

1  
2 **Implementation Costs Supporting Materials**

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# Implementation Costs Supporting Materials

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1 **Figure**

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# 1 Acronyms and Abbreviations

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BAAQMD	Bay Area Air Quality Management District
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CRAM	California Rapid assessment Method
DRMS	Delta Risk Management Strategy
DWR	California Department of Water Resources
EIR	environmental impact report
EIS	environmental impact statement
FTE	full-time equivalent
GIS	geographic information system
GPS	global positioning system
HCP	habitat conservation plan
IAV	invasive aquatic vegetation
IEP	Interagency Ecological Program
MHHW	mean higher high water
mg/L	milligrams per liter
NCCP	natural community conservation plan
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
NWR	national wildlife refuge
O&M	operations and maintenance
ROA	restoration opportunity area
SJVAPCD	San Joaquin Valley Air Pollution Control District
SMAQMD	Sacramento Metropolitan Air Quality Management District
TMDL	total maximum daily load
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Services
USGS	U.S. Geological Survey
UMPS II	Uniform Minimum Protocols and Standards for Watercraft Interception Programs for Dreissenid Mussels in the Western United States

## Implementation Costs Supporting Materials

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This appendix presents supporting assumptions and background information for Chapter 8, *Implementation Costs and Funding Sources*. The appendix first presents detailed assumptions for implementing each conservation measure, then for program administration, monitoring, research, changed circumstances, and EIR/EIS mitigation measures. Assumptions for monitoring and research costs are also presented for each conservation measure.

### 8.A.1 Conservation Measure Implementation Costs

#### 8.A.1.1 CM1 Water Facilities and Operation

##### 8.A.1.1.1 Land Acquisition

Data from the California Department of Water Resources (DWR) land use surveys for Delta counties were combined with hypothetical facility, staging, and borrow site footprints to estimate facility land acquisition and easement requirements.<sup>1</sup> Table 8.A-1 shows the land acquisition schedule and cost assumptions used to estimate CM1 land acquisition costs. Table 8.A-2 shows the estimated capital and operating costs for CM1 by 5-year periods.

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<sup>1</sup> Acreage amounts are reflective of the Delta Habitat Conservation and Conveyance Program Revision 10b engineering geographic information system (GIS) data (July 2012).

1 **Table 8.A-1. CM1 All Tunnel Conveyance Land Acquisition Footprint**

2

**All Tunnel Conveyance Land Acquisition Footprint**

Dollar Base: 2012

[DWR\\_Non\\_State\\_Landuse\\_MPTORev2b\\_Intersect\\_20130804.xlsx](#)

Surface Land Impacts			County Acreage				County Land Value (\$/Acre)				Land Cost				
Option	No. of Units	Non-State Acreage	Contra Costa/ Alameda	Sacramento	San Joaquin	Yolo	Contra Costa/ Alameda	Sacramento	San Joaquin	Yolo	Contra Costa/ Alameda	Sacramento	San Joaquin	Yolo	Total
Tunnel - Footprint and Work Areas*															
Field		4,604	1,394	865	2,346		\$6,094	\$7,260	\$6,094		\$8,492,731	\$6,278,567	\$14,295,134	\$0	\$29,066,433
Truck Field Crops		381	3	288	90		\$6,094	\$8,745	\$6,094		\$18,421	\$2,517,965	\$549,846	\$0	\$3,086,232
Orchard		199	5	194	0		\$18,549	\$9,738	\$18,549		\$89,425	\$1,887,159	\$0	\$0	\$1,976,583
Vineyard		110	9	100	0		\$17,489	\$21,199	\$17,489		\$165,813	\$2,130,092	\$0	\$0	\$2,295,905
Semiagricultural Class		280	129	67	85		\$123,481	\$123,481	\$123,481		\$15,872,269	\$8,222,381	\$10,521,440	\$0	\$34,616,090
Urban-Residential		18	3	15	1		\$135,671	\$135,671	\$135,671		\$444,272	\$1,969,427	\$82,533	\$0	\$2,496,232
Urban-Commercial		1	1	0	0		\$135,671	\$135,671	\$135,671		\$151,942	\$1,291	\$0	\$0	\$153,234
Urban-Industrial		2	2	0	0		\$135,671	\$135,671	\$135,671		\$244,898	\$5,887	\$0	\$0	\$250,785
Urban Landscape		0	0	0	0		\$135,671	\$135,671	\$135,671		\$0	\$0	\$0	\$0	\$0
Urban Vacant		77	30	24	22		\$135,671	\$135,671	\$135,671		\$4,112,809	\$3,298,381	\$3,013,858	\$0	\$10,425,049
Native Veg		723	365	130	228		\$1,621	\$1,621	\$1,621		\$591,202	\$210,469	\$369,696	\$0	\$1,171,367
<b>Total</b>		<b>6,395</b>	<b>1,941</b>	<b>1,682</b>	<b>2,772</b>	<b>0</b>	<b>\$15,553</b>	<b>\$15,765</b>	<b>\$10,401</b>	<b>\$0</b>	<b>\$30,183,782</b>	<b>\$26,521,620</b>	<b>\$28,832,508</b>	<b>\$0</b>	<b>\$85,537,910</b>

Subsurface Land Impacts			County Acreage				Subsurface Easement Value (\$/Acre)				Easement Cost				
Option	No. of Units	Non-State Acreage	Contra Costa/ Alameda	Sacramento	San Joaquin	Yolo	Contra Costa/ Alameda	Sacramento	San Joaquin	Yolo	Contra Costa/ Alameda	Sacramento	San Joaquin	Yolo	Total
Tunnel - Subsurface Acreage**															
Field & Grazing		606	19	85	501	0	\$2,438	\$2,904	\$2,438	\$0	\$46,293	\$247,579	\$1,221,994	\$0	\$1,515,866
Truck Field Crops		92	0	42	51	0	\$2,438	\$3,498	\$2,438	\$0	\$0	\$146,431	\$123,262	\$0	\$269,693
Orchard		5	0	5	0	0	\$7,420	\$3,895	\$7,420	\$0	\$0	\$20,557	\$0	\$0	\$20,557
Vineyard		71	0	71	0	0	\$6,996	\$8,479	\$6,996	\$0	\$0	\$598,784	\$0	\$0	\$598,784
Semiagricultural Class		25	2	8	16	0	\$49,392	\$49,392	\$49,392	\$0	\$77,786	\$390,617	\$777,253	\$0	\$1,245,656
Urban-Residential		1	0	1	0	0	\$54,269	\$54,269	\$54,269	\$0	\$0	\$70,390	\$0	\$0	\$70,390
Urban-Commercial		0	0	0	0	0	\$54,269	\$54,269	\$54,269	\$0	\$0	\$0	\$0	\$0	\$0
Urban-Industrial		2	0	2	0	0	\$54,269	\$54,269	\$54,269	\$0	\$0	\$124,419	\$0	\$0	\$124,419
Urban Landscape		0	0	0	0	0	\$54,269	\$54,269	\$54,269	\$0	\$0	\$0	\$0	\$0	\$0
Urban Vacant		6	0	2	4	0	\$54,269	\$54,269	\$54,269	\$0	\$14,359	\$89,283	\$240,292	\$0	\$343,934
Native Veg		100	1	10	90	0	\$648	\$648	\$648	\$0	\$478	\$6,197	\$58,176	\$0	\$64,851
<b>Total</b>		<b>909</b>	<b>22</b>	<b>226</b>	<b>662</b>	<b>0</b>	<b>\$6,441</b>	<b>\$7,506</b>	<b>\$3,658</b>	<b>\$0</b>	<b>\$138,915</b>	<b>\$1,694,257</b>	<b>\$2,420,977</b>	<b>\$0</b>	<b>\$4,254,149</b>

<b>Subtotal Fee &amp; Easement Cost</b>	<b>\$30,322,697</b>	<b>\$28,215,877</b>	<b>\$31,253,484</b>	<b>\$0</b>	<b>\$89,792,059</b>
<b>Mineral Rights</b>					<b>\$32,300,000</b>
Transaction Costs @ 10% of Fee	\$3,032,270	\$2,821,588	\$3,125,348	\$0	\$12,209,206
<b>Subtotal Purchase Cost</b>	<b>\$33,354,967</b>	<b>\$31,037,465</b>	<b>\$34,378,833</b>	<b>\$0</b>	<b>\$134,301,265</b>
Contingency @ 20% of Purchase Cost	\$6,670,993	\$6,207,493	\$6,875,767	\$0	\$26,860,253
<b>Grand Total Purchase &amp; Contingency</b>	<b>\$40,025,960</b>	<b>\$37,244,958</b>	<b>\$41,254,599</b>	<b>\$0</b>	<b>\$161,161,517</b>

3

1 **Table 8.A-2. CM1 Capital and Operating Costs by 5-Year Period**

2

Capital Costs	Capital Costs Per Costing Period										Total	
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
Land Acquisition	\$ 161,161,517											\$161,161,517
Construction	\$ 5,763,880,000	\$ 8,645,820,000										\$14,409,700,000
<b>Total</b>	<b>\$ 5,925,041,517</b>	<b>\$ 8,645,820,000</b>	<b>\$ -</b>	<b>\$14,570,861,517</b>								

3

Operating Costs	Operating Costs Per Costing Period										Total	
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
Power			\$31,250,000	\$31,250,000	\$31,250,000	\$31,250,000	\$31,250,000	\$31,250,000	\$31,250,000	\$31,250,000	\$31,250,000	\$250,000,000
O&M			\$94,250,000	\$94,250,000	\$94,250,000	\$94,250,000	\$94,250,000	\$94,250,000	\$94,250,000	\$94,250,000	\$94,250,000	\$754,000,000
Reliability & Replacement Fund					\$75,333,333	\$75,333,333	\$75,333,333	\$75,333,333	\$75,333,333	\$75,333,333	\$75,333,333	\$452,000,000
<b>Total</b>	<b>\$0</b>	<b>\$0</b>	<b>\$125,500,000</b>	<b>\$125,500,000</b>	<b>\$200,833,333</b>	<b>\$1,456,000,000</b>						

## 1 **8.A.1.2 CM2 Yolo Bypass Fisheries Enhancement**

### 2 **8.A.1.2.1 Construction**

3 Low and high construction costs for each element were estimated by the Delta Habitat Conservation  
4 and Conveyance Program (2010). Table 8.A-3 shows low and high estimated construction costs for  
5 the Yolo Bypass improvements. In Chapter 8, the mid-point of the cost range is used to represent the  
6 cost for this conservation measure. Table 8.A-4 shows the estimated costs for CM2 by 5-year period.  
7 Table 8.A-5 shows the CM2 costs by 5-year period.

1 **Table 8.A-3. CM2 Construction Costs**

Construction Element			Estimated Costs (millions)	
Fac #		Description	Low	High
<b>1-4,8</b>		<b>Fremont Weir Fish Facilities</b>	<b>\$147.1</b>	<b>\$175.4</b>
	1	Modify Existing Fish Ladder	\$0.0	\$0.0
	2	New Sturgeon Ramps (4 each)	\$7.5	\$7.5
	3	New Fish Ladders	\$1.8	\$1.8
	4	Non-Physical or Physical Barriers in Sacramento River	\$9.4	\$9.4
	5	Channels Prior to the Gate Structure (included)	\$0.0	\$0.0
	6	Deep "Fish Passage" Gate Structures for Connectivity Flow	\$3.3	\$3.3
	7	Intermediate depth "Floodplain Inundation" Gate Structures for	\$48.8	\$48.8
	8	Channels After the Gate Structures	\$76.2	\$104.6
<b>1-4,8</b>		<b>Other Civil/Site Work near Fremont Weir</b>	<b>\$12.5</b>	<b>\$43.0</b>
	9	Operations Building	\$0.7	\$0.7
	10	Electrical Connection	\$0.2	\$0.2
	11	Parking Lot	\$0.0	\$0.0
	12	Roads from Property Gates	\$0.7	\$0.7
	13	Bridges over Gate Structures	\$10.9	\$10.9
	13A	Additional Bridge between Gates D and H	\$0.0	\$30.5
<b>1-4, 6, 8</b>		<b>Other Civil/Site Work for Fremont Weir</b>	<b>\$20.8</b>	<b>\$47.6</b>
	14	Road Improvements Prior to Western Gate	\$0.0	\$0.4
	15	Road Improvements Prior to Eastern Gate	\$0.7	\$4.0
	16	Levee Improvements along the edges of Fremont Weir Wildlife	\$0.0	\$0.0
	17	Agricultural Crossing #1	\$4.7	\$10.5
	18	Agricultural Crossing #2	\$4.7	\$10.5
	19	Agricultural Crossing #3	\$4.7	\$10.5
	20	Agricultural Crossing #4	\$4.7	\$10.5
	21	Electrical Connection for Ag Crossings 1-3 (N/A)	\$0.0	\$0.0
	22	Electrical Connection for Ag Crossing 4	\$0.1	\$0.1
	23	Road/Utility Improvements for Ag Crossings 1-3	\$0.8	\$0.9
	24	Road/Utility Improvements for Ag Crossing 4	\$0.2	\$0.2
<b>5</b>		<b>Sacramento Weir</b>	<b>\$49.5</b>	<b>\$49.5</b>
	25	Levee Improvements Using Sacramento Bypass Spoils	\$15.6	\$15.6
		Additional Channel Excavation (greater than fish passage)	\$0.0	\$0.0
	26	Channels Prior to the Gate Structures	\$0.1	\$0.1
	27	Deep Gate Structures for Connectivity Flow	\$0.6	\$0.6
	28	Intermediate Depth Gate Structures for Continued Flood Flow	\$31.5	\$31.5
	29	Channels after the Gate Structure	\$1.6	\$1.6
	30	Electrical Connection (N/A)	\$0.0	\$0.0
	31	Road/Utility Improvements (N/A)	\$0.0	\$0.0
<b>6</b>		<b>Lisbon Weir</b>	<b>\$24.3</b>	<b>\$24.3</b>
	32	Gate Structure	\$19.9	\$19.9
	33	Electrical Connection	\$0.3	\$0.3
	34	Road/Utility Improvements	\$4.1	\$4.1
<b>6</b>		<b>Los Rios Check Structure</b>	<b>\$17.5</b>	<b>\$17.5</b>
	35	Gate Structure	\$15.7	\$15.7
	36	Electrical Connection (N/A)	\$0.0	\$0.0
	37	Road/Utility Improvements	\$1.8	\$1.8

2

1 **Table 8.A-4. CM2 Construction Costs (cont'd)**

<b>7</b>	<b>Putah Creek - Gate Structure</b>	<b>\$17.5</b>	<b>\$17.5</b>
38	Gate Structure	\$15.7	\$15.7
39	Electrical Connection (N/A)	\$0.0	\$0.0
40	Road/Utility Improvements	\$1.8	\$1.8
<b>7</b>	<b>Putah Creek Realignment</b>	<b>\$6.9</b>	<b>\$17.3</b>
41	Excavation	\$6.9	\$17.3
42	Spoils (included)	\$0.0	\$0.0
<b>10</b>	<b>West Side Supply Element</b>	<b>\$0.0</b>	<b>\$60.7</b>
43	Gate Structure	\$0.0	\$42.9
44	Electrical Connection	\$0.0	\$0.2
45	Channel after Gate Structure	\$0.0	\$13.6
46	Road/Utility Improvements	\$0.0	\$4.0
	<b>Total Direct Cost</b>	<b>\$296.0</b>	<b>\$452.8</b>
	Planning, Preliminary Engineering & Permitting at 8%	\$23.7	\$36.2
	Contingency at 50%	\$148.0	\$226.4
	<b>Subtotal</b>	<b>\$467.7</b>	<b>\$715.4</b>
	PM/CM/Final Design at 18%	\$79.9	\$122.3
	<b>Total Construction Cost, including Contingency</b>	<b>\$547.6</b>	<b>\$837.7</b>

2 *Source of Estimate: Yolo Bypass Construction Cost Estimate 09-14-10.pdf*

1 **Table 8.A-5. CM2 Land and Construction Costs by 5-Year Period**

Capital Costs	Cost Per Period										Total	
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
Easements	\$25,004,940	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$25,004,940
Transaction Costs	\$2,500,494	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$2,500,494
Easement Contingency	\$5,501,087	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$5,501,087
Planning, Preliminary Engineering & Permitting at 8%	\$14,975,454	\$14,975,454										\$29,950,909
PM/CM/Final Design at 18%	\$50,542,159	\$50,542,159										\$101,084,317
Fremont Weir Fish Facilities	\$80,628,922	\$80,628,922										\$161,257,844
Other Civil/Site Work near Fremont Weir	\$5,608,672	\$5,608,672										\$11,217,344
Sacramento Weir	\$24,743,877	\$24,743,877										\$49,487,755
Lisbon Weir	\$12,125,202	\$12,125,202										\$24,250,404
Los Rios Check Structure	\$8,758,152	\$8,758,152										\$17,516,305
Putah Creek - Gate Structure	\$8,734,934	\$8,734,934										\$17,469,867
Putah Creek Realignment	\$6,048,064	\$6,048,064										\$12,096,128
West Side Supply Element	\$15,163,941	\$15,163,941										\$30,327,882
Contingency	\$113,664,689	\$113,664,689										\$227,329,377
<b>Total</b>	<b>\$ 374,000,587</b>	<b>\$ 340,994,066</b>	<b>\$ -</b>	<b>\$ 714,994,653</b>								

2  
3

1 **8.A.1.3 CM3 Natural Communities Protection and**  
2 **Restoration**

3 **8.A.1.3.1 Land Acquisition and Existing Land Use Distributions**

4 Table 8.A-5 shows the assumed land acquisition costs for CM3 by 5-year period. Table 8.A-6 shows  
5 the assumed distributions of existing land uses of acreage to be acquired. The land costs for CM3 are  
6 based on these distributions. Table 8.A-7 shows CM3 existing land use distributions.

1 **Table 8.A-6. CM3 Land Acquisition Costs by 5-Year Period**

Vernal Pool Complex Terrain

Land Assembly by Conservation Zone	Acres Acquired by Period										Total Acreage
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
1	76	76	76	0	0	0	0	0	0	0	228
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0
8	61	61	61	0	0	0	0	0	0	0	182
9	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0
11	63	63	63	0	0	0	0	0	0	0	190
<b>Total</b>	<b>200</b>	<b>200</b>	<b>200</b>	<b>0</b>	<b>600</b>						
<b>Running Total</b>	<b>200</b>	<b>400</b>	<b>600</b>								

\*Based on rangeland land value, 2009 California Trends in Agricultural Land and Lease Values, California Chapter ASFMRA

Fee-Title Purchase %	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Easement Purchase %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Easement:Fee-Title Cost Ratio	80%
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Land Assembly Cost	Cost Per Period										Total Cost
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Purchase Cost	\$651,859	\$651,859	\$651,859	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$1,955,577
Transaction Cost (10% of fee title cost)	\$65,186	\$65,186	\$65,186	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$195,558
<b>Subtotal</b>	<b>\$717,045</b>	<b>\$717,045</b>	<b>\$717,045</b>	<b>\$0</b>	<b>\$2,151,135</b>						
Contingency (20%)	\$143,409	\$143,409	\$143,409	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$430,227
<b>Total</b>	<b>\$860,454</b>	<b>\$860,454</b>	<b>\$860,454</b>	<b>\$0</b>	<b>\$2,581,362</b>						

2

**Alkali Seasonal Wetland Complex**

Land Assembly by Conservation Zone	Acres Acquired by Period										Total Acreage
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
1	0	45	2	2	2	2	2	2	0	0	56
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0
8	0	30	1	1	1	1	1	1	0	0	38
9	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0
11	0	45	2	2	2	2	2	2	0	0	56
<b>Total</b>	<b>0</b>	<b>120</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>150</b>
<b>Running Total</b>	<b>0</b>	<b>120</b>	<b>125</b>	<b>130</b>	<b>135</b>	<b>140</b>	<b>145</b>	<b>150</b>	<b>150</b>	<b>150</b>	<b>150</b>

*\*Based on rangeland land value, 2009 California Trends in Agricultural Land and Lease Values, California Chapter ASFMRA*

Fee-Title Purchase %	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Easement Purchase %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Easement:Fee-Title Cost Ratio	80%										

Land Assembly Cost	Cost Per Period										Total Cost
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Purchase Cost	\$0	\$391,115	\$16,296	\$16,296	\$16,296	\$16,296	\$16,296	\$16,296	\$0	\$0	\$488,894
Transaction Cost (10% of fee title cost)	\$0	\$39,112	\$1,630	\$1,630	\$1,630	\$1,630	\$1,630	\$1,630	\$0	\$0	\$48,889
<b>Subtotal</b>	<b>\$0</b>	<b>\$430,227</b>	<b>\$17,926</b>	<b>\$17,926</b>	<b>\$17,926</b>	<b>\$17,926</b>	<b>\$17,926</b>	<b>\$17,926</b>	<b>\$0</b>	<b>\$0</b>	<b>\$537,784</b>
Contingency (20%)	\$0	\$86,045	\$3,585	\$3,585	\$3,585	\$3,585	\$3,585	\$3,585	\$0	\$0	\$107,557
<b>Total</b>	<b>\$0</b>	<b>\$516,272</b>	<b>\$21,511</b>	<b>\$21,511</b>	<b>\$21,511</b>	<b>\$21,511</b>	<b>\$21,511</b>	<b>\$21,511</b>	<b>\$0</b>	<b>\$0</b>	<b>\$645,340</b>

1

Valley/Foothill Riparian

Land Assembly by Conservation Zone	Acres Acquired										Total Acreage	
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0
7	398	353	0	0	0	0	0	0	0	0	0	750
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>398</b>	<b>353</b>	<b>0</b>	<b>750</b>								
<b>Running Total</b>	<b>398</b>	<b>750</b>	<b>750</b>									

Fee-Title Purchase %	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Easement Purchase %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Easement:Fee-Title Cost Ratio	80%
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Land Assembly Cost	Cost Per Period										Total Cost	
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
Purchase Cost	\$607,579	\$538,796	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$ 1,146,375
Transaction Cost (10% of fee title cost)	\$60,758	\$53,880	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$ 114,638
<b>Subtotal</b>	<b>\$668,337</b>	<b>\$592,676</b>	<b>\$0</b>	<b>\$ 1,261,013</b>								
Contingency (20%)	\$133,667	\$118,535	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$ 252,203
<b>Total</b>	<b>\$ 802,004</b>	<b>\$ 711,211</b>	<b>\$ -</b>	<b>\$ 1,513,215</b>								

1

**Grassland**

Land Assembly by Conservation Zone	Acres Acquired by Period										Total Acreage
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
1	631	631	631	631	631	631	631	631	0	0	5,046
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0
8	173	173	173	173	173	173	173	173	0	0	1,384
9	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0
11	196	196	196	196	196	196	196	196	0	0	1,570
<b>Total</b>	<b>1,000</b>	<b>1,000</b>	<b>1,000</b>	<b>1,000</b>	<b>1,000</b>	<b>1,000</b>	<b>1,000</b>	<b>1,000</b>	<b>0</b>	<b>0</b>	<b>8,000</b>
<b>Running Total</b>	<b>1,000</b>	<b>2,000</b>	<b>3,000</b>	<b>4,000</b>	<b>5,000</b>	<b>6,000</b>	<b>7,000</b>	<b>8,000</b>	<b>8,000</b>	<b>8,000</b>	<b>8,000</b>

Fee-Title Purchase %	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Easement Purchase %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Easement:Fee-Title Cost Ratio	80%
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Land Assembly Cost	Cost Per Period										Total Cost
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Purchase Cost	\$3,406,634	\$3,406,634	\$3,406,634	\$3,406,634	\$3,406,634	\$3,406,634	\$3,406,634	\$3,406,634	\$0	\$0	\$27,253,070
Transaction Cost (10% of fee title cost)	\$340,663	\$340,663	\$340,663	\$340,663	\$340,663	\$340,663	\$340,663	\$340,663	\$0	\$0	\$2,725,307
<b>Subtotal</b>	<b>\$3,747,297</b>	<b>\$0</b>	<b>\$0</b>	<b>\$29,978,377</b>							
Contingency (20%)	\$749,459	\$749,459	\$749,459	\$749,459	\$749,459	\$749,459	\$749,459	\$749,459	\$0	\$0	\$5,995,675
<b>Total</b>	<b>\$4,496,757</b>	<b>\$0</b>	<b>\$0</b>	<b>\$35,974,052</b>							

1

**Managed Wetland**

Land Assembly by Conservation Zone	Acres Acquired by Period										Total Acreage	
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	1,896	2,904	594	594	528	528	528	528	528	0	0	8,100
<b>Total</b>	<b>1,896</b>	<b>2,904</b>	<b>594</b>	<b>594</b>	<b>528</b>	<b>528</b>	<b>528</b>	<b>528</b>	<b>528</b>	<b>0</b>	<b>0</b>	<b>8,100</b>
<b>Running Total</b>	<b>1,896</b>	<b>4,800</b>	<b>5,394</b>	<b>5,988</b>	<b>6,516</b>	<b>7,044</b>	<b>7,572</b>	<b>8,100</b>	<b>8,100</b>	<b>8,100</b>	<b>8,100</b>	<b>8,100</b>

Fee-Title Purchase %	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Easement Purchase %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Easement:Fee-Title Cost Ratio	80%
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Land Assembly Cost	Cost Per Period										Total Cost
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Purchase Cost	\$2,898,036	\$4,438,764	\$907,929	\$907,929	\$807,048	\$807,048	\$807,048	\$807,048	\$0	\$0	\$12,380,850
Transaction Cost (10% of fee title cost)	\$289,804	\$443,876	\$90,793	\$90,793	\$80,705	\$80,705	\$80,705	\$80,705	\$0	\$0	\$1,238,085
<b>Subtotal</b>	<b>\$3,187,840</b>	<b>\$4,882,640</b>	<b>\$998,722</b>	<b>\$998,722</b>	<b>\$887,753</b>	<b>\$887,753</b>	<b>\$887,753</b>	<b>\$887,753</b>	<b>\$0</b>	<b>\$0</b>	<b>\$13,618,935</b>
Contingency (20%)	\$637,568	\$976,528	\$199,744	\$199,744	\$177,551	\$177,551	\$177,551	\$177,551	\$0	\$0	\$2,723,787
<b>Total</b>	<b>\$3,825,408</b>	<b>\$5,859,168</b>	<b>\$1,198,466</b>	<b>\$1,198,466</b>	<b>\$1,065,303</b>	<b>\$1,065,303</b>	<b>\$1,065,303</b>	<b>\$1,065,303</b>	<b>\$0</b>	<b>\$0</b>	<b>\$16,342,722</b>

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**Nontidal Marsh**

Land Assembly by Conservation Zone	Acres Acquired by Period										Total Acreage	
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
1	10	15	5	5	5	5	5	0	0	0	0	50
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>10</b>	<b>15</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>50</b>
<b>Running Total</b>	<b>10</b>	<b>25</b>	<b>30</b>	<b>35</b>	<b>40</b>	<b>45</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>50</b>

Fee-Title Purchase %	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Easement Purchase %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Easement:Fee-Title Cost Ratio	80%
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Land Assembly Cost	Cost Per Period										Total Cost
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Purchase Cost	\$16,206	\$24,309	\$8,103	\$8,103	\$8,103	\$8,103	\$8,103	\$0	\$0	\$0	\$81,029
Transaction Cost (10% of fee title cost)	\$1,621	\$2,431	\$810	\$810	\$810	\$810	\$810	\$0	\$0	\$0	\$8,103
<b>Subtotal</b>	<b>\$17,826</b>	<b>\$26,740</b>	<b>\$8,913</b>	<b>\$8,913</b>	<b>\$8,913</b>	<b>\$8,913</b>	<b>\$8,913</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$89,132</b>
Contingency (20%)	\$3,565	\$5,348	\$1,783	\$1,783	\$1,783	\$1,783	\$1,783	\$0	\$0	\$0	\$17,826
<b>Total</b>	<b>\$21,392</b>	<b>\$32,088</b>	<b>\$10,696</b>	<b>\$10,696</b>	<b>\$10,696</b>	<b>\$10,696</b>	<b>\$10,696</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$106,959</b>

1

**Cultivated Habitat**

Land Assembly by Conservation Zone	Acres Acquired by Period										Total Acreage
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
1	481	483	395	337	337	331	331	330	0	0	3,024
2	1,098	1,102	901	768	768	754	754	752	0	0	6,897
3	1,351	1,356	1,109	945	945	927	927	926	0	0	8,486
4	352	353	289	246	246	242	242	241	0	0	2,210
5	969	972	795	677	677	665	665	664	0	0	6,085
6	596	598	489	417	417	409	409	408	0	0	3,744
7	2,407	2,416	1,976	1,683	1,683	1,653	1,653	1,649	0	0	15,120
8	508	510	417	355	355	349	349	348	0	0	3,190
9	137	137	112	96	96	94	94	94	0	0	860
10	1	1	1	1	1	1	1	1	0	0	9
11	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>7,900</b>	<b>7,930</b>	<b>6,486</b>	<b>5,524</b>	<b>5,524</b>	<b>5,424</b>	<b>5,424</b>	<b>5,414</b>	<b>0</b>	<b>0</b>	<b>49,625</b>
<b>Running Total</b>	<b>7,900</b>	<b>15,830</b>	<b>22,316</b>	<b>27,840</b>	<b>33,364</b>	<b>38,788</b>	<b>44,211</b>	<b>49,625</b>	<b>49,625</b>	<b>49,625</b>	<b>49,625</b>

Fee-Title Purchase %	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Easement Purchase %	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%

Easement:Fee-Title Cost Ratio	80%
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Land Assembly Cost	Cost Per Period										Total Cost
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Easement	\$36,398,755	\$36,536,978	\$29,884,990	\$25,450,332	\$25,450,332	\$24,989,588	\$24,989,588	\$24,943,514	\$0	\$0	\$228,644,076
Fee-Title	\$11,374,611	\$11,417,806	\$9,339,059	\$7,953,229	\$7,953,229	\$7,809,246	\$7,809,246	\$7,794,848	\$0	\$0	\$71,451,274
Transaction Cost (10% of fee title cost)	\$5,687,305	\$5,708,903	\$4,669,530	\$3,976,614	\$3,976,614	\$3,904,623	\$3,904,623	\$3,897,424	\$0	\$0	\$35,725,637
<b>Subtotal</b>	<b>\$53,460,671</b>	<b>\$53,663,686</b>	<b>\$43,893,579</b>	<b>\$37,380,175</b>	<b>\$37,380,175</b>	<b>\$36,703,457</b>	<b>\$36,703,457</b>	<b>\$36,635,786</b>	<b>\$0</b>	<b>\$0</b>	<b>\$335,820,987</b>
Contingency (20%)	\$10,692,134	\$10,732,737	\$8,778,716	\$7,476,035	\$7,476,035	\$7,340,691	\$7,340,691	\$7,327,157	\$0	\$0	\$67,164,197
<b>Total</b>	<b>\$64,152,805</b>	<b>\$64,396,423</b>	<b>\$52,672,295</b>	<b>\$44,856,210</b>	<b>\$44,856,210</b>	<b>\$44,044,149</b>	<b>\$44,044,149</b>	<b>\$43,962,943</b>	<b>\$0</b>	<b>\$0</b>	<b>\$402,985,184</b>

1  
2

1 **Table 8.A-7. CM3 Existing Land Use Distributions**

CM3: Vernal Pool Complex Terrain							
Land Assembly by Conservation Zone	Total Acreage	% of Acres					Total
		Rangeland	Pasture/Alfalfa	Field Crop	Truck Crop	Orchard	
1	228	100	0	0	0	0	100
2	0						0
3	0						0
4	0						0
5	0						0
6	0						0
7	0						0
8	182	100	0	0	0	0	100
9	0						0
10	0						0
11	190	100	0	0	0	0	100
<b>Total</b>	<b>600</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>100</b>

CM3: Alkali Seasonal Wetland Complex							
Land Assembly by Conservation Zone	Total Acreage	% of Acres					Total
		Rangeland	Pasture/Alfalfa	Field Crop	Truck Crop	Orchard	
1	56	100	0	0	0	0	100
2	0						0
3	0						0
4	0						0
5	0						0
6	0						0
7	0						0
8	38	100	0	0	0	0	100
9	0						0
10	0						0
11	56	100	0	0	0	0	100
<b>Total</b>	<b>150</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>100</b>

2

CM3: Valley/Foothill Riparian							
Land Assembly by Conservation Zone	Total Acreage	% of Acres					Total
		Native Veg	Pasture/Alfalfa	Field Crop	Truck Crop	Orchard	
1	0	100	0	0	0	0	100
2	0	100	0	0	0	0	100
3	0	100	0	0	0	0	100
4	0	100	0	0	0	0	100
5	0	100	0	0	0	0	100
6	0	100	0	0	0	0	100
7	750	100	0	0	0	0	100
8	0	100	0	0	0	0	100
9	0	100	0	0	0	0	100
10	0	100	0	0	0	0	100
11	0	100	0	0	0	0	100
<b>Total</b>	<b>750</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>100</b>

CM3: Grassland							
Land Assembly by Conservation Zone	Total Acreage	% of Acres					Total
		Rangeland	Pasture/Alfalfa	Field Crop	Truck Crop	Orchard	
1	5,046	75	25				100
2	0						0
3	0						0
4	0						0
5	0						0
6	0						0
7	0						0
8	1,384	82	18				100
9	0						0
10	0						0
11	1,570	83	17				100
<b>Total</b>	<b>8,000</b>	<b>78</b>	<b>22</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>100</b>

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<b>CM3: Managed Wetland</b>							
<b>Land Assembly by Conservation Zone</b>	<b>Total Acreage</b>	<b>% of Acres</b>					<b>Total</b>
		<b>Native Veg</b>	<b>Pasture/ Alfalfa</b>	<b>Field Crop</b>	<b>Truck Crop</b>	<b>Orchard</b>	
1	0						0
2	0						0
3	0						0
4	0						0
5	0						0
6	0						0
7	0						0
8	0						0
9	0						0
10	0						0
11	8,100	100					100
<b>Total</b>	<b>8,100</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>100</b>
<b>CM3: Cultivated Habitat</b>							
<b>Land Assembly by Conservation Zone</b>	<b>Total Acreage</b>	<b>% of Acres</b>					<b>Total</b>
		<b>Rangeland</b>	<b>Pasture/ Alfalfa</b>	<b>Field Crop</b>	<b>Truck Crop</b>	<b>Orchard/ Vineyard</b>	
1	3,024	0	76	24	0	0	100
2	6,897	0	10	26	64	0	100
3	8,486	0	89	11	0	0	100
4	2,210	0	92	8	0	0	100
5	6,085	0	13	65	12	10	100
6	3,744	0	18	68	12	2	100
7	15,120	0	91	9	0	0	100
8	3,190	0	90	10	0	0	100
9	860	0	81	19	0	0	100
10	9	0	62	38	0	0	100
11		0	0	100	0	0	100
<b>Total</b>	<b>49,625</b>	<b>0</b>	<b>63</b>	<b>24</b>	<b>11</b>	<b>1</b>	<b>100</b>

<b>CM3: Nontidal Marsh</b>							
<b>Land Assembly by Conservation Zone</b>	<b>Total Acreage</b>	<b>% of Acres</b>					<b>Total</b>
		<b>Native Veg</b>	<b>Pasture/ Alfalfa</b>	<b>Field Crop</b>	<b>Truck Crop</b>	<b>Orchard/ Vineyard</b>	
1	50	100	0	0	0	0	100
2	0						0
3	0						0
4	0						0
5	0						0
6	0						0
7	0						0
8	0						0
9	0						0
10	0						0
11	0						0
<b>Total</b>	<b>50</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>100</b>

<b>CM3: Total Requirement</b>							
<b>Land Assembly by Conservation Zone</b>	<b>Total Acreage</b>	<b>% of Acres</b>					<b>Total</b>
		<b>Rangeland /Native</b>	<b>Pasture/ Alfalfa</b>	<b>Field Crop</b>	<b>Truck Crop</b>	<b>Orchard</b>	
1	8,404	49	42	9	0	0	100
2	6,897	0	10	26	64	0	100
3	8,486	0	89	11	0	0	100
4	2,210	0	92	8	0	0	100
5	6,085	0	13	65	12	10	100
6	3,744	0	18	68	12	2	100
7	15,870	5	87	9	0	0	100
8	4,794	28	65	7	0	0	100
9	860	0	81	19	0	0	100
10	9	0	62	38	0	0	100
11	9,916	97	3	0	0	0	100
<b>Total</b>	<b>67,275</b>	<b>24</b>	<b>49</b>	<b>18</b>	<b>8</b>	<b>1</b>	<b>100</b>

## 1 **8.A.1.4 CM4 Tidal Natural Communities Restoration**

### 2 **8.A.1.4.1 Land Acquisition**

3 Spatial data from DWR land use surveys, county parcel maps, and the tidal natural communities  
4 footprints are combined to determine the number of parcels and amount of acreage by land use  
5 classification that will need to be acquired in each restoration opportunity area (ROA). Table 8.A-8  
6 and Table 8.A-9 provide data and assumptions to estimate tidal natural communities construction  
7 costs. Cost estimates developed by Philip Williams and Associates for Scenario A are used in  
8 Chapter 8. Table 8.A-10 shows the CM4 construction costs by 5-year period. Table 8.A-11 shows the  
9 land acquisition costs by 5-year period.

1 **Table 8.A-8. CM4 Restoration Opportunity Area Per Acre Land Value Assumptions by Land Use Category**

(\$/Acre, 2012 Dollars)

ROA*	Native Veg.	Field Crop	Truck Crop	Orchard	Vineyard	Semi Ag	Urban
Cache Slough	\$ 1,621	\$ 5,220	\$ 6,492	\$ 8,479	\$ 18,549	\$ 123,481	\$135,671
Cosumnes/Mokelumne	\$ 1,621	\$ 4,902	\$ 4,902	\$ 17,224	\$ 16,694	\$ 123,481	\$135,671
East Delta	\$ 1,621	\$ 4,902	\$ 4,902	\$ 17,224	\$ 16,694	\$ 123,481	\$135,671
South Delta	\$ 1,621	\$ 4,902	\$ 4,902	\$ 17,224	\$ 16,694	\$ 123,481	\$135,671
Suisun Marsh	\$ 3,641	\$ 5,220	\$ 6,492	\$ 8,479	\$ 18,549	\$ 123,481	\$135,671
West Delta	\$ 1,621	\$ 4,902	\$ 4,902	\$ 17,224	\$ 16,694	\$ 123,481	\$135,671
Yolo Bypass	\$ 1,621	\$ 5,220	\$ 6,492	\$ 8,479	\$ 18,549	\$ 123,481	\$135,671

\* Values for field, truck, orchard, and vineyard are the average of the low and mid-point value estimates in the

2009 CSFMRA Report

4 **Table 8.A-9. CM4 Tidal Natural Communities Restoration Construction: Scenario A Cost Estimate (2009 dollars)**

CM4: Tidal Habitat Restoration Footprint								
Acres Acquired	Total Acquisition							Total Acres
	Native Veg.	Field Crop	Truck Crop	Orchard	Vineyard	Semi Ag	Urban	
Cache Slough ROA	6,022	16,428	0	0	0	1,682	199	24,333
Cosumnes River ROA	239	1,991	904	116	216	196	24	3,685
East Delta ROA	0	0	0	0	0	0	0	0
South Delta ROA	793	15,146	6,143	639	1,204	2,127	238	26,290
Suisun Marsh ROA	7,793	425	0	0	0	8	30	8,256
West Delta ROA	1,180	1,034	0	15	14	90	104	2,436
<b>Total</b>	<b>16,027</b>	<b>35,025</b>	<b>7,047</b>	<b>770</b>	<b>1,434</b>	<b>4,102</b>	<b>595</b>	<b>65,000</b>

Land Acquisition Costs

Acres Acquired by Costing Period	Cost Period										Total Acreage	% Private
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
Cache Slough ROA	3,051	3,051	3,622	2,929	2,939	2,939	2,901	2,901	-	-	24,333	90%
Cosumnes River ROA	462	462	549	444	445	445	439	439	-	-	3,685	80%
East Delta ROA	-	-	-	-	-	-	-	-	-	-	-	0%
South Delta ROA	3,296	3,296	3,913	3,165	3,175	3,175	3,135	3,135	-	-	26,290	100%
Suisun Marsh ROA	1,035	1,035	1,229	994	997	997	984	984	-	-	8,256	90%
West Delta ROA	305	305	363	293	294	294	290	290	-	-	2,436	70%
Yolo Bypass ROA	-	-	-	-	-	-	-	-	-	-	-	-
<b>Total</b>	<b>8,150</b>	<b>8,150</b>	<b>9,675</b>	<b>7,825</b>	<b>7,850</b>	<b>7,850</b>	<b>7,750</b>	<b>7,750</b>	<b>-</b>	<b>-</b>	<b>65,000</b>	
<b>Running Total</b>	<b>8,150</b>	<b>16,300</b>	<b>25,975</b>	<b>33,800</b>	<b>41,650</b>	<b>49,500</b>	<b>57,250</b>	<b>65,000</b>	<b>65,000</b>	<b>65,000</b>	<b>65,000</b>	

Private Acres Acquired	Cost Period										Total Acreage	Fee-Title Cost (\$/Acre)*
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
Cache Slough ROA	2,746	2,746	3,260	2,636	2,645	2,645	2,611	2,611	-	-	21,899.26	\$4,255
Cosumnes River ROA	370	370	439	355	356	356	351	351	-	-	2,948.05	\$5,822
East Delta ROA	-	-	-	-	-	-	-	-	-	-	-	\$0
South Delta ROA	3,296	3,296	3,913	3,165	3,175	3,175	3,135	3,135	-	-	26,290.20	\$5,716
Suisun Marsh ROA	932	932	1,106	895	897	897	886	886	-	-	7,430.58	\$3,722
West Delta ROA	214	214	254	205	206	206	203	203	-	-	1,704.99	\$3,329
Yolo Bypass ROA	-	-	-	-	-	-	-	-	-	-	-	-
<b>Total</b>	<b>7,557.32</b>	<b>7,557.32</b>	<b>8,971.42</b>	<b>7,255.95</b>	<b>7,279.13</b>	<b>7,279.13</b>	<b>7,186.41</b>	<b>7,186.41</b>	<b>-</b>	<b>-</b>	<b>60,273.08</b>	
<b>Running Total</b>	<b>7,557.32</b>	<b>15,114.63</b>	<b>24,086.05</b>	<b>31,342.00</b>	<b>38,621.14</b>	<b>45,900.27</b>	<b>53,086.68</b>	<b>60,273.08</b>	<b>60,273.08</b>	<b>60,273.08</b>	<b>60,273.08</b>	

Land Purchase Cost	Land Purchase Cost Per Costing Period										Total Cost	Avg Cost Per Acre
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
Cache Slough ROA	\$ 11,682,628	\$ 11,682,628	\$ 13,868,642	\$ 11,216,757	\$ 11,252,593	\$ 11,252,593	\$ 11,109,248	\$ 11,109,248	\$ -	\$ -	\$ 93,174,336	\$4,255
Cosumnes River ROA	\$ 2,152,111	\$ 2,152,111	\$ 2,554,807	\$ 2,066,291	\$ 2,072,892	\$ 2,072,892	\$ 2,046,486	\$ 2,046,486	\$ -	\$ -	\$ 17,164,075	\$5,822
East Delta ROA	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	-
South Delta ROA	\$ 18,841,927	\$ 18,841,927	\$ 22,367,563	\$ 18,090,561	\$ 18,148,359	\$ 18,148,359	\$ 17,917,169	\$ 17,917,169	\$ -	\$ -	\$ 150,273,034	\$5,716
Suisun Marsh ROA	\$ 3,468,037	\$ 3,468,037	\$ 4,116,964	\$ 3,329,741	\$ 3,340,379	\$ 3,340,379	\$ 3,297,826	\$ 3,297,826	\$ -	\$ -	\$ 27,659,188	\$3,722
West Delta ROA	\$ 711,640	\$ 711,640	\$ 844,800	\$ 683,262	\$ 685,445	\$ 685,445	\$ 676,713	\$ 676,713	\$ -	\$ -	\$ 5,675,658	\$3,329
Yolo Bypass ROA	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	-
<b>Total</b>	<b>\$ 36,856,343</b>	<b>\$ 36,856,343</b>	<b>\$ 43,752,775</b>	<b>\$ 35,386,611</b>	<b>\$ 35,499,668</b>	<b>\$ 35,499,668</b>	<b>\$ 35,047,443</b>	<b>\$ 35,047,443</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 293,946,292</b>	<b>\$4,877</b>
<b>Running Total</b>	<b>\$ 36,856,343</b>	<b>\$ 73,712,686</b>	<b>\$ 117,465,461</b>	<b>\$ 152,852,072</b>	<b>\$ 188,351,739</b>	<b>\$ 223,851,407</b>	<b>\$ 258,898,850</b>	<b>\$ 293,946,292</b>	<b>\$ 293,946,292</b>	<b>\$ 293,946,292</b>	<b>\$ 293,946,292</b>	

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Due Diligence Assumptions	
Due Diligence Multiplier	1.25
Appraisal Cost (\$/Parcel)	\$ 5,512
Preliminary Title Report (\$/Parcel)	\$ 551
Phase 1 Site Assessment (\$/Parcel)	\$ 7,165
Legal Description (\$/Parcel)	\$ 4,520
Boundary Survey (\$/Linear Foot of Boundary)	\$ 0.50
Monumentation (\$/Linear Foot of Boundary)	\$ 0.38

<< Applied to number of acquired parcels to account for parcels surveyed, etc., but not ultimately purchased.

Pre-Acquisition Survey Assumptions	
Survey Multiplier	1.25
Land cover type svry (hrs/100 acres)	12
Covered species habitat svry (hrs/100 acres)	16
Covered plant habitat svry (hrs/100 acres)	32
Covered wildlife svry (hrs/100 acres)	28
Contractor Cost (\$/hr)	\$ 135.67

<< Applied to number of acquired acres to account for acres surveyed, etc., but not ultimately purchased. Same as Due Diligence Multiplier.  
 Includes surveys for federal and state jurisdictional waters and wetland delineation, and submitting of a report to the USACE and obtaining a verification (including hours to respond to changes required by USACE).  
 Includes three visits during the blooming season to cover different blooming times.

Parcel Assumptions for Due Diligence Co	Near-Term		Early Long-Term		Late Long-Term	
	Parcels in Footprint	Tot Boundary Length (lf)	Parcels in Footprint	Tot Boundary Length (lf)	Parcels in Footprint	Tot Boundary Length (lf)
Cache Slough ROA	22.5	323990.1	18.9	323630.1	54	633957.3
Cosumnes River ROA	13.6	173516.8	0	0	4	45627.2
East Delta ROA	0	0	0	0	0	0
South Delta ROA	0	0	0	0	90	1048543
Suisun Marsh ROA	15.3	209061.9	3.6	49139.1	10.8	165081.6
West Delta ROA	7	80045	19.6	82296.2	27.3	287443.1
Yolo Bypass ROA	0	0	0	0	0	0

Due Diligence Cost	Cost Period										Total Cost
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Cache Slough ROA	\$ 427,703	\$ 427,703	\$ 775,146	\$ 379,010	\$ 379,010	\$ 379,010	\$ 379,010	\$ 379,010	\$ 379,010		\$ 3,525,602
Cosumnes River ROA	\$ 246,253	\$ 246,253	\$ -	\$ 27,782	\$ 27,782	\$ 27,782	\$ 27,782	\$ 27,782	\$ 27,782		\$ 631,414
East Delta ROA	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -		\$ -
South Delta ROA	\$ -	\$ -	\$ -	\$ 629,913	\$ 629,913	\$ 629,913	\$ 629,913	\$ 629,913	\$ 629,913		\$ 3,149,564
Suisun Marsh ROA	\$ 284,652	\$ 284,652	\$ 133,897	\$ 84,223	\$ 84,223	\$ 84,223	\$ 84,223	\$ 84,223	\$ 84,223		\$ 1,124,314
West Delta ROA	\$ 121,654	\$ 121,654	\$ 525,306	\$ 184,341	\$ 184,341	\$ 184,341	\$ 184,341	\$ 184,341	\$ 184,341		\$ 1,690,318
Yolo Bypass ROA	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -		\$ -
<b>Total</b>	<b>\$ 1,080,261</b>	<b>\$ 1,080,261</b>	<b>\$ 1,434,349</b>	<b>\$ 1,305,268</b>	<b>\$ -</b>	<b>\$ 10,121,211</b>					

Pre-Acquisition Survey Cost	Cost Period										Total Cost
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Cache Slough ROA	\$ 455,316	\$ 455,316	\$ 540,513	\$ 437,159	\$ 438,555	\$ 438,555	\$ 432,969	\$ 432,969	\$ -	\$ -	\$ 3,631,351
Cosumnes River ROA	\$ 68,956	\$ 68,956	\$ 81,858	\$ 66,206	\$ 66,417	\$ 66,417	\$ 65,571	\$ 65,571	\$ -	\$ -	\$ 549,953
East Delta ROA	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
South Delta ROA	\$ 491,948	\$ 491,948	\$ 584,000	\$ 472,331	\$ 473,840	\$ 473,840	\$ 467,804	\$ 467,804	\$ -	\$ -	\$ 3,923,514
Suisun Marsh ROA	\$ 154,492	\$ 154,492	\$ 183,400	\$ 148,331	\$ 148,805	\$ 148,805	\$ 146,910	\$ 146,910	\$ -	\$ -	\$ 1,232,144
West Delta ROA	\$ 45,577	\$ 45,577	\$ 54,106	\$ 43,760	\$ 43,900	\$ 43,900	\$ 43,340	\$ 43,340	\$ -	\$ -	\$ 363,500
Yolo Bypass ROA	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Total</b>	<b>\$ 1,216,289</b>	<b>\$ 1,216,289</b>	<b>\$ 1,443,876</b>	<b>\$ 1,167,786</b>	<b>\$ 1,171,517</b>	<b>\$ 1,171,517</b>	<b>\$ 1,156,593</b>	<b>\$ 1,156,593</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 9,700,461</b>

1 **Table 8.A-10. CM4 Tidal Natural Communities Restoration Construction Cost Estimate**

Source: PWA Tidal Marsh Construction Cost Estimate (Scenario A) BDCPPublicDraft.xlsx

Unit Costs*												
Permitting, planning, design, CM (\$/acre)												
Mass grading (\$/acre)												
Temporary levees (\$/acre)												
Long-term levees (\$/acre)												
Restoration and vegetation (\$/acre)												
Cost uncertainty contingency (\$/acre)												
Site specific factors contingency (\$/acre)												
<b>Total (\$/acre)</b>												

\*Unit costs averaged across all acres in all ROAs with tidal restoration footprint. Unit costs derived from PWA (2009), which estimated construction cost separately for each ROA. Unit costs updated from 2009 to 2012 dollars.

Construction Cost	Cost Period										Total Cost
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Permitting, planning, design, CM	\$39,924,939	\$39,924,939	\$47,395,556	\$38,332,840	\$38,455,309	\$38,455,309	\$37,965,433	\$37,965,433	\$0	\$0	\$318,419,758
Mass grading	\$4,820,085	\$4,820,085	\$5,722,003	\$4,627,873	\$4,642,659	\$4,642,659	\$4,583,517	\$4,583,517	\$0	\$0	\$38,442,398
Temporary levees	\$32,307,795	\$32,307,795	\$38,353,118	\$31,019,447	\$31,118,551	\$31,118,551	\$30,722,136	\$30,722,136	\$0	\$0	\$257,669,527
Long-term levees	\$41,267,246	\$41,267,246	\$48,989,031	\$39,621,619	\$39,748,206	\$39,748,206	\$39,241,859	\$39,241,859	\$0	\$0	\$329,125,272
Restoration and vegetation establishment	\$35,574,419	\$35,574,419	\$42,230,982	\$34,155,807	\$34,264,931	\$34,264,931	\$33,828,435	\$33,828,435	\$0	\$0	\$283,722,360
<b>Subtotal</b>	<b>\$153,894,483</b>	<b>\$153,894,483</b>	<b>\$182,690,690</b>	<b>\$147,757,587</b>	<b>\$148,229,656</b>	<b>\$148,229,656</b>	<b>\$146,341,380</b>	<b>\$146,341,380</b>	<b>\$0</b>	<b>\$0</b>	<b>\$1,227,379,316</b>
Cost uncertainty contingency	\$16,430,016	\$16,430,016	\$19,504,344	\$15,774,831	\$15,825,230	\$15,825,230	\$15,623,635	\$15,623,635	\$0	\$0	\$131,036,938
Site specific factors contingency	\$21,906,688	\$21,906,688	\$26,005,792	\$21,033,108	\$21,100,307	\$21,100,307	\$20,831,513	\$20,831,513	\$0	\$0	\$174,715,917
<b>Total construction</b>	<b>\$ 192,231,187</b>	<b>\$ 192,231,187</b>	<b>\$ 228,200,827</b>	<b>\$ 184,565,527</b>	<b>\$ 185,155,193</b>	<b>\$ 185,155,193</b>	<b>\$ 182,796,528</b>	<b>\$ 182,796,528</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 1,533,132,170</b>

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1 **Table 8.A-11. CM4 Cost Estimate by 5-Year Period**

Capital Costs	Cost Period										Total
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Land Acquisition	\$46,983,471	\$46,983,471	\$55,957,200	\$45,431,599	\$45,571,744	\$45,571,744	\$45,011,165	\$45,011,165	\$0	\$0	\$ 376,521,558
Construction	\$192,231,187	\$192,231,187	\$228,200,827	\$184,565,527	\$185,155,193	\$185,155,193	\$182,796,528	\$182,796,528	\$0	\$0	\$ 1,533,132,170
<b>Total</b>	<b>\$239,214,658</b>	<b>\$239,214,658</b>	<b>\$284,158,027</b>	<b>\$229,997,126</b>	<b>\$230,726,936</b>	<b>\$230,726,936</b>	<b>\$227,807,693</b>	<b>\$227,807,693</b>	<b>\$0</b>	<b>\$0</b>	<b>\$ 1,909,653,728</b>

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## 1 **8.A.1.5 CM5 Seasonally Inundated Floodplain Restoration**

### 2 **8.A.1.5.1 Land Acquisition**

3 Floodplain development is expected to involve land acquisition through fee-title and easements.  
4 Table 8.A-12 shows the land acquisition costs by 5-year period. Table 8.A-13 shows the construction  
5 cost assumptions and costs by 5-year period. The high and low CM5 cost shares by 5-year period are  
6 shown in Table 8.A-14.

1 **Table 8.A-12. CM5 Restoration Assumptions and Costs by 5-Year Period**

Total Flood Plain Acres	
San Joaquin River	7,000
Old and Middle Rivers	3,000

Miles of Setback Levees	Cost Period										Total Miles
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
San Joaquin River	-	-	4.0	7.2	7.2	7.2	7.2	7.2	-	-	40.0
Old and Middle Rivers	-	-	1.7	3.1	3.1	3.1	3.1	3.1	-	-	17.0
<b>Total</b>	-	-	<b>5.7</b>	<b>10.3</b>	<b>10.3</b>	<b>10.3</b>	<b>10.3</b>	<b>10.3</b>	-	-	<b>57.0</b>
<b>Running Total</b>	-	-	<b>5.7</b>	<b>16.0</b>	<b>26.2</b>	<b>36.5</b>	<b>46.7</b>	<b>57.0</b>	<b>57.0</b>	<b>57.0</b>	<b>57.0</b>

Setback Assumptions	
Avg Levee Footprint (ft)	160
Avg Interior Levee Setback Per Channel Bank (ft)	1447

Land Easement/Purchase Requirement (Acres)	Cost Period										Total Acres
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
San Joaquin River	-	-	779	1,403	1,403	1,403	1,403	1,403	-	-	7,793
Old and Middle Rivers	-	-	331	596	596	596	596	596	-	-	3,312
<b>Total</b>	-	-	<b>1,111</b>	<b>1,999</b>	<b>1,999</b>	<b>1,999</b>	<b>1,999</b>	<b>1,999</b>	-	-	<b>11,105</b>
<b>Running Total</b>	-	-	<b>1,111</b>	<b>3,110</b>	<b>5,109</b>	<b>7,107</b>	<b>9,106</b>	<b>11,105</b>	<b>11,105</b>	<b>11,105</b>	<b>11,105</b>
<b>Created Flood Plain Habitat (Total Land Area - Levee Footprint)</b>	-	-	<b>1,000</b>	<b>2,800</b>	<b>4,600</b>	<b>6,400</b>	<b>8,200</b>	<b>10,000</b>	<b>10,000</b>	<b>10,000</b>	<b>10,000</b>

Footprint Land Use Assumptions	% of Total	Cost/Acre
Native Veg	9%	1,621
Field Crop	59%	6,094
Truck Crop	27%	6,094
Orchard	1%	18,549
Vineyard	4%	17,489
Semi Ag		
Urban		

Easement to Fee-Title Cost Ratio	60%
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Land Cost Assumptions	Cost Per Acre		% of Acquired Land	
	Easement	Purchase	Easement	Purchase
San Joaquin River	\$3,745	\$6,242	51.7%	48.3%
Old and Middle Rivers	\$3,745	\$6,242	51.7%	48.3%

Easement Cost	Cost Period										Total Cost	
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
San Joaquin River	\$0	\$0	\$1,509,048	\$2,716,286	\$2,716,286	\$2,716,286	\$2,716,286	\$2,716,286	\$2,716,286	\$0	\$0	\$15,090,480
Old and Middle Rivers	\$0	\$0	\$641,345	\$1,154,422	\$1,154,422	\$1,154,422	\$1,154,422	\$1,154,422	\$1,154,422	\$0	\$0	\$6,413,454
<b>Total</b>	\$ -	\$ -	\$ 2,150,393	\$ 3,870,708	\$ 3,870,708	\$ 3,870,708	\$ 3,870,708	\$ 3,870,708	\$ 3,870,708	\$ -	\$ -	\$21,503,934

Fee-Title Cost	Cost Period										Total Cost	
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
San Joaquin River	\$0	\$0	\$2,349,678	\$4,229,421	\$4,229,421	\$4,229,421	\$4,229,421	\$4,229,421	\$4,229,421	\$0	\$0	\$23,496,782
Old and Middle Rivers	\$0	\$0	\$998,613	\$1,797,504	\$1,797,504	\$1,797,504	\$1,797,504	\$1,797,504	\$1,797,504	\$0	\$0	\$9,986,132
<b>Total</b>	\$ -	\$ -	\$ 3,348,291	\$ 6,026,925	\$ 6,026,925	\$ 6,026,925	\$ 6,026,925	\$ 6,026,925	\$ 6,026,925	\$ -	\$ -	\$33,482,914

Total Land Acquisition Cost	Cost Period										Total Cost	
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
Due Dilligence/Surveys	\$0	\$0	\$693,228	\$1,247,810	\$1,247,810	\$1,247,810	\$1,247,810	\$1,247,810	\$1,247,810	\$0	\$0	\$6,932,280
Easements	\$0	\$0	\$2,150,393	\$3,870,708	\$3,870,708	\$3,870,708	\$3,870,708	\$3,870,708	\$3,870,708	\$0	\$0	\$21,503,934
Fee-Title	\$0	\$0	\$3,348,291	\$6,026,925	\$6,026,925	\$6,026,925	\$6,026,925	\$6,026,925	\$6,026,925	\$0	\$0	\$33,482,914
<b>Subtotal</b>	\$0	\$0	\$6,191,913	\$11,145,443	\$11,145,443	\$11,145,443	\$11,145,443	\$11,145,443	\$11,145,443	\$0	\$0	\$61,919,128
Contingency @ 20%	\$0	\$0	\$1,238,383	\$2,229,089	\$2,229,089	\$2,229,089	\$2,229,089	\$2,229,089	\$2,229,089	\$0	\$0	\$12,383,826
<b>Total</b>	\$0	\$0	\$7,430,295	\$13,374,532	\$13,374,532	\$13,374,532	\$13,374,532	\$13,374,532	\$13,374,532	\$0	\$0	\$74,302,953

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1 **Table 8.A-13. CM5 Construction Assumptions and Costs by 5-Year Period**

**Construction Cost Assumptions**

Source assumptions: [Setback Levee Construction Cost](#)

Levee Construction Cost Assumptions	
Levee Construction (\$/mi)	
Mobilization	\$287,087
Levee Construction	\$8,223,585
Other	\$767,646
Subtotal Construction	\$9,278,318
Permitting/Design/Engineering @ 18% of Const.	\$1,670,513
Construction Management @ 7% of Const.	\$649,066
Total Construction & Allowances	\$11,597,897
Contingency @ 20%	\$2,319,579
Grand Total (\$/mi)	\$13,917,476

Floodplain Revegetation Cost Assumptions	
Cost/Acre	
Revegetation/Erosion Control/Grading	\$10,270
Permitting/Design/Engineering @ 18% of Const.	\$1,849
Construction Management @ 7% of Const.	\$719
Subtotal	\$12,837
Contingency @ 20%	\$2,567
Grand Total (\$/acre)	\$15,405

Levee Construction	Cost Period										Total
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Miles of Levee	-	-	5.7	10.3	10.3	10.3	10.3	10.3	-	-	57
Acres of revegetation	0	0	483	869	869	869	869	869	0	0	4,830

Planning, Construction & Oversight*	Cost Period										Total Cost	
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
Permitting/Design/Engineering @ 18% of Const.	\$ -	\$ -	\$ 10,414,781	\$ 18,746,607	\$ 18,746,607	\$ 18,746,607	\$ 18,746,607	\$ 18,746,607	\$ 18,746,607	\$ -	\$ -	\$ 104,147,814
Construction Management @ 7% of Const.	\$ -	\$ -	\$ 4,046,899	\$ 7,284,418	\$ 7,284,418	\$ 7,284,418	\$ 7,284,418	\$ 7,284,418	\$ 7,284,418	\$ -	\$ -	\$ 40,468,989
Levee Construction	\$ -	\$ -	\$ 52,886,410	\$ 95,195,538	\$ 95,195,538	\$ 95,195,538	\$ 95,195,538	\$ 95,195,538	\$ 95,195,538	\$ -	\$ -	\$ 528,864,099
Revegetation/Erosion Control/Benches	\$ -	\$ -	\$ 4,960,311	\$ 8,928,560	\$ 8,928,560	\$ 8,928,560	\$ 8,928,560	\$ 8,928,560	\$ 8,928,560	\$ -	\$ -	\$ 49,603,113
Subtotal	\$ -	\$ -	\$ 72,308,401	\$ 130,155,123	\$ 130,155,123	\$ 130,155,123	\$ 130,155,123	\$ 130,155,123	\$ 130,155,123	\$ -	\$ -	\$ 723,084,015
Contingency @ 20%	\$ -	\$ -	\$ 14,461,680	\$ 26,031,025	\$ 26,031,025	\$ 26,031,025	\$ 26,031,025	\$ 26,031,025	\$ 26,031,025	\$ -	\$ -	\$ 144,616,803
Total	\$ -	\$ -	\$ 86,770,082	\$ 156,186,147	\$ 156,186,147	\$ 156,186,147	\$ 156,186,147	\$ 156,186,147	\$ 156,186,147	\$ -	\$ -	\$ 867,700,817

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1 **Table 8.A-14. CM5 Costs by 5-Year Period**

Capital Costs	Cost Period										Total Cost	
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
Land acquisition	\$ -	\$ -	\$ 7,430,295	\$ 13,374,532	\$ 13,374,532	\$ 13,374,532	\$ 13,374,532	\$ 13,374,532	\$ 13,374,532	\$ -	\$ -	\$ 74,302,953
Construction	\$ -	\$ -	\$ 86,770,082	\$ 156,186,147	\$ 156,186,147	\$ 156,186,147	\$ 156,186,147	\$ 156,186,147	\$ 156,186,147	\$ -	\$ -	\$ 867,700,817
<b>Total</b>	\$ -	\$ -	\$ 94,200,377	\$ 169,560,679	\$ 169,560,679	\$ 169,560,679	\$ 169,560,679	\$ 169,560,679	\$ 169,560,679	\$ -	\$ -	\$ 942,003,771

**Low Cost Share**

Low Cost Share 50%

Capital Costs	Cost Period										Total Cost	
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
<b>Total</b>	\$ -	\$ -	\$ 47,100,189	\$ 84,780,339	\$ 84,780,339	\$ 84,780,339	\$ 84,780,339	\$ 84,780,339	\$ 84,780,339	\$ -	\$ -	\$ 471,001,885

**High Cost Share**

High Cost Share 75%

Capital Costs	Cost Period										Total Cost	
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
<b>Total</b>	\$ -	\$ -	\$ 70,650,283	\$ 127,170,509	\$ 127,170,509	\$ 127,170,509	\$ 127,170,509	\$ 127,170,509	\$ 127,170,509	\$ -	\$ -	\$ 706,502,828

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## 1 **8.A.1.6 CM6 Channel Margin Enhancement**

### 2 **8.A.1.6.1 Construction**

3 This conservation measure provides for the enhancement of 20 linear miles of channel margin  
4 habitat in the Delta. For the cost analysis, it is assumed that channel margin enhancement will entail  
5 creating low benches that support emergent vegetation and higher elevation benches that support  
6 riparian vegetation along existing levees. The estimated costs for CM6 by 5-year period are shown in  
7 Table 8.A-15. Costs only run through year 30; therefore, the tables do not show the full 50-year  
8 permit period.



### 1 **8.A.1.7 CM7 Riparian Natural Community Restoration**

2 This conservation measure provides for the establishment of 5,000 acres of riparian forest and  
3 scrub in areas of restored tidal marsh, floodplain, and channel margin. Establishment of riparian  
4 habitat will rely on both natural recruitment and active planting. Nonnative vegetation in riparian  
5 restoration areas will be controlled during the first 3 years of native riparian establishment. The  
6 natural recruitment and planting costs are summarized by 5-year period in Table 8.A-16. The weed  
7 control costs are summarized by 5-year period in Table 8.A-17.

1 **Table 8.A-16. CM7 Recruitment and Planting Costs by 5-Year Period**

**Prorated Acreage by Cost Period**

Natural Recruitment Summary	Cost Period										Total Acres
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Suisun Marsh	0	0	0	0	0	0	0	0	0	0	0
Cache Slough	46	46	84	14	14	14	14	14	14	14	14
West Delta	14	14	26	1	1	1	1	1	1	1	1
Cosumnes	16	16	0	0	0	0	0	0	0	0	0
East Delta	0	0	0	16	16	16	16	16	16	16	16
South Delta	0	0	0	169	169	169	169	169	169	169	169
Channel Margin											0
Floodplain											0
<b>Total</b>	<b>77</b>	<b>77</b>	<b>110</b>	<b>200</b>	<b>200</b>	<b>200</b>	<b>200</b>	<b>200</b>	<b>200</b>	<b>200</b>	<b>1,664</b>
<b>Running Total</b>	<b>77</b>	<b>153</b>	<b>263</b>	<b>463</b>	<b>663</b>	<b>863</b>	<b>1,064</b>	<b>1,264</b>	<b>1,464</b>	<b>1,664</b>	<b>1,664</b>

Active Planting Summary	Cost Period										Total Acres
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Suisun Marsh	0	0	0	0	0	0	0	0	0	0	0
Cache Slough	14	14	25	4	4	4	4	4	4	4	4
West Delta	4	4	8	0	0	0	0	0	0	0	0
Cosumnes	5	5	0	0	0	0	0	0	0	0	0
East Delta	0	0	0	5	5	5	5	5	5	5	5
South Delta	0	0	0	51	51	51	51	51	51	51	51
Channel Margin	9	9	0	8	8	8	8	8	8	8	8
Floodplain	541	541	857	118	118	118	118	118	118	118	118
<b>Total</b>	<b>573</b>	<b>573</b>	<b>890</b>	<b>186</b>	<b>3,336</b>						
<b>Running Total</b>	<b>573</b>	<b>1,147</b>	<b>2,037</b>	<b>2,222</b>	<b>2,408</b>	<b>2,594</b>	<b>2,779</b>	<b>2,965</b>	<b>3,151</b>	<b>3,336</b>	<b>3,336</b>

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<b>Active Planting Cost</b>											
Unit planting cost (\$/acre)	\$4,208										
<b>Active Planting Cost Summary</b>	<b>Cost Period</b>										<b>Total Cost</b>
	<b>1-5</b>	<b>6-10</b>	<b>11-15</b>	<b>16-20</b>	<b>21-25</b>	<b>26-30</b>	<b>31-35</b>	<b>36-40</b>	<b>41-45</b>	<b>46-50</b>	
Suisun Marsh	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$ -
Cache Slough	\$58,039	\$58,039	\$105,760	\$18,265	\$18,265	\$18,265	\$18,265	\$18,265	\$18,265	\$18,265	\$ 349,696
West Delta	\$18,159	\$18,159	\$32,910	\$682	\$682	\$682	\$682	\$682	\$682	\$682	\$ 73,998
Cosumnes	\$20,651	\$20,651	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$ 41,302
East Delta	\$0	\$0	\$0	\$20,490	\$20,490	\$20,490	\$20,490	\$20,490	\$20,490	\$20,490	\$ 143,428
South Delta	\$0	\$0	\$0	\$213,116	\$213,116	\$213,116	\$213,116	\$213,116	\$213,116	\$213,116	\$ 1,491,812
Channel Margin	\$38,254	\$38,254	\$0	\$32,789	\$32,789	\$32,789	\$32,789	\$32,789	\$32,789	\$32,789	\$ 306,032
Floodplain	\$2,277,227	\$2,277,227	\$3,607,033	\$495,877	\$495,877	\$495,877	\$495,877	\$495,877	\$495,877	\$495,877	\$ 11,632,628
<b>Subtotal</b>	<b>\$2,412,329</b>	<b>\$2,412,329</b>	<b>\$3,745,703</b>	<b>\$781,219</b>	<b>\$14,038,894</b>						
Contingency (20%)	\$482,466	\$482,466	\$749,141	\$156,244	\$156,244	\$156,244	\$156,244	\$156,244	\$156,244	\$156,244	\$ 2,807,779
<b>Total</b>	<b>\$2,894,795</b>	<b>\$2,894,795</b>	<b>\$4,494,844</b>	<b>\$937,463</b>	<b>\$16,846,673</b>						

\*Assumptions for planting cost from Eric Ginney, PWA. Based on Draft Management Plan for TRLIA Levee Setback. Costs developed by River Partners.

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1 **Table 8.A-17. CM7 Nonnative Species Control Costs**

<b>Weed Control Cost</b>	
% of natural recruitment acres	50%
% of active planting acres	100%
No. years of treatment following planting	3
Active planting cost (\$/acre)	\$1,367
Native recruitment control cost multiplier	1.4
Native recruitment cost (\$/acre)	\$1,914

\*Cost multiplier from Eric Ginney, PWA, to account for higher maintenance costs in wildland areas.

\*Assumptions for annual treatment cost from Eric Ginney, PWA. Based on Draft Management Plan for TRLIA Levee Setback. Costs developed by River Partners.

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Natural recruitment control cost	Cost Period										Total Cost	
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
Suisun Marsh	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$ -
Cache Slough	\$61,606	\$114,412	\$165,065	\$115,611	\$36,006	\$36,006	\$36,006	\$36,006	\$36,006	\$36,006	\$36,006	\$ 672,732
West Delta	\$19,275	\$35,796	\$51,453	\$30,665	\$1,344	\$1,344	\$1,344	\$1,344	\$1,344	\$1,344	\$1,344	\$ 145,251
Cosumnes	\$21,920	\$40,709	\$18,789	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$ 81,418
East Delta	\$0	\$0	\$0	\$21,749	\$40,391	\$40,391	\$40,391	\$40,391	\$40,391	\$40,391	\$40,391	\$ 264,095
South Delta	\$0	\$0	\$0	\$226,214	\$420,112	\$420,112	\$420,112	\$420,112	\$420,112	\$420,112	\$420,112	\$ 2,746,887
Channel Margin	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$ -
Floodplain	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$ -
<b>Total</b>	<b>\$ 102,801</b>	<b>\$ 190,916</b>	<b>\$ 235,308</b>	<b>\$ 394,240</b>	<b>\$ 497,853</b>	<b>\$ 3,910,382</b>						

Active planting control cost	Cost Period										Total Cost	
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
Suisun Marsh	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$ -
Cache Slough	\$26,403	\$49,034	\$70,742	\$49,548	\$15,431	\$15,431	\$15,431	\$15,431	\$15,431	\$15,431	\$15,431	\$ 288,314
West Delta	\$8,261	\$15,341	\$22,051	\$13,142	\$576	\$576	\$576	\$576	\$576	\$576	\$576	\$ 62,250
Cosumnes	\$9,394	\$17,447	\$8,052	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$ 34,893
East Delta	\$0	\$0	\$0	\$9,321	\$17,310	\$17,310	\$17,310	\$17,310	\$17,310	\$17,310	\$17,310	\$ 113,183
South Delta	\$0	\$0	\$0	\$96,949	\$180,048	\$180,048	\$180,048	\$180,048	\$180,048	\$180,048	\$180,048	\$ 1,177,237
Channel Margin	\$17,402	\$32,318	\$14,916	\$14,916	\$27,701	\$27,701	\$27,701	\$27,701	\$27,701	\$27,701	\$27,701	\$ 245,761
Floodplain	\$1,035,937	\$1,923,884	\$2,528,829	\$1,632,051	\$418,935	\$418,935	\$418,935	\$418,935	\$418,935	\$418,935	\$418,935	\$ 9,634,311
<b>Total</b>	<b>\$ 1,097,397</b>	<b>\$ 2,038,023</b>	<b>\$ 2,644,591</b>	<b>\$ 1,815,927</b>	<b>\$ 660,002</b>	<b>\$ 11,555,951</b>						

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Weed Control: Total	Cost Period										Total Cost	
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
Suisun Marsh	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$ -
Cache Slough	\$88,009	\$163,445	\$235,808	\$165,159	\$51,438	\$51,438	\$51,438	\$51,438	\$51,438	\$51,438	\$51,438	\$ 961,046
West Delta	\$27,535	\$51,137	\$73,505	\$43,808	\$1,919	\$1,919	\$1,919	\$1,919	\$1,919	\$1,919	\$1,919	\$ 207,501
Cosumnes	\$31,314	\$58,155	\$26,841	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$ 116,311
East Delta	\$0	\$0	\$0	\$31,070	\$57,701	\$57,701	\$57,701	\$57,701	\$57,701	\$57,701	\$57,701	\$ 377,278
South Delta	\$0	\$0	\$0	\$323,163	\$600,160	\$600,160	\$600,160	\$600,160	\$600,160	\$600,160	\$600,160	\$ 3,924,125
Channel Margin	\$17,402	\$32,318	\$14,916	\$14,916	\$27,701	\$27,701	\$27,701	\$27,701	\$27,701	\$27,701	\$27,701	\$ 245,761
Floodplain	\$1,035,937	\$1,923,884	\$2,528,829	\$1,632,051	\$418,935	\$418,935	\$418,935	\$418,935	\$418,935	\$418,935	\$418,935	\$ 9,634,311
<b>Subtotal</b>	<b>\$1,200,198</b>	<b>\$2,228,939</b>	<b>\$2,879,898</b>	<b>\$2,210,167</b>	<b>\$1,157,855</b>	<b>\$15,466,333</b>						
Contingency (20%)	\$240,040	\$445,788	\$575,980	\$442,033	\$231,571	\$231,571	\$231,571	\$231,571	\$231,571	\$231,571	\$231,571	\$ 3,093,267
<b>Total</b>	<b>\$1,440,238</b>	<b>\$2,674,727</b>	<b>\$3,455,878</b>	<b>\$2,652,200</b>	<b>\$1,389,426</b>	<b>\$18,559,600</b>						

## 1 **8.A.1.8 CM8 Grassland Natural Community Restoration**

2 This conservation measure provides for the restoration of 2,000 acres of grassland habitat in  
3 Conservation Zones 1, 8, and/or 11. Table 8.A-18 shows the assumed distribution of existing land  
4 uses on acquired acreage and the expected cost of acquisition by 5-year period. The existing land  
5 use distributions are shown in Table 8.A-19. Table 8.A-20 shows the construction and weed control  
6 costs by 5-year period.

1 **Table 8.A-18. CM8 Land Acquisition Costs by 5-Year Period**

Land Assembly by Conservation Zone	Cost Period										Total Acreage
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
1	315	323	203	83	83	83	83	80	0	0	1,250
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0
8	79	81	51	21	21	21	21	20	0	0	313
9	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0
11	236	242	152	62	62	62	62	60	0	0	938
<b>Total</b>	<b>630</b>	<b>645</b>	<b>405</b>	<b>165</b>	<b>165</b>	<b>165</b>	<b>165</b>	<b>160</b>	<b>0</b>	<b>0</b>	<b>2,500</b>
<b>Running Total</b>	<b>630</b>	<b>1,275</b>	<b>1,680</b>	<b>1,845</b>	<b>2,010</b>	<b>2,175</b>	<b>2,340</b>	<b>2,500</b>	<b>2,500</b>	<b>2,500</b>	<b>2,500</b>
Fee-Title Purchase %	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Easement Purchase %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Easement:Fee-Title Ratio	60%	<<Surface easement set to 80% of fee title, per email from David Zippin, dated January 19, 2012.									
Land Assembly Cost	Cost Period										Total Cost
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Purchase Cost	\$2,053,356	\$2,102,245	\$1,320,015	\$537,784	\$537,784	\$537,784	\$537,784	\$521,487	\$0	\$0	\$ 8,148,238
Transaction Cost (10% of fee title cost)	\$205,336	\$210,225	\$132,001	\$53,778	\$53,778	\$53,778	\$53,778	\$52,149	\$0	\$0	\$ 814,824
Subtotal	\$2,258,691	\$2,312,470	\$1,452,016	\$591,562	\$591,562	\$591,562	\$591,562	\$573,636	\$0	\$0	\$ 8,963,061
Contingency (20%)	\$451,738	\$462,494	\$290,403	\$118,312	\$118,312	\$118,312	\$118,312	\$114,727	\$0	\$0	\$ 1,792,612
<b>Total</b>	<b>\$ 2,710,430</b>	<b>\$ 2,774,964</b>	<b>\$ 1,742,419</b>	<b>\$ 709,874</b>	<b>\$ 709,874</b>	<b>\$ 709,874</b>	<b>\$ 709,874</b>	<b>\$ 688,363</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 10,755,674</b>

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1 **Table 8.A-19. CM8 Existing Land Use Distribution**

Land Assembly by Conservation Zone	Total Acreage	% of Acres					Total
		Rangeland	Pasture/ Alfalfa	Field Crop	Truck Crop	Orchard	
1	1,250	100					100
2	0						0
3	0						0
4	0						0
5	0						0
6	0						0
7	0						0
8	313	100					100
9	0						0
10	0						0
11	938	100					100
<b>Total</b>	<b>2,500</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>100</b>

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1 **Table 8.A-20. CM8 Costs by 5-Year Period**

<b>Construction of Grassland Communities</b>											
	Mid	Low	High								
Grassland Habitat Construction Cost Per Acre	\$1,272	\$1,060	\$1,484								
Weed Control Cost Per Acre/Yr	\$318	\$212	\$424								
% of Acres Receiving Weed Control	100%										
Years of Treatment	4.0										
<i>Personal Comm. Matt Gause, Westervelt Ecological Services, 6/28/2010</i>											
<b>Construction Cost Estimate</b>											
Construction Cost Line Items	Cost Period										Total Cost
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Grassland Habitat Construction	\$801,310	\$820,388	\$515,128	\$209,867	\$209,867	\$209,867	\$209,867	\$203,507	\$0	\$0	\$ 3,179,800
Contingency (20%)	\$160,262	\$164,078	\$103,026	\$41,973	\$41,973	\$41,973	\$41,973	\$40,701	\$0	\$0	\$ 635,960
<b>Total</b>	<b>\$ 961,572</b>	<b>\$ 984,466</b>	<b>\$ 618,153</b>	<b>\$ 251,840</b>	<b>\$ 251,840</b>	<b>\$ 251,840</b>	<b>\$ 251,840</b>	<b>\$ 244,209</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 3,815,760</b>
<b>Weed Control Cost Estimate</b>											
Weed Control Cost Line Items	Cost Period										Total Cost
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Weed Control Costs	\$801,310	\$820,388	\$515,128	\$209,867	\$209,867	\$209,867	\$209,867	\$203,507	\$0	\$0	\$ 3,179,800
Contingency (20%)	\$160,262	\$164,078	\$103,026	\$41,973	\$41,973	\$41,973	\$41,973	\$40,701	\$0	\$0	\$ 635,960
<b>Total</b>	<b>\$ 961,572</b>	<b>\$ 984,466</b>	<b>\$ 618,153</b>	<b>\$ 251,840</b>	<b>\$ 251,840</b>	<b>\$ 251,840</b>	<b>\$ 251,840</b>	<b>\$ 244,209</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 3,815,760</b>
<b>Cost Schedule by 5-Yr Period</b>											
Capital Costs	Capital Costs per Period										Total
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Land Assembly	\$ 2,710,430	\$ 2,774,964	\$ 1,742,419	\$ 709,874	\$ 709,874	\$ 709,874	\$ 709,874	\$ 688,363	\$ -	\$ -	\$ 10,755,674
Planning & Construction	\$ 961,572	\$ 984,466	\$ 618,153	\$ 251,840	\$ 251,840	\$ 251,840	\$ 251,840	\$ 244,209	\$ -	\$ -	\$ 3,815,760
Weed Control During Establishment	\$ 961,572	\$ 984,466	\$ 618,153	\$ 251,840	\$ 251,840	\$ 251,840	\$ 251,840	\$ 244,209	\$ -	\$ -	\$ 3,815,760
<b>Total</b>	<b>\$ 4,633,573</b>	<b>\$ 4,743,896</b>	<b>\$ 2,978,725</b>	<b>\$ 1,213,555</b>	<b>\$ 1,213,555</b>	<b>\$ 1,213,555</b>	<b>\$ 1,213,555</b>	<b>\$ 1,176,780</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 18,387,194</b>

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1 **8.A.1.9 CM9 Vernal Pool and Alkali Seasonal Wetland**  
2 **Complex Restoration**

3 This conservation measure provides for the restoration of 200 acres of vernal pool complex habitat  
4 in Conservation Zones 1, 8, and/or 11. Costs are estimated for habitat restoration and ongoing weed  
5 management during the establishment period for the vernal pool complex terrain. Land acquisition  
6 costs are counted under *CM3 Natural Communities Protection and Restoration*. Table 8.A-21 shows  
7 the land acquisition costs by 5-year period. Table 8.A-22 shows the construction costs by 5-year  
8 period.

1 **Table 8.A-21. CM9 Land Acquisition Costs by 5-Year Period**

Vernal Land Assembly by Conservation Zone	Acres Acquired by Period										Total Acreage
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0
11	20	20	27	0	0	0	0	0	0	0	67
<b>Total</b>	<b>20</b>	<b>20</b>	<b>27</b>	<b>0</b>	<b>67</b>						
<b>Running Total</b>	<b>20</b>	<b>40</b>	<b>67</b>								

Fee-Title Purchase %	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Easement Purchase %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Easement:Fee-Title Ratio **60%** <<Surface easement set to 80% of fee title, per email from David Zippin, dated January 19, 2012.

Vernal Pool Land Assembly Cost	Cost Period										Total Cost	
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
Purchase Cost	\$65,186	\$65,186	\$88,001	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$ 218,373
Transaction Cost (10% of fee title cost)	\$6,519	\$6,519	\$8,800	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$ 21,837
Subtotal	\$71,704	\$71,704	\$96,801	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$ 240,210
Contingency (20%)	\$14,341	\$14,341	\$19,360	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$ 48,042
<b>Total</b>	<b>\$ 86,045</b>	<b>\$ 86,045</b>	<b>\$ 116,161</b>	<b>\$ -</b>	<b>\$ 288,252</b>							

Alkali Wetland Land Assembly by Conservation Zone	Acres Acquired by Period										Total Acreage
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0
11	29	29	5	5	4	0	0	0	0	0	72
<b>Total</b>	<b>29</b>	<b>29</b>	<b>5</b>	<b>5</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>72</b>
<b>Running Total</b>	<b>29</b>	<b>58</b>	<b>63</b>	<b>68</b>	<b>72</b>						

Fee-Title Purchase %	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Easement Purchase %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Easement:Fee-Title Ratio **60%** <<Surface easement set to 80% of fee title, per email from David Zippin, dated January 19, 2012.

Alkali Wetland Land Assembly Cost	Cost Period										Total Cost	
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
Purchase Cost	\$94,520	\$94,520	\$16,296	\$16,296	\$13,037	\$0	\$0	\$0	\$0	\$0	\$0	\$ 234,669
Transaction Cost (10% of fee title cost)	\$9,452	\$9,452	\$1,630	\$1,630	\$1,304	\$0	\$0	\$0	\$0	\$0	\$0	\$ 23,467
Subtotal	\$103,972	\$103,972	\$17,926	\$17,926	\$14,341	\$0	\$0	\$0	\$0	\$0	\$0	\$ 258,136
Contingency (20%)	\$20,794	\$20,794	\$3,585	\$3,585	\$2,868	\$0	\$0	\$0	\$0	\$0	\$0	\$ 51,627
<b>Total</b>	<b>\$ 124,766</b>	<b>\$ 124,766</b>	<b>\$ 21,511</b>	<b>\$ 21,511</b>	<b>\$ 17,209</b>	<b>\$ -</b>	<b>\$ 309,763</b>					

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1 **Table 8.A-22. CM9 Construction Costs by 5-Year Period**

**Construction of Vernal Pool and Alkali Wetland Habitat**

Vernal Pool Density (% of acres)	15%		
<i>Personal Comm. Matt Gause, Westervelt Ecological Services, 6/28/2010</i>			
	Mid	Low	High
Vernal Pool/Alkali Construction Cost Per Acre	\$34,448	\$26,498	\$42,397
Grassland Habitat Construction Cost Per Acre	\$1,272	\$1,060	\$1,484
Weed Control Cost Per Acre/Yr	\$344	\$159	\$530
% of Acres Receiving Weed Control	15%	10%	20%
Years of Treatment	4	3.0	5.0

*Personal Comm. Matt Gause, Westervelt Ecological Services, 6/28/2010*

**Construction Cost Estimate**

Construction Cost Line Items	Cost Period										Total Cost	
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
Vernal Pool Construction	\$253,192	\$253,192	\$165,350	\$25,836	\$20,669	\$0	\$0	\$0	\$0	\$0	\$0	\$ 718,237
Grassland Habitat Construction	\$52,975	\$52,975	\$34,596	\$5,406	\$4,325	\$0	\$0	\$0	\$0	\$0	\$0	\$ 150,277
<b>Subtotal</b>	<b>\$306,167</b>	<b>\$306,167</b>	<b>\$199,946</b>	<b>\$31,242</b>	<b>\$24,993</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$ 868,515</b>
Contingency (20%)	\$61,233	\$61,233	\$39,989	\$6,248	\$4,999	\$0	\$0	\$0	\$0	\$0	\$0	\$ 173,703
<b>Total</b>	<b>\$ 367,400</b>	<b>\$ 367,400</b>	<b>\$ 239,935</b>	<b>\$ 37,490</b>	<b>\$ 29,992</b>	<b>\$ -</b>	<b>\$ 1,042,218</b>					

**Weed Control Cost Estimate**

Weed Control Cost Line Items	Cost Period										Total Cost	
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
Weed Control Costs	\$10,128	\$10,128	\$6,614	\$1,033	\$827	\$0	\$0	\$0	\$0	\$0	\$0	\$ 28,729
Contingency (20%)	\$2,026	\$2,026	\$1,323	\$207	\$165	\$0	\$0	\$0	\$0	\$0	\$0	\$ 5,746
<b>Total</b>	<b>\$ 12,153</b>	<b>\$ 12,153</b>	<b>\$ 7,937</b>	<b>\$ 1,240</b>	<b>\$ 992</b>	<b>\$ -</b>	<b>\$ 34,475</b>					

2

## 1 **8.A.1.10 CM10 Nontidal Marsh Restoration**

2 This conservation measure provides for the restoration of up to 1,950 acres of nontidal freshwater  
3 marsh to provide giant garter snake habitat<sup>2</sup> and restoration of 320 acres of managed wetland for  
4 sandhill crane habitat. Restored nontidal marsh natural community will be distributed in two blocks,  
5 one in Conservation Zone 2 (600 acres) and the other in Conservation Zone 4 or 5 (1,350 acres).  
6 Additionally, managed wetland will be distributed in two 160-acre blocks (one in Conservation  
7 Zone 5 and the other in Conservation Zone 6). Table 8.A-23 shows the land acquisition costs by 5-  
8 year period. Table 8.A-24 shows the construction costs by 5-year period.

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<sup>2</sup> Up to 750 acres of nontidal freshwater marsh will be restored to contribute toward the requirement for 1,500 acres of “rice or equivalent giant garter snake habitat” in Conservation Zone 4 or 5, where rice is scarce.

1 **Table 8.A-23. CM10 Land Acquisition Costs by 5-Year Period**

Non Tidal Marsh Land Assembly by Conservation Zone	Acres Acquired										Total Acreage
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
1	0	0	0	0	0	0	0	0	0	0	0
2	94	103	70	70	86	86	86	83	0	0	677
3	0	0	0	0	0	0	0	0	0	0	0
4	105	116	78	78	97	97	97	93	0	0	762
5	105	116	78	78	97	97	97	93	0	0	762
6	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>304</b>	<b>334</b>	<b>226</b>	<b>226</b>	<b>280</b>	<b>280</b>	<b>280</b>	<b>270</b>	<b>0</b>	<b>0</b>	<b>2,200</b>
<b>Running Total</b>	<b>304</b>	<b>638</b>	<b>864</b>	<b>1,090</b>	<b>1,370</b>	<b>1,650</b>	<b>1,930</b>	<b>2,200</b>	<b>2,200</b>	<b>2,200</b>	<b>2,200</b>
Fee-Title Purchase %	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Easement Purchase %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Easement:Fee-Title Ratio	80%										
Land Assembly Cost	Cost Per Period										Total Cost
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Purchase Cost	\$2,770,470	\$3,043,872	\$2,059,626	\$2,059,626	\$2,551,749	\$2,551,749	\$2,551,749	\$2,460,615	\$0	\$0	\$ 20,049,455
Transaction Cost (10% of fee title cost)	\$277,047	\$304,387	\$205,963	\$205,963	\$255,175	\$255,175	\$255,175	\$246,061	\$0	\$0	\$ 2,004,945
Subtotal	\$3,047,517	\$3,348,259	\$2,265,588	\$2,265,588	\$2,806,924	\$2,806,924	\$2,806,924	\$2,706,676	\$0	\$0	\$ 22,054,400
Contingency (20%)	\$609,503	\$669,652	\$453,118	\$453,118	\$561,385	\$561,385	\$561,385	\$541,335	\$0	\$0	\$ 4,410,880
<b>Total</b>	<b>\$ 3,657,021</b>	<b>\$ 4,017,911</b>	<b>\$ 2,718,706</b>	<b>\$ 2,718,706</b>	<b>\$ 3,368,308</b>	<b>\$ 3,368,308</b>	<b>\$ 3,368,308</b>	<b>\$ 3,248,012</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 26,465,280</b>
Managed Wetland Land Assembly by Conservation Zone	Acres Acquired										Total Acreage
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0
5	125	125	0	0	0	0	0	0	0	0	250
6	125	125	0	0	0	0	0	0	0	0	250
7	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>250</b>	<b>250</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>500</b>
<b>Running Total</b>	<b>250</b>	<b>500</b>	<b>500</b>	<b>500</b>	<b>500</b>						
Fee-Title Purchase %	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Easement Purchase %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Easement:Fee-Title Ratio	80%										
Land Assembly Cost	Cost Per Period										Total Cost
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Purchase Cost	\$1,523,654	\$1,523,654	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$ 3,047,308
Transaction Cost (10% of fee title cost)	\$152,365	\$152,365	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$ 304,731
Subtotal	\$1,676,020	\$1,676,020	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$ 3,352,039
Contingency (20%)	\$335,204	\$335,204	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$ 670,408
<b>Total</b>	<b>\$ 2,011,224</b>	<b>\$ 2,011,224</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 4,022,447</b>					

2



## 8.A.1.11 CM11 Natural Communities Enhancement and Management

Habitat management costs for BDCP conservation lands are based on a quantitative analysis of natural lands management costs for a broad sample of publicly and privately managed natural preserves in the western United States, with emphasis given to management costs associated with habitat conservation plan (HCP) reserve management. The analysis resulted in a cost function relating management cost to acres under management, which is used to estimate BDCP reserve management costs. Per-acre costs fall over time as more land comes under management.

Budgetary data collected for 18 national wildlife refuges (NWR) in the western United States were used to calculate cost per acre under management (Table 8.A-25). The natural log of unit cost was regressed against the natural log of acreage under management to derive a relationship between costs per acre and preserve size (Table 8.A-26). The data and regression results are shown in the following tables. The NWR budget and acreage data are from Carver and Caudill (Carver and Caudill 2007). CM11 costs for a 5-year period are shown in Table 8.A-27.

**Table 8.A-25. Examples of National Wildlife Refuge Budgets**

National Wildlife Refuge	State	2006 Budget (2010 Dollars)	Acres	Unit Cost \$/Acre
Malheur	OR	\$1,782,000	187,000	\$10
Hakalau Forest	HI	\$1,110,456	38,300	\$29
San Francisco	CA	\$824,040	30,000	\$27
San Luis	CA	\$1,385,748	26,609	\$52
Umatilla	OR	\$1,057,212	23,000	\$46
Stone Lakes	CA	\$610,740	18,000	\$34
Turnbull	WA	\$1,844,208	16,000	\$115
McNary	WA	\$1,057,212	15,000	\$70
Deer Flat	ID	\$433,080	11,388	\$38
Sacramento	CA	\$948,888	10,783	\$88
Kern	CA	\$944,784	10,618	\$89
Cama	ID	\$398,520	10,578	\$38
Modoc	CA	\$1,029,456	7,000	\$147
William Finley	OR	\$2,116,908	5,666	\$374
Ridgefield	WA	\$1,037,448	5,217	\$199
Nisqually	WA	\$1,110,240	3,000	\$370
Brandon Marsh	OR	\$416,880	889	\$469
Dungeness	WA	\$478,548	636	\$752

Source: Carver and Caudill 2007

16

1 **Table 8.A-26. Regression Analysis: Costs Per Acre as a Function of Preserve Size**

Regression Statistics	
Multiple R	0.9235
R Square	0.8528
Adjusted R Square	0.8436
Standard Error	0.4616
Observations	18

## ANOVA

	df	SS	MS	F
Regression	1	19.7550	19.7550	92.6948
Residual	16	3.4099	0.2131	
Total	17	23.1649		

	Coefficients	Standard Error	t Stat	P-value
Intercept	12.0208	0.7923	15.1720	0.0000
LNACRES	-0.8154	0.0847	-9.6278	0.0000

2  
3 An analysis of preserve management costs for the *Western Riverside County Multiple Species Habitat*  
4 *Conservation Plan* (Dixon et al. 2008), which is of similar scale to the BDCP, concluded that  
5 management costs were unlikely to fall below \$45 per acre (2010 dollars) once the reserve was fully  
6 assembled. This is about 60% greater than the unit management costs derived from the NWR data.  
7 NWR management costs are expected to be lower because their management is not tied to the  
8 higher standards of HCP or natural community conservation plan (NCCP) requirements. To account  
9 for higher management costs under HCP/NCCP requirements, the unit costs estimated using the  
10 NWR data were constrained to not fall below \$45 per acre.

11 Figure 8.A-1 provides a comparison of BDCP unit management costs to management costs for other  
12 managed natural lands as reported in the following reports

- 13
- *East Contra Costa Habitat Conservation Plan*(Contra Costa County 2006)
  - 14 • *Draft Santa Clara Valley Habitat Conservation Plan*(Santa Clara County et al. 2010)
  - 15 • 28 case studies of natural lands management costs prepared for the U.S. Environmental  
16 Protection Agency by Center for Natural Lands Management using the PAR model (Center for  
17 Natural Lands Management 2004)

18 BDCP unit management costs are similar in magnitude to costs estimated for the East Contra Costa  
19 and Santa Clara Valley HCP/NCCPs, which provide the most applicable comparison. BDCP unit  
20 management costs are higher in magnitude to costs estimated by the Center for Natural Lands  
21 Management. These are primarily mitigation sites that are not tied to the higher standards for  
22 HCP/NCCPs, so their unit management costs would be expected to be lower, as borne out by the  
23 data.  
24

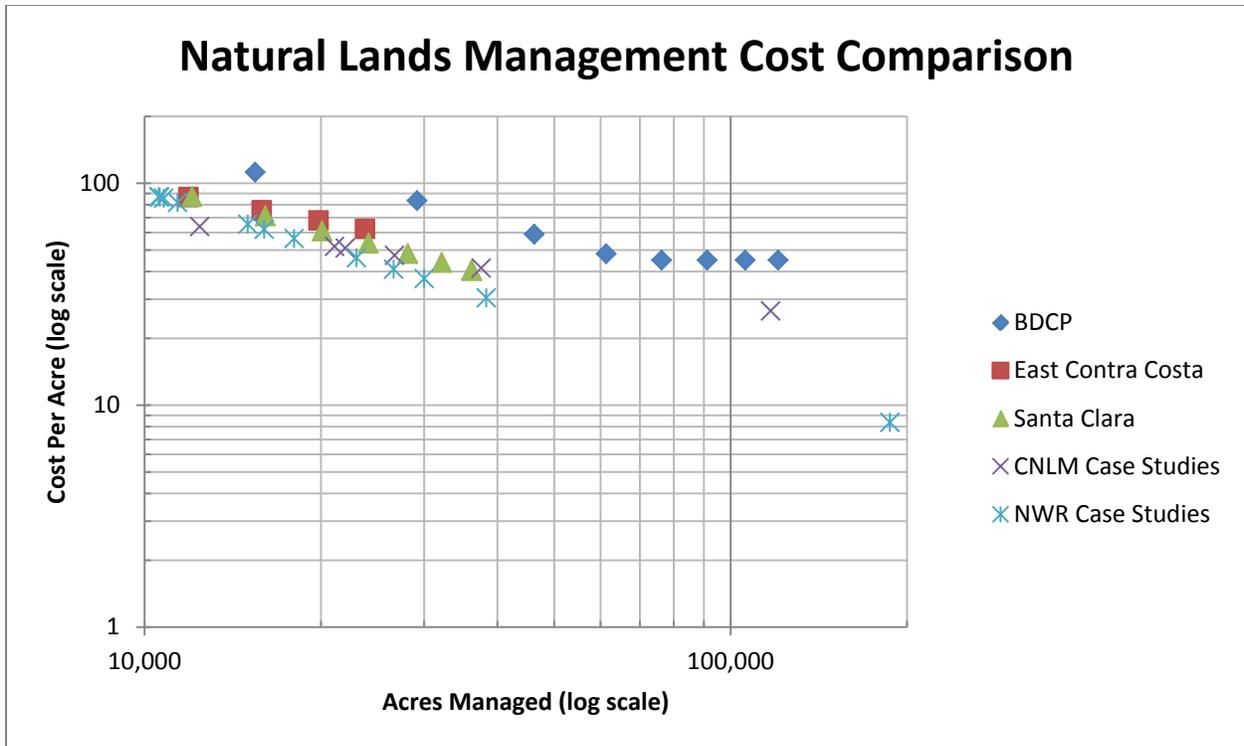


Figure 8.A-1. Natural Lands Management Cost Comparison

1  
2  
3

1 **Table 8.A-27. CM11 Costs by 5-Year Period**

Cost Schedule by 5-Yr Period											
Capital Costs	Cost Period										Total Cost
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Recreation Trails & Facilities	\$914,590	\$927,102	\$927,102	\$914,590	\$914,590	\$914,590	\$838,270	\$456,670	\$0	\$0	\$ 6,807,504
Recreation Boat Launch Facility	\$0	\$0	\$2,281,200	\$1,140,600	\$0	\$0	\$0	\$0	\$0	\$0	\$ 3,421,800
<b>Subtotal</b>	<b>\$ 914,590</b>	<b>\$ 927,102</b>	<b>\$ 3,208,302</b>	<b>\$ 2,055,190</b>	<b>\$ 914,590</b>	<b>\$ 914,590</b>	<b>\$ 838,270</b>	<b>\$ 456,670</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 10,229,304</b>
Contingency (@20%)	\$182,918	\$185,420	\$641,660	\$411,038	\$182,918	\$182,918	\$167,654	\$91,334	\$0	\$0	\$ 2,045,861
<b>Total Recreation Capital Cost</b>	<b>\$ 1,097,508</b>	<b>\$ 1,112,522</b>	<b>\$ 3,849,962</b>	<b>\$ 2,466,228</b>	<b>\$ 1,097,508</b>	<b>\$ 1,097,508</b>	<b>\$ 1,005,924</b>	<b>\$ 548,004</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 12,275,165</b>
Endowment Fund	\$12,584,385	\$12,584,385	\$12,584,385	\$12,584,385	\$12,584,385	\$12,584,385	\$12,584,385	\$12,584,385	\$12,584,385	\$12,584,385	\$ 125,843,855
<b>Total Costs</b>	<b>\$ 13,681,894</b>	<b>\$ 13,696,908</b>	<b>\$ 16,434,348</b>	<b>\$ 15,050,614</b>	<b>\$ 13,681,894</b>	<b>\$ 13,681,894</b>	<b>\$ 13,590,310</b>	<b>\$ 13,132,390</b>	<b>\$ 12,584,385</b>	<b>\$ 12,584,385</b>	<b>\$ 138,119,019</b>
O&M Costs	Cost Period										Total Cost
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Recreation Trails & Facilities	\$0	\$275,457	\$554,848	\$834,238	\$1,109,695	\$1,385,152	\$1,660,609	\$1,913,170	\$2,051,251	\$2,051,251	\$ 11,835,672
Recreation Boat Launch Facility	\$0	\$0	\$0	\$684,360	\$1,026,540	\$1,026,540	\$1,026,540	\$1,026,540	\$1,026,540	\$1,026,540	\$ 6,843,600
Reserve Management	\$0	\$12,110,580	\$13,810,576	\$17,922,992	\$19,398,067	\$23,352,819	\$27,566,841	\$31,769,160	\$35,976,160	\$35,976,160	\$ 217,883,356
<b>Total Costs</b>	<b>\$0</b>	<b>\$12,386,037</b>	<b>\$14,365,424</b>	<b>\$19,441,590</b>	<b>\$21,534,302</b>	<b>\$25,764,511</b>	<b>\$30,253,990</b>	<b>\$34,708,870</b>	<b>\$39,053,951</b>	<b>\$39,053,951</b>	<b>\$236,562,628</b>

2

## 1 **8.A.1.12 CM12 Methylmercury Management**

2 This conservation measure provides for actions to minimize the potential for bioaccumulation of  
3 mercury that could occur in areas of restoration actions, including site characterization of mercury  
4 prior to acquisition, restoration design modification to address unacceptable concentrations of  
5 mercury in substrate, long-term monitoring and adaptive management. This cost estimate addresses  
6 site characterization and design modification costs. The CM12 assumptions and costs by 5-year  
7 period are shown in Table 8.A-28.

1 **Table 8.A-28. CM12 Costs by 5-Year Period**

<b>Surveys</b>											
<b>Pre-Acquisition Survey Samples</b>	<b>Value</b>										
Acres Characterized	75,000										
Acres per sample	185										
Number of Samples	405										
<b>Project Design Survey</b>											
Acres Characterized for Regrading	40,409										
Acres per sample	50										
Number of Samples	808										
<b>Total samples</b>	<b>1214</b>										
<b>Unit Sample Cost</b>											
Cost of sampling & report (175 samples)	\$208,034										
Unit sampling & report cost (\$/sample)	\$1,200	rounded to nearest \$100									
Cost per Sample	\$1,196										
<b>Cost Schedule by 5-Yr Period</b>											
<b>Land Acquisition Used to Allocated Survey Costs</b>	<b>Cost Per Period</b>										<b>Total Cost</b>
	<b>1-5</b>	<b>6-10</b>	<b>11-15</b>	<b>16-20</b>	<b>21-25</b>	<b>26-30</b>	<b>31-35</b>	<b>36-40</b>	<b>41-45</b>	<b>46-50</b>	
CM 4 (excluding West Delta)	7845	7845	9312	7532	7556	7556	7460	7460	0	0	62,564
CM 5	0	0	1111	1999	1999	1999	1999	1999	0	0	11,105
<b>Total</b>	<b>7,845</b>	<b>7,845</b>	<b>10,423</b>	<b>9,531</b>	<b>9,555</b>	<b>9,555</b>	<b>9,459</b>	<b>9,459</b>	<b>0</b>	<b>0</b>	<b>73,669</b>
% of Total	11%	11%	14%	13%	13%	13%	13%	13%	0%	0%	100%
Prorated number of samples	129	129	172	157	157	157	156	156	0	0	1214
<b>Operating Cost</b>	<b>Cost Per Period</b>										<b>Total Cost</b>
	<b>1-5</b>	<b>6-10</b>	<b>11-15</b>	<b>16-20</b>	<b>21-25</b>	<b>26-30</b>	<b>31-35</b>	<b>36-40</b>	<b>41-45</b>	<b>46-50</b>	
Sampling & report cost	\$154,579	\$154,579	\$205,387	\$187,806	\$188,280	\$188,280	\$186,383	\$186,383	\$0	\$0	\$ 1,451,677
Contingency (50%)	\$77,290	\$77,290	\$102,694	\$93,903	\$94,140	\$94,140	\$93,192	\$93,192	\$0	\$0	\$ 725,839
<b>Total</b>	<b>\$231,869</b>	<b>\$231,869</b>	<b>\$308,081</b>	<b>\$281,708</b>	<b>\$282,420</b>	<b>\$282,420</b>	<b>\$279,575</b>	<b>\$279,575</b>	<b>\$0</b>	<b>\$0</b>	<b>\$2,177,516</b>

2

### 1 **8.A.1.13 CM13 Invasive Aquatic Vegetation Control**

2 This conservation measure provides for the control of Brazilian waterweed (*Egeria densa*), water  
3 hyacinth, and other invasive aquatic vegetation (IAV) throughout the Delta. To implement this  
4 conservation measure, the Implementation Office will apply existing control methods tested and  
5 developed by the California Department of Boating and Waterways *Egeria densa* and Water  
6 Hyacinth Control Programs. CM13 treatment and control costs by 5-year period are shown in Table  
7 8.A-29.

1 **Table 8.A-29. CM13 Treatment and Control Costs by 5-Year Period**

**Cost Estimate**

Year Treatment Begins	2	
Acres Treated Per Year	2,500	mid-point of acreage control target listed in source doc.
End Year for Primary Treatment	20	year by which egeria substantially eliminated from Delta listed in source doc.
Start Year for Secondary Treatment	21	year in which secondary control of invasives begins at 50% cost of primary control.

Treated Acres	Tidal & Subtidal Treated Per Costing Period									
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Primary Treatment	10,000	12,500	12,500	12,500	0	0	0	0	0	0
Secondary Treatment	0	0	0	0	12,500	12,500	12,500	12,500	12,500	12,500

Primary Treatment Costs Per Acre	Share	
Herbicide	\$619	20%
Labor	\$774	25%
Environmental monitoring	\$1,238	40%
Other	\$464	15%
<b>Total</b>	<b>\$3,095</b>	<b>100%</b>
<b>Less:</b>		
Toxicity monitoring	\$445	
<b>Net Cost</b>	<b>\$2,650</b>	

<<< Costs are from DBW's Egeria Densa EIR Addendum, 2006.

Secondary Treatment Cost as % of Primary	50%
--	-----

Control Costs Per Period	Control Costs Per Costing Period										Total Costs
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Labor	\$ 7,737,514	\$ 9,671,892	\$ 9,671,892	\$ 9,671,892	\$ 4,835,946	\$ 4,835,946	\$ 4,835,946	\$ 4,835,946	\$ 4,835,946	\$ 4,835,946	\$ 65,768,865
Materials & Equipment	\$ 10,832,519	\$ 13,540,649	\$ 13,540,649	\$ 13,540,649	\$ 6,770,324	\$ 6,770,324	\$ 6,770,324	\$ 6,770,324	\$ 6,770,324	\$ 6,770,324	\$ 92,076,411
Environmental monitoring	\$ 7,928,302	\$ 9,910,377	\$ 9,910,377	\$ 9,910,377	\$ 4,955,188	\$ 4,955,188	\$ 4,955,188	\$ 4,955,188	\$ 4,955,188	\$ 4,955,188	\$ 67,390,563
Contingency @ 20%	\$ 5,299,667	\$ 6,624,583	\$ 6,624,583	\$ 6,624,583	\$ 3,312,292	\$ 3,312,292	\$ 3,312,292	\$ 3,312,292	\$ 3,312,292	\$ 3,312,292	\$ 45,047,168
<b>Total</b>	<b>\$ 31,798,001</b>	<b>\$ 39,747,501</b>	<b>\$ 39,747,501</b>	<b>\$ 39,747,501</b>	<b>\$ 19,873,750</b>	<b>\$ 270,283,006</b>					

2

1 **8.A.1.14 CM14 Stockton Deep Water Ship Channel Dissolved**  
2 **Oxygen Levels**

3 This conservation measure, which will occur in the Stockton Deep Water Ship Channel, is designed  
4 to maintain dissolved oxygen concentrations at levels that will not adversely affect covered fish  
5 species during periods when these fish are present in the channel. CM14 costs by 5-year period are  
6 shown in Table 8.A-30.

1 **Table 8.A-30. CM14 Costs by 5-Year Period**

<b>DO Diffuser Cost Assumptions</b>											
<b>Diffuser Equipment &amp; Operating Costs</b>		Useful Life	<< W. McLaughlin, DWR, pers. comm.								
Diffuser Facility	\$3,709,767	15	<< Demonstration facility assumed to be replaced in Year 10.								
Annualized facility cost	\$310,754										
Mean Annual Operating Cost (\$/Yr)	\$158,990										
<b>Cost Schedule by 5-Yr Period</b>											
<b>Capital Costs Per Costing Period</b>											
<b>Capital Costs (including contingency)</b>	<b>1-5</b>	<b>6-10</b>	<b>11-15</b>	<b>16-20</b>	<b>21-25</b>	<b>26-30</b>	<b>31-35</b>	<b>36-40</b>	<b>41-45</b>	<b>46-50</b>	<b>Total</b>
Diffuser Facility Costs	\$ -	\$ -	\$ 1,553,772	\$ 1,553,772	\$ 1,553,772	\$ 1,553,772	\$ 1,553,772	\$ 1,553,772	\$ 1,553,772	\$ 1,553,772	\$ 12,430,179
Contingency @ 20%	\$ -	\$ -	\$ 310,754	\$ 310,754	\$ 310,754	\$ 310,754	\$ 310,754	\$ 310,754	\$ 310,754	\$ 310,754	\$ 2,486,036
<b>Total</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 1,864,527</b>	<b>\$ 1,864,527</b>	<b>\$ 1,864,527</b>	<b>\$ 1,864,527</b>	<b>\$ 1,864,527</b>	<b>\$ 1,864,527</b>	<b>\$ 1,864,527</b>	<b>\$ 1,864,527</b>	<b>\$ 14,916,215</b>
<b>Operating Costs Per Costing Period</b>											
<b>Operating Costs (including contingency)</b>	<b>1-5</b>	<b>6-10</b>	<b>11-15</b>	<b>16-20</b>	<b>21-25</b>	<b>26-30</b>	<b>31-35</b>	<b>36-40</b>	<b>41-45</b>	<b>46-50</b>	<b>Total</b>
Diffuser Operating Costs	\$ 794,950	\$ 794,950	\$ 794,950	\$ 794,950	\$ 794,950	\$ 794,950	\$ 794,950	\$ 794,950	\$ 794,950	\$ 794,950	\$ 7,949,500
Contingency @ 20%	\$ 158,990	\$ 158,990	\$ 158,990	\$ 158,990	\$ 158,990	\$ 158,990	\$ 158,990	\$ 158,990	\$ 158,990	\$ 158,990	\$ 1,589,900
<b>Total</b>	<b>\$ 953,940</b>	<b>\$ 953,940</b>	<b>\$ 953,940</b>	<b>\$ 953,940</b>	<b>\$ 953,940</b>	<b>\$ 953,940</b>	<b>\$ 953,940</b>	<b>\$ 953,940</b>	<b>\$ 953,940</b>	<b>\$ 953,940</b>	<b>\$ 9,539,400</b>

2

## 1 **8.A.1.15 CM15 Localized Reduction of Predatory Fishes**

2 This conservation measure addresses the local effects of nonnative predators on covered fish  
3 species by supporting focused predator control in high predator density locations. The BDCP will  
4 conduct focused predator reduction using a variety of methods in locations in the Delta that are  
5 known to have high densities of predators (predator hotspots). The assumptions regarding predator  
6 reduction under CM15 are shown in Table 8.A-31. The costs by 5-year period are shown in Table  
7 8.A-32.  
8

1 **Table 8.A-31. CM15 Assumptions and Costs**

<b>Focused Predator Control</b>			
	Start Date	End Date	Days
Predator control period	10/1	6/30	272
<b>Sites</b>	No. of Locations at Site	Frequency	No. of Removal Events
North Delta Diversion Structures	5	Daily	971
Head of Old River	1	Daily	194
Georgiana Slough	3	Daily	583
Sutter Slough	2	Daily	389
Steamboat Slough	2	Daily	389
Salvages Fish Release Sites	4	Weekly	155
		Total Events:	<b>2,681</b>
Hours Per Event			2.00
Avg Travel Time Per Location (hours)			1.25
Events Per Day			9.9
Hours Per Day, including travel time			32.0
Hours Per Boat-Day			8
Boat Crews Required			4.00
	No. of Positions Per Crew	Annual Salary	
<b>Boat Crew Staffing</b>			
Environmental Scientist	1	\$67,611	
Fish and Wildlife Technician	2	\$43,667	
Supervising Environmental Scientist	0.5	\$78,681	
FTE Salary Cost Per Crew		\$194,285	
Benefits Multiplier		1.35	
FTE Labor Cost Per Crew		\$262,284	
<b>Total Salary and Benefit Cost (\$/yr)</b>			<b>\$ 1,049,137</b>
<i>* Salary estimates based on proposed salaries for 2008-09 for corresponding positions within the Resources Agency, as reported by the California Department of Finance (<a href="http://www.dof.ca.gov/budget/historical/2008-09/salaries_and_wages/index.htm">www.dof.ca.gov/budget/historical/2008-09/salaries_and_wages/index.htm</a>).</i>			

2

<b>Boat Operating Cost</b>			
Boat operating hours per year (hrs/boat)			1,554
Boat Operating Cost/Hr			\$26
Annual operating cost per boat			\$41,186
<b>Total boat operating cost (\$/yr)</b>			<b>\$ 164,744</b>
<i>*Based on sample of vessel operating costs for DFG 20-25 ft boats used for IEP surveys. Includes fuel, maintenance &amp; repair, and haul out.</i>			
<b>Vehicle Capital Cost</b>			
Cost of new boat			\$60,000
Cost of new pickup & trailer			\$40,000
Total capital cost			\$400,000
Useful life (yrs)			10
<b>Total amortized capital cost (\$/yr)</b>			<b>\$ 46,892</b>
<b>General Overhead</b>			
CDFW overhead multiplier			0.23
Total annual capital and operating cost			\$ 1,260,773
<b>Total overhead (\$/yr)</b>			<b>\$ 289,978</b>
<b>Removal of Abandoned Boats</b>			
Boats Removed Per Year			10
Cost Per Removed Boat			\$3,300
<b>Total boat removal cost (\$/yr)</b>			<b>\$ 33,000</b>
<b>Removal of Abandoned Structures</b>			
Structures Removed Per Year			20
Cost Per Removed Structure			\$8,300
<b>Total structure removal cost (\$/yr)</b>			<b>\$ 166,000</b>
<i>* Cost based on proxy structure: 30 ft dock anchored firmly to bottom of channel. Assume \$100/ft for dock removal and disposal. \$800 per pile. Assume 2 piles per 10 ft of dock. Costs from Contra Costa County Sheriff Department.</i>			

1

1 **Table 8.A-32. CM15 Costs by 5-Year Period**

Capital Costs	Cost Period										
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	Total
Focused Predator Control at Hot Spots	\$ 234,461	\$ 234,461	\$ 234,461	\$ 234,461	\$ 234,461	\$ 234,461	\$ 234,461	\$ 234,461	\$ 234,461	\$ 234,461	\$ 2,344,610
Contingency @ 20%	\$ 46,892	\$ 46,892	\$ 46,892	\$ 46,892	\$ 46,892	\$ 46,892	\$ 46,892	\$ 46,892	\$ 46,892	\$ 46,892	\$ 468,922
<b>Total</b>	<b>\$ 281,353</b>	<b>\$ 2,813,532</b>									

2

Operating Costs	Cost Period										
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	Total
Focused Predator Control at Hot Spots	\$7,519,294	\$7,519,294	\$7,519,294	\$7,519,294	\$7,519,294	\$7,519,294	\$7,519,294	\$7,519,294	\$7,519,294	\$7,519,294	\$ 75,192,940
Abandoned Vessel Removal	\$165,000	\$165,000	\$165,000	\$165,000	\$165,000	\$165,000	\$165,000	\$165,000	\$165,000	\$165,000	\$ 1,650,000
Abandoned Structure Removal	\$830,000	\$830,000	\$830,000	\$830,000	\$830,000	\$830,000	\$830,000	\$830,000	\$830,000	\$830,000	\$ 8,300,000
Contingency @ 20%	\$ 1,702,859	\$ 1,702,859	\$ 1,702,859	\$ 1,702,859	\$ 1,702,859	\$ 1,702,859	\$ 1,702,859	\$ 1,702,859	\$ 1,702,859	\$ 1,702,859	\$ 17,028,588
<b>Total</b>	<b>\$ 10,217,153</b>	<b>\$ 102,171,528</b>									

## 1 **8.A.1.16 CM16 Nonphysical Fish Barriers**

2 This conservation measure provides funding for the installation and operation of nonphysical  
3 barriers at the heads of various Delta channels to redirect outmigrating juvenile salmonids. Potential  
4 locations for nonphysical barriers are described in Chapter 3, *Conservation Strategy*, and include the  
5 Head of Old River, the Delta Cross Channel, Georgiana Slough, Turner Cut, Columbia Cut, the Delta  
6 Mendota Canal intake, and the Clifton Court Forebay. Final locations for the nonphysical barriers  
7 may differ from the potential sites listed in Chapter 3, and will be determined by engineering  
8 feasibility, fishery benefit, and cost-effectiveness. The CM16 assumptions and costs by 5-year period  
9 are shown in Table 8.A-33.

1 **Table 8.A-33. CM16 Assumptions and Costs by 5-Year Period**

<b>Barrier Cost Assumptions</b>	
Barrier Cost: Equip and Ops (\$/Yr/Barrier)	\$3,000,000
Contingency %	35%
Contingency Cost (\$/Yr/Barrier):	\$1,050,000
No. of Barriers	7
<b>Capital % of total cost</b>	
	60% <i>assumption</i>
<b>O&amp;M % of total cost</b>	
	40% <i>assumption</i>

**Cost Estimate**

% of Baseline Estimate	Cost Period										Total Costs
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
<b>Total Costs</b>											
Physical Barriers	\$ 27,000,000	\$ 75,000,000	\$ 105,000,000	\$ 105,000,000	\$ 105,000,000	\$ 105,000,000	\$ 105,000,000	\$ 105,000,000	\$ 105,000,000	\$ 105,000,000	\$ 942,000,000
Contingency @ 35%	\$ 9,450,000	\$ 26,250,000	\$ 36,750,000	\$ 36,750,000	\$ 36,750,000	\$ 36,750,000	\$ 36,750,000	\$ 36,750,000	\$ 36,750,000	\$ 36,750,000	\$ 329,700,000
<b>Total</b>	<b>\$ 36,450,000</b>	<b>\$ 101,250,000</b>	<b>\$ 141,750,000</b>	<b>\$ 1,271,700,000</b>							

<b>Capital Costs</b>	Capital Costs Per Costing Period										Total
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Physical Barriers	\$ 16,200,000	\$ 45,000,000	\$ 63,000,000	\$ 63,000,000	\$ 63,000,000	\$ 63,000,000	\$ 63,000,000	\$ 63,000,000	\$ 63,000,000	\$ 63,000,000	\$ 565,200,000
Contingency @ 35%	\$ 5,670,000	\$ 15,750,000	\$ 22,050,000	\$ 22,050,000	\$ 22,050,000	\$ 22,050,000	\$ 22,050,000	\$ 22,050,000	\$ 22,050,000	\$ 22,050,000	\$ 197,820,000
<b>Total</b>	<b>\$ 21,870,000</b>	<b>\$ 60,750,000</b>	<b>\$ 85,050,000</b>	<b>\$ 763,020,000</b>							

<b>Operating Costs</b>	Operating Costs Per Costing Period										Total
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Physical Barriers	\$ 10,800,000	\$ 30,000,000	\$ 42,000,000	\$ 42,000,000	\$ 42,000,000	\$ 42,000,000	\$ 42,000,000	\$ 42,000,000	\$ 42,000,000	\$ 42,000,000	\$ 376,800,000
Contingency @ 35%	\$ 3,780,000	\$ 10,500,000	\$ 14,700,000	\$ 14,700,000	\$ 14,700,000	\$ 14,700,000	\$ 14,700,000	\$ 14,700,000	\$ 14,700,000	\$ 14,700,000	\$ 131,880,000
<b>Total</b>	<b>\$ 14,580,000</b>	<b>\$ 40,500,000</b>	<b>\$ 56,700,000</b>	<b>\$ 508,680,000</b>							

2

## 1 **8.A.1.17 CM17 Illegal Harvest Reduction**

2 This conservation measure provides for the funding of actions designed to reduce the incidence of  
3 illegal harvest of covered fish species. Over the course of the BDCP, funding will be provided to  
4 support 17 field wardens and five supervisory staff that will be assigned to the Delta-Bay Enhanced  
5 Enforcement Program. The CM17 assumptions and costs by 5-year period are shown in Table  
6 8.A-34.

1 **Table 8.A-34. CM17 Assumptions and Costs by 5-Year Period**

<b>Staffing Assumptions*</b>			Pay Scale Range (Per Month)		
<b>Position</b>	<b>FTEs*</b>	<b>Ann. Salary**</b>	Low	Hi	Mid
FISH AND GAME WARDEN (B)	17	\$59,478	4271	5642	4957
FISH AND GAME LIEUTENANT (SPECIALIST)	2	\$66,372	4767	6295	5531
FISH AND GAME LIEUTENANT (SUPERVISOR)	1	\$66,468	4777	6301	5539
FISH AND GAME CAPTAIN	1	\$76,230	5468	7237	6353
ASSOCIATE GOVERNMENTAL PROGRAM ANALYST	1	\$58,488	4400	5348	4874
STAFF PROGRAMMER ANALYST (SPECIALIST)	1	\$69,186	5065	6466	5766
Annual Salary Cost		\$1,414,242			
Benefits Multiplier		1.35			
Annual Salary & Benefits Cost		\$1,909,227			
Overtime Allowance		\$300,000			
<b>Total Salary and Benefit Cost (\$/yr)</b>		<b>\$2,209,227</b>			
<i>* Positions, FTEs, and overtime allowance from CDFG Delta/Bay Enforcement Proposal (April 12, 2012)</i>					
<i>** Salary estimates from State of California Civil Service Pay Scales (<a href="http://www.calhr.ca.gov/Pay%20Scales%20Library/PS_Sec_17.pdf">http://www.calhr.ca.gov/Pay%20Scales%20Library/PS_Sec_17.pdf</a>)</i>					
<b>Direct Operating Costs</b>					
Allowances for personnel and office equipment, vehicle O&M, boat slips, etc.		\$1,422,000	<<includes cost allowance for vehicles, boat slips, fuel, equipment, uniforms, office costs, etc. Estimate provided by B. Nashund, CDFG.		
Special Units Investigation Allowance		\$500,000	<<Estimate from CDFG Delta/Bay Enforcement Proposal (April 12, 2012)		
<b>Total Direct Operating Cost (\$/yr)</b>		<b>\$1,922,000</b>			
<b>Vehicle Capital Cost</b>					
Vehicle/Equip. Capital Allowance		\$900,000	<<Capital Estimate from CDFG Delta/Bay Enforcement Proposal (April 12, 2012). Useful life is an assumption adopted for cost analysis.		
Useful life (yrs)		10			
<b>Total amortized capital cost (\$/yr)</b>		<b>\$105,507</b>			
<b>General Overhead</b>					
CDFW overhead multiplier		0.23			
Total annual capital and operating cost		\$4,236,734			
<b>Total overhead (\$/yr)</b>		<b>\$ 974,449</b>			

2

Cost Schedule by 5-Yr Period												
Capital Costs	Cost Period										Total Costs	
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
Capital equipment	\$ 527,537	\$ 527,537	\$ 527,537	\$ 527,537	\$ 527,537	\$ 527,537	\$ 527,537	\$ 527,537	\$ 527,537	\$ 527,537	\$ 527,537	\$ 5,275,373
Contingency @ 10%	\$ 52,754	\$ 52,754	\$ 52,754	\$ 52,754	\$ 52,754	\$ 52,754	\$ 52,754	\$ 52,754	\$ 52,754	\$ 52,754	\$ 52,754	\$ 527,537
<b>Total</b>	<b>\$ 580,291</b>	<b>\$ 5,802,910</b>										

Operating Costs	Cost Period										Total Costs	
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
Salary & Benefits	\$ 11,046,134	\$ 11,046,134	\$ 11,046,134	\$ 11,046,134	\$ 11,046,134	\$ 11,046,134	\$ 11,046,134	\$ 11,046,134	\$ 11,046,134	\$ 11,046,134	\$ 11,046,134	\$ 110,461,335
Direct operating cost	\$ 9,610,000	\$ 9,610,000	\$ 9,610,000	\$ 9,610,000	\$ 9,610,000	\$ 9,610,000	\$ 9,610,000	\$ 9,610,000	\$ 9,610,000	\$ 9,610,000	\$ 9,610,000	\$ 96,100,000
General overhead	\$ 4,872,244	\$ 4,872,244	\$ 4,872,244	\$ 4,872,244	\$ 4,872,244	\$ 4,872,244	\$ 4,872,244	\$ 4,872,244	\$ 4,872,244	\$ 4,872,244	\$ 4,872,244	\$ 48,722,443
Contingency @ 10%	\$ 2,552,838	\$ 2,552,838	\$ 2,552,838	\$ 2,552,838	\$ 2,552,838	\$ 2,552,838	\$ 2,552,838	\$ 2,552,838	\$ 2,552,838	\$ 2,552,838	\$ 2,552,838	\$ 25,528,378
<b>Total</b>	<b>\$ 28,081,216</b>	<b>\$ 280,812,156</b>										

1

## 1 **8.A.1.18 CM18 Conservation Hatcheries**

2 This conservation measure provides for the support of existing and establishment of new  
3 conservation propagation programs for delta and longfin smelt. The conservation measure includes  
4 the development of a U.S. Fish and Wildlife Services (USFWS) delta and longfin smelt conservation  
5 hatchery to house a delta smelt refugial population and provide a source of delta and longfin smelt  
6 for supplementation or reintroduction, if deemed necessary by fishery agencies; and the expansion  
7 of the refugial population of delta smelt and establishment of a refugial population of longfin smelt  
8 at the University of California, Davis Fish Conservation and Culture Laboratory to serve as a  
9 population safeguard in case of a catastrophic event in the wild.<sup>3</sup>The CM18 assumptions and costs  
10 by 5-year period are shown in Table 8.A-35.

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<sup>3</sup> There have been no commitments yet to fully fund this conservation measure by BDCP. Costs are presented for full funding but BDCP may only partially fund this conservation measure.

1 **Table 8.A-35. CM18 Assumptions and Costs by 5-Year Period**

<b>Facility construction cost</b>	Plan Year Operational	Low	High	Mid								
FWS Smelt Hatchery	7	\$16,500,000	\$28,000,000	\$22,250,000								
Smelt Refugial Pop Expansion	4			\$5,200,851								
<b>Total facility construction cost</b>				<b>\$27,450,851</b>								
<b>Annual Operating Costs</b>	Plan Years	Low	High	Mid								
FWS Smelt Hatchery	Yrs 7-50	\$4,100,000	\$6,800,000	\$5,450,000								
Smelt Refugium	Yrs 4-8			\$2,080,340								
Smelt Refugium	Yrs 9-50			\$832,136								
<b>Cost Schedule by 5-Yr Period</b>												
<b>Capital Costs</b>	<b>Capital Costs Per Costing Period</b>										Total Costs	
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
FWS Smelt Hatchery - Construction	\$22,250,000											\$ 22,250,000
Delta Smelt Refugial - Construction	\$5,200,851											\$ 5,200,851
Contingency @ 20%	\$5,490,170	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$ 5,490,170
<b>Total Costs Per Period</b>	<b>\$32,941,021</b>	<b>\$ -</b>	<b>\$ 32,941,021</b>									
<b>Operating Costs</b>	<b>Operating Costs Per Costing Period</b>										Total Costs	
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
FWS Smelt Hatchery - O&M	\$0	\$21,800,000	\$27,250,000	\$27,250,000	\$27,250,000	\$27,250,000	\$27,250,000	\$27,250,000	\$27,250,000	\$27,250,000	\$27,250,000	\$ 239,800,000
Delta Smelt Refugial - O&M	\$4,160,681	\$7,905,293	\$4,160,681	\$4,160,681	\$4,160,681	\$4,160,681	\$4,160,681	\$4,160,681	\$4,160,681	\$4,160,681	\$4,160,681	\$ 45,351,417
Contingency @ 10%	\$416,068	\$2,970,529	\$3,141,068	\$3,141,068	\$3,141,068	\$3,141,068	\$3,141,068	\$3,141,068	\$3,141,068	\$3,141,068	\$3,141,068	\$ 28,515,142
<b>Total Costs Per Period</b>	<b>\$4,576,749</b>	<b>\$ 32,675,822</b>	<b>\$ 34,551,749</b>	<b>\$ 313,666,559</b>								

2

### 1 **8.A.1.19 CM19 Urban Stormwater Treatment**

2 Under CM19 Urban Stormwater Treatment, the BDCP Implementation Office will oversee a program  
3 to provide funding for grants to entities such as the Sacramento Stormwater Quality Partnership,  
4 and/or counties and cities whose stormwater contributes to Delta waterways (hereafter the  
5 stormwater entities) under the National Pollutant Discharge Elimination System (NPDES) MS4  
6 (municipal) stormwater permits, to implement actions from and in addition to their respective  
7 stormwater management plans. Proposed actions will be reviewed by technical staff in the  
8 Implementation Office or by outside experts supporting the Implementation Office. Projects will be  
9 funded if the Implementation Office determines that they are expected to benefit covered species.

### 10 **8.A.1.20 CM20 Recreational Users Invasive Species Program**

11 This conservation measure will provide for a Delta recreational users invasive species program  
12 designed to implement actions to prevent the introduction of new aquatic invasive species and  
13 reduce the spread of existing aquatic invasive species via recreational watercraft, trailers, and other  
14 mobile recreational equipment used in aquatic environments within the Plan Area. The CM20  
15 assumptions and costs by 5-year period are shown in Table 8.A-36.

1 **Table 8.A-36. CM20 Assumptions and Costs by 5-Year Period**

<b>Salary and Benefit Cost Estimate</b>					
Staff Position	Stations	FTE/Station	Total FTE*	Ann. Salary	
Education program coordinator	1	0.5	0.5	\$76,036	
Training specialist	1	0.5	0.5	\$43,479	
Public events specialist	1	0.5	0.5	\$43,479	
Inspector - level 2 highway spotcheck stations	7	1.91	13.5	\$48,888	
Inspector - level 3 offhighway inspection stations	9	2.80	25.0	\$48,888	
			Annual Salary Cost	\$1,963,685	
			Benefits Multiplier	1.35	
<b>Total Salary and Benefit Cost (\$/yr)</b>				<b>\$ 2,650,975</b>	
<i>*rounded to nearest 0.5 FTE.</i>					
<b>Signage Capital Cost</b>					
	Quantity	Unit Cost	Total Cost	Useful Life (yrs)	Amortized Cost (\$/yr)
Interpretive Displays	30	\$3,745	\$112,350	10	\$13,171
Billboards	10	\$21,344	\$213,440	20	\$14,347
<b>Total signage capital cost (\$/yr)</b>					<b>\$27,517</b>
<b>50-yr signage cost (\$)</b>					<b>\$ 1,375,868</b>
<b>Inspection Station Capital Cost</b>					
	Quantity	Unit Cost	Total Cost	Useful Life (yrs)	Amortized Cost (\$/yr)
Level 3 mobile inspection station	6	\$15,600	\$93,600	5	\$20,438
Level 3 semi-permanent inspection station	3	\$104,000	\$312,000	10	\$36,576
<b>Total station station cost (\$/yr)</b>					<b>\$57,014</b>
<b>50-yr signage cost (\$)</b>					<b>\$ 2,850,695</b>
<b>Inspection Station Operating Cost</b>					
	Quantity	\$/Mo	Month/Yr	Annual Cost	
Level 3 inspection station	9	\$3,525	8	\$253,800	
Level 2 spot check station	7	\$3,525	4	\$98,700	
<b>Total station operating cost (\$/yr)</b>					<b>\$352,500</b>
<b>Education Program Printing Cost</b>					
	Quantity	Unit Cost	Annual Cost		
Annual printing allowance	LS	\$30,000	\$30,000		
<b>Total printing allowance (\$/yr)</b>					<b>\$30,000</b>
<b>General Overhead</b>					
CDFW overhead multiplier				0.23	
Total annual capital and operating cost				\$ 3,118,006	
<b>Total overhead (\$/yr)</b>					<b>\$ 717,141</b>

2

Cost Schedule by 5-Yr Period												
Capital Costs	Cost Period										Total	
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
Signage	\$ 137,587	\$ 137,587	\$ 137,587	\$ 137,587	\$ 137,587	\$ 137,587	\$ 137,587	\$ 137,587	\$ 137,587	\$ 137,587	\$ 137,587	\$ 1,375,868
Inspection Stations	\$ 285,070	\$ 285,070	\$ 285,070	\$ 285,070	\$ 285,070	\$ 285,070	\$ 285,070	\$ 285,070	\$ 285,070	\$ 285,070	\$ 285,070	\$ 2,850,695
Contingency (20%)	\$ 84,531	\$ 84,531	\$ 84,531	\$ 84,531	\$ 84,531	\$ 84,531	\$ 84,531	\$ 84,531	\$ 84,531	\$ 84,531	\$ 84,531	\$ 845,313
<b>Total, with contingency</b>	<b>\$ 507,188</b>	<b>\$ 5,071,876</b>										
Operating Costs	Cost Period										Total	
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50		
Program staffing	\$ 13,254,875	\$ 13,254,875	\$ 13,254,875	\$ 13,254,875	\$ 13,254,875	\$ 13,254,875	\$ 13,254,875	\$ 13,254,875	\$ 13,254,875	\$ 13,254,875	\$ 13,254,875	\$ 132,548,749
Inspection stations	\$ 1,762,500	\$ 1,762,500	\$ 1,762,500	\$ 1,762,500	\$ 1,762,500	\$ 1,762,500	\$ 1,762,500	\$ 1,762,500	\$ 1,762,500	\$ 1,762,500	\$ 1,762,500	\$ 17,625,000
Printing	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 1,500,000
General overhead	\$ 3,585,707	\$ 3,585,707	\$ 3,585,707	\$ 3,585,707	\$ 3,585,707	\$ 3,585,707	\$ 3,585,707	\$ 3,585,707	\$ 3,585,707	\$ 3,585,707	\$ 3,585,707	\$ 35,857,072
Contingency (10%)	\$ 1,875,308	\$ 1,875,308	\$ 1,875,308	\$ 1,875,308	\$ 1,875,308	\$ 1,875,308	\$ 1,875,308	\$ 1,875,308	\$ 1,875,308	\$ 1,875,308	\$ 1,875,308	\$ 18,753,082
<b>Total, with contingency</b>	<b>\$ 20,628,390</b>	<b>\$ 206,283,903</b>										

1

### 1 **8.A.1.21 CM21 Nonproject Diversions**

2 This conservation measure will provide funding for actions that will minimize the potential for  
3 entrainment of covered fish associated with operation of nonproject diversions. The CM21  
4 assumptions and costs by 5-year period are shown in Table 8.A-37.

1 **Table 8.A-37. CM21 Assumptions and Costs by 5-Year Period**

Diversion Inventory and Prioritization Studies		Quantity	Cost*										
Yr 1 study cost		LS	\$3,744,612										
Yr 2 & 3 study cost		LS	\$1,872,306										
<b>Total diversion inventory and prioritization studies cost</b>			<b>\$5,616,919</b>										
<i>Source: Dan Meier, USFWS, personal communication.</i>													
	Yr Implementation Begins	Annual Rate (cfs/yr)	Program Target (cfs)										
<b>BDCP remediation target (cfs)</b>													
Remediation target (cfs)	6	100	4400										
<b>CM21 Remediation Cost</b>	< 100 cfs	100-250 cfs	> 250 cfs										
Remediation cost per cfs*	\$8,700	\$33,300	\$111,800										
% of unscreened diversion capacity	90%	5%	5%										
<i>* Screen costs for &lt; 250 cfs estimated from data set of screening costs for recent projects in California compiled by PG&amp;E, provided by DFG.</i>													
<i>Screen costs for &gt;250 cfs is the mid point of a range provided by personal communication, Thomas Schoyer, DFG, 10/7/2009.</i>													
<i>Screens of unknown capacity assumed to be &lt; 100 cfs.</i>													
	Quantity	Unit Cost*	Total Cost										
Remediation cost	4400	\$15,100	\$66,440,000										
Capital expenditure cap			\$50,000,000										
<i>*weighted average remediation cost</i>													
<b>Cost Schedule by 5-Yr Period</b>													
	Cost Period												
<b>Capital Costs</b>	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	Total		
cfs remediated	0	500	500	500	500	500	259	0	0	0	2,759		
Diversion Remediation	\$ -	\$ 7,550,000	\$ 7,550,000	\$ 7,550,000	\$ 7,550,000	\$ 7,550,000	\$ 3,916,667	\$ -	\$ -	\$ -	\$ 41,666,667		
Contingency (20%)	\$ -	\$ 1,510,000	\$ 1,510,000	\$ 1,510,000	\$ 1,510,000	\$ 1,510,000	\$ 783,333	\$ -	\$ -	\$ -	\$ 8,333,333		
<b>Total</b>	\$ -	\$ 9,060,000	\$ 9,060,000	\$ 9,060,000	\$ 9,060,000	\$ 9,060,000	\$ 4,700,000	\$ -	\$ -	\$ -	\$ 50,000,000		
<b>Cumulative Cost</b>	\$ -	\$ 9,060,000	\$ 18,120,000	\$ 27,180,000	\$ 36,240,000	\$ 45,300,000	\$ 50,000,000	\$ 50,000,000	\$ 50,000,000	\$ 50,000,000	\$ 50,000,000		
	Cost Period												
<b>Operating Costs</b>	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	Total		
Inventory and Prioritization Study	\$ 5,616,919	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 5,616,919		
Contingency	\$ 1,123,384	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,123,384		
<b>Total</b>	\$ 6,740,302	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 6,740,302		

2

## 8.A.1.22 CM22 Avoidance and Minimization Measures

This section provides assumptions and cost estimates for implementing avoidance and minimization measures identified in Appendix 3-C, *Avoidance and Minimization Measures*. Planning, preconstruction, and construction survey costs are included with avoidance and minimization measure costs, summarized below.

### *AMM1. Worker Awareness Training*

#### *Assumptions:*

- This action is subsumed under construction monitoring and administrative costs; no additional costs are expected to be incurred.

### *AMM2. Construction Best Management Practices and Monitoring*

#### *Assumptions:*

- Best management practices are subsumed under construction monitoring and administrative costs; no additional costs will be incurred.
- For construction monitoring, the average construction site is estimated to be 50 acres, and the average restoration site is estimated to be 100 acres.
- During the construction period, when native vegetation is removed or disturbed, a biological monitor (junior-level) will be deployed to each construction site to determine that construction best management practices and avoidance and minimization measures are implemented.
- Each construction site will be monitored for 8 hours daily by a biologist for an average of 4 months (120 days) each.
- Restoration sites will be monitored during the initial period, when native vegetation is removed or disturbed. The average duration of construction monitoring for restoration sites is one week.
- Each biological monitor will operate a truck and an ATV for an average of 10 hours per deployment day (includes travel time to sites).

### *AMM3. Stormwater Pollution Prevention Plan*

#### *Assumptions:*

- This action is subsumed under construction monitoring and administrative costs; no additional costs are expected to be incurred.

### *AMM4. Erosion and Sediment Control Plan*

#### *Assumptions:*

- This action is subsumed under construction monitoring and administrative costs; no additional costs are expected to be incurred.

1        *AMM5. Spill Prevention, Containment, and Countermeasure Plan*

2        *Assumptions:*

- 3        ● This action is subsumed under construction monitoring and administrative costs; no  
4        additional costs are expected to be incurred.

5        *AMM6. Spoils, Tunnel Muck, and Dredged Material Disposal Plan*

6        *Assumptions:*

- 7        ● This action is subsumed under construction monitoring and administrative costs; no  
8        additional costs are expected to be incurred.

9        *AMM7. Barge Operations Plan*

10       *Assumptions:*

- 11       ● This action is subsumed under construction monitoring and administrative costs; no  
12       additional costs are expected to be incurred.

13       *AMM8. Fish Rescue and Salvage Plan*

14       *Assumptions:*

- 15       ● This action is subsumed under construction monitoring and administrative costs; no  
16       additional costs are expected to be incurred.

17       *AMM9. Underwater Sound Control and Abatement Plan*

18       *Assumptions:*

- 19       ● This action is subsumed under construction monitoring and administrative costs; no  
20       additional costs are expected to be incurred.

21       *AMM10. Restoration of Temporarily Affected Natural Communities*

- 22       ● Restoration of 125 acres of temporarily affected tidal perennial aquatic will occur from  
23       years 1 to 40 at a cost of \$3,700 per acre.
- 24       ● Restoration of 6 acres of temporarily affected tidal freshwater emergent wetland will occur  
25       from years 1 to 40 at a cost of \$3,700 per acre.
- 26       ● Restoration of 208 acres of temporarily affected valley/foothill riparian will occur from  
27       years 1 to 40 at a cost of \$5,600 per acre.
- 28       ● Restoration of 301 acres of temporarily affected grassland will occur from years 1 to 40 at a  
29       cost of \$1,300 per acre.
- 30       ● Restoration of 2 acres of temporarily affected nontidal freshwater perennial emergent  
31       wetland will occur from years 1 to 40 at a cost of \$6,700 per acre.
- 32       ● Restoration of 34 acres of temporarily affected nontidal perennial aquatic will occur from  
33       years 1 to 40 at a cost of \$6,700 per acre.
- 34       ● Restoration of 50 acres of temporarily affected managed wetland will occur from years 1 to  
35       40 at a cost of \$6,700 per acre.

1        *AMM11. Covered Plant Species*2        *Assumptions:*

- 3        ● Cost associated with avoidance of covered plant species is subsumed under cost estimate of
- 
- 4        planning surveys; no additional costs are expected to be incurred.

5        *AMM12. Vernal Pool Crustaceans*6        *Assumptions:*

- 7        ● Cost associated with avoidance of vernal pool crustaceans is subsumed under cost estimates
- 
- 8        of planning and preconstruction surveys; no additional costs are expected to be incurred.

9        *AMM13. California Tiger Salamander*10       *Assumptions:*

- 11       ● Cost associated with avoidance of California tiger salamander is subsumed under cost
- 
- 12       estimates of planning, preconstruction, and construction surveys and construction costs; no
- 
- 13       additional costs are expected to be incurred.

14       *AMM14. California Red-Legged Frog*15       *Assumptions:*

- 16       ● Cost associated with avoidance of California red-legged frog is subsumed under cost
- 
- 17       estimates of planning, preconstruction, and construction surveys and construction costs; no
- 
- 18       additional costs are expected to be incurred.

19       *AMM15. Valley Elderberry Longhorn Beetle*20       *Assumptions:*

- 21       ● Fencing and marking of elderberry shrub zones is subsumed under planning,
- 
- 22       preconstruction, and construction surveys and construction costs.
- 
- 23       ● Cost associated with relocation of elderberry shrub can range from \$3,000 to \$20,000. It is
- 
- 24       assumed that shrubs will be translocated to locations as close to the original site as possible,
- 
- 25       and these areas will be close to roads. Therefore, relocation cost is assumed to be \$5,000 per
- 
- 26       shrub.
- 
- 27       ● Fifteen shrubs will be relocated annually during the first ten years of implementation, and
- 
- 28       ten shrubs will be relocated annually for the next 30 years during restoration activities.

29       *AMM16. Giant Garter Snake*30       *Assumptions:*

- 31       ● Cost associated with avoidance of giant garter snake is subsumed under cost estimates of
- 
- 32       planning, preconstruction, and construction surveys and construction costs; no additional
- 
- 33       costs are expected to be incurred.

1 *AMM17. Western Pond Turtle*2 *Assumptions:*

- 3 • Cost associated with avoidance of western pond turtle is subsumed under cost estimates of  
4 planning, preconstruction, and construction surveys and construction costs; no additional  
5 costs are expected to be incurred.

6 *AMM18. Swainson's Hawk and White-Tailed Kite*7 *Assumptions:*

- 8 • Cost associated with avoidance of Swainson's hawk and white-tailed kite is subsumed under  
9 cost estimates of planning, preconstruction, and construction surveys and construction  
10 costs; no additional costs are expected to be incurred.

11 *AMM19. California Clapper Rail and California Black Rail*12 *Assumptions:*

- 13 • Surveys will be conducted by a midlevel biologist and a field technician.
- 14 • Four sites will be visited twice annually.
- 15 • A truck and ATV will be used on field days.

16 *AMM20. Greater Sandhill Crane*17 *Assumptions:*

- 18 • Cost associated with avoidance of greater sandhill crane is subsumed under cost estimates  
19 of planning, preconstruction, and construction surveys and construction costs; no additional  
20 costs are expected to be incurred.

21 *AMM21. Tricolored Blackbird*22 *Assumptions:*

- 23 • Cost associated with avoidance of tricolored blackbird is subsumed under cost estimates of  
24 planning, preconstruction, and construction surveys and construction costs; no additional  
25 costs are expected to be incurred.

26 *AMM22 Suisun Song Sparrow, Yellow-Breasted Chat, Least Bell's Vireo, Yellow-Billed Cuckoo*27 *Assumptions:*

- 28 • Cost associated with avoidance of Suisun song sparrow, yellow-breasted chat, least Bell's  
29 vireo, and yellow-billed cuckoo is subsumed under cost estimates of planning,  
30 preconstruction, and construction surveys and construction costs; no additional costs are  
31 expected to be incurred.

32 *AMM23. Western Burrowing Owl*33 *Assumptions:*

- 34 • Cost associated with avoidance of western burrowing owl is subsumed under cost estimates  
35 of planning, preconstruction, and construction surveys and construction costs; no additional  
36 costs are expected to be incurred.

1 *AMM24. San Joaquin Kit Fox*2 *Assumptions:*

- 3 ● Cost associated with avoidance of San Joaquin kit fox is subsumed under cost estimates of
- 4 planning, preconstruction, and construction surveys and construction costs; no additional
- 5 costs are expected to be incurred.

6 *AMM25 Riparian Woodrat and Riparian Brush Rabbit*7 *Assumptions:*

- 8 ● Cost associated with avoidance of riparian woodrat and riparian brush rabbit is subsumed
- 9 under cost estimates of planning, preconstruction, and construction surveys and
- 10 construction costs; no additional costs are expected to be incurred.

11 *AMM26. Salt Marsh Harvest Mouse and Suisun Shrew*12 *Assumptions:*

- 13 ● Cost associated with avoidance of salt marsh harvest mouse and Suisun shrew is subsumed
- 14 under cost estimates of planning, preconstruction, and construction surveys and
- 15 construction costs; no additional costs are expected to be incurred.

16 **8.A.1.22.1 Avoidance and Minimization Survey Assumptions**17 *Planning surveys for covered wildlife and plant species.*18 *Assumptions:*

- 19 ● Planning surveys will be conducted by a wildlife biologist and a botanist (midlevel) to
- 20 determine if further surveys (i.e., preconstruction surveys) are needed.
- 21 ● Presurvey planning time (for review of existing data and maps) is subsumed under
- 22 administrative costs.
- 23 ● On average, each planning survey will require 4 hours of survey time by a wildlife biologist
- 24 and a botanist each for each 20 acres of project footprint.
- 25 ● Travel time will be on average two hours per day per biologist.
- 26 ● Each planning survey will require a pickup truck and an ATV.
- 27 ● Reporting and documentation of planning survey results will require 3 hours of time per
- 28 survey.
- 29 ● The average project size will be 20 acres.
- 30 ● Thus, total staff time (including preparation, travel, field survey and reporting) will be 10
- 31 hours per average (20 acre) parcel.

32 *Preconstruction surveys for covered wildlife and plant species.*33 *Assumptions:*

- 34 ● Preconstruction surveys will be deemed necessary for all species for which modeled habitat
- 35 is impacted by BDCP covered activities.

- 1           ● Preconstruction surveys will be conducted by midlevel biologists and midlevel botanists  
2           accompanied by a field technician to determine species occurrence on project sites.
- 3           ● Preconstruction surveys for multiple species are combined by taxonomic group (e.g., plants,  
4           raptors, reptiles, amphibians) unless specific survey protocol requirements have been  
5           established.
- 6           ● Survey requirements for some covered species are detailed in USFWS survey protocols.
- 7           ● Preconstruction surveys for species that require protocol-surveys will involve various  
8           efforts and costs (Table 8.A-38).
- 9           ● For all other species, survey time requirements have been estimated on the basis of acreage,  
10          the size of the organism and other factors (terrain, vegetation, type of survey etc.; Table  
11          8.A-39)
- 12          ● A pickup truck and an ATV will be used on each 10-hour field day (includes travel time to  
13          sites).
- 14          ● Presurvey planning and mapping will be subsumed under administrative costs.

15          Table 8.A-38 and Table 8.A-39 summarize the assumptions described above. Table 8.A-40 shows the  
16          planning, preconstruction, and survey costs by 5-year period.

17          **Table 8.A-38. Assumptions for Total Average Hours Required to Comply With Survey Protocols for**  
18          **Selected Covered Species**

Species	Basis (acres)	Average Estimated Personnel Hours	Survey elements (mandatory)
San Joaquin kit fox	100	100	Reporting, 100% of area covered by visual transect, 10 nights of spotlight surveys, camera set monitoring 10 nights
California red-legged frog	10	80	Reporting, up to eight surveys (3 day surveys and 5 night surveys)
California tiger salamander	10	200	Reporting, 3 aquatic larval samples, drift fence / pitfall trapping on 20 nights
Western burrowing owl	10	40	Reporting, 4 field visits, 100% of area covered by walking survey, mapping of burrows
Vernal pool crustaceans	10	80	8 surveys, 10 soil samples, reports
Valley elderberry longhorn beetle	10	40	2 site visits, counting beetles and bore holes, reporting time (monitoring of relocation success is not included – see monitoring action for AMM9 through AMM26)
Giant garter snake	10	10	Site visit, reporting

19

1 **Table 8.A-39. Assumptions for Monitoring Time Requirements for Species for Which No Survey**  
 2 **Protocol has been Established by Regulatory Agencies**

Species	Basis (acres)	Time (hours)	Predominant survey type
Raptors	100	10	field surveys during nesting season
Songbirds	10	10	breeding bird surveys
Shore birds	100	10	field surveys
Bats	10	20	bat detector, mist netting
Reptiles	10	10	Visual surveys
Amphibians	10	20	dip netting for larvae, pitfall trapping
Insects	10	10	visual surveys
Plants	10	30	3 site visits

3

4 **Table 8.A-40. Planning, Preconstruction, and Construction Survey Costs by 5-Year Intervals**

	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40
Planning	\$780,000	\$790,000	\$600,000	\$600,000	\$610,000	\$610,000	\$610,000	\$610,000
Pre-construction	\$2,710,000	\$2,710,000	\$1,600,000	\$730,000	\$730,000	\$730,000	\$730,000	\$730,000
Total	\$3,490,000	\$3,500,000	\$2,200,000	\$1,330,000	\$1,340,000	\$1,340,000	\$1,340,000	\$1,340,000

5

## 6 **8.A.2 Plan Administration Costs**

### 7 **8.A.2.1 Implementation Office Staff-Related Costs**

8 The Implementation Office employee costs are based on a staffing plan developed for the BDCP and  
 9 the salary and benefit assumptions described in Section 8.3, *Common Assumptions for Cost*  
 10 *Estimation*. Staffing costs include allowances for benefits, travel, and training. Staffing levels  
 11 assumed for the cost estimate vary over the permit period, from a low 41 FTE positions in the first  
 12 5 years of Plan implementation to a maximum of 57 FTE positions by the 21st year of Plan  
 13 implementation. Assumed staffing level and costs by 5-year period are shown in Table 8.A-41 and  
 14 Table 8.A-42, and summarized in Table 8.A-43.

1 **Table 8.A-41. Implementation Office Staff Full-Time Equivalent Positions**

Staff Levels Position	Avg Annual FTEs Per Cost Period									
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Program Manager	1	1	1	1	1	1	1	1	1	1
Deputy Program Manager	1	1	1	1	1	1	1	1	1	1
Program Counsel	1	1	1	1	1	1	1	1	1	1
Habitat Restoration Program Manager	1	1	1	1	1	1	1	1	1	1
Other Stressors Program Manager	1	1	1	1	1	1	1	1	1	1
Monitoring and Research Program Manager	1	1	1	1	1	1	1	1	1	1
IT/Database/GIS Management	1	1	1	1	1	1	1	1	1	1
GIS Specialist	1	1	1	1	1	1	1	1	1	1
Budget Analyst	1	1	1	1	1	1	1	1	1	1
Land Acquisition Specialist	6	6	6	6	4	2	1	1	1	1
Contracts Officer	3	3	3	3	3	3	3	3	1	1
Regulatory Specialist	1	1	1	1	1	1	1	1	1	1
Public Outreach Program Manager	1	1	1	1	1	1	1	1	1	1
Admin - Secretary	2	2	2	2	2	2	2	2	2	2
Clerks	3	3	3	3	3	3	3	3	3	3
Civil Engineer	1	1	1	1	1	1	1	1	1	1
Staff Scientist	2	3	3	3	3	3	3	3	3	3
Water Operations Specialist	2	2	2	2	2	2	2	2	2	2
Habitat Restoration Project Manager	1	2	3	3	3	3	2	2	1	1
Other Stressors Project Manager	2	2	3	3	3	3	2	2	2	2
Terrestrial Preserve Manager	1	1	2	2	2	2	2	2	2	2
Technical Specialist	5	10	10	10	10	10	8	6	5	4
Laborer	2	4	6	8	10	10	10	10	10	10
<b>Total FTE Positions</b>	<b>41</b>	<b>50</b>	<b>55</b>	<b>57</b>	<b>57</b>	<b>55</b>	<b>50</b>	<b>48</b>	<b>44</b>	<b>43</b>

2  
3

1 **Table 8.A-42. Implementation Office Staff FTE Salary Assumptions**

<b>Staff Cost Assumptions</b>						
<b>Position</b>	<b>DFG Proxy Position</b>	<b>Annual FTE Salary</b>	<b>Benefit Multiplier</b>	<b>Overnight Travel (Days/FTE/Yr)</b>	<b>Mileage Allowance (Miles/FTE/Yr)</b>	<b>Requires Office Equipment 1=Yes, 0=No</b>
Program Manager	C.E.A. III, Resour	\$ 121,892	1.35	10	2,500	1
Deputy Program Manager	C.E.A. II, Bay Del	\$ 112,353	1.35	10	2,500	1
Program Counsel	Staff Counsel III	\$ 119,772	1.35	10	2,500	1
Habitat Restoration Program Manager	Environmental P	\$ 91,154	1.35	1	250	1
Other Stressors Program Manager	Environmental P	\$ 91,154	1.35	1	250	1
Monitoring and Research Program Manager	Environmental P	\$ 91,154	1.35	1	250	1
IT/Database/GIS Management	Research Manag	\$ 80,555	1.35	2	500	1
GIS Specialist	Research Analys	\$ 68,896	1.35	-	-	1
Budget Analyst	Associate Budge	\$ 63,596	1.35	1	250	1
Land Acquisition Specialist	Sr Land Agent - S	\$ 81,615	1.35	2	500	1
Contracts Officer	Staff Services M	\$ 75,255	1.35	2	500	1
Regulatory Specialist	Associate Gover	\$ 62,536	1.35	2	500	1
Public Outreach Program Manager	Information Offi	\$ 64,656	1.35	5	1,250	1
Admin - Secretary	Executive Assista	\$ 42,397	1.35	-	250	1
Clerks	Account Clerk II	\$ 34,978	1.35	-	-	1
Civil Engineer	Associate Civil E	\$ 86,915	1.35	2	500	1
Staff Scientist	Staff Env Scientis	\$ 75,255	1.35	2	500	1
Water Operations Specialist	Operations Rese	\$ 81,615	1.35	2	500	1
Habitat Restoration Project Manager	Staff Env Scientis	\$ 67,611	1.35	2	500	1
Other Stressors Project Manager	Staff Env Scientis	\$ 75,255	1.35	2	500	1
Terrestrial Preserve Manager	Staff Env Scientis	\$ 75,255	1.35	5	1,250	1
Technical Specialist	Fish Habitat Spe	\$ 48,757	1.35	-	-	1
Laborer	Laborer - Tractor	\$ 44,517	1.35	-	-	0
Labor Cost Markup to account for higher federal and private sector e		1.15				
<b>Staff Travel &amp; Training Cost Assumptions</b>						
Per Diem Travel Allowance (\$/day)	\$	193				
Exec Dir Per Diem Multiplier for Airfare		3.00				
Mileage Reimbursement (\$/mi)	\$	0.583				
Training (\$/Yr)	\$	551				

2

Staff Levels	Avg Annual FTEs Per Cost Period									
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Program Manager	1	1	1	1	1	1	1	1	1	1
Deputy Program Manager	1	1	1	1	1	1	1	1	1	1
Program Counsel	1	1	1	1	1	1	1	1	1	1
Habitat Restoration Program Manager	1	1	1	1	1	1	1	1	1	1
Other Stressors Program Manager	1	1	1	1	1	1	1	1	1	1
Monitoring and Research Program Manager	1	1	1	1	1	1	1	1	1	1
IT/Database/GIS Management	1	1	1	1	1	1	1	1	1	1
GIS Specialist	1	1	1	1	1	1	1	1	1	1
Budget Analyst	1	1	1	1	1	1	1	1	1	1
Land Acquisition Specialist	6	6	6	6	4	2	1	1	1	1
Contracts Officer	3	3	3	3	3	3	3	3	3	1
Regulatory Specialist	1	1	1	1	1	1	1	1	1	1
Public Outreach Program Manager	1	1	1	1	1	1	1	1	1	1
Admin - Secretary	2	2	2	2	2	2	2	2	2	2
Clerks	3	3	3	3	3	3	3	3	3	3
Civil Engineer	1	1	1	1	1	1	1	1	1	1
Staff Scientist	2	3	3	3	3	3	3	3	3	3
Water Operations Specialist	2	2	2	2	2	2	2	2	2	2
Habitat Restoration Project Manager	1	2	3	3	3	3	2	2	1	1
Other Stressors Project Manager	2	2	3	3	3	3	2	2	2	2
Terrestrial Preserve Manager	1	1	2	2	2	2	2	2	2	2
Technical Specialist	5	10	10	10	10	10	8	6	5	4
Laborer	2	4	6	8	10	10	10	10	10	10
<b>Total FTE Positions</b>	<b>41</b>	<b>50</b>	<b>55</b>	<b>57</b>	<b>57</b>	<b>55</b>	<b>50</b>	<b>48</b>	<b>44</b>	<b>43</b>

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1 **Table 8.A-43. Implementation Office Staff Cost by 5-Year Period (Inclusive of Salary, Benefit, Travel, and Training Cost)**

Total Staff Cost	Total Staff Cost Per Costing Period										
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
<b>Subtotal by Position</b>											
Program Manager	\$ 979,339	\$ 979,339	\$ 979,339	\$ 979,339	\$ 979,339	\$ 979,339	\$ 979,339	\$ 979,339	\$ 979,339	\$ 979,339	
Deputy Program Manager	\$ 905,289	\$ 905,289	\$ 905,289	\$ 905,289	\$ 905,289	\$ 905,289	\$ 905,289	\$ 905,289	\$ 905,289	\$ 905,289	
Program Counsel	\$ 962,883	\$ 962,883	\$ 962,883	\$ 962,883	\$ 962,883	\$ 962,883	\$ 962,883	\$ 962,883	\$ 962,883	\$ 962,883	
Habitat Restoration Program Manager	\$ 711,451	\$ 711,451	\$ 711,451	\$ 711,451	\$ 711,451	\$ 711,451	\$ 711,451	\$ 711,451	\$ 711,451	\$ 711,451	
Other Stressors Program Manager	\$ 711,451	\$ 711,451	\$ 711,451	\$ 711,451	\$ 711,451	\$ 711,451	\$ 711,451	\$ 711,451	\$ 711,451	\$ 711,451	
Monitoring and Research Program Manager	\$ 711,451	\$ 711,451	\$ 711,451	\$ 711,451	\$ 711,451	\$ 711,451	\$ 711,451	\$ 711,451	\$ 711,451	\$ 711,451	
IT/Database/GIS Management	\$ 630,284	\$ 630,284	\$ 630,284	\$ 630,284	\$ 630,284	\$ 630,284	\$ 630,284	\$ 630,284	\$ 630,284	\$ 630,284	
GIS Specialist	\$ 537,558	\$ 537,558	\$ 537,558	\$ 537,558	\$ 537,558	\$ 537,558	\$ 537,558	\$ 537,558	\$ 537,558	\$ 537,558	
Budget Analyst	\$ 497,530	\$ 497,530	\$ 497,530	\$ 497,530	\$ 497,530	\$ 497,530	\$ 497,530	\$ 497,530	\$ 497,530	\$ 497,530	
Land Acquisition Specialist	\$ 3,829,613	\$ 3,829,613	\$ 3,829,613	\$ 3,829,613	\$ 2,553,173	\$ 1,276,732	\$ 638,512	\$ 638,512	\$ 638,512	\$ 638,512	
Contracts Officer	\$ 1,766,853	\$ 1,766,853	\$ 1,766,853	\$ 1,766,853	\$ 1,766,853	\$ 1,766,853	\$ 1,766,853	\$ 1,766,853	\$ 589,145	\$ 589,145	
Regulatory Specialist	\$ 490,413	\$ 490,413	\$ 490,413	\$ 490,413	\$ 490,413	\$ 490,413	\$ 490,413	\$ 490,413	\$ 490,413	\$ 490,413	
Public Outreach Program Manager	\$ 510,199	\$ 510,199	\$ 510,199	\$ 510,199	\$ 510,199	\$ 510,199	\$ 510,199	\$ 510,199	\$ 510,199	\$ 510,199	
Admin - Secretary	\$ 663,876	\$ 663,876	\$ 663,876	\$ 663,876	\$ 663,876	\$ 663,876	\$ 663,876	\$ 663,876	\$ 663,876	\$ 663,876	
Clerks	\$ 822,813	\$ 822,813	\$ 822,813	\$ 822,813	\$ 822,813	\$ 822,813	\$ 822,813	\$ 822,813	\$ 822,813	\$ 822,813	
Civil Engineer	\$ 679,650	\$ 679,650	\$ 679,650	\$ 679,650	\$ 679,650	\$ 679,650	\$ 679,650	\$ 679,650	\$ 679,650	\$ 679,650	
Staff Scientist	\$ 1,177,999	\$ 1,766,853	\$ 1,766,853	\$ 1,766,853	\$ 1,766,853	\$ 1,766,853	\$ 1,766,853	\$ 1,766,853	\$ 1,766,853	\$ 1,766,853	
Water Operations Specialist	\$ 1,276,732	\$ 1,276,732	\$ 1,276,732	\$ 1,276,732	\$ 1,276,732	\$ 1,276,732	\$ 1,276,732	\$ 1,276,732	\$ 1,276,732	\$ 1,276,732	
Habitat Restoration Project Manager	\$ 529,807	\$ 1,059,323	\$ 1,588,839	\$ 1,588,839	\$ 1,588,839	\$ 1,588,839	\$ 1,059,323	\$ 1,059,323	\$ 529,807	\$ 529,807	
Other Stressors Project Manager	\$ 1,177,999	\$ 1,177,999	\$ 1,766,853	\$ 1,766,853	\$ 1,766,853	\$ 1,766,853	\$ 1,177,999	\$ 1,177,999	\$ 1,177,999	\$ 1,177,999	
Terrestrial Preserve Manager	\$ 592,476	\$ 592,476	\$ 1,184,224	\$ 1,184,224	\$ 1,184,224	\$ 1,184,224	\$ 1,184,224	\$ 1,184,224	\$ 1,184,224	\$ 1,184,224	
Technical Specialist	\$ 1,906,158	\$ 3,812,315	\$ 3,812,315	\$ 3,812,315	\$ 3,812,315	\$ 3,812,315	\$ 3,049,852	\$ 2,287,389	\$ 1,906,158	\$ 1,524,926	
Laborer	\$ 696,641	\$ 1,393,282	\$ 2,089,924	\$ 2,786,565	\$ 3,483,206	\$ 3,483,206	\$ 3,483,206	\$ 3,483,206	\$ 3,483,206	\$ 3,483,206	
<b>Total</b>	<b>\$ 22,768,469</b>	<b>\$ 26,489,637</b>	<b>\$ 28,896,396</b>	<b>\$ 29,593,037</b>	<b>\$ 29,013,237</b>	<b>\$ 27,736,797</b>	<b>\$ 25,217,744</b>	<b>\$ 24,455,281</b>	<b>\$ 22,366,825</b>	<b>\$ 21,985,594</b>	

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## 1 **8.A.2.2 Office Space and Related Costs**

2 Office space and related costs include the office rental costs, utilities, general office equipment,  
3 employee-assigned office equipment, geographic information system (GIS) hardware and software,  
4 and public outreach materials. Office expenses and related costs are summarized in Table 8.A-44.

1 **Table 8.A-44. Implementing Entity Office Space Costs**

<b>Implementing Entity Office Space Costs</b>										
<b>Office Space Assumptions</b>										
Lease Cost (\$/Sqft/Mo)	\$2.65	<i>Lease rate based on current sacramento lease market prices, plus adder to account for depressed market conditions</i>								
Area Per Employee (Sqft)	250									
Utilities Cost (\$/Yr/1000 Sqft)	\$0.00									
<b>Office Space Costs by Cost Period</b>										
<b>Total Office Space Costs</b>	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Square Feet of Space	9,750	11,500	12,250	12,250	11,750	11,250	10,000	9,500	8,500	8,250
Lease Cost Per Period	\$ 1,550,153	\$ 1,828,385	\$ 1,947,628	\$ 1,947,628	\$ 1,868,133	\$ 1,788,638	\$ 1,589,900	\$ 1,510,405	\$ 1,351,415	\$ 1,311,668
Utilities Cost Per Period	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Total Office Space Cost Allocation</b>										
Program Administration	\$ 1,550,153	\$ 1,828,385	\$ 1,947,628	\$ 1,947,628	\$ 1,868,133	\$ 1,788,638	\$ 1,589,900	\$ 1,510,405	\$ 1,351,415	\$ 1,311,668
Restoration										
Stressors										
Monitoring & Research										
<b>Total</b>	<b>\$ 1,550,153</b>	<b>\$ 1,828,385</b>	<b>\$ 1,947,628</b>	<b>\$ 1,947,628</b>	<b>\$ 1,868,133</b>	<b>\$ 1,788,638</b>	<b>\$ 1,589,900</b>	<b>\$ 1,510,405</b>	<b>\$ 1,351,415</b>	<b>\$ 1,311,668</b>

**Implementing Entity Office Equipment Costs**

<b>General Office Equipment Assumptions</b>	Cost	Service Life (Yrs)	Amortized Cost (\$/Yr)	Service Contract (\$/Yr)
Copy Machine (lease)	\$ 12,719	5	\$ 2,777	\$ 1,272
Telephone System (lease)	\$ 6,614	1	\$ 6,614	\$ 661
Books and Journals (purchase)	\$ 1,590	1	\$ 1,590	\$ -
Fax Machine (purchase)	\$ 318	5	\$ 69	\$ -
Printers (purchase)	\$ 2,120	5	\$ 463	\$ 155
Digital Camera (purchase)	\$ 530	3	\$ 187	\$ -
Radio Base Station (purchase)	\$ 2,756	10	\$ 323	\$ 110
Trunked Radio System (lease)	\$ 6,614	1	\$ 6,614	\$ -

<b>Average Units Per Year by Cost Period</b>										
<b>Stock of General Office Equipment</b>	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Copy Machine (lease)	4	4	4	4	4	4	4	4	4	4
Telephone System (lease)	1	1	1	1	1	1	1	1	1	1
Books and Journals (purchase)	1	1	1	1	1	1	1	1	1	1
Fax Machine (purchase)	2	2	2	2	2	2	2	2	2	2
Printers (purchase)	4	4	4	4	4	4	4	4	4	4
Digital Camera (purchase)	3	3	3	3	3	3	3	3	3	3
Radio Base Station (purchase)	1	1	1	1	1	1	1	1	1	1
Trunked Radio System (lease)	1	1	1	1	1	1	1	1	1	1

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General Office Equipment Costs	General Office Equipment Costs by Cost Period									
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Copy Machine (lease)	\$ 80,984	\$ 80,984	\$ 80,984	\$ 80,984	\$ 80,984	\$ 80,984	\$ 80,984	\$ 80,984	\$ 80,984	\$ 80,984
Telephone System (lease)	\$ 36,377	\$ 36,377	\$ 36,377	\$ 36,377	\$ 36,377	\$ 36,377	\$ 36,377	\$ 36,377	\$ 36,377	\$ 36,377
Books and Journals (purchase)	\$ 7,950	\$ 7,950	\$ 7,950	\$ 7,950	\$ 7,950	\$ 7,950	\$ 7,950	\$ 7,950	\$ 7,950	\$ 7,950
Fax Machine (purchase)	\$ 694	\$ 694	\$ 694	\$ 694	\$ 694	\$ 694	\$ 694	\$ 694	\$ 694	\$ 694
Printers (purchase)	\$ 12,353	\$ 12,353	\$ 12,353	\$ 12,353	\$ 12,353	\$ 12,353	\$ 12,353	\$ 12,353	\$ 12,353	\$ 12,353
Digital Camera (purchase)	\$ 2,810	\$ 2,810	\$ 2,810	\$ 2,810	\$ 2,810	\$ 2,810	\$ 2,810	\$ 2,810	\$ 2,810	\$ 2,810
Radio Base Station (purchase)	\$ 2,167	\$ 2,167	\$ 2,167	\$ 2,167	\$ 2,167	\$ 2,167	\$ 2,167	\$ 2,167	\$ 2,167	\$ 2,167
Trunked Radio System (lease)	\$ 33,070	\$ 33,070	\$ 33,070	\$ 33,070	\$ 33,070	\$ 33,070	\$ 33,070	\$ 33,070	\$ 33,070	\$ 33,070
<b>Total</b>	<b>\$ 176,405</b>	<b>\$ 176,405</b>	<b>\$ 176,405</b>	<b>\$ 176,405</b>	<b>\$ 176,405</b>	<b>\$ 176,405</b>	<b>\$ 176,405</b>	<b>\$ 176,405</b>	<b>\$ 176,405</b>	<b>\$ 176,405</b>

Staff Office Equip Assumptions	Cost Per FTE Per Replacement Period	Service Life (Yrs)	Amortized Cost (\$/Yr)	Service Contract (\$/Yr)
Common Office Furniture	\$ 4,409	20	\$ 296	\$ -
Cubicle Furniture	\$ 2,205	20	\$ 148	\$ -
Computers	\$ 2,756	3	\$ 974	\$ 276
Cell Phones	\$ 661	2	\$ 346	\$ 155
Office Supplies	\$ 551	1	\$ 551	\$ -

Staff Related Office Equip. Costs	Employee Office Equipment Costs Per Costing Period									
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Program Manager	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730
Deputy Program Manager	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730
Program Counsel	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730
Habitat Restoration Program Manager	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730
Other Stressors Program Manager	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730
Monitoring and Research Program Manager	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730
IT/Database/GIS Management	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730
GIS Specialist	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730
Budget Analyst	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730
Land Acquisition Specialist	\$ 82,380	\$ 82,380	\$ 82,380	\$ 82,380	\$ 54,920	\$ 27,460	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730
Contracts Officer	\$ 41,190	\$ 41,190	\$ 41,190	\$ 41,190	\$ 41,190	\$ 41,190	\$ 41,190	\$ 41,190	\$ 13,730	\$ 13,730
Regulatory Specialist	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730
Public Outreach Program Manager	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730
Admin - Secretary	\$ 27,460	\$ 27,460	\$ 27,460	\$ 27,460	\$ 27,460	\$ 27,460	\$ 27,460	\$ 27,460	\$ 27,460	\$ 27,460
Clerks	\$ 41,190	\$ 41,190	\$ 41,190	\$ 41,190	\$ 41,190	\$ 41,190	\$ 41,190	\$ 41,190	\$ 41,190	\$ 41,190
Civil Engineer	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730	\$ 13,730
Staff Scientist	\$ 27,460	\$ 41,190	\$ 41,190	\$ 41,190	\$ 41,190	\$ 41,190	\$ 41,190	\$ 41,190	\$ 41,190	\$ 41,190
Water Operations Specialist	\$ 27,460	\$ 27,460	\$ 27,460	\$ 27,460	\$ 27,460	\$ 27,460	\$ 27,460	\$ 27,460	\$ 27,460	\$ 27,460
Habitat Restoration Project Manager	\$ 13,730	\$ 27,460	\$ 41,190	\$ 41,190	\$ 41,190	\$ 41,190	\$ 27,460	\$ 27,460	\$ 13,730	\$ 13,730
Other Stressors Project Manager	\$ 27,460	\$ 27,460	\$ 41,190	\$ 41,190	\$ 41,190	\$ 41,190	\$ 27,460	\$ 27,460	\$ 27,460	\$ 27,460
Terrestrial Preserve Manager	\$ 13,730	\$ 13,730	\$ 27,460	\$ 27,460	\$ 27,460	\$ 27,460	\$ 27,460	\$ 27,460	\$ 27,460	\$ 27,460
Technical Specialist	\$ 68,650	\$ 137,299	\$ 137,299	\$ 137,299	\$ 137,299	\$ 137,299	\$ 109,839	\$ 82,380	\$ 68,650	\$ 54,920
Laborer	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Total</b>	<b>\$ 535,467</b>	<b>\$ 631,576</b>	<b>\$ 672,766</b>	<b>\$ 672,766</b>	<b>\$ 645,306</b>	<b>\$ 617,846</b>	<b>\$ 549,197</b>	<b>\$ 521,737</b>	<b>\$ 466,817</b>	<b>\$ 453,087</b>

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### 1 **8.A.2.3 Vehicle and Related Costs**

2 Vehicle costs include the costs for owned and rented vehicles as well as allowances for fuel,  
3 maintenance, and insurance. Owned vehicle annual costs are based on the vehicle's estimated  
4 purchase cost amortized over its useful life plus an annual allowance for fuel, maintenance, and  
5 insurance. Annual costs for rented vehicles are based on a daily rental rate multiplied by the number  
6 of rental days per year per 1,000 acres of habitat under management. Vehicle assumptions and costs  
7 by 5-year period are summarized in Table 8.A-45.

1 **Table 8.A-45. Implementing Entity Vehicle Costs**

<b>Implementing Entity Vehicle Costs</b>										
<b>Owned Vehicles Assumptions</b>	Vehicles/FTE	Cost	Service Life (Yrs)	Amortized Cost (\$/Yr)	Maintenance (\$/Yr)	Fuel Cost (\$/Yr)	Insurance (\$/Yr)			
Passenger Car	0.25	\$ 22,488	7	\$ 3,609	\$ 1,323	\$ 1,653	\$ 1,929			
4WD Truck	0.25	\$ 33,070	7	\$ 5,308	\$ 2,205	\$ 2,205	\$ 1,929			
Boat	0.10	\$ 31,798	10	\$ 3,728	\$ 2,120	\$ 3,180	\$ 1,929			
ATV & Trailers	0.25	\$ 8,819	5	\$ 1,926	\$ 551	\$ 441	\$ 965			
<b>Average Units Per Year by Cost Period</b>										
<b>Owned Vehicles Assumptions</b>	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Passenger Car - Mgt FTE's	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
4WD Truck - Field FTE's	11.0	19.0	24.0	26.0	28.0	28.0	24.0	22.0	20.0	19.0
Boat - Field FTE's	11.0	19.0	24.0	26.0	28.0	28.0	24.0	22.0	20.0	19.0
ATV & Trailers - Field FTE's	11.0	19.0	24.0	26.0	28.0	28.0	24.0	22.0	20.0	19.0
<b>Average Units Per Year by Cost Period</b>										
<b>Stock of Owned Vehicles</b>	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Passenger Car	2	2	2	2	2	2	2	2	2	2
4WD Truck	3	5	6	7	7	7	6	6	5	5
Boat	1	2	2	3	3	3	2	2	2	2
ATV & Trailers	3	5	6	7	7	7	6	6	5	5
<b>Vehicle Costs Per Costing Period</b>										
<b>Owned Vehicle Costs</b>	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Passenger Car	\$ 85,148	\$ 85,148	\$ 85,148	\$ 85,148	\$ 85,148	\$ 85,148	\$ 85,148	\$ 85,148	\$ 85,148	\$ 85,148
4WD Truck	\$ 174,695	\$ 291,158	\$ 349,390	\$ 407,622	\$ 407,622	\$ 407,622	\$ 349,390	\$ 349,390	\$ 291,158	\$ 291,158
Boat	\$ 54,782	\$ 109,564	\$ 109,564	\$ 164,347	\$ 164,347	\$ 164,347	\$ 109,564	\$ 109,564	\$ 109,564	\$ 109,564
ATV & Trailers	\$ 58,233	\$ 97,056	\$ 116,467	\$ 135,878	\$ 135,878	\$ 135,878	\$ 116,467	\$ 116,467	\$ 97,056	\$ 97,056
<b>Total</b>	<b>\$ 372,858</b>	<b>\$ 582,926</b>	<b>\$ 660,569</b>	<b>\$ 792,994</b>	<b>\$ 792,994</b>	<b>\$ 792,994</b>	<b>\$ 660,569</b>	<b>\$ 660,569</b>	<b>\$ 582,926</b>	<b>\$ 582,926</b>
<b>Rented Vehicle/Equip Assumptions</b>										
	Rental Rate (\$/Day)	Annual Rental* (Days/1000 acres)								
Tractor	\$ 253	3.3								
Small Tractor	\$ 143	3.3								
Dump Truck	\$ 215	3.3								
Fire Truck	\$ 108	3.3								
<small>*1/3 rental days assumed by Santa Clara HCP to account for subtidal acreage</small>										
<b>Rented Vehicle/Equipment Costs Per Costing Period</b>										
<b>Rented Vehicle/Equipment Costs</b>	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Total Preserve Acres	-	21,186	43,536	63,575	81,672	99,782	117,788	135,743	153,719	153,719
Tractor	\$ -	\$ 89,451	\$ 183,812	\$ 268,417	\$ 344,826	\$ 421,287	\$ 497,308	\$ 573,118	\$ 649,013	\$ 649,013
Small Tractor	\$ -	\$ 50,527	\$ 103,827	\$ 151,616	\$ 194,776	\$ 237,965	\$ 280,906	\$ 323,728	\$ 366,597	\$ 366,597
Dump Truck	\$ -	\$ 75,977	\$ 156,124	\$ 227,986	\$ 292,886	\$ 357,829	\$ 422,400	\$ 486,791	\$ 551,253	\$ 551,253
Fire Truck	\$ -	\$ 38,176	\$ 78,447	\$ 114,554	\$ 147,164	\$ 179,796	\$ 212,240	\$ 244,594	\$ 276,984	\$ 276,984
<b>Total Rented Vehicle/Eq Costs</b>	<b>\$ -</b>	<b>\$ 254,130</b>	<b>\$ 522,210</b>	<b>\$ 762,573</b>	<b>\$ 979,653</b>	<b>\$ 1,196,877</b>	<b>\$ 1,412,854</b>	<b>\$ 1,628,231</b>	<b>\$ 1,843,848</b>	<b>\$ 1,843,848</b>

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## 1 **8.A.2.4 Legal, Accounting, and Insurance Costs**

2 Insurance requirements for the Implementation Office are assumed to include directors and officers  
3 insurance, general liability insurance, and professional liability insurance. Liability insurance is  
4 assumed to total \$39,000 per year.<sup>4</sup> The Implementation Office is assumed to require outside legal  
5 and accounting assistance throughout the term of the BDCP. services. Legal, accounting, and  
6 insurance assumptions and costs by 5-year period are summarized in Table 8.A-46.

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<sup>4</sup> Vehicle and employee health/disability/workers compensation insurance costs are calculated separately from liability insurance costs. Vehicle insurance costs are included in the vehicle cost estimate, while employee insurance costs are captured by the benefits multiplier applied to wage and salary costs.

1 **Table 8.A-46. Legal, Accounting, and Insurance Costs**

**Implementing Entity Liability Insurance Costs**

<b>Liability Insurance Assumptions</b>	<b>Annual Premium (\$/Yr)</b>
Directors and Officers Insurance	\$ 10,599
General Liability Insurance	\$ 10,599
Professional Liability Insurance	\$ 10,599

<b>Liability Insurance Costs</b>	<b>Liability Insurance Costs Per Costing Period</b>									
	<b>1-5</b>	<b>6-10</b>	<b>11-15</b>	<b>16-20</b>	<b>21-25</b>	<b>26-30</b>	<b>31-35</b>	<b>36-40</b>	<b>41-45</b>	<b>46-50</b>
Directors and Officers Insurance	\$52,997	\$52,997	\$52,997	\$52,997	\$52,997	\$52,997	\$52,997	\$52,997	\$52,997	\$52,997
General Liability Insurance	\$52,997	\$52,997	\$52,997	\$52,997	\$52,997	\$52,997	\$52,997	\$52,997	\$52,997	\$52,997
Professional Liability Insurance	\$52,997	\$52,997	\$52,997	\$52,997	\$52,997	\$52,997	\$52,997	\$52,997	\$52,997	\$52,997
<b>Total Liability Insurance Costs</b>	<b>\$158,990</b>	<b>\$158,990</b>	<b>\$158,990</b>	<b>\$158,990</b>	<b>\$158,990</b>	<b>\$158,990</b>	<b>\$158,990</b>	<b>\$158,990</b>	<b>\$158,990</b>	<b>\$158,990</b>

**Implementing Entity Legal & Accounting Assistance**

<b>Legal &amp; Accounting Assistance Assumptions</b>	
Legal Counsel Avg Hourly Rate	\$ 424
Audit/Financial Asst Cost (\$/Analysis)	\$ 39,218

<b>Level of Legal/Financial Assistance</b>	<b>Average Units Per Year Per Costing Period</b>									
	<b>1-5</b>	<b>6-10</b>	<b>11-15</b>	<b>16-20</b>	<b>21-25</b>	<b>26-30</b>	<b>31-35</b>	<b>36-40</b>	<b>41-45</b>	<b>46-50</b>
Legal Counsel (Hours/Yr)	2000	2000	2000	2000	1500	1500	1000	1000	500	500
Audit/Financial Assistance (Analyses/Yr)	0.333	0.333	0.333	0.333	0.333	0.333	0.333	0.333	0.333	0.333

<b>Legal &amp; Accounting Assistance Costs</b>	<b>Legal &amp; Accounting Assistance Costs Per Costing Period</b>									
	<b>1-5</b>	<b>6-10</b>	<b>11-15</b>	<b>16-20</b>	<b>21-25</b>	<b>26-30</b>	<b>31-35</b>	<b>36-40</b>	<b>41-45</b>	<b>46-50</b>
Legal Counsel	\$ 4,239,733	\$ 4,239,733	\$ 4,239,733	\$ 4,239,733	\$ 3,179,800	\$ 3,179,800	\$ 2,119,867	\$ 2,119,867	\$ 1,059,933	\$ 1,059,933
Audit/Financial Assistance	\$ 65,363	\$ 65,363	\$ 65,363	\$ 65,363	\$ 65,363	\$ 65,363	\$ 65,363	\$ 65,363	\$ 65,363	\$ 65,363
<b>Total</b>	<b>\$ 4,305,096</b>	<b>\$ 4,305,096</b>	<b>\$ 4,305,096</b>	<b>\$ 4,305,096</b>	<b>\$ 3,245,163</b>	<b>\$ 3,245,163</b>	<b>\$ 2,185,229</b>	<b>\$ 2,185,229</b>	<b>\$ 1,125,296</b>	<b>\$ 1,125,296</b>

2

## 8.A.3 Monitoring Costs

The following are cost assumptions for the compliance and effectiveness monitoring actions described in Section 8.6, *Costs of Monitoring and Research Actions*. Monitoring costs are identified below for each conservation measure.

### 8.A.3.1 CM1 Water Facilities and Operation

#### 8.A.3.1.1 Facility Construction

*Monitoring Action MA1-1: Document compliance with best management practices associated with construction activities.*

*Assumptions:*

- Costs for this monitoring action are subsumed under *CM22 Avoidance and Minimization Measures*. No additional costs will be incurred.

*Monitoring Action MA1-2: Document that facility construction complied with fish screen design criteria.*

*Assumptions:*

- As-built construction drawings and actual facilities will be evaluated by a qualified engineering firm to determine if the constructed facility adhered to design criteria developed prior to construction.
- Total effort will comprise evaluation, site visits and producing a final report.
- This will be a contracted monitoring action at a one-time cost of \$8,000.

#### 8.A.3.1.2 Facility Operation

*Monitoring Action MA1-3: Document that operation of the water diversion facilities are complying with the operational criteria and within the adaptive operational limits.*

*Assumptions:*

- Automatic water monitoring station will be compatible with existing water monitoring technology, databases and protocols currently used by the Interagency Ecological Program (IEP) and the U.S. Geological Survey (USGS), and USGS will be involved in designing and selecting installation sites for these systems.
- Prior to completion of water diversion facilities, a series of automatic water monitoring stations (e.g., 600 Kiloherz Sideward-looking Acoustic Doppler Current Profilers) will be built and installed near intakes to estimate the velocity profile of the bypass flow.
- A total installation cost of \$300,000 has been estimated for a fully instrumented, telemetered system (Bureau pers. comm.).

- 1           ● After an initial monitoring period of 5 years, in which operational parameters for the facility  
2 will be fine-tuned and a robust forecasting model will be developed, monitoring equipment  
3 may be adaptively reduced. Replacement costs after 5 years will be \$150,000.
- 4           ● Total operational cost of these water monitoring stations through the duration of the BDCP  
5 will be \$40,000 per year.

6           *Monitoring Action MA1-4: Document compliance of diversion operations with flow requirements in Old  
7 and Middle Rivers.*

8           *Assumptions:*

- 9           ● This monitoring action will make use of existing fixed-site sampling stations to collect time-  
10 histories of water quality variables, with flow pattern (direction, velocity and volume of  
11 flows) in Old and Middle River as the primary metrics.
- 12          ● Within 1 year of initiation of the south Delta diversion operational limits, fixed-site sampling  
13 stations will track flow on a daily basis.
- 14          ● The automatic water monitoring station will record the volume and timing of water  
15 diversion, conveyance, and bypass flows (with flows in cfs as the primary metric) and will  
16 be compatible with existing water monitoring technology, databases and protocols currently  
17 used by IEP and USGS.
- 18          ● No additional cost due to existing adequate monitoring facilities.

19          *Monitoring Action MA1-5: Document compliance with the minimum flow requirements at Rio Vista.*

20          *Assumptions:*

- 21          ● This monitoring action will make use of the existing network of fixed-site sampling stations  
22 to document flow patterns (volume and timing) in the Sacramento River reach between  
23 Sacramento and Rio Vista, with cfs as the primary metric.
- 24          ● Fixed-site sampling stations will be operated on a continuous basis for at least 5 years  
25 following operational modifications or until a robust predictive model can be derived that  
26 allows forecasting of flow patterns.
- 27          ● The automatic water monitoring station will record the volume and timing of water  
28 diversion, conveyance, and bypass flows (with flows in cfs as the primary metric) and will  
29 be compatible with existing water monitoring technology, databases and protocols currently  
30 used by IEP and USGS.
- 31          ● No additional cost due to existing adequate monitoring facilities.

32          *Monitoring Action MA1-6: Document compliance with the minimum flow requirements in San Joaquin  
33 River.*

34          *Assumptions:*

- 35          ● This monitoring action will require new fixed-site sampling stations to document flow  
36 patterns (volume and timing) in the San Joaquin River, with cfs as the primary metric.
- 37          ● The cost for a fully instrumented, telemetered system is \$300,000 and the cost for annual  
38 operation is \$40,000 per year.

- 1           ● Fixed-site sampling stations will be operated on a continuous basis for at least 5 years  
2 following operational modifications or until a robust predictive model can be derived that  
3 allows forecasting of flow patterns.
- 4           ● The automatic water monitoring station will record the volume and timing of water  
5 diversion, conveyance, and bypass flows (with flows in cfs as the primary metric) and will  
6 be compatible with existing water monitoring technology, databases and protocols currently  
7 used by IEP and USGS.

8           *Monitoring Action RA1-7: Monitor fish entrainment at intakes of new water diversion facility in the*  
9 *north Delta.*

10           *Assumptions:*

- 11           ● Action will be conducted via underwater 10 cameras each mounted around the three  
12 intakes (e.g., Multi SeaCam, DeepSea Inc.) at a cost of \$3,500 each (including camera, video  
13 equipment, and viewing monitor).
- 14           ● Replacement of equipment will occur once every 10 years.
- 15           ● A junior-level biologist will spend 80 hours per month analyzing video sequences and  
16 estimating fish entrainment by study period. A senior-level biologist will analyze fish  
17 entrainment data, requiring 600 hours annually. These hours are in addition to what BDCP's  
18 full-time staff would provide.

19           *Monitoring Action MA1-8: Document and quantify the number of fish impinged at intakes of new water*  
20 *diversion facility in the north Delta.*

21           *Assumptions:*

- 22           ● Impingement quantification will occur primarily during scheduled screen cleaning, but not  
23 less than once per week.
- 24           ● Screen cleaning will be implemented via backflush. Debris (and impinged fish remains) are  
25 retrieved from the water column via net following expulsion of debris from screens upon  
26 backflush.
- 27           ● A crew of three technicians is needed in a boat to handle the net, retrieve impinged debris  
28 and sort out fish remains.
- 29           ● Total time required for this sampling is 8 hrs per intake screen (24 person-hours per  
30 screen).
- 31           ● For fish remains that cannot be identified by species on site, DNA analysis is required. At  
32 maximum of 100 DNA samples will be analyzed per month at a per-sample cost of \$40.

## 1 **8.A.3.2 CM2 Yolo Bypass Fisheries Enhancement**

### 2 **8.A.3.2.1 Facility Construction**

3 *Monitoring Action MA2-1: Document compliance with BMPs associated with construction activities.*

4 *Assumptions:*

- 5 ● Compliance monitoring for CM2 is subsumed under monitoring costs for *CM22 Avoidance*
- 6 *and Minimization Measures* and no additional costs will be incurred.

7 *Monitoring Action MA2-2: Document that modifications have been made to Fremont Weir in*

8 *compliance with design criteria.*

9 *Assumptions:*

- 10 ● As built construction drawings and actual facilities will be evaluated by a qualified
- 11 engineering firm to determine if the constructed facility adhered to design criteria
- 12 developed prior to construction.
- 13 ● Total effort will comprise evaluation, site visits and producing a final report.
- 14 ● This will be a contracted monitoring action at a one-time cost of \$8,000.

15 *Monitoring Action MA2-3: Document that experimental sturgeon ramps have been built in compliance*

16 *with design criteria.*

17 *Assumptions:*

- 18 ● As built construction drawings and structure will be evaluated by a qualified engineering
- 19 firm to determine if construction adhered to design criteria developed prior to construction.
- 20 ● Total effort will comprise evaluation, site visits and producing a final report.
- 21 ● This will be a contracted monitoring action at a one-time cost of \$8,000.

22 *Monitoring Action MA2-4: Document completion of the Tule Canal/Toe Drain improvements are in*

23 *compliance with design criteria.*

24 *Assumptions:*

- 25 ● As built construction drawings and actual facilities will be evaluated by a qualified
- 26 engineering firm to determine if the constructed facility adhered to design criteria
- 27 developed prior to construction.
- 28 ● Total effort will comprise evaluation, site visits and producing a final report.
- 29 ● This will be a contracted monitoring action at a one-time cost of \$8,000.

30 *Monitoring Action MA2-5: Document that modification of the Sacramento Weir is done in compliance*

31 *with design criteria of the Sacramento Weir fish passage modification plan.*

32 *Assumptions:*

- 33 ● As built construction drawings and actual facilities will be evaluated by a qualified
- 34 engineering firm to determine if the constructed facility adhered to design criteria
- 35 developed prior to construction.

1           ● Total effort will comprise evaluation, site visits and producing a final report.

2           ● This will be a contracted monitoring action at a one-time cost of \$8,000.

3           *Monitoring Action MA2-6: Document that modifications to berms, levees and water control structures*  
4           *have been made according to plan.*

5           *Assumptions:*

6           ● As built construction drawings and actual facilities will be evaluated by a qualified  
7           engineering firm to determine if the constructed facility adhered to design criteria  
8           developed prior to construction.

9           ● Total effort will comprise evaluation, site visits and producing a final report.

10          ● This will be a contracted monitoring action at a one-time cost of \$16,000.

11          *Monitoring Action MA2-7: Document that realignment of Lower Putah Creek is done in compliance*  
12          *with design criteria.*

13          *Assumptions:*

14          ● As built construction drawings and actual facilities will be evaluated by a qualified  
15          engineering firm to determine if the constructed facility adhered to design criteria  
16          developed prior to construction.

17          ● Total effort will comprise evaluation, site visits and producing a final report.

18          ● This will be a contracted monitoring action at a one-time cost of \$8,000.

### 19    **8.A.3.2.2           Facility Operation**

20          *Monitoring Action MA2-8: Document that flow over Fremont Weir meets minimum flow requirements.*

21          *Assumptions:*

22          ● This monitoring action will be integrated into the DWR/NRCO river stage monitoring  
23          program.

24          ● Rating curves are developed by DWR and will not create any additional costs.

25          ● A remote sensor would be installed at the Fremont Weir that would continuously monitor  
26          water surface elevations at an annual maintenance and operation cost of \$30,000 to  
27          \$40,000.

28          ● Monitoring would be conducted continuously over the term of the BDCP.

29          ● Staff time to administer and manage this additional gage and data is estimated at 20 hours of  
30          a junior-level hydrologist's time per month for the duration of the BDCP.

31          *Monitoring Action MA2-9: Document that flow in Tule Canal/toe drain meets operational*  
32          *requirements.*

33          *Assumptions:*

34          ● Monitoring stations will be built and/or will commence operations prior to completion of  
35          the modifications to the facilities. Monitoring will continue through the duration of the  
36          BDCP.

- 1           ● Equipment costs associated with this monitoring action (automatic gages) are expected to  
2 range from \$30,000 to \$40,000.
- 3           ● Monitoring of flow in the Tule Canal and toe drain will commence with the first overtopping  
4 of the Fremont weir each season and will continue as long as the Yolo Bypass is flooded.
- 5           ● Managing the additional monitoring stations will be coordinated with DWR and will be  
6 integrated in the DWR data protocol and databases.
- 7           ● Total cost of this monitoring will entail annual maintenance and operational costs of  
8 \$10,000.

9           *Monitoring Action MA2-10: Evaluate passage rates of covered salmonids, sturgeon, Sacramento*  
10 *splittail, and lamprey from the Sacramento River into the Yolo Bypass during periods of Fremont Weir*  
11 *operation.*

12           *Assumptions:*

- 13           ● Fish passage rates will be estimated from a mark-recapture approach.
- 14           ● Cost of mark-recapture studies in the Yolo Basin will cost \$150,000 annually.
- 15           ● Mark-recapture studies will be conducted annually for 5 years following modifications at  
16 Fremont Weir and every 10 years thereafter.
- 17           ● This monitoring action will also be complemented by ongoing fish escapement studies (e.g.,  
18 Fall Midwater Trawl, Summer Towntnet Survey, Larval Fish Survey, 20 millimeter Survey and  
19 Spring Kodiak Trawl).

20           *Monitoring Action MA2-11: Measure passage delays in Yolo Bypass using methods such as Dual-*  
21 *Frequency Identification Sonar (DISDON) or other suitable method to observe fish behavior. Document*  
22 *results in progress reports.*

23           *Assumptions:*

- 24           ● Initial monitoring efforts will establish baseline conditions.
- 25           ● Monitoring will be conducted once every 2 years for the first 20 years of BDCP  
26 implementation, and every 3 years thereafter to document efficacy of operations.
- 27           ● Total cost is estimated at \$250,000 annually.
- 28           ● Preparation of reports will be subsumed under administrative costs and is not expected to  
29 create additional costs.

30           *Monitoring Action MA2-12: Assess juvenile steelhead through-Delta survival as well as condition of*  
31 *population (i.e., stable or expanding), or continue conducting coded wire-tag studies, using fish of*  
32 *similar size to steelhead juveniles. Document results in progress reports.*

33           *Assumptions:*

- 34           ● Initial monitoring efforts will establish baseline conditions.
- 35           ● Monitoring will be conducted every 3 years.
- 36           ● Total cost is estimated at \$250,000 annually.

- 1           ● Preparation of reports will be subsumed under administrative costs and is not expected to  
2           create additional costs.

3           *Monitoring Action MA2-13: Assess the abundance of Sacramento splittail as part of the fall midwater*  
4           *trawl survey. Document results in progress report.*

5           *Assumptions:*

- 6           ● This will be a computer-based exercise using fall midwater trawl data.  
7           ● Preparation of reports will be subsumed under administrative costs and is not expected to  
8           create additional costs.

9           *Monitoring Action MA2-14: Determine the distribution and abundance of giant garter snake in the Yolo*  
10          *Bypass.*

11          *Assumptions:*

- 12          ● A randomized stratified survey for giant garter snakes is conducted in garter snake habitat  
13          in areas that are wetted in less than 25% of inundation years.  
14          ● Garter snake surveys are conducted during periods of snake activity.  
15          ● Each survey day will include two midlevel biologists for 8 hours of field time and 2 hours of  
16          travel time.  
17          ● Surveys will be repeated weekly for up to 3 months (12 survey days per year).  
18          ● Initial monitoring efforts will establish baseline conditions.  
19          ● Annual survey effort will be repeated for at least 15 inundation years.  
20          ● Repeat every 3 years thereafter, focusing on areas that were previously verified  
21          occurrences.

### 22    **8.A.3.3           CM3 Natural Communities Protection and** 23    **Restoration**

24          *Monitoring Action MA3-1: Document the acquisition or protection of suitable land.*

25          *Assumptions:*

- 26          ● Documentation will be updated annually.  
27          ● Mapping, delineation, and addition to database will be subsumed under administrative costs  
28          (GIS staff) and will not create additional costs.

29          *Monitoring Action MA3-2: Document acquisition or protection of edge habitat in tidal mudflats (i.e.,*  
30          *transition between tidal marsh plain and uplands) suitable for associated species (e.g., Delta tule pea,*  
31          *Suisun Marsh aster).*

32          *Assumptions:*

- 33          ● Documentation will be updated annually.  
34          ● Mapping, delineation, and addition to database will be subsumed under administrative costs  
35          (GIS staff) and will not create additional costs.

1 *Monitoring Action CM3-3: Record, quantify and delineate occurrences of covered plant species and rare*  
2 *alliances.*

3 *Assumptions:*

- 4 ● Mapping, delineation, and addition to database will be subsumed under administrative costs  
5 (GIS staff) and will not create additional costs.
- 6 ● Occurrence information from survey efforts outside the BDCP will be incorporated into the  
7 occurrence database.
- 8 ● Baseline surveys (of natural communities excluding cultivated lands) will serve to provide  
9 occurrence information and guide future monitoring efforts on protected land. A survey will  
10 be conducted once every 5 years to document the presence and condition/abundance of  
11 special status plants in areas where they have already been detected and areas where their  
12 presence is suspected but has not been confirmed.
- 13 ● Monitoring will be conducted by two midlevel botanists.
- 14 ● The average parcel size of 100 acres will be surveyed in 50 hours of field work (this includes  
15 travel time to sites) for baseline surveys.
- 16 ● The average parcel size of 100 acres will be surveyed in 20 hours of field work (this includes  
17 travel time to sites) for focused surveys for covered plant species.
- 18 ● A truck and ATV will be used on field days.

19 *Monitoring Action CM3-4: Document habitat connectivity among reserve units in the reserve system.*

20 *Assumptions:*

- 21 ● Documentation will be updated annually.
- 22 ● This is a GIS-based data mining/mapping exercise where fieldwork is not required.
- 23 ● Mapping and delineation will be subsumed under administrative costs (GIS staff) and will  
24 not create additional costs.

### 25 **8.A.3.4 CM4 Tidal Natural Communities Restoration**

26 *Monitoring Action MA4-1: Document restoration of tidal habitat suitable for covered fish species using*  
27 *a GIS database to map habitat restored for each covered species life stage using as-built bathymetry,*  
28 *substrate (assessed before levee breaching), and water quality parameters.*

29 *Assumptions:*

- 30 ● Costs for GIS database development and maintenance are subsumed under administrative  
31 costs.
- 32 ● GIS databases will be updated annually for the first 5 years following reestablishment of  
33 tidal flow and then updated every 5 years thereafter.

1        *Monitoring Action MA4-2: Conduct site-level assessment of bathymetry and topography.*

2        *Assumptions:*

- 3        ● Costs for GIS database development and maintenance are subsumed under administrative  
4        costs.
- 5        ● GIS databases will be updated annually for the first 5 years following reestablishment of  
6        tidal flow.

7        *Monitoring Action MA4-3: Conduct site-level assessment of warm-season dissolved oxygen*  
8        *concentrations.*

9        *Assumptions:*

- 10       ● Two warm-season studies will be performed in two different years, between the second and  
11       fifth years following completion of restoration.
- 12       ● One sampling site is assumed for every 35 acres of restored tidal habitat (approximately  
13       2,000 sampling sites for 65,000 acres).
- 14       ● Ten samples will be evaluated for each station at a cost of \$20 per sample.

15       *Monitoring Action MA4-4: Conduct site-level assessment of use by native and nonnative fishes.*

16       *Assumptions:*

- 17       ● Monthly seine/net surveys will be conducted during one water year between the second  
18       and fifth year following site construction.
- 19       ● Fish sampling involves a three-person crew (one midlevel biologist, two junior-level  
20       biologists) for a 10-hour sampling day for a 500-acre study area (includes travel time to  
21       sites).
- 22       ● A truck and boat are needed for each sampling day.

23       *Monitoring Action MA4-5: Conduct site-level assessment of channel morphology.*

24       *Assumptions:*

- 25       ● Mapping, delineation, and addition to database will be subsumed under administrative costs  
26       (GIS staff) and will not create additional costs.

27       *Monitoring Action MA4-6: Document extent of covered fish species habitat at restoration sites.*

28       *Assumptions:*

- 29       ● Update GIS database with changes in aquatic habitat for covered species life stages using as-  
30       built bathymetry, substrate (assessed before levee breaching), and water quality  
31       parameters.
- 32       ● Derive estimates of extent of restored habitat, extent of spawning habitat, extent of rearing  
33       habitat, and portion of restored habitat within migration routes/corridors from information  
34       obtained from federal and state wildlife agencies.
- 35       ● Repeat annually for the first 10 years and every 5 years thereafter.
- 36       ● All costs are subsumed under administration.

1 *Monitoring Action MA4-7: Conduct plankton and invertebrate sampling in restored tidal natural*  
2 *communities.*

3 *Assumptions:*

- 4 ● Water samples to determine aquatic food production will be collected during vegetation  
5 sampling pursuant to Monitoring Action MA4-8.
- 6 ● The annual cost of analysis of these water samples will be \$20,000.
- 7 ● Monitoring will be conducted annually for the first 5 years after completion of the subtidal  
8 habitat restoration construction, and once every 5 years thereafter.

9 *Monitoring Action MA4-8: Conduct vegetation sampling in restored tidal natural communities.*

10 *Assumptions:*

- 11 ● Vegetation sampling will be conducted to assess vegetation composition, diversity, and  
12 structural complexity.
- 13 ● Vegetation sampling involves a two-person crew (two midlevel botanists) for a 10-hour  
14 sampling day for a 100-acre study area (includes travel time to sites).
- 15 ● Sampling will occur annually for the first 5 years after completion of the subtidal habitat  
16 restoration construction, and once every 5 years thereafter.
- 17 ● A truck and boat are needed for each sampling day.

18 *Monitoring Action MA4-9: Conduct population sampling of salt marsh harvest mouse in restored tidal*  
19 *natural communities.*

20 *Assumptions:*

- 21 ● Salt marsh harvest mouse population sampling involves a two-person crew (two midlevel  
22 biologists) for a 10-hour sampling day for a 50-acre study area (includes travel time to  
23 sites).
- 24 ● A total of 1,500 acres of Suisun Marsh will be sampled.
- 25 ● Each sampling event requires two trips.
- 26 ● Sampling will occur twice for 2 years prior to restoration, twice for 5 years after restoration,  
27 and then every 5 years after completion of the subtidal habitat restoration until occupancy  
28 targets have been met.
- 29 ● A truck and boat are needed for each sampling day.

30 *Monitoring Action MA4-10: Conduct vegetation sampling of salt marsh harvest mouse habitat in*  
31 *restored tidal natural communities.*

32 *Assumptions:*

- 33 ● This monitoring action will be subsumed under Monitoring Action MA4-8 and is not  
34 expected to create additional costs.

1 *Monitoring Action MA4-11: Conduct site level assessment of habitat for giant garter snake in restored*  
2 *tidal natural communities.*

3 *Assumptions:*

- 4 ● This monitoring action will be subsumed under Monitoring Action MA4-8 and is not  
5 expected to create additional costs.

6 *Monitoring Action MA4-12: Document the response and status of salt marsh harvest mouse and Suisun*  
7 *shrew to loss of existing Suisun Marsh habitats that are restored as tidal habitat.*

8 *Assumptions:*

- 9 ● This monitoring action will be subsumed under Monitoring Action MA4-9 and  
10 administrative costs and is not expected to create additional costs.

11 *Monitoring Action MA4-13: Determine covered wildlife species use of restored tidal habitats in Suisun*  
12 *Marsh.*

13 *Assumptions:*

- 14 ● 3,000 acres of tidal brackish emergent wetland will be monitored in Suisun Marsh over the  
15 term of the BDCP.
- 16 ● Monitoring of covered species presence, abundance, and breeding activity will occur twice  
17 annually during species' active periods, following appropriate protocols for surveying  
18 covered plant and wildlife species, for 5 years following completion of restoration  
19 construction and every 5 years thereafter.
- 20 ● Monitoring will be conducted by two midlevel biologists.
- 21 ● An average restoration site size of 100 acres can be surveyed in 50 hours of field work  
22 (includes travel time to sites).
- 23 ● A truck and ATV will be used for each field day.

24 *Monitoring Action MA4-14: Determine covered wildlife species use of restored tidal habitats in the*  
25 *Delta.*

26 *Assumptions:*

- 27 ● Monitoring of covered species presence, abundance, and breeding activity will occur twice  
28 annually during species' active periods, following appropriate protocols for surveying  
29 covered plant and wildlife species, for 5 years following completion of restoration  
30 construction and every 5 years thereafter.
- 31 ● Monitoring will be conducted by two midlevel biologists.
- 32 ● An average restoration site size of 100 acres can be surveyed in 40 hours of field work  
33 (includes travel time to sites).
- 34 ● A truck and ATV will be used for each field day.

### 8.A.3.5 CM5 Seasonally Inundated Floodplain Restoration

*Monitoring Action MA5-1: Document compliance of enhanced inundated floodplain habitat for covered species.*

*Assumptions:*

- The monitoring action will consist of the establishment of a GIS database to map the inundated floodplain habitat for covered species, using automatic monitoring devices installed in the field.
- The documentation will be completed within 1 years of modifications to levees and water control structures.
- Costs of GIS database development and maintenance are subsumed under administrative costs.

*Monitoring Action MA5-2: Document floodplain elevations and flooding frequency.*

*Assumptions:*

- Using automatic monitoring devices installed in the field, document floodplain elevations and flooding frequency.
- Costs of database development and maintenance are subsumed under administrative costs.

*Monitoring Action MA5-3: Document lateral channel migration.*

*Assumptions:*

- Using automatic monitoring devices installed in the field, document floodplain elevations and flooding frequency.
- Costs of database development and maintenance are subsumed under administrative costs.

*Monitoring Action MA5-4: Document presence and abundance of juvenile salmonids in restored floodplain habitats during inundation periods.*

*Assumptions:*

- Presence and abundance of juvenile salmonids in restored floodplain habitats is measured as catch per unit effort.
- Juvenile salmonids will be counted biweekly during floodplain inundation events that coincide with rearing/outmigration periods (November through June) of juvenile salmonids for the first 5 years following floodplain restoration (assume 13 sampling days per year for first 5 years).
- After first 5 years of sampling, subsequent sampling days will occur after every fifth flooding event (assume 3 sampling days per year).
- Sampling involves two crews consisting of one midlevel biologist and two technicians each for 10 hours a week (includes travel time).
- Two boats (small motorboats) and two boat-towing trucks are needed for 10 hours per sampling day.

1 *Monitoring Action MA5-5: Delineate and quantify Sacramento splittail spawning and rearing in*  
2 *relationship to restored seasonally inundated floodplain habitat.*

3 *Assumptions:*

- 4 ● Spawning success is measured as catch per unit effort of juvenile splittail at the end of the  
5 spawning season.
- 6 ● Juvenile splittail are counted weekly by beach seining during the first 5 floodplain  
7 inundation periods during splittail spawning season (assume 6 sampling days per year).  
8 Subsequently, sampling will occur during every fifth flood event coinciding with the splittail  
9 spawning season (assume 3 sampling days per year).
- 10 ● Annual spawning success sampling of splittail juveniles involves a three-man crew (one  
11 midlevel biologist and two field technicians) for 10 hours each week for up to 6 weeks.
- 12 ● One boat (small motorboat) and a boat-towing truck are needed for 10 hours per sampling  
13 day.

14 *Monitoring Action MA5-6: Record and quantify incidences and locations of stranded covered fish*  
15 *species following inundation of restored floodplains.*

16 *Assumptions:*

- 17 ● Monitoring action will consist of seining remnant puddles during floodplain draining events  
18 for the first 5 years after floodplain restoration, with subsequent monitoring occurring  
19 every fifth year.
- 20 ● Six field technicians will spend 100 hours each in the field for every 1,000 acres of restored  
21 floodplain.
- 22 ● Three trucks and three ATVs will be used on field days.
- 23 ● Documentation of reports of fish strandings within restored floodplain habitat will be  
24 subsumed under administrative costs.

25 *Monitoring Action MA5-7: Identify types and quantities of aquatic food production for covered fish*  
26 *species.*

27 *Assumptions:*

- 28 ● Water samples to determine aquatic food production will be collected during fish sampling  
29 pursuant to Monitoring Action MA5-4.
- 30 ● The annual cost of analysis of these water samples will be \$10,000.
- 31 ● Monitoring will be conducted for the first 5 years after floodplain restoration construction is  
32 completed and every 5 years thereafter.

33 *Monitoring Action MA5-8: Create landscape-level assessment of restored floodplains throughout*  
34 *reserve system.*

35 *Assumptions:*

- 36 ● Costs of database development and maintenance are subsumed under administrative costs.

1 *Monitoring Action MA5-9: Document frequency, duration, and extent of inundation of restored*  
2 *floodplain habitat in the South Delta.*

3 *Assumptions:*

- 4 ● Costs of database development and maintenance are subsumed under administrative costs.

5 *Monitoring Action MA5-10: Document occurrences and abundance of delta button-celery and slough*  
6 *thistle.*

7 *Assumptions:*

- 8 ● Mapping, delineation, and addition to database will be subsumed under administrative costs  
9 (GIS staff) and will not create additional costs.
- 10 ● Occurrence information from survey efforts outside the BDCP will be incorporated into the  
11 occurrence database.
- 12 ● Baseline surveys (of natural communities excluding cultivated lands) will serve to provide  
13 occurrence information and guide future monitoring efforts on protected land. A survey will  
14 be conducted 3 years after restoration to document the presence and condition/abundance  
15 of special status plants in areas where they have already been detected and areas where  
16 their presence is suspected but has not been confirmed.
- 17 ● Subsequent surveys will be conducted once every 5 years.
- 18 ● It is assumed that only 5,000 acres of seasonally inundated floodplain would be suitable  
19 habitat for delta button-celery and slough thistle.
- 20 ● Monitoring will be conducted by two midlevel botanists.
- 21 ● An average restoration site size of 100 acres can be surveyed in 10 hours of field work  
22 (includes travel time to sites).
- 23 ● A truck and ATV will be used on field days.

### 24 **8.A.3.6 CM6 Channel Margin Enhancement**

25 *Monitoring Action MA6-1: Delineate extent of channel margin enhanced to provide habitat for covered*  
26 *species using a GIS database. Quantify habitat restored for each covered species expected to use natural*  
27 *community based on habitat models.*

28 *Assumptions:*

- 29 ● This is a GIS-based monitoring delineating the extent of restored channel margin habitat,  
30 including habitat type and vegetation communities.
- 31 ● Mapping and delineation will be subsumed under administrative costs (GIS staff) and will  
32 not create additional costs.
- 33 ● Each restored site will be visited annually for 5 years after restoration construction is  
34 completed, for field verification of the completed GIS database.
- 35 ● The average size of restoration sites is 60 acres, and 10 hours of field work by two midlevel  
36 biologists are necessary for each site verification survey (includes travel time to sites).
- 37 ● A truck and small boat will be used for field verification for each day.

1 *Monitoring Action MA6-2: Assess whether splittail spawn in enhanced channel margins.*

2 *Assumptions:*

- 3 ● Each mile of enhanced channel margin will be visited six times per year for 5 years after  
4 restoration construction is completed and three times per year every 5 years thereafter.
- 5 ● Sampling day involves two crews consisting of one midlevel biologist and one technician  
6 each for 10 hours (includes travel time).
- 7 ● Two boats (small motorboats) and two boat-towing trucks are needed for 10 hours per  
8 sampling day.

9 *Monitoring Action MA6-3: Assess the extent to which juvenile salmon and splittail hold and forage in*  
10 *enhanced channel margins.*

11 *Assumptions:*

- 12 ● This monitoring action will be subsumed under Monitoring Action MA6-2 and is not  
13 expected to create additional costs.

14 *Monitoring Action MA6-4: Assess whether piscivorous predators use woody debris associated with*  
15 *enhanced channel margins as ambush cover.*

16 *Assumptions:*

- 17 ● This monitoring action assumed to require approximately 25% of the effort required for  
18 Monitoring Action MA6-2.

19 *Monitoring Action MA6-5: Measure plankton and invertebrate abundance in aquatic habitat within*  
20 *and adjacent to enhanced channel margins.*

21 *Assumptions:*

- 22 ● Water samples to determine aquatic food production will be collected during fish sampling  
23 pursuant to Monitoring Action MA6-2.
- 24 ● The annual cost of analysis of these water samples will be \$10,000.
- 25 ● Monitoring will be conducted for the first 5 years after channel margin enhancement is  
26 completed and every 5 years thereafter.

27 *Monitoring Action MA6-6: Evaluate the distribution and abundance of covered fish species and*  
28 *predators at enhancement sites.*

29 *Assumptions:*

- 30 ● Fish sampling by seining will be conducted to assess presence and abundance of covered  
31 and nonnative fish species using enhanced channel margin habitats.
- 32 ● Fish sampling involves a two-person crew (one midlevel biologist, one field technician) for  
33 four 10-hour sampling days for each 2.5 miles of enhanced channel margin (includes travel  
34 time).
- 35 ● Sampling will occur annually for the first 5 years after completion of the channel  
36 enhancement, and once thereafter every 5 years.
- 37 ● A truck and small boat will be used for 10 hours per sampling day.

1 *Monitoring Action MA6-7: Quantify the extent and dynamics of establishment of emergent vegetation.*

2 *Assumptions:*

- 3 ● Restoration parcel sizes will be visited by an aquatic midlevel botanist and a field technician
- 4 in years 1, 2, and 5 after construction completion and every 3 years thereafter to document
- 5 establishment of emergent vegetation cover, including invasive species.
- 6 ● The average size of restoration sites is 60 acres, and 10 hours of field work by a midlevel
- 7 botanist and a field technician is necessary for each site verification survey (includes travel
- 8 time to sites).
- 9 ● A truck and small boat will be used for field verification for each day.

10 *Monitoring Action CM6-8: Document occurrences and abundances of intertidal covered plant species.*

11 *Assumptions:*

- 12 ● Restoration parcel sizes will be visited by an aquatic botanist (midlevel) twice in the first
- 13 year after restoration (at the beginning and end of the wet season) and annually thereafter
- 14 for 5 years to document occurrences and abundances of intertidal covered plant species.
- 15 Thereafter, sites will be visited every 3 years.
- 16 ● The average size of restoration sites is 60 acres, and 10 hours of field work by two midlevel
- 17 botanists is necessary for each site verification survey (includes travel time to sites).
- 18 ● A truck and small boat will be used for field verification for each day.

### 19 **8.A.3.7 CM7 Riparian Natural Community Restoration**

20 *Monitoring Action MA7-1: Document the extent of riparian species habitat restored in GIS database.*  
 21 *Map habitat restored for each covered species expected to use natural community based on habitat*  
 22 *models.*

23 *Assumptions:*

- 24 ● Mapping and delineation will be subsumed under administrative costs (GIS staff) and is not
- 25 expected to create additional costs.

26 *Monitoring Action MA7-2: Document the extent of riparian species habitat restored.*

27 *Assumptions:*

- 28 ● Mapping and delineation will be subsumed under administrative costs (GIS staff) and will
- 29 not create additional costs.
- 30 ● As riparian vegetation develops and diversifies, a midlevel botanist and field technician will
- 31 characterize vegetation community type, structure, and seral stage, as well as canopy height,
- 32 canopy closure, and percent midstory cover.
- 33 ● Each restored site will be visited once a year for the first 5 years after restoration
- 34 construction is completed, and once every 5 years thereafter.
- 35 ● The average size of restoration sites is 100 acres, and 50 hours of field work is necessary for
- 36 each site for each survey (includes travel time to sites).
- 37 ● A truck and ATV will be used for each field day.

1 *Monitoring Action MA7-3: Assess connectivity between existing patches of riparian natural community.*

2 *Assumptions:*

- 3 ● This monitoring action will be subsumed under Monitoring Action MA7-2 and is not  
4 expected to create additional costs.

5 *Monitoring Action MA7-4: Assess structural heterogeneity of plant community structure in restored*  
6 *riparian.*

7 *Assumptions:*

- 8 ● This monitoring action will be subsumed under vegetation sampling conducted under  
9 Monitoring Action MA7-2 and is not expected to create additional costs.

10 *Monitoring Action MA7-5: Determine amount of early- to midsuccessional riparian vegetation in areas*  
11 *targeted for 1,000-acre minimum.*

12 *Assumptions:*

- 13 ● This monitoring action will be subsumed under vegetation sampling conducted under  
14 Monitoring Action MA7-2 and is not expected to create additional costs.

15 *Monitoring Action MA7-6: Determine amount of mature riparian forest intermixed with early- to*  
16 *midsuccessional riparian vegetation in areas targeted for 500-acre minimum.*

17 *Assumptions:*

- 18 ● This monitoring action will be subsumed under vegetation sampling conducted under  
19 Monitoring Action MA7-2 and is not expected to create additional costs.

20 *Monitoring Action MA7-7: Map rare vegetation alliances in representative locations of restored*  
21 *riparian.*

22 *Assumptions:*

- 23 ● This monitoring action will be subsumed under vegetation sampling conducted under  
24 Monitoring Action MA7-2 and administrative costs (GIS staff) and is not expected to create  
25 additional costs.

26 *Monitoring Action MA7-8: Document vegetation composition and structure in restored riparian.*

27 *Assumptions:*

- 28 ● This monitoring action will be subsumed under vegetation sampling conducted under  
29 Monitoring Action MA7-2 and administrative costs and is not expected to create additional  
30 costs.

31 *Monitoring Action MA7-9: Document the extent of covered species habitat supported by restored*  
32 *riparian natural communities.*

33 *Assumptions:*

- 34 ● The schedule for monitoring and quantification of the extent of covered species habitat will  
35 be conducted concurrent with riparian habitat restoration monitoring.

- 1           ● Habitat quantification will be subsumed under administrative costs and will not create  
2 additional costs.

3           *Monitoring Action MA7-10: Document the extent of restored riparian brush rabbit and riparian*  
4 *woodrat habitat.*

5           *Assumptions:*

- 6           ● Patches of riparian brush rabbit and riparian woodrat habitat will be identified and  
7 delineated as part of the larger effort to document the extent of covered species habitat in  
8 riparian restoration areas.
- 9           ● Where patches of suitable habitat are identified, stratified randomized surveys for riparian  
10 brush rabbit and riparian woodrat will be conducted for 10 consecutive days during the  
11 appropriate time of year once every 5 years by a senior-level biologist and one field  
12 technician.
- 13          ● Presence and location of suitable riparian brush rabbit refugia will be documented.
- 14          ● A total of 60 acres of riparian woodrat and riparian brush rabbit habitat will be surveyed at  
15 an average patch size of 5 acres.
- 16          ● A truck and ATV will be used during each field day.

17           *Monitoring Action MA7-11: Document the vegetation composition and structure of riparian woodrat*  
18 *habitat.*

19           *Assumptions:*

- 20          ● This monitoring action will be subsumed under vegetation sampling conducted under  
21 Monitoring Action MA7-2 and administrative costs and is not expected to create additional  
22 costs.

23           *Monitoring Action MA7-12: Document the self-sustainability of restored riparian habitats and their*  
24 *functioning over time.*

25           *Assumptions:*

- 26          ● This monitoring action is subsumed under monitoring action MA7-2.

27           *Monitoring Action MA7-13: Determine covered wildlife species use of restored riparian habitats.*

28           *Assumptions:*

- 29          ● Monitoring of covered species presence and species composition will occur twice annually  
30 during species' active periods, following appropriate protocols for surveying covered plant  
31 and wildlife species, for 5 years following completion of restoration and every 5 years  
32 thereafter.
- 33          ● Monitoring will be conducted by two midlevel biologists.
- 34          ● The average size of restoration sites is 100 acres, and 50 hours of field work is necessary for  
35 each site for each survey (includes travel time to sites).
- 36          ● A truck and ATV will be used each field day.

## 1 **8.A.3.8 CM8 Grassland Natural Community Restoration**

2 *Monitoring Action MA8-1: Document the extent of grassland restored in GIS database. Map habitat*  
3 *restored for each covered species expected to use natural community based on habitat models.*

4 *Assumptions:*

- 5 ● Mapping and delineation will be subsumed under administrative costs (GIS staff) and is not  
6 expected to create additional costs.

7 *Monitoring Action MA8-2: Document the extent of grassland species habitat restored.*

8 *Assumptions:*

- 9 ● Mapping and delineation will be subsumed under administrative costs (GIS staff) and will  
10 not create additional costs.
- 11 ● As grassland vegetation develops and diversifies, a midlevel botanist and a field technician  
12 will characterize percent absolute vegetation cover and percent relative cover of native  
13 plant species.
- 14 ● Each restored site will be visited once a year for the first 5 years after restoration  
15 construction is completed.
- 16 ● The average size of restoration sites is 100 acres and 50 hours of fieldwork is necessary for  
17 each site for each survey (includes travel time to sites).
- 18 ● A truck and ATV will be used for each field day.

19 *Monitoring Action MA8-3: Map connectivity of restored lands with grassland patches, and provision of*  
20 *upland adjacent to riparian or emergent wetland natural communities.*

21 *Assumptions:*

- 22 ● Mapping and delineation will be subsumed under administrative costs (GIS staff) and is not  
23 expected to create additional costs.

24 *Monitoring Action MA8-4: Determine percent cover of vegetation dominated by species.*

25 *Assumptions:*

- 26 ● This monitoring action will be subsumed under Monitoring Action MA8-2 and is not  
27 expected to create additional costs.

28 *Monitoring Action MA8-5: Determine percent cover of noxious weeds and bare ground.*

29 *Assumptions:*

- 30 ● This monitoring action will be subsumed under Monitoring Action MA8-2 and is not  
31 expected to create additional costs.

32 *Monitoring Action MA8-6: Determine extent, distribution, and number of native vegetation alliances.*

33 *Assumptions:*

- 34 ● This monitoring action will be subsumed under Monitoring Action MA8-2 and is not  
35 expected to create additional costs.

1 *Monitoring Action MA8-7: Determine native species richness and species diversity,*

2 *Assumptions:*

- 3 ● This monitoring action will be subsumed under Monitoring Action MA8-2 and is not  
4 expected to create additional costs.

5 *Monitoring Action MA8-8: Document the ecosystem functions of restored grassland habitat in*  
6 *comparison with site potential.*

7 *Assumptions:*

- 8 ● A rangeland health assessment protocol (e.g., Interpreting Indicators of Rangeland Health)  
9 will be used to assess the health of restored grassland sites 5 years after completion of  
10 restoration work and every 10 years thereafter.
- 11 ● A midlevel botanist and a field technician will apply the protocol in 50 hours (includes travel  
12 time to sites) of field work for each site given the average restoration site size is 100 acres.
- 13 ● Ecological site descriptions are available or soil maps can be used as substitutes.
- 14 ● A truck and ATV will be used for each field day.

15 *Monitoring Action MA8-9: Determine covered wildlife and plant species use of restored grassland.*

16 *Assumptions:*

- 17 ● Monitoring of covered species presence, abundance, and breeding activity will occur twice  
18 annually during species' active periods, following appropriate protocols for surveying  
19 covered plant and wildlife species, for 5 years following completion of restoration and every  
20 5 years thereafter.
- 21 ● Monitoring will be conducted by 2 midlevel biologists.
- 22 ● An average restoration site size of 100 acres and each site can be surveyed in 50 hours of  
23 field work (includes travel time to sites).
- 24 ● A truck and ATV will be used for each field day.

25 *Monitoring Action MA8-10: Document the extent of covered species habitat supported by restored*  
26 *grassland natural communities.*

27 *Assumptions:*

- 28 ● The schedule for monitoring and quantification of the extent of covered species habitat will  
29 be conducted concurrent with determining covered wildlife and plant species use of  
30 restored grassland (MA8-9).
- 31 ● Habitat quantification will be subsumed under administrative costs and will not create  
32 additional costs.

### 8.A.3.9 CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration

*Monitoring Action MA9-1: Document the extent of vernal pool complex restored in a GIS database. Map habitat restored for each covered species expected to use natural community based on habitat models.*

*Assumptions:*

- Mapping and delineation will be subsumed under administrative costs (GIS staff) and is not expected to create additional costs.

*Monitoring Action MA9-2: Document the extent of vernal pool complex species habitat restored.*

*Assumptions:*

- Mapping and delineation will be subsumed under administrative costs (GIS staff) and will not create additional costs.
- As vernal pool complex vegetation develops and diversifies, two midlevel botanists will characterize percent absolute vegetation cover, the different components of restored vernal pool complex habitat, percent relative cover of native plant species, and determine covered species population estimates.
- Each restored site will be visited once a year for the first 5 years after restoration construction is completed, and once every 3 years thereafter.
- The average size of restoration sites is 40 acres and 30 hours of fieldwork is necessary for each site for each survey (includes travel time).
- A truck and ATV will be used for each field day.

*Monitoring Action MA9-3: Quantify the extent of covered species habitat and functions supported by restored vernal pool complexes.*

*Assumptions:*

- Monitoring of covered species presence and species composition, presence and abundance of nonnative species, and other measures of habitat use by covered species will occur three times annually during species' active periods, following appropriate protocols for surveying covered plant and wildlife species, for 5 years following implementation and every 3 years thereafter.
- Monitoring will be conducted by a senior-level biologist and a midlevel biologist.
- An average restoration site size of 40 acres and each site can be surveyed in 60 hours of field work (includes travel time to sites).
- A truck and ATV will be used each field day.

*Monitoring Action MA9-4: Determine the percentage of relative cover attributable to native vernal pool species.*

*Assumptions:*

- This monitoring action will be subsumed under Monitoring Action MA9-3 and will not create additional costs.

1 *Monitoring Action MA9-5: Determine the hydrology of restored vernal pool complexes.*

2 *Assumptions:*

- 3 ● Biweekly monitoring of the hydroperiod and seasonality of inundation of restored vernal  
4 pools will be conducted for 5 years after project completion.
- 5 ● Total time required for monitoring of vernal pool sites by sampling up to five plots or pools  
6 per site per year (including up to 10 visits per year to measure hydroperiod) is estimated at  
7 250 hours per year for the first 5 years; thereafter, monitoring of the hydroperiod will be  
8 reduced to once every 3 years, with an average restoration site size of 40 acres being  
9 surveyed with 30 hours of field work (includes travel time to sites).
- 10 ● Monitoring will be conducted by two midlevel biologists.
- 11 ● A truck and ATV will be used each field day.

12 *Monitoring Action MA9-6: Conduct a plant count on restored vernal pool complex acreage.*

13 *Assumptions:*

- 14 ● This monitoring action will be subsumed under Monitoring Action MA9-3 and will not  
15 create additional costs.

### 16 **8.A.3.10 CM10 Nontidal Marsh Restoration**

17 *Monitoring Action MA10-1: Document the extent of nontidal marsh restored in GIS database. Map*  
18 *habitat restored for each covered species and expected to use natural community based on habitat*  
19 *models.*

20 *Assumptions:*

- 21 ● Mapping and delineation will be subsumed under administrative costs (GIS staff) and is not  
22 expected to create additional costs.

23 *Monitoring Action MA10-2: Document the extent of nontidal marsh species habitat restored.*

24 *Assumptions:*

- 25 ● Mapping and delineation will be subsumed under administrative costs (GIS staff) and is not  
26 expected to create additional costs.
- 27 ● As nontidal marsh vegetation develops and diversifies, a midlevel botanist and field  
28 technician will characterize percent absolute vegetation cover, the different components of  
29 restored nontidal marsh habitat, and percent relative cover of native plant species.
- 30 ● Each restored site will be visited once a year for the first 5 years after restoration  
31 construction is completed, and once every 5 years thereafter.
- 32 ● The average size of restoration sites is 40 acres and 20 hours of fieldwork is necessary for  
33 each site for each survey (includes travel time to sites).
- 34 ● A truck and ATV will be used for each field day.

1 *Monitoring Action MA10-3: Document the extent, attributes and functions of giant garter snake and*  
2 *other covered species habitat supported by restored nontidal marsh communities.*

3 *Assumptions:*

- 4 ● The schedule for monitoring and quantification of the extent of covered species habitat will  
5 be conducted concurrent with nontidal marsh habitat restoration monitoring.
- 6 ● Habitat quantification will be subsumed under administrative costs and will not create  
7 additional costs.

8 *Monitoring Action MA10-4: Document the functionality and condition of restored nontidal marsh*  
9 *habitats over time.*

10 *Assumptions:*

- 11 ● The California Rapid Assessment Method (CRAM) for wetlands will serve as a monitoring  
12 protocol guide.
- 13 ● CRAM assessment will occur 5 years after completion of restoration construction and every  
14 5 years thereafter.
- 15 ● A midlevel biologist and a junior-level biologist will apply the CRAM protocol in 50 hours  
16 (includes travel time to sites) of field work for each site given the average restoration site  
17 size is 40 acres.
- 18 ● A truck and ATV will be used for each field day.

19 *Monitoring Action MA10-5: Determine covered wildlife species use of restored nontidal marsh habitats.*

20 *Assumptions:*

- 21 ● Monitoring of covered species presence, abundance, and breeding activity will occur once  
22 annually during covered species' active period for 5 years following completion of  
23 restoration construction and every 5 years thereafter.
- 24 ● Monitoring will be conducted by two midlevel biologists.
- 25 ● An average restoration site size of 40 acres and each site can be surveyed in 20 hours of field  
26 work (includes travel time to sites).
- 27 ● A truck and ATV will be used for each field day.

28 *Monitoring Action MA10-6: Determine giant garter snake distribution and abundance in restored*  
29 *nontidal marsh.*

30 *Assumptions:*

- 31 ● A randomized stratified survey for giant garter snakes is conducted in garter snake habitat  
32 in areas that are wetted in less than 25% of inundation years.
- 33 ● Garter snake surveys are conducted during periods of snake activity.
- 34 ● Initial monitoring efforts will establish baseline conditions.
- 35 ● Survey costs are assumed to be \$80,000 per year.

## 8.A.3.11 CM11 Natural Communities Enhancement and Management

*Monitoring Action MA11-1: Document that required site-specific management plans were developed.*

*Assumptions:*

- Documentation of management plan completion will be subsumed under BDCP administrative costs and will not create additional costs.

*Monitoring Action MA11-2: Quantify covered species habitat availability, function, and suitability of BDCP protected and restored natural communities.*

*Assumptions:*

- Baseline surveys will be completed the first year following implementation of site-specific management plans, then will be repeated every 2 years for 10 years, followed by surveys every 5 years thereafter.
- Surveys will be conducted by a midlevel botanist and midlevel terrestrial ecologist to increase mapping accuracy and determine habitat quality and the presence of key habitat correlates.
- The average size of conservation land sites is 100 acres, and 50 hours of field work is necessary for each natural community site (excluding cultivated lands, which will require only 10 hours) for each survey (includes travel time to sites).
- A truck and ATV will be used each field day.

*Monitoring Action MA11-3: Implement a plan for inventory and control of invasive plant species in BDCP protected and restored natural communities.*

*Assumptions:*

- The Implementation Office will conduct surveys of protected lands within 2 years of acquisition and will create site-specific management plans based on those surveys. These will include an assessment of nonnative species abundance and effect on habitat functions. This is subsumed under the costs for *CM11 Natural Communities Enhancement and Management*.
- After implementation of site-specific management plans, inventories of invasive plant populations will be conducted once during the first year following plan implementation, and again every 5 years thereafter.
- Two midlevel botanists will conduct surveys in grassland/alkali seasonal wetland/vernal pool complex areas at a rate of 20 acres per 50 hours of field work (includes travel time to sites).
- The Implementation Office will use the surveys to establish thresholds for control actions and implement the actions before the thresholds are reached, as part of adaptive management. This is subsumed under the costs for *CM11 Natural Communities Enhancement and Management*.
- A truck and ATV will be used each field day.

1 *Monitoring Action MA11-4: Document the increase in habitat function for covered species.*

2 *Assumptions:*

- 3 • This is subsumed under administrative costs and costs associated with monitoring action  
4 MA11-2.

### 5 **8.A.3.12 CM12 Methylmercury Management**

6 *Monitoring Action MA12-1: Document completion and implementation of site-specific Methylmercury*  
7 *Management Plans for restoration sites.*

8 *Assumptions:*

- 9 • This monitoring action will be subsumed under administrative costs and will not create  
10 additional costs.

### 11 **8.A.3.13 CM13 Invasive Aquatic Vegetation Control**

12 *Monitoring Action MA13-1: Document that funding was provided to study and evaluate the success of*  
13 *invasive aquatic vegetation (IAV) control measures.*

14 *Assumptions:*

- 15 • Documentation of funding will be subsumed under administrative costs and will not create  
16 additional costs.

17 *Monitoring Action MA13-2: Delta-wide risk assessment of invasive aquatic vegetation.*

18 *Assumptions:*

- 19 • Total effort will comprise evaluation and producing a final report.  
20 • This will be a contracted action at a one-time cost of \$100,000.

21 *Monitoring Action MA13-3: Delta-wide prioritization of invasive aquatic vegetation treatment areas.*

22 *Assumptions:*

- 23 • Total effort will comprise evaluation and producing a final report.  
24 • This will be a contracted action at a one-time cost of \$100,000.

25 *Monitoring Action MA13-4: Site-level assessment to determine the need for implementation of IAV*  
26 *control actions and the effectiveness of IAV control actions.*

27 *Assumptions:*

- 28 • Surveys will be done by one midlevel biologist and one field technician at a rate of 500 acres  
29 per 10-hour day (includes travel time to sites) and will require a small boat and pick-up  
30 truck.  
31 • Area of IAV treated annually will be 3,300 acres for 8 years, and 330 acres annually  
32 thereafter.

- 1           ● Surveys will be conducted monthly for 3 months following control actions to determine  
2 whether IAV has stabilized or is spreading. Thereafter, surveys for this action will occur  
3 annually for 8 years.
- 4           ● Costs of analysis are subsumed under BDCP administrative costs.

5           *Monitoring Action MA13-5: Determine the effectiveness of IAV control actions in reducing predation*  
6 *risk from nonnative predatory fish on covered fish species.*

7           *Assumptions:*

- 8           ● Area of IAV treated annually will be 3,300 acres for 8 years, and 330 acres annually  
9 thereafter.
- 10          ● Fish sampling by seining will be conducted to determine the abundance and distribution of  
11 nonnative predatory fish species.
- 12          ● Fish sampling involves a three-person crew (one midlevel biologist, two field technicians)  
13 for a 10-hour sampling day for a 250-acre study area.
- 14          ● Sampling will occur twice prior to and twice following IAV control actions.
- 15          ● A truck and boat are needed for each sampling day.

16          *Monitoring Action MA13-5: Conduct surveys to assess new infestations of IAV throughout the Plan*  
17 *Area.*

18          *Assumptions:*

- 19          ● Surveys will be done by one midlevel aquatic biologist and one field technician at a rate of  
20 500 acres per 10-hour day (includes travel time to sites) and will require a small boat and  
21 pick-up truck.
- 22          ● One-tenth of existing Plan Area tidal waterways will be surveyed each year (approximately  
23 10,000 acres/year), resulting in a full survey of all currently existing waterways every 10  
24 years.
- 25          ● Restored areas of tidal marsh will be surveyed once every 5 years after restoration is  
26 complete.

### 27 **8.A.3.14           CM14 Stockton Deep Water Ship Channel Dissolved** 28 **Oxygen Levels**

29          *Monitoring Action MA14-1: Document funding and operation of the dissolved oxygen facility in the*  
30 *Stockton Deep Water Ship Channel.*

31          *Assumptions:*

- 32          ● This monitoring action will be subsumed under administrative costs and will not create  
33 additional costs.

1 *Monitoring Action MA14-2: Measure levels of dissolved oxygen delivered to the river at various*  
 2 *distances within the 7.5 mile low dissolved oxygen area of the ship channel.*

3 *Assumptions:*

- 4 ● The existing Rough and Ready Island water quality monitoring station will continue to be  
 5 the main station for determining the effectiveness of the aeration facility in the Stockton  
 6 Deep Water Ship Channel.
- 7 ● The TMDL monitoring strategy will integrate the City of Stockton’s weekly water quality  
 8 grab sampling as part of their compliance monitoring.
- 9 ● Additional monitoring will be needed to ensure adequate coverage of the entire length of the  
 10 ship channel.
- 11 ● One dissolved oxygen data logger will be installed for every .75 mile of the 7.5-mile length of  
 12 low dissolved oxygen area—staggered on both sides of the channel—requiring 20 dissolved  
 13 oxygen data loggers.
- 14 ● Equipment costs associated with this monitoring action (dissolved oxygen data loggers and  
 15 anchoring equipment) are expected to be \$1,300 per installation.
- 16 ● Replacement of dissolved oxygen monitors is estimated at 5-year intervals.
- 17 ● Maintenance and calibration of monitors, collection of data, and data analysis are subsumed  
 18 under BDCP administrative costs.
- 19 ● Long-term monitoring of dissolved oxygen levels in the Deep Water Ship Channel will  
 20 continue for the duration of the BDCP.

21 *Monitoring Action MA14-3: Evaluate if aeration increases the use of the Stockton Deep Water Ship*  
 22 *Channel as a migration route for covered fish species.*

23 *Assumptions:*

- 24 ● Tracking studies (e.g., radio-telemetry, acoustic tracking, or other appropriate methods) of  
 25 juvenile salmon and other species as appropriate will be used to determine the proportion  
 26 and survival of fish migrating through the Deep Water Ship Channel, and to determine the  
 27 effects of the aeration facility on survival of juvenile fish.
- 28 ● Total cost is estimated at \$250,000 annually (estimate based on costs of previous acoustic  
 29 tracking studies by CDFW and USGS).
- 30 ● This is a program addition to existing CDFW fish tracking studies.
- 31 ● This monitoring activity will occur every 5 years.

### 32 **8.A.3.15 CM15 Localized Reduction of Predatory Fishes**

33 *Monitoring Action MA15-1: Document progress of the pilot program and research actions in annual*  
 34 *adaptive management and monitoring reports*

35 *Assumptions:*

- 36 ● Communication, mapping and delineation will be subsumed under administrative costs (GIS  
 37 staff) and will not create additional costs.

1 *Monitoring Action MA15-2: Monitor predator distribution and abundance at known predator hotspots*  
 2 *to determine effectiveness of conservation measure actions to reduce potential predation loss*

3 *Assumptions:*

- 4 ● Monitoring will begin during year 3 of BDCP implementation.
- 5 ● Monitoring will be conducted annually for 10 years, and then once every 3 years thereafter.
- 6 ● Cost of monitoring is estimated at an annual cost of \$300,000.

### 7 **8.A.3.16 CM16 Nonphysical Fish Barriers**

8 *Monitoring Action MA16-1: Document the installation and operation of nonphysical fish barriers in a*  
 9 *database that tracks seasonal operation and cost.*

10 *Assumptions:*

- 11 ● This monitoring action will be subsumed under administrative costs and will not create  
 12 additional costs.

13 *Monitoring Action MA16-2: Evaluate the permeability of nonphysical barriers for outmigrating juvenile*  
 14 *salmonids.*

15 *Assumptions:*

- 16 ● A methodology similar to that described in Bowen and Bark 2010 will be used to monitor  
 17 the permeability of the nonphysical barrier to outmigrating salmonids and determine  
 18 survival rates of salmonid smolts. This involves three releases of approximately 1,000  
 19 acoustically tagged salmonid smolts over 3 days, deployment of a DIDSON camera parallel to  
 20 the nonphysical fish barrier, and recording and analysis of data.
- 21 ● Monitoring will be conducted simultaneously with the initiation of operation of nonphysical  
 22 fish barriers.
- 23 ● Monitoring will be conducted at seven nonphysical barriers for the first 2 years of operation  
 24 to determine permeability and survival rates of outmigrating salmonids. Monitoring will  
 25 then be discontinued for 5 years, after which three nonphysical barriers (selected at  
 26 random) will undergo monitoring every 5 years.
- 27 ● Two midlevel biologists will conduct the monitoring.
- 28 ● The cost of 1 years of monitoring for one nonphysical barrier is \$250,000<sup>5</sup>.

### 29 **8.A.3.17 CM17 Illegal Harvest Reduction**

30 *Monitoring Action MA17-1: Document funding and actual costs to provide for required CDFW staff*  
 31 *serving in the Plan Area.*

32 *Assumptions:*

- 33 ● Documentation of the provision of funding for additional game wardens will be subsumed  
 34 under Implementation Office administrative costs and will not create additional costs.

<sup>5</sup> Draft CVPIA Fiscal Year 2011 Annual Work Plan. January 31, 2011. Program title: Head of Old River Barrier. South Delta Improvements Program CVPIA Section 3406(b)(15).

1 *Monitoring Action MA17-2: Determine and report compliance ratios in routine enforcement activities*  
2 *including the number of contacts with the public and number of warnings and citations issued per year.*

3 *Assumptions:*

- 4 ● Game wardens' tracking of their contact rate with the public will be subsumed under  
5 administrative costs and will not create additional costs.
- 6 ● The Implementation Office review of annual reports of enforcement statistics for the Plan  
7 Area will be subsumed under administrative costs and will not create additional costs.

8 *Monitoring Action MA17-3: Track trends of the number and distribution of citations and arrests*  
9 *relative to conservation measure efforts.*

10 *Assumptions:*

- 11 ● Review of enforcement statistics will be subsumed under administrative costs and will not  
12 create additional costs.

### 13 **8.A.3.18 CM18 Conservation Hatcheries**

14 *Monitoring Action MA18-1: Document construction and operation of facilities to expand the refugial*  
15 *population of delta smelt and to establish a refugial population of longfin smelt at the University of*  
16 *California, Davis Fish Conservation and Culture Laboratory.*

17 *Assumptions:*

- 18 ● Costs for this monitoring action will be subsumed under administrative costs and will not  
19 create additional costs.

20 *Monitoring Action MA18-2: Monitor smelt genetic diversity to ensure that it is maintained at a level*  
21 *comparable to wild populations.*

22 *Assumptions:*

- 23 ● Methods to be developed in collaboration with fish agency and hatchery staff.
- 24 ● Costs for this monitoring action are subsumed under *CM18 Conservation Hatcheries*. No  
25 additional costs will be incurred.

### 26 **8.A.3.19 CM19 Urban Stormwater Treatment**

27 *Monitoring Action MA19-1: Document funding made available and provided to the Sacramento*  
28 *Stormwater Quality Partnership and/or jurisdictions in the Delta watershed, and how funding was*  
29 *used to support goals of conservation measure.*

30 *Assumptions:*

- 31 ● Costs for this monitoring action will be subsumed under administrative costs and will not  
32 create additional costs.

1 *Monitoring Action MA19-2: Ongoing review of monitoring, progress, and other relevant reports from*  
2 *the stormwater entities.*

3 *Assumptions:*

- 4 • Costs for this monitoring action will be subsumed under administrative costs and will not  
5 create additional costs.

### 6 **8.A.3.20 CM20 Recreational Users Invasive Species Program**

7 *Monitoring Action MA20-1: Document funding provided to the CDFW Watercraft Inspection Program*  
8 *in the Delta and how funding was spent to support goals of conservation measure.*

9 *Assumptions:*

- 10 • Costs for this monitoring action will be subsumed under administrative costs and will not  
11 create additional costs.

12 *Monitoring Action MA20-2: Identification of aquatic invasive species detected during program*  
13 *implementation.*

14 *Assumptions:*

- 15 • Costs for this monitoring action are subsumed under *CM20 Recreational Users Invasive*  
16 *Species Program*. No additional costs will be incurred.

### 17 **8.A.3.21 CM21 Nonproject Diversions**

18 *Monitoring Action MA21-1: Document funding made available, notification and selection process for*  
19 *grants to landowners and water agencies, participation in program, and projects built to reduce*  
20 *covered fish species entrapment.*

21 *Assumptions:*

- 22 • Costs for this monitoring action are subsumed under administrative costs. No additional  
23 costs will be incurred.

24 *Monitoring Action MA21-2: Preproject monitoring of high-priority diversions selected for remediation.*

25 *Assumptions:*

- 26 • Costs for this monitoring action are subsumed under *CM21 Nonproject Diversions*. No  
27 additional costs will be incurred.

28 *Monitoring Action MA21-3: Postproject monitoring of active (i.e., modified, not removed) diversions.*

29 *Assumptions:*

- 30 • Costs for this monitoring action are subsumed under *CM21 Nonproject Diversions*. No  
31 additional costs will be incurred.

32

## 1 **8.A.3.22 Summary of Costs of Monitoring Actions**

2 Table 8.A-47 provides a summary of the estimated costs, broken down by direct costs, vehicle costs,  
3 labor costs and total costs, that will be incurred during each 5-year interval while implementing the  
4 monitoring actions and avoidance and minimization measures over the 50-year term of the BDCP. A  
5 20% contingency is added to the estimates for monitoring actions not already underway in existing  
6 programs such as IEP because the costs (cost per unit and number of units) for these new  
7 monitoring actions could vary from those calculated. A 20% contingency is also added to the cost  
8 estimate for avoidance and minimization measures as these actions have not been tested and could  
9 vary from the calculations provided.

1 **Table 8.A-47. Total Costs of Compliance and Effectiveness Monitoring for Implementation of all Conservation Measures over the Term of the**  
 2 **BDCP by 5-Year Periods**

Effectiveness Monitoring	1-5 yrs	6-10 yrs	11-15 yrs	16-20 yrs	21-25 yrs	26-30 yrs	31-35 yrs	36-40 yrs	41-45 yrs	46-50 yrs
	Near-Term		Early Long-Term	Late Long-Term						
CM1 Conveyance Construction and Operations	\$ 60,000	\$ 60,000	\$ 1,310,000	\$ 1,200,000	\$ 1,310,000	\$ 1,200,000	\$ 1,310,000	\$ 1,200,000	\$ 1,310,000	\$ 1,200,000
CM2 Yolo Bypass Fisheries Enhancement	\$ 810,000	\$ 2,060,000	\$ 1,060,000	\$ 1,170,000	\$ 780,000	\$ 1,180,000	\$ 770,000	\$ 930,000	\$ 1,030,000	\$ 920,000
CM3 Protect Natural Communities	\$ 90,000	\$ 200,000	\$ 170,000	\$ 180,000	\$ 200,000	\$ 230,000	\$ 250,000	\$ 270,000	\$ 240,000	\$ 240,000
CM4 Restore Tidal Marsh	\$ 3,950,000	\$ 4,680,000	\$ 6,240,000	\$ 6,060,000	\$ 6,740,000	\$ 7,420,000	\$ 7,900,000	\$ 8,560,000	\$ 5,640,000	\$ 5,620,000
CM5 Restore Floodplain Inundation	\$ -	\$ -	\$ 430,000	\$ 660,000	\$ 790,000	\$ 920,000	\$ 1,050,000	\$ 1,190,000	\$ 780,000	\$ 780,000
CM6 Channel Margin Enhancement	\$ -	\$ 250,000	\$ 280,000	\$ 560,000	\$ 620,000	\$ 680,000	\$ 290,000	\$ 280,000	\$ 280,000	\$ 280,000
CM7 Riparian Restoration	\$ 280,000	\$ 470,000	\$ 570,000	\$ 710,000	\$ 1,040,000	\$ 1,160,000	\$ 1,300,000	\$ 1,460,000	\$ 1,350,000	\$ 950,000
CM8 Grassland Restoration	\$ 120,000	\$ 300,000	\$ 460,000	\$ 320,000	\$ 280,000	\$ 310,000	\$ 310,000	\$ 350,000	\$ 280,000	\$ 270,000
CM9 Vernal Pool Complex Restoration	\$ 160,000	\$ 220,000	\$ 270,000	\$ 120,000	\$ 90,000	\$ 80,000	\$ 90,000	\$ 90,000	\$ 80,000	\$ 90,000
CM10 Nontidal Marsh Restoration	\$ 520,000	\$ 540,000	\$ 570,000	\$ 590,000	\$ 730,000	\$ 770,000	\$ 820,000	\$ 860,000	\$ 680,000	\$ 680,000
CM11 Manage and Enhance Protected Nat Comms	\$ 4,430,000	\$ 8,870,000	\$ 11,640,000	\$ 13,520,000	\$ 15,710,000	\$ 18,060,000	\$ 20,380,000	\$ 22,730,000	\$ 21,640,000	\$ 20,990,000
CM12 MeHg Management	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
CM13 Invasive Aquatic Vegetation Control	\$ 800,000	\$ 470,000	\$ 150,000	\$ 150,000	\$ 160,000	\$ 170,000	\$ 170,000	\$ 180,000	\$ 190,000	\$ 190,000
CM14 Stockton Deep Water Ship Channel DO	\$ 280,000	\$ 280,000	\$ 280,000	\$ 280,000	\$ 280,000	\$ 280,000	\$ 280,000	\$ 280,000	\$ 280,000	\$ 280,000
CM15 Predator Control	\$ 900,000	\$ 1,500,000	\$ 900,000	\$ 300,000	\$ 600,000	\$ 600,000	\$ 300,000	\$ 600,000	\$ 600,000	\$ 300,000
CM16 Nonphysical Fish Barriers	\$ 3,500,000	\$ 750,000	\$ 750,000	\$ 750,000	\$ 750,000	\$ 750,000	\$ 750,000	\$ 750,000	\$ 750,000	\$ 750,000
CM17 Illegal Harvest Reduction	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
CM18 Conservation Hatcheries	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
CM19 Urban Stormwater Treatment	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
CM20 Recreational Users Invasive Species Program	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
CM21 Nonproject Diversions	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total	\$ 15,900,000	\$ 20,650,000	\$ 25,080,000	\$ 26,570,000	\$ 30,080,000	\$ 33,810,000	\$ 35,970,000	\$ 39,730,000	\$ 35,130,000	\$ 33,540,000
20% Contingency	\$ 3,180,000	\$ 4,130,000	\$ 5,016,000	\$ 5,314,000	\$ 6,016,000	\$ 6,762,000	\$ 7,194,000	\$ 7,946,000	\$ 7,026,000	\$ 6,708,000
Grand Total	\$ 19,080,000	\$ 24,780,000	\$ 30,096,000	\$ 31,884,000	\$ 36,096,000	\$ 40,572,000	\$ 43,164,000	\$ 47,676,000	\$ 42,156,000	\$ 40,248,000
Compliance Monitoring	1-5 yrs	6-10 yrs	11-15 yrs	16-20 yrs	21-25 yrs	26-30 yrs	31-35 yrs	36-40 yrs	41-45 yrs	46-50 yrs
	Near-Term		Early Long-Term	Late Long-Term						
CM1 Conveyance Construction and Operations	\$ 300,000	\$ 310,000	\$ 550,000	\$ 350,000	\$ 350,000	\$ 350,000	\$ 350,000	\$ 350,000	\$ 350,000	\$ 350,000
CM2 Yolo Bypass Fisheries Enhancement	\$ 60,000	\$ 270,000	\$ 290,000	\$ 290,000	\$ 290,000	\$ 290,000	\$ 290,000	\$ 290,000	\$ 290,000	\$ 290,000
CM3 Protect Natural Communities	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
CM4 Restore Tidal Marsh	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
CM5 Restore Floodplain Inundation	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
CM6 Channel Margin Enhancement	\$ -	\$ 10,000	\$ 10,000	\$ 10,000	\$ 10,000	\$ 10,000	\$ 10,000	\$ -	\$ -	\$ -
CM7 Riparian Restoration	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
CM8 Grassland Restoration	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
CM9 Vernal Pool Complex Restoration	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
CM10 Nontidal Marsh Restoration	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
CM11 Manage and Enhance Protected Nat Comms	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
CM12 MeHg Management	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
CM13 Invasive Aquatic Vegetation Control	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
CM14 Stockton Deep Water Ship Channel DO	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
CM15 Predator Control	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
CM16 Nonphysical Fish Barriers	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
CM17 Illegal Harvest Reduction	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
CM18 Conservation Hatcheries	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
CM19 Urban Stormwater Treatment	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
CM20 Recreational Users Invasive Species Program	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
CM21 Nonproject Diversions	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total	\$ 360,000	\$ 590,000	\$ 850,000	\$ 650,000	\$ 650,000	\$ 650,000	\$ 650,000	\$ 640,000	\$ 640,000	\$ 640,000
20% Contingency	\$ 72,000	\$ 118,000	\$ 170,000	\$ 130,000	\$ 130,000	\$ 130,000	\$ 130,000	\$ 128,000	\$ 128,000	\$ 128,000
Grand Total	\$ 432,000	\$ 708,000	\$ 1,020,000	\$ 780,000	\$ 780,000	\$ 780,000	\$ 780,000	\$ 768,000	\$ 768,000	\$ 768,000

3

4

## 8.A.4 Research Program Costs

The following are cost assumptions for the examples of potential research actions described in Section 8.6, *Costs of Monitoring and Research Actions*. Research costs are estimated for each conservation measure.

### 8.A.4.1 CM1 Water Facilities and Operation

*Potential Research Action RA1-1: Document effects of Delta Cross Channel operations (increasing the duration of Delta Cross Channel closure) on hydrodynamics and fish migration.*

*Assumptions:*

- Tracking studies (e.g., radio-telemetry, acoustic tracking, or other appropriate methods) of juvenile winter-run Chinook salmon, green and white sturgeon, and other species as appropriate will be used to determine the proportion and survival of fish migrating through the mainstem Sacramento River and tributaries and the interior of the Delta, and to determine the effects of cross channel closure on survival of juvenile fish.
- Total cost is estimated at \$250,000 annually.
- This is a program addition to existing CDFW fish tracking studies.
- This activity will continue for 5 years. The schedule may be adaptively altered if data resolution requirements are not met or when a clear relationship between Delta Cross channel operation, covered species survival and transport, and tidal flows is established and can be predicted robustly and with low uncertainty.

*Potential Research Action RA1-2: Determine the extent and patterns of predator aggregation at north Delta intakes*

*Assumptions:*

- The cost of this potential research action is subsumed under RA15-11, which monitors predator distribution and abundance at the north Delta intakes.

*Potential Research Action RA1-3: Determine the magnitude of losses of covered fish due to predation at these facilities*

*Assumptions:*

- Some of the cost of this potential research action is subsumed under RA15-11, which monitors predator distribution and abundance at the north Delta intakes.
- In addition to and concurrent with RA15-11, radio telemetry, acoustic tagging and potential stomach content analysis will be used.
- An additional \$100,000, in conjunction with funding for RA15-11, will be utilized annually for the first 5 years after CM2 implementation, thereafter the cost is assumed to be \$100,000 every 5 years.

1 *Potential Research Action RA1-4: Determine the changes in central Delta predation attributable to*  
2 *altered flow downstream of the new north Delta intake which may affect fish migration pathways*

3 *Assumptions:*

- 4 ● Monitoring will begin during the first year of operation of the north Delta intakes and  
5 continue for 5 years.
- 6 ● Monitoring will be conducted in four locations.
- 7 ● Subsequent monitoring will be conducted once every 5 years thereafter.
- 8 ● Cost of monitoring is estimated at an annual cost of \$300,000.

9 *Potential Research Action RA1-5: Determine how new water operations affect magnitude and timing of*  
10 *predation near the south Delta facilities, especially in Clifton Court Forebay*

11 *Assumptions:*

- 12 ● Monitoring will begin during the first year of operation of the north Delta intakes and  
13 continue for 5 years.
- 14 ● Subsequent monitoring will be conducted once every 5 years thereafter.
- 15 ● Cost of monitoring is estimated at an annual cost of \$300,000.

16 *Potential Research Action RA1-6: Conduct "decision tree" studies and develop process for determining*  
17 *appropriate criterion values at the initiation of dual conveyance operations*

18 *Assumptions:*

- 19 ● Costs are estimated at \$2 million per year.
- 20 ● Costs will be incurred for 11 years, until initiation of dual conveyance operations.

## 21 **8.A.4.2 CM2 Yolo Bypass Fisheries Enhancement**

22 *Potential Research Action RA2-1: Evaluate the potential effects of the fish passage gates at Fremont*  
23 *Weir (replacing fish ladder).*

24 *Assumptions:*

- 25 ● Action will be conducted via eight underwater cameras mounted within the fish passage  
26 gates (e.g., Multi SeaCam, DeepSea Inc.) at a cost of \$3,500 each (including camera, video  
27 equipment and viewing monitor).
- 28 ● Automatic fish counters (e.g., Logie 2100 resistivity counter, Aquantic Ltd.) will be installed.
- 29 ● A junior-level biologist will spend 20 hours per month analyzing video sequences and  
30 estimating fish passage by study period.
- 31 ● This action will continue for 5 years.

1 *Potential Research Action RA2-2: Evaluate the effectiveness of experimental sturgeon ramps for the*  
2 *upstream migration of adult sturgeon and lamprey from the Yolo Bypass to the Sacramento River.*

3 *Assumptions:*

- 4 ● The cost of this potential research action is subsumed under RA2-1, which evaluates fish  
5 passage through the Fish passage gates on Fremont Weir.
- 6 ● Adult Sturgeon and lampreys using the experimental sturgeon ramps will be passing  
7 through the weir, where they will be sampled and counted by automatic and video fish  
8 counters proposed under RA2-1.
- 9 ● No additional costs will be incurred.

10 *Potential Research Action RA2-3: Evaluate stilling basin modification and assess risk of covered fish*  
11 *stranding.*

12 *Assumptions:*

- 13 ● Documentation of the modification of the stilling basin will be based on as-built construction  
14 drawings and measurements of the bathymetry of the stilling basin upon completion of the  
15 construction (see MA2-2).
- 16 ● Fish sampling will be conducted once per year if water remains in the stilling basin after  
17 weir spills have ceased and floodplain drainage has begun (i.e., hydrological connectivity of  
18 the stilling basin with the floodplain has been lost and fish could be stranded within the  
19 basin).
- 20 ● This action is based on ongoing fish rescue efforts by CDFW in the Fremont Weir stilling  
21 basin.
- 22 ● Fish sampling will require six fisheries technicians for a 10-hour day (travel time included)  
23 and three pick-up trucks.

24 *Potential Research Action RA2-4: Evaluate Sacramento Weir improvements for fish passage and*  
25 *minimization of stranding risk.*

26 *Assumptions:*

- 27 ● Action will be conducted via underwater 10 cameras mounted within the fish passage way  
28 (e.g., Multi SeaCam, DeepSea Inc.) at a cost of \$3,500 each (including camera, video  
29 equipment and viewing monitor).
- 30 ● Automatic fish counters (e.g., Logie 2100 resistivity counter, Aquantic Ltd.) will be installed  
31 within the passage channel at Sacramento Weir. Capital cost is \$25,000–\$35,000 with  
32 annual operating costs of \$15,000 (McCubbing et al. 2000).
- 33 ● A junior-level biologist will spend 20 hours per month analyzing video sequences and  
34 estimating fish passage by study period. A midlevel biologist will analyze fish passage data,  
35 requiring 120 hours annually. These hours are in addition to what BDCP's full-time staff  
36 would provide.
- 37 ● Fish sampling will be conducted once per flood recession (assuming rescued fish are  
38 released) if water remains in the stilling basin after weir spills have ceased and floodplain  
39 drainage has begun (i.e., hydrological connectivity of the stilling basin with the floodplain  
40 has been lost and fish could be stranded within the basin).

- 1           ● This sampling will occur twice over a 2-week period.
- 2           ● This action will continue for 5 years.
- 3           ● Fish sampling will require six fisheries technicians for a 10-hour day (travel time included)
- 4           and three pick-up trucks.

5           *Potential Research Action RA2-5: Determine effectiveness of Tule Canal/Toe Drain and Lisbon Weir*  
6           *improvements to reduce the delay, stranding, and loss of migrating salmon, steelhead, and sturgeon.*

7           *Assumptions:*

- 8           ● Monitoring will be conducted for three weeks annually for 5 years.
- 9           ● Monitoring will be conducted by a midlevel biologist and a fishery technician.
- 10          ● A truck and seining gear will be used.

11          *Potential Research Action RA2-6: Determine the effectiveness of Lower Putah Creek realignments to*  
12          *improve upstream and downstream passage of covered fish species in Putah Creek and floodplain*  
13          *habitat restoration.*

14          *Assumptions:*

- 15          ● Automatic fish counters (e.g., Logie 2100 resistivity counter, Aquantic Ltd. or other suitable  
16          system) will be installed within the channel at lower Putah Creek. Capital cost is \$25,000–  
17          \$35,000 with annual operating costs of \$15,000.
- 18          ● Costs associated with processing of data obtained by automatic fish counters will be  
19          subsumed under BDCP administrative costs.
- 20          ● This action will continue for 5 years.

21          *Potential Research Action RA2-7: Evaluate growth rates of juvenile salmonids entering the Yolo Bypass*  
22          *during periods of Fremont Weir operation.*

23          *Assumptions:*

- 24          ● This action will be based on ongoing juvenile salmon sampling (e.g., Midwater Trawl at  
25          Chipps Island).
- 26          ● Growth rates will be estimated from a mark-recapture approach (see MA2-10) and from  
27          passage data at entry and exit points.
- 28          ● Growth rate data analysis is estimated to be subsumed under routine staff duties and will be  
29          included under administrative staff costs.
- 30          ● No additional costs will be incurred.

31          *Potential Research Action RA2-8: Document Sacramento splittail spawning and spawning success in*  
32          *the Yolo Bypass during periods of Fremont Weir operation.*

33          *Assumptions:*

- 34          ● Spawning success is measured as catch per unit effort of juvenile splittail at the end of the  
35          spawning season during the dewatering phase of the Yolo Bypass near its southern terminus  
36          (Liberty Island).
- 37          ● Juvenile splittail are counted weekly by beach seining.

- 1           ● Five sampling locations are selected.
- 2           ● Sampling will be conducted annually for the first 5 years following Fremont Weir  
3           modifications and then once every 5 years thereafter.
- 4           ● Annual spawning success sampling of splittail juveniles involves a two-person crew (one  
5           midlevel biologist, one technician) for 10 hours (includes travel time) each week for up to 6  
6           weeks.
- 7           ● One boat (small motorboat) and a truck are needed for 10 hours per sampling day.

8           *Potential Research Action RA2-9: Determine severity of predation effects on covered fish using the Yolo*  
9           *Bypass.*

10           *Assumptions:*

- 11           ● Monitoring will begin for the first 5 years following Fremont Weir modifications.
- 12           ● Monitoring will be conducted in two locations.
- 13           ● Subsequent monitoring will be conducted once every 5 years thereafter.
- 14           ● Cost of monitoring is estimated at an annual cost of \$150,000.

15           *Potential Research Action RA2-10: Monitor key indices of plant health and vigor for elderberry shrubs*  
16           *and other riparian species at selected sites prior to implementation of CM2, and at regular intervals (to*  
17           *be determined) following Fremont Weir improvements.*

18           *Assumptions:*

- 19           ● Monitoring will be conducted three times prior to completion of improvements and twice  
20           every 5 years after completion of improvements.
- 21           ● Monitoring will be conducted at four locations.
- 22           ● Monitoring will be conducted by a senior-level biologist and a field technician for two days  
23           for each site.
- 24           ● A truck and ATV will be used.

25           *Potential Research Action RA2-11: Determine plankton and invertebrate production rates during*  
26           *periods the Fremont Weir is operated.*

27           *Assumptions:*

- 28           ● The estimate of this monitoring action is based on ongoing IEP Environmental Monitoring  
29           Program.
- 30           ● Additions to the IEP environmental monitoring program consist of 10 additional sampling  
31           stations in the Yolo Bypass.
- 32           ● During Bypass inundation weekly grab samples will be taken at each station.
- 33           ● This sampling effort will constitute an estimated 3% increase in the IEP environmental  
34           monitoring program efforts of \$4.6 M; total annual cost is therefore estimated at \$140,000.
- 35           ● Monitoring will be conducted on three occasions in first 5 years of BDCP implementation to  
36           establish baseline conditions.

- 1       • Thereafter, monitoring will continue annually for 10 years, and then once every 3 years for the  
2       duration of the permit.

### 3   **8.A.4.3       CM4 Tidal Natural Communities Restoration**

4       *Potential Research Action RA4-1: Quantify the primary and secondary production, including food*  
5       *suitable for covered species, exported from restored tidal marsh plain into adjacent restored subtidal*  
6       *aquatic habitat areas.*

7       *Assumptions:*

- 8       • This potential research action involves quantifying primary and secondary production  
9       produced in and exported from restored tidal habitats to downstream locations, either  
10      through modeling or direct observation.
- 11      • Total cost of this potential research action is estimated to be subsumed under monitoring  
12      action MA4-7 and BDCP administration (staff biologist time).

13      *Potential Research Action RA4-2: Document the export of organic carbon produced in restored tidal*  
14      *marsh plain into existing Plan Area channels.*

15      *Assumptions:*

- 16      • The potential research action involves determining the extent of organic carbon produced in  
17      and exported from restored tidal habitats to downstream locations, either through modeling  
18      or direct observation.
- 19      • Will be conducted once to establish the extent of organic carbon that is exported and repeat  
20      as needed if hydrodynamic conditions change sufficiently in the future such that export  
21      rates might be affected.
- 22      • Total cost of this potential research action is estimated to be subsumed under Potential  
23      Research Action RA4-7 and administration (staff biologist time).

24      *Potential Research Action RA4-3: Determine the extent and patterns of establishment of nonnative*  
25      *clams in restored subtidal aquatic habitats.*

26      *Assumptions:*

- 27      • Benthic monitoring will be conducted at up to 20 sites within the estuary.
- 28      • Four benthic samples and one sediment sample will be taken at each site using a hydraulic  
29      winch and Ponar dredge or other appropriate grab sampler.
- 30      • Samples will be analyzed by a contracting lab.
- 31      • A database will be established to track observation and incidental records of nonnative  
32      bivalves to estimate their habitat use and range expansion in the Delta. This cost will be  
33      subsumed under BDCP administration.
- 34      • Survey costs are based on similar surveys conducted in Lake Tahoe to assess nonnative clam  
35      infestation and to collect and analyze sediment samples.
- 36      • Surveys will be conducted quarterly over the term of the BDCP.

1 *Potential Research Action RA4-4: On restored tidal brackish marsh, perform a capture and release*  
 2 *tagging study to determine colonization rate, abundance, and distribution of salt marsh harvest mouse.*

3 *Assumptions:*

- 4 ● Costs for this potential research action are subsumed under Monitoring Action 4-9 and  
 5 administrative costs.

6 *Potential Research Action RA4-5: On restored tidal brackish marsh, perform a capture and release*  
 7 *tagging study to determine colonization rate, abundance, and distribution of Suisun shrew.*

8 *Assumptions:*

- 9 ● Costs for this potential research action are subsumed under Monitoring Action 4-9 and  
 10 administrative costs.

11 *Potential Research Action RA4-6: Evaluate the distribution and abundance of covered fish species and*  
 12 *predators at restoration sites.*

13 *Assumptions:*

- 14 ● Costs for this potential research action are subsumed under Monitoring Action 4-4 and  
 15 administrative costs.

16 *Potential Research Action RA4-7: Document and evaluate water quality conditions for covered fish*  
 17 *species in restored subtidal aquatic habitats.*

18 *Assumptions:*

- 19 ● The monitoring action involves establishing new monitoring stations as needed in areas  
 20 where subtidal habitat has been restored.
- 21 ● This is an extension of ongoing water quality monitoring conducted under IEP and will be  
 22 integrated within the existing IEP Environmental Monitoring Program (current funding  
 23 level \$4,567,000).
- 24 ● The estimated increase in the budget of the respective IEP monitoring program due to this  
 25 monitoring action is 10%.

#### 26 **8.A.4.4 CM5 Seasonally Inundated Floodplain Restoration**

27 *Potential Research Action RA5-1: Quantify abundance of nonnative fish species in restored floodplain*  
 28 *habitats during inundation periods.*

29 *Assumptions:*

- 30 ● Presence and abundance of nonnative fish in restored floodplain habitats is measured as  
 31 catch per unit effort.
- 32 ● Information on nonnative fish presence and abundance will be collected incidental to  
 33 monitoring of splittail and salmonids conducted pursuant to Monitoring Actions MA5-4 and  
 34 MA5-5.
- 35 ● In addition, separate sampling efforts may be conducted to determine nonnative fish  
 36 presence and abundance in restored floodplain habitat.

- 1           ● Nonnative fish sampling efforts would occur on up to seven additional occasions annually
- 2           during floodplain inundation periods for 5 years following floodplain restoration,
- 3           ● Thereafter, up to 3 sampling days may be conducted per year on restored floodplain
- 4           habitats.
- 5           ● Sampling crew consists of two midlevel biologists and one field technician for each 10 hour
- 6           sampling day.
- 7           ● One boat (small motorboat) and a boat-towing truck are needed for 10 hours per sampling
- 8           day.

#### 9    **8.A.4.5           CM7 Riparian Natural Community Restoration**

10       *Potential Research Action RA7-1: Perform live-trapping of riparian brush rabbit biannually in suitable*  
11       *riparian brush rabbit habitat in Conservation Zone 7, using methods developed in coordination with*  
12       *the Endangered Species Recovery Program, to estimate status and trends of the riparian brush rabbit*  
13       *population in the Plan Area.*

14       *Assumptions:*

- 15           ● Where patches of suitable riparian brush rabbit habitat are identified, live trapping will be
- 16           conducted during the time period May-September, requiring 5 consecutive days of survey
- 17           efforts.
- 18           ● Surveys will be conducted once every 5 years by a senior-level biologist and one field
- 19           technician.
- 20           ● A total of 60 acres of riparian brush rabbit habitat will be surveyed at an average patch size
- 21           of 5 acres.

22       *Potential Research Action RA7-2: Conduct research to determine what management techniques will*  
23       *encourage colonization of covered species in riparian natural communities.*

24       *Assumptions:*

- 25           ● Research costs are assumed to be \$80,000 per year.

#### 26    **8.A.4.6           CM11 Natural Communities Enhancement and** 27    **Management**

28       *Potential Research Action RA11-1 Conduct studies with exotic plant control techniques in protected*  
29       *and restored natural communities to determine what techniques are useful for exotic plant control*  
30       *while safe for use on or near native plant and wildlife species.*

31       *Assumptions:*

- 32           ● Studies will be conducted annually at a cost of \$100,000 per year.

## 8.A.4.7 CM12 Methylmercury Management

*Potential Research Action RA12-1: Characterize methylmercury concentrations, accounting for cycling through sediment, the water column, and biota.*

*Assumptions:*

- Total effort will comprise evaluation and producing a final report.
- This will be a contracted action at a one-time cost of \$500,000.

*Potential Research Action RA12-2: Determine the trend in load of methylmercury or precursors discharged from treated sources.*

*Assumptions:*

- Samples will be collected every two months for the first 5 years after restoration, quarterly for the next 10 years, twice annually for the following 10 years, and then annually thereafter.
- One sample will be collected for every 50 acres of restored tidal marsh.
- 600 acres will be sampled within one 10-hour field day.
- Two field technicians will collect the samples.
- A truck and boat will be used during each field day.
- Laboratory costs for analysis of samples for mercury, organic mercury, sulfide and pH will be \$300 per sample.
- Interpretation of analysis results will be subsumed under BDCP administrative costs.

*Potential Research Action RA12-3: Evaluate efficacy of Low Intensity Chemical Dosing(LICD) in preventing the formation and transport of MeHg in restored tidal wetlands.*

*Assumptions:*

- Sample collection, analysis, and preparation of technical report will cost \$165,000.
- \$50,000 is added to the cost of each analysis conducted to account for required follow-up actions.
- Four studies will be conducted at 8 sites during the first four 5-year periods of BDCP implementation (i.e., first 20 years of BDCP implementation). Two at the beginning of each 5-year period and two at the end.
- By year 20, areas that are both high and low risk for mercury will have been inundated.
- Follow-up studies starting in year 21 will occur at a rate of 16 studies per 5-year period, some of which may occur in the same approximate location during different times in the 5-year period.
- Studies will continue at a rate of 16 per 5-year period for the duration of the BDCP.

## 1 **8.A.4.8 CM13 Invasive Aquatic Vegetation Control**

2 *Potential Research Action RA13-1: Conduct empirical and lab studies to determine flow constraints on*  
3 *rooting of IAV species of concern.*

4 *Assumptions:*

- 5 ● Total effort will comprise evaluation and producing a final report.
- 6 ● This will be a contracted action at a one-time cost of \$250,000.

7 *Potential Research Action RA13-2: Conduct model studies to assess velocity field for alternative*  
8 *restoration site design.*

9 *Assumptions:*

- 10 ● Total effort will comprise evaluation and producing a final report.
- 11 ● This will be a contracted action at a one-time cost of \$250,000.

12 *Potential Research Action RA13-3: Conduct field tests in restoration site projects.*

13 *Assumptions:*

- 14 ● Total effort will comprise evaluations and production of three to five final reports.
- 15 ● These will be contracted actions at a total cost of \$500,000.

16 *Potential Research Action RA13-4: Evaluate the effect of tidal habitat restoration on the establishment*  
17 *of invasive aquatic vegetation (IAV) in subtidal aquatic habitats.*

18 *Assumptions:*

- 19 ● Surveys will occur every other month for 5 years at each site after restoration construction  
20 is completed.
- 21 ● Surveys will be aerial, utilizing a fixed wing aircraft with a mounted camera for photo  
22 documentation of restored sites, and one observer (midlevel biologist).
- 23 ● Average tidal habitat restoration site is assumed to be 1,000 acres in size.
- 24 ● Data collected during aerial surveys will be evaluated relative to data collected under other  
25 monitoring actions. The cost of this analysis will be subsumed under BDCP administrative  
26 costs.

27 *Potential Research Action RA13-5: Evaluate whether there have been changes in IAV that could be*  
28 *related to Plan operations (e.g., changes in Delta hydrodynamics).*

29 *Assumptions:*

- 30 ● Total effort will comprise evaluation and producing a final report.
- 31 ● This will be a contracted action at a one-time cost of \$100,000.

1 *Potential Research Action RA13-6: Evaluate the distribution of delta smelt and longfin smelt in relation*  
2 *to IAV infestation.*

3 *Assumptions:*

- 4 ● Sampling will occur at a rate of 1,500 acres per year for 10 years after treatment of IAV has  
5 begun.
- 6 ● Treatment of IAV begins in year 2 of BDCP implementation.
- 7 ● Fish sampling by seining will be conducted to determine the abundance and distribution of  
8 nonnative predatory fish species.
- 9 ● Fish sampling involves a two-person crew (one midlevel biologist, one technician) for a 10-  
10 hour sampling day for a 250-acre study area (includes travel time to sites).
- 11 ● Sampling will occur twice prior to and twice following IAV control actions.
- 12 ● A truck and boat are needed for each sampling day.

13 *Potential Research Action RA13-7: Determine effects of water flow (residence time) and temperature*  
14 *on Microcystis blooms and its effects on phytoplankton.*

15 *Assumptions:*

- 16 ● Total effort will comprise evaluation and producing a final report.
- 17 ● This will be a contracted action at a one-time cost of \$150,000.

18 *Potential Research Action RA13-8: Evaluate environmental conditions that support pondweed beds,*  
19 *focusing on abiotic factors, particularly salinity, that determine growth and distribution of native*  
20 *pondweeds.*

21 *Assumptions:*

- 22 ● Total effort will comprise evaluation and producing a final report.
- 23 ● This will be a contracted action at a one-time cost of \$175,000.

24 *Potential Research Action RA13-9: Evaluate how future salinity changes affect growth and distribution*  
25 *of pondweeds and Egeria.*

26 *Assumptions:*

- 27 ● Total effort will comprise evaluation and producing a final report.
- 28 ● This will be a contracted action at a one-time cost of \$175,000.

29 *Potential Research Action RA13-10: Determine what differences in environmental conditions and*  
30 *abiotic factors favor Stuckenia over Egeria.*

31 *Assumptions:*

- 32 ● Total effort will comprise evaluation and producing a final report.
- 33 ● This will be a contracted action at a one-time cost of \$175,000.

1 *Potential Research Action RA13-11: Evaluate to what extent restoration sites can be designed to*  
2 *encourage colonization and growth of native pondweeds while discouraging Egeria.*

3 *Assumptions:*

- 4 ● Total effort will comprise evaluation and producing a final report.
- 5 ● This will be a contracted action at a one-time cost of \$175,000.

6 *Potential Research Action RA13-12: Determine the potential for native pondweed beds to contribute to*  
7 *restoration of native communities and ecosystem functions in the Delta.*

8 *Assumptions:*

- 9 ● Total effort will comprise evaluation and producing a final report.
- 10 ● This will be a contracted action at a one-time cost of \$175,000.

11 *Potential Research Action RA13-13: Determine if the epifaunal invertebrate assemblages supported by*  
12 *pondweed beds provide substantial foraging and cover benefits in comparison with Egeria.*

13 *Assumptions:*

- 14 ● Total effort will comprise evaluation and producing a final report.
- 15 ● This will be a contracted action at a one-time cost of \$175,000.

#### 16 **8.A.4.9 CM15 Localized Reduction of Predatory Fishes**

17 *Potential Research Action RA15-1: Evaluate predation effect on productivity of covered fish species*  
18 *using life-cycle simulation models and bioenergetics modeling.*

19 *Assumptions:*

- 20 ● Total effort will comprise evaluation and producing a final report.
- 21 ● This will be a contracted action at a one-time cost of \$100,000.

22 *Potential Research Action RA15-2: Determine whether large predators that are comparatively easy to*  
23 *target for reduction are the key predators of some or many covered fishes.*

24 *Assumptions:*

- 25 ● Costs for this potential research action are subsumed under *CM15 Localized Reduction of*  
26 *Predatory Fishes*. No additional costs will be incurred.

27 *Potential Research Action RA15-3: Conduct site-specific monitoring of predator abundance (by species*  
28 *and life stage) during periods when covered fish species are present (particularly juvenile salmonids).*

29 *Assumptions:*

- 30 ● Costs for this potential research action are subsumed under CM15. No additional costs will  
31 be incurred.

1 *Potential Research Action RA15-4: Conduct site-specific diet composition of predators (at finer*  
2 *resolution than simply “fish”).*

3 *Assumptions:*

- 4 ● Costs for this potential research action are subsumed under CM15. No additional costs will  
5 be incurred.

6 *Potential Research Action RA15-5: Use DNA analysis of predator stomach contents to identify prey*  
7 *species.*

8 *Assumptions:*

- 9 ● Costs for this potential research action are subsumed under CM15. No additional costs will  
10 be incurred.

11 *Potential Research Action RA15-6: Refine bioenergetics modeling of consumption rates with site-*  
12 *specific monitoring data.*

13 *Assumptions:*

- 14 ● Costs for this potential research action are subsumed under CM15. No additional costs will  
15 be incurred.

16 *Potential Research Action RA15-7: Identify habitat factors, in addition to those already known (i.e.,*  
17 *large water diversions, trapezoidal channels, clear-water conditions, warmer water temperatures, or*  
18 *low-flow conditions), that facilitate predation in the Delta.*

19 *Assumptions:*

- 20 ● Most actions required by this potential research action will be conducted as part of the pilot  
21 program described in CM15. However, additional analysis will be needed.
- 22 ● The cost of additional analysis is estimated to be a one-time cost of \$75,000.

23 *Potential Research Action RA15-8: For known hotspots, establish a habitat suitability approach to*  
24 *identify specific physical features and hydrodynamic conditions that facilitate elevated predation loss.*

25 *Assumptions:*

- 26 ● Most actions required by this potential research action will be conducted as part of the pilot  
27 program described in CM15. However, additional analysis will be needed.
- 28 ● The cost of additional analysis is estimated to be a one-time cost of \$75,000.

29 *Potential Research Action RA15-9: Document the extent and locations of fish predator hotspots within*  
30 *the Delta, and evaluate relative intensity of predation and feasibility of treatment.*

31 *Assumptions:*

- 32 ● Data necessary to identify predator hotspots within the Delta (e.g., bathymetry data,  
33 fishermen surveys, agency personnel knowledge) is already available or will be collected as  
34 other monitoring (e.g., tidal habitat restoration monitoring) is conducted and will not create  
35 additional costs.
- 36 ● Communication, mapping and delineation will be subsumed under administrative costs (GIS  
37 staff) and will not create additional costs.

1 *Potential Research Action RA15-10: Use a habitat suitability approach at known hotspots to identify*  
2 *specific physical features and hydrodynamic conditions that facilitate elevated predation loss.*

3 *Assumptions:*

- 4 ● Costs for this potential research action are subsumed under Potential Research Action  
5 RA15-8. No additional costs will be incurred.

6 *Potential Research Action RA15-11: Monitor predator distribution and abundance at the north Delta*  
7 *intakes to refine preliminary estimates of potential predation loss.*

8 *Assumptions:*

- 9 ● Monitoring will begin during the first year of operation of the north Delta intakes and  
10 continue for 5 years.
- 11 ● Subsequent monitoring will be conducted once every 5 years thereafter.
- 12 ● Cost of monitoring is estimated at an annual cost of \$200,000.

13 *Potential Research Action RA15-12: Continue with acoustic-tagging studies to identify areas that*  
14 *facilitate intense predation.*

15 *Assumptions:*

- 16 ● Existing IEP studies of predatory fish abundance and mortality levels of covered fish species  
17 will be expanded to incorporate sites targeted for predator removal activities if these sites  
18 are not already included in existing studies.
- 19 ● Total costs are approximately \$250,000 per year.
- 20 ● Studies would be conducted for 5 years.

21 *Potential Research Action RA15-13: Test and evaluate various reduction techniques with regards to*  
22 *efficacy, logistics, feasibility, cost and benefits, and public acceptance.*

23 *Assumptions:*

- 24 ● Total effort will comprise evaluation and producing a final report.
- 25 ● This will be a contracted monitoring action at a one-time cost of \$100,000.

26 *Potential Research Action RA15-14: Determine if covered fish species are caught as by-catch during*  
27 *predator reduction efforts and assess ways to reduce such by-catch, if necessary.*

28 *Assumptions:*

- 29 ● This action will be *subsumed* under administrative costs and will not create additional costs.

30 *Potential Research Action RA15-15: Conduct before and after studies (BACI design) evaluating the*  
31 *distribution and abundance of predators and covered fish species at treatment location and nearby*  
32 *sites. Metrics include abundance, age classes, and distribution of predators such as striped bass,*  
33 *largemouth bass, and other smaller piscivorous fish.*

34 *Assumptions:*

- 35 ● Total effort will comprise *site* visits, evaluation, and producing a final report.
- 36 ● This will be a contracted *monitoring* action at a one-time cost of \$250,000.

1 *Potential Research Action RA15-16: Conduct acoustic-tagging studies of covered species survival*  
2 *(migrating juvenile salmonids) before and after predator reduction in reaches with and without*  
3 *reduction efforts.*

4 *Assumptions:*

- 5 ● Costs for this potential research action are subsumed under Potential Research Action  
6 RA15-12. No additional costs will be incurred.

7 *Potential Research Action RA15-17: Monitor recolonization rates of habitats by predators following*  
8 *reduction treatments to assess longevity of treatment effects.*

9 *Assumptions:*

- 10 ● Total effort will *comprise* site visits, evaluation, and producing a final report.
- 11 ● This will be a *contracted* action at a one-time cost of \$50,000.

12 *Potential Research Action RA15-18: Evaluate suitability of predator-naïve hatchery salmonids as*  
13 *surrogates of naturally-spawned fish in tagging experiments to estimate predation rates and survival.*

14 *Assumptions:*

- 15 ● Total effort will *comprise* site visits, evaluation, and producing a final report.
- 16 ● This will be a *contracted* action at a one-time cost of \$50,000.

17 *Potential Research Action RA15-19: Utilize novel methods such as genetic assays to detect delta smelt*  
18 *in gut contents to document and measure consumption by predators.*

19 *Assumptions:*

- 20 ● Total effort will *comprise* site visits, evaluation, and producing a final report.
- 21 ● This will be a *contracted* action at a one-time cost of \$50,000.

22 *Potential Research Action RA15-20: Develop monitoring and potential active adaptive management*  
23 *studies if increased predation is suspected or demonstrated in conjunction with habitat restoration or*  
24 *enhancement projects.*

25 *Assumptions:*

- 26 ● This action will be *subsumed* under administrative costs and will not create additional costs.

27 *Potential Research Action RA15-21: Perform literature review and interviews with qualified agency*  
28 *and independent scientists to summarize potential benefits, hazards, costs, and implementation issues*  
29 *associated with using modification of sportfishing regulations to manage predatory fish in the Delta.*

30 *Assumptions:*

- 31 ● This action will be *subsumed* under administrative costs and will not create additional costs.

## 1 **8.A.4.10 CM16 Nonphysical Fish Barriers**

2 *Potential Research Action RA16-1: Evaluate change in survivorship of outmigrating juvenile salmonids*  
3 *redirected by nonphysical barriers.*

4 *Assumptions:*

- 5 • Costs for this potential research action will be subsumed under costs of Monitoring Action  
6 MA16-2 and will not create *additional* costs.

7 *Potential Research Action RA16-2: Evaluate effectiveness of nonphysical barriers in high flow areas.*

8 *Assumptions:*

- 9 • Costs for this potential research action will be subsumed under costs of Monitoring Action  
10 MA16-2 and will not create *additional* costs.

11 *Potential Research Action RA16-3: Monitor changes in proportion of covered species distribution and*  
12 *abundance upstream and downstream of nonphysical barrier.*

13 *Assumptions:*

- 14 • Costs for this potential *research* action will be subsumed under costs of Monitoring Action  
15 MA16-2 and will not create additional costs.

16 *Potential Research Action RA16-4: Evaluate behavioral response of covered species to barriers.*

17 *Assumptions:*

- 18 • Total effort will comprise site visits, evaluation, and producing a final report.
- 19 • This will be a *contracted* monitoring action at a one-time cost of \$100,000.

20 *Potential Research Action RA16-5: Evaluate the effectiveness and permeability of nonphysical barriers*  
21 *for outmigrating juvenile salmonids.*

22 *Assumptions:*

- 23 • Costs for this *potential* research action will be subsumed under costs of Monitoring Action  
24 MA16-2 and will not create additional costs.

25 *Potential Research Action RA16-6: Determine the abundance of predators within the area of the*  
26 *nonphysical barriers, both before and after installation, and evaluate the effect of the barriers on the*  
27 *survival of outmigrating juvenile salmonids.*

28 *Assumptions:*

- 29 • Costs for this potential research action will be subsumed under costs of Monitoring Action  
30 MA16-2 and will not *create* additional costs.

1 *Potential Research Action RA16-7: Evaluate effectiveness of nonphysical barriers on green sturgeon,*  
2 *white sturgeon, and Chinook salmon.*

3 *Assumptions:*

- 4 ● Tracking studies (e.g., radio-*telemetry*, acoustic tracking, or other appropriate methods) will  
5 be used to determine the proportion and survival of fish migrating past the nonphysical  
6 barriers.
- 7 ● Total cost is estimated at \$250,000 annually (estimate based on costs of previous acoustic  
8 tracking studies by CDFW and USGS).
- 9 ● This is a program addition to existing CDFW fish tracking studies.
- 10 ● If implemented, this activity will occur every 5 years.

11 *Potential Research Action RA16-8: Evaluate potential attraction of predators to fish nonphysical barriers*  
12 *(type of predators, number of predators).*

13 *Assumptions:*

- 14 ● Costs for this potential *research* action will be subsumed under costs of Monitoring Action  
15 MA16-2 and will not create additional costs.

16 *Potential Research Action RA16-9: Evaluate the extent of predator aggregation at nonphysical barriers*  
17 *before and after installation.*

18 *Assumptions:*

- 19 ● Costs for this potential research action will be subsumed under costs of Monitoring Action  
20 MA16-2 and will not *create* additional costs.

21 *Potential Research Action RA16-10: Evaluate predator composition before and after installation of*  
22 *nonphysical barriers.*

23 *Assumptions:*

- 24 ● Costs for this potential research action will be subsumed under costs of Monitoring Action  
25 MA16-2 and will not create additional costs.

26 *Potential Research Action RA16-11: Evaluate predator response to operation of nonphysical barriers.*

27 *Assumptions:*

- 28 ● Costs for this potential research action will be subsumed under costs of Monitoring Action  
29 MA16-2 and will not create additional costs.

30

### 1 **8.A.4.11 CM17 Illegal Harvest Reduction**

2 *Potential Research Action RA17-1: Evaluate incidence of illegal take of covered species.*

3 *Assumptions:*

- 4 • Costs for this potential research action will be subsumed under administrative costs and will  
5 not create additional costs.

6 *Potential Research Action RA17-2: Evaluate whether changes in abundance and population dynamics  
7 can be attributed to reductions in illegal harvest.*

8 *Assumptions:*

- 9 • Costs for this potential research action will be subsumed under administrative costs and will  
10 not create additional costs.

### 11 **8.A.4.12 CM18 Conservation Hatcheries**

12 *Potential Research Action RA18-1: Develop techniques for ensuring successful breeding and  
13 survivorship, so that refugial populations can be shown to increase without further supplementation  
14 from wild stocks.*

15 *Assumptions:*

- 16 • Costs for this potential research action are subsumed under CM18 Conservation Hatcheries.  
17 No additional costs will be incurred.

### 18 **8.A.4.13 CM20 Recreational Users Invasive Species Program**

19 *Potential Research Action RA20-1: Ensure through adaptive management that the measure remains  
20 focused on the principal invasive species of concern, as identified in the annual work plan for the Delta  
21 Recreational Users Invasive Species Program.*

22 *Assumptions:*

- 23 • Costs for this potential research action will be subsumed under administrative costs and will  
24 not create additional costs.

### 25 **8.A.4.14 CM21 Nonproject Diversions**

26 *Potential Research Action RA21-1: Develop means of more quickly and effectively estimating preproject  
27 entrainment risk and project effectiveness in reducing entrainment risk.*

28 *Assumptions:*

- 29 • Costs for this potential research action are subsumed under CM21 Nonproject Diversions.  
30 No additional costs will be incurred.

31 Table 8.A-48 shows the total costs of the research program by 5-year period.

1 **Table 8.A-48. Total Costs of Potential Research Actions over the Term of the BDCP by 5-Year Intervals**

Potential Research	1-5 yrs	6-10 yrs	11-15 yrs	16-20 yrs	21-25 yrs	26-30 yrs	31-35 yrs	36-40 yrs	41-45 yrs	46-50 yrs
	Near-Term		Early Long-Term	Late Long-Term						
CM1 Conveyance Construction and Operations	\$ 10,000,000	\$ 10,000,000	\$ 11,250,000	\$ 1,600,000	\$ 1,600,000	\$ 1,600,000	\$ 1,600,000	\$ 1,600,000	\$ 1,600,000	\$ 1,600,000
CM2 Yolo Bypass Fisheries Enhancement	\$ 450,000	\$ 1,340,000	\$ 2,240,000	\$ 480,000	\$ 620,000	\$ 620,000	\$ 480,000	\$ 620,000	\$ 620,000	\$ 480,000
CM3 Protect Natural Communities	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
CM4 Restore Tidal Marsh	\$ 4,290,000	\$ 4,290,000	\$ 4,290,000	\$ 4,290,000	\$ 4,290,000	\$ 4,290,000	\$ 4,290,000	\$ 4,290,000	\$ 4,290,000	\$ 4,290,000
CM5 Restore Floodplain Inundation	\$ -	\$ -	\$ 50,000	\$ 70,000	\$ 90,000	\$ 110,000	\$ 130,000	\$ 150,000	\$ 130,000	\$ 130,000
CM6 Channel Margin Enhancement	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
CM7 Riparian Restoration	\$ 480,000	\$ 480,000	\$ 480,000	\$ 480,000	\$ 480,000	\$ 480,000	\$ 480,000	\$ 480,000	\$ 480,000	\$ 480,000
CM8 Grassland Restoration	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
CM9 Vernal Pool Complex Restoration	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
CM10 Nontidal Marsh Restoration	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
CM11 Manage and Enhance Protected Nat Comms	\$ 500,000	\$ 500,000	\$ 500,000	\$ 500,000	\$ 500,000	\$ 500,000	\$ 500,000	\$ 500,000	\$ 500,000	\$ 500,000
CM12 MeHg Management	\$ 8,730,000	\$ 11,670,000	\$ 13,250,000	\$ 14,170,000	\$ 9,080,000	\$ 9,230,000	\$ 9,490,000	\$ 9,700,000	\$ 8,230,000	\$ 7,350,000
CM13 Invasive Aquatic Vegetation Control	\$ 1,450,000	\$ 1,450,000	\$ 1,690,000	\$ 750,000	\$ 640,000	\$ 640,000	\$ 640,000	\$ 640,000	\$ -	\$ -
CM14 Stockton Deep Water Ship Channel DO	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
CM15 Predator Control RA15-11	\$ 250,000	\$ 1,650,000	\$ 1,100,000	\$ 200,000	\$ 200,000	\$ 200,000	\$ 200,000	\$ 200,000	\$ 200,000	\$ 200,000
CM16 Nonphysical Fish Barriers	\$ 250,000	\$ 350,000	\$ 250,000	\$ 250,000	\$ 250,000	\$ 250,000	\$ 250,000	\$ 250,000	\$ 250,000	\$ 250,000
CM17 Illegal Harvest Reduction	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
CM18 Conservation Hatcheries	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
CM19 Urban Stormwater Treatment	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
CM20 Recreational Users Invasive Species Program	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
CM21 Nonproject Diversions	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Total</b>	<b>\$ 26,400,000.00</b>	<b>\$ 31,730,000.00</b>	<b>\$ 35,100,000.00</b>	<b>\$ 22,790,000.00</b>	<b>\$ 17,750,000.00</b>	<b>\$ 17,920,000.00</b>	<b>\$ 18,060,000.00</b>	<b>\$ 18,430,000.00</b>	<b>\$ 16,300,000.00</b>	<b>\$ 15,280,000.00</b>
20% Contingency	\$ 5,280,000	\$ 6,346,000	\$ 7,020,000	\$ 4,558,000	\$ 3,550,000	\$ 3,584,000	\$ 3,612,000	\$ 3,686,000	\$ 3,260,000	\$ 3,056,000
<b>Grand total</b>	<b>\$ 31,680,000</b>	<b>\$ 38,076,000</b>	<b>\$ 42,120,000</b>	<b>\$ 27,348,000</b>	<b>\$ 21,300,000</b>	<b>\$ 21,504,000</b>	<b>\$ 21,672,000</b>	<b>\$ 22,116,000</b>	<b>\$ 19,560,000</b>	<b>\$ 18,336,000</b>
Existing On-Going Monitoring/Research (e.g. IEP)	\$ 28,580,000	\$ 28,580,000	\$ 28,580,000	\$ 28,580,000	\$ 28,580,000	\$ 28,580,000	\$ 28,580,000	\$ 28,580,000	\$ 28,580,000	\$ 28,580,000

2

## 1 8.A.5 Changed Circumstances Costs

### 2 8.A.5.1 Failure of BDCP-Constructed Levees

3 Both tidal habitat restoration and floodplain development involve modification of existing and/or  
 4 construction of new levees. Notwithstanding the integrity of constructed levees, the  
 5 Implementation Office may encounter circumstances in which these levees subsequently fail. Table  
 6 8.A-49 through

7 Table 8.A-53 show the DRMS and BDCP data used to estimate BDCP seismic levee failure probabilities  
 8 and expected costs in 2010 dollars. These costs were updated to 2012 dollars for use in Chapter 8. The  
 9 levee failure probabilities for the ROAs are shown in Table 8.A-54 through Table 8.A-58.

10 **Table 8.A-49. DRMS Seismic Levee Failure Probabilities for Islands in Cache Slough ROA**

DRMS Island ID	Levee Miles	Island Failure Probability	Per-Mile Failure Probability
68	10.3	1.94E-02	1.88E-03
70	5.4	2.77E-03	5.13E-04
72	7.5	2.46E-03	3.28E-04
79	3.8	0.00E+00	0.00E+00
80	2.1	0.00E+00	0.00E+00
88	8.9	1.17E-02	1.31E-03
89	7.2	1.46E-02	2.03E-03
1001	17.1	2.59E-03	1.51E-04
<b>Total/Avg</b>	<b>62.3</b>		<b>8.59E-04</b>

11

12 **Table 8.A-50. DRMS Seismic Levee Failure Probabilities for Islands in Cosumnes-Mokelumne ROA**

DRMS Island ID	Levee Miles	Island Failure Probability	Per-Mile Failure Probability
169	8.7	2.39E-02	2.75E-03
170	11.5	1.47E-02	1.28E-03
171	6.8	0.00E+00	0.00E+00
172	13.6	2.93E-02	2.15E-03
<b>Total/Avg</b>	<b>40.6</b>		<b>1.67E-03</b>

13

1 **Table 8.A-51. DRMS Seismic Levee Failure Probabilities for Islands in West Delta ROA**

<b>DRMS Island ID</b>	<b>Levee Miles</b>	<b>Island Failure Probability</b>	<b>Per-Mile Failure Probability</b>
6	7.4	3.36E-02	4.54E-03
147	28.3	2.86E-02	1.01E-03
179	11.9	3.37E-02	2.83E-03
1006	11.2	4.26E-02	3.80E-03
1007	29.9	4.26E-02	1.42E-03
1015	19.4	3.67E-02	1.89E-03
<b>Total/Avg</b>	<b>108.1</b>		<b>2.01E-03</b>

2

3 **Table 8.A-52. DRMS Seismic Levee Failure Probabilities for Islands in South Delta ROA**

<b>DRMS Island ID</b>	<b>Levee Miles</b>	<b>Island Failure Probability</b>	<b>Per-Mile Failure Probability</b>
112	3.4	0.00E+00	0.00E+00
113	4.3	0.00E+00	0.00E+00
115	17.8	3.30E-03	1.85E-04
117	25.3	2.70E-02	1.07E-03
1003	29.6	4.20E-02	1.42E-03
<b>Total/Avg</b>	<b>80.4</b>		<b>8.99E-04</b>

4

1 **Table 8.A-53. DRMS Seismic Levee Failure Probabilities for Islands in Suisun Marsh**

<b>DRMS Island ID</b>	<b>Levee Miles</b>	<b>Island Failure Probability</b>	<b>Per-Mile Failure Probability</b>
39	4.3	2.62E-02	6.09E-03
40	5.7	2.67E-02	4.68E-03
41	2.6	2.58E-02	9.92E-03
42	1.5	1.20E-02	8.00E-03
43	4.7	2.13E-02	4.53E-03
44	6.1	2.67E-02	4.38E-03
45	3	1.99E-02	6.63E-03
46	4.1	2.58E-02	6.29E-03
47	4.5	2.67E-02	5.93E-03
48	12.1	2.65E-02	2.19E-03
49	8	2.72E-02	3.40E-03
50	20.2	2.63E-02	1.30E-03
51	5.2	1.65E-02	3.17E-03
54	7.6	2.80E-02	3.68E-03
55	31.6	5.43E-02	1.72E-03
59	6.2	2.08E-02	3.35E-03
60	14.1	2.32E-02	1.65E-03
123	8.3	1.88E-02	2.27E-03
124	9.9	1.85E-02	1.87E-03
133	8.9	3.42E-02	3.84E-03
198	9.5	2.27E-02	2.39E-03
201	15	2.36E-02	1.57E-03
202	4.7	5.51E-02	1.17E-02
203	9.9	5.61E-02	5.67E-03
54b	5.3	2.80E-02	5.28E-03
59b	4.2	2.08E-02	4.95E-03
<b>Total/Avg</b>	<b>217.2</b>		<b>3.28E-03</b>

2

1 **Table 8.A-54. Composite BDCP Levee Failure Probabilities for Cache Slough ROA (2010 dollars)**

Cache Slough ROA	BDCP Permanent Levee Construction (Mi)		
	Near Term	Early Long Term	Late Long Term
Miles of Levee	2.8	5.9	14.3
Restored Habitat Acres	6,102	9,724	24,333
BDCP Levee Failure Probability/mile	BDCP Levees		
	Near Term	Early Long Term	Late Long Term
Flood*	3.56E-03	1.71E-03	6.99E-04
Seismic	8.59E-04	8.59E-04	8.59E-04
Composite	4.42E-03	2.57E-03	1.56E-03
<i>*BDCP levees assumed to have 1:100 year flood protection</i>			
Prob of BDCP Levee Failure (%/yr)	1.24E-02	1.50E-02	2.23E-02
<i>Likelihood of breach assumed to be uniformly distributed across all levee miles, so prob of breach in BDCP levee = prob of levee failure/mi x levee miles</i>			
Avg Breach Repair Cost	\$13,249,167		
<i>Repair Cost Assumptions: 1/2 the average repair cost estimated by Suddeth, Mount, and Lund (www.science.calwater.ca.gov/pdf/Repair costs reduced by half because it is not expected that every breach will entail significant dewatering costs.</i>			
Avg Habitat Repair Cost (\$/acre)	\$6,360		
% of area damaged per breach	10%		
Cache Slough Expected Cost of Levee Failure (\$/Yr)	Near Term	Early Long Term	Late Long Term
Avg Annual Levee Repair Cost	\$164,475	\$199,190	\$295,254
Avg Annual Habitat Repair	\$48,173	\$92,969	\$344,845

2

1 **Table 8.A-55. Composite BDCP Levee Failure Probabilities for Cosumnes-Mokelumne ROA (2010**  
 2 **dollars)**

	BDCP Permanent Levee Construction (Mi)		
	Near Term	Early Long Term	Late Long Term
<b>Cosumnes-Mokelumne</b>			
Miles of Levee	3.5	3.5	3.5
Restored Habitat Acres	924	1,473	3,685
	Near Term	Early Long Term	Late Long Term
<b>BDCP Levee Failure Prob/mi</b>			
Flood*	2.83E-03	2.83E-03	2.83E-03
Seismic	1.67E-03	1.67E-03	1.67E-03
Composite	4.51E-03	4.51E-03	4.51E-03
<i>*BDCP levees assumed to have 1:100 year flood protection</i>			
Probability of Breach in BDCP Levee	1.59E-02	1.59E-02	1.59E-02
<i>Likelihood of breach assumed to be uniformly distributed across all levee miles, so prob of breach in BDCP levee = prob of levee fai</i>			
Avg Breach Repair Cost	\$13,249,167		
<i>Repair Cost Assumptions: 1/2 the average repair cost estimated by Suddeth, Mount, and Lund (www.science.calwater.ca.gov/pdf/v</i>			
<i>Repair costs reduced by half because it is not expected that every breach will entail significant dewatering costs.</i>			
Avg Habitat Repair Cost (\$/acre)	\$6,360		
% of area damaged per breach	10%		
<b>Cosumnes-Mokelumne Expected Cost of Levee Failure (\$/Yr)</b>	Near Term	Early Long Term	Late Long Term
Avg Annual Levee Repair Cost	\$210,710	\$210,710	\$210,710
Avg Annual Habitat Repair	\$9,346	\$14,894	\$37,271

3  
4

1 **Table 8.A-56. Composite BDCP Levee Failure Probabilities for West ROA**

	BDCP Permanent Levee Construction (Mi)		
	Near Term	Early Long Term	Late Long Term
<b>West Delta</b>			
Miles of Levee	1.7	9.2	9.9
Restored Habitat Acres	611	973	2,436
BDCP Levee Failure Prob/mi	Near Term	Early Long Term	Late Long Term
Flood*	5.99E-03	1.09E-03	1.02E-03
Seismic	2.01E-03	2.01E-03	2.01E-03
Composite	8.00E-03	3.11E-03	3.03E-03
<i>*BDCP levees assumed to have 1:100 year flood protection</i>			
Probability of Breach in BDCP Levee	1.34E-02	2.85E-02	2.98E-02
<i>Likelihood of breach assumed to be uniformly distributed across all levee miles, so prob of breach in BDCP levee = prob of levee fai</i>			
Avg Breach Repair Cost	\$13,249,167		
<i>Repair Cost Assumptions: 1/2 the average repair cost estimated by Suddeth, Mount, and Lund (www.science.calwater.ca.gov/pdf/\</i>			
<i>Repair costs reduced by half because it is not expected that every breach will entail significant dewatering costs.</i>			
Avg Habitat Repair Cost (\$/acre)	\$6,360		
% of area damaged per breach	10%		
West Delta Expected Cost of Levee Failure (\$/Yr)	Near Term	Early Long Term	Late Long Term
Avg Annual Levee Repair Cost	\$177,071	\$377,013	\$395,432
Avg Annual Habitat Repair	\$5,191	\$17,614	\$46,231

2

1 **Table 8.A-57. Composite BDCP Levee Failure Probabilities for South ROA (2010 dollars)**

	BDCP Permanent Levee Construction (Mi)		
	Near Term	Early Long Term	Late Long Term
<b>South Delta</b>			
Miles of Levee	0.0	0.0	21.9
Restored Habitat Acres	6,593	10,506	26,290
	Near Term	Early Long Term	Late Long Term
<b>BDCP Levee Failure Prob/mi</b>			
Flood*	0.00E+00	0.00E+00	4.57E-04
Seismic	0.00E+00	0.00E+00	8.99E-04
Composite	0.00E+00	0.00E+00	1.36E-03
<i>*BDCP levees assumed to have 1:100 year flood protection</i>			
Probability of Breach in BDCP Levee	0.00E+00	0.00E+00	2.97E-02
<i>Likelihood of breach assumed to be uniformly distributed across all levee miles, so prob of breach in BDCP levee = prob of levee fai</i>			
Avg Breach Repair Cost	\$13,249,167		
<i>Repair Cost Assumptions: 1/2 the average repair cost estimated by Suddeth, Mount, and Lund (<a href="http://escholarship.org/uc/item/9w">http://escholarship.org/uc/item/9w</a>)</i>			
<i>Repair costs reduced by half because it is not expected that every breach will entail significant dewatering costs.</i>			
Avg Habitat Repair Cost (\$/acre)	\$6,360		
% of area damaged per breach	10%		
	Near Term	Early Long Term	Late Long Term
<b>South Delta Expected Cost of Levee Failure (\$/Yr)</b>			
Avg Annual Levee Repair Cost	\$0	\$0	\$393,059
Avg Annual Habitat Repair	\$0	\$0	\$496,013

2  
3

1 **Table 8.A-58. Composite BDCP Levee Failure Probabilities for Suisun Marsh (2010 dollars)**

	BDCP Permanent Levee Construction (Mi)		
	Near Term	Early Long Term	Late Long Term
<b>Suisun Marsh ROA</b>			
Miles of Levee	1.7	3.5	15.0
Restored Habitat Acres	2,070	3,299	8,256
	BDCP Levees		
	Near Term	Early Long Term	Late Long Term
<b>BDCP Levee Failure Prob/mi</b>			
Flood*	5.95E-03	2.88E-03	6.65E-04
Seismic	3.28E-03	3.28E-03	3.28E-03
Composite	9.23E-03	6.16E-03	3.94E-03
<i>*BDCP levees assumed to have 1:100 year flood protection</i>			
Prob of BDCP Levee Failure (%/yr)	1.55E-02	2.14E-02	5.93E-02
<i>Likelihood of breach assumed to be uniformly distributed across all levee miles, so prob of breach in BDCP levee = prob of levee fai</i>			
Avg Breach Repair Cost	\$13,249,167		
<i>Repair Cost Assumptions: 1/2 the average repair cost estimated by Suddeth, Mount, and Lund (www.science.calwater.ca.gov/pdf/v</i>			
<i>Repair costs reduced by half because it is not expected that every breach will entail significant dewatering costs.</i>			
Avg Habitat Repair Cost (\$/acre)	\$6,360		
% of area damaged per breach	10%		
<b>Suisun Expected Cost of Levee Failure (\$/Yr)</b>	Near Term	Early Long Term	Late Long Term
Avg Annual Levee Repair Cost	\$205,427	\$283,137	\$785,432
Avg Annual Habitat Repair	\$20,415	\$44,839	\$311,265

2  
3

4 **8.A.5.1.1 Floodplain Levee Failure Probabilities and Expected Costs**

5 Expected levee repair cost is based on the average cost of repair for a significant levee failure, as  
 6 reported by Suddeth et al (2010). Additionally, it is assumed that damages to land and assets  
 7 protected by a breached floodplain levee would equal 10% of the flooded island’s or tract’s land and  
 8 asset value. The two costs are multiplied by the probability of failure for each permit year to  
 9 estimate the expected cost of floodplain levee failure of the 50-year permit period. This cost is then  
 10 allocated between the BDCP and state/federal flood agencies according to the cost share  
 11 percentages used to calculate the low and high cost estimates for *CM5 Seasonally Inundated*  
 12 *Floodplain Restoration*.

13 Table 8.A-59 show the DRMS and BDCP data used to estimate BDCP seismic levee failure  
 14 probabilities and expected costs in 2010 dollars. These costs were updated to 2012 dollars for use in  
 15 Chapter 8. Table 8.A-60 shows the costs of levee failure by 5-year period.

1 **Table 8.A-59. DRMS Seismic Levee Failure Probabilities for Islands in Floodplain Region (2010 dollars)**

<b>DRMS Island ID</b>	<b>Levee Miles</b>	<b>Island Failure Probability</b>	<b>Per Mile Failure Probability</b>	<b>Assets At Risk</b>
112	3.4	0.00E+00	0.00E+00	
113	4.3	0.00E+00	0.00E+00	
117	25.3	2.70E-02	1.07E-03	\$221,581,567
119	7.0	0.00E+00	0.00E+00	\$49,893,874
165	6.2	0.00E+00	0.00E+00	\$39,968,824
1003	29.6	4.20E-02	1.42E-03	\$702,574,230
115	17.8	3.30E-03	1.85E-04	
1008	12.2	0.00E+00	0.00E+00	\$70,818,479
<b>Total/Avg</b>	<b>105.8</b>		<b>6.83E-04</b>	<b>\$1,084,836,974</b>

1 **Table 8.A-60. Costs of Levee Failure by 5-Year Period**

Composite Levee Failure Probabilities	Cost Period									
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Miles of Completed Setback Levee*	0.0	0.0	2.5	8.3	23.1	38.0	52.8	67.7	82.5	82.5
BDCP Levee Failure Prob/mi										
Flood**	0.00E+00	0.00E+00	4.04E-03	1.21E-03	4.33E-04	2.64E-04	1.89E-04	1.48E-04	1.21E-04	1.21E-04
Seismic	0.00E+00	6.83E-04								
Composite	0.00E+00	6.83E-04	4.72E-03	1.90E-03	1.12E-03	9.47E-04	8.73E-04	8.31E-04	8.05E-04	8.05E-04

\*Completed miles = total miles constructed by end of previous 5-year period

\*\*BDCP levees assumed to have 1:100 year flood protection

Probability of Breach in BDCP Levee (%/yr)	0.00E+00	0.00E+00	1.17E-02	1.56E-02	2.58E-02	3.59E-02	4.61E-02	5.62E-02	6.64E-02	6.64E-02
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Likelihood of breach assumed to be uniformly distributed across all levee miles, so prob of breach in BDCP levee = prob of levee failure/mi x levee miles

Avg Breach Repair Cost	\$26,498,334
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Repair Cost Assumptions: Average repair cost estimated by Suddeth, Mount, and Lund ([www.science.calwater.ca.gov/pdf/workshops/workshop\\_pic2\\_Appendix\\_B\\_Suddeth.pdf](http://www.science.calwater.ca.gov/pdf/workshops/workshop_pic2_Appendix_B_Suddeth.pdf))

Flood Plain Levee Repair	Cost Period										Total
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Levee Repair Cost	\$0	\$0	\$0	\$1,840,996	\$2,769,937	\$3,698,879	\$4,627,821	\$5,556,763	\$6,485,705	\$6,485,705	\$ 31,465,807
Damages	\$0	\$0	\$0	\$1,507,400	\$2,268,015	\$3,028,629	\$3,789,243	\$4,549,858	\$5,310,472	\$5,310,472	\$ 25,764,089
Total	\$ -	\$ -	\$ -	\$ 3,348,396	\$ 5,037,952	\$ 6,727,508	\$ 8,417,065	\$ 10,106,621	\$ 11,796,177	\$ 11,796,177	\$ 57,229,896

Expected annual damages = 10% of land & asset value/acre x avg acres flooded per breach x prob failure

Cost Estimate	Cost Period										Total
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Levee Repair Cost	\$0	\$0	\$0	\$1,150,622	\$1,731,211	\$2,311,800	\$2,892,388	\$3,472,977	\$4,053,566	\$4,053,566	\$ 19,666,130
Damages	\$0	\$0	\$0	\$942,125	\$1,417,509	\$1,892,893	\$2,368,277	\$2,843,661	\$3,319,045	\$3,319,045	\$ 16,102,555
Total	\$ -	\$ -	\$ -	\$ 2,092,748	\$ 3,148,720	\$ 4,204,693	\$ 5,260,665	\$ 6,316,638	\$ 7,372,611	\$ 7,372,611	\$ 35,768,685

4

## 1 8.A.6 EIR/EIS Mitigation Measures

2 Mitigation measures necessary to avoid, reduce, minimize, or compensate for adverse  
 3 environmental effects of Plan implementation are documented in the Plan's environmental impact  
 4 report (EIR)/environmental impact statement (EIS). To ensure that all Plan costs were accounted  
 5 for, EIR/EIS mitigation measures were screened to determine which would entail additional costs  
 6 above and beyond the estimated costs of Plan implementation presented in Chapter 8.A complete  
 7 list of the EIR/EIS mitigation measures with results of the screening process is presented in Table  
 8 8.A-61.

9 **Table 8.A-61. EIR/EIS Mitigation Measures Cost Screen**

<b>EIR/S Measure ID</b>	<b>Description</b>	<b>Applicable CMs</b>	<b>Incremental Cost?</b>	<b>Reason</b>
AES-1a	Locate new transmission lines and access routes to minimize the removal of trees and shrubs and pruning needed to accommodate new transmission lines and underground transmission lines where feasible	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of CM1
AES-1b	Install visual barriers between construction work areas and sensitive receptors	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of CM1
AES-1c	Develop and implement a spoil/borrow and tunnel muck area reclamation plan	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of CM1
AES-1d	Restore barge-loading facility sites once decommissioned	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of CM1
AES-1e	Apply aesthetic design treatments to all structures to the extent feasible	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of CM1
AES-1f	Locate concrete batch plants and fuel stations away from sensitive visual resources and receptors and restore sites upon removal of facilities	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of CM1
AES-4a	Limit construction to daylight hours within 0.25 mile of residents	1	No	This requirement is already factored into the CM1 construction cost estimate.

<b>EIR/S Measure ID</b>	<b>Description</b>	<b>Applicable CMs</b>	<b>Incremental Cost?</b>	<b>Reason</b>
AES-4b	Minimize fugitive light from portable sources used for construction	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of CM1
AES-4c	Install visual barriers along access routes, where necessary, to prevent light spill from truck headlights toward residences	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of CM1
AES-6b	Evaluate implementation of an afterhours low-intensity and lights off policy	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of CM1
AES-6c	Implement a comprehensive visual resources management plan for the Delta and Plan Area	1-22	Yes	Measure would entail planning costs not included in cost estimates of existing CMs.
AG-1	Develop an Agricultural Lands Stewardship Plan (ALSP) to preserve agricultural productivity of Important Farmland and land subject to Williamson Act contracts and to compensate off-site	1	Yes	Cultivated land reserve anticipated to mitigate 39,500 acres of the 45,000 acres of Important Farmland mitigation requirement. Incremental costs for easements or other mitigation actions will be incurred for the 5,400 acres of residual mitigation requirement.
AQ-12	Contribute to an Off-Site Mitigation Fee Program to Fund Emissions Reduction Projects	1	Yes	The measure is currently being developed. Specific actions have not yet been determined
AQ-14	Develop an Air Quality Mitigation Plan (AQMP) to ensure air district regulations and recommended mitigation are incorporated into future conservation measures and associated project activities	2-22	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, for BDCP conservation measures
AQ-15	Prepare a land use sequestration analysis to quantify and mitigate (as needed) GHG flux associated with conservation measures and associated project activities	2-22	Yes	Implementation of measure may entail costs in excess of those already estimated for planning and construction, including contingency, for BDCP conservation measures

<b>EIR/S Measure ID</b>	<b>Description</b>	<b>Applicable CMs</b>	<b>Incremental Cost?</b>	<b>Reason</b>
AQ-2	Prepare and implement an air quality mitigation program to in SMAQMD to mitigate and offset construction-generated criteria pollutant emissions to net zero (0) for emissions in excess of General Conformity de minimis thresholds (where applicable) and to quantities below applicable CEQA thresholds for other pollutants	1	Yes	Need cost estimate of air quality mitigation fees to be paid to SMAQMD. Ken Bogdan of ICF has developed initial cost estimates for the GHG mitigation in a memo dated 5/31/12.
AQ-4	Prepare and implement an air quality mitigation program in SJVAPCD to mitigate and offset construction-generated criteria pollutant emissions to net zero (0) for emissions in excess of General Conformity de minimis thresholds (where applicable) and to quantities below applicable CEQA thresholds for other pollutants	1	Yes	Need cost estimate of air quality mitigation fees to be paid to SJVAPCD. Ken Bogdan of ICF has developed initial cost estimates for the GHG mitigation in a memo dated 5/31/12.
AQUA-1a	Minimize the use of impact pile driving to address effects from pile driving and other construction-related underwater noise	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, for CM1
AQUA-1b	Use an attenuation device to reduce underwater sound levels if impact pile driving is required to address effects from pile driving and other construction-related underwater noise	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, for CM1
BIO-1	Create or restore 222 acres of tidal perennial aquatic habitat	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, for CM4
BIO-10	Create or restore [9] acres of tidal freshwater emergent wetland	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, for CMs 4 and 10
BIO-115	Compensate for loss of sandhill crane habitat	1	No	Terrestrial and wetland reserve acreage is expected to provide adequate mitigation for this impact.

<b>EIR/S Measure ID</b>	<b>Description</b>	<b>Applicable CMs</b>	<b>Incremental Cost?</b>	<b>Reason</b>
BIO-116	Design and construct power lines to reduce the risk of bird strike	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, for CM1
BIO-17	Create or restore [69] acres of valley/foothill riparian habitat	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, for CM7
BIO-204	Compensate for permanent and temporary habitat loss of giant garter snake habitat	1	No	Terrestrial and wetland reserve acreage is expected to provide adequate mitigation for this impact.
BIO-218	Compensate for temporary and permanent habitat loss of California red-legged frog habitat	1	No	Terrestrial and wetland reserve acreage is expected to provide adequate mitigation for this impact.
BIO-24	Create or restore 18 acres of nontidal perennial aquatic habitat	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, for CM10
BIO-240	Compensate for indirect effects on vernal pool crustacean habitat	1(?)	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, for CMs 3 and 9
BIO-245	Compensate for loss and disturbance of valley elderberry longhorn beetle habitat.	1	No	Costs to compensate for loss and disturbance of valley elderberry longhorn beetle habitat are included in CM7
BIO-259	Compensate for loss delta green ground beetle habitat	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, for CMs 3 and 9
BIO-260	Compensate for indirect effects on delta green ground beetle habitat	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, for CMs 3 and 9
BIO-263a	Document special-status species occurrences	1	No	Costs of preconstruction or preacquisition surveys are included in CM22 and CM3, respectively.

<b>EIR/S Measure ID</b>	<b>Description</b>	<b>Applicable CMs</b>	<b>Incremental Cost?</b>	<b>Reason</b>
BIO-263b	Avoid or minimize impacts on special-status species by redesigning the project, protecting special-status species populations, and, if necessary, developing a relocation plan	1	No	Costs of preconstruction or preacquisition surveys are included in CM22 and CM3, respectively.
BIO-269	Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds	1	Yes	Need DWR to confirm if implementation of measure would entail costs in excess of those already estimated for planning and construction, including contingency, for CM1
BIO-30	Create or restore [1.5] acres of nontidal freshwater perennial emergent wetland	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, for CM10
BIO-33	Avoid impacts on alkali seasonal wetland complex through design of tidal restoration projects	4	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, for CM4
BIO-34	Avoid impacts on alkali seasonal wetland complex through design of Yolo Bypass Fisheries Enhancement	2	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, for CM2
BIO-37	Create or restore [10.5] acres of habitat in managed wetlands	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, for CM10
BIO-373	Active bank swallow colonies shall be avoided and indirect effects on bank swallow will be minimized	2-22	No	It is reasonable to assume cost of preconstruction survey and on-site biologist included in planning and construction cost elements of habitat conservation measures. While temporary halts to construction may result in incremental construction cost, these costs are covered by the estimate's cost contingency

<b>EIR/S Measure ID</b>	<b>Description</b>	<b>Applicable CMs</b>	<b>Incremental Cost?</b>	<b>Reason</b>
BIO-38	Avoid loss of grasslands, alkali seasonal wetlands, and nontidal freshwater marsh in managed wetlands by project design, or compensate for their loss by creating or restoring grasslands, alkali seasonal wetlands, and nontidal perennial aquatic emergent wetlands elsewhere in the Plan Area	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, for CMs 3, 8, 9, and 10
BIO-385	Conduct preconstruction surveys for roosting bats and implement protective measures	1	Yes	Cannot assume cost of this measure included in the planning cost estimates for CM1 or Monitoring, Research, and Avoidance and Minimization Measures. Most bats are not covered species
BIO-75	Compensate for temporary and permanent loss of San Joaquin kit fox habitat	1	No	Terrestrial and wetland reserve acreage is expected to provide adequate mitigation for this impact.
BIO-XX	AMMs 1, 6, and 25 shall be implemented for all noncovered special-status plant species adversely affected by the BDCP to avoid, minimize, or compensate for impacts	1	No	Implementation of measure would not entail costs in excess of those already estimated for Monitoring, Research, and Avoidance and Minimization Measures
CUL-1	Prepare a data recovery plan and perform data recovery excavations on the affected portion of the deposits of identified and significant archaeological sites	1	Yes	Need DWR to confirm if measure would entail costs in excess of those already estimated for planning and construction, including contingency, of CM1
CUL-2	Conduct inventory, evaluation, and treatment of archaeological resources	1	Yes	Need DWR to confirm if measure would entail costs in excess of those already estimated for planning and construction, including contingency, of CM1
CUL-3	Implement a cultural resources discovery plan, perform training of construction workers, and conduct construction monitoring	1	Yes	Need DWR to confirm if measure would entail costs in excess of those already estimated for planning and construction, including contingency, of CM1

<b>EIR/S Measure ID</b>	<b>Description</b>	<b>Applicable CMs</b>	<b>Incremental Cost?</b>	<b>Reason</b>
CUL-4	Follow state and federal law governing human remains if such resources are discovered during construction	1	Yes	Need DWR to confirm if measure would entail costs in excess of those already estimated for planning and construction, including contingency, of CM1
CUL-5	Implement a built environment treatment plan, consult with relevant parties, and implement treatment	1	Yes	Need DWR to confirm if measure would entail costs in excess of those already estimated for planning and construction, including contingency, of CM1
CUL-6	Direct and indirect effects on unidentified historic architectural/built environment resources resulting from construction activities	1	Yes	Measure would entail costs in excess of those already estimated for planning and construction, including contingency, of CM1
CUL-7	Conduct cultural resource studies and adopt cultural resource mitigation measures for cultural resource impacts associated with conservation component implementation	2-22	Yes	Measure would entail costs in excess of those already estimated for planning and construction, including contingency, of CMs 2-22.
ENG-2	Acquisition of additional energy supply	1	No	Costs for this measure are included in the "Utilities and Power" cost line item in the CM1 construction cost estimate.
GW-1	Maintain well yields in preexisting nearby wells during construction	1	No	Costs included in CM1 construction contingencies
GW-2	Maintain well yields in preexisting nearby wells during operation	1	No	Costs included in CM1 construction contingencies
GW-5	Agricultural lands seepage minimization during project operation	1	No	Costs included in CM1 construction contingencies
GW-6	Agricultural lands seepage minimization during operation of conservation components	2-22	No	Cost of this measure subsumed within the cost estimate for Monitoring, Research, and Avoidance and Minimization Measures

<b>EIR/S Measure ID</b>	<b>Description</b>	<b>Applicable CMs</b>	<b>Incremental Cost?</b>	<b>Reason</b>
GW-7	Provide a cleaner or alternate source of water	2-22	No	The EIR/EIS was unable to reach a definitive conclusion regarding the potential for groundwater quality degradation beneath restoration areas. Should impacts occur, they will need to be addressed on a site-specific basis. There is insufficient information available regarding the extent or significance of impact to estimate a cost for this mitigation measure.
GW-8	Maintain domestic and municipal well yields during project operations	1	No	Costs included in CM1 construction contingencies
GW-9	Provide a cleaner or alternate source of water	1(?)	No	Costs included in CM1 construction contingencies
HAZ-1a	Perform preconstruction surveys, including soil and groundwater testing, at known or suspected contaminated areas within the construction footprint, and remediate and/or contain contamination	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of CM1
HAZ-1b	Perform predemolition surveys for structures to be demolished within the construction footprint, characterize hazardous materials and dispose of them in accordance with applicable federal, state and local regulations	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of CM1
HAZ-6	Test dewatered solids from solids lagoons and dredged sediment prior to disposal and dispose of in accordance with applicable federal, state and local regulations	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of CM1
HAZ-8	Consult with individual airports and USFWS, and other relevant organizations	2-22	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of conservation measures
Mercury/Selenium	Mercury, methyl mercury, and selenium control measures	2, 4, 5, 10	No	Implementation of measure would not entail costs in excess of those already estimated for implementation of CM12

<b>EIR/S Measure ID</b>	<b>Description</b>	<b>Applicable CMs</b>	<b>Incremental Cost?</b>	<b>Reason</b>
MIN-11	Purchase the Decker Island aggregate materials for use in BDCP construction	1-22	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of conservation measures
MIN-13	Recycle BDCP-derived materials and use recycled materials to the extent practicable during construction	1-22	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of conservation measures
MIN-14	DWR will participate in the local and regional aggregate evaluation and permitting process	1-22	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of conservation measures
MIN-5	Avoid displacement of active natural gas wells to the extent feasible through conservation component design	2-22	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of conservation measures
MIN-6	Maintain drilling access to natural gas wells to the extent feasible through design of conservation components	2-22	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of conservation measures
NOI-1a	Employ noise-reducing construction practices during construction	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of CM1
NOI-1b	Prior to construction, initiate a complaint/response tracking program	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of CM1
NOI-2	Employ vibration-reducing construction practices during construction of water conveyance facilities	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of CM1

<b>EIR/S Measure ID</b>	<b>Description</b>	<b>Applicable CMs</b>	<b>Incremental Cost?</b>	<b>Reason</b>
NOI-3	Design and construct intake facilities and other pump facilities such that operational noise does not exceed 50 dBA (one-hour $L_{eq}$ ) during daytime hours (7:00 a.m. to 10:00 p.m.) or 45 dBA (one-hour $L_{eq}$ ) during nighttime hours (10:00 p.m. to 7:00 a.m.) or the applicable local noise standard (whichever is less) at nearby noise sensitive land uses	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of CM1
PALEO-1a	Prepare a monitoring and mitigation plan for paleontological resources	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of CM1
PALEO-1b	Review 90% design submittal and develop specific language identifying how the mitigation measures will be implemented along the alignment	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of CM1
PALEO-1c	Educate construction personnel in recognizing fossil material	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of CM1
PALEO-1d	Stop work if substantial fossil remains are encountered during construction	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of CM1
SOILS-2a	Minimize extent of excavation and soil disturbance	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, for CM1
SOILS-2b	Salvage, stockpile, and replace topsoil and prepare a topsoil storage and handling plan	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, for CM1
SW-4	Implement measures to reduce runoff and sedimentation	1-22	No	Implementation of measure would not entail costs in excess of those already estimated for conservation measure construction, including contingency.

<b>EIR/S Measure ID</b>	<b>Description</b>	<b>Applicable CMs</b>	<b>Incremental Cost?</b>	<b>Reason</b>
SW-6	Implement measures to address potential wind fetch issues	2, 4, 5	No	Implementation of measure would not entail costs in excess of planning and construction costs, including contingencies, already estimated for CMs 2, 4, and 5
TRANS-1	Implement site-specific construction traffic management plan	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of CM1
TRANS-2	Limit Hours or Amount of Construction Activity on Congested Roadway Segments	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of CM1
TRANS-3	Prohibit Construction Traffic on Congested Roadway Segments	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of CM1
TRANS-4	Enhance Capacity of Congested Roadway Segments as Stipulated in Mitigation Agreements	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of CM1
TRANS-5	Prohibit Construction Activity on Physically Deficient Roadway Segments	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of CM1
TRANS-6	Limit Construction Activity on Physically Deficient Roadway Segments	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of CM1
TRANS-7	Improve Physical Condition of Affected Roadway Segments as Stipulated in Mitigation Agreements	1	Yes	Caltrans is conducting a conceptual study per DWR's request that provide cost estimates for Hwy 4 & 12 reinforcement
UT-2	Ensure the continuation of fire protection services by the Courtland Fire Protection District	1	No	Costs for this measure are included in the "Utilities and Power" cost line item in the CM1 construction cost estimate.
UT-6a	Verify locations of utility infrastructure	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of CM1

<b>EIR/S Measure ID</b>	<b>Description</b>	<b>Applicable CMs</b>	<b>Incremental Cost?</b>	<b>Reason</b>
UT-6b	Relocate utility infrastructure in a way that avoids or minimizes any effect on operational reliability	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of CM1
UT-6c	Relocate utility infrastructure in a way that avoids or minimizes any effect on worker and public health and safety	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of CM1
VIS-1g	Implement best management practices to implement project landscaping plan	1	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, of CM1
VIS-6a	Underground new or relocated utility lines where feasible	1	No	Costs for relocating utility lines are included in the "Utilities and Power" cost line item in the CM1 construction cost estimate.
WQ-11	Reduce, avoid, and compensate for reduced water quality conditions (EC)	1, 4	No	Cost of this measure is subsumed within WQ-7
WQ-18	Design wetland and riparian habitat features to minimize effects on municipal intakes	4, 7	No	Implementation of measure would not entail costs in excess of those already estimated for planning and construction, including contingency, for CMs 4 and 7
WQ-22	Implement least toxic integrated pest management strategies (for aquatic veg control)	13	No	Implementation of measure would not entail costs in excess of those already estimated for implementation of CM13
WQ-5	Reduce, avoid, and compensate for reduced water quality conditions (bromide)	1	No	Cost of this measure is subsumed within WQ-7
WQ-7a	Conduct additional evaluation and modeling of increased chloride levels	1, 4	No	Additional studies required by measure will be conducted as part of BDCP plan development

<b>EIR/S Measure ID</b>	<b>Description</b>	<b>Applicable CMs</b>	<b>Incremental Cost?</b>	<b>Reason</b>
WQ-7b	Coordinate with Delta water purveyors to identify means to avoid, minimize, offset, compensate for reduced seasonal availability of water that meets applicable water quality objective	1, 4	No	The EIR/EIS was unable to reach a definitive concluding regarding the potential for groundwater quality degradation beneath restoration areas. Should impacts occur, they will need to be addressed on a site-specific basis. There is insufficient information available regarding the extent or significance of impact to estimate a cost for this mitigation measure.
WQ-7c	Coordinate with CDFW/USFWS, and Suisun Marsh stakeholders, to identify the means to avoid or minimize the predicted chloride level increases in the marsh	1, 4	No	Implementation of measure may entail changes to existing salinity control facilities and/or construction of new facilities. It is not know if sufficient information is available to estimate the cost of this measure.
WQ-7d	Design and implement restoration areas to minimize tidal exchange to the extent possible that allows achievement of the restoration objectives	4	No	Implementation of measure would not entail costs in excess of those already estimated for CM4 planning and construction, including contingency.
WQ-7e	Evaluate effects to Delta species in light of new scientific information on chloride effects developed by the State of Iowa Department of Natural Resources and USEPA	1, 4	No	Implementation of measure would not entail costs in excess of those already estimated for Monitoring, Research, and Avoidance and Minimization Measures.

1

## 2 **8.A.7 EIR/EIS Mitigation Costs Not Counted Elsewhere**

3 Mitigation measures necessary to avoid, reduce, minimize, or compensate for adverse  
4 environmental effects of Plan implementation are documented in the environmental impact report  
5 (EIR)/environmental impact statement (EIS) that will be based on the Plan. These mitigation  
6 measures are consistent with the California Environmental Quality Act (CEQA) and the National  
7 Environmental Policy Act (NEPA) (not the Endangered Species Act or the Natural Community  
8 Conservation Act) and are included here to provide a more complete accounting of all Plan costs.

9 To ensure that all Plan costs were accounted for, potential EIR/EIS mitigation measures were  
10 screened to determine which would entail additional costs beyond the estimated costs of Plan  
11 implementation already presented. This section presents cost estimates for the subset of EIR/EIS  
12 mitigation measures expected to entail additional implementation costs. Estimated costs for EIR/EIS  
13 mitigation measures not counted elsewhere are summarized in Table 8.A-62.

## 8.A.7.1 Agricultural Lands Mitigation Measures

Implementation of CM1, CM2, CM4, and CM5 is estimated to permanently affect approximately 45,000 acres of Important Farmland in the Plan Area.<sup>6</sup> Implementation of the cultivated land reserve for the benefit of the covered species may offset most of this impact. The estimated size of the cultivated land reserve is 49,625 acres, of which 87%, or approximately 43,174 acres, is expected to be Important Farmland.<sup>7</sup> The EIR/EIS mitigation measure AG-1 states that the conventional approach for mitigation of lost Important Farmland is often protection of other agricultural land in the path of urban development through easements or other similar measures, usually at a ratio of 1 to 1. It will not be known until implementation if the 43,174 acres can also count toward the EIR/EIS mitigation measure; however, for the purposes of the cost estimate, if it were assumed that the full acreage is counted, the residual EIR/EIS mitigation requirement would be 1,752 acres.

The EIR/EIS mitigation measure AG-1 provides for a wide range of actions that could help offset the loss of Important Farmland in the Plan Area. For cost estimating purposes, however, mitigation through acquisition of additional conservation easements of cultivated land at a 1:1 ratio is assumed. While this mitigation measure allows for agricultural stewardship strategies other than conservation easements, it is assumed these strategies would be pursued only if they have a lower cost than conservation easements. The acreage-weighted average fee-title value of farmland in the cultivated land reserve is \$7,199 per acre. Easement cost is set to 60% of this value, or \$4,319 per acre. Transaction costs are estimated at \$720 per acre. Unit easement cost, without contingency, is therefore \$5,039 per acre. A 20% contingency is added to account for potential increases in farmland values and other cost uncertainties. Unit easement cost, with contingency, is \$6,047 per acre. Therefore, based on a 1:1 ratio of mitigation for residual land not protected through the cultivated lands strategy, total easement cost over the 50-year permit term is estimated to be \$10.6 million.

## 8.A.7.2 Air Quality Mitigation Measures

Costs for the majority of air quality mitigation measures are incorporated into the planning, construction, and operating costs estimates for Plan implementation. Costs for emission offsets covered under EIR/EIS mitigation measures AQ-2 through AQ-4, however, are incremental to these costs. Emission offset costs for the Sacramento Metropolitan Air Quality Management District (SMAQMD), Bay Area Air Quality Management District (BAAQMD), and San Joaquin Valley Air Pollution Control District (SJVAPCD) were estimated based on current management district offset fees and estimated emission offsets needed to achieve either net zero or CEQA-threshold offset levels.<sup>8</sup> Estimated emission offset costs by air quality management district are:

- SMAQMD: \$7.9 million
- BAAQMD: \$0.4 to \$1.9 million<sup>9</sup>

<sup>6</sup> Important Farmland for CEQA purposes is defined as farmland designated as Prime Farmland, Farmland of Statewide Importance, and Unique Farmland. The BDCP EIR/EIS is also counting Farmland of Local Importance as Important Farmland for mitigation purposes.

<sup>7</sup> This is based on the ratio of Important Farmland to total farmland in the Plan Area.

<sup>8</sup> Costs for SMAQMD and SJVAPCD are based on net zero emission offset levels. Costs for BAAQMD, which does not have a net zero offset policy, are based on CEQA-threshold offset requirements.

<sup>9</sup> BAAQMD does not have an offset program. Calculation of the lower-bound cost assumes an offset cost equivalent to the SMAQMD fee (lowest amongst existing air district fees). Calculation of the upper-bound cost assumes an offset cost equivalent to the SJVAPCD fee (highest amongst existing air district fees).

- 1       • SJVAPCD: \$14.4 million

2       Total estimated emission offset costs are \$23.4 million.<sup>10</sup>

3       Costs to mitigate generation of cumulative greenhouse gas emissions during construction of the  
4       proposed water conveyance facility are not included in the CM1 cost estimate. These impacts are  
5       addressed by EIR/EIS mitigation measure AQ-12. Mitigation may entail a broad range of actions,  
6       including use of alternative fuels in construction vehicles and generators to funding alternative  
7       energy projects. Expected costs are highly variable and depend on the mix of mitigation strategies  
8       employed. Low-, medium-, and high-cost estimates are presented.

- 9       • The low cost estimate is based on the cost of purchasing carbon offsets at \$5.20 per metric ton  
10       for a total mitigation cost of \$8.6 million.
- 11       • The medium cost estimate is based on a combination of measure strategies to achieve a balance  
12       between costs and local co-benefits. Mitigation cost under a mixed strategy is expected to range  
13       between \$139.9 and \$207.0 million.
- 14       • The high cost estimate is based on offsetting emissions by funding construction of solar energy  
15       systems. The high cost estimate is \$368 million.<sup>11</sup>

16       Cost summaries presented in the next section use the midpoint of the AQ-12 cost range, \$188.3  
17       million.

### 18   **8.A.7.3       Biological Resources Mitigation Measures**

19       The vast majority of the mitigation measures for biological resources are addressed within the  
20       habitat and other stressor conservation measures and their costs are subsumed in the  
21       implementation costs of those measures. Preconstruction surveys for nesting birds (EIR/EIS  
22       mitigation measure BIO-269) and roosting bats (EIR/EIS mitigation measure BIO-385), however,  
23       are expected to entail incremental costs. Survey costs for nesting birds and roosting bats were  
24       estimated by multiplying the amount of acreage subject to abrupt habitat removal by the average  
25       per-acre survey cost. An allowance was added to the roosting bat costs for analysis of acoustical  
26       recording data. The total estimated cost for the two surveys and supporting analysis is \$300,000.

### 27   **8.A.7.4       Cultural Resources Mitigation Measures**

28       Mitigation of cultural resources is addressed by EIR/EIS mitigation measures CUL-1 through CUL-7.  
29       Implementation of these measures is expected to entail completion of the following surveys and  
30       archaeological resources recovery plans before construction of the conveyance facility or of some  
31       restoration projects.

- 32       • Preparation of a data recovery plan and completion of data recovery excavations on deposits of  
33       identified and significant archaeological sites.
- 34       • Completion of an inventory and evaluation of archaeological resources.
- 35       • Implementation of a cultural resources discovery plan, construction worker training, and  
36       construction monitoring.
- 37       • Implementation of a built environment treatment plan.

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<sup>10</sup> The total cost is based on the midpoint of the BAAQMD cost range.

<sup>11</sup> This assumes funding 1,460 systems at an average cost of \$252,000 per system.

- 1       • Completion of an inventory and evaluation of built resources within conveyance right-of-way.  
 2       • Treatment of affected land parcels and structure identified as culturally or archaeologically  
 3       significant.

4       Costs in this section are based on a predicted density of cultural and archaeological resources and  
 5       very general averages for typical treatment costs for other projects. Accurate estimates for EIR/EIS  
 6       cultural resources mitigation measures will require access to affected parcels, evaluation and impact  
 7       analysis for affected properties, and selection of treatment by agencies after public and interagency  
 8       consultation. It is expected the cost estimates in this section will be refined as part of Plan  
 9       implementation.

10       These estimates are based on the following cost estimation methods and assumptions.

- 11       • The average treatment cost for culturally significant built resources is assumed to be \$65,000  
 12       per structure.
- 13       • Mitigation costs for built resources are predicated on 105 properties or structures receiving  
 14       treatment, including 65 properties within the footprint of the conveyance facility; 30 properties  
 15       within the footprint for tidal natural communities restoration; and 10 properties within other  
 16       conserved lands.<sup>12</sup>
- 17       • The average treatment cost for archaeologically significant resources is assumed to be \$100,000  
 18       per site.
- 19       • Mitigation costs for archaeologically significant resources are predicated on 115 sites receiving  
 20       treatment, including 50 sites within the footprint of the conveyance facility; 45 sites within the  
 21       footprint for tidal natural communities restoration; and 20 sites within other conserved lands.<sup>13</sup>
- 22       • Site monitoring during construction is estimated to cost a total of \$7.5 million, of which \$3  
 23       million each are expected to be required for conveyance facility and tidal restoration site  
 24       monitoring and \$1.5 million is required for other restoration sites.

## 25       **8.A.7.5       Summary of Costs for Mitigation Measures Not** 26       **Counted Elsewhere**

27       Estimated costs for EIR/EIS mitigation measures not counted elsewhere are summarized in Table  
 28       8.A-62.

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<sup>12</sup>The count of culturally significant treated properties for tidal habitat restoration areas assumes a density of 1.5 built resources per 1,000 acres with 30% receiving treatment. For other restoration areas, the assumed density is 6.7 built resources per 1,000 acres with 10% receiving treatment.

<sup>13</sup>The count of archaeologically significant treated properties for tidal habitat restoration areas assumes a density of seven potential sites for 1,000 acres with 10% receiving treatment. For other restoration areas, the assumed density is the same, with 20% receiving treatment.

1 **Table 8.A-62. Incremental Cost Estimate for EIR/EIS Mitigation Measures**

Conservation Measure Cost Items	Average Annual Expenditure by Plan Implementation Period (Millions) <sup>a</sup>			50-Year Permit Term Total Expenditure (Millions) <sup>a</sup>
	Near Term (Yrs 1–10)	Early Long-Term (Yrs 11–15)	Late Long-Term (Yrs 16–50)	
<b>Capital Costs</b>				
Agricultural lands	\$0.34	\$0.29	\$0.17	\$10.59
Air quality	\$21.17	\$0.00	\$0.00	\$211.70
Biological surveys not elsewhere counted	\$0.03	\$0.00	\$0.00	\$0.30
Cultural resources	\$1.51	\$0.37	\$0.25	\$25.83
<b>Total Capital</b>	<b>\$23.05</b>	<b>\$0.66</b>	<b>\$0.42</b>	<b>\$248.42</b>
Notes:				
<sup>a</sup> In undiscounted 2012 dollars				
The 50-year total expenditures are more precise than the annual averages and may not sum directly from the annual averages due to rounding error.				

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