

# Delta Flood Risk Management Assessment District Feasibility Study: Appendices

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*Prepared for:*  
*Delta Protection Commission*  
*State of California*

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## ACRONYMS AND ABBREVIATIONS

AB	Assembly Bill
AJE	alternative justifiable expenditure
BBA	benefits-based allocation
BDCP	Bay-Delta Conservation Plan
Cal OES	California Office of Emergency Services
Caltrans	California Department of Transportation
CCED	California Conservation Easement Database
CDFW	California Department of Fish and Wildlife
CESA	California Endangered Species Act
CFA	Mello-Roos Community Facilities Act of 1982
CFD	community facility district
CM	conservation measure
CSFMRA	California Chapter of the American Society of Farm Managers and Rural Appraisers
CVFPB	Central Valley Flood Protection Board
CVFPP	Central Valley Flood Protection Plan
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
Delta	Sacramento-San Joaquin River Delta
Delta Conservancy	Sacramento-San Joaquin Delta Conservancy
Delta ER Program	Delta Flood Emergency Preparedness, Response, and Recovery Program
DLIS	Delta Stewardship Council Delta Levee Investment Strategy
DRMS	California Department of Water Resources' Delta Risk Management Study
DWR	California Department of Water Resources
EBMUD	East Bay Municipal Utility District
EIP	Early Implementation Program
EPMC	equal percentage marginal costs
ERP	Ecosystem Restoration Program
FEMA	Federal Emergency Management Agency
FESA	Federal Endangered Species Act

FESSRO	FloodSAFE Environmental Stewardship and Statewide Resources Office
GHAD	Geologic Hazard Abatement District
GIS	geographic information system
GRR	General Re-Evaluation Report
HMP	Habitat Management Plan
I	Interstate
MHHW	mean higher high water
MW	megawatts
NFIP	National Flood Insurance Program
PG&E	Pacific Gas and Electric Company
PL	Public Law
PUOF	proportionate use of facilities
RD	Reclamation District
SCFRRP	Small Community Flood Risk Reduction Program
SCO	State Controller's Office
SRCB	separable-cost, remaining benefits
SPFC	State Plan of Flood Control
SSIA	State System-wide Investment Approach
SWP	State Water Project
UFRRP	Urban Flood Risk Reduction Program
USACE	United States Army Corps of Engineers
USBR	United States Bureau of Reclamation
VSL	Value of a Statistical Life

## APPENDIX A      ARCHETYPES USED THE STUDY

The primary purpose of the “archetypes” is to assist in evaluation of financing mechanisms in the Delta Flood Risk Management Assessment District Feasibility Study (the study). The archetypes are intended to provide a means of organizing the Delta’s complexities and directing attention to the beneficiaries most at risk, most levee-dependent, and most likely to be associated with an assessment program. The archetype approach aims to represent realistic but hypothetical situations that will aid in testing the degree to which each financing mechanism might be aligned with each type of beneficiary within the widely variable set of conditions prevailing in the Delta. These archetypes may also suggest the organizational structures that would be needed to administer implementation of the financing mechanisms.

Five archetypes were created to address the main concerns of any assessment scheme:

- Land uses and/or users that are deriving the most benefit;
- Differences in the conditions or location that would affect the level of risk and cost of remedy; and
- Administrative and legal issues that would affect the ability to assess (e.g.: federal, state, or private ownership, mixed ownership, unclear ownership, issues of liability).

### Structure and Design of the Archetypes

Each archetype includes a mapped representation and an illustration of the features of interest.

The intent is to focus on the most important features likely to influence the viability of the alternative financial mechanisms under analysis. These features include: levee type, land uses, exposure to inundation, channel characteristics, type of ownership, and whether solutions can be applied to individual islands or must be part of a broader multi-island or regional effort to be effective.

The archetypes were crafted by looking broadly at issues of levee maintenance and upgrade and then selecting islands that appear representative (“referent islands”). We created the characteristics of the archetypes by extracting key characteristics from the referent islands (which remain anonymous, allowing us to focus on their key characteristics rather than detailed specifics). Where several referent islands were used to inform the contents of the archetype, GIS analysis yielded measurements for the key characteristics (e.g., levee type by miles, acreage, inundation depths, and land use). Rough estimates of the cost of levee improvements were derived from the California Department of Water Resources’ Delta Risk Management Study (DRMS)<sup>1</sup> (these estimates can be updated if new information becomes available).

The five archetypes are described in detail below. They include:

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<sup>1</sup> Available at CDWR, *Delta Risk Management Strategy*, <http://www.water.ca.gov/floodsafe/fessro/levees/drms/>.

1. Island-centric with uses consisting mainly of agriculture, habitat, and recreation.<sup>2</sup>
2. Cross-Delta and in-Delta infrastructure, where protection will require coordinated development involving many islands.
3. Through-Delta water transfer and in-Delta water use.
4. In-Delta mixed use, including low-density housing, small communities, and commercial activities.
5. Islands close to areas now undergoing, or designated for, urban development.

Each archetype includes:

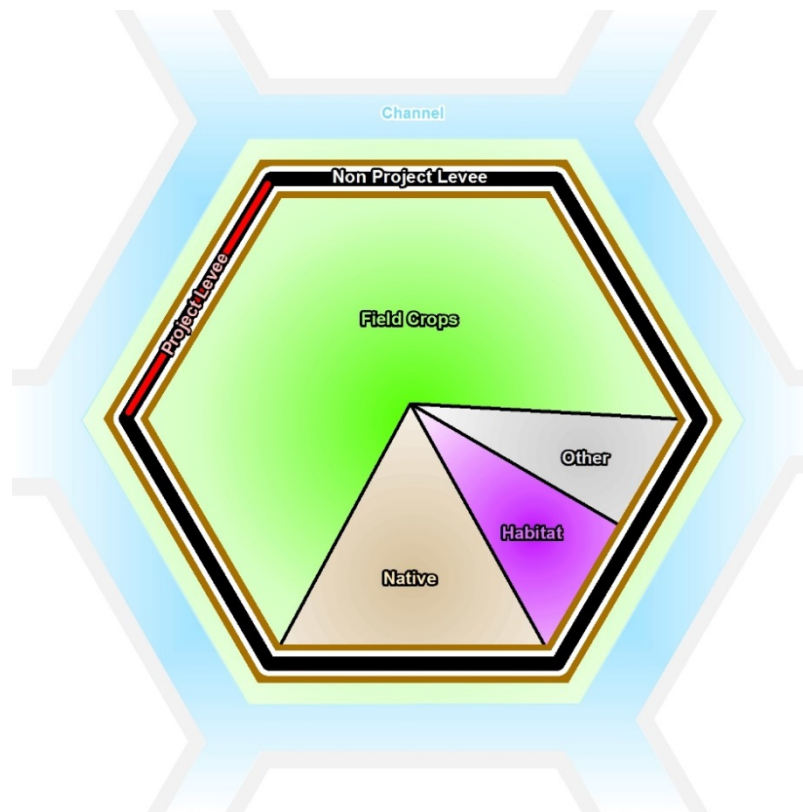
- A “map” of the representative characteristics arrayed a hexagonal presentation
- A narrative of the purpose and characteristics of the archetype to describe the intent of why we created that archetype
- A list of the specific characteristics (which we varied sometimes when conducting the analysis)
- A table from the spreadsheet model used in the cost allocation analysis that shows the activities and purposes assigned to beneficiaries, the physical traits and asset values, the values at risk to flood damage, and results from a scenario using a specified flood hazard.

**Disclaimer:** The table accompanying each archetype shows the data used to assess relative magnitudes of flood protection benefits. The tables are for informational purposes for this study only and do not represent real asset values or estimated flood risks for specific assets.

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<sup>2</sup> We recognize that islands are not in fact isolated but are dependent on broader economic, transportation and hydrologic processes. Still, levee maintenance has been island-centric and some financing mechanisms may continue to be applied in this way.

## Archetype 1: Island-centric agriculture, habitat, and recreation



This example is meant to provide a template for considering the need for levee upgrade and maintenance in situations where the primary land use is agriculture, with habitat protection, recreation and ecosystem restoration also of value.

While this archetype captures the role of levees in supporting land-based habitat and recreation, it does not capture the role of the levees as channels supporting the riparian/estuarine ecosystem, water management, water recreation, water quality, and water transfers (except to the degree that the Subventions Program provides some support for these broader state interests).<sup>3</sup>

Based upon our review of referent islands chosen to represent this archetype, it was given the following characteristics:

- Levee miles: 12 (mix of HMP, PL84-99, and Project)
- Acreage: 3,650
- Estimated asset value:<sup>4</sup> \$2M
- Average depth upon inundation (MHHW): 16 ft.

<sup>3</sup> Archetype 3 below addresses through-Delta water transfer and in-Delta water use.

<sup>4</sup> Asset values present here are based on DRMS and DLIS data. These values are intended to be illustrative and not definitive. They have been used to measure relative magnitudes of benefits and flood risks, and likely have both data error bands and a wide range of characteristics across the referent islands.

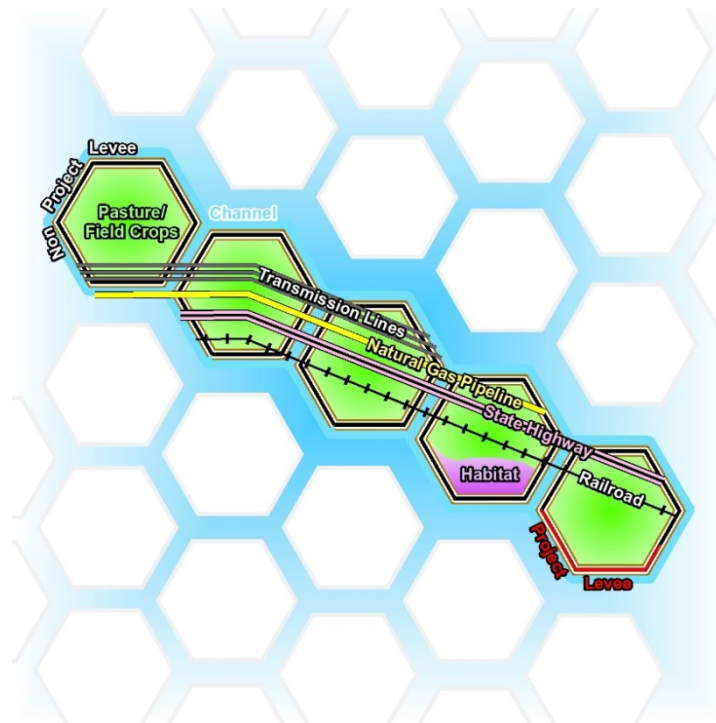
- Ownership: Private - 2025 acres/23 parcels; Public - 1625 acres/11 parcels
- Seismic hazard level: High/Moderate
- Riverine, tidal and sunny-day flood hazard: 1 in 50 years
- Types of assets:
  - Private: Agriculture (mainly row- and field crops, pasture, and vineyard/orchard), gas wells, points of water diversion
  - Public: habitat
- Population: 12 people

Archetype 1 Benefit Values by Beneficiary				Single Island			Level of Protection: Low Cost/Protection							
		Asset	Beneficiary		Asset Value/unit	Number of units	Total Asset Value by Beneficiary	Vulnerability factors	Annualized Damages	Avoided Expected Annual Damages	% of total NPV	IMPLAN economic multiplier	PV of Damages	Avoided PV Damages
private beneficiaries	capital	Real property--field crops	In-Delta Agricultural Operators		\$4,500	2,510	\$11,293,751	0%	\$0	\$0	0%		\$0	\$0
		Oil and Gas Wells (infrastructure)	Oil and Gas Companies		\$4,533,223	21	\$95,197,683	0%	\$0	\$0	0%		\$0	\$0
	production	Field crops	In-Delta Agricultural Operators		\$1,067	2,510	\$2,678,509	100%	\$2,678,509	\$702,539	31%		\$104,987,156	\$27,536,803
		Oil and Gas Wells (production)	Oil and Gas Companies		\$8,719	120	\$1,046,239	33%	\$345,259	\$90,557	4%		\$13,532,810	\$3,549,485
public beneficiaries	habitat	Habitat (not including habitat value of ag land)	Public concerned for the protection/restoration of Delta ecosystem resources			1568	\$8,635,259	50%	\$4,317,629	\$1,132,460	50%		\$169,234,312	\$44,388,020
	indirect/ induced	Field crops	indirect and induced impacts							\$290,785	13%	0.41	\$43,454,786	\$11,397,641
		Oil and Gas Wells (production)	indirect and induced impacts							\$27,468	1%	0.30	\$4,104,772	\$1,076,630
			<b>Total:</b>							\$2,243,808			\$335,313,835	\$87,948,578





## Archetype 2: Cross-Delta and in-Delta infrastructure



This example is meant to provide a template for considering the need for levee upgrade and maintenance in situations that involve levees on more than one island, and in which a wide range of assets are subject to a variety of Delta conditions and are exposed to different sources of risk. The assets may include State highways, county roads, railroads, electric transmission lines, communications facilities, and pipelines. Some of these uses currently benefit from Delta levees but do not directly contribute to levee improvements or maintenance. Their dependence on Delta levees varies, as some asset owners have other risk-avoidance mechanisms such as flood-proofing, redundancy, relocation, or insurance.

Based upon our review of the referent islands chosen to represent this archetype, it was given the following characteristics:

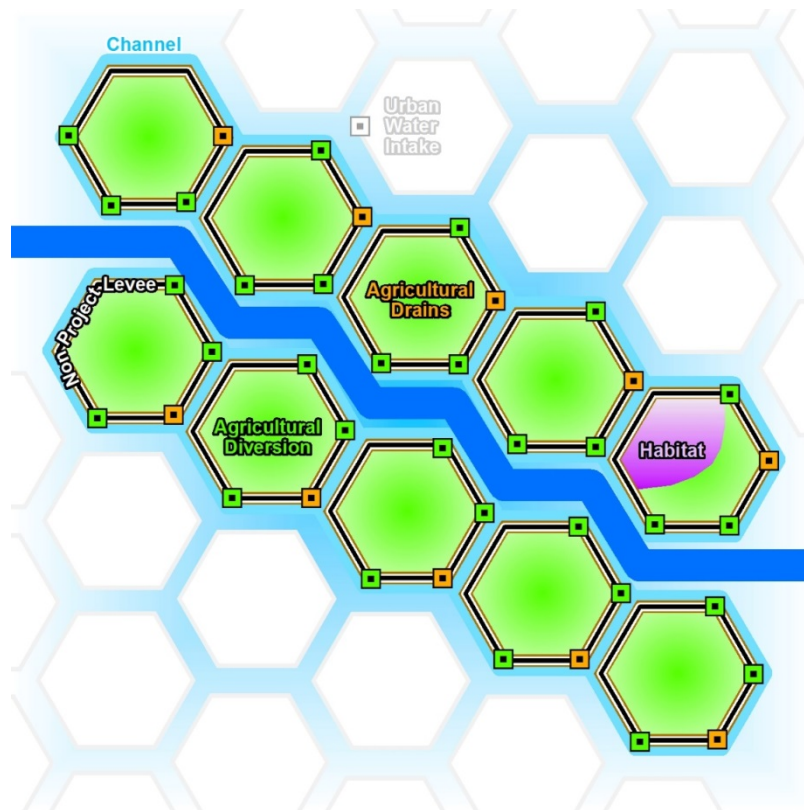
- Levee miles: 60 (mix of HMP, PL84-99, and Project)
- Acreage: 41,200
- Estimated asset value: \$34M
- Average depth upon inundation (MHHW): 11 ft.
- Riverine, tidal and sunny day flood hazard: 1 in 34 years
- Ownership: Private – 29,500 acres/402 parcels; Public – 14,900 acres/195 parcels
- Types of assets:
  - Agriculture: mostly row- and field crops, pasture, some orchard/vineyard
  - Infrastructure: state highways, electrical transmission lines, gas lines, rail
- Population: 7

- 80

		Archetype 2 Benefit Values by Beneficiary		System of 5 islands				Level of Protection: Low Cost/Protection					
		Asset	Beneficiary	Asset Value/unit	Number of units	Total Asset Value by Beneficiary	Vulnerability factors	Annualized Damages	Avoided Expected Annual Damages	% of total NPV	IMPLAN economic multiplier	PV of Damages	Avoided PV Damages
private	capital	Real property--field crops	In-Delta Agricultural Operators	\$4,500	34,176	\$153,791,370	0%	\$0	\$0	0%		\$0	\$0
		Gas Pipeline	Natural Gas Utility Company	\$1,117,000	21	\$22,909,670	25%	\$5,727,417	\$3,550,723	3%		\$224,492,528	\$139,174,575
		Electricity infrastructure	Electric Utility	\$1,617,225	25	\$40,867,267	25%	\$10,216,817	\$6,333,935	6.2%		\$400,459,554	\$248,265,672
		State Highways	Caltrans and State Highway Users	\$1,237,574	8	\$10,172,859	25%	\$2,543,215	\$1,576,671	1.5%		\$99,684,144	\$61,799,377
	production	Rail	Railroad Companies	\$1,856,361	10	\$19,306,154	25%	\$4,826,539	\$2,992,222	2.9%		\$189,181,572	\$117,283,480
		Field crops	In-Delta Agricultural Operators	\$1,485	34,176	\$50,753,270	100%	\$50,753,270	\$31,464,588	31%		\$1,989,331,139	\$1,233,289,670
		Gas Pipeline	Natural Gas Utility Company	\$3.30	5,590	\$18,445,680	25%	\$4,611,420	\$2,858,859	3%		\$180,749,760	\$112,056,162
		Electric Transmission (days downtime)	Electricity Infrastructure Owners	\$21,000,000	4	\$84,000,000	25%	\$21,000,000	\$13,018,990	13%		\$823,118,468	\$510,293,879
		State Highways	Caltrans and State Highway Users	\$288,843	120	\$34,661,140	15%	\$5,199,171	\$3,223,236	3%		\$203,787,318	\$126,338,340
		Rail	Railroad Companies	\$590,875	120	\$70,905,000	25%	\$17,726,250	\$10,989,423	11%		\$694,800,178	\$430,742,709
public benefit	habitat	Habitat (not including habitat value of ag land)	Public concerned for the protection/restoration of Delta ecosystem		636	\$4,610,439	50%	\$2,305,220	\$1,429,125	1%		\$90,355,661	\$56,016,166
	indirect/ induced	Field crops	indirect and induced impacts						\$13,023,373.13	13%	0.41	\$823,395,562	\$510,465,664
		Electric							\$5,461,295	5%	0.42	\$345,287,374	\$214,061,572
		State Highways							\$1,352,105	1%	0.42	\$85,486,100	\$52,997,272
		Rail							\$4,609,918	5%	0.42	\$291,459,538	\$180,690,902
			Total:					\$101,884,464			\$6,441,588,896	\$3,993,475,440	



### Archetype 3: Through-Delta water transfer and in-Delta water use



This example is meant to provide a template for considering the need for levee upgrade and maintenance in situations in which Delta levees protect several islands, while also providing channels (or “pipelines”) to manage water supply. Such channels serve a variety of state interests, such as conveying water to the state and federal water project pumps. Although not all Delta levees provide the same degree of such benefits, leveed channels ensure local water supplies for in-Delta use and urban water intakes, as well as water-based recreation and habitat. (This archetype does not include navigation channels maintained by the USACE as project levees.)

Based upon our review of the referent islands chosen to represent this archetype, it was given the following characteristics:

- Levee miles: 124 (mix of HMP, PL84-99, and Project)
- Conveyance channel levee miles: 37.2 miles (for an 18.6 mile channel)
- Acreage: 54,450
- Estimated asset value (DRMS & DLIS): \$63M
- Average depth upon inundation (MHHW): 15 ft., ranging from 2.5 to 22 ft. for the referent islands
- Riverine, tidal and sunny-day flood hazard:

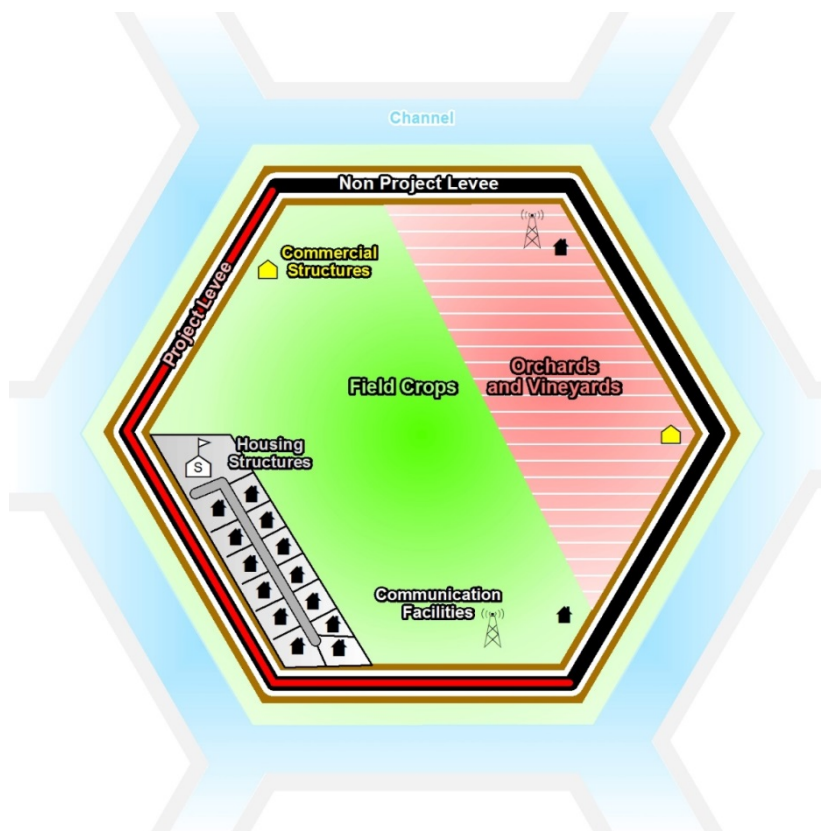
- Expected water supply loss at Clifton Court: 10,000 acre-feet (from Delta Emergency Planning Tool modeling) to 100,000 acre-feet (from Jones Tract event)
- Ownership: Private – 52,900 acres/294 parcels; Public - 480 acres/7 parcels
- Types of assets:
  - Property-based: Agriculture, agricultural diversions, agricultural drains
  - External: water conveyance and quality
  - Public: Habitat
- Population: 590

		Archetype 3 Benefit Values by Beneficiary		System of 10 islands				Level of Protection: Low Cost/Protection					
		Asset	Beneficiary	Asset Value/Unit	Number of Units	Total Asset Value by Beneficiary	Vulnerability factors	Annualized Damages	Avoided Expected Annual Damages	% of total NPV	IMPLAN Economic multiplier	PV of Damages	Avoided PV Damages
private beneficiaries	capital	field crops (property)	In-Delta Agricultural Operators	\$4,500	40,700	\$183,150,000	0%	\$0	\$0	0%		\$0	\$0
		tree and vine crops (property)	In-Delta Agricultural Operators	\$1,000	6,400	\$6,400,000	0%	\$0	\$0	0.0%		\$0	\$0
		real property (MWDSC)	South of Delta Municipal and Agricultural Water Users	\$2,314,940,800,000	1	2,314,940,800,000	0%						
	production	conveyance channel	South of Delta Municipal and Agricultural Water Users	\$541	3,667,500	\$1,983,173,427	0.15%	\$3,029,770	\$1,396,218	1%		\$118,755,233	\$54,726,311
		field crops (crop)	In-Delta Agricultural Operators	\$2,227	40,700	\$90,619,068	100%	\$90,619,068	\$41,760,242	28%		\$3,551,915,647	\$1,636,839,363
public benefit	habitat	tree and vine crops (crop)	In-Delta Agricultural Operators	\$4,026	6,400	\$25,765,329	100%	\$113,425,085	\$52,270,004	35%		\$4,445,822,979	\$2,048,781,215
		habitat (not including habitat value of ag land)	Public concerned for the protection/restoration of Delta ecosystem resources		4,900	\$97,602,000	50%	\$48,801,000	\$22,489,103	15%		\$1,912,809,732	\$881,485,535
		field crops (crop)	indirect and induced economic						\$17,284,804	11%	0.41	\$1,470,158,246	\$677,497,195
	indirect/ induced	tree and vine crops (crop)	indirect and induced economic						\$16,303,586	11%	0.31	\$1,386,700,833	\$639,037,278
		Total:											\$12,886,162,670





## Archetype 4: Small community with scattered structures



This example is meant to provide a template for considering the need for levee upgrade and maintenance in situations in which levees protect human life and some high-value properties. Current levee standards such as HMP and PL 84-99 are not intended to protect high-value assets; FEMA 100- and 200-year standards provide a greater degree of protection, but may not be affordable without state and/or federal financial assistance.

Based upon our review of the referent islands chosen to represent this archetype, it was given the following characteristics:

- Levee miles: 6 (mix of HMP, PL84-99, and Project)
- Acreage: 2,600
- Estimated asset value: \$15M
- Average depth upon inundation (MHHW): 5 ft.<sup>5</sup>
- Riverine, tidal and sunny-day flood hazard: 1 in 469 years
- Ownership: Private – 2500 acres/160 parcels; Public - 150 acres/3 parcels

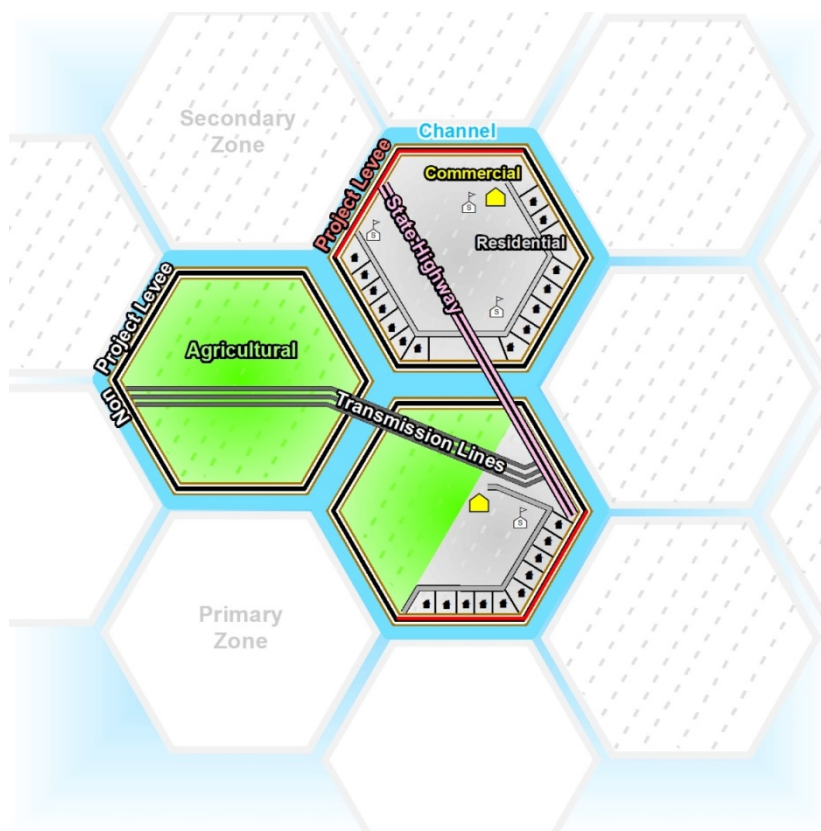
<sup>5</sup> This depth of flooding is due to tidal flooding only. Riverine flooding at the northern, eastern, and southern limits of the Delta adjacent to the Sacramento, Mokelumne, and San Joaquin Rivers could lead to flood elevations approximately 10 or more feet higher than MHHW.

- Types of assets:
  - Property-based: Housing, commerce, agriculture (row/field/pasture, some orchards/vineyards)
  - Public: habitat
- Population: 360

Archetype 4 Benefit Values by Beneficiary							Level of Protection: High Cost/Protection						
Single Island													
		Asset	Beneficiary	Asset Value/unit	Number of units	Total Asset Value by Beneficiary	Vulnerability factors	Annualized Damages	Avoided Expected Annual Damages	% of total NPV	IMPLAN economic multiplier	PV of Damages	Avoided PV Damages
private beneficiaries	community	Life	Delta Residents	\$8,699,405	0.1	\$869,940	100%	\$869,940.48	\$4,546	1%		\$34,098,289	\$178,203
		Residential--structures	Delta Residential Property Owners	\$83,158	67	\$5,592,354	40%	\$2,236,941	\$11,691	3%		\$87,679,418	\$458,226
		Residential--property	Delta Residential Property Owners	\$50,000	81	\$4,033,125	40%	\$80,310	\$420	0%		\$3,147,843	\$16,451
		Commercial--structures	Delta Commercial Property Owners	\$117,002	76	\$8,892,159	40%	\$3,556,863	\$18,589	4%		\$139,415,238	\$728,605
		Commercial--property	Delta Commercial Property Owners	\$2,250	81	\$181,491	40%	\$3,614	\$19	0%		\$141,653	\$740
		Commercial--marinas	Delta Commercial Property Owners	\$707,489	1.5	\$1,061,233	100%	\$1,061,233	\$5,546	1%		\$41,596,212	\$217,388
		School	Delta Schools/Delta Residents	\$332,587	1	\$332,587	40%	\$133,035	\$695	0%		\$5,214,448	\$27,251
	capital	Real property--field crops	In-Delta Agricultural Operators	\$4,500	1,400	\$6,301,170	0%	\$0	\$0	0%		\$0	\$0
		Real property--tree/vine crops	In-Delta Agricultural Operators	\$1,000	827	\$826,850	0%	\$0	\$0	0.0%		\$0	\$0
		Communication Facilities	Telecommunication Companies	\$3,244,128	2	\$5,677,224	15%	\$851,584	\$4,451	1.0%		\$33,378,771	\$174,442
	production	Field Crop	In-Delta Agricultural Operators	\$2,043	1400	\$2,860,816	100%	\$2,860,816	\$14,951	3%		\$112,132,877	\$586,023
		Tree or Vine Crop	In-Delta Agricultural Operators	\$11,436	827	\$9,455,471	100%	\$41,625,223	\$217,540	49%		\$1,631,547,151	\$8,526,709
		Commercial	Delta Commercial Property Owners	\$129,189	76	\$9,818,341	100%	\$9,818,341	\$51,312	12%		\$384,840,857	\$2,011,236
		Commercial--marinas	Delta Commercial Property Owners	\$1,472,924	1.50	\$2,209,386	75%	\$1,657,040	\$8,660	2%		\$64,949,526	\$339,436
		Communication Facilities	Telecommunication Companies			\$567,722	??	\$567,722	\$2,967	1%		\$22,252,514	\$116,295
Public beneficiaries	public resources	State Parks	Public		0.5	\$0.00			\$0	\$0		\$0	\$0
		County and Regional Parks	Public	\$139,375	0.3	\$34,844	100%	\$34,844	\$182	\$0		\$1,365,740	\$7,138
	indirect/ induced	Field crops	indirect and induced impacts						\$6,188.33	1%	0.41	\$46,412,441	\$242,558
		tree/vine crops	indirect and induced impacts						\$67,853	15%	0.31	\$508,897,408	\$2,659,574
		Commercial	indirect and induced impacts						\$21,525	5%	0.42	\$161,435,679	\$843,687
		Commercial--Marinas	Delta Commercial Property Owners						\$4,731	1%	0.55	\$35,480,700	\$185,427
		Communication Facilities	indirect and induced impacts						\$1,245	0%	0.42	\$9,334,637	\$48,784
		Total:							\$443,110			\$3,323,321,400	\$17,368,173



## Archetype 5. Large urban development in Secondary Zone



This example is meant to provide a template for considering the need for levee upgrades and maintenance in situations in which levees protect both agricultural uses in the Primary Zone and developed areas in the Secondary Zone. This allows us to explore two concerns: the first is whether interactions between adjoining islands and tracts with differing levels of flood protection might impose undue cost burdens on neighboring islands or tracts. The second is whether urban development in the Secondary Zone that triggers 200-year flood protection requirements can generate sufficient funds to pay for levee improvements, and whether the increased loss-of-life risk affects the choice of financing mechanisms.

Based upon our review of the referent islands chosen to represent this archetype, it was given the following characteristics:

- Levee miles: 17 (mix of HMP, PL84-99, Project and Non-Project)
- Acreage: 6,350
- Estimated asset value: \$92M
- Average depth upon inundation (MHHW): 5 ft<sup>6</sup>

<sup>6</sup> This depth of flooding is due to tidal flooding only. Riverine flooding at the northern, eastern, and southern limits of the Delta adjacent to the Sacramento, Mokelumne, and San Joaquin Rivers could lead to flood levels approximately 10 or more feet higher than MHHW.

- Riverine, tidal and sunny-day flood hazard: 1 in 48 years
- Ownership: Private – 5,550 acres/11,100 parcels; Public - 81 acres/1 parcels
- Types of assets:
  - Property-based: Housing, commerce, and agriculture (some row/field/pasture, some orchards/vineyards)
  - Infrastructure: state highways, electrical transmission lines, gas lines, rail,
  - Public: schools, habitat
- Population: 39,150

		Archetype 5 Benefit Values by Beneficiary		System of 3 Islands				Level of Protection: High Cost/Protection					
		Asset	Beneficiary	Asset Value/unit	Number of units	Total Asset Value by Beneficiary	Vulnerability factors	Annualized Damages	Avoided Expected Annual Damages	% of total NPV	IMPLAN economic multiplier	PV of Damages	Avoided PV Damages
private beneficiaries	community	Life	Delta Residents	\$8,699,405	0.1	\$869,940	100%	\$869,940	\$539,762	0%		\$34,098,289	\$21,156,586
		Residential--structures	Delta Residential Property Owners	\$128,719	23,933	\$3,080,627,509	40%	\$1,232,251,004	\$764,561,055	65%		\$48,299,455,165	\$29,967,824,990
		Residential--property	Delta Residential Property Owners	\$50,000	3,227	\$161,367,500	40%	\$3,213,249	\$1,993,689	0%		\$125,946,883	\$78,144,859
		Commercial--structures	Delta Commercial Property Owners	\$727,160	1,599	\$1,162,729,352	40%	\$465,091,741	\$288,570,292	25%		\$18,229,790,535	\$11,310,835,091
		Commercial--property	Delta Commercial Property Owners	\$2,250	3,227	\$7,261,538	40%	\$144,596	\$89,716	0%		\$5,667,610	\$3,516,519
		School	Delta Schools/Delta Residents	\$332,587	34	\$11,307,958	40%	\$4,523,183	\$2,806,449	0%		\$177,291,220	\$110,001,909
	capital	Real property--field crops	In-Delta Agricultural Operators	\$4,500	3,466	\$15,598,035	0%	\$0	\$0	0%		\$0	\$0
		Real property--tree/vine crops	In-Delta Agricultural Operators	\$1,000	415	\$414,870	0%	\$0	\$0	0.0%		\$0	\$0
		Electric Transmission	Electric Utility	\$1,252,614	31	\$39,181,773	25%	\$9,795,443	\$6,077,670	0.5%		\$383,943,344	\$238,221,050
		State Highway	Caltrans and State Highway Users	\$1,237,574	28	\$34,491,188	25%	\$8,622,797	\$5,350,091	0.5%		\$337,980,165	\$209,702,788
	production	Field crops	In-Delta Agricultural Operators	\$1,485	3,466	\$5,147,566	100%	\$5,147,566	\$3,193,853	0%		\$201,764,616	\$125,186,644
		tree/vine crops	In-Delta Agricultural Operators	\$3,715	415	\$1,541,082	100%	\$6,784,209	\$4,209,322	0%		\$265,914,635	\$164,989,092
		Commercial structures	Delta Commercial Property Owners	129,189	1,599	\$206,572,732	40%	\$82,629,093	\$51,267,953	4%		\$3,238,739,636	\$2,009,504,709
		Electric Transmission	Electricity Infrastructure Owners	\$21,000,000	4	\$84,000,000	25%	\$21,000,000	\$13,029,636	1%		\$823,118,468	\$510,711,148
		State Highway	Caltrans and State Highway Users	\$288,843	120	\$34,661,140	15%	\$5,199,171	\$3,225,872	0%		\$203,787,318	\$126,441,647
Public	indirect/induced	Field crops	indirect and induced impacts						\$1,321,954	0%	0.41	\$83,511,531	\$51,815,470
		tree/vine crops	indirect and induced impacts						\$1,312,934	0%	0.31	\$82,941,684	\$51,461,903
		Commercial structures	indirect and induced impacts						\$21,506,232	2%	0.42	\$1,358,608,689	\$842,960,801
		Electric Transmission	indirect and induced impacts						\$5,465,761	0%	0.42	\$345,287,374	\$214,236,611
		State Highway	indirect and induced impacts						\$1,353,211	0%	0.42	\$85,486,100	\$53,040,608
		Total:							\$1,175,875,452			\$74,283,333,262	\$46,089,752,427





## Approach to Estimating the Cost of Levee Upgrade Strategies for Archetypes

A key step in testing the feasibility of a mechanism is evaluating the likely allocation of revenues compared to other mechanisms. Since revenue requirements are tied to costs, we had to estimate a range of costs for flood protection for each archetype. For this Feasibility Study, our team must make reasonable assumptions about future levee improvements, the level of funding that will be required, and the timing of the investment program. We need to consider, for example, whether a financial mechanism, such as a user fee or a tax, needs to support modest investments in levee maintenance and incremental upgrades, spread out over many years (i.e. decades to in perpetuity). Alternatively, there could be a need for a substantial amount of revenue to bring flood protection up to current state and federal standards, such as that being undertaken by the Sacramento Area Flood Control Agency, to be undertaken in a relatively short timeframe (i.e. a planning, design, and construction period of approximately one decade).

This study uses archetypes, which comprise a variety of Delta levee beneficiaries with varying degrees of risk tolerance and need for levee improvements, and consequently, different funding needs. Given the need to analyze financial feasibility of a range of investments, we have developed cost estimates for two “bookend” strategies for investment. Using cost estimates from the DRMS and DLIS efforts as a starting point, we assume that a lower-cost investment strategy could be based upon the costs for upgrading levees to PL84-99 status as representative of potential costs for achieving standards specified in DWR Bulletin 192-82. For a greater level of flood protection effort which carries correspondingly higher costs, we use the DRMS estimates for raising levees to Urban Levee Standards. Assuming that Urban Levee Standard as presented in the DRMS information is equivalent to recent DWR levee standard guidance, then the Urban Levee Standard entails potentially 200-year level of flood protection, with approximately three feet of freeboard above the design flood elevation.

Both DRMS and DLIS provide levee repair costs for levee upgrades to the PL84-99 federal standard. The DLIS efforts have developed new cost estimates based on both unit fill material cost and a unit cost per linear mile of levee for levee upgrades. The DLIS costs by archetype varies from approximately 10 to 50 percent of the cost as estimated from the DRMS information because it reflects targeted upgrades rather than working on the entire ring levee of an island. The DLIS information is more current, and thus provides the lower bound cost estimate for levee upgrades. The higher bound upgrade of improving levees to the Urban Levee Standard can use the DRMS information as a starting point for the higher bookend cost. Assumptions regarding material availability, other potential costs for mitigating habitat or traffic impacts, and other details are not readily apparent in the descriptions of the DRMS and DLIS cost estimates.<sup>1</sup> However, these estimates are sufficient for our “order of magnitude” costs in the exemplar cost allocations used in the archetypes.

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<sup>1</sup> Some of the total costs seem unrealistically low, with cost estimates of less than \$10 million to repair all levees within a given Archetype to Bulletin 192-82 standards. Northwest Hydraulic Corporation’s recent experience with projects involving several hundreds of thousands of cubic yards of material excavation and subsequent placement of such material for levee

We do not assert in this study that the higher cost scenario will produce an adequate level of flood protection (more recent higher estimates of potential sea-level rise would not be accounted for, and the upgrades do not provide for seismic protection); but these figures represent a reasonable upper bound for our purposes.

Each of this study's five archetypes was created using representative referent islands for which DRMS and DLIS data is available. Thus, as illustrated below, we can use the DRMS cost estimates to generate the higher-cost scenarios for the evaluation of funding mechanisms, and the DLIS information as the lower bound. DLIS provides costs based on both unit costs based on fill material placement, or an aggregated cost per mile. Unit costs based on fill material are approximately one half to one-third the cost based on the aggregated per mile cost. We cannot opine as to which cost estimate is more accurate, but we recommend using the aggregated cost per mile as a reference point for this analysis. As an example of the cost difference between the scenarios, the urban levee upgrade cost ranges from approximately one to two orders of magnitude higher than the DLIS PL84-99 upgrade costs. Levee upgrade costs for all archetypes based on our approach as described above are summarized below. Recommended lower bound and upper bound costs are shown in bold in Table A-1.

**Table A-1 Total Levee Improvement Cost Estimates by Archetype**

	DLIS B192-82 Cost, \$15/yd <sup>3</sup> \$Millions	DLIS B192-82 Cost, \$1.5M/mile \$Millions	Modified DRMS B192-82 Cost \$Millions	Modified DRMS Urban Levee Standard Cost \$Millions
Archetype 1	14	48	120	488
Archetype 2	8	26	106	564
Archetype 3	116	240	469	2,089
Archetype 4	5	10	23	205
Archetype 5	8	26	50	295

**Key:**

DLIS = Delta Stewardship Council Delta Levee Investment Strategy

\$15/yd<sup>3</sup> = 15 dollars per cubic yard

\$1.5M/mile = 15. Million dollars per mile

DRMS = California Department of Water Resources Delta Risk Management Study

These urban levee cost estimates are large and likely do not include other costs such as habitat mitigation, infrastructure repair due to truck and equipment hauling, or traffic impacts and mitigation. The urban levee scenario would require approximately 50 million cubic yards or more of fill material, and we have not confirmed the availability or cost of that fill.<sup>2</sup>

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enhancement or rehabilitation had total construction costs of \$5 million for one project, outside of the Delta, without any significant access or habitat mitigation requirements.

<sup>2</sup> A key issue we have not addressed is that a more realistic estimate of Bulletin 192-82 unit costs per mile may be about three to four times higher than the three-foot levee raise cost as given in the DRMS spreadsheet. The lower protection level estimate

## APPENDIX B MECHANICS OF ALLOCATING COSTS

We present here a menu of cost allocation methods that our team believes represent a logical starting point for analysis. These methods have been applied in similar situations related to infrastructure investment and regulation. In some cases, these are used currently for allocating flood control costs; in others, they are used to allocate utility costs. The question of which allocation method to use in each situation depends on several factors—legal, economic, physical—that cannot be completely anticipated in this description of methods.

Each method is based on economic principles, legal requirements, and practicality. Each method is a standard practice in certain settings, as described below. As part of the screening of financial mechanisms in the next step of this study, we will evaluate the use of the appropriate cost allocation methods for the five archetypes.

### Overview

The California Department of Water Resources (DWR) has been the lead state agency on developing cost allocations for flood control measures, either directly, through the State and Central Valley Flood Protection Boards, or in concert with the United States Army Corps of Engineers. In its *Economic Analysis Guidelines*,<sup>3</sup> the DWR references three different cost allocation methods: Separable Costs-Remaining Benefits (SCRB), Alternative Justifiable Expenditures (AJE), and Proportionate Use of Facilities (POUF) methods.<sup>4</sup> A summary of these three methods is taken from De Souza et al. (2011), and each is described in more detail in the next section on “Specific Methodologies”:<sup>5</sup>

The **Separable Cost – Remaining Benefits (SCRB)** method is a commonly used approach used by State and Federal funding agencies in allocating project costs...In this method, the cost allocation is based on the economic benefits accrued for each purpose and user...The separable cost, which is the added cost for each participant, and proportion of benefits, is used to determine the proportion of joint costs allocated to each user.<sup>6</sup>

The **Alternative Justifiable Expenditure (AJE)** approach is simplified version of the SCRB method. Rather than using the separable cost for each purpose, it only uses the

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in DRMS is stated as a “repair” cost to bring the levees to an acceptable standard. (We do not have an entirely clear interpretation of what those standards are). The cost for the 3-foot raise is based on a volume calculation of raising the levee crest and sideslopes, and applying either a \$6.50 or \$20 per cubic yard for embankment earth.

<sup>3</sup> California Department of Water Resources, “Economic Analysis Guidelines,” January 2008

<sup>4</sup> The guidelines reference that these are discussed in more detail (with some examples) in the draft DWR *Economics Practices Manual*, Chapter VII (1977), but the Economics Practices Manual appears to no longer be readily available.

<sup>5</sup> Sachi De Souza, Josué Medellín-Azuara, Jay R. Lund, and Richard E. Howitt, “Beneficiary Pays Analysis of Water, Recycling Projects,” A report prepared for the State Water Resources Control Board Economic Analysis Task Force for Water Recycling in California, U.C. Davis, March 9, 2011.

<sup>6</sup> De Souza, et al 2011, op. cit.

alternative cost to construct a project which meets the same objective [e.g., flood protection].<sup>7</sup> [The **Equal Percentage Marginal Cost (EPMC)** method is a form of the AJE approach.]<sup>8</sup>

The **Proportionate Use of Facilities (PUOF)** cost allocation can be based on non-monetary benefits such as physical benefits or costs caused by each participant.<sup>9</sup> Under this methodology, a volumetric water allocation may determine the cost allocation scheme. For example, those using 30% of the water supply would pay 30% of the cost. [**Embedded Cost of Service (ECS)**, the most common method for setting water and energy utility rates, is a variation on the UOF approach.]<sup>10</sup>

In addition to the three methods cataloged in the DWR *Guidelines*, there is **Benefits-Based Allocation (BBA)**. This method is required under Proposition 218 for assessment districts, which are allowed only to charge for the special benefit that each property receives from a flood protection project. “A special benefit is a particular and distinct benefit over and above the general benefits conferred on real property located in the district or provided to the public at large. The cost of the improvements must be apportioned among the properties being assessed based on the proportionate special benefit these properties will receive.”<sup>11</sup> “The assessment rate for each parcel...is calculated by dividing the amount of annual revenue required to support each funded set of projects by the total relative flood damage reduction benefits for all parcels within the benefit zones protected by that set.”<sup>12</sup>

## General Cost Categories

Cost allocation techniques generally identify three categories of costs: specific, separable, and joint or non-separable (also known as general). As part of the process of allocating costs among beneficiaries, implementing a financing mechanism may require identifying specific, separable or joint.

**Specific costs** are costs that can readily be identified with producing a specific product or service. For example, a water recycling facility clearly produces additional water

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<sup>7</sup> De Souza, et al 2011, op. cit.

<sup>8</sup> EPMC is a new method has been developed over the last two decades that draws from optimal commodity taxation. In this approach, the marginal or incremental costs of providing a service or product to each group of customers is calculated, and then the total costs are allocated in proportion to those marginal costs.

<sup>9</sup> De Souza, 2011, op. cit.

<sup>10</sup> Costs are allocated based not on benefits but on physical criteria. In the simplest terms, the level of service to a customer is measured in physical units. Total revenue requirements (i.e., costs), sometimes specified by customer class, are divided by the appropriate physical unit. For example, “Embedded cost studies rely on the same costs used to determine the revenue requirement — that is, the historic accounting, or actual, costs that the utility incurs — and divide those costs among the customer classes in the various ways...About 30 states rely on embedded cost studies to allocate costs.” (Jim Lazard, “Electricity Regulation in the US: A Guide,” The Regulatory Assistance Project, March 2011.)

<sup>11</sup> WSP Parsons Brinckerhoff, “SAFCA Consolidated Capital Assessment District No 2, Draft Engineer’s Report,” Prepared for Sacramento Area Flood Control Agency, February 1, 2016, p. 5-1.

<sup>12</sup> Ibid, p. 5-15.

supply and reduces the costs of wastewater treatment and/or disposal. These benefits can typically be traced directly to one or more distinct beneficiary groups.

**Separable costs** are costs that can be attributed to providing a particular benefit (or group of benefits) by comparing the cost of the project with and without the components needed to produce that benefit. One common example is a multipurpose reservoir. For instance, assume a reservoir is designed to provide only water supply, and costs \$400 million. Then assume the reservoir design can be modified to provide the same level of water supply, but also provide some flood protection, and the new design costs \$500 million. The separable cost for providing flood protection at a cost of would be \$500 million minus \$400 million, or \$100 million. Estimating separable costs requires fairly detailed incremental designs and cost estimates of programs/projects.

**Joint or non-separable costs** are costs that are neither specific nor separable. These costs are costs that cannot be avoided even if a benefit or subset of benefits is removed from the program's design and operation. For instance, assume the previous example reservoir can be designed and built to provide different levels of flood protection and different levels of water supply levels, all with varying different costs. However, in order for the reservoir to provide benefits in either category it must be built to a minimum size and safety standard, at a cost of \$300 million. If the project were built to provide both flood control and water supply, the joint cost would be at least \$300 million. In practice, many costs that under ideal circumstances could be estimated as separable are treated as joint costs by necessity. This compromise often results from the many complex interactions among costs and benefits and from the lack of reliable information, and the significant expense required to estimate separable costs.

## Specific Methodologies

### Separable Cost Remaining Benefits (SCRB) Cost Allocation

The SCRB method distributes costs among the project purposes by identifying separate costs and allocating joint costs or joint savings in proportion to each purpose's remaining benefits. This method is commonly used in many water-resources related projects because the United States Army Corps of Engineers selected this method in its guidance manual.<sup>13</sup> When sufficient data exist, the SCRB method follows an economically based approach to allocate costs as follows:

1. **Assign specific costs.** Where possible, the method identifies specific costs and assigns them directly to appropriate beneficiary group (or groups). For example, if recreation facilities are constructed as part of a flood control project, the costs for these facilities are assigned to recreational users. Likewise, if a project component of a larger project is providing specific services to an identifiable user group (e.g., farmers on a specific island), then the cost for that component is assigned to that group.

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<sup>13</sup> U.S. Army Corps of Engineers, "Principles and Guidelines," Retrieved June 9, 2016, <http://planning.usace.army.mil/toolbox/guidance.cfm?id=269&Option=Principles%20and%20Guidelines>, 2016.

1. **Assign separable costs.** Where possible, separable costs are identified and assigned.
2. **Allocate joint costs.** Two or more of the following approaches can be applied to allocate joint costs for each program/project:
  - a. *Allocate joint costs in proportion to economic benefits.* This method assigns costs to different beneficiary groups in proportion to the economic benefits they are expected to receive. This traditional approach has been used often for allocating costs of public projects, and is broadly consistent with the “beneficiary pays” principle. In most cases, this approach required an estimate of physical change (e.g., water supply, habitat, water quality) that can be used to produce an estimate of the economic benefits for all major benefit categories. Benefits can then be measured as expected costs avoided if the benefits would be obtained in some other reasonable way. One example is to estimate the costs for each beneficiary (or group of beneficiaries) to develop an alternative project that provides the same benefits.
  - b. *Allocate joint costs in proportion to physical changes.* This method can be applied when there are quantitative estimates of physical changes which produce the same type of benefit across different beneficiary groups (e.g., increased water supply or reduced flood risk). If the program/project is expected to produce jointly different beneficial physical changes (e.g., increased water supply *and* reduced flood risk), the approach does not work because the different types of changes are not directly comparable.<sup>14</sup>

Another situation where this approach can be used is when existing contracts or operational agreements among beneficiaries govern how benefits are divided and costs allocated. An important example is operational agreements between the Central Valley Project (CVP) and State Water Project (SWP) on how to divide existing and new conveyance capacity in joint-use.

We can illustrate how SCRB works with two examples:

1. Beneficiaries class A can derive \$5 million in flood protection benefits at a cost of \$2 million with separate facilities costs of \$1 million; beneficiaries class B derives \$10 million in benefits with \$5 million in costs with separate facilities costing \$2 million. Assume total project costs are \$6 million.
1. Beneficiaries class A is as above; beneficiaries class C derives \$45 million in benefits with \$1 million in costs and no separable costs. Assume project costs are \$3 million.

In example 1, the separable costs allocated to A are \$1 million, and to B \$2 million. The remaining \$3 million is divided one-third to A or another \$1 million and two-thirds to B or \$2 million based on relative benefits. Total allocation to A is \$2 million and \$4 million to B.

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<sup>14</sup> Assigning dollar values to physical benefits is the usual solution to such situations. However, if economic data is unavailable or unreliable, some other allocation method is needed.

In example 2, the separable costs for A are \$1 million and none for C. The remaining \$2 million is divided 10% to A or \$100,000, and 90% to C or \$1.9 million. Total allocation to A is \$1.1 million and \$1.9 million to C.

### Alternative Justifiable Expenditure (AJE)

AJE begins with identifying the total project cost, as defined in the financial analysis, and the benefits for each purpose, as defined in the economic analysis. For each purpose, the cost of an alternative project resulting in the same benefit is also calculated. The lowest of the benefits and cost of alternative is selected and used as the justifiable cost. The justifiable cost represents the minimum value each participant should contribute to the multi-purpose project. The specific cost for each purpose is then defined. This value represents the cost of each purpose in the multi-purpose project. By subtracting the sum of the specific costs from the total project cost, the total joint cost is defined. The remaining justifiable cost is then calculated as the difference between the justifiable cost and the specific cost. The sum of all the remaining justifiable costs represents the total remaining justifiable cost. The proportion of the remaining justifiable cost to the total remaining justifiable costs then represents the present distribution for joint costs. Therefore, by multiplying the total joint cost by the representative proportion of remaining justifiable costs, joint costs are distributed among project participants. The total contribution by each party is equal to the specific cost and their proportion of the joint costs.<sup>15</sup>

Using the same examples as for SCRB, in example 1, costs are divided based solely on relative costs. The \$6 million cost is then divided 2/7 to A or \$1.7 million, and 5/7 to B or \$4.3 million. In example 2, the allocations are \$1 million to A and \$2 million to C.

### Equal Percentage Marginal-Cost (EPMC) Cost Allocation

For at least three decades, energy utility regulation in California has been guided by two key principles long accepted in the economics literature,<sup>16</sup> as tempered by equity and environmental concerns. First, in competitive markets, prices are set at the marginal cost of the last firm to enter the market; if higher profits are available, another higher-cost firm will be induced to compete.<sup>17</sup> Yet, it is assumed that “natural” monopolies, such as utilities and government services such as flood control, will exhibit increasing returns to scale, i.e., average costs decrease as total size increases. As a result of this characteristic, representative marginal costs should typically be below average costs; that means that competitive market prices are likely to fall below a level sufficient to cover average costs and firms will not be able to survive. In such situations, competitive markets will not function properly and regulation is likely needed to mitigate undue exercise of market power.

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<sup>15</sup> De Souza, et al, 2011, op. cit.

<sup>16</sup> See, e.g., Alfred E. Kahn, 1971. *The Economics of Regulation: Principles and Institutions*. New York, John Wiley and Sons, Inc. Decisions 92-12-057 and 92-12-058 rely on Kahn’s framework for developing marginal costs and revenue allocation.

<sup>17</sup> This principle holds for all assets and commodities traded in the market, regardless of whether the asset investment appears to be sunk or the asset is bundled with other attributes to create a super-asset (e.g., customer services as part of a building).



Optimal commodity taxation theory shows that a “second-best” efficient allocation is possible using marginal costs to allocate total average costs proportionately to those marginal costs.<sup>18</sup> In the preferred approach, the marginal costs to serve each customer are calculated as well as the elasticity of demand for the product or service.<sup>19</sup> The total costs are then allocated in proportion to the relative products of the marginal costs multiplied by the demand elasticities. The challenge with implementing this approach is that demand elasticities frequently are not easily estimated by individual customers or customer groups. So as an alternative based on the notion that all customers have the same price elasticity of demand (*i.e.*, that they all respond equally to price changes), the equal percent marginal cost (EPMC) revenue allocation method has been employed by the California Public Utilities Commission under the assumption that it likely results in the most efficient allocation possible of costs incurred above marginal costs.<sup>20</sup>

The first step of the analysis is to calculate what it would cost to provide incremental (additional) service at the current costs of adding facilities and acquiring additional resources. This may come to more or less than the actual costs, both because of inflation (that is, changes up or down in prices throughout the economy), and because the agency may not have exactly the right mix of resources and facilities to serve its current needs. Marginal cost studies then apportion the revenue requirement between the customer classes, in proportion to the costs each class would pay if the utility expanded, based on the incremental costs of adding to the system rather than the average costs of the existing system. For example, if the total cost of flood protection is \$6 million, and the marginal costs to beneficiaries class A is \$4 million and class C is \$6 million, then the allocation would be 40% or \$2.4 million to class A and 60% or \$3.2 million to class C. About 20 states, including California, use marginal cost studies to set energy utility rates.

### **Proportionate Use of Facilities and Embedded-Cost of Service Allocations**

The Proportionate Use of Facilities and Embedded Cost of Service methods are essentially identical. They each take total project costs and divide those over a physical usage metric to derive an average cost value. For energy utilities this is relatively straight forward, by using units of energy delivered and/or number of customers. For flood protection, it can be more complex because it can be difficult to identify a unit of consumption metric. Acreage or square footage protected could be one such metric. A disadvantage of this approach is that the economic benefit per unit of water may differ across users, introducing a bias on efficient resource allocation.<sup>21</sup> The use of facilities method is acceptable where the

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<sup>18</sup> This principle was established by Frank Ramsey in 1928 in what is now termed “Ramsey pricing.” (Frank P. Ramsey, “A Contribution to the Theory of Taxation,” *Economic Journal* 37 (1927): 47-61.)

<sup>19</sup> Elasticity of demand is the amount that the demand for a product or service changes by a customer given a change in the price.

<sup>20</sup> The EPMC method is consistent with the Shapely Value game-theoretic approach described in CALFED (undated), *op. cit.* The Nucleolus game-theoretic method is not discussed here; however, it is in essence the result of a negotiation process which would be the end-product of any successful cost allocation process.

<sup>21</sup> In the efficiency criteria, a key principle is that all users realize the same value for the last increment used; otherwise they would find it beneficial to trade among themselves to improve their situation.



use of facilities is clearly determinable on a comparable basis and where use of this method would be consistent with the basis of project formulation and authorization.<sup>22</sup>

### Embedded Cost of Service

As described in testimony submitted to the California Public Utilities Commission by the Southern California Gas Company, “(t)he embedded cost-based cost allocation methodology uses the [agency’s or] utility’s recorded expenditures and allocates them to customer classes based on cost causality. Most often, that cost causality is measured in physical units of use of specific facilities. Using embedded costs takes into account the current operations and maintenance costs and the embedded capital costs and the capital planning and implementation costs and, therefore, provides a verifiable cost starting point when allocating costs to customer classes.”<sup>23</sup>

The embedded cost method is the least consistent with economic principles of those presented here, but it is relatively easy to implement and fairly transparent in most situations.<sup>24</sup> However, a key issue has been defining “cost causality.” Not all beneficiaries use the same physical unit in the same way. For example, a square foot of a barn will not require the same flood protection as a square foot of a factory. This issue in particular has led to the adoption of the other methods described in this study.

In both examples, the allocations are the same as for AJE because the alternative and realized costs are the same, but that may not always be true. In example 1, the \$6 million cost is divided 2/7 to A or \$1.7 million, and 5/7 to B or \$4.3 million. In example 2, the allocations are \$1 million to A and \$2 million to C.

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<sup>22</sup> CALFED, “Cost Allocation Strategy Report,” Discussion Draft, Admin Record C-097696, date unknown, retrieved April 27, 2016.

<sup>23</sup> Prepared Direct Testimony of Herbert S. Emmrich, Southern California Gas Company, A.08 02 001, Before the Public Utilities Commission of the State of California, December 5, 2008, p. 10.

<sup>24</sup> See for example Emmrich (2008): “One of the other important advantages of using embedded costs [over the EPMC] approach to allocate costs by customer class is that EC studies exhibit relative computational simplicity. Because marginal costs are estimates, they must be created, requiring a complex process that is based upon numerous assumptions and analyses. Embedded cost allocation methodologies do not create this problem because, by definition, the method is directly linked to recorded historical costs that are known and measurable. Validation is therefore much simpler using recorded embedded costs... [E]mbedded cost allocation studies exhibit relative computational simplicity compared to the [long-run marginal cost] (LRMC) cost studies for two important reasons. First, the embedded cost studies do not contain the types of long-term planning assumptions required in LRMC studies simply because the underlying costs are known with certainty. Second, the embedded cost allocation studies do not require complex forecasting techniques, including computer models and other analytical tools, to derive the starting point for the analysis... Since the embedded cost allocation methodology is based upon the same cost information used to determine the utility’s overall revenue requirement, there already exists a strong familiarity with the type and level of costs included in embedded cost allocation studies. Many of these advantages work directly towards streamlining the [cost-allocation] process by reducing the degree of controversy in the selection of the costing methodology and assumptions, minimizing the opportunity for biasing results, simplifying the computational process, and enhancing the level of understanding of the underlying cost allocation theory and methodology. The distinct advantage to using embedded cost is that all of the foregoing benefits are achievable without many of the problems associated with the use of the [California Public Utilities] Commission-adopted LRMC methodology.”

## Benefits-Based Allocation under Proposition 218

The benefits-based allocation method is called for in Proposition 218. It requires distinguishing “special” benefits from “general” or incidental benefits. General benefits accrue to all beneficiaries, including those who may reside outside of the affected jurisdiction. For example, a homeowner can gain protection of the specific structure, and the local economy can generally benefit from avoiding disruption.<sup>25</sup>

To date, these benefits are typically determined through an Engineers Report.<sup>26</sup> “The special flood damage reduction benefit that will be provided to all of the properties in [the jurisdiction] is based on avoidance of damage to structures, to the contents of the structures, and to land.”<sup>27</sup> In the allocation method used for assessment districts, the first step is to evaluate potential structure content damage. This involves looking at relative structure values and relative flood depths at the targeted hazard level (e.g., a one in 200-year occurrence). Depth-damage relationships between depth of flooding and damages to structure and contents are then calculated to determine relative benefits. Damages to land values are calculated in a similar manner. The relative shares of special benefits are used to allocate the total revenues across the beneficiaries. “The amount of the annual assessments collected from each project benefit zone is sized to be sufficient to cover the local share of the cost of the improvements protecting that zone and the system operation and maintenance costs associated with those improvements.”<sup>28</sup>

But as noted in this passage, the benefits assessed have been limited to property-based purposes such as agriculture, residence and commercial activity. Other beneficiaries such as network utilities with distant users and ecosystem maintenance have not been consistently captured with this method. In cases where a beneficiary does not own property within an assessment district, such water conveyance that relies on the channels created by the levees, the assessment district may not have a means of assessing those beneficiaries. No legal precedent has been yet established on how costs might be allocated to those beneficiaries beyond the boundaries of an assessment district.

In reviewing several recent engineers’ reports, their standard approach used three fundamental premises based on the engineer’s interpretation of governing legal precedents:

- All parcels within the boundaries of the flood control agency (e.g., a reclamation district) received special benefits that are then subject to assessment;
- The cost shares from the federal and state governments represented an initial estimate of the general benefits accruing to those outside of the agency’s jurisdiction, (e.g., up to 75% of costs for the federal share on project levees, and up to 100% for the state share on non-project levees); and

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<sup>25</sup> WSP Parsons Brinckerhoff (2016), p. 5-1.

<sup>26</sup> Appendix B discusses how benefits assessment for flood protection can differ from other benefit assessments for other types of services.

<sup>27</sup> WSP Parsons Brinckerhoff (2016), p. 5-2.

<sup>28</sup> Ibid, p. 5-15.

- Certain activities within the jurisdictional boundaries, such as recreating at a local marina, are additional general benefits that are not subject to assessment but to which some costs are allocated.

In example 1, the total cost of \$6 million is divided one-third to A and two-thirds to B based on relative benefits. Total allocation to A is \$2 million and \$4 million to B. In example 2, \$6 million is divided 10% to A, and 90% to C. Total allocation to A is \$0.6 million and \$5.4 million to C.

## **APPENDIX C      BACKGROUND ON LEGAL ISSUES AND CONSTRAINTS**

This appendix describes the state and local entities involved in maintenance and improvement of Delta levees. It then describes the constraints on fees, taxes, and assessments. It concludes with a review of local agency options for raising revenue for levees. Appendix G describes California's levee programs and spending levels.

### **Institutional Context for Managing and Funding Delta Levees**

This Appendix describes the roles and responsibilities of the several state and federal agencies involved in funding Delta levee maintenance and improvements.

#### **Department of Water Resources**

The DWR's Division of Flood Management carries out multiple flood management operations throughout the state. Its Hydrology and Flood Operations Office engages in flood forecasting and flood-related emergency response activities. The DWR includes the Delta-Suisun Marsh Office, the Flood Projects Office, the Levee Repairs and Floodplain Management Office, and the Flood Maintenance Office. The DWR, along with local, regional, State, and federal partners, also implements the State's FloodSAFE California Program, outlined below. Of particular relevance to the Delta, the Delta Levees and Environmental Engineering branch of the DWR's FloodSAFE Environmental Stewardship and Statewide Resources Office (FESSRO) has provided engineering assistance as well as funding to Delta RDs to improve flood control infrastructure while protecting environmental resources and enhancing habitat in the Delta.<sup>1</sup>

#### **FloodSAFE**

FloodSAFE is a long-term strategic initiative to reduce flood risk in the state. FloodSAFE programs carry out a range of flood management planning, including regional flood management planning and a statewide flood management planning program. DWR's Central Valley Flood Management Planning Program was formed under the FloodSAFE Initiative and develops the five-year CVFPP,<sup>2</sup> as well as the SPFC, an inventory and description of the flood management facilities that make up the State-federal flood protection system in the Sacramento and San Joaquin Valleys. FESSRO has produced multiple studies of the Delta, including the Delta Risk Management Strategy, through the Delta Knowledge Improvement Program, and implements the Subventions and Special Projects Programs (described in Appendix G).

#### **Central Valley Flood Protection Board**

The CVFPB, formerly known as the California State Reclamation Board, has the mission of reducing the risk of catastrophic flooding to the people and property within the Central Valley.

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<sup>1</sup> DWR recently reorganized its offices and responsibilities, and which office is responsible for flood control in the Delta has not yet been clarified.

<sup>2</sup> The last CVFPP was adopted in 2012; the 2017 plan is now under development.

The CVFB has jurisdictional authority over the federal-state flood control system in the Central Valley. It fulfills the State's cost share obligation to the federal government for flood control projects constructed by the USACE. Upon completion of a project, the CVFB accepts responsibility for the project and transfers it to local maintaining agencies for operation and maintenance. These are classified as "project levees" and are subject to federal and state regulations of design and continued maintenance. Any modification to the federal-state flood control system or impacting the system require approval from the CVFB.

The CVFB further defined its jurisdiction in comments submitted to the DSC on the DLIS:<sup>3</sup>

The Central Valley Flood Protection Plan (CVFPP), adopted in 2012, centers around the public policy need to improve flood risk management for the entire Central Valley, including the Delta. The CVFPP's systemwide investment approach for sustainable, integrated flood management in areas currently protected by facilities of the State Plan of Flood Control (SPFC) represents the State's priorities for the Central Valley. The CVFPP will be updated every five years, with each update providing support for subsequent policy, program, and project implementation.

The Board has broad authority over the SPFC, as well as designated floodways and the regulated streams contained in Table 8.1 in Title 23, CCR, many of which are located in the Delta. The Board also holds title to real property through the Sacramento-San Joaquin Drainage District. The Board currently manages several programs, including:

- a. The Delta Subventions Program, including annual budget allocations, procedures and criteria;
- b. Issuing permits for encroachments or activities on or around the SPFC;
- c. Ordering removal of unpermitted or illegal encroachments on or around the SPFC;
- d. Serving as the non-federal sponsor for levee improvement projects requiring review by U.S. Army Corps of Engineers (USACE) pursuant to 33 USC 408 (Section 408 review);
- e. Issuing permits for projects on, under or near regulated streams (Table 8.1 in Title 23, CCR) and designated floodways.

The DWR manages the Subventions Program, which provides some State financing for non-project levees. That program is described further in Appendix G.

### **Delta Stewardship Council**

The DSC was created by the Delta Reform Act of 2009 to achieve the State's coequal goals of providing a more reliable water supply for California and protecting and enhancing the Delta ecosystem. The DSC adopted the Delta Plan in 2013 as a comprehensive, long-term management plan for the Delta to reach the co-equal goals while preserving the unique cultural, agricultural, and recreational characteristics of the Delta. The DSC was also called on in the Delta Reform Act to lead a multi-agency effort to prioritize state investments in the Delta

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<sup>3</sup> CVFPB, "Adoption of Board Consultation Guidance with the Delta Stewardship Council Regarding the Delta Levee Investment Strategy," Meeting of the Central Valley Flood Protection Board, Agenda Item No. 12A, Staff Report, September 25, 2015,

levee system to reduce flood risk, protect state interests, and advance the coequal goals. The DSC has initiated the DLIS to identify these funding priorities.

### **Delta Protection Commission**

The Delta Protection Commission was created by the Delta Protection Act of 1992, which charged the Commission with adopting a long-term resource management plan to protect and preserve the land uses within the Primary Zone of the Delta. The 2009 Delta Reform Act further charged the Commission with providing a forum for Delta residents to engage in decision-making processes regarding preserving and enhancing the Delta's unique cultural, recreational, and agricultural resources. The Delta Reform Act also identified the Commission as the appropriate entity to provide recommendations to the DSC for preserving the Delta as an "evolving place" as the Council implements the Delta Plan.<sup>4</sup>

### **Office of Emergency Services**

The California Office of Emergency Services (Cal OES) is responsible for the coordination of overall state agency response to disasters, including floods. Cal OES coordinates and supports emergency response activities, assisting local governments in emergency preparedness, response, recovery, and mitigation. It also operates the California State Warning Center for flood and other natural events. Cal OES develops and maintains the State's emergency plans.

### **U.S. Army Corps of Engineers**

The USACE is responsible for the construction and improvement of flood control projects that fall under the federal-state plan of flood control. These levees are constructed according to USACE standards and are subsequently transferred to the CVFPB and ultimately local maintaining agencies for maintenance and operation. Federal-state project levees protect population centers and waterways critical to national interests. The USACE has been the primary source of funding for improvement projects to levees that make up the federal-state flood control system, some of which are located in the Delta.

### **Federal Emergency Management Administration**

The Federal Emergency Management Administration (FEMA) is the federal agency providing emergency response and recovery services for areas impacted by national disasters. FEMA provides some funding for both emergency repairs and permanent repairs to levees that meet certain construction criteria created by the USACE through its Public Assistance Program.

### **Constitutional and Statutory Considerations Affecting New Fees, Taxes, Assessments and Charges**

California's legal framework guiding how state and local agencies collect taxes, fees, charges, and other revenues includes both constitutional and statutory considerations. Since 1978, California voters have used the initiative process several times to regulate the means by which

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<sup>4</sup> See <http://deltacouncil.ca.gov/faq/2-what-are-coequal-goals>.

the State, cities, counties, and special districts<sup>5</sup> (such as reclamation districts, or RDs) can raise revenues. The most significant initiatives were Proposition 13, passed in 1978, which reduced property taxes and restricted increases in property taxation; Proposition 218, enacted in 1996, which mandated voter approval of general and special taxes, revised assessment practices, and imposed limitations on property-related fees; and, in 2010, Proposition 26, which imposed further voter approval requirements for new local or state taxes. Cumulatively, these initiatives reduced the historic reliance on real property alone as a basis for financing public improvements.<sup>6</sup> The initiatives also constrained, through voter approval and procedural requirements, local governments' ability to raise other types of revenue. In the midst of these voter-initiated reforms, the Legislature enacted the Mitigation Fee Act (Assembly Bill [AB] 1600) in 1986, which codified the constitutional doctrine of "nexus" as it relates to exactions imposed as part of local governmental review of development projects. This cascade of increasing restrictions on local government's ability to raise taxes or impose fees, charges, or assessments is summarized below.<sup>7</sup>

### Proposition 13 (1978)

Proposition 13 added Article XIII A to the California Constitution in 1978, which capped (and in many situations lowered) the property tax revenues collected by cities, counties, school, and other districts. The measure established a maximum ad valorem tax rate of 1% based on assessed value of the property and prohibited new sales or transaction taxes on the sale of property. Annual reassessment increases are limited to no more than 2% until a property is sold or ownership is significantly modified. Proposition 13 also required local voter approval for special taxes and restricted the California Legislature's ability to enact new taxes by requiring a two-thirds vote in both legislative houses to enact new taxes. See Article XIII A Section 3.

Until Proposition 13's enactment, local entities relied heavily on property taxes to raise revenue for infrastructure investments and to pay for associated maintenance and other public services. The initiative measure significantly reduced local entities' ability to raise revenues through property taxes. It also created inequities in the tax revenues contributed by similarly situated properties. In cases where a property has been held by the same owner for many years, tax assessments can be substantially lower than market values, and two similar properties can be assessed at widely different values depending on when each property changed hands.

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<sup>5</sup> Special districts are local governmental entities with limited powers. There are more than 2,000 special districts operating in California. Examples include park districts, mosquito abatement districts, RDs and various forms of water districts. California Department of Water Resources Bulletin 155, *General Comparison of Water District Acts* (1994) describes the legal framework for all water-related agencies, including RDs.

[http://www.water.ca.gov/waterdata/library/docs/historic/Bulletins/Bulletin\\_155/Bulletin\\_155-94\\_\\_1994.pdf](http://www.water.ca.gov/waterdata/library/docs/historic/Bulletins/Bulletin_155/Bulletin_155-94__1994.pdf) . "What's So Special About Special Districts", a summary of special district organization and functions can be found at [http://www.cstda.net/wp-content/uploads/2013/04/WhatsSoSpecial\\_2010.pdf](http://www.cstda.net/wp-content/uploads/2013/04/WhatsSoSpecial_2010.pdf)

<sup>6</sup> See for example, Michael Coleman, *The California Municipal Revenue Sources Handbook*, <http://www.cob.sjsu.edu/acct&fin/tax-institute/MuniRevHBCh1Coleman.pdf>, 2008.

<sup>7</sup> More detailed analyses of these measures are available from: <http://www.cacities.org/Prop26Guide>; <http://www.caltax.org/UnderstandingProposition26.pdf>; [http://www.water.ca.gov/calendar/materials/proposition\\_218\\_implementation\\_guide\\_league\\_of\\_ca\\_cities\\_17241.pdf](http://www.water.ca.gov/calendar/materials/proposition_218_implementation_guide_league_of_ca_cities_17241.pdf)



As a consequence of the significant drop in property tax revenue caused by Proposition 13, public entities deployed supplemental revenue raising instruments (e.g., impact fees, user fees, utility charges, assessments, special taxes) to backfill for lost property tax revenue. In addition, the State developed alternative fiscal mechanisms shortly after the measure's passage to make up local agencies' revenue shortfalls.

Proposition 13 authorized cities, counties, and special districts to enact "special taxes" following a two-thirds vote of the qualified electors within the tax district.<sup>8</sup> Proposition 13 did not define "special" taxes; subsequent legislation and case law have defined the meaning of this term. The Legislature defined "special taxes" in the negative: that is, government-imposed fees or charges that were reasonably related to the cost of providing a service were excluded from being characterized as a special tax. Following the proposition's passage, the courts struggled with deciphering its scope. Through ensuing litigation, the courts reviewed numerous local revenue measures for compliance with Proposition 13. Decisions included:

- A voter-approved extension of a payroll tax whereby the tax proceeds were deposited in the City of San Francisco's general fund was not considered a "special tax." As such, the tax measure did not require a two-thirds voter approval by the electorate, but it was sufficient that the measure was passed by the voters based upon a simple majority vote.) City and County of San Francisco v. Farrell (1982) 32 Cal.3d 47).
- Assessments for bonds issued under the Streets and Highways code sections 5000 et seq. were not subject to the tax limitation because they were not special taxes and therefore not subject to the two-thirds voter approval requirement. The court concluded that assessments could not exceed the benefit conferred to the property and thus were distinguishable from taxes, which are not linked to benefits.<sup>9</sup> (County of Fresno v. Malstrom (1979) 94 Cal. App. 3d 974) However, Proposition 218 (discussed below) added important procedural steps for new assessments.
- A half-cent sales tax to benefit the San Diego County Regional Justice Facility was deemed a "special tax" subject to voter approval, as the court viewed the tax as a replacement for lost property taxes and thus an attempted evasion of Proposition 13's purposes (Rider v. County of San Diego (1991) 1 Cal. 4<sup>th</sup> 1).
- A supplemental property tax charge to fund pension benefits was not limited by Proposition 13, as it involved previously approved voter debt and was otherwise allowed for by the terms of the proposition (Carman v. Alford (1982) 31 Cal.3d 318).

Note that the phrase "special tax" as it was initially understood by the courts immediately following the passage of Proposition 13 was later modified by statute and subsequent voter-approved initiatives.

**Implications for Levee Financing:** Proposition 13 constrains the imposition of new ad valorem taxes by local or State government with a supermajority approval threshold and limits the annual escalation in assessed value. The initiative requires a two-thirds majority vote in both houses of the State Legislature to approve any new state tax (as opposed to fees or charges).

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<sup>8</sup> California Constitution, Article XIII A, section 4.

<sup>9</sup> Note however, that nowhere in State law is there a requirement that the total project benefits exceed the total costs, or that the benefit to individual taxpayers exceed the individual tax burden. Benefit-cost tests, such as those used by the U.S. Army Corps of Engineers for selecting levee projects, are generally regulatory rather than statutorily mandated.



This supermajority requirement significantly limits the State's use of new taxes to raise revenue as a minority of one-third holds effective veto power. Proposition 13 also instituted the requirement that voters approve new special taxes, a concept later refined by two subsequent initiatives, adding an additional institutional barrier to raising revenue for levee maintenance and development. This provision leads to higher administrative costs for proposing special taxes, both in designing those taxes and in staging elections, and added risks for relying on new taxes. The effect on government budgets is to favor a preference to constrain spending over raising taxes, which was the widely touted intended purpose of the proposition.

For levee financing, RDs face these higher hurdles in raising special taxes. Special districts cannot levy general taxes, only special taxes. The State legislature is constrained in gaining sufficient support for tax increases that would fund local flood protection agencies as a result of the super majority requirement.

### **Assembly Bill 1600 (1986)**

The Mitigation Fee Act, commonly referred to as AB 1600,<sup>10</sup> created a uniform process governing the adoption, collection, and accounting for "impact fees." Impact fees are defined as fees imposed either on the basis of broadly based legislative enactments that establish a uniform fee applicable to a type of development activity (for example, a city's impact fees for major roadways) or on an ad hoc basis, as determined by the specifics of a particular development project.<sup>11</sup> Local governments use such fees to finance the construction or rehabilitation of major public facilities such as roads, parks, sewer, water, levees, or other flood protection infrastructure. For example, Yuba County collects levee impact fees for certain levees within the county through its Three Rivers Levee Improvement Authority.<sup>12</sup> When adopting or imposing a fee obligation as a condition of approving a development project, a local agency must make certain findings as to the fee's purpose, the use of the funds, and the relationship between the need for the public facility and the type of development project on which the fee is imposed.<sup>13</sup> Once fees are collected, a local agency must periodically affirm the purpose and reasonable relationship between the fee and facility to be constructed.<sup>14</sup>

In most circumstances, impact fee revenues are used to invest in new or rehabilitation of long-term capital facilities. AB 1600 stipulates how cities and counties can exercise their constitutional powers to provide for the public health, safety, and welfare or, in the case of special districts, implement legislative-enacted powers, to charge fees. In particular, AB 1600 codifies the constitutional doctrine that fees must be reasonably related, or have a "nexus"

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<sup>10</sup> Government Code sections 66000-66022.

<sup>11</sup> Both legislative and ad hoc fees, along with the differences in judicial review of the two types of fees, are illustrated in Ehrlich v. City of Culver City (1996) 12 Cal. 4<sup>th</sup> 854.

<sup>12</sup> <http://www.trlia.org/docs/ASSESSMENTS-CFDs/Levee%20Impact%20Fees/Ordinances/Ordinance%201465%20Nov%2018.08.pdf>

<sup>13</sup> Government Code section 66001(a).

<sup>14</sup> Government Code section 66001(d).

between the project or activity upon which they are imposed and the facility to be financed.<sup>15</sup> As a general proposition, impact fees collected from new development cannot be used to repair existing facilities.

**Implications for Levee Financing:** AB 1600 applies to locally imposed fees assessed against new land development activities. Because impact fees are traditionally used to finance facilities as compared to maintenance, impact fees probably cannot be used to maintain levees, but such fees may be used to upgrade or replace a levee or build a new setback levee.<sup>16</sup> Cities and counties have the inherent constitutional authority to adopt and impose impact fees, but special districts do not share the same inherent power and would need specific legislative authorization to adopt impact fees. Since impact fees are tied to new development projects, the Delta Protection Act's restrictions on development within the Delta's Primary Zone reduce the potential for significant impact fee revenue in that zone.<sup>17</sup> In the Secondary Zone and outside the Delta, local governments have combined impact fees with other revenue strategies as part of a comprehensive financing program for levee improvements.<sup>18</sup>

### Proposition 218 (1996)

California voters enacted additional procedural and substantive limitations on local revenue collection strategies by approving Proposition 218, which added Articles XIII C and D to the California Constitution. Relevant to levees, this measure impacted new taxes, assessments, and property-related fees and charges, each discussed separately below.

Under Proposition 218, a majority of voters must approve new local general taxes, and two-thirds of voters must approve local special taxes.<sup>19</sup> The measure also authorized the use of the initiative process to repeal locally imposed taxes, assessments, fees, and charges, removing any doubt that local revenue measures were not exempt from a later repeal.<sup>20</sup> As a result, Proposition 218 introduced a new level of uncertainty about the long-term reliability of local governments' revenue streams.

**Taxes:** Proposition 218 classified local tax measures as special or general taxes. Special taxes are taxes used to fund particular activities or placed in the general fund but earmarked for future use. Special district taxes are classified as special taxes. The significant difference

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<sup>15</sup> Nollan v. California Coastal Commission (1987) 483 U.S. 825; Dolan v. City of Tigard (1994) 512 U.S. 374; Ehrlich v. City of Culver City (1996) 12 Cal. 4<sup>th</sup> 854.

<sup>16</sup> Rohn v. City of Visalia (1989) 214 Cal.App. 3d 1463; Bixel Associates v. City of Los Angeles (1989) 216 Cal.App. 3d 129

<sup>17</sup> Public Resources Code Sections 29700-29780.

<sup>18</sup> Three Rivers Levee Improvement Authority ("TRLIA") is a joint powers authority involving Yuba County and Reclamation District 784. For the purpose of financing levee improvements, TRLIA relies upon levee impact fees, CFD financing, assessments and State funding. <http://www.trlia.org/>

<sup>19</sup> Proposition 218 added definitions for general and special taxes. "General tax" means any tax imposed for general governmental purposes." ... "Special tax" means any tax imposed for specific purposes, including a tax imposed for specific purposes, which is placed into a general fund." " Article XIII C, Section 1 (a), (d).

<sup>20</sup> Earlier court decisions had invalidated certain initiatives repealing taxes as interfering with an essential government function. Geiger v. Board of Supervisors (1957) 48 Cal.2d 832.

between special and general taxes is that new general taxes (cities and counties) require a majority vote, whereas special taxes (cities, counties, districts) require a two-thirds vote. In addition, the revenues for special taxes can only be used for the purpose for which they were collected.

The implications of this distinction for levee improvements is that locally enacted levee-related taxes require a super-majority vote, reducing their utility as a funding strategy.

**Assessments:** Historically, assessments have served as a primary tool for local funding of levee improvements and maintenance and are frequently imposed by RDs. RDs are special districts of limited powers, formed to protect distinct geographic areas within the Delta region and administered by an independent governing body, separate from city and county governments. RDs are some of the oldest forms of government recognized under California law and are formed under general statutory authority or by special legislative acts.

Assessments are based on and levied in accordance with benefits provided to the affected property by the governmental service or activity funded by the assessment. Proposition 218 constrained local agencies' use of assessments by imposing both procedural and substantive requirements for new assessments.<sup>21</sup> These include a requirement that only special benefits (and not general benefits) may be assessed, and assessments must be based on a detailed engineer's report.<sup>22</sup> This report must quantify the proportional special benefit derived by each parcel. Special benefits are identified as separable from those conferred generally to the surrounding community. For example, a set of parcels may derive a lower risk from flood protection or may be more susceptible to a flood hazard than surrounding parcels. The assessment cannot exceed the reasonable cost of the special benefit conferred upon the parcel.

Procedural steps added by Proposition 218 require the local agency to conduct a hearing with notice to the property owner and to conduct a ballot protest proceeding prior to imposing the assessment. If the ballots opposing the measure exceed those in support, the agency may not impose the assessment. Protest ballots are weighted in accordance with the proportional financial obligation of each parcel. Thus, although they do not vote on the assessment, property owners have a direct role in determining whether or not a locally imposed assessment can go forward.

Proposition 218 requirements apply to "local agencies," which includes cities, counties, special districts, and regional governmental agencies. The State does not directly exercise assessment authority for levee improvements. Were the State to create a new regional agency for purposes of imposing assessments to fund levee improvements, the new agency would have to follow the same procedural and substantive steps as a city, county, or special district. This would pose a challenge to determining the "special benefit" for each parcel in the region and to establishing the nexus between the cost and the amount to be assessed.

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<sup>21</sup> Certain pre November 6, 1996 assessments are exempt.

<sup>22</sup> Engineer's reports have long been required, but are now key to the only avenue available for using assessments.

It is unclear whether assessments could be collected to capture levee benefits that accrue to beneficiaries outside of the Delta, e.g., water exporters or users. Under existing law, an assessment district cannot assess outside its boundaries. And because assessment districts only assess real property, the conveyance of water is not likely to be an assessable activity.

**Property-Related Fees and Charges:** The controlling legal authority pertaining to property-related fees and charges was added by Proposition 218.<sup>23</sup> This proposition established, among other provisions, new procedural and substantive rules applicable to local agencies when imposing charges based on property ownership. Generally, the limitations on property-related charges for services include the following:

- Property-related charges must be preceded by mailed notice to the property owners, coupled with a right of protest. This step allows the property owners by majority protest to veto the proposed charge. This voting is not weighted.
- Revenues cannot exceed the proportional costs required to provide the property-related service.
- Fees cannot be charged for general government services (e.g., police, fire) that are otherwise available to the public.
- Services for which fees are charged must be readily available to the property.
- New property-related fees and charges<sup>24</sup> are subject to approval by either a majority of the property owners or two-thirds of the registered voters.

Note that in contrast to assessments, in which costs are allocated in proportion to the *benefits* accruing to the property from the service or activity, property-related fees and charges are allocated based on the *costs* of providing those services or activities to each particular property. In addition, assessments can be approved by the local agency's legislative body, subject to protest, while property-related fees and charges must be approved electorally as described above.

As a funding option for levee improvements, the requirement that the service "be readily available to a property" may function as a constraint on the use of locally imposed property-related charges for levee-related work. This is because the connection of the service to the parcel is less tangible and apparent when compared to other services such as delivering potable water to a residence. Future improvements, by definition, may not be "readily available now," whereas ongoing levee maintenance would be a current activity with current benefits. Thus far, court cases have dealt with active services like turning on a spigot for water; the "service" of reduced flood risk is less tangible and immediate. It is not at all clear whether property-related charges could be employed to capture the "service" of water supply conveyance for use outside the Delta.

Many commentators have noted that following the passage of Propositions 13 and 218, voter support for local revenue measures has been mixed, undermining the predictability of local

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<sup>23</sup> California Constitution, Art. XIII D, Section 6.

<sup>24</sup> Other than charges for sewer, water and refuse collection.

revenues as part of a long-term revenue strategy.<sup>25</sup> For example, one study of the effects of voter approval requirements found that between 1986 and 2000, only 46% of RDs' proposed measures passed.

**Implications for Levee Financing:** Proposition 218 has a number of implications for taxes, fees, charges, and assessments for financing levee improvements. Primarily, Proposition 218's rules and voter approval requirements created significant challenges to local governments' successful use of assessments, and consequently reduced the likelihood of new local revenues for levee enhancement.

- Due to a set of challenges, RDs may not be raising sufficient revenues to cover the costs of levee investment and maintenance that the managing engineers deem appropriate. The supermajority approval requirement has raised the bar for enacting local taxes, both for educating voters who are unlikely to have been engaged in the decision-making process, and reaching the higher vote threshold.
- The more disciplined inquiry now required in an engineer's report (segregation of general from special benefits) may have reduced the frequency of the use of assessments as a revenue option.
- Revenues are uncertain because taxes, fees, assessments, and charges could be overturned by local initiative if property owners' support erodes over time.
- Only impact fees (see "Municipal Impact Fees," below) imposed on new development are clearly exempt from Proposition 218. This funding source is unlikely to be available to RDs in the Primary Zone due to the restrictions on development, but agencies in the Secondary Zone could use this for new levees protecting new developments.
- Special purpose districts or agencies cannot enact general taxes. As a result, RDs cannot impose a tax for general operations without local voter approval based on a supermajority vote.
- Proposition 218's changes to assessment practices have impacted local assessment proceedings. The State of California does not impose assessments, and the viability of future State assessments may depend on whether they are judicially viewed as a local assessment (subject to Proposition 218 requirements) or as a State assessment (and exempt).

### Proposition 26 (2010)

Proposition 26 further constrained both State and local governments' ability to impose new taxes. This measure is commonly viewed as a response to the decision of the California Supreme Court in *Sinclair Paint Co. v. State Bd. of Equalization* (1997) 15 Cal.4th 866. In *Sinclair*, the taxpayer challenged a fee enacted by the Legislature on the grounds that it was adopted without the requisite two-thirds vote from both legislative houses. The fee was collected from manufacturers of products containing lead and funded remedial health efforts; the State argued that it was not therefore a "tax" because it was not used for general government activity, nor did it convey a specific benefit. The Supreme Court concluded that it was not a tax

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<sup>25</sup> Kim S. Rueben and Pedro Cerdán, *Fiscal Effects of Voter Approval Requirements on Local Governments*, PPIC, [http://www.dcfp.ppic.org/content/pubs/report/R\\_103KRR.pdf](http://www.dcfp.ppic.org/content/pubs/report/R_103KRR.pdf), 2003; and Robert Wasserman, *California's State and Local Revenue Structure after Proposition 13: Is Denial an Appropriate Way to Cope?* Presentation at the "State and Local Tax Policy – Out of the Box" Conference at the Andrew Young School of Policy, Fiscal Research Center, Georgia State University, May 14, 2008.

as then defined by Proposition 13, and accordingly was not subject to the supermajority voting requirement.

Subsequently, Proposition 26 broadened the definition of “tax” for local governments as “any levy, charge, or exaction” and declared that any local tax must be approved by the voters unless the tax is specifically exempted by the terms of the proposition. The following key Proposition 26 exemptions apply to local governments:

- A charge imposed for a specific benefit conferred or privilege granted directly to the payor that is not provided to those not charged, or for services or products provided, as well as regulatory costs, all subject to a limitation of reasonableness of the costs to the government of providing the benefit, privilege, service, product, or regulatory effort. This category includes utility services that can be separately metered in some fashion, but with the restriction that the charge must be directly tied to the cost.<sup>26</sup>
- A charge imposed as a condition of property development. Various forms of development impact fees are exempt, including mitigation fees required under habitat conservation plans.
- Assessments and property-related fees imposed in compliance with the provisions of Proposition 218 (Article XIII D), discussed previously (engineer’s report, protest, and/or voter requirements).<sup>27</sup>

Proposition 26 also affected the Legislature by adopting a similar broad definition of tax compelling a two-thirds vote in both houses for new taxes (Article XIII A, sec. 3). Taxes are defined broadly, and the exemptions are similar to those for local government, although there is no exception for charges imposed in conjunction with development projects.

**Implications for Levee Financing:** For both local and State government, Proposition 26 discourages the imposition of charges and fees for general purposes but allows for charges that are correlated to the cost of services and benefits provided. The taxation capability of RDs had been limited by previous propositions and laws; consequently, Proposition 26 added little to existing requirements.

Proposition 26 did not hamper local agencies’ ability to charge for levees conferring benefits to new developments. Local government charges imposed as a condition of property development are expressly exempt from the definition of a state-imposed tax (and thus voter approval).<sup>28</sup> However, in Article XIII A Section (3), which enacts similar exemptions from the definition of a tax as those that apply to local government, there is no express exemption from the definition of a tax for charges imposed as a condition of development. One potential interpretation of this text difference is that while the state and local governments face the same constraints with respect to collecting revenues for services and benefits, the Legislature must obtain a supermajority vote in both legislative houses for development impact fees. This suggests that state-

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<sup>26</sup> In 2015, a court decision called into question the basis for tiered water utility rates based on a reading for Proposition 218 and reinforced by Proposition 26. “California Supreme Court says Capistrano tiered water rate ruling will remain published, keeping precedent for future legal battles,” *Orange County Register*, July 22, 2015, <http://www.ocregister.com/articles/water-673362-city-capistrano.html>

<sup>27</sup> See Appendix A for the Constitutional language.

<sup>28</sup> California Constitution, Art. XIII C, section 1(e)(6).

imposed development impact fees for levee improvements (which could occur only in the parts of the Delta's Secondary Zone that could be developed) may be subject to a more rigorous legislative approval process than those adopted by local agencies such as counties or RDs.

### Existing Authority to Raise Local Revenues for Flood Protection

The following discussion describes assessment processes, community facility districts, and impact fees typically relied on by local agencies to fund capital facility construction and rehabilitation, such as levee improvements and other flood protection measures. State and federal funding generally is not constrained by the myriad requirements described above. Recent funding sources and expenditures from state, federal, and other sources are discussed in Appendix G.

### Assessment Authority Generally

California law authorizes the use of assessment districts for a variety of purposes, with the range of authorized purposes varying by specific enactment.<sup>29</sup> As examples, assessments are permitted under the Landscape and Lighting Act of 1972<sup>30</sup> for landscaping, public lighting, parks, and recreational improvements. In contrast, the Parking District Law of 1951<sup>31</sup> limits assessments for acquisition, construction, and maintenance of parking facilities. New assessment districts or increases in existing assessments are subject to the procedural and substantive limitations of Proposition 218, discussed above. These limitations include use of an engineer's report that includes segregation of special from general benefits.

### Reclamation Districts

Local RDs have general statutory authority to impose assessments for financing levee improvements.<sup>32</sup> Most RDs are independent, local, special districts and are some of the oldest forms of government agencies recognized under California law. The districts are formed under general statutory authority or by special acts.<sup>33</sup> Three legal issues are of particular interest to evaluating the feasibility of financing mechanisms for levee investment and ongoing maintenance.

The first is that district-imposed assessments must be proportional to the benefits derived, pursuant to Water Code sections 51231, 51323, and 51324, and as reinforced by Proposition 218. Compliance with Proposition 218 necessitates the use of an engineering report documenting the special benefits of the services provided.

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<sup>29</sup> Further examples of relevant district forms are described briefly in Appendix D. California law pertaining to assessment districts is summarized in Chapter 9 of *Exactions and Impact Fees in California*, Solano Press (2014 Supplement). The majority of existing statutory assessment proceedings are not related to flood or drainage facilities or maintenance, and are not discussed further in this paper.

<sup>30</sup> Streets and Highways Code section 22500 et seq.

<sup>31</sup> Streets and Highways Code section 35100 et seq.

<sup>32</sup> Water Code sections 51320-51349.

<sup>33</sup> For example, RD 900 was formed in 1911 (Statutes of 1911, Chapter 100).



The second is that existing assessment authority is limited to real property and rights-of-way located within the district's boundaries. This would preclude an assessment applying to property and beneficiaries outside the RD's boundaries.

Third, another important statutory limitation relates to what property (i.e., location and by ownership) is subject to an assessment. Water Code section 51200 provides as follows: "The assessments levied by a district shall include all lands and rights of way within the district, owned by the State or by any city, county, public corporation, or utility district formed under the laws of the State *other than public roads, highways, and school districts.*" For new assessments, this language is at odds with and likely superseded by Proposition 218 and implementing legislation<sup>34</sup> that requires all properties, public and private, to be assessed.

As an aside, the State Reclamation Board (now the Central Valley Flood Protection Board) reportedly exercised assessment authority for levee work over considerable areas until the 1930s.<sup>35</sup> The role of the successor Central Valley Flood Protection Board is discussed further below.

### Levee Districts

Levee districts operate under the authorities found at Water Code sections 70000 et seq. and are limited in number and location.<sup>36</sup> The governing board is elected by registered voter property owners within the district. By statute, levee districts historically collect property taxes for general revenues but are not expressly authorized within the enabling statute to collect assessments, unlike RDs, although that authority may exist elsewhere by statute.

### Community Facility Districts and Special Taxes

One legislative response to Proposition 13 was to create the authority for a flexible financing tool designed to facilitate financing for capital improvements and maintenance of certain services. This particular strategy relies on self-imposed taxes (in contrast to impact fees, charges, or assessments). Special taxes are frequently used in conjunction with new development to finance infrastructure and maintenance through the Mello-Roos Community Facilities Act of 1982 (CFA) (Government Code section 53311 et seq.). These taxes are imposed to pay for services or capital facilities and are typically several years in duration, in contrast to impact fees, which are one-time, up-front impositions typically used to fund capital facilities. The reason for the more frequent use of special taxes in new development is that the developer controls the voting power as the sole property owner in the district before residents move in and can readily satisfy any required voting/protest provisions. A significant distinction between CFA special taxes and other revenue tools is that CFA taxes are not limited by the rigors of the benefit analysis (assessments), nexus (impact fees), or reasonableness (user charges). However,

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<sup>34</sup> Government Code sections 53750-53758

<sup>35</sup> George Bayse, "Comments on the History and Future Need for Levee Maintenance Funding," Downey Brand for the American River Flood Control District, April 1, 2003.

<sup>36</sup> Estimated at seven based upon the 2011-12 annual special district report issued by the State Controller's Office, and are mostly located in Glenn and Colusa counties. [http://www.sco.ca.gov/Files-ARD-Local/LocRep/1112\\_special\\_districts.pdf](http://www.sco.ca.gov/Files-ARD-Local/LocRep/1112_special_districts.pdf)



these special taxes (except those used to retire debt) can be repealed by voters in future years as a result of Proposition 218.

CFA special taxes could be used to pay for building or improving levees, as well as maintenance.<sup>37</sup> As an example, special taxes are used as part of a comprehensive strategy for funding levee improvements by the Three Rivers Levee Improvement Authority, a joint powers agency comprising Reclamation District 784 and the County of Yuba.<sup>38</sup>

### Municipal Impact Fees

Municipal impact fees can be adopted by cities or counties. Cities and counties frequently collect impact fees either in implementation of master plans for infrastructure such as sewers, water facilities, roads, and levees or as part of the evaluation of individual development projects, typically in conjunction with the environmental review of a development project.<sup>39</sup> The legal framework and the utility of impact fees in financing levee improvements are discussed above under “Assembly Bill 1600 (1986).”

### Findings

Local agencies, including RDs, face many restrictions that shape financing options for non-project levees and other capital projects. Important restrictions include:

- Property owner protests;
- Supermajority voter approval requirements;
- Limits on raising revenues through both general and special taxes; and
- Required demonstrations of a proportional relationship (or nexus) between the benefits received and the assessments imposed on property owners. In contrast, State and federal levee programs lack such proportionality requirements, leaving the determination of appropriate benefit to the administering agency.

As a result, local agencies face higher administrative costs for proposing special taxes, both in designing those taxes and in staging elections, and added risks for relying on new taxes. The effect on government budgets is to favor a preference to constrain spending over raising taxes.

Levee improvements can be financed through several types of local assessment district structures. However, the development limits placed on the Primary Zone constrain the de facto applicability and generally force existing property owners to bear the burden of those improvements.

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<sup>37</sup> Govt. Code section 53313.5

<sup>38</sup> <http://www.trlia.org/CFDs.asp>

<sup>39</sup> California Environmental Quality Act (“CEQA”), Public Resources Code 21000 et seq.



**Table C-1 Mechanism Categories: Legal Characteristics and Potential Limitations**

Revenue Option	Cities and Counties	Special Districts	State of California
<b>Assessments</b>	Proposition 218 procedural and substantive limitations apply: engineer's report, capture of special benefits only, hearings, and majority protests based on weighted voting tied to relative financial obligations. The assessed property must specifically benefit from the improvements or services.	Same as cities and counties.	Proposition 218 assessment requirements do not apply to the State. Current State assessment activity is non-existent or limited at most. State assessments may require a 2/3 vote of both legislative houses unless the tax (charge) is reasonably related to the cost of a benefit, service, facility, or regulatory effort being provided to the payor.
<b>General Taxes</b>	Ad valorem property taxes are capped by Proposition 13 at 1% of full cash value. New general taxes where revenues are collected for general revenue purposes must be approved by the local voters.	Ad valorem property taxes are capped by Proposition 13 at 1% of full cash value. Special districts may be entitled to a historic proportionate share of property taxes. Special districts cannot levy a general tax.	Ad valorem property taxes capped by Proposition 13 at 1% of full cash value. New taxes require a 2/3 vote of both legislative houses unless the tax (charge) is reasonably related to the cost of a benefit, service, facility, or regulatory effort being provided to the payor.
<b>Special Taxes</b>	As stipulated by Proposition 218, new special taxes are subject to 2/3 voter approval. Tax revenues can only be used for the purpose for which the tax is collected.	Same as cities and counties.	New state taxes require approval by 2/3 vote in both legislative houses unless the tax (charge) is reasonably related to the cost of a benefit, service, or regulatory effort provided to the payor.

Revenue Option	Cities and Counties	Special Districts	State of California
<b>Impact Fees</b>	Cities and counties have the inherent constitutional authority to adopt impact fees. Under the Mitigation Fee Act, the fees charged have to be reasonably related to their stated purpose. Impact fees are generally associated with new development activity. Impact fees would have limited utility in the Delta Primary Zone but may be more applicable in the Secondary Zone where urban development is occurring.	Special districts do not have the inherent authority to adopt impact fees and must rely on specific legislative authorization. If a district is authorized to adopt impact fees, it must follow the Mitigation Fee Act. Impact fees would have limited utility in the Delta Primary Zone but may be more applicable in the Secondary Zone where urban development is occurring.	The Mitigation Fee Act applies only to local agencies. State impact fees, if enacted, may require a 2/3 vote in the legislature pursuant to Proposition 26.
<b>New or Increased Property-Related Fees and Charges</b>	Property owners must be notified of the proposed charge and given the right of protest (the measure must be terminated by majority protest). The fee must be reasonably related to the service being provided and not for general governmental purposes. The burden is on the agency to correlate fees/charges to service costs. Fees/charges (other than water, sewer, or solid waste disposal charges) must be approved by the voters (property owner or registered voter) (Proposition 218).	Same as cities and counties.	Proposition 218's limitations on property-related fees and charges do not apply to the State, although would apply to a state created regional agency. New state imposed charges are limited by Propositions 13 and 26.
<b>Regulatory Charges</b>	Regulatory charges are restricted to the reasonable costs of providing the service or activity; they cannot be used for general revenue purposes. The	Same as cities and counties.	Same as cities and counties.

Revenue Option	Cities and Counties	Special Districts	State of California
	burden is on the agency to correlate fees/charges to service costs.		
<b>User Fees</b>	User fees are restricted to the reasonable costs of providing the service or activity; they cannot be used for general revenue purposes. Depending on the specific imposition, a user fee may also fall under the requirements of Proposition 218 (see New or Increased Property-Related Fees and Charges, above).	Same as cities and counties.	New state levied taxes require a 2/3 vote of both legislative houses unless the tax (charge) is reasonably related to the cost of providing the benefit, service, or regulatory effort. Under Proposition 26, revenues cannot be used for general revenue purposes.



## APPENDIX D DESCRIPTION AND EVALUATION OF BENEFICIARIES AND BENEFITS

### Evaluating Benefits Received by Beneficiaries

The beneficiary analysis focuses on estimating monetary values for at-risk private and public goods and services (e.g., flood protection for property, products, and services). As this is only a feasibility study, estimates need only provide a rough approximation of the magnitude of economic and social values that might reasonably be required to meet assessment objectives. For our purposes here, consistency with the Delta Levee Investment Strategy (DLIS) data sources is a sufficient universe for reviewing, but further analysis could look further afield. If and when new funding mechanisms for flood protection in the Delta are pursued further for implementation, more detailed estimates of benefit values will be necessary.

Many of the estimates provided in this report rely on data gathered in support of past studies of the Delta. These include, most recently, the DLIS, which in turn relied heavily on data gathered for the 2013 study completed for the California Department of Water Resources (DWR), Asset Exposure Information to Support Delta Levee Improvement Prioritization, as well as a Delta Asset Inventory developed as part of DWR's FloodSAFE Framework for Department of Water Resources Integrated Flood Management Investments in the Delta and Suisun Marsh. This information was also supplemented in the DLIS by data from the Delta Risk Management Strategy (DRMS) and the DPC Economic Sustainability Plan.<sup>1</sup>

Valuation of tangible (physical) assets in the Delta generally relies on methods that have been used in past studies. In large part, this follows the traditional method used by the United States Army Corps of Engineers (USACE) for assessing project levee cost-benefit ratios and cost allocations, where the purposes of project levees are legally prescribed by federal law. The DLIS study to date has not estimated economic values of non-physical assets and public benefits, or estimated the size of local and regional economic impacts because it follows the USACE traditional method (a recent USACE announcement indicates it may be broadening the scope of benefits considered).<sup>2</sup> For these additional beneficiary categories, the literature is sparser. Where reliable data or information pertaining to non-physical assets and public assets are not available, we assess these potential benefits more qualitatively. For many of these categories, such as the protection of Legacy Communities, non-market benefit values are extremely difficult to estimate and fall outside of the scope of this feasibility study. Wherever possible, we attempt to arrive at a rough estimate of benefits, even with large margins of error, as it is necessary to make these estimates in order to proceed with the cost allocation analysis and evaluate potential financing mechanisms.

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<sup>1</sup> The data sources used in the archetype cost allocation models are listed in the Excel file with those models, and described in the appendix that serves as a user guide to those models.

<sup>2</sup> U.S. ACE, "Sacramento River General Reevaluation Study: Public Scoping Presentation," [http://www.spk.usace.army.mil/Portals/12/documents/civil\\_works/sac\\_river\\_grr/Sac\\_River\\_GRR\\_Public\\_Scoping\\_Pres\\_2NOV15.pdf](http://www.spk.usace.army.mil/Portals/12/documents/civil_works/sac_river_grr/Sac_River_GRR_Public_Scoping_Pres_2NOV15.pdf), November 2015.

## General Methodology and Assumptions

The general methodology for estimating benefits is to calculate expected annual damages avoided by improving levees from their current level of protection to a target level of protection. We perform this calculation for two scenarios—a low-cost/low level of protection, which is generally equivalent to PL 84-99, and a high-cost/high level of protection, which is a 1 in 200-year urban level standard.

In order to evaluate the benefits of flood protection in the Delta, it is necessary to make a number of assumptions. Where a time element is involved in evaluating benefits, we assume that a flooded island will be flooded for a period of four months. This includes an implicit assumption that all islands will in fact be de-watered and recovered.

After calculating asset values or replacement costs for Delta Assets, Expected Annual Damages Avoided are calculated using a vulnerability or damage function. For residential and commercial buildings, these values are readily available from standard sources. For other categories, it was necessary to assume these values. For instance, we assume that physical infrastructure in the Delta is relatively impervious to flood damage and therefore use a vulnerability factors of 0–25%. For other categories, such as field crops, a flood would destroy the entire crop, so we assign a vulnerability factor of 100%. These assumptions were necessary to arrive at ballpark estimates of beneficiary values. Users of the beneficiary model can adjust these factors as they see fit.

The following section gives a brief explanation of each beneficiary category and the valuation data sources and methodology for estimating economic benefits. Table D-1 describes whether benefits were estimated for this study and, if so, what method was used. These methods are described in more detail for each beneficiary below, but to briefly summarize:

- Avoided in-Delta property damage – avoided flood-incurred damages, weighted by flood hazard probability;
- Avoided benefit interruption/alternative – avoided costs of either activity interruption or alternative flood protection measures;
- Non-market benefits – benefits derived from activities or purposes that are not part of economic transactions, such as creation and enjoyment of habitat, or reduced risk of fatalities; and
- Secondary impacts – benefits to beneficiaries who do not directly have activities within the Delta but who interact with Delta activities, such as agricultural product trucking or community businesses near the Delta.



**Table D-1 Beneficiary Categories and Approach**

Beneficiary	Benefit Estimation Method				
	Benefits Estimated ? (Y/N)	Avoided in-Delta property damage	Avoided benefit interruption/ alternative	Non-market benefits	Secondary impacts
<b>Community</b>					
Delta Residents	Y			X	
Delta Commercial and Residential Property Owners	Y	X			
Delta Public Facilities	N	X			
Delta Schools	Y	X			
Local Economy	Y				X
<b>Agricultural</b>					
In-Delta Agricultural Operators	Y	X			
South of Delta and North Bay Agricultural Water Users	Y		X		
<b>Municipal Water Supply</b>					
In-Delta Municipal Water Users	N	X			
South of Delta Municipal Water Users	Y		X		
<b>Infrastructure</b>					
EBMUD Mokelumne Aqueduct Users	N	X	X		
Oil and Gas Companies	Y	X	X		
Power Plant Owners	N	X	X		
Electricity Infrastructure Owners	Y	X	X		
Telecommunications Companies	Y	X	X		
Railroad companies	Y	X	X		
Caltrans and State Highway Users	Y	X	X		
Ports of Stockton and West Sacramento	N	X	X		
<b>Upstream Dischargers</b>					

**Table D-1 Beneficiary Categories and Approach**

Beneficiary	Benefit Estimation Method				
	Benefits Estimated ? (Y/N)	Avoided in-Delta property damage	Avoided benefit interruption/ alternative	Non-market benefits	Secondary impacts
Wastewater dischargers	N		X		
Storm water dischargers	N		X		
Other Indirect Beneficiaries					
Instream Diverters	N		X		
Hydropower Owners and Operators	N		X		
General Public Beneficiaries					
Ecosystem Beneficiaries	Y			X	
Commercial and Recreation Fishers	N		X	X	
Recreational Participants	N			X	
Delta as Place Beneficiaries	N			X	
State and Local Government and Special Districts					
State Government	N				X
Local Government	N				X
Special Districts	N				X
Other Economic Beneficiaries					
State Economy	Y				X

### Community Beneficiaries

Community-level beneficiaries of flood protection in the Delta include residents, local property owners, and public facilities. These community categories are similar to categories used in past studies, particularly the DLIS and the DWR's 2013 Asset Exposure study. Two additional categories are entities that operate public facilities critical to flood and other emergency response, and beneficiaries of potential indirect impacts on the local economy. As previously indicated, the DLIS only considers potential direct impacts to physical assets. As identified in Table D-1, the benefits to Community Beneficiaries of flood protection from levee investments are mostly evaluated on a quantitative level based on data available in past studies.

## Delta Residents

*Description:* Delta levees protect against loss of life for the local Delta population. The DLIS estimates that an estimated 262,000 persons currently live in the Delta. The assessment of potential benefits from flood protection to Delta residents will focus on estimating the economic value of lives saved associated with different levels of flood risk.

*Valuation Data:* Avoided loss of life to residents of the Delta has been considered in the DLIS study. The appropriate metric for placing an economic value on avoided mortality is termed the “Value of a Statistical Life” (VSL). This is a measure of what society is willing to pay for a marginal reduction in mortality risk. One of the most recent surveys of VSL calculations for policy use is the United States Department of Transportation’s 2013 estimate of \$9.1 million (2012 \$).<sup>3</sup> Our approach also relies on estimates of Expected Annual Fatalities from flooding on each Delta Island from the DLIS Study.

## Delta Residential and Commercial Property Owner

*Description:* The residential and commercial beneficiary category includes Delta residents and local business owners who own private residential and commercial structures and property in the Delta. Similar to other assets located in the Delta, this property would be directly damaged by Delta flooding, and owners benefit from avoiding these losses through levee improvements.

*Valuation Data:* The DLIS study provides a count and assessed value for all commercial and residential parcels and structures in the Delta as part of their inventory of assets in the Delta. We assume a 40% damage factor for these assets based on average depth-damage functions used in the Central Valley Flood Protection Plan, Appendix 8F. In addition to damage to the physical assets, we also attempt to evaluate the interruption of commercial activity in a flood event. For this calculation, we rely on estimates of lost profit per day of flooding from the DRMS Phase 1 Economic Consequences Technical Memo and apply the assumed period of four months of flooding. For marina enterprises, we use a different approach. Using data from the Delta Economic Sustainability Plan, Appendices H and I, we calculate the average expenditures inside the Delta on boating, fishing, and camping per marina/camping enterprise and use this value, prorated for a 120-day period as the lost revenue in a flood event. Note that these calculations do not include employee damages and may therefore underestimate actual business interruption losses.

## Delta Public Facilities

*Description:* Public facilities in the Delta include police and fire stations, hospitals, utilities, and emergency centers. These facilities can be either public or private. However, because of their critical role in responding to flood events and other emergencies, owners of these facilities need to be considered separately from owners of residential and commercial properties.

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<sup>3</sup> US Department of Transportation. Guidance on Treatment of the Economic Value of a Statistical Life (VSL) in US Department of Transportation Analysis. 2013. [https://www.transportation.gov/sites/dot.dev/files/docs/VSL%20Guidance\\_2013.pdf](https://www.transportation.gov/sites/dot.dev/files/docs/VSL%20Guidance_2013.pdf)

*Valuation Data:* Asset values for public facilities in the Delta are available in the DLIS. The DLIS includes a count and estimates of asset value for emergency centers, fire stations, police stations, prisons, and DWR flood-fight warehouses in the Delta.

### Delta Schools

*Description:* Owners of schools located in the Delta receive benefits from Delta flood protection in the form of avoided property damage. Although often grouped with other public facilities (e.g., DWR's Asset Exposure Study – see Appendix 2), schools are categorized separately from other public facilities for this study because they would be expected to have a different role in emergency response than the public facilities described above.

*Valuation Data:* The DLIS study provides a count of private and public schools on Delta islands as well as average asset values, which we rely on for our analysis. These asset values are based on a replacement value from Asset Exposure Study of \$323,000. However, this estimate likely underestimates the true replacement value of a public school. The value of school property at risk will require further investigation if a beneficiary-pays financing mechanism moves forward to implementation. As with residential and commercial structures, we apply a damage function of 40%, based on averages from the Central Valley Flood Protection Plan, Appendix 8F.

### Local Economy

*Description:* Economic impacts of flooding in the Delta can spread beyond the entities that receive direct damage. For example, flooding of a single island impacts not only the property owners on that island, but also business owners on neighboring islands that may depend on agricultural inputs or outputs from the flooded island. Examples in this case can include equipment and fertilizer dealers for inputs, or trucking and packing houses for outputs. Changes in local economic activity from upstream or downstream economic transactions are termed indirect impacts. Like the Delta itself, the Delta economy is a highly interrelated system, where impacts do not occur in isolation. This beneficiary category accounts for the owners of businesses located in the Delta but that are not directly impacted by flooding.

*Valuation Data:* It should be noted that local economic impacts are not considered in the DLIS analysis, which includes only direct economic benefits from flood protection. To estimate local economic impacts we employ economic multipliers from the IMPLAN model dataset for San Joaquin County. We apply these multipliers to agricultural crop production and commercial economic impacts, as well as to infrastructure production estimates, which are outlined elsewhere in this appendix. We calculate average multipliers for field crops, tree/vine crops, and an economy-wide average that is applied to all other categories. Note that this approach arrives at a single estimate of secondary economic impacts and cannot easily be separated into local/region and state level impacts.

### Agricultural Land Owners, Producers and Water-Users

Owners of agricultural land in the Delta, as well as owners of a large portion of the agricultural lands south of the Delta, depend on water supplies that flow through the Delta, thereby benefiting either directly or indirectly from improved flood protection in the Delta. As identified

in Table D-1, the benefits to Agricultural Land Owners, Producers and End Users of flood protection from levee investments are evaluated on a quantitative basis.

### **In-Delta Agricultural Landowners and Operators**

*Description:* Agricultural landowners and operators benefit directly from flood protection in the Delta. Avoiding agricultural losses from flooding damages is a benefit of flood protection that accrues to agricultural interests in the Delta. Flooding of agricultural land may cause the loss of crop output for at least a single season, or over multiple seasons in the case of tree and vine crops.

*Valuation Data:* Benefits to agriculture can be approached in two ways: crop value and land value. As outlined in the Federal Emergency Management Agency Cost Benefit Analysis Guidelines, including both loss of rental value (or annualized land value) and loss of production (or crop value) would be double counting avoided damages. Our approach is therefore to include only gross crop value as the benefit to agricultural landowners, although real estate value is also readily available from DLIS. Per acre crop value data are sourced from the DLIS, which relied on 2010 agricultural land use and crop value data from the California Pesticide Regulation Database, which was collected by the University of the Pacific in support of the DPC's Economic Sustainability Plan (2012). Data for Contra Costa County agricultural land use, however, were taken from DWR county land use files that were obtained and merged for the State Flood Management Plan in 2011. For field crops, we assume a loss of a single year's crop value; for tree and vine crops we assume a loss of five years of crop value.

### **South of Delta and North Bay Agricultural Water Users**

*Description:* A large portion of agricultural production south of the Delta and in the San Francisco Bay Area depend on water pumped through the Delta as part of the State Water Project (SWP) and the Central Valley Project (CVP). Although owners and operators of these agricultural lands do not receive direct benefits from Delta flood protection, water deliveries through SWP and CVP infrastructure in the Delta rely on the Delta levee system to convey water through Delta channels, to protect the projects' pumping infrastructure, and to act as a barrier against seawater intrusion into the Delta, which protects water quality. Flooding of Delta islands, particularly those near SWP and CVP pumps and in the western Delta, has the potential to increase salinity to levels unsuitable for agricultural use, which would disrupt water deliveries through the Delta. Depending on the duration of disruption and the availability of alternative water supplies (e.g., from groundwater pumping in the San Joaquin Valley), such flooding events have the potential to cause crop damage and also to contribute to the overdrafting of groundwater supplies. Avoided crop damage and/or overdrafting of groundwater supplies are potential benefits of flood protection measures to agricultural interests outside of the Delta.

*Valuation Data:* Economic benefits of flood protection in the Delta to agricultural water contractors south of the Delta and in the Bay Area are not considered in the DLIS. We therefore relied on estimates of net benefits per acre-foot of deliveries through the Delta from the BDCP and created an estimate of likely export curtailments from a flood event using the Delta Emergency Planning Tool. Economic benefits are based on estimates from the BDCP,

summarized in Appendix 9A of the Draft BDCP. We use the BDCP's estimate of annual net benefits under the high outflow scenario applied to the incremental difference between annual water deliveries under that scenario and the existing scenario to arrive at an estimate of benefits per acre-foot of water moved through the Delta. Although these estimates were developed for a specific BDCP scenario, they are the best readily available estimates of the value of exporting water through the Delta. However, they do come with some shortcomings. The economic benefit calculation is not disaggregated between agricultural and urban users, nor is it disaggregated between direct and secondary economic impacts, though both are included in the calculation. In this analysis, we therefore use a single estimate of the benefit of water conveyance through the Delta and do not assign separate values to south-of-Delta agricultural users, south-of-Delta urban users, or state economic impacts associated with conveyance. To estimate a likely export deficit from a flood event, we used the Delta Emergency Planning Tool to run a set of scenarios for individual island failures and a set of three archetype island failures in wet, average, and dry years to arrive at a probability-weighted average export deficit of 5,603 acre-feet from a flood event.<sup>4</sup>

## **Municipal Water Providers and End-Users**

Residents of the Delta, as well as residents of urban areas outside of the Delta who rely on SWP and CVP water deliveries (including large swaths of the Los Angeles and San Diego metropolitan areas and the Bay Area), depend on fresh water supplies that flow through the Delta. As identified in Table D-1, the benefits to South of Delta Municipal Water Providers and End Users of flood protection from levee investments are evaluated on a quantitative level, while those to In-Delta Users are not.

### **In-Delta Municipal Water Users**

*Description:* Residential, commercial, and industrial water users (termed here as “municipal” water users, as distinct from agricultural water users) in the Delta rely on water supplies that flow through Delta channels. They benefit from flood protection in the Delta in several ways. First, the physical infrastructure that conveys water through Delta channels is protected from potential flood damages by levees. The water supply is transported in channels and directed by Delta levees and, in some cases, stored on islands; islands in the West Delta and the levees that protect them also play a large role in maintaining water quality by preventing seawater from entering the Delta. Flooding of upstream islands also would affect the water quality for downstream in-Delta water users. According to DLIS information, the Delta is home to approximately 261,800 residents, all of whom rely on the Delta for their water supply.

Bordering Delta communities, such as Antioch, Stockton, and Suisun, also rely at least in part on surface water diversions from the Delta. Contra Costa Water District also is considered as an in-Delta water user. Though it receives nearly all of its water supply from the CVP, the Contra Costa Water District is classified as an in-Delta water contractor and receives its supply through the Contra Costa Canal rather than the large pumping plants in the south Delta.

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<sup>4</sup> DWR Flood Operations provided the DEPT software program to the project team to conduct this evaluation.

*Valuation Data:* There are no readily available data sources for the value of water to in-Delta urban water users. For the purposes of this analysis, the majority of in-Delta water users are also captured under other beneficiary categories as Delta Residents, or Delta Commercial and Residential Property Owners.

### South of Delta Municipal Water Users

*Description:* The Delta also serves as a hub for moving water to municipal and industrial users south of the Delta through the SWP and CVP. Twenty-nine water agencies in southern California supply water to about 25 million state residents, and these agencies rely either partially or mostly on supplies conveyed through the Delta and delivered by the SWP.<sup>5</sup> From the Banks Pumping Plant in the South Delta, the SWP also delivers water to large portions of the Bay Area, including parts of the East Bay and Silicon Valley, and the Central Coast. From the North Bay Aqueduct, the SWP also supplies water to Napa and Solano Counties.

*Valuation Data:* As described in the South of Delta Agricultural Water Users category above, estimates of the value of exporting water through the Delta are available from the BDCP. However, it is not possible to disaggregate the benefits to urban and agricultural water users from the data available. In this analysis, we therefore use a single estimate of the benefit of exporting water, which includes municipal and agricultural users as well as direct and indirect economic impacts. See “South of Delta and North Bay Agricultural Water Users,” above, for a detailed description of the data approach used in this analysis.

### Infrastructure Owners and End-Users

The Delta, given its location at the center of the Northern California megaregion, serves as an infrastructure hub for the movement of goods, natural resources, and people across Northern California, the state, and beyond. Owners of multiple types of physical infrastructure assets, primarily located land-side on Delta islands, benefit directly from Delta flood protection. Owners of these physical infrastructure assets and end users indirectly benefit from Delta flood protection in the form of service reliability and avoided infrastructure downtime. The loss of product or service revenues is potentially a larger consequence to infrastructure owners than the direct loss of the physical infrastructure.

Our approach to analyzing the infrastructure beneficiary categories is therefore to calculate two benefit values—one that captures the benefit of protecting the physical infrastructure and one that captures the production value of that infrastructure.

As identified in Table D-1, the benefits to Infrastructure Owners and End Users of flood protection from levee investments are primarily evaluated on a quantitative level, with the exception of the Mokelumne Aqueduct, Power Plant, and Delta Port beneficiaries.

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<sup>5</sup> <http://www.water.ca.gov/swpao/>



## EBMUD Mokelumne Aqueduct Users

*Description:* The Mokelumne Aqueduct is a water conveyance system owned and operated by the East Bay Municipal Utility District (EBMUD). It spans 90 miles from Pardee Reservoir on the Mokelumne River in the Sierra foothills to EBMUD's storage facilities in the East Bay hills. Over that span, three pipelines that make up the aqueduct pass through 15 miles of Delta lands; large, aboveground pipes are exposed to flood risk and depend on Delta levees for protection.<sup>6</sup> The Mokelumne Aqueduct is the main source of water supply for EBMUD, providing approximately 90% of the water used in the district.<sup>7</sup> Approximately 1.3 million people that make up the EBMUD service area depend on this infrastructure.<sup>8</sup>

*Valuation Data:* While we did not estimate a value for the Mokelumne Aqueduct for the current study, estimates would need to be developed in the future using a similar approach to other pipeline infrastructure considered in this study, with an infrastructure value component and a production value component. The DLIS study included Mokelumne Aqueduct infrastructure in their analysis. According to DLIS data, there are 55 miles of aqueduct that pass over the Delta. The DLIS identifies a replacement cost for the Mokelumne Aqueduct of \$32.7 million per mile. The production value should be developed in a manner consistent with the net economic benefit calculations completed for the BDCP used to estimate the value of the South of Delta Conveyance category.

## Oil and Gas Companies:

*Description:* The Delta is a valuable location for energy infrastructure, providing a critical linkage to gas production and storage facilities. According to DLIS information, there are 410 active natural gas wells and 108 square miles of natural gas fields in the Legal Delta.<sup>9</sup> This includes two major natural gas fields, one of which, the Rio Vista Field, is one of the largest in California.

Oil pipelines also pass through the Delta carrying gasoline and aviation fuel from refineries in the Bay Area to depots for distribution in Northern California and Nevada. These pipelines supply nearly half of the transportation fuel used in the Northern California megaregion.<sup>10</sup>

These significant energy infrastructure assets are subject to direct damage from flooding events. Temporary interruptions in the operation of these facilities have the potential to disrupt fuel deliveries in the state and beyond, with potentially costly consequences. In addition, damages to these facilities could cause ancillary damages to water quality and to aquatic and terrestrial habitat from oil or gas contamination.

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<sup>6</sup> <http://www.ebmud.com/water-and-drought/about-your-water/water-supply/ebmud-and-delta/>

<sup>7</sup> EBMUD. 2010 Urban Water Management Plan. 2011. [file:///C:/Users/Liz/Downloads/UWMP-2010-2011-07-21-web-small%20\(1\).pdf](file:///C:/Users/Liz/Downloads/UWMP-2010-2011-07-21-web-small%20(1).pdf)

<sup>8</sup> <https://www.ebmud.com/water-and-drought/about-your-water/>

<sup>9</sup> The Delta received its first official boundary in 1959 with the passage of the Delta Protection Act (Section 12220 of the Water Code). The term "Legal Delta" refers to the statutory boundary established in the Delta Protection Act.

<sup>10</sup> Delta Protection Commission. Economic Sustainability Plan for the Sacramento-San Joaquin Delta. 2012



*Valuation Data:* An inventory as well as estimates of the value of gas oil production fields, gas storage facilities, gas wells, natural gas pipelines, natural gas stations, and oil pipelines located in the Delta are available from DLIS. In addition to the asset value, we also consider the production value of these infrastructure resources. These estimates are not readily available and required making several assumptions about gas pipeline shipments. We assume that gas pumped through the pipeline is equal to the amount of storage at McDonald Island. Using the total Northern California daily natural gas requirement in a cold temperature and dry hydro year,<sup>11</sup> and the estimate from the Delta Vision Utilities study that 20% of Northern California supply is stored at McDonald Island,<sup>12</sup> we estimate an expected peak storage amount. Based on the assumption of a four-month period of flooding and current natural gas prices from the United States Energy Information Administration,<sup>13</sup> we estimate a total value of the gas moved through the Delta. We use this value as the production value of Delta pipelines.

### Power Plant Owners

*Description:* Similar to the Delta's infrastructure role as a hub for the movement of oil and gas, and in part because of this role, the Delta also serves as an infrastructure focus for critical electricity generation and transmission. According to the Delta Economic Sustainability Plan, which relies on information from the DRMS analysis, there are 23 power plants in the Legal Delta, of which 15 are natural gas generation facilities according to the California Energy Commission. According to the 2007 DRMS analysis, these facilities had a total generation capacity of 5,300 megawatts (MW). In 2010, plants within the Legal Delta produced nearly 10% of the state's total natural gas-based generation.<sup>14</sup>

*Valuation Data:* We did not estimate a benefit value for power plants, however there are multiple information sources available for this information. Power plant values are estimated in the DLIS by typical replacement costs from FEMA's Hazus GIS database,<sup>15</sup> as cited in the Asset Exposure Study. Small power plants (<500 MW) have a typical replacement cost of \$162 million, while medium and large power plants (≥500 MW) have a typical replacement cost of \$811 million. The DLIS uses a count of 12 power plants in the Legal Delta. Both infrastructure and production value of exposed power plants would need to be considered in developing future estimates of benefit value.

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<sup>11</sup> California Gas and Electric Utilities. 2014. 2014 California Gas Report. [https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=4&cad=rja&uact=8&ved=0ahUKewiE1vS1rM7NAhVK7WMKHd3ZDtkQFgg\\_MAM&url=http%3A%2F%2Fwww.pge.com%2Fpipeline%2Flibrary%2Fregulatory%2Fdownloads%2Fcgr14.pdf&usg=AFQjCNGMOKyofdRcoGnEW0ZqMRM0SLMaXw&sig2=yRJzHeyLuYvo6CDdylCsQ&bvm=bv.125801520,d.cGc](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=4&cad=rja&uact=8&ved=0ahUKewiE1vS1rM7NAhVK7WMKHd3ZDtkQFgg_MAM&url=http%3A%2F%2Fwww.pge.com%2Fpipeline%2Flibrary%2Fregulatory%2Fdownloads%2Fcgr14.pdf&usg=AFQjCNGMOKyofdRcoGnEW0ZqMRM0SLMaXw&sig2=yRJzHeyLuYvo6CDdylCsQ&bvm=bv.125801520,d.cGc)

<sup>12</sup> Delta Vision. 2007. Delta Vision Context Memorandum: Utilities. [http://www.deltavision.ca.gov/Context\\_Memos/Utilities/Utilities\\_Part1\\_Iteration1.pdf](http://www.deltavision.ca.gov/Context_Memos/Utilities/Utilities_Part1_Iteration1.pdf)

<sup>13</sup> [http://www.eia.gov/dnav/ng/ng\\_pri\\_sum\\_dcu\\_SCA\\_m.htm](http://www.eia.gov/dnav/ng/ng_pri_sum_dcu_SCA_m.htm)

<sup>14</sup> Delta Protection Commission. Economic Sustainability Plan for the Sacramento-San Joaquin Delta. 2012.

<sup>15</sup> See <http://www.fema.gov/hazus>.

### Electricity Infrastructure Owners:

*Description:* Electricity transmission and distribution lines also run through the Delta, both to provide local electricity services and to connect California with the Pacific Northwest electricity market. Three major transmission lines cross the Delta and carry approximately 10% of California's summer electricity load.<sup>16</sup>

*Valuation Data:* We use infrastructure replacement values and electricity infrastructure counts from the DLIS. To estimate the production value of electricity transmission through the Delta, we use information from the DRMS Phase 1 Economic Consequences Technical Memo.<sup>17</sup> That report estimates the cost of a two-month outage, which we scale up to four months.

### Telecommunications Companies:

*Description:* Telecommunications infrastructure in the Delta, including cellular towers and other communications facilities, provides cellular coverage in the Delta.

*Valuation Data:* Although we did not estimate the value of benefits to telecommunications companies in this analysis, some estimates are readily available from the DLIS. The DLIS includes counts and replacement values for communications towers and communications facilities.

### Railroad Companies:

*Description:* Several railroad lines are located in the Delta, including historical shortline railroads, portions of large freight rail networks, and segments of several passenger rail lines that link the Bay Area with the Central Valley and Sacramento. Rail infrastructure in the Delta provides connectivity to the Ports of Oakland, Stockton, and West Sacramento, facilitating the movement of goods across the state and the nation. Passenger rail networks include the Amtrak San Joaquin route, which connects Bakersfield to Sacramento and Oakland, and the Altamont Commuter Express Rail, which operates between Stockton and San Jose.

*Valuation Data:* An inventory of railroad infrastructure and infrastructure replacement value is taken from the DLIS database. Production value of rail transportation in the Delta was estimated using information from the DRMS Phase 1 Economic Consequences Technical Memo.<sup>18</sup> That memorandum estimates economic consequences of an interruption to intercity passenger rail and freight rail through the Delta per day. We apply these estimates to the assumed four-month period of flooding to arrive at a final estimate of production value.

### Caltrans and State Highway Users:

*Description:* Numerous state highways of varying sizes cross the Delta, ranging from small two-lane scenic highways to large interstate corridors. According to DLIS information, there are over

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<sup>16</sup> Delta Protection Commission. Economic Sustainability Plan for the Sacramento-San Joaquin Delta. 2012.

<sup>17</sup> DWR. Technical Memorandum: Delta Risk Management Strategy Phase 1 Topical Area: Economic Consequences. 2008. [http://www.water.ca.gov/floodmgmt/dsmo/sab/drmspd/docs/Economic\\_Consequences\\_TM.pdf](http://www.water.ca.gov/floodmgmt/dsmo/sab/drmspd/docs/Economic_Consequences_TM.pdf) See Table 19.

<sup>18</sup> Ibid. See Tables 25 and 26.

130 miles of highway roads in the Delta. Three state highways (State Routes 4, 12, and 160 located in the Delta's Primary Zone) and three interstate freeways (Interstate [I]-5, I-80, and I-205 located in the Secondary Zone) pass through the Delta; two interstate highways (I-580 and I-680) border the Delta to the west. The Delta's geographic proximity to the large urban population of the Bay area, and its role in facilitating road freight linkages for the Central Valley's agricultural economy, make its infrastructure critical to Northern California.

*Valuation Data:* The DLIS includes a count of highway infrastructure in the Delta, as well as infrastructure replacement costs. Estimates of the production value of highway infrastructure is based on information in the DRMS Phase 1 Economic Consequences Technical Memo.<sup>19</sup> That memorandum includes estimates from two different models of the economic consequences of an interruption in highway use, with disparate results. In this analysis, we use an average of the two model estimates as the average cost of highway interruptions per day. Applying this to our assumed four-month period of flooding we arrive at a final estimate of production value of highways in the Delta.

### Ports of Stockton and West Sacramento:

*Description:* The Ports of West Sacramento and Stockton are located in the Delta. These ports are also the primary navigation beneficiaries in the Delta. Both of these ports rely on deep-water shipping channels from the San Francisco Bay through the Delta. These channels require regular dredging to prevent silt from accumulating on the channel floor and to maintain a minimum depth for ships to pass. Levee integrity along these shipping channels is integral to maintaining the shipping channels and accessibility to the ports. Project levees are the primary means of flood control to protect these channels.

*Valuation Data:* The deepwater channels through the Delta and the Ports of Stockton and West Sacramento were considered among the assets included in the DLIS; however, the study only estimated a replacement value for the ports. For the two Ports of Stockton and West Sacramento, the DLIS identifies a typical replacement value of \$7.7 million each. Although archetypes did not analyze the benefits to ports and the associated cost responsibility (the situation of each port is too unique to generalize to the other and across the Delta), an assessment of the production value of the ports would also need to be developed in the future. Information on the value of goods moved through the port from port authority annual reports may be useful for this purpose in the future.

### Upstream Dischargers

Upstream dischargers of treated wastewater and stormwaters have received minimal attention in past studies of Delta flooding that focus on physical assets, such as wastewater infrastructure, that are actually located in the Delta. This study includes entities that benefit from discharging water into surface waters (e.g., Sacramento River) that contribute flows to the Delta among beneficiaries of flood control in the Delta. Upstream beneficiaries include

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<sup>19</sup> DWR. Technical Memorandum: Delta Risk Management Strategy Phase 1 Topical Area: Economic Consequences. 2008. [http://www.water.ca.gov/floodmgmt/dsmo/sab/drmisp/docs/Economic\\_Consequences\\_TM.pdf](http://www.water.ca.gov/floodmgmt/dsmo/sab/drmisp/docs/Economic_Consequences_TM.pdf) See Tables 21 and 22.

wastewater dischargers and storm water dischargers to water bodies that contribute flows to the Delta. However, estimates of the value of these benefits are difficult to estimate with very little precedent in past reports on the Delta. Therefore, as identified in Table D-1, the benefits to Upstream Dischargers of flood protection from levee investments will be assessed primarily using qualitative analyses.

### **Wastewater Dischargers**

*Description:* Wastewater dischargers located upstream of the Delta benefit from flood protection in the Delta. They are permitted by the Regional Water Quality Control Board to discharge treated effluent to water bodies that contribute flows to the Delta. Discharging treated wastewater directly into water bodies that contribute flows and to water quality in the Delta provides owners/operators of wastewater treatment facilities with a cost-effective means of storing and disposing of treated effluent. Delta flooding has the potential to disrupt these activities that would like impose higher costs for treatment plant owners/operators.

*Valuation Data:* The benefit to wastewater dischargers was not evaluated quantitatively. Further analysis of this beneficiary category may be necessary.

### **Stormwater Dischargers:**

*Description:* To avoid local flooding, municipalities both within and upstream of the Delta, divert storm waters into floodplain channels that ultimately flow in to the Delta. Stormwater runoff enters the Delta from Stockton, Manteca, Tracy, Sacramento, and West Sacramento. To the extent that Delta levees are able to accommodate higher flood flows, upstream flood control managers are able to divert greater amounts of floodwater into the upstream channels rather than using local acreage to absorb those flows.

*Valuation Data:* The benefit to stormwater dischargers was not evaluated quantitatively. Further analysis of this beneficiary category may be necessary.

## **Other Indirect Beneficiaries**

### **Instream Water Diverters**

Diverters of instream flow along the Sacramento River within and upstream of the Delta, and diverters of instream flow along the San Joaquin River within and upstream of the Delta are another category of potential beneficiaries. Delta flooding could potentially affect the need for and timing of the diversions by these beneficiaries. Potential changes in diversion practices could contribute to the severity of flood-related damages to beneficiaries in the Delta and beyond.

*Valuation Data:* The benefit to instream water diverters was not evaluated quantitatively. Further analysis of this beneficiary category may be necessary.

### **Hydropower Owners and Operators:**

*Description:* Delta flooding has the potential to affect the operation of hydroelectric power facilities located on the two primary rivers that form the Delta (Sacramento and San Joaquin Rivers), as well as on tributary streams and rivers to the primary rivers. Many large hydropower

facilities are co-located with flood control reservoirs. Increasing flood water storage space directly trades off with storage for water supplies and summertime hydropower generation. Being able to accommodate greater flood flows in the Delta through stronger levees reduces the need for flood storage and increases the power generated during the more valuable summer peak load season. As identified in Table D-1, the benefits to Hydropower Owners and Operators from flood protection from levee investments are only assessed qualitatively

*Valuation Data:* The benefit to hydropower was not evaluated quantitatively. Further analysis of this beneficiary category may be necessary.

## General Public Beneficiaries

Broadly speaking, public benefits are those that cannot be assigned explicitly to individuals or entities. The beneficiaries cannot be easily excluded from enjoying those benefits, so they cannot be charged a price or an entry fee to enjoy them. The classic example is the enjoyment of a sunset—no one can sell tickets to the event.

In general, three types of public benefits are specific to the Delta—habitat services, use of ecosystem resources, and the ongoing existence of the Delta as a distinct place. Examples of habitat services include improved water quality, biodiversity, threatened and endangered species habitat, and carbon sequestration. Although the value of some of the habitat services could be quantified in monetary terms, it required data not readily available and beyond the scope for the study. Alternatively, an “imputed willingness to pay” method was used in which it is assumed that the value of the proposed habitat was at least equal to the costs incurred to produce similar types of habitat in the project area. We discuss these valuation methods more extensively in the section on data sources. Use values accrue to specific activities such as fishing and boating, but it is difficult to charge entry or use prices that capture the true benefits. Finally, defining the value of the Delta as place is perhaps the most intangible benefit.

Of particular importance are the aquatic and terrestrial habitat that benefit many species of flora and fauna found both in the Delta as well as part of freshwater environments located upstream of the Delta, and in the marine environments located in San Francisco Bay and the Pacific Ocean. Habitat conditions in the Delta are critical to efforts to restore and preserve several types of threatened, rare, or endangered species. Game fish species, such as salmon, provide opportunities for both commercial and sport fishing in the Delta and elsewhere that contribute millions of dollars annually to the State and many local economies, as well as providing livelihoods for many who rely on fishing activities. Also, the Delta supports a wide range of both water contact and noncontact water recreation activities.

In addition to supporting healthy, functioning natural environments and those who rely on these natural environments for their livelihood or enjoyment, Delta flood protection plays a key role in maintaining cultural benefits and a quality of life that are enjoyed by both residents and visitors to the Delta. For this study, the general public that benefits from the cultural and quality of life values generated by the unique environmental and social characteristics of the Delta, including from the maintenance of Legacy Towns, is characterized as Delta-as-Place Beneficiaries. As identified in Table D-1, the benefits to General Public Beneficiaries of flood

protection from levee investments are assessed mainly quantitatively, with the exception of ecosystem resources, which are estimated quantitatively.

### **Public Concerned for the Protection/Restoration of Delta Ecosystem Resources**

*Description:* Delta ecosystems perform many complex and interrelated functions that provide not only provide basic biological support but also valuable goods and services to society.<sup>20</sup> Ecosystems that provide biocentric (or biological) services are those that benefit the plants and animals inhabiting the ecosystem. Anthropocentric services are those that directly benefit humans, such as the maintenance of water supply quantity and quality, soil and air quality, floodwater storage, and recreation, among others. Other human services supported by ecosystems include the maintenance of genetic information over time—for example, preserving genetic material, which might lead to new drugs or other products.

Methods of valuing an ecosystem's benefits can be grouped based on the how "willingness to pay" by individuals for public goods is being estimated: revealed willingness to pay, imputed willingness to pay, expressed willingness to pay, and benefit transfers. Although none of these valuation methods can be applied to an ecosystem's biological services, tools are available that attempt to measure the physical outputs of ecosystems (such as, habitat evaluation procedures). Commonly cited examples of floodplain and wetland services include flood conveyance and storage, erosion control, pollution prevention and control, fish and shellfish production, water supply, recreation, food production, education and research, historical, archaeological values, open space and aesthetic values, timber production, and habitat for waterfowl and other wildlife, including game species.

Although there are many approaches to valuing public willingness to pay for ecosystem services, in keeping with common flood analysis methodology and the approach used for many of the other beneficiary categories, we use estimates of habitat replacement cost to estimate the public benefit of protecting Delta ecosystems from flooding.

*Valuation Data:* For the benefits assessment for this study, information from DWR's Asset Exposure study on ecosystem resources (i.e., ecological reserves, wildlife areas, habitat types, and sensitive and rare species) by levee maintenance is used to quantify ecosystem resources in the Delta across the categories of riparian forest, wetlands, grasslands, and mixed habitat. It should be noted that these habitat categories are mainly terrestrial habitats. As a proxy for public willingness to pay for preserving habitat in the Delta, we use projected habitat restoration costs from the BDCP.<sup>21</sup> If habitat were destroyed, this is the potential cost of restoring that habitat by ecosystem type.

### **Commercial and Recreational Fishers**

*Description:* As indicated above, the Delta provides aquatic habitat that is critical to the survival of certain fish species that are critically important to commercial and recreational fishers.

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<sup>20</sup> The following is largely taken from Chapter 4 Ecosystem Valuation Methods of DWR's Economic Analysis Guidebook (2008)

<sup>21</sup> The method for developing these estimates is included in Attachment A to this appendix.

Because a number of these important species are anadromous (i.e., spawn in freshwater, migrate to the ocean to grow up, then return to freshwater to spawn and complete its lifecycle), the Delta serves as an important transition area, both in the journey to sea and also in the return to spawn in native fresh waters. In addition to several species of salmon, other anadromous species that transition through the Delta include steelhead, shad, and sturgeon. The Delta is also home to many resident fish species, such as striped bass, that are popular to sport fishers; Delta flooding could undermine the delicate salinity balance and other conditions that provide the habitat needed to help sustain populations of these important species.

*Valuation Data:* Recreational use is not considered in the DLIS but has been studied as part of the Delta Economic Sustainability Plan. While no quantitative estimate of economic benefit was made for this beneficiary category, information in the Delta Economic Sustainability Plan may be used to develop such an estimate for future work.

### **Recreation Participants**

*Description:* According to the Economic Sustainability Plan for the Sacramento-San Joaquin Delta, approximately 12 million visitor days occur in the Delta each year, including visits to State, regional and county parks in the region.<sup>22</sup> Important recreational activities in the Delta include boating, fishing, other water-related recreation, hunting and wildlife viewing, driving for pleasure, winetasting, visiting farmers' markets, and visiting historical or other tourist attractions. According to the Economic Sustainability Plan, Northern California is considered the primary market area for Delta tourism. Protecting against Delta flooding is integral to maintaining the recreation economy in the Delta, which is supported by water conditions that accommodate a wide array of both water contact and non-contact water activities.

*Valuation Data:* While no quantitative estimate of economic benefit was made for this beneficiary category, information in the Delta Economic Sustainability Plan may be used to develop such an estimate for future work.

### **Delta-as-Place Beneficiaries**

*Description:* Delta-as-Place beneficiaries include Delta residents and visitors who place value on the unique characteristics of the Delta, including the continued existence of legacy communities. Although not previously considered in assessing Delta flood protection benefits, which focus primarily on physical assets and property that are exposed to direct flood risk, Delta-as-Place benefits go beyond the value of physical assets to consider the value of certain amenities, such as the Delta's geography and agriculture, that make the Delta and its communities a unique place.

The legacy towns of Freeport, Hood, Courtland, Locke, Walnut Grove, Isleton, Rio Vista, Ryde, and Clarksburg are an important part of the Delta's history and character. Ensuring their

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<sup>22</sup> This estimate includes 6.4 million in boating related visitor days, 1.5 million in other resource-related visits, 2 million in urban park visits, and 2 million in driving for pleasure. Sources include a 2002 Department of Boating and Waterways study, permit and license data, a 1993 Dangermond study for the Planning and Conservation League Foundation, and estimates based on the total market are for Delta tourism.



continued existence is part of protecting the Delta as a unique and evolving place, as required by the 2009 Delta Reform Act (Water Code Section 85020-85023). These small communities, including their historical points of interest, benefit directly from flood protection provided by levees in the Delta.

*Valuation Data:* No quantitative estimate of economic benefit was made for this beneficiary category. This intangible, non-market benefit of maintaining the Delta as a unique and evolving place will require further study that is beyond the scope of this report. Some information in the Delta Economic Sustainability Plan may be used as a starting point to develop such an estimate in the future.

## State and Local Government and Special Districts

Local and State governments and special districts are another beneficiary category not previously evaluated in Delta flood protection studies. The DLIS study does not evaluate indirect economic impacts, such as fiscal effects on local governments, and the DWR's Delta Asset Exposure study only estimated economic values of physical assets. Because of the Delta's important role in moving goods and resources across the state, and the potential for disruptions in public service delivery, potential effects on state and local government entities and special districts are being considered. As identified in Table D-1, the benefits to Local and State government Beneficiaries from flood protection from levee investments will be assessed mainly qualitatively.

### State Government

*Description:* Beyond local government operations, flooding in the Delta has the potential to impact State government operations as well. Indirect impacts, particularly those from disruptions in water deliveries south of the Delta, energy transmission, and transportation, may affect economic activity outside of the Delta and associated government operations. This beneficiary entity includes State government, which relies on businesses throughout the state to generate revenues and to provide a wide range of services. Avoiding or reducing flood-related costs, including long-term system maintenance costs, would benefit State government operations.

*Valuation Data:* The benefit of flood control to state government was not estimated quantitatively for this study.

### Local Government

*Description:* Delta flooding has the potential to affect the costs of public service delivery and revenue generation at the local government level. Also, local agencies in the Delta contribute funding to the costs of long-term system maintenance.

*Valuation Data:* The benefit of flood control to local government was not estimated quantitatively for this study.



## Special Districts

*Description:* Similar to potential effects on local governments, Delta flooding has the potential to affect the costs of public service delivery and revenue generation for special districts. Special districts are a form of local government created by a local community to meet a specific need.<sup>23</sup> Nearly 85% of California's special districts perform a single function such as sewage, water, fire protection, pest abatement or cemetery management. Multi-function districts, like community services districts, provide two or more services.

In California, special districts can be established as either independent or dependent districts. Independent special districts are governed by an independent board of directors elected by the districts' voters or appointed to a fixed term of office by either the city council or board of supervisors. Just over a quarter of California's independent special districts are enterprise districts that operate more like a business enterprise, charging customers for their services. Non-enterprise districts provide services that don't lend themselves to fees because they benefit the entire community, not just certain residents. Dependent districts are governed by other existing legislative bodies, like a city council or board of supervisors.<sup>24</sup>

Reclamation Districts (RDs) are one form of special-purpose districts, with responsible for reclaiming and/or maintaining land that is threatened by permanent or temporary flooding for agricultural, residential, commercial, or industrial use.<sup>25</sup> Although RDs are required to register with the State Lands Commission, it is difficult to accurately identify the number of "active" RDs in the state (or in the Delta region) because there is no requirement to inform the State Lands Commission when they become inactive or dissolve. For example, there were 84 RDs recorded in Sacramento County as of December 2015, but only 21 are believed to be currently active.

*Valuation Data:* The benefit of flood control to state government was not estimated quantitatively for this study.

## State Economy

*Description:* Both natural and built resources in the Delta that are at risk to flooding contribute importantly to the state economy. Although State legislation, including the Delta Protection Act of 1992 and the Delta Reform Act of 2009, focuses primarily on the natural resources of the Delta and the economic activity sustained by those resources, such as agriculture and outdoor recreation, the Delta also supports significant water, energy, and transportation infrastructure that serves not only the Delta and regional economy, but also the state economy.<sup>26</sup> Development of the economic cluster in the Delta consisting of transportation, warehousing, and utilities is directly dependent on maintaining and enhancing the Delta as a regional

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<sup>23</sup> California Special Districts Association, Laws Governing Special Districts, Last updated: December 23, 2015

<sup>24</sup> California Special Districts Association, Laws Governing Special Districts, Last updated: December 23, 2015

<sup>25</sup> Sacramento Local Area Formation Commission. Reclamation Districts: Listing by category, service providers, County of Sacramento. <http://www.saclafo.org/ServiceProviders/SpecialDistricts/Pages/ReclamationDistricts.aspx>. Accessed: March 22, 2016

<sup>26</sup> Delta Protection Commission. Economic Sustainability Plan for the Sacramento-San Joaquin Delta. 2012

transportation and energy hub. In addition, the Delta's water resources provide critical habitat that supports a number of commercial and recreational salmon fisheries throughout the state.

The Legal Delta, which includes both a Primary and Secondary Zone, contains significant portions of five counties—Contra Costa, Sacramento, San Joaquin, Solano, and Yolo—and a small rural corner of Alameda County. Parts of several large cities, including Antioch, Pittsburg, Stockton, Sacramento, Tracy, and West Sacramento, also are located in the Delta. Economic activity generated in the Delta's Primary Zone is export-oriented, creating jobs and income far in excess of the population and workforce that resides in the Primary Zone.<sup>27</sup> The Delta's Secondary Zone, which includes the urbanized areas surrounding the Primary Zone, supplies the economy of the Primary Zone with a workforce, services, manufacturing, and transportation that add value to the agricultural, energy, and other resource-based output of the Delta. That zone also facilitates exports from the Primary Zone.

Although the Delta's importance to the state water system is widely recognized, its importance to energy, transportation, and in-Delta municipal and industrial water supplies is less appreciated. The Delta is a critical infrastructure hub for the regional and state economy and is an important energy resource for California. As previously identified, the Delta contains the largest natural gas production field in California, and Delta power plants produce 20% of California's natural gas-powered electricity.<sup>28</sup> However, these infrastructure services are vulnerable to floods, earthquakes, and sea-level rise, requiring the continued maintenance and enhancement of the Delta's levee system. The Delta's levee and emergency response systems play a critical role in improving water supply reliability, economic sustainability in the Delta, and reliable energy, transportation, and water infrastructure that serves a wide range of state interests

According to the Economic Sustainability Plan for the Delta, agricultural production in the Delta supports an estimated 25,100 jobs statewide, and annually generates more than an estimated \$5.6 billion statewide in economic output. Recreation and tourism activity in the Delta accounts for an estimated \$312 million in direct annual spending in the Delta, and an estimated additional \$205 million in recreation-related spending for supplies and travel outside the Delta. Statewide, Delta recreation and tourism supports more than 5,200 jobs, and an estimated \$645 million in economic output. Potential economic disruptions in the Delta due to flooding would have potentially substantial effects on the state economy.

*Valuation Data:* State economic impacts are not considered in past studies of the Delta, such as the DLIS, which considers only direct economic benefits from flood protection. To estimate economic impacts, we use economic multipliers from the IMPLAN model dataset for San Joaquin County. We apply these multipliers to agricultural crop production and commercial economic impacts, as well as infrastructure production estimates, which are outlined elsewhere in this appendix. We calculate average multipliers for field crops, tree/vine crops, and an economy-wide average that is applied to all other categories. This approach arrives at a single

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<sup>27</sup> Delta Protection Commission. Economic Sustainability Plan for the Sacramento-San Joaquin Delta. 2012

<sup>28</sup> Delta Protection Commission. Economic Sustainability Plan for the Sacramento-San Joaquin Delta. 2012

estimate of secondary economic impacts, and cannot easily be separated into local/region and state level impacts. Therefore, state economic impacts are bundled with local economic impacts into a single estimate.

**Table D-2 Relevant Terms for the Beneficiary Assessment**

Term	Definition [Source Code]
<b>Benefits</b>	
economic benefits	Economic benefits are a measure of the willingness to pay for goods and services derived from implementation of a program or project—benefits could be measured in terms of the value added to an entity or person, or in the value of costs or damages avoided. [2, as modified]
private benefits	Benefits that accrue to identifiable subset of the community and from which individuals can be excluded. The ability to restrict benefits to those that pay enables these benefits to be funded with user money. Note that as used here, private beneficiaries would include "public" agencies that provide services to an identifiable group of users [2]
public benefits	Benefits that are shared by a wide cross-section of the community and from which individuals cannot realistically be excluded. Inability to exclude individuals means that imposing charges for access to the benefit is difficult. If 'free riders' can access the benefits without paying, there is no economic incentive for them to spend their money for these benefits. This means that if these benefits are to be created, public funding must usually be used. [2]
systemic benefits	Systemic beneficiaries refer to beneficiaries who receive more than one type of benefit from the levee system - for example, in-Delta residents benefit from flood protection for their property as well as protection from disruption to water supply caused by salination of irrigation systems. Systemic beneficiaries also include beneficiaries that are provided benefits by protecting multiple islands or tracts—for example, south of Delta water users benefit from the integrity of a through-Delta conveyance corridor, and the California Department of Transportation (Caltrans) benefits from protection of highways that span multiple islands. [1]
local benefits	For purposes of this assessment, local benefits are defined as those benefits accruing to landowners within the boundaries of the Legal Delta.
beneficiary	Any entity (individual, group, organization, agency, or community) that receives benefits or services (i.e., asset protection, protection from water supply disruption, or ecosystem enhancements) from the existing Delta levee system, or that would receive benefits or services from future investments in the Delta levee system. [1]
direct beneficiaries	Direct beneficiaries are those whose property or assets are affected in the case of avoiding or minimizing flooding [1]
indirect beneficiaries	Indirect beneficiaries are those who are affected from secondary effects of flooding, such as reduced access to shipped products if a highway is damaged. [1]
extended beneficiaries	Beneficiaries linked to an affected island via network infrastructure or through linked consequences of levee failure on a particular island. For example, a highway crossing several islands may be cut off by a levee failure, or neighboring islands' flood protection may be impacted. [CDWR]

Term	Definition [Source Code]
peripheral beneficiaries	Beneficiaries located beyond the boundaries of the Legal Delta, including both upstream, downstream, and other areas of the State. [CDWR]
<b>assets</b>	
assets	For purposes of this assessment, an asset is defined as property owned by a person or group—or any item that can be considered for the common good—that is regarded as having economic value. [1]
tangible assets	Tangible assets are physical assets, such as land, vehicles, equipment, and machinery. Tangible assets are at risk of damage, either from naturally occurring incidents, or by accidents. Tangible assets, sometimes referred to as tangible fixed assets or long-lived tangible assets, are divided into three main types: property, plant, and equipment. [7, as modified]
intangible assets	Intangible assets are nonphysical. Depending on the type of entity that owns them, intangible assets may include permits, licensing agreements, and service contracts, among others. Intangible assets can add value to an entity's future worth. In some cases, intangible assets can be much more valuable than tangible assets. [7, as modified]
<b>cost allocation</b>	
cost allocation	<p>Cost allocation refers to methods that can be used to allocate the costs of a program or project to different beneficiaries. The particular method that is used to allocate costs often depends on the data that are available because each method has different data requirements, and the allocation typically depends on the underlying assumptions on which the allocation is to be based. The method also is dependent on the legal requirements specified in particular financing mechanisms. For example, in project levees the cost allocation methodology is specified in federal and state law. For local funding, whether revenues are derived from assessments or special taxes can determine the cost allocation method which can differ from federal law.</p> <p>Cost allocation is the process by which financial costs of a project are distributed equitably among project purposes. A common cost-allocation method is Separable Costs-Remaining Benefits (SCRB) which distributes costs among the project purposes by identifying separate costs and allocating joint costs or joint savings in proportion to each purpose's remaining benefits.[4]</p>
separable costs	Separable costs are project cost savings with one purpose excluded, or costs incurred for structures serving multiple (but not all) purposes. In some cases, specific and separable costs, which are costs of facilities serving only one included purpose, are the same. [6]
non-separable costs	Non-separable costs, also known as joint or residual costs, are costs of features that support all included purposes plus otherwise unallocated costs (e.g., environmental, aesthetic, and social). [6]
<b>Delta as Place</b>	
Delta as Place	Refers to the unique cultural, recreational, natural resource, and agricultural values of the Delta as a unique and evolving place, as protected under the Delta Reform Act of 2009. [5]

Term	Definition [Source Code]
legacy communities	Eleven towns or communities in the Delta that have high cultural, historic, or ambiance value. The communities include: Bethel Island, Clarksburg, Courtland, Freeport, Hood, Isleton, Knightsen, Rio Vista, Ryde, Locke, and Walnut Grove. Each community has its own character. These communities have higher flood risks than Delta cities.[5]
<b>flood protection</b>	
level of protection	Relates to protection of assets from the risks of flood damage measured as either a probability of flood occurrence or as a specific engineering standard of construction.
project levees	Project levees are levees constructed by the U.S. Army Corps of Engineers as part of federal-state flood control projects, and have been turned over to the state and local agencies for operation and maintenance. The state has in turn generally passed on the responsibility for routine maintenance to local reclamation districts, although the Paterno Decision confirmed the state's continued basic liability with respect to these levees. [3]
non-project levees	Levees built and maintained by local reclamation districts or similar special districts and municipalities. [3]

Notes:

[1] Delta Stewardship Council. Delta Levee Investment Strategy: Technical Memorandum 2.1: Baseline Information on Islands and Tracts, Assets, Hazards, and Beneficiaries. 2015.

[2] CALFED. CALFED Bay-Delta Program Draft Implementation Plan: Financing Plan. 2005

[3] Delta Protection Commission. Economic Sustainability Plan for the Sacramento-San Joaquin Delta. 2012

[4] Department of Water Resources. Economic Analysis Guidebook. 2008

[5] Delta Stewardship Council. The Delta Plan. 2013

[6] Delta Stewardship Council. Delta Levees Investment Strategy. Technical Memorandum 3.2: Cost Allocation Methodology. April 15, 2015.

[7] Investopedia. Accessed at: <http://www.investopedia.com/ask/answers/012815/what-difference-between-tangible-and-intangible-assets.asp>

## Attachment A Cost Estimates for Establishing Further Habitat Restoration and Ecosystem Protection in the Delta

For the purposes of evaluating and comparing the various habitat conservation and ecosystem restoration strategies described in this document, it is useful to establish cost estimates for these activities in the Delta. However, cost estimates vary widely and depend on many factors, including the type of restoration activity, easements, restrictions placed on land use, land values, and whether the landowner donates or sells the land. What is more, as discussed in Appendix G, Attachment D, comprehensive and readily analyzable data for location and cost of existing conservation easements do not exist. However, data and analysis conducted for the Draft BDCP provide some insight on estimated costs associated with establishing habitat conservation easements in the Delta. The Draft BDCP conservation measures and approach for developing cost estimates are described in detail below.

### Bay-Delta Conservation Plan

While EcoRestore is the replacement for the conservation portion of the BDCP, the documentation has not been fully updated so we relied the older version to estimate flood protection benefits associated with habitat restoration. The initial BDCP submittal attempted to set out a comprehensive conservation strategy for the Delta to restore and protect ecosystem health, water supply, and water quality within a stable-regulatory framework.<sup>1</sup> The Draft BDCP included estimated implementation costs for establishing the originally proposed natural community conservation plan and habitat conservation plan, including cost estimates for establishing conservation easements that would be required under the plans. While State and federal agencies have since bifurcated the BDCP into WaterFix and EcoRestore to replace the proposed BDCP, cost estimates included in the Draft BDCP provide a useful basis for the benefits estimates used in this study.

The Draft BDCP included a number of conservation measures (CMs). Under *CM3 Natural Communities Protection and Restoration*, the BDCP implementation office was to establish a system of protected lands in the Plan Area, called a reserve system. The Draft BDCP divided the Plan Area, which includes the statutory Delta and other areas targeted for conservation such as Suisun Marsh and the Yolo Bypass, into 11 conservation zones (Figure Att-C-2). CM3 required a total of 67,275 acres of land to be protected and included in the reserve system. Of this 67,275 acres, it was anticipated that lands used for ecosystem restoration actions would primarily be those that are currently under public ownership or that would be acquired in fee-title, because restoration activities have high potential to preclude other land uses. However, it was assumed that the majority of lands (80%) acquired for the protection and maintenance of existing habitat

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<sup>1</sup> California Department of Water Resources and U.S. Bureau of Reclamation. Bay-Delta Conservation Plan. 2013b. Public Review Draft. <http://baydeltaconservationplan.com/EnvironmentalReview/EnvironmentalReview/2013-2014PublicReview/2013PublicReviewDraftBDCP.aspx>. Accessed December 14, 2015. In its habitat restoration plan, the Draft BDCP (made available for public review on December 13, 2013) proposed that the BDCP serve as both a natural community conservation plan under the State's Natural Community Conservation Planning Act and a habitat conservation plan under Section 10 of the FESA.

functions would be protected through conservation easements. Because conservation easements are usually established on private lands, the BDCP assumed that all of the conservation easements that contribute to the reserve system would be established on cultivated habitat. Of the 67,275 acres of land to be included in the reserve system, CM3 targeted 49,625 acres of conservation easements on cultivated habitat.

To estimate the value of cultivated lands that would be required to be protected under CM3, the Draft BDCP derived estimates from value ranges published by the California Chapter of the American Society of Farm Managers and Rural Appraisers (CSFMRA) in 2009. The estimated value of lands in each of the conservation zones was set to the midpoint of the CSFMRA value range for that zone (Table Att-C-5).

**Table Att-A-5 Cultivated Land Fee-Title Value Estimates by Conservation Region**

Conservation Zone	County	Fee-Title Value \$/Acre (2012 dollars)*	Range land	Pasture/ Alfalfa	Field Crop	Truck Crop	Orchard/ Vineyard
1	Solano	Region One: South Sutter, Western Placer, Solano and Yolo Counties	\$3,259	\$3,180	\$7,261	\$8,744	\$9,539
2	Yolo	Region One: South Sutter, Western Placer, Solano and Yolo Counties	\$3,259	\$3,180	\$7,261	\$8,744	\$9,539
3	Yolo, Sacramento	Region One: South Sutter, Western Placer, Solano and Yolo Counties	\$3,259	\$3,180	\$7,261	\$8,744	\$9,539
4	San Joaquin, Sacramento	Region Three: Lodi Region	\$3,529	\$11,659	\$13,779	\$15,899	\$17,489
5	San Joaquin, Sacramento	Region Three: Delta Lands	\$3,259	\$3,710	\$6,095	\$8,479	\$17,489
6	San Joaquin, Contra Costa	Region Three: Delta Lands	\$3,259	\$3,710	\$6,095	\$8,479	\$17,489
7	San Joaquin	Region Three: Westside	\$3,259	\$8,479	\$10,599	\$12,719	\$17,489
8	San Joaquin, Contra Costa, Alameda	Region Three, Westside	\$3,259	\$8,479	\$10,599	\$12,719	\$17,489
9	Contra Costa	Region Three: Westside	\$3,259	\$8,479	\$10,599	\$12,719	\$17,489
10	Contra Costa	Region Three: Westside	\$3,259	\$8,479	\$10,599	\$12,719	\$17,489
11	Solano	Region One:	\$3,259	\$3,180	\$7,261	\$8,744	\$9,539

**Table Att-A-5 Cultivated Land Fee-Title Value Estimates by Conservation Region**

Conservation Zone	County	Fee-Title Value \$/Acre (2012 dollars)*	Range land	Pasture/ Alfalfa	Field Crop	Truck Crop	Orchard/ Vineyard
		South Sutter, Western Placer, Solano and Yolo Counties					

Source: *California Department of Water Resources and U.S. Bureau of Reclamation. Bay-Delta Conservation Plan. 2013a. Public Review Draft. Chapter 8, Implementation Costs and Funding Sources.*

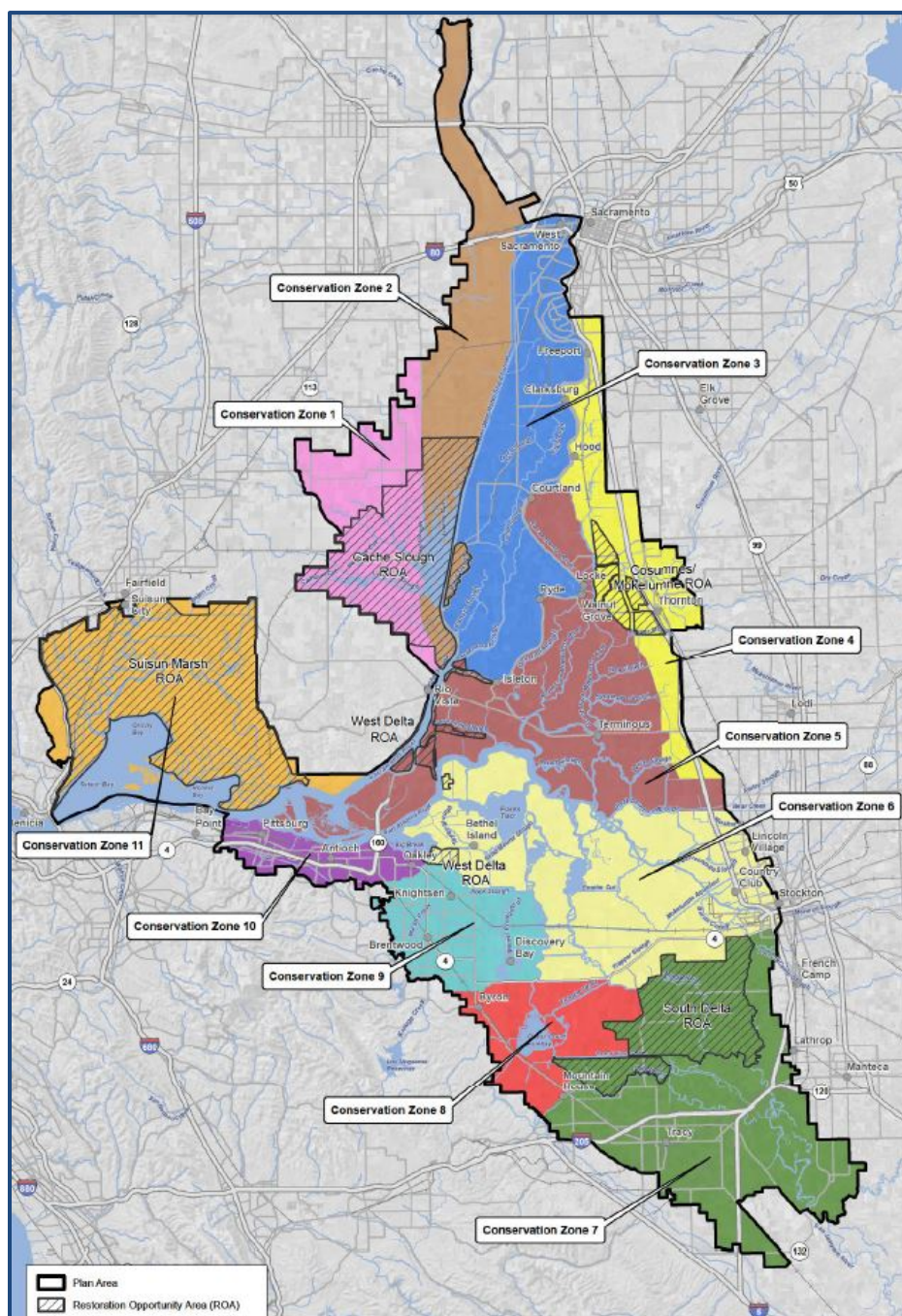
[http://baydeltaconservationplan.com/Libraries/Dynamic\\_Document\\_Library/Public\\_Draft\\_BDCP\\_Chapter\\_8\\_-\\_Implementation\\_Costs\\_and\\_Funding\\_Sources.sflb.ashx](http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Public_Draft_BDCP_Chapter_8_-_Implementation_Costs_and_Funding_Sources.sflb.ashx). Accessed December 14, 2015.

**Note:**

*\* Average fee value (rounded to nearest \$100) for specific land use categories by county. Fee values based on midpoint California Chapter of the American Society of Farm Managers and Rural Appraisers (CSFMRA) regional estimate for which county is located.*



### Figure Att-A-2 Bay-Delta Conservation Plan Conservation Zones



Source: California Department of Water Resources and U.S. Bureau of Reclamation. Bay-Delta Conservation Plan. 2013b. Public Review Draft. <http://baydeltaconservationplan.com/EnvironmentalReview/EnvironmentalReview/2013-2014PublicReview/2013PublicReviewDraftBDP.aspx>. Accessed December 14, 2015.

To estimate the costs of habitat conservation easements, which typically entail significant restrictions on land use, the Draft BDCP assumed that the costs of habitat conservation easements were 80% of the fee-title value of the land. In addition, the BDCP estimated that land acquisition transaction costs were 10% of the fee-title value of the acquired land. Finally, a

20% contingency cost was included in the total cost estimate. Table Att-A-6 shows the acreage of cultivated lands targeted for protection in each of the conservation zones.

**Table Att-A-6 Total Acreage of Cultivated Lands Targeted for Protection by Conservation Zone**

Conservation Zone	Total Acreage
1	3,024
2	6,897
3	8,486
4	2,210
5	6,085
6	3,744
7	15,120
8	3,190
9	860
10	9
11	0
<b>Total</b>	<b>49,625</b>

Source: Bay-Delta Conservation Plan. 2013c. Public Review Draft. Appendix 8.A, Implementation Costs Supporting Materials.

[http://baydeltaconservationplan.com/Libraries/Dynamic\\_Document\\_Library/Public\\_Draft\\_BDCP\\_Appendix\\_8A\\_-\\_Implementation\\_Costs\\_Supporting\\_Materials.sflb.ashx](http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Public_Draft_BDCP_Appendix_8A_-_Implementation_Costs_Supporting_Materials.sflb.ashx). Accessed December 14, 2015.

To estimate the costs required for protecting cultivated lands, the Draft BDCP assumed that 80% of the acreage would be protected through conservation easements and 20% of the acreage would be acquired through fee-title purchase of the lands. Table Att-A-7 shows the total estimated costs for protecting the cultivated lands.

**Table Att-A-7 Reserve Assembly Estimated Cost for Protection of Cultivated Lands**

Land Acquisition Category	Cost*
Conservation Easement Cost	\$228,644,076
Fee-Title Cost	\$71,451,274
Transaction Cost	\$35,725,637
Contingency	\$67,164,197
<b>Total</b>	<b>\$402,985,184</b>

Source: Bay-Delta Conservation Plan. 2013c. Public Review Draft. Appendix 8.A, Implementation Costs Supporting Materials.  
[http://baydeltaconservationplan.com/Libraries/Dynamic\\_Document\\_Library/Public\\_Draft\\_BDCP\\_Appendix\\_8A\\_-\\_Implementation\\_Costs\\_Supporting\\_Materials.sflb.ashx](http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Public_Draft_BDCP_Appendix_8A_-_Implementation_Costs_Supporting_Materials.sflb.ashx). Accessed December 14, 2015.

Note:

\* Cost estimates for conservation easements and fee-title acquisition are based on the weighted average value of land in each conservation zone from which land for the cultivated habitat reserve would need to be acquired.



### *Difficulty of Compiling Information on Conserved Land in California*

Due to several challenges, no comprehensive geospatial dataset tracking conservation easements exists in California. Easements are recorded in individual County Recorder offices, and since 2002, recorders have been required by State law to compile lists of easements on land within their respective counties (Government Code 27255). However, despite being required by law to make these lists, a number of recorders have failed to do this, and there has been little enforcement of the requirement.<sup>2</sup> Moreover, landowner concerns regarding developing a comprehensive conservation easement dataset often pose a barrier. For instance, landowners may have concerns about making easement locations available due to concerns about trespass, perceptions by neighbors, broader political perceptions, and privacy. In addition, developing a comprehensive geospatial database has proven challenging because there are over 165 easement holding organizations in California, and collecting relevant data from a subset of them every time the information is needed is unrealistic and costly.<sup>24</sup>

Several entities track information about conservation easements in California. Federal agencies (e.g., the Natural Resources Conservation Service and United States Fish and Wildlife Service) make geographic information system (GIS) data on federal easements available without restriction. However, the lands division of the CDFW (the largest easement holder among State agencies) has a data policy restricting its GIS easement data from being incorporated into other data. This is despite the fact that the California Wildlife Conservation Board (the land purchasing body for CDFW programs) has maintained an online GIS database since 2005 for all CDFW easement acquisitions.<sup>3</sup> Since 2006, the California Conservation Easement Registry has tracked conservation easements acquired with State funds after 2000, but the law establishing it specifically bars tracking the specific locations of these easements.<sup>25</sup>

Recognizing the need for comprehensive tracking of easement-protected open lands for a variety of applications, including land use and conservation planning generally, the California Strategic Growth Council funded a two-year program in 2012 to improve data for California's protected open lands. GreenInfo Network, a nonprofit technology support organization, used the funds to develop the CCED. The CCED is a single source of aggregated easement data in the state. Although the CCED does not yet contain all easements in the state,<sup>4</sup> it contains geospatial data for 1.6 million acres of conservation easements and is, to date, the most comprehensive dataset in existence. For these reasons, we used the CCED to characterize the existing setting of conservation easements within the Legal Delta.

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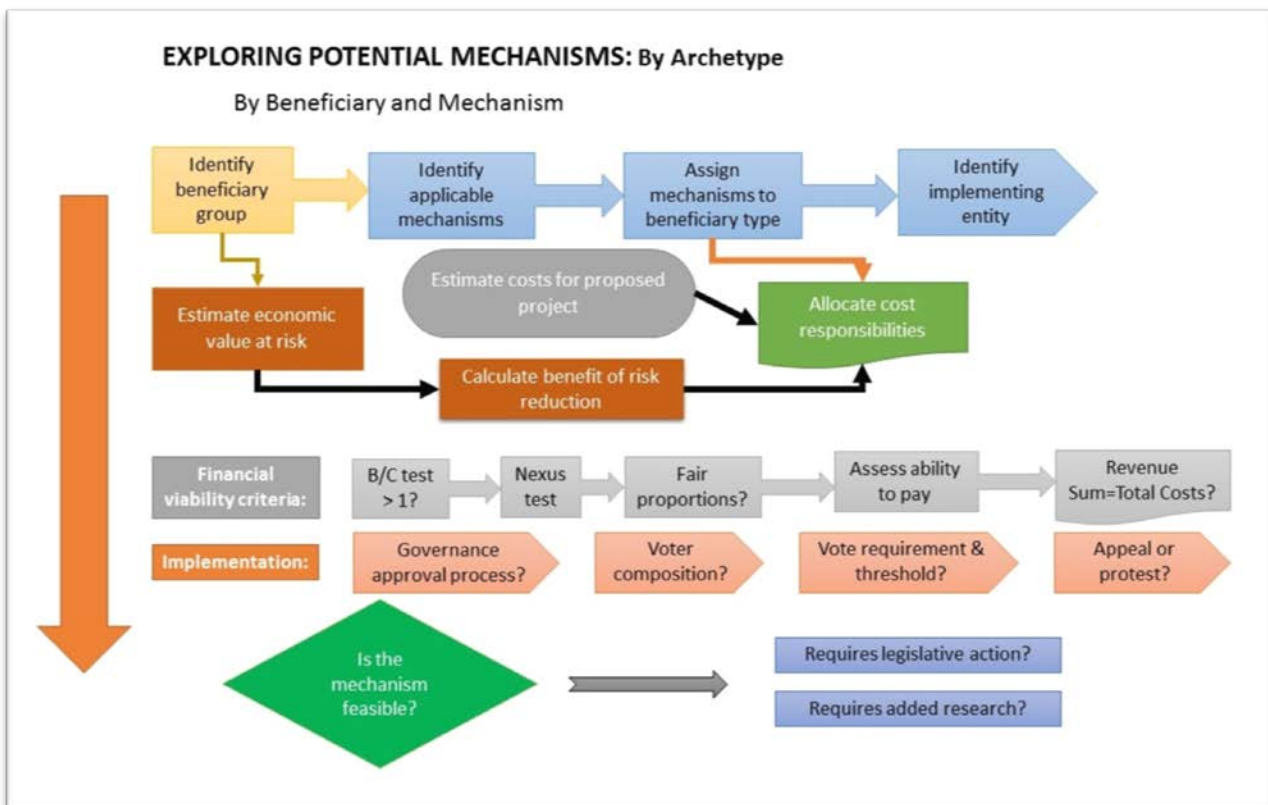
<sup>3</sup> GreenInfo Network. 2015. Easement GIS for Data in California: Assessment and Guidelines for the California Conservation Easement Database (CCED). [http://www.calands.org/uploads/docs/CCED\\_EasementReviewAndPolicy\\_Feb2014.pdf](http://www.calands.org/uploads/docs/CCED_EasementReviewAndPolicy_Feb2014.pdf). Accessed December 14, 2015.

<sup>4</sup> The current version of the CCED contains easements held by 93 agencies. However, the easement data for holdings by the California Department of Fish and Wildlife is incomplete because the data had to be obtained through secondary sources. In addition, not all of the easements held by the California Rangeland Trust are included in the dataset. GreenInfo Network estimates that there are at least 200,000 easement acres yet to be included in the CCED.

## APPENDIX E FINANCIAL MECHANISM SCREENING PROCESS

The study devised a screening process to identify the most promising financial mechanisms to be applied in each archetype. The steps are as follows: 1) identify beneficiary groups, 2) identify applicable mechanisms, 3) assign mechanisms to beneficiary type, 4) identify the implementing entities 5) estimate economic value at risk and the benefits of reducing that risk, 5) estimate costs of proposed project, 6) allocate cost responsibility, 7) check financial viability (with associated substeps), and 8) set out the implementation steps (again, with several substeps). Figure E-1 summarizes this process, and details of each step are provided below.

**Figure E-1 Stepwise Financing Mechanism Screening Process**



*Identify beneficiary groups:* Potential beneficiaries of flood control measures are identified in Appendix D. The team determined which beneficiaries were involved in each archetype. Each archetype has a unique combination of beneficiaries; not all beneficiaries are in each archetype.

*Identify applicable mechanisms:* Certain categories of mechanisms are applicable to specific beneficiaries. For example, a local assessments district such as an RD cannot capture revenues from a water exporter, but the state could impose a user fee on a water exporter. The initial pool of 50 candidate mechanisms is shown in Table 7-1 in Chapter 7 of the Feasibility Study.

*Assign mechanisms to beneficiary type:* In this step, possible financing approaches are matched with potential beneficiaries and the state, local, or special district public sector entities that 1) authorize and 2) collect charges identified. In many cases, this is a straightforward exercise; for example, a user fee on highways could be linked to benefits to highway users and could be



imposed by agencies that are responsible for ensuring highway access, such as the California Department of Transportation (Caltrans) or counties. The unit on which the revenue measure will be assessed (e.g., acreage, miles, weight, value) would depend on the potential mechanisms.

*Estimate economic value at risk and the benefits of reducing that risk:* This is the value associated with the purposes and activities protected from flooding and is a function of the total assets and the proportion exposed to the flood hazard. Estimating this value involves several sequential steps, as outlined below.

1. **Estimate or compute total asset value by benefit and associated beneficiary.** This value reflects what is being protected, either in dollar terms or, if that is not possible, relative magnitude. In general, the starting point for the team's valuation is available information, either specific to the location or something comparable, with an identification of what additional data or analysis is needed to refine value estimates. For study purposes, the team assumes that existing uses are static unless there is an explicit reason to assume otherwise (e.g., planned new residential developments). Assets with similar relative values within an archetype can be grouped, with the importance of developing more detailed values influenced by the magnitude of asset value in a particular setting (e.g., agriculture in the western Delta in the Primary Zone or residential developments in the Secondary Zone)<sup>5</sup>.

**Estimate flood hazard.** This estimate reflects the probability of a flood event occurring that could damage assets given current protection. The initial flood hazard estimate comes from the team's evaluation of California Department of Water Resources' Delta Risk Management Study (DRMS) results;<sup>6</sup> it should be updated with stakeholder input or additional external information when moving to implementation.

**Estimate damage from flood event.** This reflects the potential reduction in asset value created from a specified flood event. The initial estimate will come from DWR analyses,<sup>7</sup> but again should be updated with stakeholder input when moving to implementation.

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<sup>5</sup> State law describes the Primary and Secondary Zones as follows:

29728. The **Primary Zone** is the Delta land and water area of primary State concern and statewide significance situated within the boundaries of the Delta, as described in Section 12220 of the Water Code, but is not within either the urban limit line or sphere of influence line of any local government's general plan or studies existing as of January 1, 1992. The precise boundary lines of the Primary Zone includes the land and water areas as shown on the map titled "Delta Protection Zones" on file with the California State Lands Commission. The Primary Zone consists of approximately 500,000 acres.

29731. The **Secondary Zone** is all the Delta land and water area within the boundaries of the Legal Delta not included within the Primary Zone, subject to the land use authority of local government, and that includes the land and water areas as shown on the map referenced herein. The Secondary Zone consists of approximately 238,000 acres.

(Public Resources Code, <http://www.leginfo.ca.gov/cgi-bin/displaycode?section=prc&group=29001-30000&file=29720-29734>; Delta Protection Commission, <http://www.delta.ca.gov/commission.htm>, retrieved 2016.)

<sup>6</sup> Based on draft DRMS spreadsheet file data (2008) provided by the consulting team.

<sup>7</sup> 2012 Central Valley Flood Protection Plan, Attachment 8F

**Estimate value at risk by beneficiary.** This equals the estimated asset value, multiplied by asset damage, multiplied by flood hazard. For example, a residence may be worth \$100,000, and the expected flood damage may be 25% with 2 feet of inundation, with the expected damage \$25,000. If the flood hazard is 1 in 100 years, or 1%, then the estimated value at risk in any given year is \$250. The annual risk can be accumulated over a specified number of years, usually either the life of the asset or the underlying term of debt on the asset. In this example, with a 30-year mortgage and a 3% discount rate, the present value of the value at risk is \$4,900.

*Estimate cost for proposed project or flood protection activity:* This reflects the cost of the specified measure to reduce the risk of a damaging flood (e.g., raising levees). This could include raising all or portions of an island's levee to a specific engineering standard, such as those contained in DWR's Bulletin 192-82,<sup>8</sup> or it may consist of ongoing maintenance to keep levees at current levels.

*Calculate the benefit from reduced flood risk from a project:* Estimating this value is based, in most cases, on reducing the risks associated with doing nothing. This is the benefit derived from flood protection. Again, this involves several sequential steps.

1. **Calculate change in flood hazard.** This is the reduction in flood risk from a flood control measure. For example, the levee project may reduce the hazard from 1 in 100 to 1 in 200 years, which is a reduction from 1% to 0.5%.
2. **Characterize change in value at risk by beneficiary.** This equals asset value, multiplied by asset damage, multiplied by change in flood risk. Using the example above of a residence and the change in flood hazard, the present value of the change in risk would be \$2,450.<sup>9</sup>
3. **Estimate cost of alternative risk reduction measure.** For example, alternatives could include armoring a portion of the levee, purchasing flood insurance, improving emergency response, or armoring individual assets. For example, a residence might be built on stilts or a berm to raise it above the flood plain.
4. **Assess relative benefits across beneficiaries.** For each archetype, relative benefits, as defined either by the appropriate financing mechanisms or from accepted economic methods, is estimated compared to other co-located or related beneficiaries (e.g., agricultural neighboring habitat). The key is arriving at a common metric for that comparison. This comparison is used in the cost allocation step, next.

*Allocate cost responsibility.* The chosen portfolio of financing mechanisms may dictate how to allocate costs among beneficiaries in particular settings. For example, federal law requires the

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<sup>8</sup> A set of agricultural and urban levee standards specific to the Delta developed by DWR in 1982. These standards are higher than the Hazard Mitigation Plan (HMP) Standard, which was a minimum, short-term, interim standard created by FEMA, DWR, and RDs following 1983 and 1986 flooding events, as a precondition for receiving FEMA disaster assistance. DWR, *Bulletin 192-82: Delta Levees Investigation*, December 1982

<sup>9</sup> An important next step in implementation would be to *characterize risk tolerance*. This starts with the change in value at risk, then asks for stakeholder input on the probable value of avoiding the flood hazard if it differs from the initial estimate. The team has not developed values for these in the feasibility study because doing so requires substantial effort that is best reserved for moving to the implementation phase. Such tolerance is not easily derived for hypothetical situations illustrated with the archetypes.

separable-cost, remaining benefits (SCRB) method;<sup>10</sup> for land-based assessments, Proposition 218 mandates that there be a strict linkage between the assessment and the benefits delivered to those being assessed, with only specific (rather than general) benefits eligible for assessment.

Based on the relative benefits metrics and the chosen financing mechanisms, the basic principles for the cost allocation method that is applicable to each mechanism are described. Since different cost-allocation methods may be applicable based on legal, administrative, and societal criteria, several scenarios may be presented.

*Financial viability criteria:* Within the cost-allocation step, certain threshold tests may be applied depending on circumstances:

- *Nexus test—cause/effect:* The flood control intervention must provide value to the beneficiary according to this legal test. For example, for land-based assessments, the proportional relationship, i.e., nexus, between the benefit received and the assessment imposed must be analytically demonstrated. For non-land-based revenue-generating mechanisms like a tax, there may or may not need to be a relationship between the activity on which the charge is being levied and what is being protected.
- *Fair proportions:* The fair proportional allocation is bounded by the relative benefits received by a beneficiary as the upper bound, and the cost of service to a beneficiary as the lower. In other words, a beneficiary should not pay more than the potential benefit in costs, but should pay at least the direct cost of service.<sup>11</sup>
- *Characterize the relevant RD's ability to pay:* Per Water Code section 12986(a)(3)(A), the DWR must verify an RD's ability to determine local versus state cost shares on Delta levee subventions.
- *Apply benefit-cost test—check if value is greater than cost:* This reflects a threshold test to determine whether the change in value at risk is greater than the minimum cost of risk reduction measures. An example of the latter is the Proposition 218 test that an assessment not exceed the benefits. For the justification test, the cumulative change in the value at risk or benefits can be compared to the total project costs, without allocating costs to beneficiaries. For the legal test, the cost allocation usually must be done first, and then the allocated costs compared to the individual benefits.
- *Do total revenues equal total costs:* Does the sum of the revenues collected from all beneficiaries equal the total costs of protection measures? This determines whether the application of the bundle of mechanisms to the set of beneficiaries can feasibly pay for the needed risk reduction interventions.

*Legal implementation requirements:* Identify the state, local, or special district public sector entity—or the voting jurisdiction—that has to authorize the mechanism, under what

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<sup>10</sup> As described in the USACE Cost-Benefits Manual and the DLIS Technical Memo 3.1.

<sup>11</sup> The fair share to be paid by a beneficiary (bounded by these two values) would be determined during implementation through negotiation and should be informed by the literature on optimal taxation and other topics.



requirements (e.g., majority, super-majority), with what voter composition (e.g., registered voters, landowners), and the appeals process (e.g., Proposition 218).

## **APPENDIX F      EVALUATION OF CANDIDATE FINANCING MECHANISMS**

Tables F-1A and F-1B summarize the multi-step process used to screen candidate mechanisms for feasibility based on the criteria specified in this report. These criteria reflect the opportunities, challenges and barriers afforded by each candidate mechanism. The tables are organized in the same manner as Table 7-1 of the Report, with mechanisms broadly grouped by legal categories.

The Table F-1A lists likely responsible agencies or entities that would implement the mechanism, and the legal requirements to adopt and implement it. Table F-1B shows the determination of cost responsibility and relative revenue potential, and political considerations that are likely to arise before adopting the mechanism.

As is to be expected in a complex political environment, there are no simple “yes or no” answers to the question of whether any particular mechanism is feasible given the range of considerations explored here. This table provides more detailed discussion about each dimension of a mechanism reviewed. The reader may arrive at a different conclusion than the report authors based on this information.

Certain mechanisms list references to other mechanisms; notations are provided to facilitate cross references. These are alternatives to each other that target similar populations of beneficiaries, but may have different characteristics.

**Table F-1A - Funding Mechanisms: Opportunities, Barriers, and Challenges**

Funding Mechanism/Groupings		Institutional Implementing entities with legal authority / potential capacity	Legal					
		Governing statutes and/or key restrictions / requirements	Governance approval	Voter composition	Vote requirement	Appeal or protest	Benefit-cost test	
1	Property-related Local assessment district [e.g. existing reclamation districts]	Local	Proposition 218	City/County/district	Local board	Majority	Weighted by financial obligation	Only special benefits can be assessed. Costs must be reasonably related to special benefits
2	Delta-wide assessment district	Regional	Prop. 218; likely requires implementing legislation	Joint Powers Authority; special legislation	Local board	Majority vote in each jurisdiction	Weighted by financial obligation	Only special benefits can be assessed. Costs must be reasonably related to special benefits
3	State assessment district	State	Possibly triggers Proposition 26. State-created district may be treated as a local assessment which triggers Prop 218.	California Legislature	Legislature	Likely two-thirds vote	Not unless added by statute	Charge must be reasonably related to cost
4	Geological hazard abatement district	Local	Prop. 218; typically formed based on property owner consent	City/County	Local board	Majority	Weighted by financial obligation	Only special benefits can be assessed. Costs must be reasonably related to special benefits
5	Incremental tax district (e.g., Mello-Roos)	Local	Prop. 218; typically formed based on property owner consent	Local legislative body	Local voters	Two-thirds vote	No	No
6	Parcel/assessed value tax	Local	Proposition 13	Local legislative	Local voters	Two-thirds vote	No	None

	<b>Funding Mechanism/Groupings</b>	<b><u>Institutional</u></b>	<b><u>Legal</u></b>					
		<i>Implementing entities with legal authority / potential capacity</i>	Governing statutes and/or key restrictions / requirements	Governance approval	Voter composition	Vote requirement	Appeal or protest	Benefit-cost test
				body; voters				
7	Delta Flood Prevention Fee	Delta Stewardship Council	Requires state legislation	California Legislature	Legislature	Majority or two-thirds, depending on outcome of ongoing litigation	Yes, depending on legislation	No
	<b>User Fees</b>							
8	Delta water user fee / acre-feet (see 9 as alternative)	SWRCB (if diversion fee) or DSC (if Delta use fee)	Federal/State water contracts; Prop. 26	California Legislature; possible contract modification	Legislature	Majority	No	Charge must be reasonably related to cost
9	State Water Project (SWP)/Central Valley Project (CVP) water conveyance fee; (see 8 and 10 as alternative)	California Department of Water Resources (CDWR); or SWRCB	Federal/State water contracts; Prop. 26	Legislature; possible contract modification	Legislature	Majority	No	Property use rates tied to fair market value
10	State Water Project (SWP)/Central Valley Project (CVP) water conveyance lease; i.e., transmission capacity pricing (see 8 and 9 as alternative)	State Lands Commission	Federal/State water contracts; Prop. 26 does not apply to use of government property	Legislature; possible contract modification	Legislature	Majority	No	Property use rates tied to fair market value
11	Agricultural discharge fee / AF	State Water Resource Control Board (SWRCB); Central Valley Regional Water Quality CB (CVRWQCB)	Prop. 26	California Legislature	Legislature	Majority	No	Charge must be reasonably related to cost
12	Groundwater pumping fee / AF	SWRCB, CVRWQCB	Prop. 26, Prop. 218. Matter is in active litigation around the state	California Legislature	Legislature	<i>To be resolved in pending court cases</i>	No	Charge must be reasonably related to cost

	<b>Funding Mechanism/Groupings</b>	<b><u>Institutional</u></b>	<b><u>Legal</u></b>					
		<i>Implementing entities with legal authority / potential capacity</i>	Governing statutes and/or key restrictions / requirements	Governance approval	Voter composition	Vote requirement	Appeal or protest	Benefit-cost test
13	Earmark illegal diversion fines	SWRCB	Requires legislation	California Legislature	Legislature	Majority	No	No
14	Delta boat registration tag (see 16 as alternative)	Department of Motor Vehicles (DMV)	Prop. 26	California Legislature	Legislature	Two-thirds	No	None
15	Fishing/licenses	California Department of Fish and Wildlife (CDFW)	Prop. 26	Regulation	No	No	No	Charge must be reasonably related to cost
16	Motorboat use fee (see 14 as alternative)	California Division of Boating and Waterways (CDBW)	Prop. 26	Regulation	No	No	No	Charge must be reasonably related to cost
17	Electric vehicle charging station franchises	California Public Utilities Commission (CPUC); Board of Equalization (BOE)	Prop. 26, requires legislation	Regulation	No	Majority	No	To be determined
18	Flood protection fee on cross Delta infrastructure (see 23-25 as alternatives)	CDWR or DSC or SLC	Prop. 26; requires legislation	California Legislature	Legislature	Majority	No	Charge must be reasonably related to cost
	<b>Highway-related fees and tolls</b>							
19	Electronic tolls	California Department of Transportation	Requires legislation	California Legislature	Legislature	Majority	No	Charge must be reasonably related to cost
20	Pollution fee (e.g. oil, braking particles)	SWRCB	Requires legislation	California Legislature	Legislature	Majority	No	May qualify as a regulatory fee
21	Truck fees	DMV	Requires legislation, may be barred by Art. XIX	California electorate	Voters	Majority	No	Charge must be reasonably related to cost

	<b>Funding Mechanism/Groupings</b>	<b>Institutional</b>	<b>Legal</b>					
		<i>Implementing entities with legal authority / potential capacity</i>	Governing statutes and/or key restrictions / requirements	Governance approval	Voter composition	Vote requirement	Appeal or protest	Benefit-cost test
22	Vehicle licensing fees	DMV	Requires legislation including <b>potential amendment to Art. XIX of the California Constitution</b>	California electorate	State voters	Majority	No	Charge set by statute and locked in by Constitutional amendment
	<b>Regulatory charges</b>							
23	Delta rail line use fee	CPUC	<b>Potential Federal pre-emption</b> ; requires legislation	<b>Federal</b> ; State	Legislature	Majority	No	Charge must be reasonably related to cost
24	Electricity distribution/transmission assessment	CPUC; <b>California Independent System Operator</b>	Requires legislation	Regulation	Commission	Majority	No	To be determined
25	Franchise fees (gas, electric, telecommunications)	CPUC or Board of Equalization	Prop. 26, state statutes setting maximum rates	California Legislature	Legislature	Majority	No	Charge must be reasonably related to cost
26	Gas well fees ( <b>see 31 as alternative</b> )	Division of Oil, Gas, and Geothermal Resources (DOGGR), State Water Resources Control Board, Central Valley Regional Water Quality Control Board	Prop. 26	Legislature (Regulatory action by DOGGR or SWRCB may be sufficient)	Legislative action may be required to expand role of DOGGR & SWRCB	Majority	No	Charge must be reasonably related to cost
	<b>Impact fees</b>							
27	Groundwater pumping assessment ( <b>see 28 alternative</b> )	BOE	Prop. 26	California Legislature	Legislature	Two-thirds	No	Charge must be reasonably related to cost
28	Groundwater pumping parcel tax ( <b>see 27 alternative</b> )	BOE	Prop. 26	California Legislature / Electorate	Legislature	Two-thirds	No	None

	<b>Funding Mechanism/Groupings</b>	<b><u>Institutional</u></b>	<b><u>Legal</u></b>					
		<i>Implementing entities with legal authority / potential capacity</i>	Governing statutes and/or key restrictions / requirements	Governance approval	Voter composition	Vote requirement	Appeal or protest	Benefit-cost test
29	Upstream discharger fee (see 34 & 38 alternatives)	CVFPB	Prop. 26	California Legislature	Legislature	Majority	No	Charge must be reasonably related to cost
30	Development impact fees	Local	Prop. 13	City/County	Local board	Majority	No	Nexus: must be reasonably related
31	Delta gas severance fee (see 26 as alternative)	SLC	Requires legislation	California Legislature	Legislature	Two-thirds	No	Charge must be reasonably related to cost
32	Commodity /Made in Delta fee	Co-op	May require legislation	California Legislature	Legislature	Two-thirds		
33	Habitat conservation plan (HCP)	Multi-agency	Prop. 13 applies to local impact fees	City/County	Local board	Majority	No	Nexus: must be reasonably related
34	Flood control plan akin to HCP (see 38 alternative)	Multi-agency	Prop. 13 applies to local impact fees	City/County	Local board	Majority	No	Charge must be reasonably related to cost
35	Repeal of property tax exemption for habitat mitigation for SWP/CVP, or require in-lieu payment tied to specific benefit	CDFW; U.S. Fish and Wildlife Service	Federal consent to pay charge, waiver of state immunity	California Legislature	Legislature	Majority	NA	None
36	Land trust support	Conservancy	Private action	NGO	NA	NA	NA	NA
37	Property covenants/set asides in exchange for investment	Private; non-governmental organization	Private action	NGO / negotiated	NA	NA	NA	NA
38	Delta periphery levees upgrade fee (see 29 & 34 alternatives)	Federal; State	Requires Federal/State legislation	California Legislature	Legislature	Two-thirds	No	Charge must be reasonably related to cost
39	Carbon sequestration/ capture	California Air Resources Board	Statutory (AB 32 et al)	Private firms / CARB permits	NA	NA	NA	NA

	<b>Funding Mechanism/Groupings</b>	<b><u>Institutional</u></b> <i>Implementing entities with legal authority / potential capacity</i>	<b><u>Legal</u></b>					
			Governing statutes and/or key restrictions / requirements	Governance approval	Voter composition	Vote requirement	Appeal or protest	Benefit-cost test
40	CATP Allowance Funds	Strategic Growth Council (SGC)	Statutory (AB 32 et al)	California Legislature	Legislature	Majority	No	[Specified in AB 32]
	<b>Public benefits financing tools</b>							
41	General Fund	State; Local	Requires legislation	California Legislature	Legislature	Majority	No	No
42	General/revenue bonds	State	Requires legislation; public vote	California Legislature / Electorate	Legislature / state voters	Majority	No	No
43	Subventions	CDWR	Requires legislation	California Legislature	Legislature	Majority	No	Per DWR regulations
44	Federal financing	U.S. Army Corps of Engineers	Requires legislation	U.S. Congress	Legislature	Majority	No	Per USACE guidance
45	Regional financing agency	State	Requires legislation	California Legislature	Legislature	Majority	No	No
46	Sales tax	State/Local	Prop. 26	Voters	State/local voters	Majority	No	None
47	Certificate of Participation	State/Local with private participants	Statutory	Local or State agency	Local board / State agency	Majority	No	No
48	Tax dedicated zones, with revenues redirected to Delta (e.g. sales; tobacco)	State	Requires legislation; Prop. 26 would apply to a new tax	California Legislature	Legislature	Two-thirds to create new tax obligation	No	No
49	Agricultural property tax redirection	State	May require California Constitutional amendment	California Legislature	Legislature/ state voters	Majority	No	No
	<b>Heritage Site related</b>							
50	Federal/UN funding support	U.S.; <b>United Nations</b>	Requires legislation	<b>U.S. Congress</b>	Legislature	Majority	No	No



**Table F-1B - Funding Mechanisms: Opportunities, Barriers, and Challenges**

Funding Mechanism/Groupings	Cost Responsibility & Limits			Stakeholder / Political Support
	Cost allocation method	Revenue capacity	Revenue-generating potential, including timing; risks	Potential Feasibility/Prospects for Successful Implementation
<b>Property-related</b>				
Local assessment district [e.g. existing reclamation districts]	Benefits-based/Alternative justifiable expenditures	Status quo	Low, unlikely to generate significant new revenues	Current practice under status quo; problematic if state subvention significantly reduced and/or need for substantially greater revenue levels
Delta-wide assessment district	Benefits-based/Alternative justifiable expenditures	Medium	<b>Low</b> ; five to 10 year development process	<b>Substantial administrative, legal, and political challenges. Rejected by SF Bay Restoration Authority.</b>
State assessment district	Benefits-based/Alternative justifiable expenditures	High	High; five to 10 year development process	<b>Substantial administrative, legal, and political challenges.</b>
Geological hazard abatement district	Benefits-based/Alternative justifiable expenditures	<b>Low</b>	<b>Low; similar to local assessment districts</b>	Possible on a geographic-specific basis, <b>but no obvious gain over RDs.</b>
Incremental tax district (e.g., Mello-Roos)	Benefits-based/Alternative justifiable expenditures	<b>Low</b>	<b>Low</b> , other than geographic areas that are likely to experience significant development	Possible on a geographic-specific basis for new developments.
Parcel/assessed value tax	<i>Taxes can be established independent of cost allocation</i>	Medium	Medium	<b>Requires effective ballot campaign; not beneficiary-pays based as dictated by parcel, not economic value.</b>
Delta Flood Prevention Fee	Could be assessed on a per structure basis	Medium	Medium, based on Assembly Bill 29X1, Fire Prevention Fee. More likely to pay for operations and maintenance than capital expenses	Requires similar motivation as Rural Fire Prevention Fee. FPF presents precedential model passed by the Legislature.
<b>User Fees</b>				
Delta water user fee / acre-feet (see 9 as alternative)	Proportionate use of facilities /Alternative justifiable expenditures	High	Bay-Delta Finance Plan (2004) proposed that SWP/CVP fund 15% of levee costs.	Similar to Bay-Delta Financing Plan user fee proposed in 2005, which identified levee financing as one component.
State Water Project (SWP)/Central Valley Project (CVP) water conveyance fee; (see 8 and 10 as alternative)	Proportionate use of facilities /Alternative justifiable expenditures	High	Bay-Delta Finance Plan (2004) proposed that SWP/CVP fund 15% of levee costs.	Similar to Bay-Delta Financing Plan user fee proposed in 2005, which identified levee financing as one component.

Cost Responsibility & Limits				Stakeholder / Political Support
Funding Mechanism/Groupings	Cost allocation method	Revenue capacity	Revenue-generating potential, including timing; risks	Potential Feasibility/Prospects for Successful Implementation
State Water Project (SWP)/Central Valley Project (CVP) water conveyance lease; i.e., transmission capacity pricing (see 8 and 9 as alternative)	To be determined, e.g., could use FERC-based pricing model	High	Channel basin lease akin to gas pipeline pricing. Could be priced at WaterFix cost net of "leakage."	Legal basis similar to Tideland Oil & Gas Lease. Structured as contractual relationship rather than intergovernmental.
Agricultural discharge fee / AF	Proportionate use of facilities /Alternative justifiable expenditures	Low	Low	Likely to be strongly opposed by agricultural stakeholders
Groundwater pumping fee / AF	Proportionate use of facilities /Alternative justifiable expenditures	Low	Low	Likely to be strongly opposed by agricultural stakeholders. Nexus tenuous to the Delta.
Earmark illegal diversion fines	Proportionate use of facilities /Alternative justifiable expenditures	Low	Low	Nexus tenuous, and funds currently earmarked for SWRCB.
Delta boat registration tag (see 16 as alternative)	Taxes can be established independent of cost allocation	Low	Low	Similar to environmental license fee which has substantial support. Difficult to link directly to Delta usage.
Fishing/licenses	Proportionate use of facilities /Alternative justifiable expenditures	Low	Low	Similar to environmental license fee which has substantial support. Benefit value low relative to collection costs.
Motorboat use fee (see 14 as alternative)	Proportionate use of facilities /Alternative justifiable expenditures	Low	Low	Issues of controlling access; cost of collecting fees
Electric vehicle charging station franchises	To be determined	Low	Low	Poor nexus.
Flood protection fee on cross Delta infrastructure (see 23-25 as alternatives)	To be determined. Underwriting and allocation of risk.	Medium	Treat as flood insurance for island recovery.	Need to designate a separate agency to enforce and collect.
<b>Highway-related fees and tolls</b>				
Electronic tolls	Proportionate use of facilities /Alternative justifiable expenditures	Low	Low; five to 10 year development process	Issues of controlling access; cost of collecting fees
Pollution fee (e.g. oil, braking particles)	Proportionate use of facilities /Alternative justifiable expenditures	Low	Low	Fee collection basis unclear

Cost Responsibility & Limits				Stakeholder / Political Support
Funding Mechanism/Groupings	Cost allocation method	Revenue capacity	Revenue-generating potential, including timing; risks	Potential Feasibility/Prospects for Successful Implementation
Truck fees	Proportionate use of facilities /Alternative justifiable expenditures	Low	Low; five to 10 year development process	Fees could be modeled after other states (e.g., Oregon). Hits ag directly. <b>Issues of controlling access; cost of collecting fees</b>
Vehicle licensing fees	Not specified	Low	Medium	Has been strong opposition in the past; constitutional barrier. <b>Constitutional ban.</b>
<b>Regulatory charges</b>				
Delta rail line use fee	Agency discretion (any method)	Low	Medium	<b>Need to designate a separate agency to enforce and collect.</b>
Electricity distribution/transmission assessment	Agency discretion (any method)	Medium (check CA)	Low	<b>Would require further investigation</b>
Franchise fees (gas, electric, telecommunications)	Agency discretion (any method)	Medium	Low	Medium, depending on political will. <b>Franchise fees already dedicated to other local functions.</b>
Gas well fees (see 31 as alternative)	Proportionate use of facilities /Alternative justifiable expenditures	Medium	Depends on ability to geographically target fee.	<b>Difficulty expanding scope of current regulatory fee.</b>
<b>Impact fees</b>				
Groundwater pumping assessment (see 28 alternative)	Proportionate use of facilities /Alternative justifiable expenditures	Medium	Depends on SGMA implementation and ability to measure pumping rates	<b>Likely to be strongly opposed by agricultural stakeholders; nexus is convoluted.</b>
Groundwater pumping parcel tax (see 27 alternative)	<i>Taxes can be established independent of cost allocation</i>	Medium	Medium. Dependent on size of parcel tax amount, and properties targeted.	<b>Likely to be strongly opposed by agricultural stakeholders. Probably requires local approval like SF Bay Restoration Fee.</b>
Upstream discharger fee (see 34 & 38 alternatives)	Benefits-based/Alternative justifiable expenditures	Low	Runoff metric basis in Alameda Co FCWCD for benefits assessment. <b>Cost of collection could be significant</b>	Akin to ACFCWCD fee basis. Used with property protection method in SAFA.
Development impact fees	Proportionate use of facilities /Alternative justifiable expenditures	Low	<b>Low, other than geographic areas that are likely to experience significant development</b>	Applicable on a geographic-specific basis, but <b>not useful in Primary Zone.</b>
Delta gas severance fee (see 26 as alternative)	Proportionate use of facilities /Alternative justifiable expenditures	Medium	<b>Revenues likely volatile as its tied directly to market price.</b>	<b>Opposition from WSPA/CIPA on imposing severance fee. Unknown if geographic targeting allowed for a fee.</b>

Cost Responsibility & Limits				Stakeholder / Political Support
Funding Mechanism/Groupings	Cost allocation method	Revenue capacity	Revenue-generating potential, including timing; risks	Potential Feasibility/Prospects for Successful Implementation
Commodity /Made in Delta fee	Agency discretion (any method)	Low	Low	Would require lead organization
Habitat conservation plan (HCP)	Proportionate use of facilities /Alternative justifiable expenditures	Medium	Paid by water exporters mostly. Issue of whether ERP covers this already.	SWP/CVP contractors: believe already paying this cost.
Flood control plan akin to HCP (see 38 alternative)	Proportionate use of facilities /Alternative justifiable expenditures	Low	Depending on development paying for flood control mitigation elsewhere in Delta	Requires identifying and quantifying specific upstream benefits.
Repeal of property tax exemption for habitat mitigation for SWP/CVP, or require in-lieu payment tied to specific benefit	Taxes can be established independent of cost allocation	Medium	May only require Legislature to fund current local assessments on CDFW land. Remove other muni exemptions.	Munis may object as being precedential for other activities. Formal requirement for in-lieu payment may be alternative.
Land trust support	NA	Low	Low	Required non-profit sector participation and identifying separate financing source.
Property covenants/set asides in exchange for investment	NA	Low	Low	Needs to be associated with water supply reliability
Delta periphery levees upgrade fee (see 29 & 34 alternatives)	Proportionate use of facilities /Alternative justifiable expenditures	Low	To compensate for adverse effects downstream from higher levees.	Similar to SAFCA and ACFCWCD district-based cost allocation assessments.
Carbon sequestration/ capture	NA	Low	Carbon offset slow to start, dependent on future GHG cap implementation	Not a substantial set of sequestration sites yet in the Delta. Only required private action.
CATP Allowance Funds	Not specified	Medium	Dependent on SGC action for eligibility and allocations. Allowance funds decreasing recently.	Competition with other applicants
Public benefits financing tools				
General Fund	Separable costs / remaining benefits	High	High	Recent funding has been displaced by bonds.

Cost Responsibility & Limits				Stakeholder / Political Support
Funding Mechanism/Groupings	Cost allocation method	Revenue capacity	Revenue-generating potential, including timing; risks	Potential Feasibility/Prospects for Successful Implementation
General/revenue bonds	Separable costs / remaining benefits	High	High	Episodic issuances, usually tied to a broad range of issues.
Subventions	Separable costs / remaining benefits	Medium	Low, already in use	Primary current source, but continuation uncertain.
Federal financing	Separable costs / remaining benefits	High	High	Funding reductions in recent years; USACE ruled many levees ineligible indefinitely in 2012
Regional financing agency	Not specified	Medium	Medium, but requires outside contributions.	Akin to Delta Conservancy, and large scale urban flood control agencies.
Sales tax	Taxes can be established independent of cost allocation	High	High	Requires effective ballot campaign. Nexus tenuous.
Certificate of Participation	Not specified	Project specific	Dependent on separate underlying financing source. Needs to be tied to specific projects, as it is leased back. Can avoid a vote on an assessment or a bond.	May have limited applications
Tax dedicated zones, with revenues redirected to Delta (e.g. sales; tobacco)	Not specified	Low	Low	Nexus tenuous.
Agricultural property tax redirection	Not specified	Low	Low	Nexus tenuous.
Heritage Site related				
Federal/UN funding support	Not specified	Low	Low	Highlighting distinctions that merit funding a site in a relatively wealthy nation from other candidate heritage sites would be difficult.



## APPENDIX G CURRENT FUNDING FOR DELTA FLOOD PROTECTION

### Purpose and Summary

This Appendix describes the set of facts and assumptions about current financial resources that are used in the Study. It also describes several key characteristics of Delta levees and outlines past and current federal, state, and local funding for levee investment and maintenance.<sup>113</sup> This includes an overview of State of California levee subvention and special projects funding, and a summary of local RD financing sources. Attachments A and B provide more detailed accounting of historic levee funding and RD finances.

### Summary of Findings

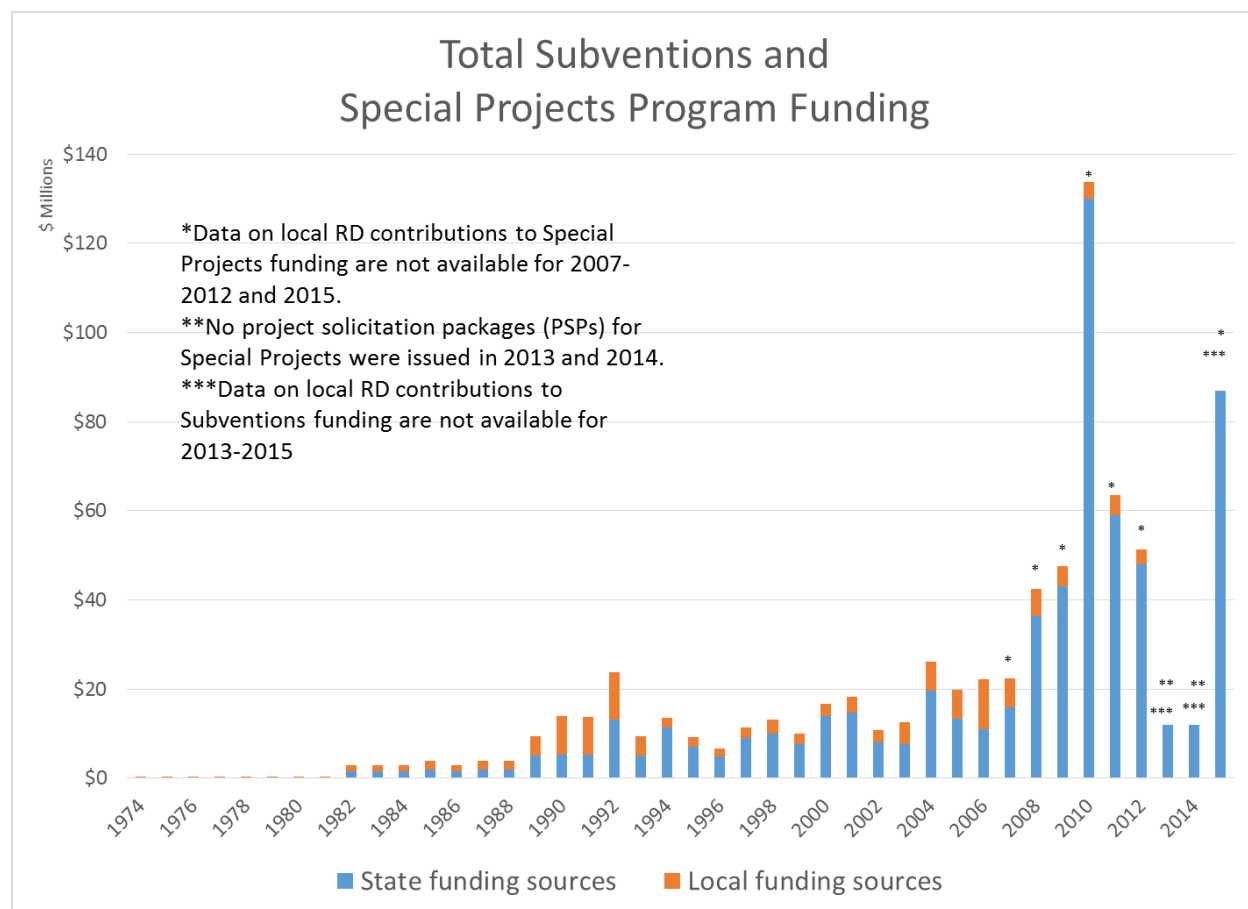
Simply put, the funding available for Delta levee maintenance and improvements depends mainly on whether the levee is a “project” or a “non-project” levee. Roughly one-third of Delta levees are project levees, meaning that they are part of federally authorized flood control projects, are considered to be part of the SPFC, and are owned by the State. The remaining two-thirds are privately owned non-project levees.

Delta levees depend on a mix of federal, state, and local funding. Some funding comes from the USACE, with State cost-sharing requirements. Federal funds pay for project levee improvements that are consistent with federal program priorities and guidelines, but do not pay for maintenance. State funding comes primarily from general obligation bonds, which pay for project and non-project levee maintenance and improvements through a variety of programs administered by the DWR. Local agencies, such as RDs, can assess local property owners for the costs of maintaining and improving levees. Generally speaking, such assessments are insufficient to cover the costs of levee improvements, and local agencies rely on state and federal funding for both project and non-project levees.

A review of historic and current spending on Delta levees shows that State funding has grown since the mid-1990s, yet has also been episodic, with significant swings over the last eight years. State funding relies primarily on general obligation bonds. Since 1996, State general obligation bonds have provided about \$1.1 billion for statewide flood control, of which approximately \$725 million was earmarked for levees, most of which are in the Delta. Local agencies contributed approximately 16% in matching funds. The current cycle of bond funding is about to end, making future funding uncertain. Figure G-1 shows how funding has varied. The full dataset of subventions and special projects expenditures is shown in Attachment A.

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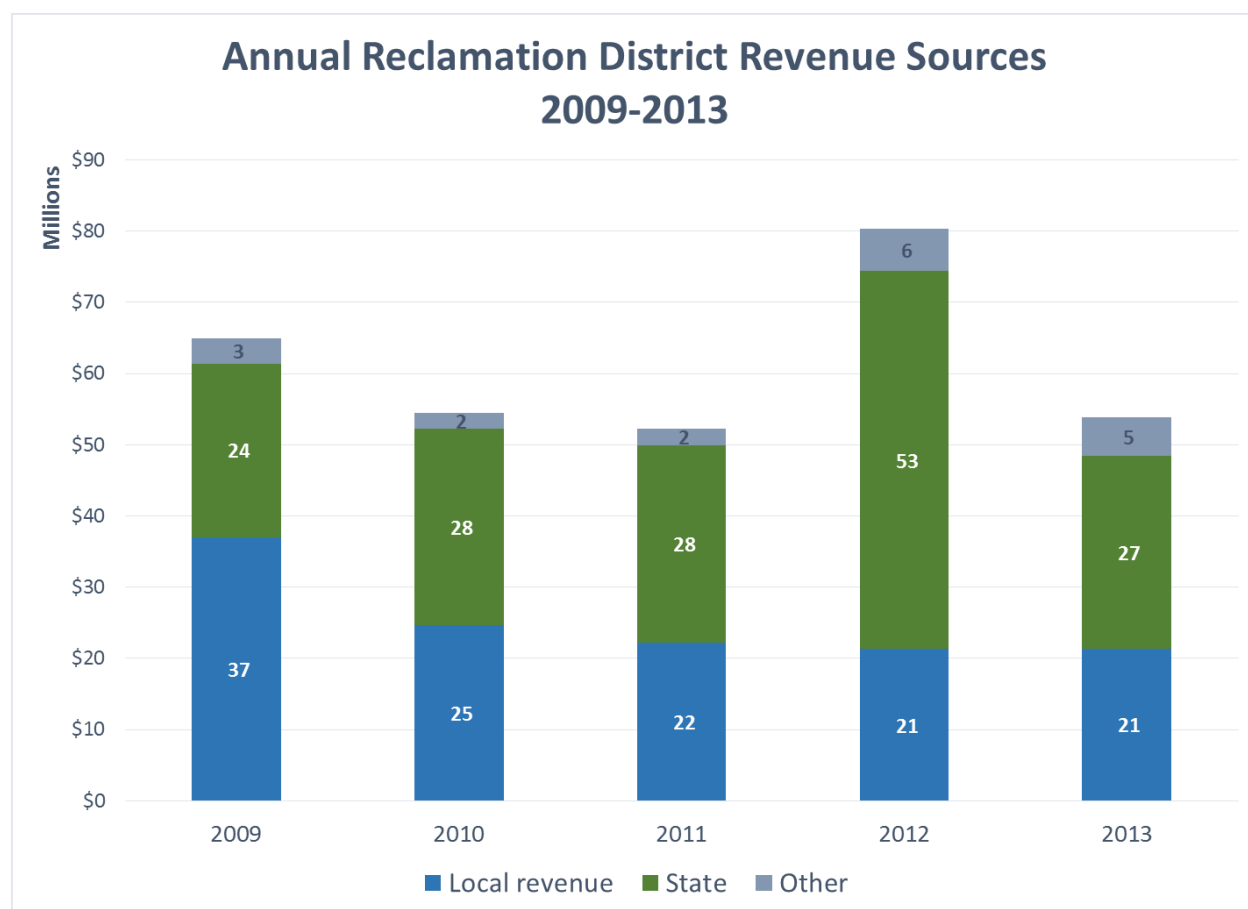
<sup>113</sup> This report relies on data sources that are readily available that summarize revenues and spending from the identified sources. Collecting and/or collating data from primary sources is beyond the scope of this study, as well as auditing associated revenues and spending. That step likely will be necessary if the decision is made to move forward with implementing some or all of the financing mechanisms identified here.

**Figure G-1 Total Subventions and Special Projects Funding**

Source: Data provided to the study team by DWR's Delta Levees Program.

According to the State Controller's Office (SCO), local agencies are now spending about \$73 million annually on levee maintenance and improvements, about one-third of which comes from State bond-funded programs. Figure G-2 summarizes local agencies' funding sources over a five-year period.



**Figure G-2 Annual Reclamation District Revenue Sources FY 2009–2013**

Source: State Controllers Annual Reports on Special Districts, compiled by the DSC.

Estimates of the total need for spending on Delta levee improvements varies; stakeholders and agencies have not yet agreed on the standards to be used for flood protection and levee construction, or the amount of funding needed. This report, and the overall Delta Flood Risk Management Assessment District Feasibility Study, does not intend to develop a cost estimate.

## An Overview of Delta Levees

The current Delta levee system consists of about 1,100 miles of levees in the Delta, along with about 12 miles of levees in the Suisun Marsh.<sup>114</sup> Funding for levee maintenance and improvements depends greatly on whether the levee is part of the SPFC. This section summarizes the regulatory context of Delta levees, focusing on the relationship between regulatory setting and the availability of and eligibility for various sources of funding. It also summarizes recent state bond spending on flood control and protection in the Delta.

<sup>114</sup> Some of the descriptions of project and non-project levees included in this section are excerpted from DWR's *Framework for Department of Water Resources Integrated Flood Management Investments in the Delta and Suisun Marsh*, September 24, 2013. Available at [http://www.water.ca.gov/floodsafe/fessro/docs\\_policies/](http://www.water.ca.gov/floodsafe/fessro/docs_policies/).

The State and federal institutions managing and funding flood protection focus on two different types of levees:

**Project Levees:** A project levee is a levee that is part of federally authorized flood control projects, is considered to be part of the SPFC, and is owned by the State. The SPFC defines project levees specifically as a: “levee that is part of the facilities of the State Plan of Flood Control (SPFC). Facilities of the SPFC include levees, weirs, channels, and other features of the federal and state authorized flood control facilities located in the Sacramento River and San Joaquin River drainage basins for which the Central Valley Flood Protection Board (CVFPB) or the Department of Water Resources (DWR) has given the assurances of nonfederal cooperation to the United States required for the project, and those facilities identified in Section 8361 of the Water Code. The facilities of the State Plan of Flood Control are listed and described in the State Plan of Flood Control Descriptive Document.”<sup>115</sup>

**Non-Project Levee:** A non-project levee is a local flood control levee in the Delta that is not a project facility under the SPFC.<sup>116</sup> These levees typically are financed through State and local sources. In most cases, the latter are RDs that rely solely on assessments as their internal source. Local sources are discussed further in Chapter 3.

## Project Levees

Since 1917, an ongoing collaboration between State, federal, and local agencies has produced the flood control system of the Sacramento and San Joaquin watersheds, which consists of levees, dams, weirs, bypasses, and other facilities, called the SPFC.<sup>117</sup> As noted above, about one-third of Delta levees are “project” levees. In exchange for receiving federal funding for improvements, the State is required to operate and maintain these project levees and other works.

Project levees are built according to the USACE guidelines in effect at the time of construction and are eligible for federal aid from the USACE for levee repair and rehabilitation, such as for emergencies and specific projects. However, the USACE does not provide funds for routine maintenance; these levees compete with non-project levees for State funding for maintenance.

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<sup>115</sup> DWR, “Flood Management,”

[http://www.water.ca.gov/floodmgmt/lrafm/fmb/fas/risknotification/frequently\\_asked\\_questions.cfm](http://www.water.ca.gov/floodmgmt/lrafm/fmb/fas/risknotification/frequently_asked_questions.cfm).

<sup>116</sup> Project and Non-project levees are defined in the State Water Resources Law of 1945, as shown on page 38 of the Department of Water Resources “Sacramento-San Joaquin Delta Atlas,” dated 1993. Section 12980(e) of Water Code.

<sup>117</sup> Section 9110(f) of the California Water Code defines the SPFC as follows:

“State Plan of Flood Control” means the state and federal flood control works, lands, programs, plans, policies, conditions, and mode of maintenance and operations of the Sacramento River Flood Control Project described in Section 8350, and of flood control projects in the Sacramento River and San Joaquin River watersheds authorized pursuant to Article 2 (commencing with Section 12648) of Chapter 2 of Part 6 of Division 6 for which the board or the department has provided the assurances of nonfederal cooperation to the United States, and those facilities identified in Section 8361.

For more information, see the *State Plan of Flood Control Descriptive Document*, November 2010. Available at <http://www.water.ca.gov/cvfp/docs/SPFCDescriptiveDocumentNov2010.pdf>.

Project levees are publicly owned and, as a result of the California Supreme Court's 2003 decision in *Paterno v. California*, the State is liable for flood damages resulting from breaches. The Court found that "when a public entity operates a flood management system built by someone else, it accepts liability as if it had planned and built the system itself."<sup>118</sup>

### Central Valley Flood Protection Plan

The Central Valley Flood Protection Board (CVFPB), as the authorized representative of the State and a key non-federal sponsor for construction of project levees, has made "assurances of cooperation" to the federal government. These assurances require, among other things, that the CVFPB provide all lands, easements, and rights-of-way necessary to complete a project and must pay for the non-federal portion of levee projects. The CVFPB must also maintain and operate all facilities after they are completed. The State has turned most of the project levees over to local maintaining agencies for operation and maintenance.<sup>119</sup>

The 2012 Central Valley Flood Protection Plan (CVFPP) is the latest incarnation of the SPFC as a "comprehensive framework for system-wide flood management and flood risk reduction in the Sacramento and San Joaquin River Basins."<sup>120</sup> The CVFPP provides guidance to reduce the risk of flooding for about one million people and \$70 billion in infrastructure, homes, and businesses, with a goal of providing 200-year protection to urban areas and reducing flood risks to small communities and rural agricultural lands.

The State System-wide Investment Approach (SSIA) outlined in the CVFPP includes significant capital investments to strengthen levees that protect existing urban areas and small communities, prioritizing improvements to the 1,600-mile levee system included in the SPFC. The SSIA also focuses on improving system resiliency in the face of climate change by expanding flood conveyance capacities, coordinating reservoir operations, and restoring floodplains. Total projected investment statewide ranges from \$13.9 to \$16.9 billion. This represents total combined costs for federal, state, and local agencies, in 2011 dollars. Estimates include costs for capital improvements and 25 years of ongoing annual work to maintain the system, of which some funds are already dedicated from Propositions 84 and 1E. Estimated costs for the SSIA in the Delta range from \$G.35 to \$G.8 billion.

### Non-Project Levees

The remaining two-thirds of Delta levees that are not part of the SPFC are known as "non-project levees."<sup>121</sup> Most of these levees were built to drain islands and tracts for agricultural use. They were

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<sup>118</sup> For more information, see Water Education Foundation, "State Liability, Flood Protection and the Paterno Decision." Available at <http://www.watereducation.org/aquapedia/state-liability-flood-protection-and-paterno-decision>, accessed February 2016.

<sup>119</sup> Local districts are allowed, under Water Code section 8618, to carry out maintenance or operation actions of these project levees under agreements with the Central Valley Flood Protection Board. This process of delegation and acceptance of duties earns reclamation districts their title of "local maintaining agencies."

<sup>120</sup> Central Valley Flood Management Program, *2012 Central Flood Protection Plan*, Public Draft, December 2011. Available at [http://www.water.ca.gov/cvfmp/docs/2012\\_CVFPP\\_FullDocumentHighRes\\_20111230.pdf](http://www.water.ca.gov/cvfmp/docs/2012_CVFPP_FullDocumentHighRes_20111230.pdf).

<sup>121</sup> DWR Flood Management describes a project levee as follows:

originally constructed before project levees and without assistance of State and federal governments. Non-project levees are locally owned and are managed by RDs on behalf of landowners.

Non-project levees do not receive financial assistance from the USACE. The State is not liable for non-project levees (nor does it want such liability). However, because of their benefits to state interests, the State contributes financially to the maintenance and improvement of non-project levees through the Special Projects and Subventions programs (defined below), with a local cost-sharing requirement.

Figure G-3 shows the project and non-project levees in the Delta within the Legal Delta, drawn from geographic information system (GIS) data collected for this project.

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A project or State-Federal levee is a levee that is part of the facilities of the State Plan of Flood Control (SPFC). Facilities of the SPFC include levees, weirs, channels, and other features of the federal and state authorized flood control facilities located in the Sacramento River and San Joaquin River drainage basins for which the Central Valley Flood Protection Board (CVFPB) or the Department of Water Resources (DWR) has given the assurances of nonfederal cooperation to the United States required for the project, and those facilities identified in Section 8361 of the Water Code. Also, levees that protect lands lying within the Tulare Lake Basin, including the Kings River, and the Kern River Basin are not State-Federal levees, even though geographically, these lands are considered part of the Central Valley. The facilities of the State Plan of Flood Control are listed and described in the State Plan of Flood Control Descriptive Document.

(DWR Flood Management, Frequently Asked Questions, "What is a Project or State-Federal Levee." Accessed 2016. Available at [http://www.water.ca.gov/floodmgmt/lrafm/fmb/fas/risknotification/frequently\\_asked\\_questions.cfm](http://www.water.ca.gov/floodmgmt/lrafm/fmb/fas/risknotification/frequently_asked_questions.cfm).)

Further, project levees are levees or floodwalls that are a facility of the State Plan of Flood Control. (DWR FloodSAFE, Urban Levee Design Criteria, May 2012. Available at [http://www.water.ca.gov/floodsafe/leveedesign/ULDC\\_May2012.pdf](http://www.water.ca.gov/floodsafe/leveedesign/ULDC_May2012.pdf).)

DWR's Urban Design Criteria adds more detail:

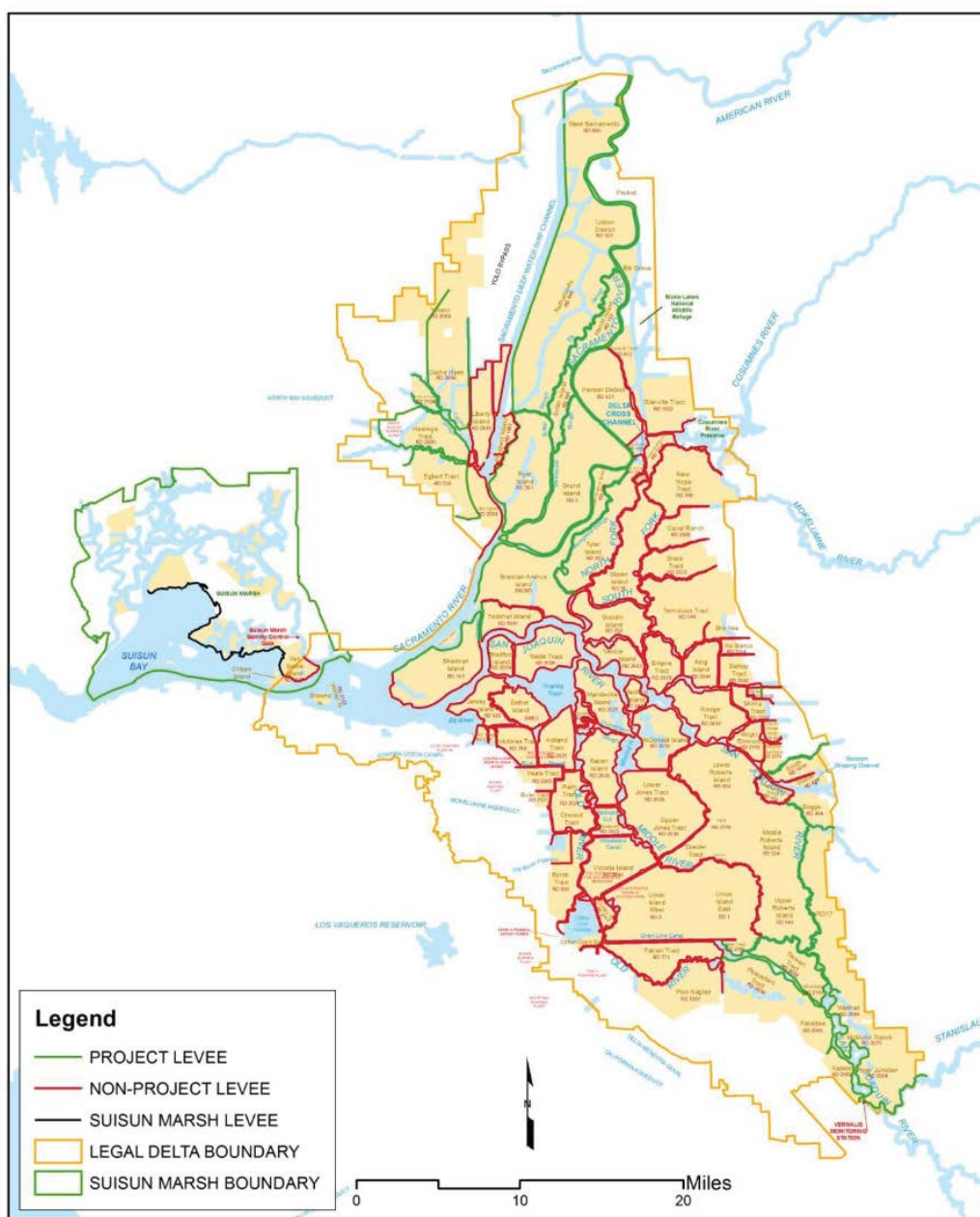
Federal flood control levees, as shown on page 40 of the Department of Water Resources "Sacramento-San Joaquin Delta Atlas," dated 1993, that is a project facility under the State Water Resources law of 1945 (Chapter 1 [commencing with Section 12570] and Chapter 2 [commencing with Section 12639 of Part 6]), if not less than a majority of acreage within the jurisdiction of the Local Agency that maintains the levee is within the primary zone of the delta, as defined in Section 29728 of the Public Resources Code.

(Department of Water Resources Delta Suisun Marsh Office, Delta Levee Special Flood Control Projects, DRAFT, Interim Guidelines For Providing Funding to Local Public Agencies, FY 2008 – 2009, November 2008. Available at <http://www.water.ca.gov/floodmgmt/dsmo/docs/DeltaLeveeProgramInterimGuidelines.pdf>.)

DWR's Delta Suisun Marsh Office defines non-project levees as:

A local flood control levee in the Delta that is not a project facility under the State Water Resources Law of 1945, as shown on page 38 of the Department of Water Resources "Sacramento-San Joaquin Delta Atlas," dated 1993. Section 12980(e) of Water Code.

(DWR Delta Suisun Marsh Office, Delta Levee Special Flood Control Projects, DRAFT, Interim Guidelines For Providing Funding to Local Public Agencies, FY 2008 – 2009, November 2008. Available at <http://www.water.ca.gov/floodmgmt/dsmo/docs/DeltaLeveeProgramInterimGuidelines.pdf>.)

**Figure G-3 Project and Non-Project Levees in the Delta**

Source: Northwest Hydraulic Consultants 2015.

### State Spending on Flood Control in the Delta

Over the past half-century, California has spent hundreds of millions of dollars on maintenance, repairs, and improvements to Delta flood control facilities. Most of these investments have been funded through issuance of general obligation bonds. Since 1997, as shown in Table G-1, the State authorized five general obligation bond acts totaling about \$22 billion for natural resources and water supply, including flood protection, a portion of which has been or will be spent in the Delta. To date, \$1.1 billion has been awarded to specific flood protection projects

from those bonds. As shown in Table G-1, almost \$725 million of this amount was to be spent on levees, most of which are located in the Delta.<sup>122</sup>

**Table G-1 California Bond Spending on Water Supply & Natural Resources**

Proposition	40	50	84	1E	1	TOTAL
Year enacted	2002	2002	2006	2006	2014	
Total bond amount (\$million)	2,600	3,440	5,388	4,090	7,120	22,638
% of total bond not yet appropriated*	0%	0%	3%	0.2%	22%	9%
Awarded amounts under the flood protection function (\$ million)						
Channels and other infra-structure	-	-	2	25	-	27
General watershed improvements	-	-	0	-	-	0
Levees	-	7	133	584	-	724
Multi-purpose	0.4	-	3	23	-	26
Planning	-	-	36	13	-	49
Storage	-	-	-	290	-	290
TOTAL	0.4	7	174	934	-	1,115
% of proposition	0.02%	0.2%	3.2%	22.8%	NA	4.9%

Source: Public Policy Institute of California, Data Set: State General Obligation Bond Spending on Water, retrieved October 2015, <http://www.ppic.org/main/dataset.asp?p=1458>.

Note:

\* Bond Accountability Office

The DWR's Delta Levees Program distributes the bond funds for levee maintenance and rehabilitation to RDs through two programs: the Delta Levees Maintenance Subventions Program (Subventions Program) and the Delta Special Flood Control Projects Program (Special Projects Program). The Subventions Program makes funding available for all Delta levees; the Special Projects Program focuses on levees that improve State Water Project export reliability. To date, the State has disbursed \$205 million through the Subventions Program, with RDs providing \$125 million, or about 38% of project costs, as local matching funds. For Special Projects, the State has disbursed \$422 million, with \$7 million from the RDs in matching funds.

In the 2013–14 fiscal year, RDs received \$56 million in revenues, of which about half came from State sources. The RDs have spent about \$73 million annually in the last two fiscal years. Revenues have varied significantly year to year. Figure G-2, above, illustrates the shifting shares

<sup>122</sup> The geographic distribution of the historic fund allocations is not readily available from DWR at this time.



of local and state revenues accruing to RDs over that period. Attachment B contains details on the revenues and expenditures for the RDs for the last five years.

## Funding for Project Levees

The federal and State governments spend money to improve project levees in the Delta and to repair them after high-water events. Delta-specific federal expenditures are difficult to isolate because USACE expenditures are organized by projects (e.g., the Sacramento River Bank Protection Project) that include levees both inside and outside of the Delta. As a result, without significant additional research it is not possible to determine how much is actually spent in the Delta itself. However, from 2011 to 2015, the USACE Civil Works Department budgeted a total of \$40 million to projects located at least partially in the Delta, though only a portion of those funds is likely to have been spent on projects in the Delta.<sup>123</sup> This section briefly describes federal and State levee programs.

## Federal Programs

The USACE is the lead agency for the Sacramento River Bank Protection Project, the South Sacramento County Streams Project, and the Public Law (PL) 84-99 Program. The geographic scope of these programs partially overlaps the Delta. The USACE also provides funds for feasibility and other flood control studies within the SPFC.

Each of these programs has different goals and eligibility requirements:

- **Small Erosion Repair Program:** A DWR pilot program to streamline regulatory review to repair small erosion sites on levees within the Sacramento River Flood Control Project area. In this program's previous incarnation as the Sacramento-San Joaquin Erosion Protection Program, the State spent about \$277 million from 2006 to 2010 for repairs to 102 sites throughout the Sacramento and San Joaquin River Basins Planning Area for the SPFC, only a small portion of which lies within the Delta.
- **Sacramento River Bank Protection Project:** A continuing construction project carried out by the USACE, in conjunction with the CVFPB, focused on protecting levees along the Sacramento River. A small portion of these levees is located in the Delta's northern portion. The USACE has budgeted \$28 million to the project from 2011 to 2015.<sup>124</sup>
- **South Sacramento County Streams:** An effort to provide flood damage reduction, levee improvements, ecosystem restoration, and recreation along streams in south Sacramento County. A small portion of this project area overlaps the northeastern part of the Delta. The total budget for this project is \$27.4 million, though only a small portion will have been spent in the Delta.
- **PL84-99 Rehabilitation Program:** The USACE provides assistance to levee-maintaining agencies to repair projects after damage by high water events to bring them up to PL84-99 standards.

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<sup>123</sup> This report does not include spending by the Federal Emergency Management Agency (FEMA) in the region in this accounting. Attachment D describes activities and spending by the state and federal government on emergency planning and response.

<sup>124</sup> USACE Civil Works Budgets Fiscal Year 2011-2015. Available at <http://www.usace.army.mil/Missions/CivilWorks/Budget.aspx>

- USACE Studies: The USACE currently provides funding for several flood control studies on the State-federal flood control project, a portion of which lies in the Delta. These studies include the Central Valley Integrated Flood Management Study, a General Re-evaluation Report (GRR) for the American River Common Feature carried out by the Sacramento Area Flood Control Agency, the Lower San Joaquin River Feasibility Study carried out by the San Joaquin Area Flood Control Agency, the West Sacramento GRR carried out by the West Sacramento Area Flood Control Agency, and the Sacramento River GRR just started by the USACE. To date, the USACE has expended over \$11.3 million on these flood control studies, out of a total budget of \$18.3 million.<sup>125</sup>

From 2011 to 2015, the USACE Civil Works Department budget allocated a total of \$40 million to projects closely related to the Delta, including the Sacramento River Bank Protection Project, outlined above; work on the Sacramento Deepwater Ship Channel; and the Port of Stockton shipping channel. However, only a portion of these funds is expended on flood control facilities located within the Delta. These projects are focused on the USACE's strategic goals of facilitating commercial navigation and protecting population centers. The USACE also receives budget allocations to investigate future projects and for the operation and maintenance of Delta shipping channels.

## State Programs

The DWR provides additional funding to project levees through the Early Implementation Program and the Urban Flood Risk Reduction Program. Since 2007, the DWR has allocated \$390 million to projects with a geographic scope located at least partially within the Delta. Several specific programs have invested in the Delta, including the following:

- The Early Implementation Program (EIP) – The EIP was created by the Disaster Preparedness and Flood Prevention Bond Act of 2006 (Proposition 1E) to provide funding for repair, rehabilitation, reconstruction, or replacement of levees, weirs, bypasses, and facilities of the SPFC before the adoption of the CVFPP. Repairs of project levees in the Delta Primary Zone may be funded through the EIP. In the Secondary Zone, repairs of project levees and urban non-project levees, as well as levees likely to be added to the SPFC, are all eligible for EIP funding. Other non-project levees are not eligible for funding through the EIP.<sup>126</sup>
- To date, the DWR has expended over \$49.5 million of a total budgeted amount of \$124 million from the EIP to three projects that overlap the Delta. These include the RD-17 100-year Seepage Remediation project, a San Joaquin Area Flood Control Area's Smith Canal Design project, and the West Sacramento Area Flood Control Area's Design and North Area Construction project.
- Urban Flood Risk Reduction Program – The Urban Flood Risk Reduction Program (UFRRP) is funded through the Disaster Preparedness and Flood Prevention Bond Act of 2006 (Proposition 1E) to support the DWR's priority of investing in flood protection of urban areas. Funding is available to help urban local agencies in planning, designing, and constructing flood risk

<sup>125</sup> Information provided by Erin Mullin, DWR Delta Levees Office. Individual study expenditures: SAFCA-American River Common Feature GRR \$3.725 million; WSAFCA-West Sacramento GRR \$2.585 million; SJAFCA-Lower San Joaquin River Feasibility Study \$3.749 million; CVIFMS \$875,000; Sacramento River GRR \$338,000.

<sup>126</sup> Department of Water Resources Delta Suisun Marsh Office, *Delta Levee Special Flood Control Projects*, DRAFT, Interim Guidelines For Providing Funding to Local Public Agencies, FY 2008 – 2009, November 2008. Available at <http://www.water.ca.gov/floodmgmt/dsmo/docs/DeltaLeveeProgramInterimGuidelines.pdf>.



reduction projects on SPFC facilities in the Sacramento-San Joaquin Valley to achieve an urban level of flood control (defined as protection from a 200-year flood) or better.

- To date, the UFRFP has provided funding to four projects located at least partially in the Delta: the Sacramento Area Flood Control Agency's Levee Accreditation Project, the West Sacramento Area Flood Control Agency's Southport Construction Project, the San Joaquin Area Flood Control Agency's Smith Canal Construction Project, and the City of Lathrop's RD17 Phase 4 Urban Levee Design Criteria Improvements Project. The DWR has expended \$54.5 million out of a total budgeted \$265.5 million.
- Small Community Flood Risk Reduction Program – The Small Community Flood Risk Reduction Program (SCFRRP) was created by the 2012 CVFPP and funded by the Disaster Preparedness and Flood Protection Bond Act of 2006 (Proposition 1E) to help local communities achieve 100-year flood protection. The program provides grant funding to communities with 10,000 or fewer residents that are protected by project levees. However, funding will initially be limited to project feasibility studies, up to a maximum of \$500,000 per applicant; expenditures beyond \$500,000 will be shared between the applicant and DWR. Eleven communities in the Delta are expected to apply for SCFRRP funding, for a total of \$5.5 million over the next two years.

### State and Federal Cost-Sharing Formulas

Table G-2 summarizes the federal, State, and local cost shares for project levees.<sup>127</sup> In general, the federal share is 50% to 75%, with higher shares for levees that protect urban populations. The State generally covers 70% of the remaining costs. Other factors such as community characteristics and preserving ecosystem benefits can increase federal and state cost shares.

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<sup>127</sup> These tables are a summary of the discussion in Delta Stewardship Council, Delta Levees Investment Strategy, *Technical Memorandum 3.2: Cost Allocation Methodology*, Peer Review (Draft Revision 0), April 15, 2015.

**Table G-2 Project Levees: Federal-State-Local Cost Shares**

	Cost Share	Notes	Reference
<i>Total Costs</i>			
Federal	50%-75%	Urban = 65%	California Water Code, sections 12310-12318
State	35%-5G.5%	70% non-Federal share	
Local	15%-2G.5%	30% non-Federal Share	
<i>Improvements</i>			
Federal	<50%	50% maximum	
State	>25%	50% Base	
<i>Disadvantaged + multiple benefits</i>	>45%	Up to 90%: 1) the project serves a disadvantaged area community; 2) the project improves the system; 3) the project includes ecosystem enhancement and improvement; and 4) the project includes other multi-benefit features.	
<i>Setback Levees</i>	>40% if setback		
Local	>25%	Net of state share	
<i>Disadvantaged + multiple benefits</i>	>10%		
<i>Setback Levees</i>	>20%		

## State Funding for Non-Project Levees

From 1973 through 2015, the State provided more than \$628 million to Delta RDs to improve levee stability and reduce flood risk through the Subventions and Special Projects Programs. This section describes the State's programs and spending on non-project levees.

### A Brief History of Recent Financing

California established the Subventions Program in 1973 in Senate Bill 541, also known as the Way Bill (Water Code Sections 12980 to 12993). The program was originally to be paid for by the General Fund, with annual expenditures ranging from \$175,000 to \$200,000 between 1974 and 1981. At its inception, the program was aimed at non-project levees only; it was expanded in 1996 to include both project and non-project levees in the Delta and Suisun Marsh.

During the 1980s, annual expenditures increased in the range of \$1.5 to \$2 million annually, funded principally with Tideland Oil Revenues, funds collected each year from oil and gas leases on state-owned tidelands and ocean waters in Southern California.

The Delta Flood Protection Act of 1988 created the Special Projects Program, as well as the Delta Flood Protection Fund, and declared the California Legislature's intention to dedicate

\$120 million over 10 years to the two programs (Water Code Sections 12310 to 12316 and Sections 12980 to 12993).<sup>128</sup>

In 1996, the Legislature established the reimbursement rates for Delta levee maintenance for up to 75% for the next 10 years. In 2006, the Legislature extended the reimbursement rate to 2010, and extended it again in 2010 and in 2016. These extensions were based, in part, on the need for the DWR and the DSC to complete their respective studies and plans for Delta levees.<sup>129</sup>

From 1988 to 1996, General Fund contributions to local flood control were unreliable due to the State's fiscal condition. The series of general obligation bonds passed in the late 1990s and early 2000s created more stable state funding for the programs:

- Proposition 204, The Safe, Clean Reliable Water Supply Act of 1996, dedicated \$193 million to the Delta Improvement Account, including \$25 million for Delta levee rehabilitation.
- Proposition 13, The Safe Drinking Water, Clean Water, Watershed Protection, and Flood Protection Act of 2000, provided \$30 million for Delta levee rehabilitation.
- Proposition 50, The Water Quality, Supply and Safe Drinking Water Projects, Coastal Wetlands Purchase and Protection Act of 2002, dedicated \$70 million to Delta levees.
- Proposition 84, The Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006, authorized \$265 million to the two Delta levee programs.
- Proposition 1E, the Disaster Preparedness and Flood Protection Bond Act of 2006 provided a total of more than \$3 billion, but did not specify a set amount for Delta levees. Through FY 2012–13, the legislature appropriated more than \$320 million of Proposition 1E for Delta levees.<sup>130</sup>
- Proposition 1, the Water Quality, Supply, and Infrastructure Act of 2014, authorized \$7.5 billion for various water projects, including \$395 million for statewide flood management projects.

However, the funds available from these bonds are now nearing exhaustion. According to the California Bond Accountability website, Propositions 84 and 1E only have 3% and 0.2%, respectively, of their total authorized amount remaining to be appropriated. Proposition 1 has 27% of its funds remaining to be appropriated.

Figure G-1, above, shows annual State and local expenditures for Delta levees from fiscal years 1973 to 2014. Note that the local contributions were not readily available for 2013–2015, but these are a relatively small proportion of total spending. From fiscal years 1973 to 2012, RDs contributed \$125 million to levee maintenance and improvement under the Subventions Program, and more than \$7 million under the Special Projects Program. While levee

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<sup>128</sup> The \$120 million was allocated or authorized, not appropriated. It can be assumed the amount actually appropriated was closer to the funds disbursed by the two programs in those years.

<sup>129</sup> In 2006, DWR had yet to complete the Delta Risk Management Study; in 2010, the Delta Stewardship Council had yet to complete the Delta Plan with its priorities for state investments in levees. In 2012, the Legislature acknowledged the dire financial conditions of Delta levee agencies and the importance of levees for California's water infrastructure as the rationale for extending the reimbursement rate. (Senate Committee on Natural Resources and Water, Analysis of SB 554, January 4, 2016).

<sup>130</sup> DWR, FloodSAFE California, Grant Programs. Available at <http://www.water.ca.gov/floodsafe/grants/>.

expenditures were fairly stable from 1990 to 2008, State contributions spiked significantly in 2010 and 2015.

### Cost-Share Formulas

Currently, the federal government does not contribute to non-project levee costs.<sup>131</sup> In the Primary Zone, State shares for construction can range from 75% to 100%, but the exact rationales for the differences are not contained in State code. In the Secondary Zone, the shares range from 50% to 95%. For maintenance, the State share is 75% after costs reach a threshold of \$1,000 per levee mile.

Table G-3 describes the cost-share formulas for non-project levees, which vary by location (Primary vs. Secondary Zone) and by the type of project (construction vs. maintenance).<sup>132</sup>

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<sup>131</sup> These cost share formulas do not account for federal entities that benefit from flood protection provided by these levees.

<sup>132</sup> DWR, Division of Flood Management, *Cost Share Guidelines for State-Local Cost Shared Flood Programs and Projects*, December 11, 2014. Available at <http://www.water.ca.gov/floodmgmt/docs/Cost-Share-Guidelines-Final-12-11-14.pdf>

**Table G-3 Non Project Levees: State and Local Cost-Shares**

Type of Funding	Primary Zone	Secondary Zone	Notes	Reference
<b>Construction (Special Projects)</b>				
State	<100%; <\$10M		<20% preconstruction costs	2016 Guidelines for Providing Funding to Local Agencies
<i>Primary Zone</i>	75%	50%–75%	Base up to Local Agency Benefits Assessment (LABA) study max	
<i>Habitat</i>	<100%	<90%	up to 40% over base funding	
<i>Enhanced Shares</i>				
<i>Specific Public Purposes</i>	<95%	<70%	up to 20%	
<i>Net Habitat Improvement</i>	<85%	<60%	up to 10% full mitigation	
<i>Subsidence Control</i>	<85%	<60%	up to 10% control or reversal	
<i>Ecosystem Enhancement</i>	<95%	<70%	10% additive to water supply reliability	
<i>Water Supply Reliability</i>	<95%	<70%	10% additive to ecosystem enhancement	
<i>Third Party Match</i>	<95%	<95%	50% state match	
Local	25%–0%	50%–5%		
<b>Maintenance (Subventions)</b>				
State	75% for >\$1,000 per mile		Subject to ATP to 7/1/2018	California Water Code section 12986
Local	\$1,000 per mile + 25%			

### Delta Levees Subventions Program

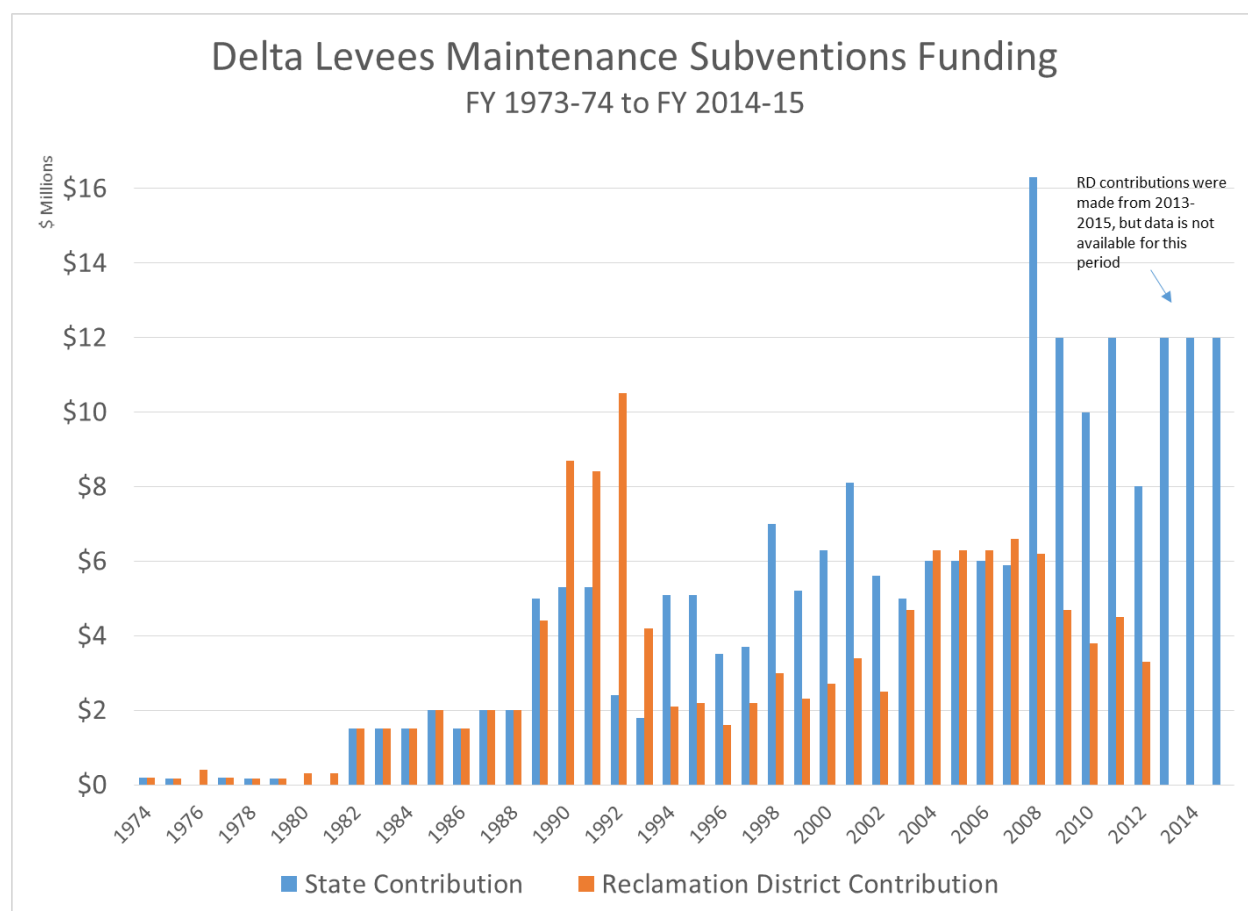
The Subventions Program annually receives applications for grant funds for the operation, maintenance, repair, or improvement of eligible levees and evaluates them according to goals for the Delta established in the *California Water Action Plan* and *The Delta Plan*.<sup>133</sup> According to the California Water Code, to be eligible for Subventions Program funds, RDs must have CVFPB-approved plans for the maintenance and improvement of their levees. The DWR reviews applications and recommends reimbursement amounts for each RD to the CVFPB. Reimbursements are based on the maintenance cost shares described above in Table G-3. Currently, the State reimburses RDs for up to 75% of eligible costs associated with levee

<sup>133</sup> See FloodSAFE Delta Levees program websites: <http://www.water.ca.gov/floodsafe/fessro/deltalevees/subventions/> and [http://www.water.ca.gov/floodsafe/fessro/deltalevees/special\\_projects/](http://www.water.ca.gov/floodsafe/fessro/deltalevees/special_projects/).

maintenance and improvements, after they have spent \$1,000 per mile and the RD's ability to pay, as determined by an Ability to Pay Study.<sup>134, 135</sup> With CVFPB approval, the DWR defines agreements with each RD, indicating what work is eligible for reimbursement and stipulating the potential maximum reimbursement. RDs conduct levee maintenance and improvements according to their own schedule, paying invoices as they proceed. At the end of the fiscal year, each RD submits a claim to DWR for reimbursement.

From fiscal years 2008–09 to 2014–15, the Subventions Program received approximately \$12 million annually in appropriations, with Proposition 1E bond funding expected to continue through 2018. State and local contributions to Delta flood protection through the Subventions Program are shown in Figure G-4. Over the life of the Subventions program, from 1973 to present, the State has invested more than \$205 million in local levee maintenance in the Delta. Data for the local shares after 2012 are not readily available.

**Figure G-4 Delta Levees Maintenance Subventions Funding FY 1973–1974 to FY 2014–2015**



<sup>134</sup> In 1996, California Water Code Section 12986 was amended to require applicants to provide information on the District's ability to pay in their application for funds under the Delta Levees Programs.

<sup>135</sup> DWR, Delta Levees Maintenance Subventions Program, Guidelines: Procedures and Criteria, Draft, December 2015. Available at [http://www.water.ca.gov/floodsafe/fessro/deltalevees/subventions/docs/subventions\\_guidelines\\_2015draft.pdf](http://www.water.ca.gov/floodsafe/fessro/deltalevees/subventions/docs/subventions_guidelines_2015draft.pdf).

Source: Data provided by DWR's Delta Levees Program.

As reflected in Figure G-4, the proportion of State subvention reimbursement, currently defined by statute as up to 75% of total project costs, has changed over time. During some periods (e.g., from 1982 to 1998 and 2004 to 2007) the program only reimbursed 50% of total costs. The total funding level authorized by the Legislature caps total state expenditures. In fiscal years 2014–15 and 2015–16, local RDs have applied for funding in the amount of \$50.3 and \$52.6 million, respectively. In fiscal year 2014–15, \$12 million was awarded; the fiscal year 2015–16 amount is still being determined.

Requests for funding often exceed available funds; the DWR must identify projects that are most critical and beneficial to achieve flood control and other goals in the Delta. In the Subventions Program Guidelines, the most current version of which was adopted by the CVFPB in 2011,<sup>136</sup> the DWR defines program priorities in terms of different types of levee work and standards, along with maximum reimbursable amounts for each type of work. The first priority is levee maintenance up to the geometric standards described in Bulletin 192-82, for the associated land use. The next priority level includes CVFPB-mandated top-priority funding items, projects that make special habitat provisions, and projects based on meeting the Short-Term Hazard Mitigation Plan (HMP) standards, or Bulletin 192-82 or PL 84-99 standards.<sup>137</sup> Lower priorities include levee work that costs more than an average of \$100,000 per levee mile and work in excess of Bulletin 192-82 standards.

Funding provided to RDs through the Subventions Program is distributed broadly throughout the Delta's Primary Zone.<sup>138</sup> The map in Figure G-5 shows how Subventions Program funds have been dispersed among RDs cumulatively from 1987 to 2013.<sup>139</sup> Note that spending has been highest in the central Delta region, which corresponds with the greatest flooding hazard.<sup>140</sup>

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<sup>136</sup> DWR FloodSAFE Environmental Stewardship and Statewide Resources Office (FESSRO), Delta Levees Maintenance Subventions Program Guidelines: Procedures and Criteria, Adopted by the Central Valley Flood Protection Board, September 23, 2011. Available at [http://www.water.ca.gov/floodsafe/fessro/docs/subventions\\_guidelines.pdf](http://www.water.ca.gov/floodsafe/fessro/docs/subventions_guidelines.pdf).

<sup>137</sup> PL 84-99 standards are a minimum standard for all federal flood control project levees, created by the USACE in response to PL 84-99. These standards are similar, but not identical, to the Bulletin 192-82 standards. For practical purposes and ease of exposition, we treat them as requiring similar levels of investment and maintenance.

<sup>138</sup> Primary zones were created under the 1992 Delta Protection Act. No new development is allowed in a Primary Zone; the Secondary Zone includes urban areas around the perimeter of the legally defined Delta. The boundary between the two zones was determined by political compromise rather than a specific geographical standard. Subventions are not limited to the Primary Zone, but in practice do go mainly to the Primary Zone.

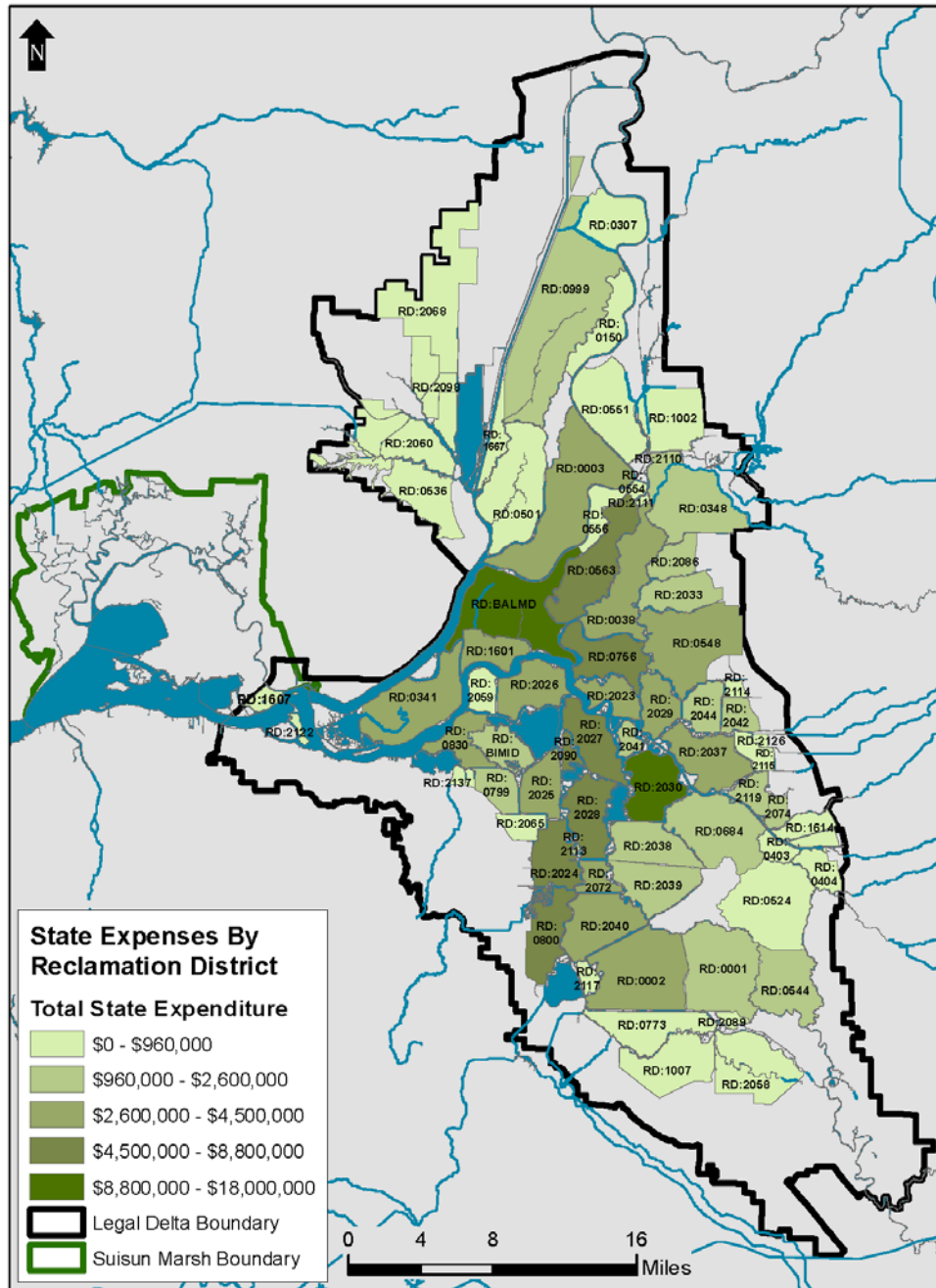
<sup>139</sup> DSC, "Delta Council Meeting - 02/26/2015," Meeting Agenda Materials. Available at <http://deltacouncil.ca.gov/event-detail/11646>.

<sup>140</sup> "Hazard" is the measure of the probability of an adverse event without estimating the consequences of that event. For example, the hazard of flooding an island devoid of any economic activity might be high since no one is interested in flood protection because the consequences are small and thus the risk also is low.

**Figure G-5 Delta Levees Maintenance Subventions Program Expense (FY1987–2013)**

## Delta Levees Maintenance Subventions Program Expense (1987 - 2013)

Agenda Item 8  
Attachment 1



Delta Reclamation Districts

SOURCE: DSC - Delta Plan Atlas, Department of Water Resources - FESSRO, and Esri ArcMap 10.2

February 18, 2015

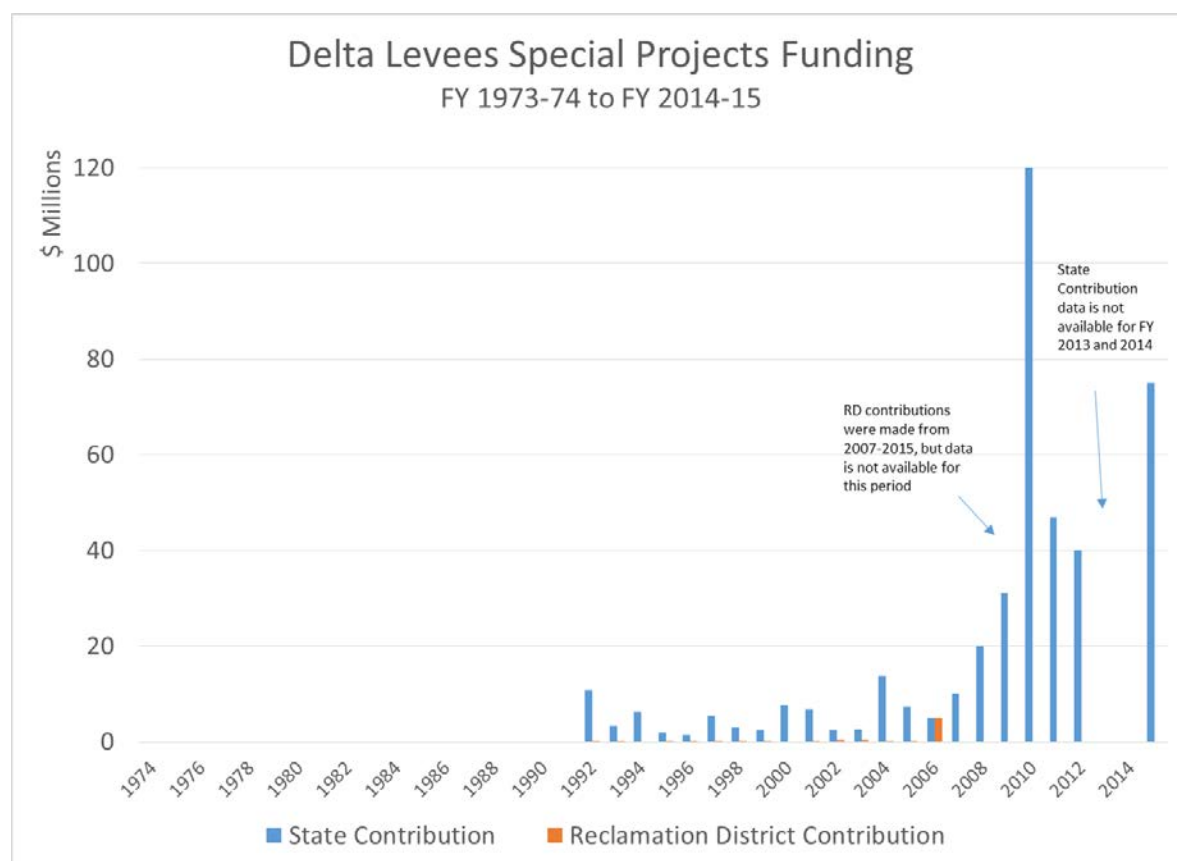


## Delta Special Flood Control Projects Program

The Legislature established the Special Projects Program under the Delta Flood Protection Act of 1988, though it was not funded until 199G. The Legislature authorized the Special Projects Program to fund levee improvements in the eight western Delta islands and communities of Walnut Grove and Thornton, with the specific goal of improving local levees to facilitate export water supply reliability.<sup>141</sup> Today, improvements to project and non-project levees in the Delta's Primary Zone, and non-project levees in the Delta's Secondary Zone, are eligible for funding.

Special Projects funding levels have varied over the course of the program, with expenditures ranging from an average of \$4 million annually in the 1990s to an average of \$40 million since 2007 after Proposition 84 and Proposition 1E funding became available, with a high of \$120 million in 2010. Figure G-6 shows state and local contributions by RDs to the Special Projects program from 1992 to present.

**Figure G-6 Delta Levees Special Projects Funding Fiscal Year 1973-1974 to 2014-2015**



Source: Data provided to the study team by DWR's Delta Levees Program.

Under the program, the DWR awards grants to RDs for levee stability improvements, flood risk reduction initiatives, emergency preparedness and response, habitat improvements, subsidence control, and studies to guide program implementation. The DWR periodically issues

<sup>141</sup> Under Senate Bill 34; 1988.

Projects Solicitation Packages designed to achieve specific goals. These packages include eligibility criteria and types of work to be performed, and may identify specific Delta corridors of importance to the State and federal water projects to be given priority in that funding round. The DWR selects projects for funding based on Special Projects Program priorities and the project's ability to improve export reliability and create long-term ecosystem enhancements. The cost-share is based on the construction category shown in Table G-3, above. Before an agreement is reached, the DWR and the RD estimate project expenses and negotiate cost shares based on the project category (e.g., levees, habitat). Work agreements are signed by the RD, CDFW, and DWR. Like the Subventions program, Special Projects Program financing allows the RD to contract its own work and retain liability for construction and ongoing maintenance.

The DWR maintains a list of special projects by island/tract, project cost, description, and state/local share.<sup>142</sup> Of note is that Special Project reimbursements to RDs are higher than the revenues from the State to those districts reported by the SCO in some years, as shown in Appendix B. This may be because many Special Projects from past funding years are still in progress and therefore not yet reimbursed by the State.

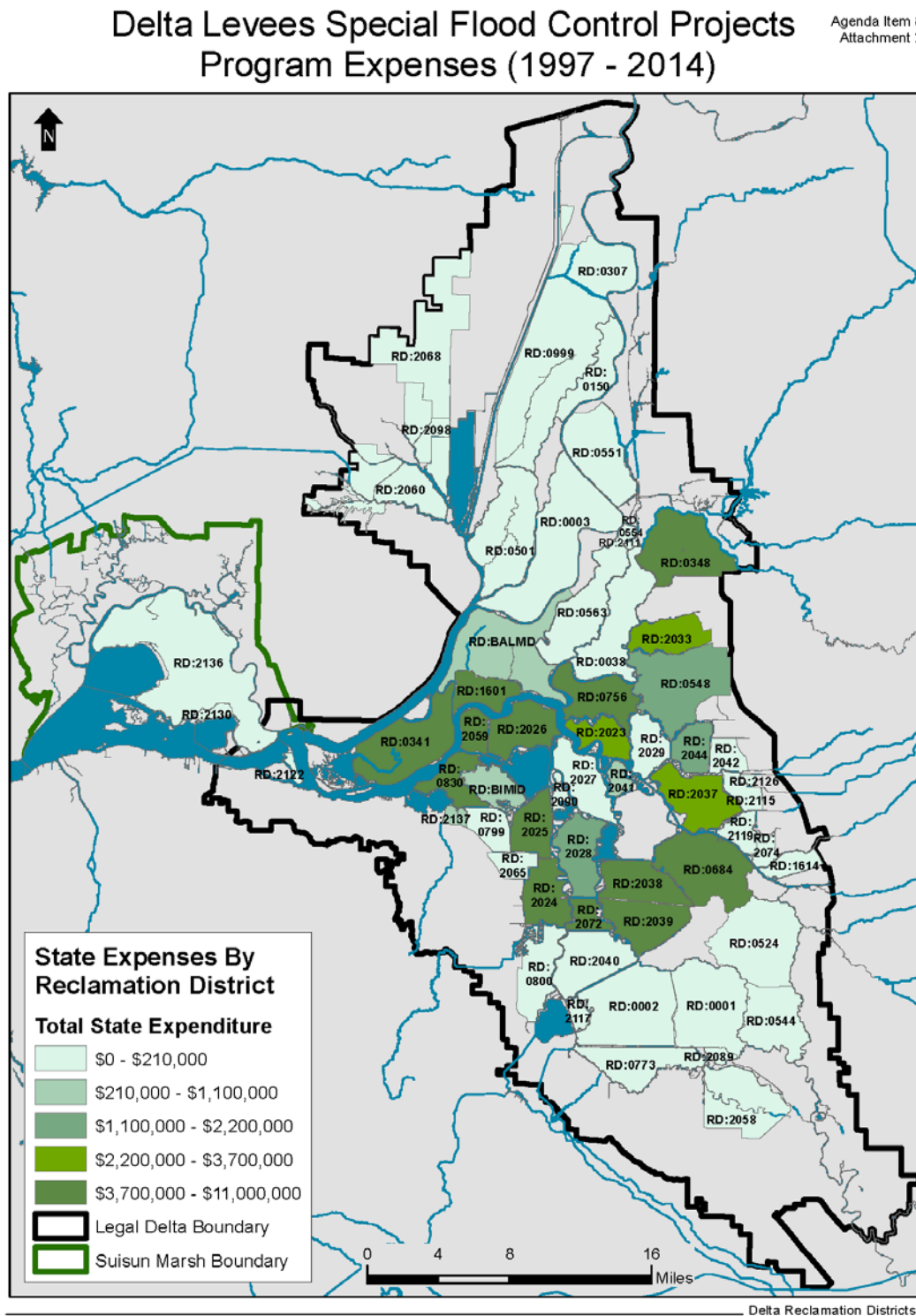
The Special Projects Program concentrates on projects in the western and central Delta. Figure G-7 shows how cumulative funding from FY 1997 to 2014 has been distributed among Delta RDs, confirming this geographic concentration of funding.<sup>143</sup> According to 2014 Special Projects Program guidelines, future funding under the program will focus on multi-benefit projects that help simultaneously improve the environment, flood management, and water supply reliability, in keeping with the Governor's *Water Action Plan*.

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<sup>142</sup> DWR, Delta Levees Special Flood Control Projects, Active Projects List (Updated 08-14-2015). Available at [http://www.water.ca.gov/floodsafe/fessro/deltalevees/special\\_projects/docs/special\\_active\\_projects.pdf](http://www.water.ca.gov/floodsafe/fessro/deltalevees/special_projects/docs/special_active_projects.pdf).

<sup>143</sup> Delta Stewardship Council, "Delta Council Meeting - 02/26/2015," Meeting Agenda Materials Available at <http://deltacouncil.ca.gov/event-detail/11646>.

**Figure G-7 Delta Levees Special Flood Control Projects Program Expenses (FY 1997–2014)**



## Local Reclamation District Financing

Individual RDs raise the funding necessary to support local drainage systems and meet local cost-share requirements associated with the Subventions and Special Projects Programs. Under California law, RDs have authority to use assessments and charge fees for services, such as provision of water or drainage, and may have access to other local tax revenue at their disposal. RDs may also issue bonds to finance improvement projects.

Nearly all RDs in the Delta use assessments, which form the largest component of local funding. From 2009 to 2013, according to SCO data, local assessments made up 90% of local RD revenues (i.e., non-state, non-federal revenues).<sup>144</sup> Under this financing approach, all property in a district that receives special benefit from levee and drainage system improvements is assessed on an annual basis. “Special benefit” is defined according to Proposition 218 as a “particular and distinct benefit over and above general benefits conferred on real property located in the district or to the public at large.”<sup>145</sup> Assessments may be used for design, construction, and operation and maintenance of reclamation works.

To set or increase assessments, an engineering report must be prepared in order to determine the cost of necessary project improvements and develop an allocation of assessments based on the proportionate benefits of the improvements to each landowner. A district must also determine the general benefit to the greater community, as it is only allowed to recover costs from landowners to the degree that they receive a special benefit from the improvement. This process is followed by public meetings, comment periods, and a local vote by property owners on the assessment.<sup>146</sup>

The assessment for each landowner appears on the landowner’s property tax bill for that year. Assessments are considered a lien against the property receiving the special benefit; the property can be sold to pay for overdue assessments.

Per SCO data, over the five-year period from FY 2009 to 2013, Delta RDs collected approximately \$124 million in property assessments.<sup>147</sup> Table G-4 summarizes local property assessment revenues among RDs during this period across different Delta regions. This reflects 90% of total local revenues, which amounted to \$137 million. Additional local revenue sources can include a portion of local property taxes, other voter-approved ad-valorem property taxes, and other local assessments. Total reported revenue for the period was \$328 million, including \$168 million in reimbursement from State sources. The remainder came from other

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<sup>144</sup> During this period, only five RDs charged fees for services.

<sup>145</sup> Cal. Const., Art. XIII D, § 2, subd. (i).

<sup>146</sup> California Central Valley Flood Control Association, *An Overview of California Reclamation and Levee Districts*, undated). Available at <http://www.cvflood.org/Documents/Overview%20of%20RD.pdf>.

<sup>147</sup> State Controller’s Office data from Delta Stewardship Council July 23-24, 2015 Meeting Agenda Item 15 Reclamation District Funding and Financing report. Available at <http://deltacouncil.ca.gov/docs/delta-stewardship-council-july-23-24-2015-meeting-agenda-item-15-reclamation-district-funding>.

government sources, charges for service, interest, and rents.<sup>148</sup> Annual assessments range from zero for more than 15 districts in some or all years, to more than \$18 million in a single district. For the period from 2009 to 2013, the average revenue from local assessments was \$307,000 for each of the 89 districts. According to SCO data, the RDs spent \$260 million over that period on flood control and drainage work and supplies (the “services and supplies” data category in SCO data being the closest approximation), with the remainder spent on salaries, benefits, insurance, and debt service.

**Table G-4 Local Property Assessment Revenues to Delta Reclamation Districts**

RD location	2009	2010	2011	2012	2013
North Delta Water Agency Jurisdiction	\$6,284,662	\$6,053,513	\$6,927,101	\$5,802,731	\$6,019,858
Central Delta Water Agency Jurisdiction	\$9,383,876	\$9,825,906	\$9,606,389	\$9,754,252	\$9,635,826
South Delta Water Agency Jurisdiction	\$20,646,173	\$8,322,922	\$5,187,984	\$5,000,167	\$5,323,761
<b>Total Revenues</b>	<b>\$36,314,711</b>	<b>\$24,202,341</b>	<b>\$21,721,473</b>	<b>\$20,557,149</b>	<b>\$20,979,445</b>

Source: State Controller's Office. Special Districts Annual Reports, compiled by Delta Stewardship Council, 2015.

Key:

RD = Reclamation District

## Examples of Special Circumstances Financing

In at least two cases, large entities have entered into agreements with local RDs to finance shares of levee improvements well beyond the amount that would be obligated under current law and methods. In both cases, the large entities conducted risk analyses and assessed alternative risk mitigation costs, and decided the least cost approach was to join in improving the levees.

- Pacific Gas and Electric Company (PG&E) agreed to finance a vast majority of the proposed levee improvements on McDonald Island in 1985.<sup>149</sup> PG&E had commissioned a study by Dames & Moore in 1982 on the flood risks to the natural gas storage facility there, and subsequent work found that levee improvements were the most cost-effective solution.<sup>150</sup>
- The East Bay Municipal Utility District (EBMUD) agreed to finance levee improvements on four islands along the route of the Mokelumne Aqueduct.<sup>151</sup> EBMUD issued grants for 10 projects to DWR and DSC to pick up the local share of those projects, which was 15% of the costs. EBMUD spent a total of \$6 million.

<sup>148</sup> The total revenue figure includes \$168 million in reimbursements from state programs and \$36 million from other local sources, income on property and other government sources.

<sup>149</sup> Workshop #1 participants, March 9, 2016.

<sup>150</sup> Dames and Moore, McDonald Island Study, Levee Stability, 1985.

<sup>151</sup> Eileen White, EBMUD, personal communication, June 28, 2016.

## Attachment A Subventions and Special Projects Annual Disbursements and Reclamation District Contributions

(\$1,000s)		Delta Levees Subventions		Delta Levees Special Projects	
Fiscal Year	Year	State Contribution	RD Contribution	State Contribution	RD Contribution
1973-74	1974	\$200	\$200		
1974-75	1975	\$175	\$175		
1975-76	1976		\$400		
1976-77	1977	\$190	\$190		
1977-78	1978	\$175	\$175		
1978-79	1979	\$175	\$175		
1979-80	1980		\$300		
1980-81	1981		\$300		
1981-82	1982	\$1,500	\$1,500		
1982-83	1983	\$1,500	\$1,500		
1983-84	1984	\$1,500	\$1,500		
1984-85	1985	\$2,000	\$2,000		
1985-86	1986	\$1,500	\$1,500		
1986-87	1987	\$2,000	\$2,000		
1987-88	1988	\$2,000	\$2,000		
88-89	1989	\$5,000	\$4,400		
89-90	1990	\$5,300	\$8,700		
90-91	1991	\$5,300	\$8,400		
91-92	1992	\$2,400	\$10,500	\$10,800	\$100
92-93	1993	\$1,800	\$4,200	\$3,300	\$100
93-94	1994	\$5,100	\$2,100	\$6,300	
94-95	1995	\$5,100	\$2,200	\$1,900	\$100
95-96	1996	\$3,500	\$1,600	\$1,400	\$200
96-97	1997	\$3,700	\$2,200	\$5,300	\$100
97-98	1998	\$7,000	\$3,000	\$3,000	\$100

(\$1,000s)		Delta Levees Subventions		Delta Levees Special Projects	
Fiscal Year	Year	State Contribution	RD Contribution	State Contribution	RD Contribution
98-99	1999	\$5,200	\$2,300	\$2,400	\$100
99-00	2000	\$6,300	\$2,700	\$7,700	
00-01	2001	\$8,100	\$3,400	\$6,700	\$100
01-02	2002	\$5,600	\$2,500	\$2,400	\$400
02-03	2003	\$5,000	\$4,700	\$2,600	\$300
03-04	2004	\$6,000	\$6,300	\$13,700	\$100
04-05	2005	\$6,000	\$6,300	\$7,300	\$200
05-06	2006	\$6,000	\$6,300	\$5,000	\$5,000
06-07	2007	\$5,900	\$6,600	\$10,000	
07-08	2008	\$16,300	\$6,200	\$20,000	
08-09	2009	\$12,000	\$4,680	\$31,000	
09-10	2010	\$10,000	\$3,800	\$120,000	
10-11	2011	\$12,000	\$4,500	\$47,000	
11-12	2012	\$8,000	\$3,300	\$40,000	
12-13	2013	\$12,000	NA		
13-14	2014	\$12,000	NA		
14-15	2015	\$12,000	NA	\$75,000	
<b>Total:</b>		<b>205,515</b>	<b>124,795</b>	<b>422,800</b>	<b>6,900</b>

Note:

Local RD contributions are not available beyond 2012 for the subventions program and 2006 for the Special Projects program.

## Attachment B State Controller's Office financial Data on Delta Reclamation Districts

Total revenues and expenditures by reclamation districts, grouped by membership in each of the three Delta Water Agencies.

**Table Att-B-1 Total Revenues**

	2009	2010	2011	2012	2013
<b>North DWA</b>	23,704,626	23,407,195	18,711,247	23,385,648	18,245,993
<b>Central DWA</b>	21,612,293	26,763,818	29,683,054	49,846,267	28,912,151
<b>South DWA</b>	23,834,291	11,997,185	8,163,687	10,381,422	9,193,248
<b>Total Revenues</b>	69,151,211	62,168,198	56,557,988	83,613,337	56,351,392
<b>State Revenues</b>					
<b>North DWA</b>	16,546,334	16,618,983	10,573,175	16,419,915	11,683,619
<b>Central DWA</b>	7,108,880	13,282,420	17,000,315	33,460,872	12,724,298
<b>South DWA</b>	1,275,900	2,522,993	1,502,155	4,390,287	2,727,548
<b>Total Revenues</b>	24,931,114	32,424,396	29,075,645	54,271,074	27,135,465
<b>Local Assessments</b>					
<b>North DWA</b>	6,284,662	6,053,513	6,927,101	5,802,731	6,019,858
<b>Central DWA</b>	9,383,876	9,825,906	9,606,389	9,754,252	9,635,826
<b>South DWA</b>	20,646,173	8,322,922	5,187,984	5,000,167	5,323,761
<b>Total Revenues</b>	36,314,711	24,202,341	21,721,473	20,557,149	20,979,445
<b>Other Revenues</b>					
<b>North DWA</b>	873,630	734,699	1,210,971	1,163,002	542,516
<b>Central DWA</b>	5,119,537	3,655,491	3,076,349	6,631,143	6,552,027
<b>South DWA</b>	1,912,218	1,151,270	1,473,548	990,969	1,141,939
<b>Total Revenues</b>	7,905,386	5,541,461	5,760,869	8,785,114	8,236,482
<b>Total Expenditures</b>					



**Table Att-B-1 Total Revenues**

	2009	2010	2011	2012	2013
North DWA	27,731,732	18,214,401	19,460,873	18,878,162	21,849,746
Central DWA	29,438,876	26,472,688	25,070,088	47,369,579	43,961,008
South DWA	10,574,786	15,873,495	11,745,078	6,828,439	7,661,586
Total	67,745,393	60,560,584	56,276,039	73,076,180	73,472,340

**Table Att-B-2 State Funds as a Portion of Total Revenues**

	2009	2010	2011	2012	2013
North DWA	70%	71%	57%	70%	64%
Central DWA	33%	50%	57%	67%	44%
South DWA	5%	21%	18%	42%	30%

## Attachment C Recent Funding for Habitat Conservation and Ecosystem Restoration in the Delta

### Summary

The Sacramento-San Joaquin River Delta (Delta) is a highly engineered system that has been substantially changed from its original natural setting over the last 150 years. In the past three decades, significant effort has been made to preserve and enhance the natural resources, particularly fauna and flora, that have been threatened by these changes. Habitat conservation and ecosystem restoration are among the main instruments used to achieve these objectives.

Many of the Delta's conservation and restoration efforts have focused on offsetting specific activities that are degrading the Delta, such as agriculture or water conveyance. These efforts are often implemented by government agencies and nonprofit organizations not subject to the public financing instruments typically used to fund flood protection in the Delta. Many of these alternative funding sources are not clearly identified or regularly accessed. Some entities, such as water agencies, may gain ancillary benefits outside of enhanced ecosystems from the conservation and restoration efforts—e.g., increased water conveyance through conservation and restoration areas from improved compliance with regulatory mandates. (This is a prime motivation for CalFed and the Bay-Delta Conservation Plan [BDCP].)

This appendix attachment describes current efforts and funding sources to promote habitat conservation and ecosystem restoration within the Delta. Specifically, it covers existing conservation easements within the Legal Delta, and existing funding sources for establishing conservation easements and advancing habitat restoration efforts in the Delta.

### Conservation Easements

**What is a conservation easement?** Land ownership carries with it a bundle of rights, such as the right to occupy, lease, develop, or farm. A landowner can “ease” some of these rights to another entity for a purpose such as conservation. These conservation easements are usually donated by a landowner to another entity, such as a land trust, which results in the landowner giving up certain rights to the land while keeping it in private ownership.<sup>152, 153</sup> The purpose of an easement is typically to retain land predominantly in its natural, scenic, historical, agricultural, forested, or open-space condition. Conservation easements often provide a cost-effective means of protecting land from development while allowing types of private land use such as farming to continue. Other State and federal programs provide funds for habitat improvement and other restoration activities. When a landowner donates a conservation easement to a

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<sup>152</sup> Although conservation easements are usually donated, they can also be sold to a private organization or public agency.

<sup>153</sup> The Nature Conservancy. 2015. *All about Conservation Easements*. <http://www.nature.org/about-us/private-lands-conservation/conservation-easements/all-about-conservation-easements.xml>. Accessed December 14, 2015.

nonprofit or public agency, the transfer may entitle the landowner to a number of tax benefits.<sup>154</sup> In California, there are about 1.8 million acres of land held under conservation easements.<sup>154</sup>

### Estimates of Conserved Acreage in the Delta

In 2012, the California Strategic Growth Council funded a two-year program to improve data on California's protected open lands. GreenInfo Network, a nonprofit technology support organization, used the funds to develop a statewide conservation easement database called the California Conservation Easement Database (CCED). To estimate the acreage of existing conservation easements in the Legal Delta, we clipped the CCED conservation easements shapefile with the Legal Delta shapefile (Figure Att-C-1). The acreage of the resulting shapefile was then calculated in ArcGIS (Table Att-C-1). Because the locations of the conservation easements included in the CCED come from a variety of sources, the locations are approximations and are not survey-grade. Additionally, the CCED may not contain all of the conservation easements in the Delta. Therefore, the resulting acreages are included in this appendix attachment only to provide a ballpark estimate of the existing acreage in the Legal Delta that is currently under conservation easement.

**Table Att-C-1 Acreage of Conservation Easements by Managing Entity within the Legal Delta**

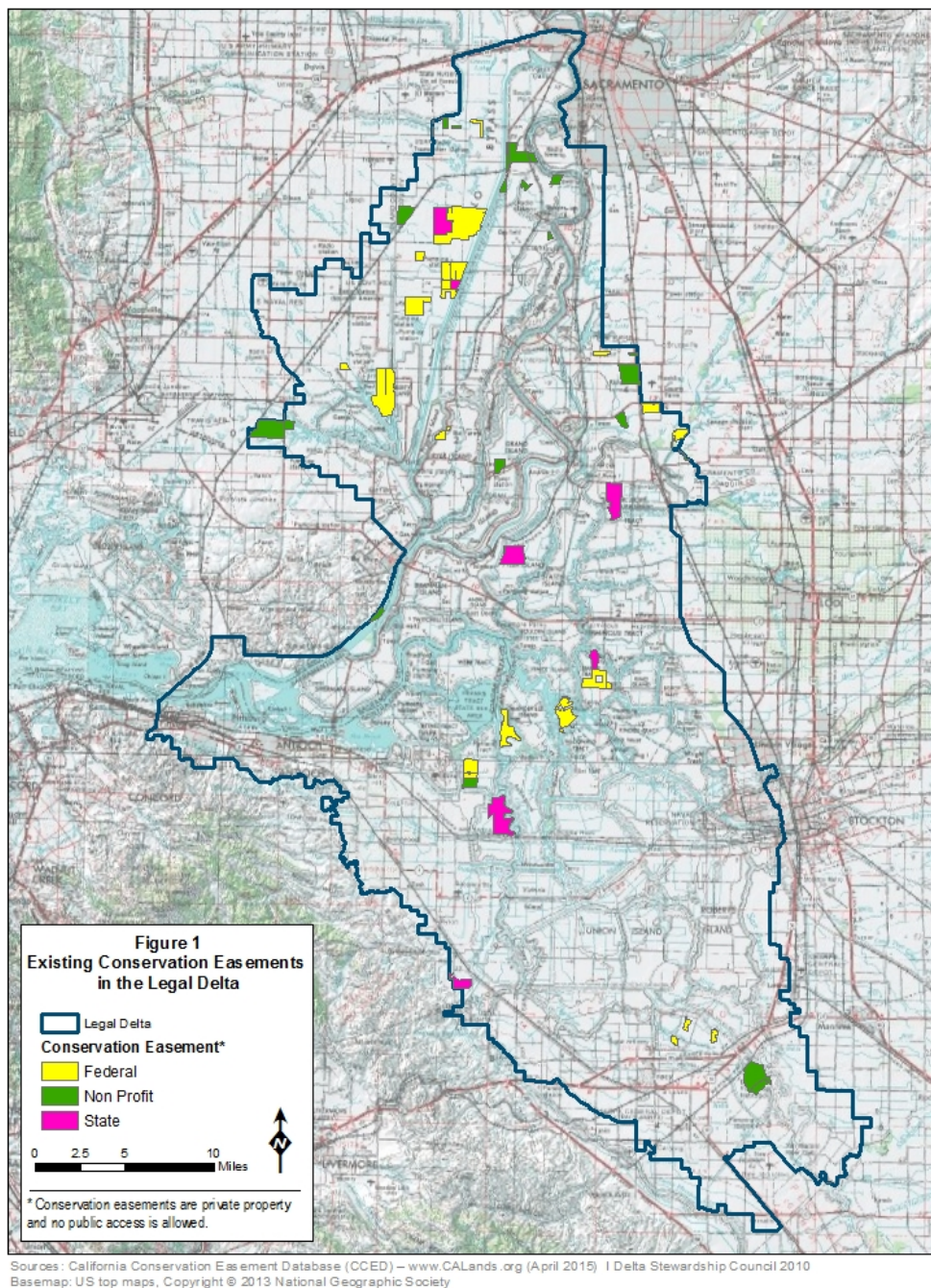
Managing Entity Category	Acres
Federal	10,811
State	4,492
Nonprofit	5,845
<b>Total</b>	<b>21,148</b>

Source: California Conservation Easement Database. 2015.  
<http://www.calands.org/uploads/docs/CCED2015a.zip>. Accessed December 14, 2015.

To estimate the acreage of existing conservation easements within specific islands and tracts by managing entity, the shapefile used to generate Table Att-C-1 was intersected with the shapefile of Delta Islands and Tracts shown in Figure Att-C-1.<sup>155</sup> The acreage of the resulting shapefile was then calculated in ArcGIS (Table Att-C-2).

<sup>154</sup> GreenInfo Network. 2014. Easement GIS for Data in California: Assessment and Guidelines for the California Conservation Easement Database (CCED). [http://www.calands.org/uploads/docs/CCED\\_EasementReviewAndPolicy\\_Feb2014.pdf](http://www.calands.org/uploads/docs/CCED_EasementReviewAndPolicy_Feb2014.pdf). Accessed December 14, 2015.

<sup>155</sup> "Managing entity" refers to the entity that acquired and monitors and enforces the easement (see "funding sources" below for more information on entities that acquire conservation easements in the Delta).

**Figure Att-C-1 Existing Conservation Easements in the Legal Delta**

**Table Att-C-2 Acreage of Conservation Easements within Islands or Tracts by Managing Entity**

Island or Tract	Managing Entity Category	Acres
Peter's Pocket	Federal	100.9
Tyler Island	Federal/State	776.4
Tyler Island	Federal	17.9
Tyler Island	State	1.8
Empire Tract	Federal	686.3
Empire Tract	State	260.4
Holland Tract	Federal	493.3
Holland Tract	Nonprofit	258.5
Medford Island	Federal	732.7
Pescadero District	Federal	338.4
Ryer Island	Federal	176.3
Quimby Island	Federal	650.0
Cache-Haas Area	Federal	1,632.8
DLIS-20 (Yolo Bypass)	Federal	4,483.4
DLIS-20 (Yolo Bypass)	Nonprofit	600.7
DLIS-20 (Yolo Bypass)	State	970.1
DLIS-19 (Grizzly Slough Area)	Federal	556.2
DLIS-19 (Grizzly Slough Area)	Nonprofit	46.4
DLIS-19 (Grizzly Slough Area)	Federal/Nonprofit	7.6
Grand Island	Nonprofit	233.9
Yolano	Nonprofit	1.0
Paradise Junction	Nonprofit	1,152.7
Lisbon District	Nonprofit	284.8
Glide District	Nonprofit	394.1
Netherlands	Nonprofit	410.0
Glanville	Nonprofit	944.7
Maintenance Area 9	Nonprofit	49.1
Hastings Tract	Nonprofit	207.2
Palm-Orwood	State	1,167.9
New Hope Tract	State	886.8
<b>Total Acreage</b>		<b>18,522.3</b>
<b>Percentage of Total Delta Land Area *</b>		<b>~3%</b>

Source: *California Conservation Easement Database. 2015. <http://www.calands.org/uploads/docs/CCED2015a.zip>. Accessed December 14, 2015.*

**Notes:**

\* *Total Delta land area is approximately 704,000 acres*

## Funding Sources

Conservation easements are funded from a variety of sources:



- **Nonprofits** (e.g., The Nature Conservancy) often purchase or receive donations of conservation easements from willing landowners.
- **Private developers and beneficiaries of government projects** may fund conservation easements and habitat restoration efforts to comply with State and federal laws—such as the California Endangered Species Act (CESA) and federal Endangered Species Act (FESA)—that require mitigation for development projects’ impacts to wildlife. For example, a development project that impacts acreage of a species listed under the CESA or FESA may be required to establish a conservation easement on lands with habitat for that species at a specified mitigation ratio (e.g., 3 acres of habitat placed under conservation easement for every 1 acre of habitat impacted by a development project). In some cases, the private developer or beneficiaries of a government project may be able to purchase credits from a mitigation bank in lieu of directly establishing a conservation easement for habitat impacts resulting from a project. Mitigation banks are privately or publicly owned land managed for its natural resource values. In exchange for permanently protecting, managing, and monitoring the land, the bank operator is allowed to sell or transfer habitat credits to project proponents who need to secure permits to mitigate the environmental impact of their projects on protected species and/or their habitats.
- **State and federal agencies** also provide funding for conservation easements and habitat restoration efforts through a variety of programs funded with tax-payer dollars. For example, the Natural Resources Conservation Service offers technical assistance to agricultural landowners and operates several programs to help finance conservation easements. These programs are:<sup>156</sup>
  - Emergency Watershed Protection Program (Floodplain Easements)
  - Farm and Ranch Lands Protection
  - Grassland Reserve Program
  - Wetland Protection Program
  - Healthy Forests Reserve Program
- **Local Resource Conservation Districts** sometimes finance and hold easements.

This section provides information on some selected funding sources for protecting habitat and restoring ecosystems in the Delta.

### *State and Federal Water Contractors*

State and federal water projects and, by association, the water contractors receiving these deliveries, are obligated through various laws and regulations to fund restoration and preservation of Delta habitat and ecosystems.

The amount of funding required from State and federal water contractors for the purposes of habitat conservation and ecosystem restoration is determined through agreements and water supply contracts between State and federal water contractors with the DWR and the USBR. In addition, the State’s Davis-Dolwig Act established the State policy that the costs of preservation (considered similar to mitigation) of fish and wildlife are to be paid by water supply contractors, and recreation and enhancement of fish and wildlife are to be paid for by appropriations from the general fund.

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<sup>156</sup> Natural Resources Conservation Service. Not Dated. Programs. NRCS Conservation Programs. <http://www.nrcs.usda.gov/programs/> Accessed December 14, 2015

The California Department of Water Resources (DWR) derives its authority to construct State water facilities and projects through the Central Valley Project Act of 1933 (Water Code 11100 et seq.), the Burns Porter Act (California Water Resources Development Bond Act) (Water Code 12930–12944), the Davis-Dolwig Act (Water Code 11900–11925), and other special acts of the State Legislature. Since the early 1960s, State Water Project (SWP) planning and capital costs, operation, maintenance, and interest have been paid for by 29 participating public water agencies pursuant to the terms of the water supply contracts.

The federal water projects managed by the United States Bureau of Reclamation (USBR) and United States Army Corps of Engineers that draw from the Delta have a variety of authorizations and funding sources. Most recently, the Central Valley Project Improvement Act (CVPIA), passed in 1992, set a number of conditions for continued operation of the USBR projects collectively known as the Central Valley Project (CVP) and renewal of water delivery contracts.<sup>157</sup> These provisions included targets for habitat conservation and ecosystem restoration. The ongoing Cost Allocation Study being conducted by the USBR considers facility costs for various habitat protection measures (as well as flood protection).<sup>158</sup> The Cost Allocation Study will be used to set new rates for CVP water supply contracts.

State and federal water contractors that participated in the development of the BDCP committed to fund construction, operation, and construction-related mitigation costs for the new water conveyance facilities.<sup>159</sup> For example, State and federal water contractors would pay 100% of the total capital costs of constructing and operating the new water conveyance facilities (estimated to be \$16 billion) and 20.2% of the cost of establishing the reserve system (estimated to be \$92.8 million of the total \$460.1 million). The BDCP also provided that funding from SWP water contractors would be provided through agreements with the DWR (i.e., through revenue bonds), and it was anticipated that CVP contractors would also enter into similar funding agreements.

## State

### *Sacramento-San Joaquin Delta Conservancy*

The Delta Conservancy is a primary State agency in the implementation of ecosystem restoration in the Delta<sup>160</sup> and is currently administering funds to promote ecosystem and

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<sup>157</sup> U.S. Bureau of Reclamation Mid Pacific Region. *Complete listing of Public Law 102-575*, [http://www.usbr.gov/mp/cvpia/title\\_34/public\\_law\\_complete.html](http://www.usbr.gov/mp/cvpia/title_34/public_law_complete.html). Accessed December 14, 2015.

<sup>158</sup> U.S. Bureau of Reclamation. *Welcome to the CVP Cost Allocation Study Website*, <http://www.usbr.gov/mp/cvp/cvp-cas/>. Accessed December 14, 2015.

<sup>159</sup> California Department of Water Resources and U.S. Bureau of Reclamation. Bay-Delta Conservation Plan. 2013a. Public Review Draft. Chapter 8, Implementation Costs and Funding Sources. [http://baydeltaconservationplan.com/Libraries/Dynamic\\_Document\\_Library/Public\\_Draft\\_BDCP\\_Chapter\\_8\\_-\\_Implementation\\_Costs\\_and\\_Funding\\_Sources.sflb.ashx](http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Public_Draft_BDCP_Chapter_8_-_Implementation_Costs_and_Funding_Sources.sflb.ashx). Accessed December 14, 2015.

<sup>160</sup> Sacramento-San Joaquin Delta Conservancy. Grant Guidelines. Fiscal Year 2015-16. Proposition 1. Delta Conservancy Ecosystem Restoration and Water Quality Grant Program. [http://deltaconservancy.ca.gov/wp-content/uploads/2015/07/GRANT-GUIDELINES\\_FINAL.pdf](http://deltaconservancy.ca.gov/wp-content/uploads/2015/07/GRANT-GUIDELINES_FINAL.pdf). Accessed December 14, 2015.

watershed protection and restoration projects. The Water Quality, Supply, and Infrastructure Improvement Act of 2014 (Proposition 1) identified \$50 million for the Delta Conservancy “for competitive grants for multi-benefit ecosystem and watershed protection and restoration projects in accordance with statewide priorities (Sec. 79730 and 79731).” This act emphasizes projects using public lands that maximize “voluntary landowner participation in projects that provide measurable and long-lasting habitat or species improvements in the Delta.” The Delta Conservancy intends to grant up to \$9 million each year for five years. High priority projects will address restoration and enhancement, water quality, and water-related agricultural sustainability. Eligible applicants include public agencies, qualifying 501(c)(3) nonprofit organizations, eligible tribal organizations, and mutual water companies, including local and regional companies.

## Federal

### *Central Valley Project Improvement Act Restoration Fund*

The CVPIA Restoration Fund was authorized in the Reclamation Projects Authorization and Adjustments Act of 1992 (Title XXXIV of Public Law 102-575; October 30, 1992).<sup>161</sup> The fund was established for the implementation of the CVPIA, which directs the following purposes related to habitat conservation and/or restoration:<sup>162</sup>

- Protect, restore, and enhance fish, wildlife, and associated habitats in the Central Valley and Trinity River Basins.
- Address impacts of the CVP on fish, wildlife, and associated habitats.
- Contribute to the State’s efforts to protect the Sacramento-San Joaquin Delta estuary.

The primary source of revenue for the CVPIA Restoration Fund is annual mitigation and restoration payments made by CVP water service and power contractors. Rates and charges are established with the goal of collecting an aggregate \$50 million per year at 1992 price levels into the restoration fund, based on a three-year rolling average. Up to \$30 million per year of this amount, at 1992 price levels, is collected from mitigation and restoration payments made by CVP water service and power contractors.

The CVPIA limits the amount of federal funds that may be spent on specific activities. For example, for activities that support the development and implementation of programs to mitigate fishery impacts associated with operations of the Jones Pumping Plant, costs are reimbursed according to the following statutory formula:

- 37.5% reimbursed as main CVP feature
- 37.5% considered a non-reimbursable federal expenditure
- 25% paid by the State of California.

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<sup>161</sup> California Department of Water Resources and U.S. Bureau of Reclamation. Bay-Delta Conservation Plan. 2013a. Public Review Draft. Chapter 8, Implementation Costs and Funding Sources. [http://baydeltaconservationplan.com/Libraries/Dynamic\\_Document\\_Library/Public\\_Draft\\_BDCP\\_Chapter\\_8\\_-\\_Implementation\\_Costs\\_and\\_Funding\\_Sources.sflb.ashx](http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Public_Draft_BDCP_Chapter_8_-_Implementation_Costs_and_Funding_Sources.sflb.ashx) . Accessed December 14, 2015.

<sup>162</sup> U.S. Fish and Wildlife Service, Sacramento Fish & Wildlife Office. *Central Valley Project Improvement Act*, [http://www.fws.gov/sacramento/fisheries/CAMP-Program/CVPIA/fisheries\\_camp-program\\_cvpia.htm](http://www.fws.gov/sacramento/fisheries/CAMP-Program/CVPIA/fisheries_camp-program_cvpia.htm)



Federal funds are contributed to the CVPIA Restoration Fund annually through the Annual Energy and Water Appropriations Bill. Table Att-C-3 presents the appropriation history of the CVPIA Restoration Fund from the Annual Energy and Water Appropriations Bill through 2012.

**Table Att-G-3 Central Valley Project Improvement Act Restoration Fund Appropriations**

Appropriation	Amount	Appropriation	Amount
1994	\$45,000,000	2003	\$48,904,000
1995	\$45,385,000	2004	\$39,600,000
1996	\$43,579,000	2005	\$54,695,000
1997	\$38,096,000	2006	\$52,219,000
1998	\$25,130,000	2007	\$52,149,990
1999	\$33,130,000	2008	\$59,122,000
2000	\$42,000,000	2009	\$56,079,000
2001	\$38,359,666	2010	\$35,358,000
2002	\$55,039,000	2011	\$49,915,000
		2012	\$53,068,000
Total			\$866,829,000

Source: California Department of Water Resources and U.S. Bureau of Reclamation . Bay-Delta Conservation Plan. 2013a. Public Review Draft. Chapter 8, Implementation Costs and Funding Sources. [http://baydeltaconservationplan.com/Libraries/Dynamic\\_Document\\_Library/Public\\_Draft\\_BDCP\\_Chapter\\_8\\_-\\_Implementation\\_Costs\\_and\\_Funding\\_Sources.sflb.ashx](http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Public_Draft_BDCP_Chapter_8_-_Implementation_Costs_and_Funding_Sources.sflb.ashx). Accessed December 14, 2015.

### **Federal California Bay-Delta Appropriations**

The CALFED Bay-Delta Restoration Program is a collaborative effort involving 25 State and federal agencies and representatives of California's urban, agricultural, and environmental communities (Senate Report 112-075, 2011).<sup>163,164</sup> The mission of the CALFED program is to conserve and restore the health of the ecosystem and improve water quality management through improvements to fish and wildlife habitat, water supply reliability, and water quality in the Delta. The federal CALFED Bay-Delta Authorization Act (Title I of Public Law 108-361) was enacted in 2004 and authorized \$389 million in federal appropriations for federal fiscal years 2005 through 2010. CALFED Bay-Delta restoration funds may be available for improvements to fish and wildlife habitat, water supply reliability, and water quality in the Bay-Delta in 2016. Authorizations in this act have been extended through September 30, 2016, and there is bill language in the 2016 budget to extend the expiration date to September 30, 2018. The 2014 and 2015 appropriations budgets each included \$27.4 million for habitat restoration.

<sup>163</sup> U.S. Bureau of Reclamation. 2014. Statement of Lowell Pimley, Acting Commissioner U.S. Department of the Interior, Before the Appropriations Committee Subcommittee on Energy and Water Development, U.S. Senate on President's Fiscal Year 2015 Budget. April 2, 2014. <http://www.usbr.gov/newsroom/testimony/detail.cfm?RecordID=2602>. Accessed December 14, 2015.

<sup>164</sup> U.S. Bureau of Reclamation. 2015. California Water. <http://www.usbr.gov/newsroom/presskit/factsheet/detail.cfm?recordid=3001>. Accessed December 14, 2015.

## Joint State-Federal CALFED Ecosystem Restoration Program

An important conservation funding source is California's Ecosystem Restoration Program (ERP).<sup>165</sup> The ERP is a multiagency effort aimed at improving and increasing aquatic and terrestrial natural communities and ecological function in the Delta and its tributaries.<sup>166</sup> The program is implemented by the CDFW in coordination with the United States Fish and Wildlife Service and the National Marine Fisheries Service. It is coordinated with a number of other agencies and programs in the Delta, including the Delta Conservancy. The CDFW water branch executes restoration actions through projects administered by the ERP's grants programs, and the majority of these projects focus on fish passage issues, species assessment, sedimentation, or natural community restoration. The number of awards and total funding depends on legislative appropriation. The primary sources of State funding for ERP projects and activities are:

- Proposition 204 – Safe, Clean, Reliable Water Supply Act (1996)
- Proposition 13 – Safe Drinking Water, Clean Water, Watershed Protection, and Flood Protection Bond Act (2000)
- Proposition 50 – Water Quality, Supply and Safe Drinking Water Projects Act (2002)
- Proposition 84 – Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act (2006)

The ERP Focus Area includes the Bay Region, Delta Region, Sacramento Region, and San Joaquin Region. Funding for the ERP has come from both State and federal sources, and ERP funding provides matches for other sources of funding to complete priority projects. Table Att-C-4 shows the amount of funding that has been authorized by the ERP through 2014.

**Table Att-C-4 Ecosystem Restoration Program Authorized Funds through 2014**

Topic Area	Number of Projects	Amount Approved
At-Risk Species Assessment	57	\$57,151,597
Ecosystem Water and Sediment Quality	67	\$79,552,317
Environmental Education	33	\$7,051,745
Environmental Water Management	8	\$7,925,853
Estuary Foodweb Productivity	4	\$2,172,064
Fish Passage	19	\$82,189,111
Fish Screens	65	\$122,431,726
Harvestable Species Assessment	2	\$774,500
Hydrodynamics, Sediment Transport, and Flow Regimes	29	\$36,876,141
Local Watershed Stewardship	54	\$19,144,716
Lowland Floodplains and Bypasses	29	\$42,707,792
Mine Remediation	4	\$2,177,550

<sup>165</sup> See CDFW, Ecosystem Restoration Program, <http://www.dfg.ca.gov/erp/>.

<sup>166</sup> Ecosystem Restoration Program. 2014. Ecosystem Restoration Program 2014 Annual Summary. <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=90959&inline>. Accessed December 14, 2015.

**Table Att-C-4 Ecosystem Restoration Program Authorized Funds through 2014**

Topic Area	Number of Projects	Amount Approved
Non-Native Species	34	\$33,109,176
Riparian Habitat	31	\$47,572,599
River Channel Restoration	18	\$24,527,234
Shallow Water and Marsh Habitat	52	\$74,165,441
Upland Habitat and Wildlife Friendly Agriculture	21	\$66,970,718
X2 Relationships (Freshwater-Seawater Interface)	1	\$509,222
<b>Totals</b>	<b>528</b>	<b>\$706,979,503</b>

Source: *Ecosystem Restoration Program. 2014. Ecosystem Restoration Program 2014 Annual Summary.*

<https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=90959&inline>. Accessed December 14, 2015.

## California EcoRestore

California EcoRestore is an initiative to help coordinate and advance at least 30,000 acres of critical habitat restoration in the Delta over the next five years.<sup>167</sup> It will include a broad range of habitat restoration projects, including aquatic, sub-tidal, tidal, riparian, flood plain, and upland ecosystems. It is not associated with any habitat restoration that may be required as part of the California WaterFix (Delta water conveyance). EcoRestore will be overseen by the California Resources Agency and implemented under the California Water Action Plan.

25,000 acres of the habitat restoration projects under EcoRestore will be associated with existing mandates pursuant to federal biological opinions. These projects will be funded exclusively by the State and federal water contractors that receive allocations from the SWP and the CVP and that are currently required to mitigate the ecological impacts of these projects in the Delta.

5,000 acres will be dedicated to habitat enhancements. These will be funded primarily from Proposition 1 grants through the Sacramento-San Joaquin Delta Conservancy (Delta Conservancy), the California Department of Fish and Wildlife (CDFW), and the DWR. Some funding for wetlands restoration will be provided by the Assembly Bill 32 Greenhouse Gas Reduction Fund, and other local and federal partners.

EcoRestore will include:

- 3,500 acres of managed wetlands created for subsidence reversal and carbon management
- 17,500 acres of floodplain restoration
- 9,000 acres of tidal and sub-tidal habitat restoration
- 1,000 acres of aquatic, riparian, and upland habitat projects, and multi-benefit flood management projects

<sup>167</sup> California Natural Resources Agency. 2016. California EcoRestore, A Stronger Delta Ecosystem. <http://resources.ca.gov/ecorestore/>. Accessed April 20, 2016.

- Multiple fish passage improvement projects in the Yolo Bypass and other key locations.

Costs for California EcoRestore are expected to reach at least \$300 million in the first four years.

## **Attachment D      Delta Emergency Flood Response**

Several alternative means exist for managing flood protection beyond improved levees. Flood response is one of the more direct activities with expenditures that can be directly traced from funding to results. Other less direct alternatives include land-use management and forms of insurance; those alternatives are not discussed in this Study. Changes in flood response practices and funding may be proposed as means to change levee investments, and these might be considered as the least-cost option in certain cost-allocation procedures.

This appendix attachment summarizes local, state, and federal planning for emergency flood response in the Sacramento-San Joaquin River Delta (Delta) (not specifically including levee maintenance and repair, although funds for these activities are included in programs and funding sources described in Appendix G) and focuses on funding for flood response activities. Flood response in the Delta is primarily coordinated at the state level through the California Department of Water Resources (DWR). Some federal money has been made available for emergency flood response through the Federal Emergency Management Agency (FEMA), but the federal role in disaster recovery in California and specifically the Delta remains unclear at the moment.

### **State Agencies and Multi-Agency Groups**

#### ***FloodSAFE California***

FloodSAFE is a long-term strategic initiative developed to reduce flood risk in California. It is designed with the recognition that addressing risks of flood damage statewide will take decades. FloodSAFE is also an important component of DWR's Integrated Water Management Initiative, which is designed to achieve a sustainable, robust, and resilient flood and water management system for the benefit of all Californians.<sup>168</sup>

#### ***California Office of Emergency Services***

The California Office of Emergency Services (Cal OES) (formerly the California Emergency Management Agency) ensures that the State is ready and able to mitigate against, prepare for, respond to, and recover from the effects of emergencies that threaten State interests, including lives, property, and the environment. During a flood emergency, Cal OES coordinates the emergency activities of all State agencies. The agency will coordinate the integration of federal resources into State and local response and recovery operations, including FEMA's pre- and post-disaster mitigation grants. It will also coordinate FEMA's Repetitive Flood Loss Program

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<sup>168</sup> <http://www.water.ca.gov/floodsafe/>

within the National Flood Insurance Program (NFIP), Flood Mitigation Assistance Program, Pre-Disaster Mitigation Grant Program, and Hazard Mitigation Grant Program.<sup>169</sup>

### *Delta Working Group*

In an effort to develop multi-agency coordination, particularly between agencies regarding the Delta and emergency response responsibilities, the Delta Working Group was created as an activity under the Multi-Agency Coordination component of Delta ER. Quarterly meetings are held throughout the Delta region with the five Delta counties, Cal OES, and DWR as lead participants to coordinate planning activities and to understand the different roles and responsibilities during a catastrophic flood event in the Delta.<sup>170</sup>

### *Senate Bill 27 Task Force*

As directed by the Sacramento-San Joaquin Delta Emergency Preparedness Act of 2008 (Senate Bill 27), Cal OES, along with the five Delta counties and the DWR, have also developed a multi-hazard planning strategy. Specific recommendations and strategies for emergency preparedness and response were developed for the Governor and Legislature. The report was completed in January 2012 and is available online.<sup>171</sup> Support and implementation of the report's recommendations is ongoing.

### **Funding Flood Preparedness and Response**

#### *California Office of Emergency Services*

Data were compiled on Cal OES's budget allocations from 2008 to 2013 but were only available at the program level, as summarized in Table Att-D-1. Specific funding for flood preparedness, response, and recovery activities is not separated in the State's budget documents.<sup>172</sup> More detailed information on where these funds were spent and for what is not readily available at this time.

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<sup>169</sup> [http://www.water.ca.gov/floodsafe/fessro/docs/announce\\_background.pdf](http://www.water.ca.gov/floodsafe/fessro/docs/announce_background.pdf)

<sup>170</sup> <http://www.water.ca.gov/floodmgmt/hafoo/fob/dfeprrp/>

<sup>171</sup> [http://www.delta.ca.gov/res/docs/emergency/SB\\_27\\_Task\\_Force\\_Report\\_1-31-12.pdf](http://www.delta.ca.gov/res/docs/emergency/SB_27_Task_Force_Report_1-31-12.pdf)

<sup>172</sup> State Department of Finance, [ebudget.ca.gov](http://ebudget.ca.gov)

**Table Att-D-1 California Office of Emergency Services Budget, 2008–2013**

	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	Grand Total
Disaster Assistance	\$291,403						\$291,403
Emergency Management Services	\$0	\$81,538	\$55,652	\$35,772	\$39,172	\$39,079	\$251,213
Grand Total	\$291,403	\$81,538	\$55,652	\$35,772	\$39,172	\$39,079	\$542,616

### *Delta Flood Emergency Preparedness, Response and Recovery Program<sup>173</sup>*

The Delta Flood Emergency Preparedness, Response, and Recovery Program (Delta ER Program) was established by the Disaster Preparedness and Flood Prevention Bond Act of 2006, which made \$135 million available to the DWR for essential emergency preparedness supplies and projects. The California Legislature recognized the vital role that the Delta plays in California's water supply and the effects that a major flood event could have on that supply.

The objectives of the program are to:

- Protect the lives, property, and infrastructure critical to the functioning of both the Delta and California as a whole.
- Protect water quality and restore water supply for both Delta and export water users.
- Reduce the recovery time of California's water supply from catastrophic flood to less than six months.
- Minimize impacts on environmental resources.

The intent of this effort is to have a coordinated and effective multi-agency response during a large-scale Delta flood emergency where the DWR works in concert with the other local, state, and federal flood emergency agencies within the Delta. The DWR's Hydrology and Flood Operations Office staff regularly engage other DWR staff, as well as Delta partners and State Water Project contractors, to develop the following Delta ER Program components:

- Analysis and evaluation tools
- Informative studies
- Emergency response facilities
- The DWR-wide Delta Emergency action plan

Table Att-D-2 lists the agencies involved in developing the Delta ER Program components.

<sup>173</sup> <http://www.water.ca.gov/floodmgmt/hafoo/fob/dfeprrp/>

**Table Att-D-2 Agencies Involved in the Delta Flood Emergency Preparedness, Response and Recovery Program**

Local and Regional Stakeholders	State	Federal
Five County Operation Area Managers	California Emergency Management Agency (Cal EMA)	U.S. Army Corps of Engineers (USACE)
Local Reclamation Districts and Levee Districts	Central Valley Flood Protection Board (CVFPB)	California-Nevada River Forecast Center (CNRFC)
	Delta Stewardship Council (DSC)	National Oceanic and Atmospheric Administration (NOAA)
State Water Contractors, Public Utilities	California Coast Guard (CCG)	Federal Emergency Management Agency (FEMA)
	State Parks and Recreation	US Bureau of Reclamation
Delta Protection Commission	California Department of Water Resources (DWR): Operations and Maintenance (O&M), Executive	National Guard

### Flood Emergency Response Projects – Local Preparedness Support

#### *Delta Grant*

To improve local flood emergency response, funding was made available from the “Disaster Preparedness and Flood Protection Bond Act of 2006” (Proposition 1E). Up to \$5 million in funding was originally made available through this grant. The DWR’s Delta Grant was designed to improve local flood emergency response and contribute to increased public safety. The funds were made available to California public agencies in the Legal Delta<sup>174</sup> with primary flood response and/or flood response coordination. The Flood Operations Branch administers the grant and requires that applicants be public agencies that have primary responsibility for flood emergency response within the Legal Delta. In 2014, the DWR released the final funding awards for these projects, as delineated in Table Att-D-3.<sup>175</sup>

<sup>174</sup> The Delta received its first official boundary in 1959 with the passage of the Delta Protection Act (Section 12220 of the Water Code). The term “Legal Delta” refers to the statutory boundary established in the Delta Protection Act.

<sup>175</sup> <http://www.water.ca.gov/floodmgmt/funding/delta.cfm>

**Table Att-D-3 Proposition 1E Funding for Delta Grant**

Lead Agency	Participating Agencies	Project Components	Amount Awarded
San Joaquin County	53	ER Plans, Training & Maps	\$1,630,000
Yolo County	21	ER Plans, Training & Maps	\$1,173,000
Contra Costa County	15	ER Plans, Maps & Alert 2 Upgrades	\$570,000
Sacramento County OES	22	ER Plans, Training & Alert 2 Upgrades	\$927,000
Solano County	8	ER Plans and Training	\$450,000
San Joaquin County Flood Control & Water Conservation District	7	Alert 2 Upgrades	\$250,000

Key:

ER = Emergency Response

OES = Office of Emergency Services

### ***Delta Communications Equipment Grant***

The Flood Emergency Response Projects - Delta Communications Equipment Grant provided \$5 million as listed in Table Att-D-4 to ensure that State and local agencies have a robust regional communication system in the Delta region for effective response to high water and flood emergencies. Funded by Proposition 84, the grant required projects to be consistent with Cal OES's *California Statewide Communication Interoperability Plan* to improve communication between emergency response agencies on a regional basis.<sup>176</sup>

**Table Att-D-4 Projects that Received Delta Flood Emergency Communications Grants in 2012**

Project	Sponsor	Amount Awarded
Bethel Island Flood Emergency Response Communication Equipment Project	Bethel Island Municipal Improvement District (BIMID)	\$34,911
Delta Interoperability Group	Sacramento County	\$1,710,000
	San Joaquin County	\$1,020,000
	Solano County	\$587,370
	Yolo County	\$1,315,000
	Contra Costa County	\$329,593

### ***Federal Emergency Management Agency Emergency Funds***

FEMA plays an important role in providing federal disaster assistance after flood events. FEMA funds cover emergency response costs, debris removal, emergency protective measures related

<sup>176</sup> <http://www.water.ca.gov/floodmgmt/funding/delta-comms.cfm>



to the floods, and the repair or replacement of damaged public facilities (including levees). In the past, FEMA has taken the following two approaches to emergency response in the Delta:

- Providing post-disaster assistance for rebuilding eligible Delta levees and other public works through FEMA's Public Assistance Program and the USACE's Public Law (PL) 84-99 Program. The eligibility standards for these programs are known as the FEMA Hazard Mitigation Plan standard and the USACE PL 84-99 standard.
- Providing affordable federally backed flood insurance for private buildings through the NFIP. Based on 100-year flood events, the NFIP is designed to provide an affordable insurance alternative for disaster assistance to repair damage caused by floods to buildings and their contents.

In 2012, FEMA and Cal OES signed a memorandum of agreement regarding FEMA's role in disaster response, but this was terminated by FEMA in 2012, making the federal role in Delta flood response uncertain.<sup>177</sup>

As an example of a FEMA response in the Delta, Table Att-D-5 shows the funds FEMA obligated after the 2004 Upper Jones Tract levee break.<sup>178</sup>

**Table Att-D-5 Federal Emergency Management Agency Funds Obligated for the Upper Jones Tract Levee Break**

	Total Public Assistance Grants - Dollars Obligated	Emergency Work (Categories A-B) - Dollars Obligated	Permanent Work (Categories C-G) - Dollars Obligated
Total Amount	\$21,025,562.	\$15,648,947	\$5,258,243

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<sup>177</sup>

[http://deltacouncil.ca.gov/sites/default/files/documents/files/Item\\_12\\_Delta\\_Flood\\_Emergency\\_Response\\_and\\_Recovery.pdf](http://deltacouncil.ca.gov/sites/default/files/documents/files/Item_12_Delta_Flood_Emergency_Response_and_Recovery.pdf)

<sup>178</sup> <https://www.fema.gov/disasters/grid/state-tribal-government/77>