Costs

Design Phase Costs	Credit Eligible Costs Expended to date	Future Costs	Total
Program Management (Design Phase)	\$122,000	\$ 587,000	\$ 709,000
Engineering Design	\$375,000	\$1,875,000	\$ 2,250,000
Independent Review	\$0	\$ 300,000	\$ 300,000
Environmental Review & Permitting	\$0	\$ 1,375,000	\$ 1,375,000
Real Estate Planning & Acquisition	\$0	\$ 141,000	\$ 141,000
Public Outreach (50% of Total)	\$0	\$ 50,000	\$ 50,000
Design Phase Total	\$497,000	\$ 4,328,000	\$ 4,825,000

February 2010

11. Recommended Cost-Share

Per EIP Guidelines design costs are shared 50% local and 50% State, with the final 'actual' being calculated prior to the construction phase. SJAFCA's estimation of the final cost share is as follows:

Base State Cost Share

Per the Guidelines, the base cost share is 50% State Share and 50% local share.

Cost Share Enhancement for providing flood protection benefits to State Facilities

The Guidelines allow up to 20% increase in State cost share for significant contributions to providing flood benefits to a State transportation facility. Interstate 5 travels through the Smith Canal area and while mainline is elevated, the I-5 ramps on and off ramps in the area would be inundated if the Smith Canal levees were to fail which would severely impeded I-5 operations. Therefore SJAFCA is recommending that the final cost share be increased by 5% due to the flood protection benefits afforded to I-5 by the Smith Canal Closure Structure.

Disadvantaged Community

The EIP Guidelines provide guidance on how to calculate increased State cost-share for areas that are economically disadvantaged. These calculations are based upon comparing the median annual household income of the area receiving benefit for the project to 80% of the California median annual household income. This calculation will be made prior to construction using 2010 census data. Since 2010 census data is not yet available the disadvantaged community cost share has not been calculated but SJAFCA has assumed a 3% disadvantaged community for financial planning purposes.

Recreation

Approximately 50% of the project's 'hard' construction costs are associated with the gate structure which primarily is included in the project to allow for recreational navigation. Therefore SJAFCA is recommending a 20% increased cost share for recreation supplemental benefits.

Table 14. Summary of Cost-Sharing Recommendations

Total Project Costs	\$30 million
Base State cost-share	50%
Cost Share Enhancement for providing flood protection benefits to State Facilities	5%
Disadvantaged Area cost share	3%
Recreation	20%
Total State Cost-Share	78%
Total State Contribution	\$23.4 million
Total Local Contribution	\$6.6 million

12. Work Plan

SJAFCA initiated the design phase of this project in 2008 and has advanced the project design to the 30% design stage. SJAFCA will be seeking credit for the work completed to date. The following is a draft work plan for the work proposed to be conducted during the remainder of the project design phase. SJAFCA will utilize a team of professional consultants, comprised for many disciplines, to carry out the tasks included in this work plan. It should be noted that this is a draft work plan and additional tasks may need to be added as the design of the closure structure evolves and progresses.

Task 1.0 – Program Management

The Smith Canal closure structure is a complex project involving many overlapping layers of regulatory review and approval. A significant level of programmatic oversight will be required to ensure that the project proceeds as smoothly and efficiently as possible. This work will include a number of subtasks, including but not limited to:

- Administration
- Accounting/Financial
- Legal

Task 2.0 – Engineering Design

Engineering services, including but not limited to surveying, hydrologic, hydraulic, civil, structural, electrical, mechanical and geotechnical engineering will be required to develop the closure structure design documents. This work will involve a number of subtasks including but not limited to:

- Perform engineering for the design of the dual sheet pile structure. Features include composite action of the fill material and the interlocking steel piling with regularly spaced anchor tie-rods exhibiting the behavior of cellular sheet pile structures.
- Perform engineering for the design of pile supported concrete foundation and control gate superstructure. Features include cast-in-steel-shell pile supported concrete slab and cellular sheet pile foundation supporting concrete walls for the “Obermeyer” gate.
- Perform engineering for the “Obermeyer” gate systems
- Perform engineering for the design of “Obermeyer” gate control building. Features include a building containing the operation of all electrical, pneumatic and mechanical controls required for the operation of the gate. Design includes electric service to site, diesel generated back-up power, interior and exterior lighting, security, communications and visual and audible gate operation warning system.
- Perform engineering for the design of sheet pile floodwall along “Dad’s Point.” Features include design of cantilever sheet pile flood wall to be constructed on

- the “Stockton Deep Water Ship Channel” side of “Dad’s Point” with a 12-foot wide patrol road on the crown.
- Prepare 60%, 90% and 100% design documentation reports documenting the design effort and the basis of design for the construction plans and specifications.
 - Prepare 60%, 90% and 100% construction plans.
 - Prepare 60%, 90% and 100% technical specifications in Construction Specification Institute (CSI) format covering the project.
 - Prepare 60% 90% and 100% estimates of opinion of probable construction costs.
 - Provide customized maintenance instructions and operating plan information needed for inclusion in Smith Canal Closure Structure O&M Manual.
 - Perform the hydrologic and hydraulic analyses needed to support issuance of a Section 408 permit by USACE.
 - Perform the surveying needed to support the engineering design.
 - Perform geotechnical explorations along the structure alignment to support the engineering design.
 - Prepare the Letter of Map Revision (LOMR) documentation and analyses needed to remove the Smith Canal area from the 100-Year floodplain.

Task 3.0 – Independent Review

DWR requires an independent review of all projects receiving EIP funds. The Smith Canal closure structure independent review panel will be comprised of three individuals who are distinguished experts in structural engineering, geotechnical engineering, and hydrology/hydraulics. It is SJAFCA’s intent to use one independent review panel to meet DWR requirements and to comply with federal guidance for 33 U.S.C. § 408.

At a minimum, the independent reviews will consider applicable USACE requirements and DWR’s interim levee design criteria. The independent review shall be conducted in an open manner in collaboration with the DWR. SJAFCA will invite DWR to all meetings of the panel and will provide DWR staff the opportunity to collaboratively develop the agenda and questions for each meeting of the panel.

Task 4.0 - CEQA/NEPA Compliance and Permitting

SJAFCA will prepare a project-level Environmental Impact Report (EIR) that is compliant with the California Environmental Quality Act (CEQA) and a project-level Environmental Impact Statement (EIS) that is compliant with the National Environmental Policy Act (NEPA). SJAFCA will also initiate consultation with state and federal agencies for required environmental permits as well as provide environmental support for the project permitting effort. A joint environmental document, meeting the needs of both CEQA and NEPA, will be explored as the compliance approach; however, the draft work plan assumes a conservative case that the NEPA document may sequentially follow the CEQA document.

The key environmental issues associated with the project may include:

- analysis of construction- and operation-related effects on fish from direct mortality and habitat disturbance;
- analysis of construction- and operation-related effects on water quality;
- analysis of construction-related effects on adjacent residences, recreation facilities, and businesses, such as noise, vibration, traffic, air quality, and visual disturbance; and
- compliance with 33 USC Section 408 (Section 408) for alteration of a federal flood control project, under the purview of the Chief of Engineers.

Following are the tasks that SJAFCA proposes to carry out in order to meet CEQA/NEPA compliance and obtain the required permits for construction and operation of the Smith Canal closure structure.

Task 4.1 Initiate Environmental Process for CEQA/NEPA Document (San Joaquin Area Flood Control Agency and U.S. Army Corps of Engineers) and Permits

The closure structure will require a number of inter-related environmental authorizations. This task will scope and plan those processes, beginning with developing the project description, conducting public scoping, and coordinating with the resource and regulatory authorities to develop a comprehensive compliance approach for efficient approvals. This work will include a number of subtasks, including but not limited to:

- Scoping, Noticing, and Hearings
 - Distribute Notice of Preparation/Notice of Intent
 - Conduct Scoping
 - Conduct Public Hearings
- Develop Project Description and Refine Alternatives
 - Prepare Project Description
 - Refine Alternatives

Task 4.2 Prepare CEQA Document (San Joaquin Area Flood Control Agency as lead agency)

SJAFCA will complete the CEQA compliance needed to adopt all the project's discretionary actions. It is assumed an EIR-level analysis will be required. It is assumed state agencies will use SJAFCA's EIR for their authorizations. This work will include a number of subtasks, including but not limited to:

- Conduct Project-Level Environmental Analysis
- Develop Administrative Draft Environmental Document
 - Introduction
 - Alternatives

- Affected Environment
 - Hydrology
 - Water Quality
 - Transportation and Navigation
 - Air Quality
 - Noise and Vibration
 - Biological Resources
 - Recreation
 - Economics
 - Population/Housing/Environmental Justice
 - Utilities
 - Visual Resources
 - Public Health/Environmental Health
 - Cultural Resources
- Environmental Effects
- Cumulative and Growth-Inducing Effects
- Compliance with Applicable Laws, Policies, Plans, and Regulatory Framework
 - Prepare Public Draft Environmental Document
 - Prepare Admin Final Environmental Document
 - Prepare Public Final Environmental Document

Task 4.3 Prepare NEPA Document (U.S. Army Corps of Engineers as lead agency)

NEPA compliance will be required for USACE to adopt and approve the project under Section 408, Clean Water Action Section 404, and Rivers and Harbors Act Section 10. It is assumed an EIS-level analysis will be required. It is assumed the CEQA document can be substantially reformulated to meet USACE's needs. This work will include a number of subtasks, including but not limited to:

- Develop Administrative Draft Environmental Document
- Prepare Public Draft Environmental Document
- Prepare Admin Final Environmental Document
- Prepare Public Final Environmental Document

Task 4.4 Individual Permit under Clean Water Act (CWA) Section 404 and Rivers & Harbors Act (RHA) Section 10 (U.S. Army Corps of Engineers)

Under Section 404 of the CWA, a permit is required from the USACE for the placement of dredged or fill material into waters of the United States. Under Section 10 of the RHA, a permit is required for effects on navigable waters. Projects may be authorized under existing general permits (e.g., nationwide permits) or may require individual permits. An individual permit is assumed based on the anticipated project features to be constructed in the waters of the United States, specifically the channel of the Smith

February 2010

Canal at the confluence with the San Joaquin River. USACE's CWA and RHA authorizations will be coordinated internally with Section 408 permission.

SJAFCA will map jurisdictional boundaries within the project area for navigable waters and waters of the United States under Section 10 of the Rivers and Harbors Act and Section 404 of the CWA, respectively.

SJAFCA will draft the permit application materials for a Section 10 and Section 404 individual permit for this project. These materials include a USACE application form, a pre-construction notification, and a mitigation/restoration plan. A complete permit application will require an impact assessment based upon a delineation of waters and project design documents (design with sufficient detail to accurately evaluate project impacts to jurisdictional waters). SJAFCA will coordinate with USACE throughout the process to ensure appropriate compliance documentation.

Task 4.5 Water Quality Certification under CWA Section 401 (Central Valley Regional Quality Control Board)

CWA Section 401 requires that the discharge of dredged or fill material into waters of the United States, including wetlands, does not violate state water quality standards. As required by Section 404 of the CWA, water quality certification from the Regional Water Quality Control Board (RWQCB) must be obtained for permit compliance. The Project will be subject to formal certification rather than a waiver. Project design (i.e. plans and specifications) will include best management practices (BMPs) to ensure avoidance, minimization or mitigation of effects on water quality. Completion of the CEQA process is required before certification may be granted.

SJAFCA will compile the necessary information and submit a complete certification package to the RWQCB. SJAFCA will coordinate with the RWQCB throughout the process to ensure appropriate compliance documentation.

Task 4.6 Authorization under National Endangered Species Act (U.S. Fish and Wildlife Service and National Marine Fisheries Service)

The project is proposed in an area known to have the potential for species and their habitat protected under the federal Endangered Species Act (ESA), as administered by the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS). ESA compliance is required prior to the issuance of a Section 404 permit and Section 408 permission.

SJAFCA assumes a Biological Assessment (BA) will need to be prepared to address any potential impacts to federally listed species and issuance of a Biological Opinion (BO) by the federal resource agencies.

SJAFCA will prepare a BA to be submitted to the USFWS and the NMFS to obtain a BO, which is required prior to USACE issuing a Section 404 permit. SJAFCA will coordinate

with the USFWS and NMFS throughout the process to ensure compliance documentation.

Task 4.7 Authorization under National Historic Preservation Act Section 106 (U.S. Army Corps of Engineers and State Historic Preservation Office)

The project may affect cultural resources that are listed or are potentially eligible for listing in the National Register of Historic Places and are therefore protected under the federal National Historic Preservation Act (NHPA), Section 106. NHPA compliance is required prior to the issuance of a Section 404 permit.

SJAFCA assumes that resources that are subject to Section 106 compliance will be discovered through the CEQA/NEPA process. It is assumed that no significant resources will be affected.

SJAFCA will conduct a records search and field reconnaissance and will supplement that work with field investigations. SJAFCA will consult with USACE and SHPO to prepare the appropriate documentation for Section 106 compliance. This task includes coordinating with USACE to determine the area of potential effect (APE) and defining the physical limits of USACE's consultation jurisdiction for Section 106.

Task 4.8 Streambed Alteration Agreement under Fish and Game Code Section 1600 and Authorization under California Endangered Species Act (California Department of Fish and Game)

A Streambed Alteration Agreement, in compliance with Section 1600 of the California Fish and Game Code, is required when projects will substantially divert, obstruct or change the natural flow of a river, stream or lake; substantially change the bed, channel, bank of a river, stream or lake; or use material from a streambed. California Endangered Species Act (CESA) compliance is required because the project is proposed in an area known to have the potential for species and their habitat protected by under CESA. CESA compliance, administered by the California Department of Fish and Game (CDFG) is required prior to the issuance of a Streambed Alteration Agreement by CDFG.

Completion of the CEQA process is required before an agreement can be issued. At this juncture SJAFCA assumes that there will be no take of state listed species and that preparation of a letter report documenting that assumption and submittal to CDFG will be sufficient to comply with CESA. While not expected, the scope for this task will need to be revisited and expanded if the project design is not able to avoid take of state-listed species, thereby requiring a CESA take permit on preparation of a Consistency Determination under Section 2080.1 and relying on federal Biological Opinions.

SJAFCA will prepare and submit the application package for the Streambed Alteration Agreement, describing the project features; construction period; construction methods; impacts to vegetation, fish and wildlife; and the proposed monitoring plan.

For the CESA requirements, SJAFCA will identify avoidance or mitigation measures and will prepare a letter report to be submitted to CDFG to obtain their concurrence that the project will have no effect or is not likely to affect listed species. SJAFCA will coordinate with CDFG throughout the process to ensure the appropriate compliance documentation for the Streambed Alteration Agreement and CESA.

Task 4.9 Environmental Support to Obtain Floodway Encroachment Permit under Title 23 of the State Water Code (Central Valley Flood Control Board)

A floodway encroachment permit from the Central Valley Flood Control Board (CVFCB, formerly The Reclamation Board of the State of California) will be required for the closure structure. The permit will require endorsements from USACE and the local maintaining agency.

It is assumed the project may be beyond the scope of just an encroachment and will require Section 408 permission from the Chief of Engineers (USACE HQ).

SJAFCA will prepare a floodway encroachment permit application and supporting documentation required for initiation of project construction. SJAFCA will engage USACE, CVFCB, and the local maintaining agency throughout the process.

Task 4.10 Environmental Support for the Storm Water Pollution Prevention Plan (SWPPP) as part of NPDES Compliance under CWA Section 402 (Regional Water Quality Control Board)

CWA Section 402 regulates discharge to surface waters through the NPDES program, administered by the EPA. In California, the State Water Resources Control Board (SWRCB) is authorized by the EPA to oversee the NPDES program through the RWQCBs. The NPDES program provides for both general permits (those that cover a number of similar or related activities) and individual permits.

The Smith Canal closure project will likely be required to obtain coverage under the NPDES General Permit for Construction Activities (General Construction Permit), which requires the project proponent to file a Notice of Intent (NOI) to discharge storm water and to prepare and implement a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP must include a site map and a description of proposed construction activities, along with demonstration of compliance with relevant local ordinances and regulations. The SWPPP must also describe the project-specific best management practices (BMPs) that will be implemented to prevent or reduce the discharge of construction-related pollutants, including sediments, into storm water runoff and surface drainage. Permittees are required to conduct monitoring and reporting to ensure that BMPs are correctly implemented and effective in controlling the discharge of construction-related pollutants into storm water runoff. It is assumed that the SWPPP will be prepared by others on behalf of SJAFCA (presumably and typically the construction contractor or a specialized subcontractor).

Task 5.0 Real Estate Acquisition Plan

Objective: The project may require acquisition of interests in real estate along Dad's Point, within Smith Canal, and at the north bank tie-in point. Additionally SJAFCA may need to acquire access easements through the Stockton Country Club Golf Course to access the closure structure from the north for construction purposes and for long term operations and maintenance purposes. During the design phase SJAFCA will prepare a plan for acquisition of interests in real estate needed to complete the project. Preparation of this plan will likely require right of way acquisition services, appraisal services, title research, geodetic and cadastral services, environmental site assessment services, legal services, etc. This work will include a number of subtasks, including but not limited to:

- Geodetic services include field surveys, examination of title to all parcels, including obtaining preliminary title reports or litigation guarantees, clearance of exceptions to title, policy of title insurance and the preparation of legal descriptions, maps and deeds.
- Appraisal of all parcels establishing the fair market value.
- Environmental site assessment reports to determine the existence of hazardous and toxic waste materials.
- Preparation of written offer including necessary acquisition documents including purchase funding agreements, maps and deeds for all parcels. SJAFCA will also prepare all other necessary temporary entry permits, rights of entry, borrow and spoil agreements.
- Negotiations for the acquisition of all parcels by deed and contract and/or condemnation. For parcels being acquired by condemnation, an order of possession shall be deemed "acquisition."
- Preparation of memorandums of settlement for transactional review and approval including settlement justification, escrow instructions worksheet and closing.
- Escrow and closing services required to consummate the transactions which are called for in the Funding Agreement, including clearing title at close of escrow, funding and issuance of a policy of title insurance.
- Preparation of a land acquisition final accounting package.

Task 6.0 Public Outreach

SJAFCA will implement a public outreach program that meets the legal requirements of CEQA/NEPA and provides a means for communication about the project and its impact to the affected stakeholders. SJAFCA will facilitate scoping meetings and public hearings related to the release of the environmental document and also meetings to inform the public regarding the project purpose, need, and schedule.

13. Schedule

SJAFCAs have already been engaged on this project since 2008 and is ready to initiate the next elements of the design phase beginning September 2011. Below is a tentative schedule for the project.

Activity	Start	Finish
EIP Funding Agreement	April 2011	June 2011
Assessment District Formation	February 2011	September 2011
60% Engineering Design	September 2011	January 2012
90% Engineering Design	February 2012	May 2012
100% Engineering Design	July 2012	September 2012
CEQA/NEPA Preparation	September 2011	July 2013
Right of Way Acquisition	July 2013	June 2014
Permitting Acquisition	July 2013	June 2014
Construction	July 2014	October 2015