FINAL

# SACRAMENTO RIVER BANK PROTECTION PROJECT PHASE II SUPPLEMENTAL AUTHORIZATION ENVIRONMENTAL IMPACT STATEMENT/ ENVIRONMENTAL IMPACT REPORT

## **VOLUME I: REPORT**

#### STATE CLEARINGHOUSE #2009012081

#### PREPARED FOR:

U.S. Army Corps of Engineers 1325 J Street Sacramento, CA 95814 Contact: Patricia K. Goodman 916-557-7420

Central Valley Flood Protection Board 3310 El Camino Avenue Sacramento, CA 95821 Contact: Kip Young 916-574-2559

**P**REPARED BY:

ICF

630 K Street, Suite 400 Sacramento, CA 95814 Contact: Gregg Ellis 916-737-3000

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1	FINAL
2 3 4 5 6	Sacramento River Bank Protection Project Environmental Impact Statement/Environmental Impact Report being jointly pursued by the U.S. Army Corps of Engineers and the Central Valley Flood Protection Board
7	The U.S. Army Corps of Engineers (Corps) and the Central Valley Flood Protection Board (CVFPB) have
8	prepared this joint programmatic environmental impact statement/environmental impact report
9	(EIS/EIR) for the Sacramento River Bank Protection Project (SRBPP) Phase II Supplemental Authority
10	(proposed program) for implementation of up to 80,000 linear feet (LF) of additional bank protection in
11	the Sacramento River Flood Control Project (SRFCP) area, as authorized by Section 3031 of the Water
12	Resources Development Act (WRDA) of 2007. The proposed program area spans portions of Butte,
13	Colusa, Glenn, Placer, Sacramento, Solano, Sutter, Tehama, Yolo, and Yuba Counties in California. The
14	Corps is the federal lead agency for this EIS/EIR, and the CVFPB is the state lead agency, pursuant to the
15	National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA),
16	respectively.
17	This programmatic EIS/EIR analyzes the environmental effects associated with implementing bank
18	protection measures along 80,000 LF of the SRFCP to arrest or avoid streambank erosion that threatens
19	the integrity of the SRFCP levee system. Five programmatic action alternatives are proposed, consisting
20	of different combinations of the following measures: setback levees, adjacent levees, riparian and
21	wetland benches with revegetation, bank fill stone protection with on-site woody vegetation, and bank
22	fill stone protection with no on-site woody vegetation. Because streambank erosion is episodic and new
23	erosion sites can appear each year, the environmental analysis in this EIS/EIR is programmatic in
24	nature, analyzing the 80,000 LF in its entirety, but relying on data associated with 106 representative
25	sites in order to provide the most detailed programmatic analysis possible. Additional project-level
26	environmental documentation, tiering from this programmatic analysis, will be prepared in the future to
27	address specific sites that will be constructed.
28	For further information on this EIS/EIR, please contact:
29	Ms. Patricia K. Goodman
30	U.S. Army Corps of Engineers
31	1325 J Street
32	Sacramento, CA 95814
33	916-557-7420
34	or
35	Mr. Kip Young
36	Central Valley Flood Protection Board
37	3310 El Camino Avenue
38	Sacramento, CA 95821
39	916-574-2559

### Contents

2	List of T	Tables	5	xv
3	List of F	igure	S	xix
4	List of A	Acron	yms and Abbreviations	xxi
5	VOLUME I: R	EPORT		
6	Executive	Summ	nary	ES-1
7	ES.1	Intro	duction	ES-1
8	ES.2	Proje	ect Location	ES-1
9	ES.3	Purp	ose and Need and Objectives	ES-1
10	ES.4	Sum	mary Description of the Project	ES-2
11	ES	.4.1	SRBPP Background	ES-2
12	ES	.4.2	SRBPP Phases	ES-3
13	ES	.4.3	Phase II Supplemental Authority (Proposed Program)	ES-3
14	ES.5	Prop	osed Site-Specific Bank Protection Measures	ES-4
15	ES	.5.1	Bank Protection Measure 1–Setback Levee:	ES-4
16	ES	.5.2	Bank Protection Measure 2–Bank Fill Stone Protection with No On-Site	
17			Woody Vegetation:	ES-5
18	ES	.5.3	Bank Protection Measure 3–Adjacent Levee:	ES-6
19	ES	.5.4	Bank Protection Measure 4–Riparian and Wetland Benches with	
20			Revegetation:	ES-6
21	ES	.5.5	Bank Protection Measure 5–Bank Fill Stone Protection with On-Site	
22	FC	ГC		ES-9
23 24				ES 11
24	E3.0 EC	Aller	Alternatives Development	ES 11
25 26	ES	.0.1 6.2	Alternative 1 No Action	ES 21
20	ES	6.2	Alternative 24 Low Maintenance	ES 21
27 28	ES	6.4	Sub-Alternative 2R-Low Maintenance within Economically Justified Basins	ES_21
20 29	ES	65	Alternative 30-Maximize Meander Zone	FS_21
20	ES	6.6	Sub-Alternative 3R-Maximize Meander Zone within Economically Justified	LJ-ZI
31	LJ	.0.0	Basins	ES-21
32	ES	.6.7	Alternative 4A–Habitat Replacement	ES-22
33	ES	.6.8	Sub-Alternative 4B–Habitat Replacement within Economically Justified	
34		-	Basins	ES-22
35	ES	.6.9	Alternative 5A–Habitat Replacement Reaching Environmental Neutrality	ES-22

1 2	E	S.6.10	Sub-Alternative 5B–Habitat Replacement Reaching Environmental Neutrality within Economically Justified Basins	ES-23
3	E	S.6.11	Alternative 6A–Habitat Replacement with ETL Variance	ES-23
4	E	S.6.12	Sub-Alternative 6B–Habitat Replacement with ETL Variance within	
5			Economically Justified Basins	ES-23
6	E	S.6.13	Preferred Alternative	ES-23
7 8	E	S.6.14	Environmentally Preferable Alternative/Environmentally Superior Alternative	ES-24
9	ES.7	Conc	lusions of the Environmental Analysis	ES-24
10	E	S.7.1	Effects and Mitigation Measures	ES-24
11	ES.8	Area	s of Known Controversy and Unresolved Issues	ES-48
12 13	ES.9	Irrev Envir	ersible and Irretrievable Commitments of Resources/Significant Irreversible conmental Changes	ES-49
14	ES.10	Relat	ionship between Short-Term Uses of the Environment and Maintenance	
15		and E	Enhancement of Long-Term Productivity	ES-50
16	ES.11	Publi	c Involvement and Agency Coordination	ES-50
17	E	S.11.1	Notice of Preparation/Notice of Intent Scoping	ES-50
18	E	S.11.2	Agency Consultation and Coordination	ES-51
19	E	S.11.3	Draft EIS/EIR Public Comments	ES-52
20	Chapter 1	Introd	uction	1-1
21	1.1	Intro	duction	1-1
22	1	.1.1	NEPA and CEQA Compliance	1-1
23	1	.1.2	Lead Agencies	1-3
24	1.2	Proje	ect Purpose and Objectives	1-3
25	1	.2.1	Need for Action	1-3
26	1	.2.2	Background of Purpose and Need	1-4
27	1.3	Publi	c Involvement and Agency Coordination	1-13
28	1	.3.1	Notice of Preparation/Notice of Intent Scoping	1-13
29	1	.3.2	Agency Consultation and Coordination	1-14
30	1	.3.3	Draft Environmental Impact Statement/ Environmental Impact Report	
31			Public Comments	1-16
32	1.4	Area	s of Known Controversy and Unresolved Issues	1-17
33	1.5	Irrev	ersible and Irretrievable Commitments of Resources/Significant Irreversible	
34		Envir	onmental Changes	1-17
35	1.6	Relat	ionship between Short-Term Uses of the Environment and Maintenance	
36		and E	Innancement of Long-Term Productivity	1-18

1	Chapter	2 Proje	ect Description	2-1
2	2.1	Intr	oduction	2-1
3	2.2	Pro	ject Location	2-1
4		2.2.1	Program Area	2-1
5		2.2.2	Erosion Sites	2-3
6	2.3	Pro	posed Site-Specific Bank Protection Measures	2-4
7		2.3.1	Bank Protection Measure 1–Setback Levee	2-5
8		2.3.2	Bank Protection Measure 2–Bank Fill Stone Protection with No On-Site	
9			Woody Vegetation	2-6
10		2.3.3	Bank Protection Measure 3–Adjacent Levee	2-6
11		2.3.4	Bank Protection Measure 4–Riparian and Wetland Benches with	
12			Revegetation	2-7
13		2.3.5	Bank Protection Measure 5–Bank Fill Stone Protection with On-Site	
14			Vegetation	2-10
15		2.3.6	Additional Measures	2-10
16	2.4	Alte	ernatives Development	2-12
17		2.4.1	Alternative 1–No Action	2-16
18		2.4.2	Alternative 2A–Low Maintenance	2-16
19		2.4.3	Sub-Alternative 2B–Low Maintenance within Economically Justified Basins	2-16
20		2.4.4	Alternative 3A–Maximize Meander Zone	2-16
21		2.4.5	Sub-Alternative 3B–Maximize Meander Zone within Economically Justified	
22			Basins	2-17
23		2.4.6	Alternative 4A–Habitat Replacement	2-17
24		2.4.7	Sub-Alternative 4B–Habitat Replacement within Economically Justified	2.47
25			Basins	2-17
26		2.4.8	Alternative 5A–Habitat Replacement Reaching Environmental Neutrality	2-18
27		2.4.9	Sub-Alternative 5B–Habitat Replacement Reaching Environmental	2 10
20		2 4 10	Alternative CA. Unbitet Deplecement with Vegetation ETL Veriance	2-18 2 10
29		2.4.10	Alternative 6A-Habitat Replacement with Vegetation ETL Variance	2-18
30 31		2.4.11	within Economically Justified Basins	2-19
32	25	Site	Specific Bank Protection Measures by Alternative	
32	2.5	Site	Selection and Implementation Process	2-19 2_20
24	2.0	261	Stop 1 Appual Percentation (Frecion Inventory	20-2 ר ר
25		2.0.1	Step 1 — Annual Recommissance/Erosion Inventory	2 20
33 26		2.0.2 262	Step 2 - Childa and Non-Childa Erosion Site Decision	۲-۲۲
30 27		2.0.3	Step 5 - Engineering Kanking and Report	2-29
ა/ აი		2.0.4	Step 4 - Justification Screening	2-30
30		2.0.5	step 5 – identify Opportunities and Constraints	2-30

1	2.6.6	Step 6 – Conceptual-Level Alternatives	2-31
2	2.6.7	Step 7 – Site Selection	2-31
3	2.6.8	Step 8 – Site Selection Report	2-32
4	2.6.9	Step 9 – Data Collection and Analysis	2-32
5	2.6.10	Step 10 – Preliminary Design and Draft Environmental Assessment/Initial	
6		Study	2-33
7	2.6.12	Step 11 – Draft Final Design, Final EA/IS, and Pre-Construction Activities	2-34
8	2.6.12	2 Step 12 – Review and Final Design	2-34
9	2.6.13	3 Step 13 – Contracting Process	2-34
10	2.6.14	4 Step 14 – Construction	2-34
11	2.6.1	5 Step 15 – Mitigation Monitoring	2-34
12	2.6.16	5 Step 16 – Site Turnover	2-35
13	2.7 Co	nstruction	2-35
14	2.7.1	Construction Activities	2-35
15	2.7.2	Real Estate	2-35
16	2.7.3	Staging Areas	2-36
17	2.7.4	Haul Routes, Borrow Areas, Traffic, and Navigation	2-36
18	2.8 Pr	eferred Alternative	2-36
19	2.9 En	vironmentally Preferable Alternative/Environmentally Superior Alternative	2-37
20	2.10 Re	storation/Mitigation Establishment and Monitoring	2-37
21	Chapter 3 Guid	de to Effects Analysis	3-1
22	3.1 Int	roduction	3-1
23	3.2 NE	PA and CEQA Requirements	3-1
24	3.3 Ap	plication of NEPA and CEQA Principles and Terminology	3-2
25	3.4 Re	source Chapters	3-3
26	3.4.1	Contents of Resource Chapters	3-4
27	Chapter 4 Floo	d Control and Geomorphology	4-1
28	4.1 Int	roduction and Summary	4-1
29	4.2 En	vironmental Setting	4-2
30	4.2.1	Program Area Description	4-2
31	4.2.2	Flood Control	4-3
32	4.2.3	Climate	4-4
33	4.2.4	Hydrology and Hydraulics	4-5
34	4.2.5	Geomorphic Conditions	4-7
35	4.2.6	Review of Alluvial River Systems Processes	4-13
36	4.2.7	Erosion Mechanisms in the Program Area	4-18
37	4.2.8	Projected Incision Estimates (Regions 1a and 1b Only)	4-21

1		4.2.9	Erosion Sites Summary	4-21
2		4.2.10	Flooding	4-22
3	4.3	Reg	ulatory Setting	4-23
4	4.4	Det	ermination of Effects	4-24
5		4.4.1	Assessment Methods	4-24
6		4.4.2	Significance Criteria	4-24
7	4.5	Effe	cts and Mitigation Measures	4-25
8		4.5.1	Alternative 1–No Action	4-25
9		4.5.2	Alternative 2A–Low Maintenance	4-26
10 11		4.5.3	Alternative 3A–Maximize Meander Zone (Environmentally Superior Alternative)	4-28
12		4.5.4	Alternative 4A—Habitat Replacement (Preferred Alternative)	4-30
13		4.5.5	Alternative 5A—Habitat Replacement Reaching Environmental Neutrality	4-31
14		4.5.6	Alternative 6A—Habitat Replacement with Vegetation ETL Variance	4-32
15	Chapter	<sup>-</sup> 5 Wate	r Quality and Groundwater Resources	5-1
16	5.1	Intr	oduction and Summary	5-1
17	5.2	Env	ironmental Setting	5-2
18		5.2.1	Existing Conditions	5-2
19	5.3	Reg	ulatory Setting	5-12
20	5.4	Det	ermination of Effects	5-12
21		5.4.1	Assessment Methods	5-12
22		5.4.2	Significance Criteria	5-13
23	5.5	Effe	cts and Mitigation Measures	5-13
24		5.5.1	Alternative 1—No Action	5-13
25		5.5.2	Alternative 2A—Low Maintenance	5-13
26 27		5.5.3	Alternative 3A—Maximize Meander Zone (Environmentally Superior Alternative)	5-17
28		5.5.4	Alternative 4A—Habitat Replacement (Preferred Alternative)	5-17
29		5.5.5	Alternative 5A—Habitat Replacement Reaching Environmental Neutrality	5-18
30		5.5.6	Alternative 6A—Habitat Replacement with Vegetation ETL Variance	5-18
31	Chapter	· 6 Geolo	ogy, Seismicity, Soils, and Mineral Resources	6-1
32	6.1	Intr	oduction and Summary	6-1
33	6.2	Env	ironmental Setting	6-2
34		6.2.1	Program Area Description	6-2
35		6.2.2	Geologic Conditions	6-2
36		6.2.3	Seismic Hazards	6-4
37		6.2.4	Landslide Hazards	6-6

1		6.2.5	Volcanic Hazards	6-6
2	6.3	Re	gulatory Setting	6-7
3	6.4	De	termination of Effects	6-7
4		6.4.1	Assessment Methods	6-7
5		6.4.2	Significance Criteria	6-7
6	6.5	Eff	ects and Mitigation Measures	6-8
7		6.5.1	Alternative 1—No Action	6-9
8		6.5.2	Alternative 2A—Low Maintenance	6-9
9 10		6.5.3	Alternative 3A—Maximize Meander Zone (Environmentally Superior Alternative)	6-11
11		6.5.4	Alternative 4A—Habitat Replacement (Preferred Alternative)	6-11
12		6.5.5	Alternative 5A—Habitat Replacement Reaching Environmental Neutrality	6-12
13		6.5.6	Alternative 6A—Habitat Replacement with Vegetation ETL Variance	6-12
14	Chapter	r 7 Tran	sportation and Navigation	7-1
15	7.1	Int	roduction and Summary	7-1
16	7.2	En	vironmental Setting	7-2
17		7.2.1	Existing Conditions	7-2
18	7.3	Re	gulatory Setting	7-4
19	7.4	De	termination of Effects	7-5
20		7.4.1	Assessment Methods	7-5
21		7.4.2	Significance Criteria	7-5
22	7.5	Eff	ects and Mitigation Measures	7-6
23		7.5.1	Alternative 1—No Action	7-6
24		7.5.2	Alternative 2A—Low Maintenance	7-6
25		7.5.3	Alternative 3A—Maximize Meander Zone (Environmentally Superior	
26			Alternative)	7-9
27		7.5.4	Alternative 4A—Habitat Replacement (Preferred Alternative)	7-9
28		7.5.5	Alternative 5A—Habitat Replacement Reaching Environmental Neutrality	7-10
29		7.5.6	Alternative 6A—Habitat Replacement with Vegetation ETL Variance	7-10
30	Chapter	8 Air C	Quality and Climate Change	8-1
31	8.1	Int	roduction and Summary	8-1
32	8.2	En	vironmental Setting	8-2
33		8.2.1	Existing Conditions	8-2
34	8.3	Re	gulatory Setting	8-17
35	8.4	De	termination of Effects	8-18
36		8.4.1	Assessment Methods	8-19
37		8.4.2	Significance Criteria	8-21

1	8.5	Eff	ects and Mitigation Measures	8-27
2		8.5.1	Alternative 1–No Action	8-27
3		8.5.2	Alternative 2A—Low Maintenance	8-27
4		8.5.3	Alternative 3A—Maximize Meander Zone (Environmentally Superior	
5			Alternative)	8-33
6		8.5.4	Alternative 4A—Habitat Replacement (Preferred Alternative)	8-36
7		8.5.5	Alternative 5A—Habitat Replacement Reaching Environmental Neutrality	8-38
8		8.5.6	Alternative 6A—Habitat Replacement with Vegetation ETL Variance	8-40
9	Chapter	9 Nois	e and Vibration	9-1
10	9.1	Int	roduction and Summary	9-1
11		9.1.1	Noise Terminology	9-2
12		9.1.2	Vibration Terminology	9-4
13	9.2	Env	vironmental Setting	9-5
14		9.2.1	Existing Noise Environment	9-5
15		9.2.2	General Types of Noise-Sensitive Land Uses	9-6
16	9.3	Re	gulatory Setting	9-6
17	9.4	De	termination of Effects	9-7
18		9.4.1	Assessment Methods	9-7
19		9.4.2	Significance Criteria	9-8
20	9.5	Eff	ects and Mitigation Measures	9-9
21		9.5.1	Alternative 1—No Action	9-9
22		9.5.2	Alternative 2A—Low Maintenance	9-9
23		9.5.3	Alternative 3A—Maximize Meander Zone (Environmentally Superior	
24			Alternative)	9-14
25		9.5.4	Alternative 4A—Habitat Replacement (Preferred Alternative)	9-15
26		9.5.5	Alternative 5A—Habitat Replacement Reaching Environmental Neutrality	9-17
27		9.5.6	Alternative 6A—Habitat Replacement with Vegetation ETL Variance	9-18
28	Chapter	10 Veg	getation and Wetlands	10-1
29	10.1	L Int	roduction and Summary	10-1
30	10.2	2 Env	vironmental Setting	10-4
31		10.2.1	Existing Conditions	10-4
32	10.3	8 Re	gulatory Setting	10-23
33	10.4	l De	termination of Effects	10-24
34		10.4.1	Assessment Methods	10-24
35		10.4.2	2 Significance Criteria	10-26
36		10.4.3	B Effect Assumptions	10-27
37		10.4.4	Effect Mechanisms	10-28

1	10.5 E	ffects and Mitigation Measures	
2	10.5	5.1 Alternative 1—No Action	
3	10.5	5.2 Alternative 2A—Low Maintenance	
4	10.5	5.3 Alternative 3A—Maximize Meander Zone (Environmentally Superior	
5		Alternative)	
6	10.5	5.4 Alternative 4A—Habitat Replacement (Preferred Alternative)	
7	10.5	5.5 Alternative 5A—Habitat Replacement Reaching Environmental Neutrality	10-42
8	10.5	5.6 Alternative 6A—Habitat Replacement with Vegetation ETL Variance	
9	Chapter 11 F	isheries and Aquatics	
10	11.1 I	ntroduction and Summary	11-1
11	11.2 E	nvironmental Setting	11-2
12	11.2	2.1 Existing Conditions	11-2
13	11.2	2.2 Life Histories of Special-Status Fish Species	11-12
14	11.2	2.3 Factors Affecting Abundance of Central Valley Fishes	11-31
15	11.3 F	Regulatory Setting	11-35
16	11.4 [	Determination of Effects	11-36
17	11.4	4.1 Assessment Methods	11-37
18	11.4	1.2 Significance Criteria	11-38
19	11.5 E	ffects and Mitigation Measures	11-39
20	11.5	5.1 Short-Term Effects	11-39
21	11.5	5.2 Long-Term Effects	11-45
22	Chapter 12 V	Vildlife	
23	12.1 I	ntroduction and Summary	12-1
24	12.2 E	Invironmental Setting	12-3
25	12.2	2.1 Existing Conditions	12-4
26	12.3 F	Regulatory Setting	12-50
27	12.4 [	Determination of Effects	12-51
28	12.4	4.1      Assessment Methods	12-51
29	12.4	1.2 Significance Criteria	12-53
30	12.5 E	ffects and Mitigation Measures	12-54
31	12.5	5.1 Alternative 1—No Action	12-54
32	12.5	5.2 Alternative 2A—Low Maintenance	12-54
33	12.5	5.3 Alternative 3A—Maximize Meander Zone (Environmentally Superior	
34		Alternative)	12-62
35	12.5	5.4 Alternative 4A—Habitat Replacement (Preferred Alternative)	12-64
36	12.5	5.5 Alternative 5A—Habitat Replacement Reaching Environmental Neutrality	12-65
37	12.5	5.6 Alternative 6A—Habitat Replacement with Vegetation ETL Variance	

1	Chapter 13	3 Land	Use and Agriculture	13-1
2	13.1	Intro	duction and Summary	13-1
3	13.2	Envir	onmental Setting	13-2
4	1	3.2.1	Existing Conditions	13-2
5	13.3	Regu	latory Setting	13-10
6	13.4	Dete	rmination of Effects	13-11
7	1	3.4.1	Assessment Methods	13-11
8	1	3.4.2	Significance Criteria	13-12
9	13.5	Effec	ts and Mitigation Measures	13-13
10	1	3.5.1	Alternative 1—No Action	13-13
11	1	3.5.2	Alternative 2A—Low Maintenance	13-13
12	1	3.5.3	Alternative 3A—Maximize Meander Zone (Environmentally Superior	
13			Alternative)	13-14
14	1	3.5.4	Alternative 4A—Habitat Replacement (Preferred Alternative)	13-16
15	1	3.5.5	Alternative 5A—Habitat Replacement Reaching Environmental Neutrality	13-18
16	1	3.5.6	Alternative 6A—Habitat Replacement with Vegetation ETL Variance	13-18
17	Chapter 14	1 Recre	eation	14-1
18	14.1	Intro	duction and Summary	14-1
19	14.2	Envir	onmental Setting	14-2
20	14.3	Regu	latory Setting	14-2
21	14.4	Dete	rmination of Effects	14-3
22	14	4.4.1	Assessment Methods	14-3
23	14	4.4.2	Significance Criteria	14-3
24	14.5	Effec	ts and Mitigation Measures	14-4
25	14	4.5.1	Alternative 1—No Action	14-4
26	14	4.5.2	Alternative 2A—Low Maintenance	14-4
27	14	4.5.3	Alternative 3A—Maximize Meander Zone (Environmentally Superior	
28			Alternative)	14-6
29	14	4.5.4	Alternative 4A—Habitat Replacement (Preferred Alternative)	14-7
30	14	4.5.5	Alternative 5A—Habitat Replacement Reaching Environmental Neutrality	14-8
31	14	4.5.6	Alternative 6A—Habitat Replacement with Vegetation ETL Variance	14-9
32	Chapter 15	5 Popu	lation and Housing	15-1
33	15.1	Intro	duction and Summary	15-1
34	15.2	Envir	onmental Setting	15-1
35	1	5.2.1	Existing Conditions	15-1
36	15.3	Regu	latory Setting	15-2
37	15.4	Dete	rmination of Effects	15-3

1	15.4.1	Assessment Methods	15-3
2	15.4.2	Significance Criteria	15-3
3	15.5 Effe	cts and Mitigation Measures	15-3
4	15.5.1	Alternative 1—No Action	15-3
5	15.5.2	Alternative 2A—Low Maintenance	15-4
6	15.5.3	Alternative 3A—Maximize Meander Zone (Environmentally Superior	
7		Alternative)	15-4
8	15.5.4	Alternative 4A—Habitat Replacement (Preferred Alternative)	15-5
9	15.5.5	Alternative 5A—Habitat Replacement Reaching Environmental Neutrality	15-5
10	15.5.6	Alternative 6A—Habitat Replacement with Vegetation ETL Variance	15-6
11	Chapter 16 Utili	ties and Public Services	16-1
12	16.1 Intro	oduction and Summary	16-1
13	16.2 Envi	ronmental Setting	16-1
14	16.2.1	Existing Conditions	16-1
15	16.3 Regi	ulatory Setting	16-11
16	16.4 Dete	ermination of Effects	16-11
17	16.4.1	Assessment Methods	16-11
18	16.4.2	Significance Criteria	16-11
19	16.5 Effe	cts and Mitigation Measures	16-12
20	16.5.1	Alternative 1—No Action	16-12
21	16.5.2	Alternative 2A—Low Maintenance	16-13
22	16.5.3	Alternative 3A—Maximize Meander Zone (Environmentally Superior	
23		Alternative)	16-14
24	16.5.4	Alternative 4A—Habitat Replacement (Preferred Alternative)	16-15
25	16.5.5	Alternative 5A—Habitat Replacement Reaching Environmental Neutrality	16-15
26	16.5.6	Alternative 6A—Habitat Replacement with Vegetation ETL Variance	16-15
27	Chapter 17 Aest	hetics	
28	17.1 Intro	oduction and Summary	17-1
29	17.2 Envi	ronmental Setting	17-2
30	17.2.1	Concepts and Terminology	17-2
31	17.2.2	Existing Conditions	17-4
32	17.3 Regi	ulatory Setting	17-9
33	17.4 Dete	ermination of Effects	17-10
34	17.4.1	Assessment Methods	17-10
35	17.4.2	Significance Criteria	17-10
36	17.5 Effe	cts and Mitigation Measures	17-11
37	17.5.1	Alternative 1—No Action	17-11

1	1	L7.5.2	Alternative 2A—Low Maintenance	17-12
2	1	L7.5.3	Alternative 3A—Maximize Meander Zone (Environmentally Superior	
3			Alternative)	
4	1	L7.5.4	Alternative 4A—Habitat Replacement (Preferred Alternative)	17-16
5	1	L7.5.5	Alternative 5A—Habitat Replacement Reaching Environmental Neutrality	
6	1	L7.5.6	Alternative 6A—Habitat Replacement with Vegetation ETL Variance	17-19
7	Chapter 1	.8 Publi	c Health and Environmental Hazards	
8	18.1	Intro	duction and Summary	
9	18.2	Envir	onmental Setting	
10	1	L8.2.1	Existing Conditions	
11	18.3	Regu	latory Setting	
12	18.4	Dete	rmination of Effects	
13	1	L8.4.1	Assessment Methods	
14	1	L8.4.2	Significance Criteria	
15	18.5	Effec	ts and Mitigation Measures	
16	1	L8.5.1	Alternative 1—No Action	
17	1	L8.5.2	Alternative 2A—Low Maintenance	
18	1	L8.5.3	Alternative 3A—Maximize Meander Zone (Environmentally Superior	
19			Alternative)	
20	1	L8.5.4	Alternative 4A—Habitat Replacement (Preferred Alternative)	
21	1	L8.5.5	Alternative 5A—Habitat Replacement Reaching Environmental Neutrality	
22	1	18.5.6	Alternative 6A—Habitat Replacement with Vegetation ETL Variance	
23	Chapter 1	9 Cultu	ral Resources	19-1
24	19.1	Intro	duction and Summary	
25	19.2	Envir	onmental Setting	
26	1	L9.2.1	Native Americans	
27	1	19.2.2	History	
28	19.3	Regu	latory Setting	
29	19.4	Dete	rmination of Effects	
30	1	L9.4.1	Assessment Methods	
31	1	19.4.2	Findings	
32	1	19.4.3	Significance Criteria	19-11
33	1	L9.4.4	Eligibility Criteria	19-12
34	19.5	Effec	ts and Mitigation Measures	19-14
35	1	L9.5.1	Alternative 1—No Action	19-14
36	1	19.5.2	Alternative 2A—Low Maintenance	

1	19.5.3	Alternative 3A—Maximize Meander Zone (Environmentally Superior	
2		Alternative)	19-16
3	19.5.4	Alternative 4A—Habitat Replacement (Preferred Alternative)	19-17
4	19.5.5	Alternative 5A—Habitat Replacement Reaching Environmental Neutrality	19-18
5	19.5.6	Alternative 6A—Habitat Replacement with Vegetation ETL Variance	19-18
6	Chapter 20 Soc	ioeconomics and Environmental Justice	20-1
7	20.1 Intr	oduction and Summary	20-1
8	20.2 Env	vironmental Setting	20-1
9	20.2.1	Existing Conditions	20-1
10	20.3 Reg	gulatory Setting	20-3
11	20.4 Det	ermination of Effects	20-3
12	20.4.1	Assessment Methods	20-4
13	20.4.2	Significance Criteria	20-4
14	20.5 Effe	ects and Mitigation Measures	20-5
15	20.5.1	Alternative 1—No Action	20-5
16	20.5.2	Alternative 2A—Low Maintenance	20-5
17	20.5.3	Alternative 3A—Maximize Meander Zone (Environmentally Superior	
18		Alternative)	20-6
19	20.5.4	Alternative 4A—Habitat Replacement (Preferred Alternative)	20-7
20	20.5.5	Alternative 5A—Habitat Replacement Reaching Environmental Neutrality	20-8
21	20.5.6	Alternative 6A—Habitat Replacement with Vegetation ETL Variance	20-8
22	Chapter 21 Effe	ects of Implementation in Economically Justified Basins Only	21-1
23	Chapter 22 Gro	wth-Inducing and Cumulative Effects	22-1
24	22.1 Gro	owth-Inducing Effects	22-1
25	22.1.1	Environmental Setting	22-1
26	22.1.2	Regulatory Setting	22-1
27	22.1.3	Determination of Effects	22-2
28	22.1.4	Effects and Mitigation Measures	22-2
29	22.2 Cur	nulative Effects	22-3
30	22.2.1	Approach to Cumulative Effects Analysis	22-4
31	22.2.2	Projects Considered for the Cumulative Assessment	22-5
32	22.2.3	Cumulative Effects by Resource	22-13
33	Chapter 23 Indi	an Trust Assets	23-1
34	23.1 Intr	oduction	23-1
35	23.2 Cor	nsultation and Determination of Effects	23-1

1	Chapter 24	Compliance with Applicable Laws, Policies, Plans, and Regulatory Framework.	24-1
2	24.1	Introduction	24-1
3	24.2	Regulatory Framework	24-1
4	24	4.2.1 Federal Requirements	24-1
5	24	1.2.2 State Requirements	24-11
6	24	1.2.3      State and Regional Plan Consistency	24-21
7	24	1.2.4 Local Plan Consistency and Regulatory Requirements	24-22
8	Chapter 25	List of Preparers	25-1
9	25.1	U.S. Army Corps of Engineers	25-1
10	25.2	California Department of Water Resources	25-1
11	25.3	HDR Inc. Consulting	25-2
12	25.4	ICF International	25-2
13	2	5.4.1 Project Management	25-2
14	2.	5.4.2 Technical Staff	25-2
15	Chapter 26	References	
16	26.1	Executive Summary	26-1
17	26.2	Chapter 1: Introduction	26-1
18	26.3	Chapter 2: Project Description	26-1
19	26.4	Chapter 3: Guide to Effects Analysis	26-2
20	26.5	Chapter 4: Flood Control and Geomorphology	26-2
21	26.6	Chapter 5: Water Quality and Groundwater Resources	26-7
22	26.7	Chapter 6: Geology, Seismicity, Soils, and Mineral Resources	26-8
23	26.8	Chapter 7: Transportation and Navigation	26-10
24	26.9	Chapter 8: Air Quality and Climate Change	26-11
25	2	5.9.1 Printed References	26-11
26	2	5.9.2 Personal Communications	26-13
27	26.10	Chapter 9: Noise and Vibration	26-14
28	26.11	Chapter 10: Vegetation and Wetlands	26-14
29	26.12	Chapter 11: Fisheries and Aquatics	26-17
30	2	5.12.1 Printed References	26-17
31	2	5.12.2 Personal Communications	26-25
32	26.13	Chapter 12: Wildlife	26-25
33	26.14	Chapter 13: Land Use and Agriculture	26-32
34	26.15	Chapter 14: Recreation	26-33
35	26.16	Chapter 15: Population and Housing	26-34
36	26.17	Chapter 16: Utilities and Public Services	26-34
37	26.18	Chapter 17: Aesthetics	26-35
	Sacramento Ri	ver Bank Protection Project	March 2020

1	26.19	Chapter 18: Public Health and Environmental Hazards2	26-36
2	26.20	Chapter 19: Cultural Resources2	26-37
3	26.21	Chapter 20: Socioeconomics and Environmental Justice2	26-38
4	26.22	Chapter 21: Effects of Implementation in Economically-Justified Basins Only2	26-38
5	26.23	Chapter 22: Growth-Inducing and Cumulative Effects2	26-38
6	26.24	Chapter 23: Indian Trust Assets2	26-40
7	26.25	Chapter 24: Compliance with Applicable Laws, Policies, Plans, and Regulatory	
8		Framework2	26-40
9	Index	Inc	lex-1

#### 11 Appendices

12	Appendix A	Public Noticing and Scoping Materials
13	Appendix B	Cultural Resources Programmatic Agreement
14	Appendix C	Regulatory Background
15	Appendix D	Air Quality Mitigation Measures by Air District
16	Appendix E	Riparian Vegetation Analysis
17	Appendix F	Standard Assessment Methodology (SAM) Analysis Process
18	Appendix G	Cultural Context
19	Appendix H	Cultural Resources Section 106 Correspondence
20 21	Appendix I	Final U.S. Fish and Wildlife Service Coordination Act Report June 2018
22 23	Appendix J	Sacramento River Bank Protection Project Phase II Supplemental Authorization Programmatic Mitigation Strategy
24 25	Appendix K	U.S. Fish and Wildlife Service Programmatic Biological Opinion December 19, 2017
26 27	Appendix L	National Marine Fisheries Service Programmatic Biological Opinion August 30, 2019

## Tables

2		Р	age
3	Table ES-1.	Site-Specific Application of Bank Protection Measures by Alternative	5-14
4	Table ES-2.	Summary of Effects and Mitigation Measures	5-25
5	Table ES-3.	Summary Comparison of Alternatives with Mitigation Considered	5-39
6	Table 1-1.	Responsible and Trustee Agencies1	-16
7 8	Table 2-1.	Watercourses, Reach Lengths, and Counties within the Program Area by Region	.2-2
9	Table 2-2.	Site-Specific Application of Bank Protection Measures by Alternative	2-20
10	Table 3-1.	Key to General NEPA and CEQA Terminology	3-3
11	Table 3-2.	Effect Findings (by increasing adversity)	3-5
12	Table 4-1.	Summary of Flood Control and Geomorphology Effects and Mitigation	4-2
13	Table 4-2.	Bank Retreat Terminology	l-15
14	Table 5-1.	Summary of Water Quality Effects and Mitigation	5-1
15 16	Table 5-2.	Clean Water Act Section 303(d) Listed Pollutants and Sources for Surface Waters in the Program Area	.5-3
17	Table 5-3.	Beneficial Uses for Surface Waters in the Program Area	5-5
18	Table 5-4.	Monthly Average TSS for Sacramento River at Colusa, Verona, and Freeport	5-7
19	Table 5-5.	Monthly Average Turbidity for Sacramento River at Verona and near Hood	5-9
20 21	Table 5-6.	Monthly Average Physical Data for the Sacramento River at Freeport (2003 to 2009)	5-10
22	Table 6-1.	Summary of Geology, Seismicity, Soils, and Mineral Resources Effects	6-1
23	Table 7-1.	Summary of Transportation, Circulation and Navigation Effects and Mitigation	.7-1
24	Table 8-1.	Summary of Air Quality and Climate Change Effects and Mitigation	8-1
25	Table 8-2.	National and California Ambient Air Quality Standards	8-5
26	Table 8-3.	Global, National, and State GHG Emissions Inventories	8-9
27	Table 8-4.	Ambient Air Quality Monitoring Data for the Sacramento Valley Air Basin	3-12
28	Table 8-5.	Ambient Air Quality Monitoring Data for the San Francisco Bay Area Air Basin	3-13

1	Table 8-6.	Criteria Pollutant Attainment Status in Program Area Counties	8-14
2 3	Table 8-7.	Federal <i>de minimis</i> Threshold Levels for Criteria Pollutants in Nonattainment Areas	8-22
4 5	Table 8-8.	Federal <i>de minimis</i> Threshold Levels for Criteria Pollutants in Maintenance Areas	8-23
6 7	Table 8-9.	Air Quality Districts and Counties Affected by the Proposed Program and Associated Significance Thresholds	8-25
8	Table 9-1.	Summary of Noise and Vibration Effects and Mitigation	9-1
9	Table 9-2.	Typical A-Weighted Sound Levels	9-3
10	Table 9-3.	Typical Construction Equipment Noise Emission Levels	9-4
11	Table 9-4.	Human Response to Steady State Vibration	9-5
12	Table 9-5.	Vibration Source Levels for Construction Equipment	9-5
13	Table 9-6.	Noise Levels during Construction of Bank Fill Rock Slope	9-10
14	Table 9-7.	Estimated Ground Vibration Levels Caused by Vibratory Roller	9-12
15	Table 9-8.	Estimated Noise Levels for Setback Levee and Adjacent Levee Construction	9-14
16	Table 9-9.	Estimated Noise Levels for Adjacent Levee Construction	9-16
17	Table 10-1.	Summary of Vegetation and Wetland Effects and Mitigation	10-2
18	Table 10-2.	Distribution of Riparian Vegetation Information within the Program Regions <sup>a</sup>	10-8
19 20	Table 10-3.	Existing Extent of Vegetation Cover Types between Current Levees and Channel, or between Channel and 100-Foot Buffer	10-9
21 22	Table 10-4.	Special-Status Plants Identified as Occurring Within 10 Miles of the Program Area	10-11
23	Table 10-5.	Number of Special-Status Plant Species by Region	10-22
24	Table 10-6.	Performance Standards for Herbaceous and Woody Vegetation	10-30
25	Table 10-7.	Summary of Site-Specific Vegetation Analysis for Alternative 2A (acres)	10-34
26	Table 10-8.	Summary of Site-Specific Vegetation Analysis for Alternative 3A (acres)	10-39
27	Table 10-9.	Summary of Site-Specific Vegetation Analysis for Alternative 4A (acres)	10-41
28	Table 10-10.	Summary of Site-Specific Vegetation Analysis for Alternative 5A (acres)	10-43
29	Table 10-11.	Summary of Site-Specific Vegetation Analysis for Alternative 6A (acres)	10-45
30	Table 11-1.	Summary of Fisheries and Aquatics Effects and Mitigation	11-1

11-8	Existing Conditions in Program Reaches	Table 11-2.	1
11-10	Special-Status Fish Species with the Potential to Occur in the Program Area	Table 11-3.	2
11-14	Central Valley Fish Species Potentially Affected by the Proposed Program	Table 11-4.	3
11-17	Assumed Life Stage Timing and Distribution of Selected Species Potentially Affected by the Proposed Program	Table 11-5.	4 5
11-20	Winter-Run Chinook Salmon Population Estimates and Corresponding Cohort Replacement Rates since 1986	Table 11-6.	6 7
11-22	Central Valley Spring-Run Chinook Salmon Population Estimates with Corresponding Cohort Replacement Rates since 1986	Table 11-7.	8 9
12-2	Summary of Wildlife Effects and Mitigation	Table 12-1.	10
12-10	Special-Status Wildlife Species with Potential to Occur in Program Area	Table 12-2.	11
12-45	Summary of Existing Bank Swallow Burrows in Close Proximity to Erosion Sites being Evaluated	Table 12-3.	12 13
13-1	Summary of Land Use and Agriculture Effects and Mitigation	Table 13-1.	14
13-2	Land Use in Program Area Counties (Percentage of Total County Acreage*)	Table 13-2.	15
13-6	Important Farmland Acreage in Program Area Counties, 2006	Table 13-3.	16
13-9	Acreages of Lands Enrolled in Williamson Act Contracts in 2007 by County	Table 13-4.	17
14-1	Summary of Recreation Effects and Mitigation	Table 14-1.	18
15-1	Summary of Population and Housing Effects	Table 15-1.	19
15-2	Populations by County for 2010	Table 15-2.	20
16-1	Summary of Utilities and Public Services Effects and Mitigation	Table 16-1.	21
17-1	Summary of Aesthetics Effects and Mitigation	Table 17-1.	22
17-13	Erosion Sites and Lengths along the Sacramento River and SR 160	Table 17-2.	23
18-1	Summary of Public Health and Environmental Hazards Effects and Mitigation	Table 18-1.	24
18-3	Known Hazardous Materials Sources in Program Area	Table 18-2.	25
19-2	Summary of Cultural Resources Effects and Mitigation	Table 19-1.	26
20-1	Summary of Socioeconomic and Environmental Justice Effects	Table 20-1.	27
20-2	Percentage of Population by Race/Origin Characteristics by County in 2011	Table 20-2.	28
20-3	Percentage of Households below Poverty Level by County and State in 2010	Table 20-3.	29
21-2	Summary of All Effects and Mitigation Measures, Including Sub-Alternatives	Table 21-1.	30

1	Table 22-1.	Additional Plans, Projects, and Programs Affecting Fish and Wildlife in the	
2		SRBPP Area22-	11

2		Follows Page
3	Figure ES-1	Project Vicinity ES-2
4	Figure ES-2	Location of Economically Justified Basins ES-12
5	Figure ES-3	Site-Specific Application of Bank Protection Measures for Alternative 2 ES-12
6	Figure ES-4	Site-Specific Application of Bank Protection Measures for Alternative 3 ES-12
7	Figure ES-5	Site-Specific Application of Bank Protection Measures for Alternative 4 ES-12
8	Figure ES-6	Site-Specific Application of Bank Protection Measures for Alternative 5 ES-12
9	Figure ES-7	Site-Specific Application of Bank Protection Measures for Alternative 6 ES-12
10	Figure 1-1	Program Vicinity1-2
11	Figure 1-2	Major Flood Risk Reduction Efforts in the Sacramento Valley1-6
12	Figure 2-1	Program Regions
13	Figure 2-2	Location of Economically Justified Basins2-14
14	Figure 2-3	Site-Specific Application of of Bank Protection Measures for Alternative 22-18
15	Figure 2-4	Site-Specific Application of of Bank Protection Measures for Alternative 32-18
16	Figure 2-5	Site-Specific Application of of Bank Protection Measures for Alternative 42-18
17	Figure 2-6	Site-Specific Application of of Bank Protection Measures for Alternative 52-18
18	Figure 2-7	Site-Specific Application of of Bank Protection Measures for Alternative 62-18
19	Figure 4-1	Conceptual Model of Downstream Changes in Bank Erosion Processes on page 4-16
20 21	Figure 11-1	Alternative 1 SAM results showing bank-line weighted relative response within all regions combined11-42
22 23	Figure 11-2	Alternative 2 SAM results showing bank-line weighted relative response within all regions combined11-42
24 25	Figure 11-3	Alternative 3 SAM results showing bank-line weighted relative response within all regions combined
26 27	Figure 11-4	Alternative 4 SAM results showing bank-line weighted relative response within all regions combined11-44
28 29	Figure 11-5	Alternative 5 SAM results showing bank-line weighted relative response within all regions combined

1 2	Figure 11-6	Alternative 6 SAM results showing bank-line weighted relative response within all regions combined1	.1-48
3 4 5	Figure 19-1	Probability of an Archaeological Site Existing within 70 Meters of a Given Point at Increasing Distances from a Permanent Water Source in the ARCF Project	19-8

## **Acronyms and Abbreviations**

ACHP	Advisory Council on Historic Preservation
ADAM	Aerometric Data Analysis and Management System
Alquist-Priolo Act	Alquist-Priolo Earthquake Fault Zoning Act
APE	area of potential effects
ARB	Air Resources Board
ARPA	Archaeological Resources Protection Act
ВА	biological assessment
BAAQMD	Bay Area Air Quality Management District
Basin Plan	Central Valley RWQCB's Water Quality Control Plan
BCAQMD	Butte County Air Quality Management District
BCFD	Butte County Fire Department
BLM	U.S. Bureau of Land Management
BMPs	best management practices
CAA	Clean Air Act
CAL FIRE	California Department of Forestry and Fire Protection
CalEPA	California Environmental Protection Agency
Cal-IPC	California Invasive Plant Council
CCAA	California Clean Air Act
CCAPCD	Colusa County Air Pollution Control District
CCR	California Code of Regulations
CDFA	California Department of Food and Agriculture
CEC	California Energy Commission
Central Valley RWQCB	Central Valley Regional Water Quality Control Board
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CH <sub>4</sub>	Methane
СНР	California Highway Patrol
CHRIS	California Historical Resources Information System
cm	centimeters
CNDDB	California Natural Diversity Database

CNPS	California Native Plant Society
CNPS	California Native Plant Society
CO <sub>2</sub>	carbon dioxide
CO <sub>2</sub> e	carbon dioxide equivalents
Common Features	American River Common Features Project
Comp Study	Sacramento–San Joaquin River Basins Comprehensive Study
Corps	U.S. Army Corps of Engineers
CRHR	California Register of Historical Resources
CSAs	county service areas
CSD	community service district
CSU Chico	California State University, Chico
CVFPA	Central Valley Flood Protection Act
CVFPB	Central Valley Flood Protection Board
CVFPP	Central Valley Flood Protection Plan
CVIFMS	Central Valley Integrated Flood Management Study
CVP	Central Valley Project
CWA	Clean Water Act
CWT	coded wire tag
dB	Decibel
dBA	A-Weighted Decibel
dbh	diameter at breast height
DE	Diatomaceous Earth
Delta	Sacramento Valley and Sacramento-San Joaquin Delta
Delta Study	Delta Islands and Levee Feasibility Study
DFW	California Department of Fish and Wildlife
DO	dissolved oxygen
DOI	Secretary of the Department of the Interior
DPM	diesel particulate matter
DPR	Department of Parks and Recreation
DPS	distinct population segment
DSC	Delta Stewardship Council
DTSC	Department of Toxic Substances Control
dW:dH	distance width to distance height
DWR	California Department of Water Resources
ECT	Electronic Calculation Template
EDR	Engineering Documentation Report

EFH	essential fish habitat
EIP	Early Implementation Program
EIR	Environmental Impact Report
EIS	environmental impact statement
EIS/EIR	Environmental Impact Statement/Environmental Impact Report
Environmental Checklist	State CEQA Guidelines
EPA	Environmental Protection Agency
ERDC	Engineer Research and Development Center
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FAA	Federal Aviation Administration
Final	Programmatic Biological Assessment for the Sacramento River Bank
	Protection Project, Phase II
FMMP	Farmland Mapping and Monitoring Program
formerly The Reclamation Board	Central Valley Flood Protection Board Encroachment Permit
FPDs	fire protection districts
fps	feet per second
FR	Federal Register
FRAQMD	Feather River Air Quality Management District
FRFH	Feather River Hatchery
g	gravity
GCAPCD	Glenn County Air Pollution Control District
GHGs	Greenhouse gases
GIS	geographic information system
GPTU	Butte County General Plan Technical Update
GRR	General Reevaluation Reports
GWP	global warming potential
HAPs	Hazardous Air Pollutants
HCPs	habitat conservation plans
HDLEVIP	Heavy-Duty Low-Emission Vehicle Incentive Programs
HEC-RAS	Hydrologic Engineering Center's River Analysis System
НРТР	Historic Properties Treatment Plan
I-5	Interstate 5
IPCC	Intergovernmental Panel on Climate Change
ITAs	Indian Trust Assets

IWG	Interagency Working Group
IWM	instream woody material
L <sub>eq</sub>	Equivalent Sound Level
LF	linear feet
LM	Levee Mile
LMAs	local maintaining agencies
$L_{max}$ and $L_{min}$	Maximum and minimum sound levels
LOS	level-of-service
L <sub>peak</sub>	Peak Sound Level
LRR	Limited Reevaluation Report
L <sub>xx</sub>	Percentile-Exceeded Sound Level
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MBTA	Migratory Bird Treaty Act
milligrams per liter	mg/l
mm	millimeter
MMP	maintenance and monitoring plan
MOA	Memorandum of Agreement
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSEWs	Mechanically stabilized earth walls
MSL	mean sea level
N <sub>2</sub> O	Nitrous oxide
NAGPRA	Native American Graves Protection and Repatriation Act
NAHC	Native American Heritage Commission
NCCPs	Natural Community Conservation Plans
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NLIP	Natomas Levee Improvement Project
NMFS	National Marine Fisheries Service
NOA	Notice of Availability
NOI	Notice of Intent
NOP	Notice of Preparation
NO <sub>X</sub>	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NTUs	nephelometric turbidity units
0&M	operation and maintenance
РА	Programmatic Agreement

PCAPCD	Placer County Air Pollution Control District
PCBs	polychlorinated biphenyls
PCWA	Placer County Water Agency
PG&E	The Pacific Gas and Electric Company
рН	potential of hydrogen
PM10	particulate matter smaller than 10 microns or less in diameter
PM2.5	2.5 microns or less in diameter
ppm	parts per million
ppt	parts per thousand
PPV	peak particle velocity
PRC	Public Resources Code
proposed program	Phase II Supplemental Authority
RBDD	Red Bluff Diversion Dam
RD	Reclamation District
RM	River Mile
ROG	reactive organic gases
RSSs	reinforced soil slopes
SAFCA	Sacramento Area Flood Control Agency
salmon FMP	Pacific Coast Salmon Fishery Management Plan
SAM	Standard Assessment Methodology
SBFCA	Sutter Butte Flood Control Agency
SCSD	Sutter County Sheriff's Department
SCWA	Sacramento County Water Agency
SFBAAB	San Francisco Bay Area Air Basin
SHPO	State Historic Preservation Officer
SIA	Sacramento International Airport
SIP	State Implementation Plan
SLC	California State Lands Commission
SMAQMD	Sacramento Metropolitan Air Quality Management District
SMARA	California Surface Mining and Reclamation Act of 1975 PRC Section 2710 et seq.
SMDs	sewer maintenance districts
SMUD	Sacramento Municipal Utility District
SO <sub>x</sub>	Sulfur Oxides
SPCCP	Spill Prevention, Control, and Countermeasure Plan
SR	State Route

SRA	shaded riverine aquatic
SRBPP	Sacramento River Bank Protection Project
SRBPPD	Sacramento Riverbank Protection Project Database
SRCSD	Sacramento Regional County Sanitation District
SRFCP	Sacramento River Flood Control Project
SRPS	South River Pump Station
SRRV	Sacramento River Riparian Vegetation
SVAB	Sacramento Valley Air Basin
SWP	State Water Project
SWPPP	Stormwater Pollution Prevention Plan
TACs	Toxic Air Contaminants
TCAPCD	Tehama County Air Pollution Control District
TCD	temperature control device
TCFD	Tehama County Fire Department
ТСР	traditional cultural properties
TCSLA	Tehama County Sanitary Landfill Association
TDS	total dissolved solids
TFCA	Transportation Fund for Clean Air
TMDLs	Total Maximum Daily Loads
TRLIA	Three Rivers Levee Improvement Authority
TSS	total suspended sediment
U.S. EPA	U.S. Environmental Protection Agency
UBC	Uniform Building Code
US-50	Highway 50
USC	United States Code
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
UYLIP	Upper Yuba River Levee Improvement Project
Valley	Sacramento Valley
Vegetation ETL	Guidelines for Landscape Planting and Vegetation Management at
	Floodwalls, Levees, Embankment Dams, and Appurtenant Structures
VFZ	vegetation-free zone
VRAP	Visual Resources Assessment Procedure
WDRs	Waste Discharge Requirements
WHMP	Wildlife Hazard Management Plan
WRDA	Water Resources Development Act

WSAFCA	West Sacramento Area Flood Control Agency
YSAQMD	Yolo-Solano Air Quality Management District
YSDI	Yuba-Sutter Disposal, Inc.
μS/cm	microSiemens per centimeter

1 2

### <sup>2</sup> ES.1 Introduction

This joint programmatic Environmental Impact Statement/Environmental Impact Report (EIS/EIR) 3 4 has been prepared for the Sacramento River Bank Protection Project (SRBPP) Phase II Supplemental Authority (proposed program) for implementation of up to 80,000 linear feet (LF) of additional 5 bank protection in the Sacramento River Flood Control Project (SRFCP) area, as authorized by 6 Section 3031 of the Water Resources Development Act (WRDA) of 2007 (Public Law [Pub. L.] No. 7 110-114, Section 3031, 121 Statutes [Stat.] 1041, 1113 (2007)). This EIS/EIR has been prepared by 8 the U.S. Army Corps of Engineers (Corps), which is federal lead agency, and the Central Valley Flood 9 Protection Board (CVFPB) (formerly The Reclamation Board), which is the state lead agency, in 10 accordance with the requirements of the National Environmental Policy Act (NEPA) and the 11 12 California Environmental Quality Act (CEQA).

13The purpose of this EIS/EIR is to disclose the environmental impacts and recommended mitigation14measures related to a proposed program and alternatives prior to making a decision on program15approval. A joint document may be prepared when both a federal and a state agency are involved.

16 Both NEPA and CEQA provide guidelines for the preparation of a programmatic EIS/EIR.

### 17 ES.2 Project Location

The SRBPP area (also referred to as the program area) is located along the Sacramento River and its
 tributaries and distributaries and spans Butte, Colusa, Glenn, Placer, Sacramento, Solano, Sutter,
 Tehama, Yolo, and Yuba Counties, California (Figure ES-1). The alternatives covered in this
 programmatic EIS/EIR are those associated with future repair of bank erosion sites on an additional

22 80,000 LF within the program area.

23The program area extends south-to-north along the Sacramento River from the town of Collinsville24at river mile (RM) 3 upstream to Chico at RM 194, and includes reaches of lower Elder and Deer25Creeks. The program area also includes Cache Creek, the lower reaches of the American River (RM260-23), Feather River (RM 0-61), Yuba River (RM 0-11), and Bear River (RM 0-17), as well as27portions of Threemile, Steamboat, Sutter, Miner, Georgiana, and Cache Sloughs. Sutter and Yolo

28 bypass levees are also located in the program area.

## 29 ES.3 Purpose and Need and Objectives

The SRBPP is a multi-year program to repair erosion problems affecting levees that are part of the SRFCP, which protects more than 1 million acres of agricultural land and communities in the Sacramento Valley and Sacramento–San Joaquin Delta (Delta). The levees in the central reaches of the Sacramento River were established close to streambanks to erode vast sediment deposits accumulated from hydraulic mining in the Sierra Nevada in the 1800s and to facilitate use of rich floodplain soils for agriculture. This sediment-removal purpose was met by about 1940, but the rivers, deprived of the natural energy dissipation of floodplains, have continued to erode laterally,

1	often undermining the toe of adjacent levees. <u>The upper reaches of the Sacramento River levees in</u>
2	the SRFCP are set back from the river and encounter erosive forces less frequently, but can still
3	<u>occasionally experience erosion during high winter flows. In the Delta region, high winter flows,</u>
4	boat wakes, and tides have eroded levee banks along the network of waterways that convey water
5	<u>toward the San Francisco Bay. <del>This</del> These o</u> ngoing problem <u>s</u> <del>has <u>have</u> two potential solutions as</del>
6	authorized under the SRBPP (The River Basin Monetary Authorization Act of 1974 (Pub. L. 93-251,
7	Section 202): 1) setback of levees to reduce floodflow depths and velocities and, thus, erosion of
8	natural banks, or 2) armoring existing or restored streambanks to resist the erosion.
9	The program purpose and objective is to arrest or avoid streambank erosion that threatens the
10	integrity of the SRFCP levee system. To protect property as well as the health and safety of residents,
11	bank repair and levee rehabilitation are needed at erosion sites. The proposed program will also
12	attempt to greatly minimize erosion, limiting the eventual loss of nearshore aquatic habitat and
13	riparian habitat that would likely occur if the proposed program were not enacted.
14	Levees within the program area provide flood damage risk reduction for the Sacramento Valley and
15	help convey water flowing from the Sierra Nevada to the Delta. Levees stressed by high winter flows
16	can weaken and fail. Implementation of an additional 80,000 LF of bank protection would ensure the
17	continued integrity of SRFCP levees <u>, reducing risk to residents, local economies</u> , <del>while protecting</del> and
18	<u>valuable</u> environmental resources <u>while and</u> compensating for significant effects to the degree
19	feasible. <del>Levees within the program area provide flood damage risk reduction for the Sacramento</del>
20	<del>Valley and help convey water flowing from the Sierra Nevada to the Delta. Levees stressed by high</del>
21	<del>winter flows can weaken and fail; t<u>T</u>o maintain the integrity of the flood control system, locations</del>
22	with a high failure potential would be identified and remedied through project implementation.
23	As part of the annual field reconnaissance reviews of the SRFCP, the Corps and its local sponsor, the
24	CVFPB, have found that the number of documented bank erosion sites in the inventory is increasing.
25	Specifically, the total number of erosion sites for the SRFCP increased from 152 in 2007 to 201 in
26	2012, despite some sites being repaired and status changes of other sites between the inventories
27	(Ayres Associates 2008:5; U.S. Army Corps of Engineers 2013:27).

### **ES.4** Summary Description of the Project

#### 29 ES.4.1 SRBPP Background

The original authorization for SRBPP in 1960 and a Phase II authorization in 1974 approved the
 construction of up to 835,000 LF of bank protection. The SRBPP is a continuing long-term project
 authorized by Section 203 of the Flood Control Act of 1960 (Pub. L. No. 86-645, Section 203, 74 Stat.
 480, 498 (1960)).

- The SRBPP was authorized to provide bank protection to maintain the integrity of the SRFCP through bank stabilization using stone protection and levee setbacks. Other methods recommended by the State of California have also been tested from time to time, including permeable dike systems (palisades) and dredge berms. The SRFCP consists of more than 1,000 miles of levees, plus overflow weirs, pumping plants, and bypass channels.
- The SRBPP is a local cooperation project. The Corps' Sacramento District serves as the federal
  participant responsible for implementation of the SRBPP with its non-federal partner, the CVFPB,





Figure ES-1 Program Vicinity

the state agency designated for non-federal responsibilities and cost sharing. The Corps (NEPA lead
 agency) and the CVFPB (CEQA lead agency) (referred to herein as Lead Agencies) have determined
 that a joint programmatic EIS/EIR is the most appropriate means to comply with both NEPA and
 CEQA because of the need for coordination among federal and state agencies, and the need to
 complete environmental review expeditiously.

WRDA of 2007 authorized construction of an additional 80,000 LF of bank protection under the 6 7 Phase II authorization. In 2008, the Corps' Sacramento District initiated development of a program 8 of action for this work under policiesas set forth in the SRBPP authorization and associated reports 9 of the Chief of Engineers, Policy Guidance on Implementation of Section 3031 of WRDA of 2007 [June 6, 2008], the Corps' planning process described in Engineer Regulation 1105-2-100 (Planning 10 Guidance Notebook)-provisions of its Planning Manual (1996) and technical engineering design 11 12 documents, NEPA, the federal Endangered Species Act (ESA), and other relevant environmental laws. 13

#### 14 ES.4.2 SRBPP Phases

15 The SRBPP has been congressionally authorized and implemented in phases. Phase I bank protection was authorized in the Flood Control Act of 1960 for 435,000 LF. It was completed in 1975 16 17 and resulted in 435,953 feet of bank protection. Current bank protection is being carried out under Phase II, which was authorized in 1974 for 405,000 LF under the River Basin Monetary 18 19 Authorization Act of 1974 (Pub. L. No. 93-252, Section 202, 88 Stat. 49 (1974)). Only about 4,966 LF of authorization remained after the 2012 construction season, and plans are under development to 20 construct the final increment. The proposed program, authorized through Section 3031 of the 21 WRDA 2007, is a continuation of Phase II and increases the amount of currently authorized bank 22 protection by 80,000 LF. Phase III (not evaluated as part of this proposed program) would involve 23 future work to protect the SRFCP on which planning has been initiated by the Corps but which 24 currently is not authorized. As construction of the Phase II supplemental authority is completed, 25 implementation of Phase III will be critical to ensuring SRFCP facilities seriously threatened by 26 erosion will receive corrective measures to prevent reduce the risk of levee failure, catastrophic 27 damage, and possible loss of life. 28

### 29 ES.4.3 Phase II Supplemental Authority (Proposed Program)

30The WRDA of 2007 added 80,000 LF of bank protection to Phase II. Before the original 197431authority runs out of linear footage, a Limited ReevaluationPost Authorization Change Report32(LRPACR) will be prepared to support revisions to the SRBPP for the additional 80,000 LF. The Post33Authorization Change (PACR) will demonstrate that the SRBPP Phase II 80,000 LF is technically34sound, is compliant with Corps policy, and meets environmental regulations.

35 The PACR and the supporting Engineering Documentation Report (EDR) will contain a programmatic plan that will apply a representative of 106 erosion sites documented in the Final 36 Alternatives Report (Kleinfelder-Geomatrix 2009). These 106 representative sites may or may not 37 receive bank protection under the new 80,000 LF authorization. The report lists sites that are 38 39 scattered along levees on the main Sacramento River, from Collinsville (RM 3) to Chico Landing (RM 194 [while the levees end at RM 184]), and tributaries and distributaries of the Sacramento River. 40 Tributaries include the American River, the Feather River, the Bear River, the Yuba River, and Cache 41 Creek, and distributaries include Steamboat, Sutter, Georgiana, and Cache Sloughs. 42

- 1 For the purposes of this EIS/EIR, the 106 selected erosion sites along the SRFCP are considered for
- 2 the supplemental 80,000 LF analysis. The number and extent of erosion sites change from year to
- 3 year because erosion is episodic and new erosion sites can appear each year. The analysis in this
- 4 EIS/EIR is programmatic in nature, analyzing the 80,000 LF in its entirety. Additional site-specific
- 5 environmental documentation tiering from this programmatic analysis will be conducted to address
- 6 sites proposed to be repaired. This EIS/EIR analyzes environmental impacts of constructing 80,000
- 7 LF of bank protection on SRFCP levees and increasing the existing Phase II authorization from
- 8 405,000 to 485,000 LF.

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## 9 ES.5 Proposed Site-Specific Bank Protection Measures

- The suite of SRBPP site-specific bank protection measures in the proposed program is described
  below with figures to support each measure. A bank protection measure is a site-specific design
  solution to control an existing erosion site while minimizing or mitigating environmental impacts.
- The following criteria have been developed for bank protection design, consistent with the project
  purpose and need.
- Restoring the flood damage risk reduction capability of the originally constructed levee through
  the use of structurally reliable erosion-control elements.
- To the extent practicable, maintaining fish and wildlife habitat and scenic and recreational
  values, and replacing habitat losses through the use of on-site mitigation elements overlying or
  integrated with erosion-control elements.
- Fully mitigating off-site significant residual fish and wildlife habitat losses to the extent justified.
  - Minimizing costs of construction and maintaining both erosion-control and on-site habitatmitigation elements.
- 23 The following measures are intended to meet these criteria while also meeting the Corps vegetation management policy as prescribed in Engineering Technical Letter 1110-2-583, Guidelines for 24 25 Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and Appurtenant Structures (Vegetation ETL) (U.S. Army Corps of Engineers 2014). The measures will also 26 comply with Implementation Guidance for Section 3013 of the Water Resources Reform and 27 Development Act of 2014, Vegetation Management Policy. For purposes of this EIS/EIR, the 28 vegetation-free zone (VFZ) is defined in the Vegetation ETL and encompasses the existing and new 29 levee footprint area and extending 15 feet outward of each levee toe. Vegetation would be restricted to 30 31 native grass in the VFZ (unless a Vegetation Variance Request is submitted and approved according to Policy Guidance Letter and October 2017 Implementation Guidance letter for the Water Resources 32 33 <u>Reform and Development Act of 2014</u>]. These measures are conceptual and will be modified to the degree necessary to be suitable for conditions at any given erosion site. As a result, dimensions in the 34 following figures are typical and will vary based on site-specific conditions and designs. 35

#### **ES.5.1** Bank Protection Measure 1–Setback Levee:

This measure entails constructing a new levee some distance landward of the existing levee and would avoid or minimize construction in the waterside or riparian areas. The land between the setback and existing levee would act as a floodplain. Land use in the new floodplain would be

- determined on a site-by-site basis. The old levee could be breached in several locations or degraded 1
- 2 to allow high flows to inundate the new floodplain. Vegetation on the new setback levee, including
- 3 15 feet beyond each toe, would be restricted to grass and managed as a VFZ, while vegetation could
- 4 remain on the existing levee. New vegetation planted in the setback area could serve as mitigation to offset project losses. Additionally, vegetation on the existing levee could become newly available to
- 5
- 6 aquatic species and contribute to a net increase in floodplain vegetation.

7 Measure 1 would be most applicable in areas where substantial habitat values exist along the 8

- channel and land uses in the setback area are not restrictive. Setback levees can be very effective,
- 9 but real estate acquisition (including the need for willing sellers), existing land use, and technical
- issues limit opportunities for setback levees in the program area. Setback levees may offer 10 opportunities for mitigation of riparian, bank swallow and fish habitat loss at other bank protection
- 11 sites and restore riverine processes. Setback levees may also provide other flood control benefits, 12
- such as addressing seepage issues or reducing pressure on banks and levees downstream, that other 13
- bank protection measures would not address. 14





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#### ES.5.2 Bank Protection Measure 2–Bank Fill Stone Protection 18 with No On-Site Woody Vegetation: 19

This measure, which entails filling the eroded portion of the bank and installing quarry stone along 20 the levee slope, is needed as determined by site-specific analysis. The rock/soil ratio of the fill would 21 22 vary by location and would be determined during site-specific design. Six inches of soil cover would be placed on the revetment above summer mean water surface elevation to support on-site cover 23 vegetation. Vegetation would be limited to native grass, and existing vegetation would be removed 24 within the VFZ. If there is a natural bank distinct from the levee that requires erosion protection, it 25 would be treated with revetment. Measure 2 would be most applicable in areas where there is 26 27 inadequate space or substantial constraints, either landside or waterside, or where hydraulic concerns would make it difficult to implement the other measures, or where existing habitat values 28 29 are very limited.


### <sup>2</sup> ES.5.3 Bank Protection Measure 3–Adjacent Levee:

This measure involves the construction of a new levee embankment adjacent to and landward of the 3 4 existing levee. The adjacent levee would be constructed to Corps design standards, which require 5 adjacent levees to be constructed with 3:1 slopes (distance width to distance height, or dW:dH) on both the waterside and landside. The landward portion of the existing levee would be an integral, 6 7 structural part of the new levee. The waterward portion of the existing levee would remain. Vegetation and instream woody material (IWM) could be placed on the old levee if that portion is 8 9 outside of the VFZ. However, a variance under the Vegetation ETL may be required if the existing levee is considered to be a waterside planting berm based on its dimensions and proximity to the new levee. 10 The existing levee may also be degraded to riparian and/or wetland benches that comply with the 11 12 Corps' vegetation management policy. Measure 3 would be appropriate at many sites where waterside berms are narrow or non-existent but landside uses limit the use of a setback levee. 13



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# ES.5.4 Bank Protection Measure 4–Riparian and Wetland Benches with Revegetation:

Measure 4 consists of three design variations presented as Measures 4a, 4b, and 4c. In general,
Measure 4 involves the placement of clean quarry stone from the toe of the bank up to the
summer/fall waterline and placing quarry stone and soil-filled quarry stone on the levee slope
above the summer/fall waterline. While Measures 4a, 4b, and 4c would comply with the Vegetation
ETL, requiring removal of all woody vegetation within the VFZ, plantings outside of the VFZ could
include a variety of native tree species.

- 1 Measures 4a, 4b, and 4c vary from one another with regard to the placement and extent of
- 2 environmental features that are intended to increase habitat quality (bank construction, vegetation,
- and IWM). These variations are driven by a number of factors, most importantly the types of existing
- 4 resources and the types of species likely to use those resources. For example, if the existing site is
- 5 downstream of Sacramento River Mile 30 and likely to be used by delta smelt, the new design would
- not include IWM below the summer/fall waterline, because IWM is not considered optimal habitat
   for delta smelt. New IWM would be installed downstream of RM 30 only to replace existing IWM
- removed during repair of the bank (1:1 ratio). Upstream of RM 30, new IWM is usually incorporated
- 8 removed during repair of the bank (1:1 ratio). Upstream of RM 30, new IWM is usually incorp into the design because dolta smalt aren't likely to be present.
- 9 into the design because delta smelt aren't likely to be present.
- 10 These measures are appropriate where the channel is wide enough to accommodate the installation 11 of the stone and soil structure without substantially affecting the hydraulic capacity of the channel.

## 12ES.5.4.1Bank Protection Measure 4a–Riparian Bench with Revegetation13and Instream Woody Material above Summer/Fall Waterline

Measure 4a entails installing revetment along the waterside levee slope or bank as well as a
rock/soil bench to support riparian vegetation and provide a place to anchor IWM. This design
provides near-bank, shallow-water habitat and components of shaded riverine aquatic (SRA) habitat
for fish and is typically applicable to sites upstream of Sacramento River Mile 30. Treatment of
existing vegetation, site preparation, and installation of revetment on the lower slope would be
similar to Measure 2.

- Measure 4a includes a riparian bench. The bench would be treated with soil-filled quarry stone and is intended to be inundated at river stages corresponding to high tide (where tidally influenced) or during average winter/spring flows. The riparian bench would be revegetated in compliance with
- the Vegetation ETL and in a manner similar to recent SRBPP projects with riparian bench designs.
- The riparian bench would be constructed at a slope of 6:1 to 10:1, and the revetment portion above
- and below the bench would typically have a 3:1 slope. The width of the bench would be
- approximately 10–30 feet, depending on site conditions. Anchored IWM would be embedded on top
- of the riparian bench above the summer/fall waterline. The IWM would be available as accessible
- habitat along the banks only during winter/spring flows, when the bench is inundated.
- 29



### 30 31

# 1ES.5.4.2Bank Protection Measure 4b–Riparian Bench with Revegetation2and Instream Woody Material above and below Summer/Fall3Waterline

Measure 4b entails installing revetment along the waterside levee slope and/or bank as well as a
 rock/soil bench (as described for Measure 4a) to support riparian vegetation and provide a place to

- 6 anchor IWM. IWM also would be placed beyond the bench below the summer/fall waterline, thereby
- 7 increasing the types and extent of mitigation for shallow-water fish habitat, providing year-round
- 8 instream habitat for targeted fish species. This design is typically applicable to sites upstream of
- 9 Sacramento River Mile 30. Treatment of existing vegetation, site preparation, and installation of
- lower slope quarry stone would be similar to Measure 2. Installation of soil-filled quarry stone and
   riparian bench would be similar to Measure 4a.



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## 14ES.5.4.3Bank Protection Measure 4c–Riparian and Wetland Benches15with Revegetation

Measure 4c entails installing revetment along the waterside levee slope and/or bank, as well as a 16 rock/soil bench to support riparian vegetation and provide a place to anchor IWM. Bench slopes 17 would be the same as those described for Measure 4a. The design also includes a wetland bench 18 19 below the summer/fall waterline to further increase habitat quality. This design is intended for sites downstream of Sacramento River Mile 30 and targets mitigation of impacts on delta smelt habitat. 20 21 Existing vegetation would be removed within the VFZ. Because IWM might increase habitat suitability of ambush predators, new IWM would be installed only to replace existing IWM removed 22 23 during project repair (1:1 ratio).

- 24 The riparian and wetland benches are intended to flood at river stages corresponding to
- 25 winter/spring (high) flows and summer/fall (low) flows, respectively. Both benches would be
- 26 revegetated in compliance with the Vegetation ETL.
- 27



# ES.5.5 Bank Protection Measure 5–Bank Fill Stone Protection with On-Site Vegetation:

Measure 5 entails filling the eroded portion of the bank and installing revetment along the waterside
 levee slope and streambank from streambed to a height determined by site-specific analysis.
 <u>Rock/soil combination revetment would be placed above summer mean water surface elevation.</u>
 The revetment would be placed at a slope of 3:1. All IWM would be removed from the bank and
 would not be replaced on the bank fill stone protection.

- Existing vegetation would be removed within the VFZ; however, grass would be allowed in this area. 10 Approximately 25% of existing vegetation that is outside of the VFZ on the waterside slope is 11 12 estimated to be retained during construction, although the actual amount of retained vegetation could vary substantially from site to site. New vegetation would be limited to native grasses within 13 14 the VFZ, while woody vegetation could be replaced by planting outside of the VFZ, as allowed by 15 site-specific conditions. The long-term goal of vegetation planting is to provide riparian and SRA 16 cover habitat as defined by the U.S. Fish and Wildlife Service (USFWS). Six inches of soil cover would 17 be placed on the revetment to support on-site vegetation. If there is a natural bank distinct from the
- 18 levee that requires erosion protection, it would be treated with revetment.
- Similar to Measure 2, Measure 5 would be most applicable in areas where there is inadequate space
   or substantial constraints that would limit the applicability of the other measures. However, some
- amount of space to allow for the planting of vegetation is necessary.
- 22

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#### **Additional Measures ES.5.6** 3

4 Additional measures may be considered and found to be appropriate during implementation of the 5 site-specific repairs. Design and analysis of any additional measures would be carried out during the site-specific planning and design phase. Examples of additional measures include toe protection, 6 7 flow modification (e.g., impermeable groins) and alternative materials in place of riprap.

#### ES.5.6.1 8 **Toe Protection**

9 Toe protection is authorized by SRBPP and could be considered for long-term erosion control. Toe protection entails filling the low-lying eroded portion of the bank to curtail further loss of the toe 10 11 and subsequent losses of the upper bank typically resulting from toe erosion. Because toe protection doesn't replace existing losses of material on the upper bank, which is often the condition at critical 12 13 sites, it is not considered a complete solution for critical sites. Consequently, toe protection has not been implemented recently because many erosion sites are considered to be at or near critical. A 14 site is considered "critical" when erosion encroaches into the cross-section of the levee foundation. 15

#### **Flow Modification** ES.5.6.2 16

Groins, or spurs, redirect or reduce erosive forces along the channel bank by diverting the stronger 17 currents and deflecting water away from the bank. By deflecting the current away from the bank 18 and causing sediment deposits, a spur or a series of spurs may protect the streambank more 19 20 effectively and at a lower cost than revetment. Spurs are also used to channelize a wide, poorly 21 defined stream into a well-defined channel that neither aggrades nor degrades, thus maintaining its 22 location from year to year. Spurs on streams with suspended sediment induce sedimentation to establish and maintain the new alignment. Dikes fall in the category of an erosion control or flow 23 24 diversion structure extending roughly perpendicular from a streambank that either diverts flow from the bank or reduces flow velocity adjacent to the bank. Flow diversion also can be 25 accomplished through biotechnical methods in some locations. For example, log brush barriers are 26 27 densely packed layers of branches and logs that divert stream flow from an eroding bank.

28 A bendway weir is an upstream-angled underwater sill. Water flowing over the weir is redirected at 29 an angle perpendicular to the weir. When weirs are angled upstream, water is directed away from the outer bank and toward the inner part of the bend, breaking up the river's strong secondary 30 31 currents. Weirs are typically built in sets (4 to 14 weirs per bend) and are designed to redirect

current directions and velocities through the bend and well into the downstream crossing. 32

#### ES.5.6.3 **Alternative Materials and Construction Methods** 33

#### **Reinforced Soil Slopes and Mechanically Stabilized Earth Walls** 34

35 Mechanically stabilized earth walls (MSEWs) are internally-reinforced soil structures with faces 36

angled 70 degrees to 90 degrees from horizontal. MSEWs stabilize unstable slopes and retain the

- soil on steep slopes and under crest loads. The wall face is often of precast segmental blocks, panels, 37
- or geocells that can tolerate some differential movement. The walls are infilled with granular soil, 38 39

the facing, forms the MSEW. Structures with slope angles less than 70 degrees are termed reinforced
 soil slopes (RSSs). An RSS is a compacted fill embankment that incorporates the use of horizontally.
 or both horizontally and vertically, placed geosynthetic reinforcement to enhance the stability of the
 soil structure.

5 MSEWs and RSSs use soil and rock with structural elements, such as geogrids, to provide for steeper stable slopes than typically occur naturally. These structures provide long-term stability yet can be 6 7 porous enough to provide filtration and support vegetated growth. Vegetated MSEW and RSS 8 structures can become stronger as root systems penetrate and grow throughout the retained mass, 9 providing a long-term vegetated solution for erosion and soil retention issues. The engineered 10 MSEWs and RSSs remain to provide stability during the time it takes vegetation to become established, as well as into the long term Engineered MSEWs and RSSs may remain to provide 11 stability while vegetation is getting established, or they may remain in place long term. The 12 advantage of these structures is a more natural appearance in areas with limited rights-of-ways or 13 unacceptable encroachment within the channel compared with some other repair methods. 14

### 15 Artificial Floating Structures

Artificial floating structures are modeled after natural floating islands formed when floating 16 vegetation grows and accumulates gas, or nutrient rich peat soil becomes buoyant, rises to the 17 surface, and is colonized by plants. Artificial floating structures are made of a recycled nontoxic 18 19 plastic mesh injected with marine foam for initial buoyancy. Artificial floating structures can be used to enhance fish habitat by simulating submerged, vegetated undercut banks and providing overhead 20 21 shaded cover. The resulting underwater root structure may provide important habitat, including 22 forage, refuge from predators, spawning substrate, and brood cover for many fish species. However, the potential for increased predation associated with artificial floating structures is not well 23 understood. Artificial floating structures might be useful in absorbing wave and wake energy, 24 25 modifying flows and hydraulic processes, complementing shoreline restoration, and providing 26 shallow water habitat. Artificial floating structures might be useful and practical in the Delta along 27 river banks where the current is not strong.

## 28 ES.6 Alternatives

### 29 **ES.6.1** Alternatives Development

- Consistent with NEPA and CEQA, a reasonable range of alternatives that would meet the project purpose and need, while avoiding or substantially lessening project effects (as required under CEQA), was evaluated. To comply with NEPA, this EIS/EIR analyzes all alternatives at the program level on an equal, non-preferential basis and at an equal level of detail. As required under NEPA and CEQA, a no action (no project) alternative has been included to allow the Lead Agencies to compare the effects of the proposed alternatives with the effects of taking no action.
- The alternatives were developed using those bank protection measures considered to reasonably
   meet the project's purpose, need, and objectives. Alternatives development also took into
- consideration an alternative's ability to eliminate significant adverse environmental impacts or
- reduce them to less-than-significant levels, as well as minimize any contribution to cumulativeimpacts.

In addition to the no action alternative, five action alternatives, as well as a sub-alternative of each 1 2 action alternative, are analyzed. The five action alternatives would apply a site-specific bank 3 protection measure (design solution) to each of the 106 representative sites. In general, selection of 4 bank protection measures at specific sites is based on consideration of the likely causes of erosion, local conditions that could impact repair and construction, and site-specific considerations for 5 6 vegetation, wildlife, land ownership, and access. The site-specific bank protection measure applied 7 to each site may vary from one alternative to another. For example, a setback levee may be applied to an erosion site under one alternative, while a bench alternative may be applied to that same site 8 9 under a different alternative. These variations allow for meeting the objectives of each alternative (e.g., minimizing impacts). 10

For bank protection measures to be feasible, they must comply with the Corps' Vegetation ETL in 11 12 accordance with current implementation guidance (U.S. Army Corps of Engineers 2014). The key aspect of the Vegetation ETL that is relevant to the development of feasible alternatives is its 13 requirement for a VFZ surrounding all levees and appurtenant structures. The VFZ must be free of 14 obstructions to ensure access by personnel and equipment for surveillance, inspection, 15 maintenance, monitoring, and flood-fighting. A secondary purpose is to provide a distance between 16 17 root systems and levees to moderate reliability risks associated with 1) piping and seepage, and 2) structural damage (e.g., wind-driven tree overturning). However, the Vegetation ETL does provide 18 19 for the use of a variance which, when justified, allows for some vegetation to remain within the VFZ. Alternative 6 includes variations of the previously described bank protection measures in that there 20 21 is sometimes vegetation within the VFZ. As a result, Alternative 6 would rely on a variance to the Vegetation ETL. 22

- All of the alternatives described below could be implemented in a variety of ways. Examples of
   potential implementation strategy variables are listed below.
  - Annual construction rate.

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- Annual geographic distribution (e.g., sites distributed among more than one region, all sites within one region/basin.
  - Use of off-site/out-of-kind mitigation that contributes to listed species recoverythat provides the greatest benefit to the listed species.

Additionally, implementation may be influenced by a benefit-cost analysis. In accordance with Corps
 policy, all water resources projects must have a federal interest and be justified by showing
 beneficial outputs greater than costs. While the traditional approach has been to look at the erosion
 sites in the aggregate (e.g., all 106 representative sites together), and that approach will likely
 continue, economic flood damages within individual basins or reclamation districts, maintenance
 areas, or levee districts would be a priority consideration in site selection.

A preliminary analysis has indicated that flood damage reduction in certain less-developed regions 36 37 in the program area that are primarily agricultural with fewer damageable structures are not likely to meet the economic benefit-cost criterion. During the implementation phase, it may be difficult to 38 justify bank protection for levees that protect these regions. In these areas, bank protection may be 39 justified where there is a substantial risk to life safety. Risk to public safety can also be managed in 40 these areas through other means such as the Public Law 84-99 Rehabilitation and Inspection 41 42 Program, which allows the Corps to undertake activities including advance measures, emergency 43 operations, and rehabilitation of flood control works threatened or destroyed by floods. Accordingly, this EIS/EIR considers a set of sub-alternatives within these "economically justified basins." A subset 44







Figure ES-3 Site-Specific Application of Bank Protection Measures for Alternative 2



Figure ES-4 Site-Specific Application of Bank Protection Measures for Alternative 3





### Figure ES-5 Site-Specific Application of Bank Protection Measures for Alternative 4





### Figure ES-6 Site-Specific Application of Bank Protection Measures for Alternative 5



### Figure ES-7 Site-Specific Application of Bank Protection Measures for Alternative 6

- 1 of the 106<u>representative</u> sites is analyzed under each action alternative. The subset, or sub-
- 2 alternative, represents the erosion sites within seven basins that are most likely to satisfy the more
- 3 restrictive approach to the benefit-cost analysis (Figure ES-2). Table ES-1 identifies the specific bank
- 4 protection measures assigned to each of the 106 <u>representative</u> sites, and includes a notation for the
- subset of erosion sites that are within the economically justified basins. Figures ES-3 through ES-7
   show the distribution of the specific bank protection measures for each of the action alternatives.
- Following Table ES-1 is a general description of the six alternatives, which consist of the no action
   alternative, and five action alternatives and their sub-alternatives.

#### 1 Table ES-1. Site-Specific Application of Bank Protection Measures by Alternative

					Site Length Bank Protection Measures by Alte					y Altern	ernative				
Region	Site Identification				(feet)	Alt 2A	Alt 2B	Alt 3A	Alt 3B	Alt 4A	Alt 4B	Alt 5A	Alt 5B	Alt 6A	Alt 6B
1a+ <u>^</u>	Cache Creek	LM	3.9	L	433	2	2	1	1	1	1	1	1	1	1
1a	Cache Slough	RM	15.9	L	182	2		3		2		1		4c	
1a	Cache Slough	RM	22.8	R	630	2		1		4c		4c		4c	
1a	Cache Slough	RM	23.6	R	1,209	2		3		2		1		4c	
1a	Deep Water Ship Channel	LM	5.0	L	N/A	N/A		N/A		N/A		N/A		N/A	
1a	Deep Water Ship Channel	LM	5.01	L	N/A	N/A		N/A		N/A		N/A		N/A	
1a	Georgiana Slough	RM	0.3	L	1,027	2		1		1*		1		4c	
1a	Georgiana Slough	RM	1.7	L	1,250	2		1		1*		1		4c	
1a	Georgiana Slough	RM	2.5	L	736	2		1		1*		1		4c	
1a	Georgiana Slough	RM	3.6	L	1,364	2		1		1*		1		4c	
1a	Georgiana Slough	RM	3.7a	L	209	2		1		1*		1		4c	
1a	Georgiana Slough	RM	3.7b	L	268	2		1		1*		1		4c	
1a	Georgiana Slough	RM	4.0	L	705	2		1		1*		1		4c	
1a	Georgiana Slough	RM	4.3	L	1,319	2		3		3*		3		4c	
1a	Georgiana Slough	RM	4.5	L	90	2		3		3*		3		4c	
1a	Georgiana Slough	RM	4.6	L	1,346	2		3		3*		3		4c	

#### Bank Protection Measures Legend

N/A: No Action

1: Setback Levee

2: Bank Fill Stone Protection with No On-Site Woody Vegetation

3: Adjacent Levee

4a: Riparian Bank with Revegetation and Instream Woody Material above Summer/Fall Waterline

4b: Riparian Bench with Revegetation and Instream Woody Material above and below Summer/Fall Waterline

4c: Riparian and Wetland Benches with Revegetation

**Executive Summary** 

					Site Length			Bank	Protect	ion Mea	isures b	y Alterr	native		
Region	Site Identification				(feet)	Alt 2A	Alt 2B	Alt 3A	Alt 3B	Alt 4A	Alt 4B	Alt 5A	Alt 5B	Alt 6A	Alt 6B
1a	Georgiana Slough	RM	5.3	L	3,171	2		3		3*		3		4c	
1a	Georgiana Slough	RM	6.1	L	1,729	2		3		3		3		4c	
1a	Georgiana Slough	RM	6.4	L	398	2		1		1*		1		4c	
1a	Georgiana Slough	RM	6.6	L	744	2		1		1*		1		4c	
1a	Georgiana Slough	RM	6.8	L	1,335	2		1		3		3		4c	
1a	Georgiana Slough	RM	8.3	L	483	2		3		3		3		4c	
1a	Georgiana Slough	RM	9.3	L	1,228	2		3		4c		4c		4c	
1a+ <u>^</u>	Knights Landing Ridge Cut	LM	0.2	R	768	2	2	3	3	2	2	2	2	5	5
1a	Knights Landing Ridge Cut	LM	3.0	L	1,279	2		2		2		2		5	
1a	Knights Landing Ridge Cut	LM	3.1	L	368	2		2		2		2		5	
1a	Knights Landing Ridge Cut	LM	4.3	L	577	2		2		2		2		5	
1a	Knights Landing Ridge Cut	LM	5.3	L	8,564	2		2		2		2		5	
1a	Steamboat Slough	RM	18.8	R	485	2		3		3		3		4c	
1a	Steamboat Slough	RM	23.2	L	N/A	N/A		N/A		N/A		N/A		N/A	
1a+	Steamboat Slough	RM	23.9	R	369	2	2	3	3	3	3	3	3	4c	4c
1a+	Steamboat Slough	RM	24.7	R	911	2	2	3	3	3	3	3	3	4c	4c
1a	Steamboat Slough	RM	25.0	L	272	2		3		3		3		4c	
1a+	Steamboat Slough	RM	25.8	R	244	2	2	3	3	3	3	3	3	4c	4c

#### **Bank Protection Measures Legend**

N/A: No Action

1: Setback Levee

2: Bank Fill Stone Protection with No On-Site Woody Vegetation

3: Adjacent Levee

4a: Riparian Bank with Revegetation and Instream Woody Material above Summer/Fall Waterline

4b: Riparian Bench with Revegetation and Instream Woody Material above and below Summer/Fall Waterline

4c: Riparian and Wetland Benches with Revegetation

**Executive Summary** 

	S				Site Length Bank Protection Measures by Alternative						ative				
Region	Site Identification				(feet)	Alt 2A	Alt 2B	Alt 3A	Alt 3B	Alt 4A	Alt 4B	Alt 5A	Alt 5B	Alt 6A	Alt 6B
1a	Steamboat Slough	RM	26.0	L	516	2		3		3		3		4c	
1a	Sutter Slough	RM	24.7	R	1,736	2		1		1		1		4c	
1a+	Sutter Slough	RM	26.5	L	568	2	2	3	3	4c	4c	4c	4c	4c	4c
1a	Willow Slough	LM	0.2	L	N/A	N/A									
1a	Willow Slough	LM	0.7	L	N/A	N/A									
1a	Willow Slough	LM	6.9	R	869	2		3		2		2		5	
1a	Yolo Bypass	LM	0.1	R	430	2		3		2		2		5	
1a	Yolo Bypass	LM	2.0	R	563	2		3		2		2		5	
1a	Yolo Bypass	LM	2.5	R	148	2		3		5		5		5	
1a	Yolo Bypass	LM	2.6	R	N/A	N/A									
1a	Yolo Bypass	LM	3.8	R	1,860	2		3		2		2		5	
1b	Lower American River	RM	7.3	R	N/A	N/A									
1b	Sacramento River	RM	21.5	L	162	2		3		4c		4c		4c	
1b	Sacramento River	RM	22.5	L	852	2		3		4c		4c		4c	
1b	Sacramento River	RM	22.7	L	309	2		3		3		3		4c	
1b	Sacramento River	RM	23.2	L	589	2		3		3		3		4c	
1b	Sacramento River	RM	23.3	L	257	2		3		4c		4c		4c	
1b	Sacramento River	RM	24.8	L	782	2		3		2		3		4c	

#### Bank Protection Measures Legend

N/A: No Action

1: Setback Levee

2: Bank Fill Stone Protection with No On-Site Woody Vegetation

3: Adjacent Levee

4a: Riparian Bank with Revegetation and Instream Woody Material above Summer/Fall Waterline

4b: Riparian Bench with Revegetation and Instream Woody Material above and below Summer/Fall Waterline

4c: Riparian and Wetland Benches with Revegetation

**Executive Summary** 

			Site Length Bank Protection Measures by Alternative												
Region	Site Identification				(feet)	Alt 2A	Alt 2B	Alt 3A	Alt 3B	Alt 4A	Alt 4B	Alt 5A	Alt 5B	Alt 6A	Alt 6B
1b	Sacramento River	RM	25.2	L	338	2		3		4c		4c		4c	
1b	Sacramento River	RM	31.6	R	446	2		3		5		5		5	
1b**	Sacramento River	RM	35.3	R	197	2		3		4a		4a		4a	
1b**	Sacramento River	RM	35.4	R	96	2		3		4a		4a		4a	
1b	Sacramento River	RM	38.5	R	359	2		1		5		5		5	
1b+ <u>^</u>	Sacramento River	RM	56.5	R	373	2	2	3	3	4b	4b	4b	4b	4b	4b
1b+ <u>^</u>	Sacramento River	RM	56.6	L	86	2	2	3	3	4a	4a	4a	4a	4a	4a
1b+ <u>^</u>	Sacramento River	RM	56.7	R	665	2	2	3	3	4b	4b	4b	4b	4b	4b
1b+***	Sacramento River	RM	58.4	L	707	2	2	3	3	5	5	5	5	5	5
1b+	Sacramento River	RM	60.1	L	455	2	2	3	3	4a	4a	3	3	4a	4a
1b+ <u>^</u>	Sacramento River	RM	62.9	R	175	2	2	3	3	4b	4b	4b	4b	4b	4b
1b+ <u>^</u>	Sacramento River	RM	63.0	R	87	2	2	3	3	4b	4b	4b	4b	4b	4b
1b	Sacramento River	RM	74.4	R	200	2		3		4b		4b		4b	
1b	Sacramento River	RM	75.3	R	2,761	2		3		5		3		5	
1b	Sacramento River	RM	77.7	R	224	2		3		5		5		5	
1b+ <u>^</u>	Sacramento River	RM	78.3	L	657	2	2	3	3	5	5	4b	4b	5	5
2 <u>^</u>	Bear River	RM	0.8	L	233	2		3		5		5		5	
2	Cherokee Canal	LM	14.0	L	N/A	N/A									

#### **Bank Protection Measures Legend**

N/A: No Action

1: Setback Levee

2: Bank Fill Stone Protection with No On-Site Woody Vegetation

3: Adjacent Levee

4a: Riparian Bank with Revegetation and Instream Woody Material above Summer/Fall Waterline

4b: Riparian Bench with Revegetation and Instream Woody Material above and below Summer/Fall Waterline

4c: Riparian and Wetland Benches with Revegetation

**Executive Summary** 

					Site Length Bank Protection Measures by Alternative										
Region	Site Identification				(feet)	Alt 2A	Alt 2B	Alt 3A	Alt 3B	Alt 4A	Alt 4B	Alt 5A	Alt 5B	Alt 6A	Alt 6B
2	Cherokee Canal	LM	21.9	L	1,800	2		5		5		5		5	
2 <u>^</u>	Feather River	RM	0.6	L	288	2		3		4a		4a		4a	
2 <u>^</u>	Feather River	RM	5.0	L****	910	2		3		4a		4a		4a	
2	Sacramento River	RM	86.3	L	3,134	2		3		5		5		5	
2**	Sacramento River	RM	86.5	R	72	2		3		4b		4b		4b	
2	Sacramento River	RM	86.9	R	289	2		3		4b		4b		4b	
2	Sacramento River	RM	92.8	L	200	2		3		5		5		5	
2	Sacramento River	RM	95.8	L	190	2		3		5		5		5	
2	Sacramento River	RM	96.2	L	560	2		3		5		4b		5	
2	Sacramento River	RM	99.0	L	160	2		3		5		5		5	
2	Sacramento River	RM	101.3	R	352	2		1		4b		4b		4b	
2	Sacramento River	RM	103.4	L	N/A	2		N/A		N/A		N/A		N/A	
2	Sacramento River	RM	104.0	L	3,459	2		3		5		4b		5	
2	Sacramento River	RM	104.5	L	301	2		3		4a		4a		4a	
2	Sacramento River	RM	116.0	L	612	2		1		4a		4a		4a	
2	Sacramento River	RM	116.5	L	2,465	2		3		4a		1		4a	
2	Sacramento River	RM	122.0	R	248	2		3		4b		4b		4b	
2	Sacramento River	RM	122.3	R	341	2		1		4b		4b		4b	

#### Bank Protection Measures Legend

N/A: No Action

1: Setback Levee

2: Bank Fill Stone Protection with No On-Site Woody Vegetation

3: Adjacent Levee

4a: Riparian Bank with Revegetation and Instream Woody Material above Summer/Fall Waterline

4b: Riparian Bench with Revegetation and Instream Woody Material above and below Summer/Fall Waterline

4c: Riparian and Wetland Benches with Revegetation

**Executive Summary** 

				Site Length Bank Protection Measures by Alternative											
Region	Site Identification				(feet)	Alt 2A	Alt 2B	Alt 3A	Alt 3B	Alt 4A	Alt 4B	Alt 5A	Alt 5B	Alt 6A	Alt 6B
2	Sacramento River	RM	123.3	L	208	2		3		4b		4b		4b	
2	Sacramento River	RM	123.7	R	120	2		3		4a		4a		4a	
2	Sacramento River	RM	127.9	R	801	2		1		5		4a		5	
2	Sacramento River	RM	131.8	L	339	2		1		4a		1		4a	
2	Sacramento River	RM	132.9	R	363	2		1		4a		4a		4a	
2	Sacramento River	RM	133.0	L	1,291	2		3		4a		4a		4a	
2	Sacramento River	RM	133.8	L	197	2		3		4a		4a		4a	
2	Sacramento River	RM	136.6	L	615	2		3		4a		4a		4a	
2	Sacramento River	RM	138.1	L	1,365	2		1		4a		1		4a	
2	Yuba River	LM	2.3	L	1,356	2		1		1		1		1	
3	Deer Creek	LM	2.4	L	496	2		3		5		3		5	
3	Elder Creek	LM	1.44	L	334	2		3		4a		4a		4a	
3	Elder Creek	LM	3.0	R	65	2		3		4a		4a		4a	
3	Elder Creek	LM	4.1	L	N/A	N/A									
3+ <u>^</u>	Sacramento River	RM	152.8	L	198	2	2	3	3	4b	4b	4b	4b	4b	4b
3+ <u>^</u>	Sacramento River	RM	163.0	L	1,213	2	2	3	3	4b	4b	1	1	4b	4b
3+ <u>^</u>	Sacramento River	RM	168.3	L	546	2	2	1	1	4b	4b	1	1	4b	4b
3+ <u>^</u>	Sacramento River	RM	172.0	L	525	2	2	1	1	4b	4b	1	1	4b	4b

### Bank Protection Measures Legend

N/A: No Action

1: Setback Levee

2: Bank Fill Stone Protection with No On-Site Woody Vegetation

3: Adjacent Levee

4a: Riparian Bank with Revegetation and Instream Woody Material above Summer/Fall Waterline

4b: Riparian Bench with Revegetation and Instream Woody Material above and below Summer/Fall Waterline

4c: Riparian and Wetland Benches with Revegetation

		Site Length			Bank	Protect	ion Mea	asures b	y Alterr	ative		
Region	Site Identification	(feet)	Alt 2A	Alt 2B	Alt 3A	Alt 3B	Alt 4A	Alt 4B	Alt 5A	Alt 5B	Alt 6A	Alt 6B
+ Site <del>is</del> w	+ Site <u>iswas</u> located within an economically justified basin <u>at time of analysis</u> .											
<u>^ Site is l</u>	Site is located within an economically justified basin at time of Final EIS/EIR publication.											
* Design	(setback or adjacent levee) combined with adjacent s	sites.										
** Sacrar	nento River 35.3R, 35.4R, and 86.5R have been repai	ired.										
*** Thoug	gh Sacramento River 58.4L is not a currently invento	ried erosion si	te, nor h	as it ev	er been	, it cons	titutes a	repres	entative	site for	the pu	poses
of the	programmatic SAM and EIS/EIR analyses. As previou	usly described	, additio	nal proj	ect-leve	el enviro	onmenta	al docun	nentatio	on, tierir	ng from	this
progra	ammatic analysis, will be prepared to address those s	sites that will b	oe consti	ucted.								

\*\*\*\* Feather River 5.0L was mistakenly called Feather River 4.9L in previous documents.

LM = levee mile; RM = river mile; L = left bank; R = right bank.

1

#### **Bank Protection Measures Legend**

N/A: No Action

1: Setback Levee

2: Bank Fill Stone Protection with No On-Site Woody Vegetation

3: Adjacent Levee

4a: Riparian Bank with Revegetation and Instream Woody Material above Summer/Fall Waterline

4b: Riparian Bench with Revegetation and Instream Woody Material above and below Summer/Fall Waterline

4c: Riparian and Wetland Benches with Revegetation

### 1 ES.6.2 Alternative 1–No Action

Under the No Action Alternative, regular operation and maintenance (0&M) of the levee system 2 3 would continue as presently executed by the local maintaining entities in accordance with the existing governing O&M manual, but the Corps would not implement bank protection along SRFCP 4 5 levees. The result is likely to be the continued gradual or sporadic loss of remnant floodplain (berm) and the riparian vegetation it supports, and ultimately the erosion could encroach into the cross 6 7 section of the levee foundation, creating critical erosion sites. It is possible that federal or state flood 8 control agencies or local maintaining agencies eventually would implement bank protection at 9 various sites along SRFCP levees through emergency action. In any case, the risk of levee failure and possibly catastrophic flooding would increase substantially as more erosion sites become critical 10 and repair is limited to emergency response. Continued erosion prior to the federal or state action 11 would result in short- and long-term losses of valuable habitat. Although some erosion is natural, the 12 channelization of project reaches increases erosive forces. 13

### 14 ES.6.3 Alternative 2A–Low Maintenance

Alternative 2A applies Bank Protection Measure 2: Bank Fill Stone Protection with No On-Site
 Woody Vegetation to all-106 representative sites. This alternative utilizes the simplest engineering
 design and would rely almost exclusively on off-site mitigation.

# ES.6.4 Sub-Alternative 2B–Low Maintenance within Economically Justified Basins

Sub-Alternative 2B applies Bank Protection Measure 2: Bank Fill Stone Protection with No On-Site
 Woody Vegetation to 18 sites erosion sites within the seven economically justified basins only.

## 22 ES.6.5 Alternative 3A–Maximize Meander Zone

Alternative 3A applies Bank Protection Measure 1: Setback Levee or Bank Protection Measure 3: 23 24 Adjacent Levee to all 106 representative sites. This alternative minimizes instream construction and 25 would rely heavily on on-site mitigation, potentially creating a surplus of mitigation credit. The Setback Levee measure is applied unless there are substantial constraints that limit the effectiveness 26 or feasibility of that measure, in which case the Adjacent Levee measure is applied. Examples of 27 28 limited effectiveness or feasibility include floodplain elevations or soil conditions that are not 29 suitable for habitat restoration, hydraulic constraints (e.g., the measure would adversely affect flow 30 splits), or the presence of substantial existing development. The Adjacent Levee measure would be applied in these situations. Table ES-1 identifies the specific bank protection measures assigned to 31 each site. 32

## ES.6.6 Sub-Alternative 3B–Maximize Meander Zone within Economically Justified Basins

Sub-Alternative 3B applies Bank Protection Measure 1: Setback Levee or Bank Protection Measure
 3: Adjacent Levee to 18 sites erosion sites within the seven economically justified basins only. Table
 ES-1 identifies the specific bank protection measures assigned to each site.

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## **ES.6.7** Alternative 4A–Habitat Replacement

2 Alternative 4A applies a combination of site-specific bank protection measures (Bank Protection Measures 1-5), and utilizes the bank protection measures recommended in the Final Alternatives 3 Report to the extent that they comply with the Vegetation ETL (Kleinfelder-Geomatrix 2009). Some 4 5 sites would not be compliant with the Vegetation ETL if the bank protection measures 6 recommended in the Final Alternatives Report were applied. These particular sites were 7 reevaluated and compliant bank protection measures were then applied. Factors taken into account 8 in application of bank protection measures to non-compliant sites included general planning and 9 engineering issues as well as habitat, hydraulic, and land use considerations. Off-site mitigation may 10 be acceptable on a site-specific basis provided that the mitigation compensates for the values being lost, and mitigation is provided within the region of impact (i.e., 1a, 1b, 2, or 3). This alternative 11 12 utilizes the approach taken over the last decade, which primarily focused on the re-creation of streambank habitats through the use of constructed benches with riparian vegetation, but makes 13 14 adjustments to account for implementation of the Vegetation ETL. The adjustments result in an 15 increased use of setback and adjacent levees. Table ES-1 identifies the specific bank protection measures assigned to each site. 16

## ES.6.8 Sub-Alternative 4B–Habitat Replacement within Economically Justified Basins

Sub-Alternative 4B applies a combination of site-specific bank protection measures to <del>18</del> <del>sites</del>erosion sites within the seven economically justified basins <u>only</u>. Table ES-1 identifies the specific bank protection measures assigned to each site.

# ES.6.9 Alternative 5A–Habitat Replacement Reaching Environmental Neutrality

Alternative 5A is similar to Alternative 4 in that it relies on the Final Alternatives Report's 24 25 recommended bank protection measures and modifies those that were not Vegetation ETL 26 compliant. Alternative 5 differs in that it minimizes the use of off-site mitigation through the 27 application of fewer site-specific bank protection measures that result in adverse habitat effects. Alternative 5 builds on the analysis of Alternative 4 and replaces certain site-specific bank 28 29 protection measures that resulted in substantial environmental deficits as calculated by the Corps' Standard Assessment Methodology (SAM) or estimated losses of riparian vegetation. Environmental 30 31 neutrality is defined as full replacement or greater of riparian vegetation losses. While mitigation outside of SRBPP sites is not anticipated under this alternative, it is considered acceptable if 32 ultimately needed and would be provided within the region of impact (e.g., 1a, 1b, 2, or 3). Table 33 ES-1 identifies the specific bank protection measures assigned to each site. 34

# ES.6.10 Sub-Alternative 5B–Habitat Replacement Reaching Environmental Neutrality within Economically Justified Basins

Sub-Alternative 5B applies a combination of site-specific bank protection measures to <del>18</del>
 <del>siteserosion sites</del> within <del>the seven economically justified basins <u>only</u>. Table ES-1 identifies the
 specific bank protection measures assigned to each site.
</del>

## 7 ES.6.11 Alternative 6A–Habitat Replacement with ETL Variance

Alternative 6A applies the bank protection measures from the Final Alternatives Report without 8 modification (Bank Protection Measures 1, 4a, 4b, 4c, and 5). While setback levees are included in 9 10 the Final Alternatives Report, they were applied to very few sites as a result of the design selection process because the process required identification of a willing seller prior to a site being 11 considered for a setback levee. A number of the bank protection measures utilized include 12 protection of existing vegetation and placement of on-site mitigation vegetation within the VFZ and 13 14 would require a Vegetation ETL variance. The area where vegetation would be preserved under a variance is typically that which is on the lower two-thirds of the waterside levee slope and the area 15 within 15 feet of the waterside levee toe. The portion of vegetation within this area that does not 16 need to be removed for construction purposes would be retained. Additionally, this area could be 17 planted as a part of project construction if there are portions without vegetation. Off-site mitigation 18 19 may be acceptable on a site-specific basis provided that the mitigation compensates for the values being lost and would be provided within the region of impact (e.g., 1a, 1b, 2, or 3). Table ES-1 20 identifies the specific bank protection measures assigned to each site. 21

# ES.6.12 Sub-Alternative 6B–Habitat Replacement with ETL Variance within Economically Justified Basins

Sub-Alternative 6B applies the bank protection measures from the Final Alternatives Report without
 modification to 18 sites erosion sites within the seven economically justified basins only. A number
 of these bank protection measures include protection of existing vegetation and placement of on-site
 mitigation vegetation within the VFZ and would require a Vegetation ETL variance. Off-site
 mitigation is acceptable and would be provided within the region of impact (e.g., 1a, 1b, 2, or 3).
 Table ES-1 identifies the specific bank protection measures assigned to each site.

## 30 ES.6.13 Preferred Alternative

The Corps and CVFPB have identified Alternative 4A (and Sub Alternative 4B) as the preferred 31 alternative. The selection was made based on Alternative  $4\underline{A}$ 's ability to meet the project purpose 32 and objectives, engineering and economic feasibility, and mitigation of environmental effects. This 33 alternative utilizes the repair design approach employed over the past decade, which primarily 34 focused on creating waterside benches revegetated with native riparian plants inundated during 35 winter-spring flows to target utilization of migrating fish. Under this alternative, up to 80,000 LF of 36 erosion protection would be constructed within economically justified basins. Based on the latest 37 economic analysis, there are 7 economically justified basins currently identified, and these are 38 39 represented as Alternative 4B for the purpose of this analysis. The project would be implemented as In the short-term, project implementation would be similar to Sub-Alternative 4B, but the basins 40

that are included in <del>this</del> that alternative <del>may</del> will change <del>as</del> based on subsequent economic analysis 1 2 is conducted. The Corps will continue to update the economic analysis approximately every 5 years 3 and/or as erosion sites are identified in areas not evaluated. In addition, there may be some 4 refinement of the determination of basins as units for this analysis through further engineering and economic assessment. Erosion sites identified outside economically justified basins would will be 5 6 referred to the nonfederal sponsor and local maintaining agencies for construction, which may 7 trigger through a Section 408 action permit (33 United States Code Section 408), which would be triggered by the for alteration of a federal project levee. 8

# 9 ES.6.14 Environmentally Preferable 10 Alternative/Environmentally Superior Alternative

Alternative 3A is the environmentally superior alternative under CEQA and the environmentally preferable alternative under NEPA. While there are many similarities among the environmental effects associated with Alternatives 3A through 6A, Alternative 3A is superior because it minimizes construction-related effects associated with water quality, vegetation, fish, and wildlife. In addition, Alternative 3A is the most consistent with natural resource agency input received during the public scoping process. Although the No Action Alternative would cause fewer direct environmental effects than Alternative 3A, it would not meet the proposed program's purpose and need or objectives.

18 It should be noted that Alternative 3A is expected to have somewhat greater effects with regard to 19 traffic and air quality. Additionally, Alternative 3A does not provide the most improvements to fish 20 habitat as determined by the SAM when compared with Alternatives 4A through 6A. However, 21 Alternative 3A would cause the least disruption to existing fish and riparian habitat and would 22 provide substantial opportunities for floodplain restoration. Effects on land use and higher costs 23 associated with land purchase and construction are considered substantial challenges to Alternative

24

3A.

## **ES.7** Conclusions of the Environmental Analysis

NEPA and CEQA are similar in that both laws require the preparation of an environmental study to evaluate the environmental effects of proposed lead agency activities. However, there are several differences between the two laws regarding terminology, procedures, environmental document content, and substantive mandates to protect the environment. For this environmental evaluation, the more rigorous of the two laws was applied in cases in which NEPA and CEQA differ. This is described further in Chapter 3, Guide to Effects Analysis.

## 32 ES.7.1 Effects and Mitigation Measures

- The proposed alternatives could result in significant or beneficial effects on various resources,
   depending on which alternative bank protection measure is implemented at individual repair sites.
- 35
- 36 Table ES-2 summarizes the findings of effects before mitigation and the proposed mitigation
- 37 measures to avoid or reduce significant effects, and also indicates whether implementation of
- recommended mitigation measures would reduce the level of effect to less than significant. The

2

- 1 findings in Table ES-2 are presented by resource topic. Table ES-3 provides an opportunity to
  - compare the effects (after mitigation) of Alternatives 2A, 3A, 4A, 5A, and 6A, as well as Sub-
- 3 Alternatives 2B through 6B.

#### 4 Table ES-2. Summary of Effects and Mitigation Measures

			Finding with
Alternative	Finding	Mitigation Measure	Mitigation
Effect FCGEOM-1: Decrease	e in Levee Erosion and	l Change in Sediment Recruitment	
Alternative 1—No Action	No effect	None required	_
Alternative 2A through Sub-Alternative 6B	Less than significant	FCGEOM-MM-1: Conduct Site- Specific Studies at Levee Repair Sites and Minimize Changes in Local Hydraulic Conditions through Project Design	Less than significant
Effect FCGEOM-2: Increase	in Levee Slope Stabili	ity	
Alternative 1—No Action	No effect	None required	_
Alternative 2A through Sub-Alternative 6B	Beneficial	None required	_
Effect FCGEOM-3: Decrease	e in Instream Woody I	Material Recruitment	
Alternative 1—No Action	No effect	None required	—
Alternative 2A through Sub-Alternative 6B	Significant	FISH-MM-2: Compensate for Loss of Fish Habitat VEG-MM-1: Compensate for the Loss of Woody Riparian Habitat	Less than significant
Effect FCGEOM-4: Changes	in Local Hydraulics a	nd Shear Stress	
Alternative 1—No Action	No effect	None required	_
Alternative 2A through Sub-Alternative 6B	Significant	FCGEOM-MM-1: Conduct Site- Specific Studies at Levee Repair Sites and Minimize Changes in Local Hydraulic Conditions through Project Design	Less than significant
Effect FCGEOM-5: Minimiz	ation of Stream Energ	y and Associated Floodplain Scour	and/or Deposition
Alternative 1 through Sub-Alternative 2B	No effect	None required	_
Alternative 3A through Sub-Alternative 6B	Beneficial	None required	_
Effect FCGEOM-6: Substant	tially Alter the Existin	g Drainage Pattern of the Site or Ar	ea
Alternative 1 through Sub-Alternative 2B	No effect	None required	_
Alternative 3A through Sub-Alternative 6B	Significant	FCGEOM-MM-2: Coordinate with Owners and Operators, Prepare Drainage Studies as Needed, and Remediate Effects through Project Design	Less than significant
Effect WQ-1: Temporary In	ncrease in Turbidity a	nd Suspended Solids during Constr	uction
Alternative 1—No Action	No effect	None required	_

Alternative	Finding	Mitigation Measure	Finding with Mitigation
Alternative 2A through Sub-Alternative 6B	Significant	WQ-MM-1: Monitor Turbidity during Construction	Less than significant
Effect WQ-2: Release of Ha Construction	zardous Materials to	Adjacent Water Body or Groundwa	ter during
Alternative 1—No Action	No effect	None required	_
Alternative 2A through Sub-Alternative 6B	Less than Significant	WQ-MM-2: Implement Measures to Maintain Surface Water and Groundwater Quality	Less than significant
Effect GEO-1: Potential Adv	verse Effects Resultin	g from Surface Fault Rupture	
Alternative 1 through Sub-Alternative 6B	No effect	None required	_
Effect GEO-2: Increase Exp Shaking	oosure of People or Str	ructures to Hazards Related to Stro	ng Seismic Ground
Alternative 1—No Action	No effect	None required	_
Alternative 2A through Sub-Alternative 6B	Less than significant	None required	—
Effect GEO-3: Potential Acc Ground Disturbance	celerated Erosion and	Sedimentation Resulting from Con	struction-Related
Alternative 1—No Action	No effect	None required	_
Alternative 2A through Sub-Alternative 6B	Less than significant	None required	—
Effect GEO-4: Loss of Signif	ficant Mineral Resour	ces as a Result of Program Implem	entation
Alternative 1—No Action	No effect	None required	_
Alternative 2A through Sub-Alternative 6B	Less than significant	None required	—
Effect TN-1: Temporary In Potential Degradation of L	crease in Traffic Volu OS for Roadways in th	mes from Construction-Generated ne Vicinity of the Program	Traffic and
Alternative 1—No Action	No effect	None required	_
Alternative 2A through Sub-Alternative 6B	Significant	TN-MM-1: Implement a Traffic Control and Road Maintenance Plan	Less than significant
Effect TN-2: Potential Incr	ease in Safety Hazard	s Attributable to Construction-Gen	erated Traffic
Alternative 1—No Action	No effect	None required	_
Alternative 2A through Sub-Alternative 6B	Significant	TN-MM-1: Implement a Traffic Control and Road Maintenance Plan	Less than significant
Effect TN-3: Increase Emer	rgency Response Time	es	
Alternative 1—No Action	No effect	None required	_
Alternative 2A through Sub-Alternative 6B	Significant	TN-MM-1: Implement a Traffic Control and Road Maintenance Plan	Less than significant
Effect TN-4: Potential Inad Equipment and Constructi	lequate Parking Supplion Workers	ly to Meet Parking Demand for Con	struction
Alternative 1 through Sub-Alternative 6B	No effect	None required	_

Alternative	Finding	Mitigation Magazina	Finding with
Alternative	Finding	Mitigation Measure	Mitigation
Effect TN-5: Potential Conf	lict with Alternative T	Transportation Modes because of T	emporary Road
Closures			
Alternative 1—No Action	No effect	None required	_
Alternative 2A through Sub-Alternative 6B	Significant	TN-MM-1: Implement a Traffic Control and Road Maintenance Plan	Less than significant
Effect TN-6: Temporary Ch	anges to Navigation		
Alternative 1—No Action	No effect	None required	_
Alternative 2A through Sub-Alternative 6B	Less than significant	None required	_
Effect TN-7: Potential Rero	uting of Roads		
Alternative 1 through Sub-Alternative 2B	No effect	None required	—
Alternative 3A through Sub-Alternative 6B	Significant	TN-MM-1: Implement a Traffic Control and Road Maintenance Plan	Less than significant
Effect AQ-1: Generation of Threshold Levels	Direct and Indirect Co	onstruction Emissions in Excess of	Federal <i>de minimis</i>
Alternative 1—No Action	No effect	None required	—
Alternative 2A through Sub-Alternative 6B	Significant	AQ-MM-1a: Apply Applicable Air District's Mitigation Measures to Reduce Construction Emissions below <i>de minimis</i> Threshold Levels AQ-MM-1b: Offset Construction- Generated NO <sub>x</sub> Emissions to Net Zero (0) for <u>ROG</u> , NO <sub>x</sub> , <u>PM10</u> , and	Significant and unavoidable

## Effect AQ-2: Generation of Direct and Indirect Operational Emissions in Excess of Federal *de minimis* Threshold Levels

PM2.5 Emissions in Excess of *de* 

minimis Thresholds

Alternative 1—No Action	No effect	None required	_
Alternative 2A through Sub-Alternative 6B	Significant	AQ-MM-2: Apply Applicable Air District's Mitigation Measures to Reduce Operational Emissions below Federal <i>de minimis</i> Thresholds	Less than significant

Alternative	Finding	Mitigation Measure	Finding with Mitigation
Effect AQ-3: Temporary In	crease in Construction	n-Related Emissions in Excess of A <sub>l</sub>	oplicable Standards
Alternative 1—No Action	No effect	None required	_
Alternative 2A through Sub-Alternative 6B	Significant	AQ-MM-3: Apply Applicable Air District's Mitigation Measures to Reduce Construction Emissions below Applicable Air District's Thresholds	Significant and unavoidable
Effect AQ-4: Elevated Heal Related HAPs/TACs	th Risks from the Expo	osure of Nearby Sensitive Receptor	s to Construction-
Alternative 1—No Action	No effect	None required	_
Alternative 2A through Sub-Alternative 6B	Significant	AQ-MM-4: Apply Applicable Air District's Mitigation Measures to Reduce HAP/TAC Emissions below the Applicable Air District's HAP/TAC Thresholds	Less than significant
Effect AQ-5: Generation of	<b>Operational Emission</b>	is in Excess of Applicable Standards	S
Alternative 1—No Action	No effect	None required	—
Alternative 2A through Sub-Alternative 6B	Significant	AQ-MM-5: Apply Applicable Air District's Mitigation Measures to Reduce Operational Emissions below Applicable Air District's Thresholds	Less than significant
Effect AQ-6: Generation of Environment	Construction GHG Em	iissions that May Have a Significant	Impact on the
Alternative 1—No Action	No effect	None required	—
Alternative 2A through Sub-Alternative 6B	Significant	AQ-MM-6: Implement Measures to Minimize GHG Emissions from Construction Activities	Significant and unavoidable
Effect AQ-7: Generation of Environment	Operational GHG Emi	ssions that May Have a Significant	Impact on the
Alternative 1—No Action	No effect	None required	_
Alternative 2A through Sub-Alternative 6B	Significant	AQ-MM-6: Implement Measures to Minimize GHG Emissions from Construction Activities	Significant and unavoidable
Effect NOI-1: Exposure of S	ensitive Receptors Ac	ljacent to the Levee Construction S	ites to Temporary
Construction-Related Nois	e	N	
Alternative 1—No Action	No effect	None required	
Alternative 2A through Sub-Alternative 6B	Significant	NOI-MM-1: Employ Noise- Reducing Construction Practices to Comply with Applicable Noise Impact Criteria	Significant and unavoidable
Effect NOI-2: Exposure of S Traffic Noise Increases	ensitive Receptors al	ong Truck Haul Routes to Substant	ial Temporary
Alternative 1—No Action	No effect	None required	
Alternative 2A through Sub-Alternative 6B	Less than significant	None required	_

Alternative	Finding	Mitigation Measure	Finding with Mitigation	
Effect NOI-3: Exposure of Sensitive Receptors to Temporary Construction-Related Vibration				
Alternative 1—No Action	No effect	None required	_	
Alternative 2A through Sub-Alternative 6B	Significant	NOI-MM-2: Conduct Vibration Monitoring at Buildings within 40 feet of Construction Equipment	Significant and unavoidable	

## Effect NOI-4: Exposure of Sensitive Receptors to Intermittent Noise Due to Long-Term Maintenance Activity including Emergency Repair Activities

Alternative 1—No Action	No effect	None required	—
Alternative 2A through Sub-Alternative 6B	Significant	NOI-MM-1: Employ Noise- Reducing Construction Practices to Comply with Applicable Noise Impact Criteria	Significant and unavoidable
		NOI-MM-3: Employ Emergency Repair Practices to Reduce Noise Where Feasible	

## Effect VEG-1: Permanent Loss of Woody Riparian Vegetation Resulting from Compliance with the Vegetation ETL

Alternative 1—No Action	No effect	None required	—
Alternative 2A and Sub- Alternative 2B	Significant	VEG-MM-1: Compensate for the Loss of Woody Riparian Habitat VEG-MM-2: Retain Qualified Botanists to Conduct Floristic Surveys for Special-Status Plants during Appropriate Identification Periods VEG-MM-3: Redesign Proposed Projects to Avoid Substantial Effects on and/or Transplant Special-Status Plants VEG-MM-4: Conduct Mandatory Contractor/Worker Awareness Training for Construction Personnel	Significant and unavoidable
Alternative 3A through Sub-Alternative 5B	Significant	VEG-MM-1: Compensate for the Loss of Woody Riparian Habitat VEG-MM-2: Retain Qualified Botanists to Conduct Floristic Surveys for Special-Status Plants during Appropriate Identification Periods VEG-MM-3: Redesign Proposed Projects to Avoid Substantial Effects on and/or Transplant Special-Status Plants VEG-MM-4: Conduct Mandatory Contractor/Worker Awareness Training for Construction Personnel	Less than significant

Alternative	Finding	Mitigation Measure	Finding with Mitigation
Alternative 6A and Sub- Alternative 6B	No effect	None required	_
Effect VEG-2: Potential Los	s of Special-Status Pla	nt Populations as a Result of Progr	am Construction
Alternative 1—No Action	No effect	None required	_
Alternative 2A through Sub-Alternative 6B	Significant	VEG-MM-2: Retain Qualified Botanists to Conduct Floristic Surveys for Special-Status Plants during Appropriate Identification Periods VEG-MM-3: Redesign Proposed Projects to Avoid Substantial Effects on and/or Transplant Special-Status Plants VEG-MM-4: Conduct Mandatory Contractor/Worker Awareness Training for Construction Personnel VEG-MM-5: Install Construction Barrier Fencing to Protect Sensitive Biological Resources Adjacent to the Construction Zone VEG-MM-6: Retain a Biological Monitor	Significant and unavoidable

## Effect VEG-3: Potential Disturbance or Removal of Riparian Habitat as a Result of Program Construction

Alternative 1—No Action	No effect	None required	—
Alternative 2A and Sub- Alternative 2B	Significant	VEG-MM-1: Compensate for the Loss of Woody Riparian Habitat VEG-MM-2: Retain Qualified Botanists to Conduct Floristic Surveys for Special-Status Plants during Appropriate Identification	Significant and unavoidable
		Periods VEG-MM-3: Redesign Proposed Projects to Avoid Substantial Effects on and/or Transplant Special-Status Plants	
		VEG-MM-4: Conduct Mandatory Contractor/Worker Awareness Training for Construction Personnel	

Alternative	Finding	Mitigation Measure	Finding with Mitigation
Alternative 3A through Sub-Alternative 6B	Significant	VEG-MM-1: Compensate for the Loss of Woody Riparian Habitat VEG-MM-2: Retain Qualified Botanists to Conduct Floristic Surveys for Special-Status Plants during Appropriate Identification Periods VEG-MM-3: Redesign Proposed Projects to Avoid Substantial Effects on and/or Transplant Special-Status Plants VEG-MM-4: Conduct Mandatory Contractor/Worker Awareness Training for Construction Personnel	Less than significant

## Effect VEG-4: Loss of Waters of the United States, Including Wetlands, as a Result of Program Construction

Alternative 1—No Action	No effect	None required	_
Alternative 2A through Sub-Alternative 6B	Significant	VEG-MM-4: Conduct Mandatory Contractor/Worker Awareness Training for Construction Personnel VEG-MM-5: Install Construction Barrier Fencing to Protect Sensitive Biological Resources Adjacent to the Construction Zone VEG-MM-6: Retain a Biological Monitor VEG-MM-7: Redesign Proposed Projects to Avoid and Minimize Effects on Sensitive Biological Resources VEG-MM-8: Compensate for the Loss of Wetlands and Other Waters	Less than significant

### Effect VEG-5: Potential Disturbance or Removal of Protected Trees as a Result of Program Construction

Alternative	1—No Action	No effect	None required	_
Alternative Sub-Alterna	2A through ttive 6B	Significant	VEG-MM-4: Conduct Mandatory Contractor/Worker Awareness Training for Construction Personnel VEG-MM-5: Install Construction Barrier Fencing to Protect Sensitive Biological Resources Adjacent to the Construction Zone VEG-MM-6: Retain a Biological Monitor VEG-MM-7: Redesign Proposed Projects to Avoid and Minimize	Less than significant

Alternative	Finding	Mitigation Measure	Finding with Mitigation
		Effects on Sensitive Biological	
		Resources	
		VEG-MM-8: Compensate for the	
		Loss of Wetlands and Other Waters	
		VEG-MM-9: Conduct a Tree Survey	
		VEG-MM-10: Compensate for the	
		Loss of Protected Trees	
Effect VEG-6: Potential Int	roduction or Spread o	f Invasive Plants as a Result of Prog	gram Construction
Alternative 1—No Action	No effect	None required	—
Alternative 2A through Sub-Alternative 6B	Significant	VEG-MM-11: Conduct a Survey to Document Invasive Plant Infestations	Less than significant
		VEG-MM-12: Avoid and Minimize	
		the Spread or Introduction of	
		Invasive Plant Species	
		VEG-MM-13: Conduct a Follow-Up	
		Weed Survey and Implement	
		Eradication Methods if New	
		Infestations Are Present	
Effect VEG-7: Potential Op	portunity for Habitat l	Restoration in Enlarged Floodplain	following Program
Construction			
Alternative 1 through Sub-Alternative 2B	No effect	None required	_
Alternative 3A through Sub-Alternative 6B	Beneficial	None required	_
Effect FISH-1: Short-Term	Effects of Rock Placen	ient into Nearshore Aquatic Habita	t during
Construction		_	_
Alternative 1—No Action	No effect	None required	_
Alternative 2A, Sub- Alternative 2B, and Alternative 4A through Sub-Alternative 6B	Significant	FISH-MM-1: Limit Construction Activity to Periods of the Year That Minimize Effects on Fish	Less than significant
Alternative 3A and Sub- Alternative 3B	No effect	None required	_
Effect FISH-2: Increases in	Sedimentation, Suspe	ended Sediments, and Turbidity du	ring Construction
Alternative 1—No Action	No effect	None required	_
Alternative 2A through Sub-Alternative 6B	Significant	WQ-MM-1: Monitor Turbidity during Construction FISH-MM-1: Limit Construction Activity to Periods of the Year That	Less than significant

Minimize Effects on Fish

			Finding with
Alternative	Finding	Mitigation Measure	Mitigation
Effect FISH-3: Spillage and	Leakage of Contamina	ants during Construction	
Alternative 1—No Action	No effect	None required	_
Alternative 2A through Sub-Alternative 6B	Significant	FISH-MM-1: Limit Construction Activity to Periods of the Year That Minimize Effects on Fish WQ-MM-2: Implement Measures to Maintain Surface Water and Groundwater Quality	Less than significant
Effect FISH-4: Long-Term H	Effects on Fish from Lo	oss of Habitat	
Alternative 1—No Action	No effect	None required	_
Alternative 2A and Sub- Alternative 2B	Significant	FISH-MM-2: Compensate for Loss of Fish Habitat FISH-MM-3: Compensate for the Loss of Spawning Habitat	Significant and unavoidable
Alternative 3A and Sub- Alternative 3B	Significant	FISH-MM-2: Compensate for Loss of Fish Habitat VEG-MM-1: Compensate for the Loss of Woody Riparian Habitat	Less than significant
Alternative 4A through Sub-Alternative 6B	Significant	FISH-MM-2: Compensate for Loss of Fish Habitat FISH-MM-3: Compensate for Loss of Spawning Habitat VEG-MM-1: Compensate for the Loss of Woody Riparian Habitat	Less than significant
Effect WILD-1: Permanent	Loss of Riparian Habi	tat for Special-Status Wildlife Spec	ies Associated with
Compliance with the Veget	tation ETL		
Alternative 1—No Action	No effect	None required	
Alternative 2A, Sub- Alternative 2B, and Alternative 4A through Sub-Alternative 5B	Significant	VEG-MM-1: Compensate for the Loss of Woody Riparian Habitat	Significant and unavoidable
Alternative 3A and Sub- Alternative 3B	Significant	VEG-MM-1: Compensate for the Loss of Woody Riparian Habitat	Less than significant
Alternative 6A and Sub- Alternative 6B	No effect	None required	_
Effect WILD 2. Detential D	icturbance or Loce of G	Special Status Wildlife Species and	Thoir Uphitate ac a

## Effect WILD-2: Potential Disturbance or Loss of Special-Status Wildlife Species and Their Habitats as a Result of Program Construction and O&M Activities

Alternative 1—No Action	No effect	None required	_
Alternative 2A, Sub- Alternative 2B, and Alternative 4A through Sub-Alternative 6B	Significant	WILD-MM-1: Document Special- Status Wildlife Species and Their Habitats WILD-MM-2: Avoid and Minimize Effects on Special-Status Wildlife Species by Redesigning the Action, Protecting Special-Status Wildlife Habitat, and Developing a	Significant and unavoidable

Alternative	Finding	Mitigation Measure	Finding with Mitigation
		Mitigation Monitoring Plan (If Necessary) WILD-MM-3: Coordinate with Resource Agencies <u>to Obtain</u> <u>Incidental Take Authorization, as</u> <u>Necessary</u> , and Develop Appropriate Wildlife Compensation Plans for Species Listed under ESA and/or CESA VEG-MM-1: Compensate for the Loss of Woody Riparian Habitat VEG-MM-4: Conduct Mandatory Contractor/Worker Awareness Training for Construction Personnel VEG-MM-8: Compensate for the Loss of Wetlands and Other Waters	
Alternative 3A and Sub- Alternative 3B	Significant	WILD-MM-1: Document Special- Status Wildlife Species and Their Habitats WILD-MM-2: Avoid and Minimize Effects on Special-Status Wildlife Species by Redesigning the Action, Protecting Special-Status Wildlife Habitat, and Developing a Mitigation Monitoring Plan (If Necessary) WILD-MM-3: Coordinate with Resource Agencies to Obtain Incidental Take Authorization, as Necessary, and Develop Appropriate Wildlife Compensation Plans for Species Listed under ESA and/or CESA VEG-MM-1: Compensate for the Loss of Woody Riparian Habitat VEG-MM-4: Conduct Mandatory Contractor/Worker Awareness Training for Construction Personnel VEG-MM-8: Compensate for the Loss of Wetlands and Other Waters	Less than significant

			Finding with
Alternative	Finding	Mitigation Measure	Mitigation
Effect WILD-3: Disturbance to or Loss of Common Wildlife Species as a Result of Construction			
Alternative 1—No Action	No effect	None required	—
Alternative 2A through Sub-Alternative 6B	Significant	WILD-MM-4: Avoid or Minimize Construction-Related Effects on Nesting Birds WILD-MM-5: Conduct a Preconstruction Survey for Roosting Bats and Avoid or	Less than significant
		Mitigate Potential Impacts <u>VEG-MM-1: Compensate for the</u>	
		Loss of Woody Riparian Habitat	
Effect WILD-4: Disruption to Wildlife Movement Corridors as a Result of Construction			
Alternative 1—No Action	No effect	None required	_
Alternative 2A through Sub-Alternative 6B	Less than significant	None required	_
Effect LA-1: Physical Division of an Established Community Located Adjacent to the Levee Corridor			
Alternative 1—No Action	No effect	None required	_
Alternative 2A through Sub-Alternative 6B	Less than significant	None required	—
Effect LA-2: Conflicts with Local Land Use and Agriculture Policies			
Alternative 1—No Action	No effect	None required	_
Alternative 2A through Sub-Alternative 6B	Less than significant	None required	_
Effect LA-3: Conversion of Important Farmland to Nonagricultural Uses			
Alternative 1—No Action	No effect	None required	_
Alternative 2A and Sub- Alternative 2B	Less than significant	None required	_
Alternative 3A through Sub-Alternative 6B	Significant	LA-MM-1: Evaluate the Potential for Direct Farmland Conversion at the Project Level and Avoid, Minimize, and Compensate for Loss of Farmland	Significant and unavoidable
Effect REC-1: Temporary Disruption of Recreational Opportunities during Construction			
Alternative 1—No Action	No effect	None required	—
Alternative 2A through Sub-Alternative 6B	Significant	REC-MM-1: Notify Recreation Users of Potential Construction Hazards REC-MM-2: Provide Alternate Recreation Routes	Less than significant
Effect REC-2: Long-Term Reduction in Quality of Existing Recreational Opportunities within the Levee			
Corridor	-		
Alternative 1—No Action	No effect	None required	_
Alternative 2A through Sub-Alternative 6B	Significant	VEG-MM-1: Compensate for the Loss of Woody Riparian Habitat	Significant and unavoidable
Alternative	Finding	Mitigation Measure	Finding with Mitigation
-----------------------------------------------------------	-------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------	-----------------------------
Effect REC-3: Temporary C	bstruction of Access	to Marina or Boat Launch Facilities	
Alternative 1 through Sub-Alternative 2B	No effect	None required	_
Alternative 3A through Sub-Alternative 6B	Significant	REC-MM-3: Preserve Marina and Boat Launch Access	Less than significant
Effect REC-4: Permanent L	oss of Recreational O	pportunities	
Alternative 1 through Sub-Alternative 2B	No effect	None required	_
Alternative 3A through Sub-Alternative 6B	Significant	REC-MM-4: Rebuild Affected Formal Park Facilities and Trails	Less than significant
Effect REC-5: Safety Hazar	ds to Recreationists		
Alternative 1 through Sub-Alternative 3B	No effect	None required	_
Alternative 4A through Sub-Alternative 6B	Significant	REC-MM-5: Hazard-Reducing Placement of Instream Woody Mat <u>erial</u>	Less than significant
Effect POP-1: Displace a Su People, Necessitating Cons	lbstantial Number of l struction of Replacem	Existing Housing Units or a Substan ent Housing Elsewhere	tial Number of
Alternative 1—No Action	No effect	None required	_
Alternative 2A through Sub-Alternative 6B	Less than significant	None required	_
Effect PUB-1: Potential for Construction	Damage of Utility Inf	rastructure and Disruption of Servi	ce during
Alternative 1—No Action	No effect	None required	_
Alternative 2A through Sub-Alternative 6B	Significant	PUB-MM-1: Verify Utility Locations, Coordinate with Utility Providers, Prepare and Implement a Response Plan, and Conduct Worker Training	Less than significant
Effect PUB-2: Potential Dis	ruption to Irrigation	Water Supply	
Alternative 1 through Sub-Alternative 2B	No effect	None required	_
Alternative 3A through Sub-Alternative 6B	Significant	PUB-MM-2: Coordinate with Irrigation Water Users Before and During Infrastructure Modifications and Minimize Disruptions to Supply	Less than significant
Effect VIS-1: Temporary V	isual Effects Caused by	y Construction Activities	
Alternative 1—No Action	No effect	None required	_
Alternative 2A through Sub-Alternative 6B	Significant	VIS-MM-1: Install Temporary Visual Barriers between Construction Zones and Residences and Maintain Construction Sites	Significant and unavoidable
		and Staging Areas in an Orderly Fashion	

Alternative	Finding	Mitigation Measure	Finding with Mitigation
Effect VIS-2: Substantially	Adversely Affect a Sce	enic Vista	
Alternative 1—No Action	No effect	None required	_
Alternative 2A and Sub- Alternative 2B	Less than significant	None required	_
Alternative 3A through Sub-Alternative 5B	Significant	Mitigation not available	Significant and unavoidable
Alternative 6A and Sub- Alternative 6B	Less than significant	None required	_
Effect VIS-3: Substantially Outcroppings, and Histori	Damage Scenic Resou c Buildings along a Sc	rces, including, but Not Limited to, enic Highway	Trees, Rock
Alternative 1—No Action	No effect	None required	_
Alternative 2A through Sub-Alternative 6B	Significant	Mitigation not available	Significant and unavoidable
Effect VIS-4: Substantially Surroundings	Degrade the Existing	Visual Character or Quality of the S	ite and Its
Alternative 1—No Action	No effect	None required	—
Alternative 2A through Sub-Alternative 6B	Significant	Mitigation not available	Significant and unavoidable
Effect VIS-5: Create a New	Source of Light or Gla	re	
Alternative 1—No Action	No effect	None required	—
Alternative 2A through Sub-Alternative 6B	Significant	Mitigation not available	Significant and unavoidable
Effect PH-1: Temporary Ex	xposure to or Release	of Hazardous Materials during Con	struction
Alternative 1—No Action	No effect	None required	_
Alternative 2A through Sub-Alternative 6B	Less than significant	None required	_
Effect PH-2: Exposure of th	he Environment to Ha	zardous Materials during Ground-I	Disturbing Activities
Alternative 1—No Action	No effect	None required	_
Alternative 2A through Sub-Alternative 6B	Less than significant	WQ-MM-2: Implement Measures to Maintain Surface Water and Groundwater Quality PH-MM-1: Employ a Toxic Release	Less than significant
Effect DU 2. Tomporary Fr	maguna ta Cafatu Uar	Contingency Plan	
Alternative 1 No Action	No offect	None required	
Alternative 2A through	Significant	None required	
Sub-Alternative 6B	Significant	Site Safety Measures	Less than significant
		Emergency Response Plan	
Effect PH-4: Exposure of P	eople or Structure to	Increased Flood Risk	
Alternative 1—No Action	No effect	None required	_
Alternative 2A through	Beneficial	None required	_
Sub-Alternative 6B			

Alternative	Finding	Mitigation Measure	Finding with Mitigation
Effect PH-5: Potential for H	ligher Frequency of C	ollision between Aircraft and Wild	life
Alternative 1 through Sub-Alternative 2B	No effect	None required	_
Alternative 3A <del>, Sub-</del> Alternative 3B, Alternative 5A, and Sub- Alternative 5B <u>through</u> Sub-Alternative 6B	Significant	PH-MM-4: Design and Manage Habitat Created by Setback Levees Such That It Does Not Attract Wildlife Known to Collide with Aircraft	Less than significant
Effect CUL-1: Disturbance	of Native American or	Historic Period Human Remains	
Alternative 1—No Action	No effect	None required	—
Alternative 2A through Sub-Alternative 6B	Significant	CUL-MM-1: Stop Work if Human Remains Are Discovered	Significant and unavoidable
Effect CUL-2: Unavoidable Protection Measures	Impacts on Historic P	Properties or Historical Resources a	is a Result of Bank
Alternative 1—No Action	No effect	None required	_
Alternative 2A through Sub-Alternative 6B	Significant	CUL-MM-2: Identify Historic Properties and Historical Resources and Implement Treatment Measures for Adverse Effects according to the Historic Properties Treatment Plan	Less than significant
Effect CUL-3: Loss of Integr River Levee System as a Hi	rity of Character-Defin istoric Property or His	ning Elements that Would Qualify t storical Resource	he Sacramento
Alternative 1 through Sub-Alternative 2B	No effect	None required	_
Alternative 3A through Sub-Alternative 6B	Significant	CUL-MM-3: Evaluate the Sacramento River Levee System for NRHP Eligibility and Implement Treatment Measures for Adverse Effects According to the Historic Properties Treatment Plan	Less than significant
Effect SOC-1: Disproportio	nate Effect on Minori	ty or Low-Income Populations	
Alternative 1—No Action	No effect	None required	—
Alternative 2A through Sub-Alternative 6B	Less than significant	None required	_
Effect SOC-2: Temporary In	ncrease in Employme	nt during Construction	
Alternative 1—No Action	No effect	None required	—
Alternative 2A through Sub-Alternative 6B	Beneficial	None required	_
Note: In the Alternative colu consists of Alternative 2A, So Alternative 4B, Alternative 5	mn, <i>through</i> is inclusiv ub-Alternative 2B, Alter 5A, Sub-Alternative 5B,	e. For example, <i>Alternative 2A through</i> rnative 3A, Sub-Alternative 3B, Altern Alternative 6A and Sub-Alternative 61	n <i>Sub-Alternative 6B</i> ative 4A, Sub- B. The findings and

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mitigation measures, if any, are the same for each alternative and sub-alternative.

### 1 Table ES-3. Summary Comparison of Alternatives with Mitigation Considered

Effect <sup>1</sup>	Alternative 2A— Low Maintenance	Alternative 3A— Maximize Meander Zone	Alternative 4A— Habitat Replacement	Alternative 5A— Habitat Replacement Reaching Environmental Neutrality	Alternative 6A— Habitat Replacement with Vegetation ETL Variance
Flood Control and Geomorphology			1	,	
FCGEOM-1: Decrease in Levee Erosion and Change in Sediment Recruitment	Less than significant*	Less than significant*	Less than significant*	Less than significant*	Less than significant*
FCGEOM-2: Increase in Levee Slope Stability	Beneficial	Beneficial	Beneficial	Beneficial	Beneficial
FCGEOM-3: Decrease in Instream Woody Material Recruitment	Less than significant*	Less than significant*	Less than significant*	Less than significant*	Less than significant*
FCGEOM-4: Changes in Local Hydraulics and Shear Stress	Less than significant*	Less than significant*	Less than significant*	Less than significant*	Less than significant*
FCGEOM-5: Minimization of Stream Energy and Associated Floodplain Scour and/or Deposition	No effect	Beneficial	Beneficial	Beneficial	Beneficial
FCGEOM-6: Substantially Alter the Existing Drainage Pattern of the Site or Area	No effect	Less than significant*	Less than significant*	Less than significant*	Less than significant*
Water Quality and Groundwater Resour	ces				
WQ-1: Temporary Increase in Turbidity and Suspended Solids during Construction	Less than significant*	Less than significant*	Less than significant*	Less than significant*	Less than significant*
WQ-2: Release of Hazardous Materials to Adjacent Water Body or Groundwater during Construction	Less than significant	Less than significant	Less than significant	Less than significant	Less than significant
Geology, Seismicity, Soils, and Mineral R	esources				
GEO-1: Potential Adverse Effects Resulting from Surface Fault Rupture	No effect	No effect	No effect	No effect	No effect
GEO-2: Increase Exposure of People or Structures to Hazards Related to Strong Seismic Ground Shaking	Less than significant	Less than significant	Less than significant	Less than significant	Less than significant

Effect <sup>1</sup>	Alternative 2A— Low Maintenance	Alternative 3A— Maximize Meander Zone	Alternative 4A— Habitat Replacement	Alternative 5A— Habitat Replacement Reaching Environmental Neutrality	Alternative 6A— Habitat Replacement with Vegetation ETL Variance
GEO-3: Potential Accelerated Erosion and Sedimentation Resulting from Construction-Related Ground Disturbance	Less than significant	Less than significant	Less than significant	Less than significant	Less than significant
GEO-4: Loss of Significant Mineral Resources as a Result of Program Implementation	Less than significant	Less than significant	Less than significant	Less than significant	Less than significant
Transportation and Navigation					
TN-1: Temporary Increase in Traffic Volumes from Construction-Generated Traffic and Potential Degradation of LOS for Roadways in the Vicinity of the Program	Less than significant*	Less than significant*	Less than significant*	Less than significant*	Less than significant*
TN-2: Potential Increase in Safety Hazards Attributable to Construction-Generated Traffic	Less than significant*	Less than significant*	Less than significant*	Less than significant*	Less than significant*
TN-3: Increase Emergency Response Times	Less than significant*	Less than significant*	Less than significant*	Less than significant*	Less than significant*
TN-4: Potential Inadequate Parking Supply to Meet Parking Demand for Construction Equipment and Construction Workers	No effect	No effect	No effect	No effect	No effect
TN-5: Potential Conflict with Alternative Transportation Modes because of Temporary Road Closures	Less than significant*	Less than significant*	Less than significant*	Less than significant*	Less than significant*
TN-6: Temporary Changes to Navigation	Less than significant	Less than significant	Less than significant	Less than significant	Less than significant
TN-7: Potential Rerouting of Roads	No effect	Less than significant*	Less than significant*	Less than significant*	Less than significant*
Air Quality and Climate Change					
AQ-1: Generation of Direct and Indirect Construction Emissions in Excess of Federal <i>de minimis</i> Threshold Levels	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*

Effect <sup>1</sup>	Alternative 2A— Low Maintenance	Alternative 3A— Maximize Meander Zone	Alternative 4A— Habitat Replacement	Alternative 5A— Habitat Replacement Reaching Environmental Neutrality	Alternative 6A— Habitat Replacement with Vegetation ETL Variance
AQ-2: Generation of Direct and Indirect Operational Emissions in Excess of Federal <i>de minimis</i> Threshold Levels	Less than significant*	Less than significant*	Less than significant*	Less than significant*	Less than significant*
AQ-3: Temporary Increase in Construction-Related Emissions in Excess of Applicable Standards	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*
AQ-4: Elevated Health Risks from the Exposure of Nearby Sensitive Receptors to Construction-Related HAPs/TACs	Less than significant*	Less than significant*	Less than significant*	Less than significant*	Less than significant*
AQ-5: Generation of Operational Emissions in Excess of Applicable Standards	Less than significant*	Less than significant*	Less than significant*	Less than significant*	Less than significant*
AQ-6: Generation of Construction GHG Emissions that May Have a Significant Effect on the Environment	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*
AQ-7: Generation of Operational GHG Emissions that May Have a Significant Effect on the Environment	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*
Noise and Vibration					
NOI-1: Exposure of Sensitive Receptors Adjacent to the Levee Construction Sites to Temporary Construction-Related Noise	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*
NOI-2: Exposure of Sensitive Receptors along Truck Haul Routes to Substantial Temporary Traffic Noise Increases	Less than significant	Less than significant	Less than significant	Less than significant	Less than significant
NOI-3: Exposure of Sensitive Receptors to Temporary Construction-Related Vibration	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*
NOI-4: Exposure of Sensitive Receptors to Intermittent Noise Due to Long-Term Maintenance Activity including Emergency Repair Activities	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*

Effect <sup>1</sup>	Alternative 2A— Low Maintenance	Alternative 3A— Maximize Meander Zone	Alternative 4A— Habitat Replacement	Alternative 5A— Habitat Replacement Reaching Environmental Neutrality	Alternative 6A— Habitat Replacement with Vegetation ETL Variance
Vegetation and Wetlands					
VEG-1: Permanent Loss of Woody Riparian Vegetation Resulting from Compliance with the Vegetation ETL	Significant and unavoidable*	Less than significant*	Less than significant*	Less than significant*	No effect
VEG-2: Potential Loss of Special-Status Plant Populations as a Result of Program Construction	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*
VEG-3: Potential Disturbance or Removal of Riparian Habitat as a Result of Program Construction	Significant and unavoidable*	Less than significant*	Less than significant*	Less than significant*	Less than significant*
VEG-4: Loss of Waters of the United States, Including Wetlands, as a Result of Program Construction	Less than significant*	Less than significant*	Less than significant*	Less than significant*	Less than significant*
VEG-5: Potential Disturbance or Removal of Protected Trees as a Result of Program Construction	Less than significant*	Less than significant*	Less than significant*	Less than significant*	Less than significant*
VEG-6: Potential Introduction or Spread of Invasive Plants as a Result of Program Construction	Less than significant*	Less than significant*	Less than significant*	Less than significant*	Less than significant*
VEG-7: Potential Opportunity for Habitat Restoration in Enlarged Floodplain following Program Construction	No effect	Beneficial	Beneficial	Beneficial	Beneficial
Fisheries and Aquatics					
Short-Term Effects					
FISH-1: Short-Term Effects of Rock Placement into Nearshore Aquatic Habitat during Construction	Less than significant*	No effect	Less than significant*	Less than significant*	Less than significant*
FISH-2: Increases in Sedimentation, Suspended Sediments, and Turbidity during Construction	Less than significant*	Less than significant*	Less than significant*	Less than significant*	Less than significant*
FISH-3: Spillage and Leakage of Contaminants during Construction	Less than significant*	Less than significant*	Less than significant*	Less than significant*	Less than significant*

Effect <sup>1</sup>	Alternative 2A— Low Maintenance	Alternative 3A— Maximize Meander Zone	Alternative 4A— Habitat Replacement	Alternative 5A— Habitat Replacement Reaching Environmental Neutrality	Alternative 6A— Habitat Replacement with Vegetation ETL Variance
Long-Term Effects					
FISH-4: Long-Term Effects on Fish from Loss of Habitat	Significant and unavoidable*	Less than significant*	Less than significant*	Less than significant*	Less than significant*
Wildlife					
WILD-1: Permanent Loss of Riparian Habitat for Special-Status Wildlife Species Associated with Compliance with the Vegetation ETL	Significant and unavoidable*	Less than significant*	Significant and unavoidable*	Significant and unavoidable*	No effect
WILD-2: Potential Disturbance or Loss of Special-Status Wildlife Species and Their Habitats as a Result of Program Construction and O&M Activities	Significant and unavoidable*	Less than significant*	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*
WILD-3: Disturbance to or Loss of Common Wildlife Species as a Result of Construction	Less than significant*	Less than significant*	Less than significant*	Less than significant*	Less than significant*
WILD-4: Disruption to Wildlife Movement Corridors as a Result of Construction	Less than significant	Less than significant	Less than significant	Less than significant	Less than significant
Land Use and Agriculture					
LA-1: Physical Division of an Established Community Located Adjacent to the Levee Corridor	Less than significant	Less than significant	Less than significant	Less than significant	Less than significant
LA-2: Conflicts with Local Land Use and Agriculture Policies	Less than significant	Less than significant	Less than significant	Less than significant	Less than significant
LA-3: Conversion of Important Farmland to Nonagricultural Uses	Less than significant	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*
Recreation					
REC-1: Temporary Disruption of Recreational Opportunities during Construction	Less than significant*	Less than significant*	Less than significant*	Less than significant*	Less than significant*
REC-2: Long-Term Reduction in Quality of Existing Recreational Opportunities within the Levee Corridor	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*
Sacramento River Bank Protection Project Phase II Supplemental Authorization		Volume I			March 2020

Effect <sup>1</sup>	Alternative 2A— Low Maintenance	Alternative 3A— Maximize Meander Zone	Alternative 4A— Habitat Replacement	Alternative 5A— Habitat Replacement Reaching Environmental Neutrality	Alternative 6A— Habitat Replacement with Vegetation ETL Variance
REC-3: Temporary Obstruction of Access to Marina or Boat Launch Facilities	No effect	Less than significant*	Less than significant*	Less than significant*	Less than significant*
REC-4: Permanent Loss of Recreational Opportunities	No effect	Less than significant*	Less than significant*	Less than significant*	Less than significant*
REC-5: Safety Hazards to Recreationists	No effect	No effect	Less than significant*	Less than significant*	Less than significant*
Population and Housing					
POP-1: Displace a Substantial Number of Existing Housing Units or a Substantial Number of People, Necessitating Construction of Replacement Housing Elsewhere	Less than significant	Less than significant	Less than significant	Less than significant	Less than significant
Utilities and Public Services					
PUB-1: Potential for Damage of Utility Infrastructure and Disruption of Service during Construction	Less than significant*	Less than significant*	Less than significant*	Less than significant*	Less than significant*
PUB-2: Potential Disruption to Irrigation Water Supply	No effect	Less than significant*	Less than significant*	Less than significant*	Less than significant*
Aesthetics					
VIS-1: Temporary Visual Effects Caused by Construction Activities	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*
VIS-2: Substantially Adversely Affect a Scenic Vista	Less than significant	Significant and unavoidable	Significant and unavoidable	Significant and unavoidable	Less than significant
VIS-3: Substantially Damage Scenic Resources, including, but Not Limited to Trees, Rock Outcroppings, and Historic Buildings along a Scenic Highway	Significant and unavoidable	Significant and unavoidable	Significant and unavoidable	Significant and unavoidable	Significant and unavoidable
VIS-4: Substantially Degrade the Existing Visual Character or Quality of the Site and Its Surroundings	Significant and unavoidable	Significant and unavoidable	Significant and unavoidable	Significant and unavoidable	Significant and unavoidable
VIS-5: Create a New Source of Light or Glare	Significant and unavoidable	Significant and unavoidable	Significant and unavoidable	Significant and unavoidable	Significant and unavoidable

Effect <sup>1</sup>	Alternative 2A— Low Maintenance	Alternative 3A— Maximize Meander Zone	Alternative 4A— Habitat Replacement	Alternative 5A— Habitat Replacement Reaching Environmental Neutrality	Alternative 6A— Habitat Replacement with Vegetation ETL Variance
Public Health and Environmental Hazar	ds				
PH-1: Temporary Exposure to or Release of Hazardous Materials during Construction	Less than significant	Less than significant	Less than significant	Less than significant	Less than significant
PH-2: Exposure of the Environment to Hazardous Materials during Ground- Disturbing Activities	Less than significant*	Less than significant*	Less than significant*	Less than significant*	Less than significant*
PH-3: Temporary Exposure to Safety Hazards from the Construction Site	Less than significant*	Less than significant*	Less than significant*	Less than significant*	Less than significant*
PH-4: Exposure of People or Structure to Increased Flood Risk	Beneficial	Beneficial	Beneficial	Beneficial	Beneficial
PH-5: Potential for Higher Frequency of Collision between Aircraft and Wildlife	No effect	Less than significant*	Less than significant <u>*</u>	Less than significant*	Less than significant <u>*</u>
Cultural Resources					
CUL-1: Disturbance of Native American or Historic Period Human Remains	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*	Significant and unavoidable*
CUL-2: Unavoidable Impacts on Historic Properties or Historical Resources as a Result of Bank Protection Measures	Less than significant*	Less than significant*	Less than significant*	Less than significant*	Less than significant*
CUL-3: Loss of Integrity of Character- Defining Elements That Would Qualify the Sacramento River Levee System as a Historic Property or Historical Resource	No effect	Less than significant*	Less than significant*	Less than significant*	Less than significant*
Socioeconomics and Environmental Just	tice				
SOC-1: Disproportionate Effect on Minority or Low-Income Populations	Less than significant	Less than significant	Less than significant	Less than significant	Less than significant
SOC-2: Temporary Increase in Employment during Construction	Beneficial	Beneficial	Beneficial	Beneficial	Beneficial

$Effect^1$	Alternative 2A— Low Maintenance	Alternative 3A— Maximize Meander Zone	Alternative 4A— Habitat Replacement	Alternative 5A— Habitat Replacement Reaching Environmental Neutrality	Alternative 6A— Habitat Replacement with Vegetation ETL Variance
Explanations:			I I I I I I I I I I I I I I I I I I I		
<sup>1</sup> Alternative 1—No Action Alternative w would be no effects.	vould not result in any	significant effects assoc	iated with implementati	ion of the proposed pro	gram; therefore, there
* (Asterisk)—denotes those effects that effects that that were found to be significant to be significa	were found to be less tl ficant and unavoidable	han significant, with the despite the implementa	implementation of recontion of recontion of reconting and the second sec	ommended mitigation r nitigation measures.	neasure, and those
Sub-Alternatives to Alternatives 2A throu conclusions were found to be the same as	gh 6A (within Economi the associated alternat	cally Justified Basins) w tive in all cases. For a dis	vere not reflected in this scussion of effects assoc	effect summary table l iated with the sub-alte	because the effect rnatives, please see

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### 1 ES.7.1.1 Alternative 1–No Action Alternative

2 The No Action Alternative would not result in any construction activities associated with the 3 proposed program (i.e., activities that would result in adverse effects on environmental resources). As detailed above, the Corps would not implement bank protection along SRFCP levees under the No 4 Action Alternative. It is possible that federal, state, or local flood control agencies would eventually 5 6 implement bank protection at various sites along SRFCP levees through emergency action. Continued erosion prior to the federal, state or local action would result in short- and long-term 7 losses of valuable habitat. Although some erosion is natural, the channelization of project reaches 8 9 increases erosive forces. These potential scenarios would result in adverse effects on the environment. However, these effects are not a result of the proposed program and would have no 10 11 effect (or no impact in CEQA terms) associated with implementation of any of the program alternatives. Therefore, Table ES-2 characterizes the findings of effects under Alternative 1–No 12 Action Alternative as "No effect." 13

### 14 ES.7.1.2 Effects Found to be Less than Significant

- 15 The EIS/EIR found that the proposed program, when mitigation is considered, would have less-than-16 significant effects on these resources.
- Flood control and geomorphology
- 18 Water quality and groundwater
- Geology, soils, seismicity and minerals
- 20 Transportation and navigation
- Air quality and climate change
- Noise
- Vegetation and wetlands
- Fisheries and aquatics
- Wildlife
- Land use and agriculture
- Recreation
- Population and housing
- Utilities and public services
- 30 Aesthetics
- Public health and environmental hazards
- 32 Cultural resources
- Socioeconomics and environmental justice

### **ES.7.1.3** Significant and Unavoidable Effects

- The proposed program would result in significant and unavoidable effects on the resources listed
   here.
- 4 Air quality and climate change
- 5 Noise
- Vegetation and wetlands
- 7 Fisheries and aquatics
- 8 Wildlife
- 9 Land use and agriculture
- 10 Recreation
- 11 Aesthetics
- Cultural resources

### 13 ES.7.1.4 Beneficial Effects of the Proposed Program

- In addition to identifying the less-than-significant effects, and the significant and unavoidable effects
   <u>listed above, Tthe EIS/EIR concludesd</u> that the proposed program would have beneficial effects on
   the resources listed here.
- Flood control and geomorphology
- 18 Vegetation and wetlands
- 19 Public health and environmental hazards
- Socioeconomics and environmental justice

# ES.8 Areas of Known Controversy and Unresolved Issues

CEQA Guidelines (14 California Code of Regulations [CCR] Section 15123(b)) requires that an EIR
 summary describe areas of controversy known to the lead agency, including issues raised by
 agencies and the public as well as unresolved issues. NEPA regulations also require disclosure of
 areas of controversy and issues to be resolved (40 Code of Federal Regulations [CFR] Section
 1502.12). No unresolved issues were identified during this programmatic evaluation.

- 28 The following issue-areas of controversy were identified during the NOI/NOP scoping period.
- Vegetation on levees.
  - Economic impacts on rural communities.
- Hydraulic effects.

30

- Public outreach and agency coordination.
- 33 Invasive species.

- Construction impacts, including routes for transporting materials.
- Effects on fish, wildlife, and vegetation, including Central Valley salmonids and bank swallow
   habitat.
- Erosion site locations and selection.
- 5 Mitigation of impacts.
- Consideration of setback levees.
- 7 Cumulative effects.
- Eminent domain as a possible tool for real estate acquisition.

# 9 ES.9 Irreversible and Irretrievable Commitments of 10 Resources/Significant Irreversible Environmental 11 Changes

State CEQA Guidelines (14 CCR 15126.2(c)) and NEPA (40 CFR Section 1502.16) require analysis of
 significant irreversible and irretrievable effects. CEQA requires evaluation of irretrievable resources
 to ensure that their use is justified. NEPA requires an explanation of which environmental impacts
 are irreversible or would result in an irretrievable commitment of resources.

Irreversible impacts are those that cause, through direct or indirect effects, use or consumption of
 resources in such a way that they cannot be restored or returned to their original condition despite
 mitigation. Potentially irreversible impacts are documented in this EIS/EIR. An irretrievable impact
 or commitment of resources occurs when a resource is removed or consumed. These types of
 impacts are evaluated to ensure that consumption is justified.

- All the program alternatives would involve a commitment of a range of natural, physical, and fiscal
   resources as follows.
- Construction materials.
- Nonrenewable resources, such as gasoline and diesel oil used to power equipment and vehicles
   used for construction, and for operations and routine maintenance.
- Additional electrical power from a renewable resource (i.e., for lighting and operations).
- Land conversion of open space, agricultural, and natural environments.
- Any construction would require expenditure of state and federal funds for the costs of construction and right-of-way. The proposed program would also require funding for operation and maintenance of the constructed sites and for vegetation establishment and monitoring associated with mitigation.
- The decision by the Lead Agencies to commit these resources is based on the concept that residents in the immediate area, region, and state would benefit from the implementation of the proposed program. The overarching benefit of the proposed program is that the integrity of the flood control system would be maintained through the application of site-specific bank protection measures to remedy erosion sites with high failure potential in order prevent levee failure, catastrophic damage,
- 36 and possible loss of life. Implementation of the SRBPP and 80,000 LF of additional bank protection

- would ensure the continued integrity of the SRFCP levees while protecting environmental resources
   and compensating for effects on significant environmental resources to the degree feasible. These
   benefits are expected to outweigh the commitment of these resources.
- ES.10 Relationship between Short-Term Uses of the
   Environment and Maintenance and Enhancement
   of Long-Term Productivity

The Council on Environmental Quality NEPA Regulations (40 CFR Part 1500 et seq.) require that an
EIS discuss issues related to environmental sustainability. In general, this EIS discussion is not
considered an environmental effect for which significance is defined or mitigation is recommended.
However, the discussion, as it relates to environmental consequences, should consider "the
relationship between local short-term uses of man's environment and the maintenance and

- 12 enhancement of long-term productivity" (42 United States Code 4332 Section (C)(iv)).
- The short-term effects on and uses of the environment in the vicinity of the program area are related to long-term effects and the maintenance and enhancement of long-term productivity. "Short term" refers to the total duration of construction: the multi-year construction period to construct 80,000 LF of bank protection and associated mitigation elements. Construction associated with the proposed program would cause short-term impacts on the environment related to alteration of topography and hydrologic conditions, water quality, biological resources, air quality, land use, recreation, visual resources, and the human environment (noise and traffic conditions).
- "Long term" refers to an indefinite period beyond the initial construction at the erosion sites and
   includes ongoing operation and maintenance of the sites as well as vegetation establishment and
   monitoring activities. Vegetation establishment and monitoring would be necessary to ensure that
   the mitigation vegetation <u>and species habitat are</u> functioning <u>and being managed as required by</u>
   <u>environmental permitsas intended</u>.
- Implementation of the proposed program includes bank repair and levee rehabilitation would result
   in long-term benefits, including protection of property and the health and safety of residents. The
   proposed river bank repair and mitigation work would greatly minimize erosion, limiting the
   eventual loss of nearshore aquatic habitat and riparian habitat that would likely occur if the
   proposed program were not enacted.
- **ES.11** Public Involvement and Agency Coordination
- The Lead Agencies are implementing a comprehensive public participation program to fully inform and engage potentially affected agencies, stakeholders and communities.

### **ES.11.1** Notice of Preparation/Notice of Intent Scoping

- In January 2009, the Lead Agencies issued a Notice of Preparation (NOP) of an EIR and a Notice of
- 35 Intent (NOI) to prepare an EIS, informing agencies and the general public that an EIS/EIR was being
- <sup>36</sup> prepared and inviting comments on the scope and content of the document during the 45-day public

- 1 review period. The NOI and NOP also requested participation at public scoping meetings. Appendix
- A includes the NOI as published in the Federal Register on January 30, 2009, and the NOP as
- 3 distributed to responsible agencies and interested parties. In February 2009, the Lead Agencies
- 4 hosted four public scoping meetings in Colusa, Walnut Grove, Sacramento, and Chico. Comment
- letters regarding the NOI and NOP and transcripts of the scoping meetings also are included in
   Appendix A.
- To publicize the scoping meetings, advertisements were placed in the *Sacramento Bee*, the Colusa
  County *Sun Herald*, and the *Chico Enterprise-Record*. Meeting notices were also sent to 68 resource
- 9 agencies, 22 local media contacts, 18 tribal contacts, eight levee districts, and 124 reclamation
- districts inviting them to the meeting or to provide input about the proposed program during the
   scoping period. Copies of the advertisements and meeting notice can be found in Appendix A.
- Additionally, a letter was sent to elected officials inviting their attendance at the public scoping
- 13 meetings and input on the proposed program. The letter was sent to the following members of the
- 14 House of Representatives: Wally Herger, Dan Lungren, Doris Matsui, Tom McClintock, Jerry
- 15 McNerney, Ellen Tauscher, George Miller, and Mike Thompson.

### 16 ES.11.2 Agency Consultation and Coordination

Consultations and coordination with numerous local, state, and federal agencies have been
 conducted throughout Phase II of the SRBPP. Chapter 24, Compliance with Applicable Laws, Policies,
 Plans, and Regulatory Framework, describes preliminary information on the major requirements for
 permitting and environmental review and consultation prior to implementation, including
 consultation to date with various agencies. The following is a summary of those coordination efforts.

### 22 ES.11.2.1 Resource Agency Coordination

- The Interagency Working Group (IWG) was formed as a term and condition of the draft (Jeopardy) and final biological opinions previously issued by USFWS and the National Marine Fisheries Service (NMFS) for Phase II. The IWG's primary purpose is to develop products for SRBPP planning, and to determine project impacts on listed species under the ESA and to coordinate related issues with state and federal natural resource agencies. Meetings are typically monthly and key participants represent the Corps, CVFPB, DWR, USFWS, NMFS, and DFW.
- In addition, between September 16, 2008 and November 25, 2008, the Corps solicited input from
  agencies that have a direct interest in flood risk management and the environmental conditions
  associated with future locations and types of bank protection alternatives. Interviews were
  conducted with staff of NMFS, California State Lands Commission, DFW, USFWS, Corps, DWR and
- 33 CVFPB to better understand their perspectives and vision for implementation of the additional
- 34 80,000 LF of bank protection. The interviews resulted in several recommendations for improvement
- of the SRBPP planning and implementation process, which are presented in Appendix A.

### 36 **ES.11.2.2** Native American Consultation

- 37 On May 4, 2009, the Native American Heritage Commission (NAHC) was contacted to request a
- 38 search of the Sacred Lands File. The NAHC staff responded on May 12, 2009 with a list of Native
- 39 American contacts for Butte, Colusa, Glenn, Placer, Sacramento, Solano, Sutter, Tehama, Yolo, and
- 40 Yuba Counties. Native American groups with potential interest in the area were identified through

- the efforts of an ethnographer. A series of letters, phone calls, emails and two workshops open to
  Native American groups in the spring of 2010 were used to further identify interested parties.
  Correspondence included a map depicting the program area, a brief description of the proposed
  program, and a request for the contacts to share any knowledge or concerns they may have
  regarding cultural resources in or adjacent to the program area. Based on this work, the Corps has
  initiated consultation with the following tribes.
- 7 Berry Creek Rancheria of Tyme Maidu Indians
- 8 Buena Vista Rancheria of Me-Wuk Indians
- 9 Cachil DeHe Band of Wintun Indians of the Colusa Indian Community
- 10 California Valley Miwok Tribe
- Cortina Band of Indians, Enterprise Rancheria (Estom Yumeka)
- 12 Grindstone Rancheria
- 13 Ione Band of Miwok Indians
- 14 Mechoopda Indian Tribe of Chico Rancheria
- 15 Mooretown Rancheria of Maidu Indians
- 16 Paskenta Band of Nomlaki Indians, Redding Rancheria
- Shingle Springs Band of Miwok Indians
- 18 United Auburn Indian Community of Auburn Rancheria
- 19 Wilton Rancheria
- 20 Yocha Dehe Wintun Nation (Rumsey Rancheria)

21 The Corps and DWR determined that development of a Programmatic Agreement (PA) for the 22 proposed program and an attending Historic Properties Treatment Plan (HPTP) would be the most 23 effective way to comply with NEPA, Section 106 of the National Historic Preservation Act, and CEOA. 24 The PA and HPTP can be found in Appendix C. Further consultation with the tribes included requesting comments on the PA and HPTP, additional outreach meetings with individual tribes, and 25 26 requesting their participation as concurring parties to the PA. To date, the California Valley Miwok Tribe, Mechoopda Indian Tribe of Chico Rancheria, and the Shingle Springs Band of Miwok have 27 28 signed as concurring parties. Those tribes that have not signed as concurring parties to the PA will 29 still be given an opportunity to comment on specific construction projects as they are designed and planned. 30

### **ES.11.3** Draft EIS/EIR Public Comments

The Draft EIS/EIR was circulated for public review in December 2014 for a public comment period 32 of 66 days, from December 24, 2014 to February 27, 2015. To initiate the public comment period, 33 the Corps and the CVFPB circulated a Notice of Availability (NOA) to federal and state agencies, 34 35 including Responsible and Trustee Agencies as defined under CEQA, involved Federal Agencies, and parties previously requesting information on the proposed project. The NOA was published in the 36 Federal Register in compliance with NEPA on January 2, 2015 and a Notice of Completion was 37 provided to the California Governor's Office of Planning and Research on December 24, 2014. 38 Comments received during public review of the Draft EIS/EIR, responses to those comments, and 39

- more information about the public review process are presented in Volume II of this Final EIS/EIR. 1 Changes have been made to the content of the EIS/EIR in response to these comments, or for 2 purposes of clarification or correction. Changes to the text are shown by strikethrough of text that 3 has been deleted and underlining of new text that has been inserted. The revisions contain 4 clarifications and corrections that have been identified, either through public comments or by the 5 6 Corps or the CVRWQCBCVFPB, since publication of the Draft EIS/EIR. The text revisions do not 7 result in substantive changes to either the analyses or conclusions presented in the EIS/EIR. This EIS/EIR will be circulated for a minimum of 45 days for public review to federal, state, and local 8 9 agencies; organizations; and individuals who have an interest in the project. A notice of availability of the draft EIS/EIR will be published in the Federal Register and local newspapers when the 10 document is released for public review. Public workshops will be held during the review period to 11 provide additional opportunities for comments on the draft document. Public notices will be sent 12 13 providing public workshop details. All comments received during the public review period will be 14 considered and incorporated into the final EIS/EIR, as appropriate. A comment and response 15 appendix will be included with the final document. Copies of the draft EIS/EIR will be submitted to the State Clearinghouse in Sacramento for 16 17 distribution to state agencies. Additionally, draft EIS/EIR will be available for public review on the
- 18 SRBPP website (http://www.spk.usace.army.mil/Missions/CivilWorks/
- 19 SacramentoRiverBankProtection.aspx) and CVFPB website
- 20 (http://www.cvfpb.ca.gov/PublicNotices/).

### 3 1.1 Introduction

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4 The U.S. Army Corps of Engineers (Corps) and the Central Valley Flood Protection Board (CVFPB) 5 (formerly The Reclamation Board) are preparing a joint programmatic Environmental Impact Statement/Environmental Impact Report (EIS/EIR) for the Sacramento River Bank Protection 6 7 Project (SRBPP) Phase II Supplemental Authority (proposed program) for implementation of up to 8 80,000 linear feet (LF) of additional bank protection in the Sacramento River Flood Control Project 9 (SRFCP) area. The proposed program is authorized by Section 3031 of the Water Resources 10 Development Act (WRDA) of 2007 (Public Law [Pub. L.] 110-114, Section 3031, 121 Statutes [Stat.] 11 1041, 1113 (2007)). The program area spans portions of Butte, Colusa, Glenn, Placer, Sacramento, 12 Solano, Sutter, Tehama, Yolo, and Yuba Counties in California (Figure 1-1).

13The SRBPP is a continuing long-term project authorized by Section 203 of the Flood Control Act of141960 (Pub. L. 86-654, Section 203, 74 Stat. 498 (1960)). This project was authorized to provide15protection to the existing levee and flood control facilities of the SRFCP. The SRFCP consists of more16than approximately 1,000 miles of levees, plus overflow weirs, pumping plants, and bypass channels17that protect communities and agricultural lands in the Sacramento Valley and Sacramento-San18Joaquin River Delta (Delta).

19 Congress has authorized the SRBPP in two phases based on LF of bank protection. Phase I bank 20 protection was completed in 1975 and resulted in 435,953 LF of bank protection. Current bank 21 protection is being carried out under Phase II. The work authorized through Section 3031 of the 22 WRDA 2007 (Pub. L. 110-114, Section 3031) for the SRBPP Phase II Supplemental Authority is a 23 continuation of Phase II bank protection, and increases the amount of currently authorized bank 24 protection (405,000 LF) by 80,000 LF to 485,000 LF. It is anticipated that this additional bank 25 protection at erosion sites would be constructed over the next 10 years. Phase III (not evaluated as 26 part of this proposed program) is future work that is needed to protect the SRFCP for which 27 planning has been initiated by the Corps but which currently is not authorized. As construction of 28 the Phase II Supplemental Authority is completed, implementation of Phase III will be critical to 29 ensuring the SRFCP levees seriously threatened by erosion will receive corrective measures to 30 prevent levee failure, catastrophic damage, and possible loss of life.

As the state regulatory agency responsible for ensuring that appropriate standards are met for the
 construction, maintenance, and protection of the SRFCP, CVFPB acts as the state partner to the
 Corps in implementing the SRBPP.

### 34 **1.1.1** NEPA and CEQA Compliance

The National Environmental Policy Act (NEPA) of 1969 established a national environmental policy and goals for the protection, maintenance, and enhancement of the environment. It requires all federal agencies to incorporate environmental considerations into planning and decision-making. NEPA also established the President's Council on Environmental Quality (CEQ) and empowered CEQ to develop regulations by which all federal agencies would comply. These regulations are published

- 1in the Code of Federal Regulations (CFR) at 40 CFR Sections 1500–1508. The Corps has also2promulgated its own Procedures for Implementing NEPA (33 CFR Part 230) to be used in
- 3 conjunction with CEQ regulations.

For those actions with the potential to create significant environmental effects, the consideration of
 the proposed action and alternatives is presented in an environmental impact statement (EIS).

- 6 Major federal agency actions typically fall within one of the following categories: (1) adoption of
- 7 official policy (i.e., rulemaking); (2) adoption of formal plans; (3) adoption of programs (i.e., a group
- 8 of concerted actions to implement a specific policy or plan); and (4) approval of specific projects
- 9 (i.e., construction or management activities located in a specified geographic area) (40 CFR Section
- 1508.18(b)). In this case, the Corps is preparing this EIS because it is considering a program
   composed of a group of bank protection actions to implement the SRBPP Phase II Supplemental
- 12 Authority.
- The California Environmental Quality Act (CEQA) applies to all discretionary activities proposed to be carried out or approved by California public agencies, including state, regional, county, and local agencies and requires those agencies to prepare multidisciplinary environmental impact analyses of the activities. Enacted in 1970, CEQA was modeled on NEPA, but CEQA contains an explicit directive requiring agencies to avoid or reduce, when feasible, the significant environmental impacts of their decisions. If an action may cause significant effects on the environment, an agency must prepare an
- Environmental Impact Report (EIR) that analyzes the action's potential significant effects and
   identifies mitigation measures and reasonable alternatives to avoid the significant effects. CEQA is
- 21 published in the Public Resources Code, Division 13, Sections 21000–21177.
- There are several types of EIRs that may be prepared under CEQA. A Program EIR is prepared for an agency program or series of actions that can be characterized as one large project. Typically, such a project involves actions that are closely related either geographically or temporally. Program EIRs generally analyze broad environmental effects of the program with the acknowledgement that sitespecific environmental review may be required for particular aspects of portions of the program
- 27 when those aspects are proposed for implementation.

### 28**1.1.1.1Document Overview and Purpose**

- This document is a joint programmatic EIS/EIR and satisfies the requirements of NEPA and CEQA
  for disclosing environmental impacts and recommended mitigation measures related to a proposed
  action and alternatives prior to a lead agency's decision on project approval. A joint EIS/EIR is
  prepared when a project is subject to both NEPA and CEQA. Both NEPA and CEQA provide
  guidelines for the preparation of a programmatic EIS/EIR.
- A programmatic EIS/EIR is prepared for a series of actions that can be characterized as one large
   project and are related in any of the following ways:
- Geographically (i.e., same general location, region, or the same body of water) and could be
   characterized as one large project.
- As logical parts in the chain of contemplated actions.
- In connection with issuance of rules, regulations, plans, or other general criteria to govern the conduct of a continuing program.
- As individual activities carried out under the same authorizing statutory or regulatory authority
   and having generally similar environmental effects that can be mitigated in similar ways (i.e.,





Figure 1-1 Program Vicinity

1 2

common timing, impacts, alternatives, or methods of implementation) (State CEOA Guidelines Section 15168).

#### Lead Agencies 3 1.1.2

4 The State CEQA Guidelines provide that a lead agency under CEQA may work with a federal agency 5 to prepare a joint document that will meet the requirements of both NEPA and CEQA. The NEPA 6 regulations similarly encourage federal agencies to cooperate with local agencies "to the fullest 7 extent possible to reduce duplication between NEPA and comparable State and local requirements," 8 including the preparation of a joint document (40 CFR Section 1506.2). A joint document cannot be 9 prepared solely by a state or local agency. The federal lead agency under NEPA must be involved in 10 the preparation of the joint document (40 CFR Section 1506.2; CEQA Guidelines Section 15222).

11 The SRBPP is a local cooperation project with the U.S. Army Corps of Engineers, Sacramento District 12 as the federal participant responsible for implementation of the SRBPP with its non-federal partner,

13 the CVFPB, the state agency designated for non-federal responsibilities and cost sharing. The Corps

- 14 (NEPA lead agency) and the CVFPB (CEOA lead agency) (referred to herein as Lead Agencies) have
- 15 determined that a joint programmatic EIS/EIR is the most appropriate means to comply with both
- 16 NEPA and CEOA because of the need for coordination among federal and state agencies, and the
- 17 need to complete environmental review as expeditiously as possible.

#### 1.2 Project Purpose and Objectives 18

19 The central reaches of the Sacramento River levees in the SRFCP were established close to 20 streambanks to erode vast sediment deposits accumulated from hydraulic mining in the Sierra 21 Nevada during the 1800s and to facilitate use of rich floodplain soils for agriculture. This sediment-22 removal purpose was met by about 1940, but the rivers, deprived of the natural energy dissipation 23 of floodplains, have continued to erode laterally, often undermining the toe of adjacent levees. The 24 upper reaches of the Sacramento River levees in the SRFCP are set back from the river and 25 encounter erosive forces less frequently, but can still occasionally experience erosion during high 26 winter flows. In the Delta region, high winter flows, boat wakes, and tides have eroded levee banks 27 along the network of waterways that convey water toward the San Francisco Bay. This These 28 ongoing problems has have two potential solutions as authorized under the Sacramento River Bank 29 Protection Project (The River Basin Monetary Authorization Act of 1974, Pub. L. 93-251, Section 30 202): setback of levees to reduce floodflow depths and velocities and thus erosion of banks, or

31 armoring existing or restored streambanks to resist the erosion.

32 The program purpose and objective is to arrest or avoid streambank erosion that threatens the 33 integrity of the SRFCP levee system. To protect property, as well as the health and safety of 34 residents, bank repair and levee rehabilitation are needed at erosion sites. The proposed program 35 will also attempt to greatly minimize erosion, limiting the eventual loss of nearshore aquatic habitat 36 and riparian habitat that would likely occur if the proposed program were not enacted.

#### **Need for Action** 1.2.1 37

38 Levees within the program area provide flood damage risk reduction for the Sacramento Valley and 39 help convey water flowing from the Sierra Nevada to the Delta. Levees stressed by high winter flows

- 1 <u>can weaken and fail.</u> Implementation of the SRBPP and 80,000 LF of additional bank protection
- 2 would ensure the continued integrity of the SRFCP levees<u>, reducing risk to residents</u>, local
- 3 <u>economies, and valuable while protecting</u> environmental resources and while compensating for
- 4 effects on significant environmental resources to the degree feasible. Levees within the program
- 5 area provide flood damage risk reduction for the Sacramento Valley and help convey water flowing
- from the surrounding mountain ranges to the Delta. Levees with eroded banks can weaken and fail,
   especially when stressed by high winter flows, boat wakes, and waves from wind; to To maintain the
- 8 integrity of the flood control system, locations with a high failure potential would be identified and
- 9 remedied through project implementation.
- As part of the annual field reconnaissance reviews of the SRFCP, the Corps and its local sponsor, the
   CVFPB, have found that the number of documented bank erosion sites in the inventory is increasing.
   Specifically, the total number of erosion sites for the SRFCP increased from 152 in 2007 to 201 in
   2012, despite some sites being repaired and status changes of other sites between the inventories
   (Ayres Associates 2008:5 and U.S. Army Corps of Engineers 2013:27).

### 15 **1.2.2 Background of Purpose and Need**

### 16 **1.2.2.1** Original Authorization (Phase I)

The SRBPP is a continuing construction program, originally authorized by the Flood Control Act of
1960, to provide protection for the existing levees and flood control facilities of the SRFCP (Pub. L.
86-654, Section 203). The SRFCP consists of more than 1,000 miles of levees, plus overflow weirs,
pumping plants, and bypass channels that protect communities and agricultural lands in the
Sacramento Valley and the Delta.

The SRFCP was originally constructed pursuant to the Flood Control Act (Pub. L. 64-367, Section 2,
39 Stat. 948, 949 [1917]), which Congress enacted on March 1, 1917. Congress first authorized the
Corps to provide substantial support for ongoing flood protection as applied to the existing SRFCP in
1960 (Flood Control Act, Pub. L. 86-654, Section 203, 74 Stat. 498 [1960]).

- By 1960, the federal government began to see the national value in investing funding in large-scale
  flood protection projects in complicated watersheds. In the Flood Control Act of 1960, Congress
  authorized substantial support for flood protection for the Sacramento River Basin (Pub. L. 86-654,
  Section 203). This constituted Phase I of the SRBPP. Phase I was constructed from 1963 to 1975 and
  consisted of 435,953 linear feet of levee repairs.
- In 1972, the Chief of Engineers found that "[a]lthough work under the initial phase [Phase I] has
   effectively controlled erosion at the critical sites, each year stream banks and levees at additional
   unprotected locations throughout the SRFCP are subject to erosion" (U.S. Army Corps of Engineers
   1972).

### 35 **1.2.2.2 Project Reauthorization (Phase II)**

- Accordingly, in 1974, repair of 405,000 LF was authorized in the River Basin Monetary
- Authorization Act of 1974 (Pub. L. 93-252, Section 202, 88 Stat. 49 (1974)). The portion of the
- 38 SRBPP completed pursuant to the 1974 authorization is identified in this document as Phase II of
- 39 the SRBPP. Construction began in 1976 under Phase II, and current bank protection is being carried

out under the original Phase II authorization. Only about 4,966 LF of authorization remain after the
 2012 construction season and plans are under development to construct this additional increment.

### 3 **1.2.2.3** Phase II Supplemental Authority (Proposed Program)

4 Through Section 3031 of the Water Resources Development Act of 2007 (Pub. L. No. 110-114, 5 Section 3031) an additional 80,000 LF was authorized as a continuation of Phase II bank protection. 6 In 2008, the Corps' Sacramento District initiated development of a program of action for this work 7 as set forth in the SRBPP authorization and associated reports of the Chief of Engineers, Policy 8 Guidance on Implementation of Section 3031 of WRDA of 2007 (June 6, 2008), the Corps' planning 9 process described in Engineer Regulation 1105-2-100 (Planning Guidance Notebook) and technical 10 engineering design documents, NEPA, the federal Endangered Species Act, and other relevant 11 environmental laws. A Limited ReevaluationPost Authorization Change Report (LRPACR) for the 12 additional 80,000 LF needs to be finalized and approved prior to construction. Approval of the 13 LRPACR and implementation of the program is dependent on compliance with NEPA and CEQA and 14 other environmental laws.

15The existing SRBPP provides for a continuing long-range program of bank stabilization and erosion16control to maintain the integrity of the SRFCP through bank protection and setback levees.

17 The <u>LRPAC</u>R will contain a programmatic plan using 106 representative erosion sites. The selection 18 of these representative sites was informed by the 2008 Field Reconnaissance Report, which lists and 19 prioritizes possible bank protection sites. In the 2008 Field Reconnaissance Report, 154 erosion 20 sites were identified that may or may not receive bank protection under Phase II. The Corps selected 21 106 of these sites as a representative sample for the LRPACR and EIS/EIR analyses. These 106 sites 22 exhibit bank and levee conditions that are threatening the function of the flood control system (see 23 discussion of Erosion Sites in Chapter 2, Project Description). As new sites are identified and existing 24 sites may change from year to year, actual selection of sites will depend on the current annual 25 inventory at time of selection. The report lists sites that are scattered along levees on the main 26 Sacramento River, from Collinsville (River Mile [RM] 3) to Chico Landing (RM 194 [while the levees 27 end at RM 184]), and tributaries of the Sacramento River. These tributaries include the American 28 River, the Feather River, the Bear River, the Yuba River, and Cache Creek.

- Although the SRBPP Phase II 80,000 LF will consist of individual bank protection sites on SRFCP
   levees, specific sites are not identified or analyzed as part of this programmatic EIS/EIR. This
   EIS/EIR analyzes environmental impacts of constructing 80,000 LF of bank protection on SRFCP
- 32 levees and increasing the Phase II authorization from 405,000 to 485,000 LF.

### 33 **1.2.2.4** Related Flood Risk Reduction Activities

- The proposed program would be implemented in coordination with other activities that overlap
  with, and are closely linked to, the SRFCP (Figure 1-2). These and other projects are briefly
  described below.
- 37 State of California Central Valley Flood Protection Plan
- 38 Lead Agencies: DWR, CVFPB.
- 39The Central Valley Flood Protection Act (CVFPA), enacted in California in 2009, called for DWR to40present a CVFPP by January 1, 2012 to the CVFPB. The CVFPP outlines a comprehensive system-

1	wide approach for the protection of lands currently protected from flooding by the facilities of the
2	State Plan of Flood Control (the SRFCP and facilities in the corresponding San Joaquin River
3	watershed to the south). It also establishes a new standard of 200-year flood protection for urban
4	areas in the Central Valley and requires this standard to be achieved by 2025.
_	
5	The CVFPP presents three preliminary approaches for addressing current challenges and affordably
6	meeting the CVFPP goals. The state has assembled what it views as the most promising, affordable,
7	and timely elements of the three preliminary approaches into the State Systemwide Investment
8	<u>Approach (SSIA), which provides guidance for future state and local participation in projects and</u>
9	programs for integrated flood management in the Central Valley. The CVFPB adopted the CVFPP in
10	June 2012. This plan is part of the State of California FloodSAFE program. FloodSAFE is a
11	<u>multifaceted program with an emphasis on better managing flood risk throughout California and</u>
12	focused on the state-federal flood protection system in the Central Valley.
13	DWR has initiated two basin-wide feasibility studies—Regional Flood Management Planning and the
14	Central Valley Flood System Conservation Strategy—to advance both ongoing and long-term
15	implementation of the SSIA. The basin-wide feasibility studies will incorporate findings and data
16	from many ongoing DWR efforts. The Conservation Strategy will provide the systemwide context for
17	improving environmental conditions and trends throughout the flood management system as a
18	whole, reducing compensatory mitigation needs for individual projects and developing efficient
19	permitting strategies for CVFPP implementation. DWR plans to actively engage locally-led regional
20	flood management planning efforts to ensure that information developed through systemwide
21	planning is available for regional plan development. Similar feedback from regional flood
22	management planning efforts will provide local perspectives and inform the analysis of systemwide
23	flood management and conservation elements.

### 24 Public Law 84-99 Rehabilitation Assistance of Flood Control Works

25 Lead Agencies: Corps, CVFPB, California Department of Water Resources (DWR).

26 The Flood Control and Coastal Emergency Act (Pub. L. 84-99 69 Stat. 186 (1955) (codified as 27 amended at 33 United States Code [USC] 701n) focuses on the repair of levees damaged by specific 28 flood events that were declared emergencies. Under this federal statute, the Corps and DWR are 29 authorized to conduct emergency repairs to flood management works threatened or destroyed by 30 high-water events, such as California's 1997 and 2006 floods. All systems considered eligible for PL 31 84-99 rehabilitation assistance have to be in the Rehabilitation and Inspection Program prior to the 32 flood event. Acceptable operation and maintenance by the public levee sponsor are verified by levee inspections conducted by the Corps on a regular basis. PL 84-99 sites are prioritized by order of 33 34 urgency, ranging from the most urban (order 1 sites) through the most rural (order 5 sites).

### 35 Bay Delta Conservation Plan

- Lead Agency: DWR, U.S. Bureau of Reclamation, U.S. Fish and Wildlife Service (USFWS), and National
   Marine Fisheries Service (NMFS).
- 38 The Bay Delta Conservation Plan (BDCP) is a part of California's overall water management
- 39 portfolio. It is being developed as a 50-year habitat conservation plan with the goals of restoring the
- 40 Sacramento-San Joaquin Delta ecosystem and securing California water supplies. The BDCP would
- 41 secure California's water supply by building new water delivery infrastructure and operating the
- 42 system to improve the ecological health of the Delta. The BDCP also would restore or protect

#### **State Plan of Flood Control**

Lead Agency: CVFPB Location: Central Valley Goal: Guide flood management expenditures under Propositions 84 & 1E Timeline: Complete Plan by 2014

#### Sacramento - San Joaquin River Basins **Comprehensive Study**

Lead Agency: USACE and DWR Location: Central Valley Goal: Flood damage reduction and ecosystem restoration Phase: Study completed in 2002; laid groundwork for several current efforts, including State Plan of Flood Control

#### Sutter Basin Feasibility Study

Lead Agency: USACE, CVFPB and SBFCA Location: Sutter and Butte counties Goal: Reduce flood risk for communities in Sutter and Butte counties Phase (Timeline): Feasibility Study and EIS (2013)

#### Natomas Levee Improvement Program

Lead Agency: SAFCA Location: Natomas Area, Sacramento Goal: Achieve 200-year flood protection for the Natomas Basin Timeline: Construct 100-year protection by 2014, 200-year protection by 2016

#### West Sacramento Levee Improvements Program

Lead Agency: WSAFCA Location: West Sacramento Goal: Achieve 200-year flood protection for the City of West Sacramento Phase (Timeline): 3 projects completed in 2008 and 2011; next project targeted to begin construction in 2014

#### West Sacramento Project

Lead Agency: USACE, CVFPB, and WSAFCA Location: West Sacramento Goal: Comprehensive analysis of the City's levee system Phase (Timeline): GRR (2015)

#### **Central Valley Flood Protection Plan**

Lead Agency: DWR and CVFPB Location: Central Valley and Sacramento-San Joaquin Delta **Goal**: Develop strategies for comprehensive system-wide flood improvements Timeline: Plan adopted in 2012; complete protection measures by 2025



#### YCWA - Yuba County Water Agency

- CVFPB Central Valley Flood Protection Board
- TRLIA Three Rivers Levee Improvement Authority

#### Feather River West Levee Improvement Project

Lead Agency: USACE, State of California, and SBFCA Location: Sutter and Butte Counties Goal : Achieve 200-year protection for urbanized areas and 100-year protection for agricultural areas Timeline: Construction 2013-2015

#### Yuba Basin Project

Lead Agency: USACE, DWR, and YCWA Location: Yuba, Feather, Bear rivers Watershed Goal: Increase flood protection for communities of Linda, Olivehurst, Arboga, Marysville, and unincorporated areas of Yuba County Phase (Timeline): GRR (2013)

#### **Three Rivers Levee Improvement Authority Projects**

Lead Agency: TRLIA Location: Southern Yuba County Goal: Increase flood protection for communities in southern Yuba County Phase (Timeline) The work was completed in 2010

#### **American River Common Features Project**

Lead Agency: USACE, DWR, and SAFCA Location: Sacramento metropolitan area Goal: Reduce flood risks for the City of Sacramento Phase (Timeline): GRR (2013)

#### Sacramento River Bank Protection Project

Lead Agency: USACE and CVFPB Location: SRFCP Goals: Federal program to correct levee erosion issues Phase (Timeline): Phase II EIS (2013)

PL 84-99 Rehabilitation Assistance of Flood Control

Lead Agency: USACE and DWR Location: Central Valley and Sacramento-San Joaquin Delta **Goals**: Federal program to provide emergency levee repairs Timeline: Ongoing

Lead Agency: USACE and DWR Location: Central Valley Goals: Develop short- and long-term plans to achieve system-wide compliance with Corps standards for the State Flood System in the Central Valley Timeline: Ongoing

- approximately 150,000 acres of habitat to address the Delta's environmental challenges. <u>Any</u>
   <u>modifications to the SRFCP undertaken as part of the BDCP implementation, or as part of any</u>
   subsequent iterations that involve similar elements, would require Clean Water Act Section 408
- 4 permissions from the Corps and the CVFPB.
- 5 The public review Draft EIR/EIS was made available for public review and comment from December
   6 13, 2013 through July 29, 2014. On August 27, 2014 DWR and the other state and federal agencies
- 7 leading the BDCP announced that they will publish a partially Recirculated Draft BDCP, EIR/EIS, and
- 8 Implementing Agreement (IA) in early 2015. The recirculated documents will include those portions
- 9 of each document that warrant another public review prior to publication of final documents. All
   10 substantive comments received on the Draft EIR/EIS and partially recirculated Draft EIR/EIS prior
- 10 substantive comments received on the Drait EIK/EIS and partially recirculated Drait EIK/EIS prior 11 to the comment period deadlines will be considered in the Final EIR/EIS and decision-making
- 12 process. No final decisions have been made regarding going forward with the BDCP or in selecting
- 13 an alternative; those decisions will only occur after the completion of the CEQA and NEPA processes.

### 14 Interagency Flood Maintenance Collaborative Program

- 15 Lead Agency: DWR.
- 16 The purpose of DWR's Interagency Flood Maintenance Collaborative Program is to engage in an
- 17 interagency collaboration that results in short-term, intermediate-term, and long-term actions to
- 18 more systematically and effectively manage the flood control system in the Central Valley. The new
- 19 approach includes improving the permit processes and the way DWR does business to reduce the
- 20 public's exposure to risks from flooding while incorporating environmental resource protection and
- enhancement. The approach should be regional, sustainable, and predictable over the long term,
   preserved in procedural and organizational changes, and result in flood system efforts that advance
- and integrate the missions and goals of the agencies participating in this process.

### 24 California Levee Stability Program

- 25 Lead Agencies: Corps, DWR.
- This program is designed to quickly implement high-priority levee reconstruction projects to reduce
   the risk of catastrophic levee failure in the Delta. In addition to flood control, the program considers
   ecosystem restoration opportunities.

### 29 Natomas Levee Improvement Project

- 30 Lead Agencies: DWR, CVFPB, Sacramento Area Flood Control Agency (SAFCA).
- As part of its long-term program to improve the Natomas Basin levee system, SAFCA is continuing
- 32 waterside and landside levee-strengthening efforts, including levee raises, seepage remediation,
- 33 increased bank protection, levee stabilization, and flattening of landside levee slopes under the
- 34 Natomas Levee Improvement Project (NLIP). The NLIP is an Early Implementation Program (EIP)
- 35 under state law. It is also a Federal action under Clean Water Act Section 408 (33 USC Section 408).
- 36 The ultimate goal of the NLIP is to provide the Natomas Basin with a 200-year level of flood
- 37 protection by improving conditions along approximately 26 miles of levees surrounding the
- 38 Natomas Basin. These levees are the Natomas Cross Canal South Levee, Sacramento River East
- 39 Levee, American River North Levee, Natomas East Main Drainage Canal West Levee, and the
- 40 Pleasant Grove Creek Canal West Levee. The NLIP is a four-phase construction program: Phase 1
- 41 occurred in 2008, Phase 2 in 2009 and 2010, Phase 3 in 2010 and 2011, and a majority of Phase 4a

work was completed in 2011 with the remainder in 2012. Phases 1 through 4a focus on the Natomas
 Cross Canal South Levee and a large portion of the Sacramento River East Levee.

3 Portions of work under Phases 3, 4a, and 4b along the Sacramento River East Levee, the American 4 River North Levee, the Natomas East Main Drainage Canal West Levee, the Pleasant Grove Creek 5 Canal West Levee, and water supply and drainage pump station improvements are still needed but 6 have been deferred from SAFCA's EIP construction program. The Corps completed the Post 7 Authorization Change ReportPACR and Interim General Re-evaluation Report, American River 8 Common Features Project, Natomas Basin, Sacramento and Sutter Counties, California study and an 9 approved Chief's report. In 2014, the project received congressional authorization as part of the 10 2014 Water Resources Reform and Development Act. With congressional authorization, SAFCA is 11 working with the state and Corps to continue implementation of the NLIP. <u>SAFCA has completed</u> 12 approximately 20 miles of levee work from State Route 99 along the Natomas Cross Canal and the 13 Sacramento River East Levee.

### 14 American River Common Features Project

15 Lead Agencies: Corps, CVFPB, DWR, SAFCA.

- 16 To increase flood protection for the city of Sacramento, which is bordered by the left bank of the
- 17 Sacramento River, the American River Common Features Project (Common Features) was
- authorized by Congress in the WRDA of 1996 (Pub L. No. 104-303, Section 101(a)(1), 110 Stat. 3658,
   3662–3663 (1996)). This authorization called for strengthening the north and south levees of the
- 20 American River and raising and strengthening the upper 12 miles of the left levee of the Sacramento
- 21 River in the Natomas area, just north of the city of Sacramento. These improvements were
- considered "common features" of any comprehensive plan of flood protection for the Sacramento
  area that might ultimately be approved by Congress. In the WRDA of 1999 (Pub. L. No. 106-53,
  Section 366, 113 Stat. 269, 319-320 (1999)), the scope of the Common Features authorization was
- expanded to include raising portions of the north and south levees of the American River (including
   the Mayhew Levee), strengthening portions of the north levee of the American River, and raising and
   strengthening the north and south levees of the Natomas Cross Canal in the Natomas area.
- 28 With the goal of strengthening the American River levees to enable them to pass a flow of 29 160,000 cubic feet per second (cfs), the Common Features project has installed roughly 24 miles of 30 slurry wall up to depths of 80 feet, raised levees to provide adequate freeboard, addressed slope 31 stability issues, and corrected some erosion problems. Because of the considerable cost increase of 32 seepage remediation on the American River, all funds appropriated by Congress throughout the late 33 1990s and the early part of the 2000s were used for construction activities on the American River 34 instead of for design efforts for the Natomas Basin. In 2006, the Common Features authorization 35 was deemed sufficient to cover improvements to the left levee of the Sacramento River near the 36 Pioneer Reservoir and in the Pocket/Freeport area.
- 37 The Corps is currently conducting conducted a post\_authorization change stud-y of the Common 38 Features project. Under this study, the Corps is reevaluating reevaluated the previous Common 39 Features project and identifying identified levee improvements needed to provide the city of 40 Sacramento and the Natomas area to the north with at least a 200-year level of flood protection. The 41 Corps uses General Reevaluation Reports (GRR) to present the results of a reevaluation of a 42 previously completed study, using current planning criteria and policies, which is required due to 43 changed conditions and/or assumptions (Engineer Regulation 1105-2-100). The results may 44 reaffirm the previous plan, reformulate and modify it, or find that no plan is currently justified. The

- results are documented in a GRR which, if recommended and supported, also serves as the decision
   document for a Federal action.
- 3 The Natomas PACR documents the evaluation of features in the Natomas Basin portion of the
- 4 <u>Common Features project and was submitted to Congress in October 2010 and obtained</u>
- 5 <u>congressional authorization in 2014.</u>The Common Features GRR is planned for completion in was
- 6 <u>completed with a signed Chief's Report in</u> 2015 and authorized by Congress in the Water Resources
- 7 <u>Development Act of 2016</u>. Construction associated with the report would begin approximately 1
- 8 year after adoption of the report by Congress. Much of this the construction work was completed or
- 9 is underway by SAFCA as an EIP and Section 408 action. The Natomas Post-Authorization Change
- 10 Report<u>PACR</u> documents the evaluation of features in the Natomas Basin portion of the Common
- 11 Features project and was submitted to Congress in October 2010 and obtained congressional
- 12 authorization in 2014.

### 13 Delta Levees Flood Protection Program

- 14 Lead Agency: DWR.
- 15 This is a grant program that works with more than 60 reclamation districts in the Delta and Suisun
- 16 Marsh to maintain and improve the flood control system and provide protection to public and
- 17 private investments in the Delta, including water supply, habitat, and wildlife. The program, through
- 18 its two major components of Delta Levees Maintenance Subventions Program and Delta Levees
- 19 Special Flood Control Projects, works with local agencies to maintain, plan, and complete levee
- 20 rehabilitation projects. One of the requirements to qualify for available funds is for the project to
- 21 result in no net loss of Delta habitat.

### 22 Lower Feather River Corridor Management Program

- 23 Lead Agency: DWR.
- 24 The Lower Feather River Corridor Management Plan (LFRCMP) describes a long-term vision and 25 multi-objective strategy for managing the 20-mile-long Feather River corridor between the 26 Marysville and Yuba City urban areas in the north and the Sutter Bypass in the south. The LFRCMP 27 provides a vision for how flood system maintenance and habitat enhancement can be integrated 28 under long-term programmatic permits, as well as recommendations for optimizing future 29 management, restoration, and maintenance of the corridor. It provides a planning tool and 30 informational resource for flood managers at DWR and local maintaining agencies, as well as 31 resource agencies, environmental and recreation advocates, farmers, and the general public. The 32 LFRCMP was released in June 2014.

### 33 Levee Repairs Program

- 34 Lead Agency: DWR.
- 35 The Levee Repairs Program is a state-run program to repair erosion sites throughout the Central
- 36 Valley flood control system. The program was implemented in response to the governor's
- declaration of a state of emergency for California's levee system in 2006. To determine the most
- 38 critical sites for repair, DWR evaluated more than 50 sites along the SRFCP, including 29 critical
- 39 erosion sites in need of urgent repairs.

### 1 Mid-Valley Levee Reconstruction Project

- 2 Lead Agencies: Corps, DWR.
- 3 This project reconstructs deficient levees of the SRFCP in the Mid-Valley area (between the Tisdale
- 4 Bypass and the Sacramento Bypass) to their original design standard. The scope includes
- 5 construction of stability berms, slurry walls, and toe drains.

### 6 Sacramento River Flood Control System Evaluation

7 Lead Agency: Corps, CVFPB, DWR.

8 Following the flood of 1986, the Corps and the state, along with local partners, completed a

- 9 comprehensive evaluation of the Sacramento River Flood Control System and initiated a flood risk 10 management program aimed at repairing, raising, and strengthening urban levees, among other
- 11 activities. This effort, known as the Sacramento River Flood Control System Evaluation (commonly
- referred to as System Evaluation), resulted in the repair of more than 70 miles of deficient levees by
   the Corps. However, to date, not all the authorized repairs have been completed. Moreover, the
- 13 the corps. However, to date, not all the authorized repairs have been completed. Moreover, the 14 completed repairs were built to standards that were in place at the time and which are no longer
- 15 current.
- 16 Due to the large scale of the evaluation, the review was split into five phases. The results were
- 17 published in the Sacramento River Flood Control System Evaluation, Phase II–V, Programmatic
- 18 EIS/EIR, dated May 1992. Phases I and II evaluations include the Sacramento urban area and
- 19 Marysville/Yuba City area. Phase III concerns the Mid-Valley area in and around the town of Knights
- Landing, approximately 27 miles northwest of Sacramento. Phase III involves reconstructing
   deficient levees of the SRFCP in the Mid-Valley area (between the Tisdale Bypass and the
- 22 Sacramento Bypass) to their original design standard. The scope includes construction of stability
   23 berms, slurry walls, and toe drains.
- Phases IV and V include the lower Sacramento River area south of Sacramento and the upper
   Sacramento River area north of Knights Landing. According to the November 2002 SRFCP Limited
   Reevaluation Report (LRR), Phase VI was added to evaluate additional potential sites in all phases,
   but its supplemental design memorandum had not been completed at that time.
- 28 Phase III is the only currently active phase and is being designed for dike slurry wall work at three 29 sites along the right bank of the Sacramento River (River Mile [RM] 84.1 to 87.2). The work also
- sites along the right bank of the Sacramento River (River Mile [RM] 84.1 to 87.2). The work also
   involves dike reconstruction, with final design being recently completed, at three sites along the left
- 30 involves dike reconstruction, with final design being recently completed, at three sites along the left 31 bank of the Knights Landing Ridge Cut. The state is proposing to complete the Knights Landing work
- 32 under an EIP; otherwise, the Corps would complete all work in 2015 to 2016.

### 33 Sutter Basin Feasibility Study

Lead Agency: Corps, State of California, and Sutter Butte Flood Control Agency (SBFCA).

- 35 The Sutter Basin is bounded roughly by the Feather River, Cherokee Canal, Sutter Buttes, and the
- 36 Sutter Bypass, and contains the cities of Gridley, Live Oak, Biggs, and Yuba City, as well as a
- 37 significant amount of agricultural land. Past flood events and geotechnical analysis show that the
- 38 levees bordering the Sutter Basin (including the Feather River West Levee) have a higher
- 39 probability of failure related to through-and under-seepage than levees designed to meet current
- 40 standards. Additionally, the levees are at risk of overtopping from floods greater than the levees are
- designed to withstand. The Sutter Basin project may eventually provide the Sutter Basin with 100-
- 42 to 200-year flood protection (depending upon location).

- 1 The Corps completed a Feasibility Study of the Sutter Basin in 2013. The Feasibility Study evaluated
- 2 structural and nonstructural flood risk management measures, including reoperation of existing
- 3 reservoirs; improvements to existing levees; construction of new levees; and other storage,
- 4 conveyance, and nonstructural options. Ecosystem restoration measures were also investigated,
- including restoration of floodplain function and habitat. The Corps released a Final Integrated
   Feasibility Report and Supplemental EIS/EIR in June 2013. In 2014, the project received
- reasibility Report and Supplemental EIS/EIR in June 2013. In 2014, the project received
   congressional authorization as part of the 2014 Water Resources Reform and Development Act.

### 8 Feather River West Levee Improvement Project

- 9 Lead Agency: Corps, State of California, and SBFCA.
- 10 Levee improvements are underway by SBFCA to reduce flood risk in portions of Sutter and Butte
- 11 Counties. The projects are intended to achieve a minimum 200-year protection for urbanized areas
- 12 and 100-year for agricultural areas by addressing flood management deficiencies on the Feather
- 13 River West Levee. The deficiencies include risks from through-seepage and under-seepage relative
- 14 to federal and state levee criteria. The current project addresses the 41 miles downstream of
- 15 Thermalito Afterbay to approximately 4 miles upstream of the confluence of the Feather River with
- 16 the Sutter Bypass. The proposed measures include cutoff walls, seepage berms, and slope flattening.
- 17 Construction was initiated in 2013 and is scheduled to be completed in 2015. The project is funded
- by local dollars provided by a parcel assessment district and state bonds from Propositions 84 and
- 19 1E, ultimately seeking Federal credit.

## Sacramento–San Joaquin River Basins Comprehensive Study and Central Valley Integrated Flood Management Study

- 22 Lead Agency: Corps.
- 23 Following the 1997 flood, the Sacramento–San Joaquin River Basins Comprehensive Study (Comp 24 Study) was initiated by the state and the Corps to formulate comprehensive plans for flood risk 25 reduction and environmental restoration. This study was unable to stimulate widespread public or 26 political interest in flood risk reduction or environmental restoration activity beyond the ongoing 27 urban levee improvement programs. The study did result in a new set of engineering criteria for the 28 design and evaluation of urban levees and a greatly expanded scope for the ongoing urban levee 29 improvement efforts on the Sacramento and American Rivers. In addition, the adequacy of previous 30 repairs was reviewed.
- 31 Presently, the Central Valley Integrated Flood Management Study (CVIFMS) is a continuation of the 32 Comp Study in which the Corps and the state are defining a long-range program for the Sacramento 33 and San Joaquin River Basins and the corresponding level of federal participation. CVIFMS will 34 evaluate flood risk management improvements in the Central Valley from a Federal perspective, and 35 provide a framework for authorization and implementation of flood risk management projects in the 36 Central Valley. This program will identify opportunities to reduce flood risk by improving the flood 37 capacity of the system while restoring and protecting floodplain and environmental features, 38 including wetlands and other fish and wildlife habitat. The approaches and management strategies 39 under CVIFMS include these measures.
- Conduct a watershed study to provide long-term reduction of flood risk and environmental
   restoration needs.
- 42 Coordinate closely with Central Valley Flood Protection Plan (CVFPP) development to produce
   43 joint products for mutual benefits and use.

- Provide leadership in specific disciplinary areas to ensure consistency in national management directives and guidelines.
- Coordinate with ongoing projects and programs to incorporate relevant information and actions in the study development.
- 5 Following completion of CVIFMS, it is anticipated that several regional feasibility studies will be
- 6 completed. When completed, the feasibility studies will be used to determine Federal interest in
- 7 implementing elements of the CVFPP and identify non-Federal responsibilities for improvement to
- 8 the system.

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### 9 Yuba Basin Project

- 10 Lead Agencies: Corps, DWR.
- 11 The Yuba Basin Project is an initiative to provide a 200-year level of protection and higher for
- 12 communities in Yuba County. When complete, it will be the first community in California's Central
- 13 Valley to achieve the state's requirement of 200-year flood protection.
- 14 To accelerate this federally authorized project, the state and local interests (Yuba County, Yuba
- 15 County Water Agency, and Three Rivers Levee Improvement Authority [TRLIA]), began an advanced
- 16 levee construction program in the southern portion of the county. Work is now complete on all of
- 17 the 29.3 miles of levees, including the construction of two new setback levees: the 2-mile long Bear
- River setback and the 6-mile long Feather River setback. Besides providing greater regional flood
   protection, these setback levees resulted in the creation of nearly 2,000 acres of wildlife habitat. The
   scheduled work for the 7.5-mile long Marysville Ring Levee has been fully funded and is the final
- 21 piece to the entire project.

### 22 Three Rivers Levee Improvement Agency Levee Improvement Program

- 23 Lead Agency: TRLIA.
- TRLIA, a joint powers agency, was established in May 2004 by Yuba County and Reclamation District
  (RD) 784 to finance and construct levee improvements in south Yuba County. The goal of the Three
  Rivers Levee Improvement Program is to provide 200-year flood protection to more than 40,000
  residents in Linda, Olivehurst, and Plumas Lake. Four work phases, covering 29 miles of levees, were
  identified to achieve this goal. All of the work identified in the four phases has been completed as of
  the end of 2011, and TRLIA is currently conducting only minor studies.
- The levees affected by this project are the south levee of the Yuba River, the east levee of the Feather River, the north levee of the Bear River, and the west levee of the Western Pacific Interceptor Canal. Improvements included stability berms, slurry cutoff walls, erosion protection, corrections to levee geometry, levee height increases, relief wells, monitoring wells, and detention basins. Setback levees were constructed along a portion of the Bear River north levee and the Feather River east levee. The land within the setback areas of both levees totals 1,750 acres, and will be used for habitat restoration and agricultural purposes.

### 37 West Sacramento General Reevaluation Report

- 38 Lead Agencies: Corps, DWR, West Sacramento Area Flood Control Agency (WSAFCA).
- 39 The Corps and DWR published the previous Sacramento Metropolitan Area General Reevaluation
- 40 Report in 1992. The purpose of that report was to recommend a program of improvements needed

- 1 to remedy structural problems and limitations of the levee system that were revealed by the 1986
- 2 flood. The subsequent 1997 flood and revisions to Corps levee construction standards after the 2005
- 3 New Orleans flood shifted attention to under-seepage deficiencies that had not been considered in
- 4 the previous study. Presently, t<u>T</u>he Corps and WSAFCA are developingdeveloped a GRR for West
- 5 Sacramento levee improvements to assess the entirety of the levees protecting the city of West
- 6 Sacramento in light of most recent criteria and knowledge regarding levee design, with particular
- 7 attention to remediation of seepage deficiencies.

8 The primary objective of the West Sacramento GRR is to determine the extent of federal interest in 9 additionally reducing the flood risk within the study program area while concurrently exploring 10 opportunities to increase recreation and restore the ecosystem along the Sacramento River within 11 the study program area. Much of this work was completed or is underway by WSAFCA as an EIP and 12 Section 408 action (see discussion of the West Sacramento Levee Improvements Program below). 13 Initiated in March 2009, the The GRR is expected to be presented towas completed in 2015 with an 14 approved Chief's Report and was authorized by Congress for authorization in 2015 in the Water 15 Resources Development Act of 2016.

### 16 West Sacramento Levee Improvements Program

- 17 Lead Agency: WSAFCA.
- 18 The goal of the program is to achieve 200-year flood protection for the city of West Sacramento. 19 WSAFCA proposes to implement a portion of the program, known as the Southport project, along 20 the right bank of the urbanized reach of the Sacramento River as an EIP and Section 408 action. The 21 study reach is approximately 6 miles, beginning at the upstream limit where a new SRBPP setback 22 levee terminates south of the barge canal connecting the Sacramento River to the Sacramento River 23 Deep Water Ship Channel and extending downstream to the West Sacramento city limit at the South 24 Cross Levee. The project would most immediately protect the part of the city known as Southport 25 and is targeted at addressing under-seepage, through-seepage, erosion, and slope instability. This 26 project is presently undergoing design development and an EIS/EIR is being prepared with the 27 Corps as the federal lead agency based on the Corps' responsibilities under Clean Water Act Section 28 408 (33 USC Section 408) and Rivers and Harbors Act Section 10 (33 USC Section 403), and 29 construction is anticipated to begin in 2015Construction of the setback levee began in 2017. 30 WSAFCA's Southport project is being coordinated with the ongoing West Sacramento Project GRR 31 (described previously). This project follows three others implemented by WSAFCA as EIPs and 32 Section 408 actions, namely, the I Street Bridge project (completed in 2008) and the CHP Academy 33 and The Rivers projects (completed in 2011).

### **1.3 Public Involvement and Agency Coordination**

The Lead Agencies are implementing a comprehensive public participation program to fully inform and engage potentially affected agencies, stakeholders and communities.

### **1.3.1** Notice of Preparation/Notice of Intent Scoping

- 38 In January 2009, the Lead Agencies issued a Notice of Preparation (NOP) of an EIR and a Notice of
- 39 Intent (NOI) to prepare an EIS, informing agencies and the general public that an EIS/EIR was being
- 40 prepared and inviting comments on the scope and content of the document during the 45-day public

- 1 review period. The NOI and NOP also requested participation at public scoping meetings. Appendix
- 2 A includes the NOI as published in the Federal Register on January 30, 2009, and the NOP as
- 3 distributed to responsible agencies and interested parties. In February 2009, the Lead Agencies
- hosted four public scoping meetings in Colusa, Walnut Grove, Sacramento, and Chico. Comment
  letters regarding the NOI and NOP and transcripts of the public scoping meetings also are included
- 6 in Appendix A.
- To publicize the scoping meetings, advertisements were placed in the *Sacramento Bee*, the Colusa
  County *Sun Herald*, and the *Chico Enterprise-Record*. Meeting notices were also sent to 68 resource
  agencies, 22 local media contacts, 18 tribal contacts, eight levee districts, and 124 reclamation
  districts inviting them to the meeting or to provide input about the proposed program during the
- 11 scoping period. Copies of the advertisements and meeting notice can be found in Appendix A.
- 12 Additionally, a letter was sent to elected officials inviting their attendance at the public scoping
- 13 meetings and input on the proposed program. The letter was sent to the following members of the
- 14 House of Representatives: Wally Herger; Dan Lungren; Doris Matsui; Tom McClintock; Jerry
- 15 McNerney; Ellen Tauscher; George Miller; and Mike Thompson.

### 16 **1.3.2** Agency Consultation and Coordination

17 Consultations and coordination with numerous local, state, and federal agencies have been 18 conducted throughout Phase II of the SRBPP. The regulatory setting for each respective resource 19 chapter in this EIS/EIR describes applicable federal, state, regional and local laws and regulations. 20 Appendix C, Regulatory Background, contains the discussion of the regulatory setting for each 21 resource area. Additionally, Chapter 24, Compliance with Applicable Laws, Policies, Plans, and 22 Regulatory Framework, describes preliminary information on the major requirements for 23 permitting and environmental review and consultation prior to implementation, including 24 consultation to date with various agencies. The following is a summary of those coordination efforts.

### 25 **1.3.2.1** Resource Agency Coordination

The Interagency Working Group (IWG) was formed as a term and condition of the draft (Jeopardy)
and final Biological Opinions (BOs) previously issued by the USFWS and NMFS for Phase II. The
IWG's primary purpose is to develop products for SRBPP planning, and to determine project impacts
on listed species under the federal Endangered Species Act and coordinate related issues with state
and federal natural resource agencies. Meetings are typically monthly and key participants include
the Corps, CVFPB, DWR, USFWS, NMFS, and the California Department of Fish and Wildlife (DFW).
Meetings have continued through the planning and Draft EIS/EIR processes.

In addition, between September 16, 2008 and November 25, 2008, the Corps solicited input from
 agencies that have a direct interest in flood risk management and the environmental conditions
 associated with future locations and types of bank protection alternatives. Interviews were
 conducted with staff of NMFS, California State Lands Commission (SLC), DFW, USFWS, Corps, DWR
 and CVFPB to better understand their perspectives and vision for implementation of the additional
 80,000 LF of bank protection. The interviews resulted in several recommendations for improvement
 of the SRBPP planning and implementation process, which are presented in Appendix A.

### 1 **1.3.2.2** Native American Consultation

2 On May 4, 2009, the Native American Heritage Commission (NAHC) was contacted to request a 3 search of its Sacred Lands File. The NAHC staff responded on May 12, 2009 with a list of Native 4 American contacts for Butte, Colusa, Glenn, Placer, Sacramento, Solano, Sutter, Tehama, Yolo, and 5 Yuba Counties. Native American groups with potential interest in the area were identified through 6 the efforts of an ethnographer. A series of letters, phone calls, emails and two workshops open to 7 Native American groups in the spring of 2010 were used to further identify interested parties. 8 Correspondence included a map depicting the program area, a brief description of the proposed 9 program, and a request for the contacts to share any knowledge or concerns they may have 10 regarding cultural resources in or adjacent to the program area. Based on this work, the Corps has initiated consultation with the following tribes. 11

- 12 Berry Creek Rancheria of Tyme Maidu Indians
- 13 Buena Vista Rancheria of Me-Wuk Indians
- Cachil DeHe Band of Wintun Indians of the Colusa Indian Community
- 15 California Valley Miwok Tribe
- 16 Cortina Band of Indians, Enterprise Rancheria (Estom Yumeka)
- 17 Grindstone Rancheria
- 18 Ione Band of Miwok Indians
- 19 Mechoopda Indian Tribe of Chico Rancheria
- 20 Mooretown Rancheria of Maidu Indians
- 21 Paskenta Band of Nomlaki Indians, Redding Rancheria
- Shingle Springs Band of Miwok Indians
- 23 United Auburn Indian Community of Auburn Rancheria
- Wilton Rancheria
- 25 Yocha Dehe Wintun Nation (Rumsey Rancheria)

26 The Corps and DWR determined that development of a Cultural Resources Programmatic 27 Agreement (PA) for the proposed program and an attending Historic Properties Treatment Plan 28 (HPTP) would be the most effective way to comply with NEPA, Section 106 of the National Historic 29 Preservation Act (NHPA), and CEQA. The PA and HPTP can be found in Appendix B. Further 30 consultation with the tribes included requesting comments on the PA and HPTP, additional outreach 31 meetings with individual tribes, and requesting their participation as concurring parties to the PA. 32 To date, the California Valley Miwok Tribe, Mechoopda Indian Tribe of Chico Rancheria, and the 33 Shingle Springs Band of Miwok have signed as concurring parties. Those tribes that have not signed 34 as concurring parties to the PA will still be given an opportunity to comment on specific

35 construction projects as they are designed and planned.

### 36 **1.3.2.3 CEQA Responsible and Trustee Agencies**

This EIS/EIR will be used by Responsible and Trustee Agencies to determine the effects of the
 proposed program. Responsible Agencies are those that have a legal responsibility to approve the

- 1 program. These agencies are required to rely on the Lead Agency's environmental document in
- 2 acting on whatever aspect of the proposed program requires the Responsible Agencies' approval but
- 3 must prepare and issue their own findings regarding the program (CEOA Guidelines Section 15096).
- 4 Trustee Agencies are those that have jurisdiction over certain resources held in trust for the people 5
- of California but do not have legal authority for approving or carrying out the proposed program.
- 6 Responsible and Trustee Agencies for the proposed program are shown in Table 1-1.

	· · · ·
Agency	Jurisdiction
Trustee	
Department of Fish and Wildlife	Fish and wildlife
	Native plants designated as rare or endangered
	Game refuges
	Ecological reserves
State Lands Commission	State-owned "sovereign" lands
Responsible	
Office of Historic Preservation	Historic and cultural resources
Central Valley Flood Protection Board	Levee modifications
Air Resources Board	Air quality
Regional Water Quality Control Board (#5)	Discharges to water bodies

#### 7 Table 1-1. Responsible and Trustee Agencies

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#### **Draft Environmental Impact Statement/** 1.3.3 9 **Environmental Impact Report Public Comments** 10

11 The Draft EIS/EIR was circulated for public review in December 2014 for a public comment period 12 of 66 days, from December 24, 2014 to February 27, 2015. To initiate the public comment period, the Corps and the CVFPB circulated a Notice of Availability (NOA) to federal and state agencies. 13 14 including Responsible and Trustee Agencies as defined under CEOA, involved Federal Agencies, and 15 parties previously requesting information on the proposed project. The NOA was published in the Federal Register in compliance with NEPA on January 2, 2015 and a Notice of Completion was 16 17 provided to the California Governor's Office of Planning and Research on December 24, 2014. Comments received during public review of the Draft EIS/EIR, responses to those comments, and 18 19 more information about the public review process are presented in Volume II of this Final EIS/EIR. 20 Changes have been made to the content of the EIS/EIR in response to these comments, or for 21 purposes of clarification or correction. Changes to the text are shown by strikethrough of text that 22 has been deleted and underlining of new text that has been inserted. The revisions contain clarifications and corrections that have been identified, either through public comments or by the 23 24 Corps or the CVRWOCBCVFPB, since publication of the Draft EIS/EIR. The text revisions do not 25 result in substantive changes to either the analyses or conclusions presented in the EIS/EIR. This 26 EIS/EIR will be circulated for a minimum of 45 days for public review to federal, state, and local 27 agencies; organizations; and individuals who have an interest in the project. A notice of availability 28 of the draft EIS/EIR will be published in the Federal Register and local newspapers when the 29 document is released for public review. Public workshops will be held during the review period to 30 provide additional opportunities for comments on the draft document. Public notices will be sent 31 providing public workshop details. All comments received during the public review period will be
- 1 considered and incorporated into the final EIS/EIR, as appropriate. A comment and response
- 2 appendix will be included with the final document.
- 3 Copies of the draft EIS/EIR will be submitted to the State Clearinghouse in Sacramento for
- 4 distribution to state agencies. Additionally, the draft EIS/EIR will be available for public review on
- 5 the SRBPP website (http://www.spk.usace.army.mil/Missions/CivilWorks/
- 6 SacramentoRiverBankProtection.aspx) and CVFPB website
- 7 (http://www.cvfpb.ca.gov/PublicNotices/).

### 1.4 Areas of Known Controversy and Unresolved Issues

- 9 CEQA Guidelines Section 15123(b) requires that an EIR describe areas of controversy known to the 10 lead agency, including issues raised by agencies and the public as well as unresolved issues. NEPA 11 regulations also require disclosure of areas of controversy and issues to be resolved (40 CFR Section 12 1502.12). No unresolved issues were identified during this programmatic evaluation.
- 13 The following issue areas of controversy were identified during the NOI/NOP scoping period.
- Vegetation on levees.
- 15 Economic impacts on rural communities.
- 16 Hydraulic effects.

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- Public outreach and agency coordination.
- 18 Invasive species.
- 19 Construction impacts, including routes for transporting materials.
- Effects on fish, wildlife, and vegetation, including Central Valley salmonids and bank swallow
   habitat.
- Erosion site locations and selection.
- Mitigation of impacts.
- Consideration of setback levees.
- Cumulative effects.
- Eminent domain as a possible tool for real estate acquisition.

# 1.5 Irreversible and Irretrievable Commitments of Resources/Significant Irreversible Environmental Changes

- 30 State CEQA Guidelines (14 California Code of Regulations 15126.2[c]) and NEPA (40 CFR Section
- 31 1502.16) require analysis of significant irreversible and irretrievable effects. CEQA requires
- 32 evaluation of irretrievable resources to ensure that their use is justified. NEPA requires an
- 33 explanation of which environmental impacts are irreversible or would result in an irretrievable
- 34 commitment of resources.

- 1 Irreversible impacts are those that cause, through direct or indirect effects, use or consumption of 2 resources in such a way that they cannot be restored or returned to their original condition despite 3 mitigation. Potentially irreversible impacts are documented in this EIS/EIR. An irretrievable impact 4 or commitment of resources occurs when a resource is removed or consumed. These types of 5 impacts are evaluated to ensure that consumption is justified.
- 6 All the program alternatives would involve a commitment of a range of natural, physical, and fiscal 7 resources as follows.
- 8 Construction materials.
- 9 Nonrenewable resources, such as gasoline and diesel oil used to power construction equipment 10 and vehicles.
- 11 Nonrenewable energy resources necessary to operate barges, trucks, and equipment used for 12 construction, and operations and routine maintenance.
- 13 Additional electrical power from a renewable resource for lighting and operations.
- 14 Land conversion of open space, agricultural lands, and natural environments to other uses. •
- 15 Any construction would require expenditure of state and federal funds for the costs of construction 16 and right-of-way. The proposed program would also require funding for operation and maintenance 17 of the constructed sites and for vegetation establishment and monitoring activities associated with 18 mitigation elements.
- 19 The decision by the Lead Agencies to commit these resources is based on the concept that residents
- 20 in the immediate area, region, and state would benefit from the implementation of the proposed
- 21 program. The overarching benefit of the proposed program is that the integrity of the flood control
- 22 system would be maintained through the application of site-specific bank protection measures to
- 23 remedy erosion sites with high failure potential in order to prevent levee failure, catastrophic
- 24 damage, and possible loss of life. Implementation of the SRBPP and 80,000 LF of additional bank
- 25 protection would ensure the continued integrity of the SRFCP levees while protecting 26 environmental resources and compensating for effects on significant environmental resources to the
- 27 degree feasible. These benefits are expected to outweigh the commitment of these resources.
- **1.6 Relationship between Short-Term Uses of the** 28
- 29

### **Environment and Maintenance and Enhancement** of Long-Term Productivity

- 31 The CEQ NEPA Regulations (40 CFR Section 1502.16) require that an EIS discuss issues related to 32 environmental sustainability. In general, this EIS discussion is not considered an environmental 33 effect for which either significance is defined, or mitigation is recommended. However, the 34 discussion, as it relates to environmental consequences, must be included in the EIS, and should 35 consider "the relationship between local short-term uses of man's environment and the 36 maintenance and enhancement of long-term productivity" (42 USC Section 4332(C)(iv).
- 37 The short-term effects on and uses of the environment in the vicinity of the program area are related 38 to long-term effects and the maintenance and enhancement of long-term productivity. Short term

- 1 refers to the total duration of construction: the multi-year construction period to construct 80,000
- 2 LF of bank protection in the SRFCP area and associated mitigation elements to replace habitat
- 3 losses. Construction associated with the proposed program, including implementation of various
- bank protection measures, would cause short-term impacts on the environment related to alteration
  of topography and hydrologic conditions, water quality, biological resources, air quality, land use,
  recreation, visual resources, and the human environment (noise and traffic conditions).
- *Long term* refers to an indefinite period beyond the initial construction of the erosion sites and
  includes longer term and ongoing operation and maintenance of the sites as well as vegetation
  establishment and monitoring activities. Vegetation establishment and monitoring would be
- recessary to ensure that the vegetation and species habitat required for mitigation is successfully
   establishing and that the vegetation is functioning as intended and being managed as required by
- 12 <u>environmental permits</u>.
- 13 Implementation of the proposed program would include bank repair and levee rehabilitation, which
- 14 would result in long-term benefits including protection of property and the health and safety of
- 15 residents. The proposed river bank repair and mitigation work would greatly minimize erosion,
- 16 limiting the eventual loss of nearshore aquatic habitat and riparian habitat that would likely occur if
- 17 the proposed program were not enacted.
- 18 The No Action Alternative would offer none of the benefits and would likely cause substantially
- 19 lesser impacts than those listed above. It would, however, do nothing to maintain the integrity of the
- 20 flood control system by identifying and remedying locations with a high failure potential.

### 3 2.1 Introduction

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The U.S. Army Corps of Engineers, Sacramento District (Corps) and the Central Valley Flood
Protection Board (CVFPB) propose to implement the proposed program, which would result in the
construction of an additional 80,000 linear feet (LF) of bank protection in the Sacramento River
Flood Control Project (SRFCP) area. This chapter describes the proposed program components,
provides a summary of the alternatives screening process and alternatives selected for analysis, and
discusses physical and operational characteristics of the alternatives.

### 10 2.2 Project Location

11The Sacramento River Bank Protection Project (SRBPP) area (also referred to as the program area)12is located along the Sacramento River and its tributaries, distributaries and bypasses, and spans13Butte, Colusa, Glenn, Placer, Sacramento, Solano, Sutter, Tehama, Yolo, and Yuba Counties in14California (Figure 1-1). The alternatives covered in this programmatic EIS/EIR are those associated15with future repair of bank erosion sites on an additional 80,000 LF within the program area.

### 16 2.2.1 Program Area

17The program area extends along the Sacramento River from Collinsville at river mile (RM) 3, which18is the southernmost point in the program area, upstream to Chico at RM 194, the northernmost19point, and includes reaches of lower Elder and Deer Creeks. The program area also includes several20tributary streams and distributary sloughs, including Cache Creek, the lower reaches of the21American River (RM 0–13), Feather River (RM 0–61), Yuba River (RM 0–11), and Bear River (RM 0–2217), as well as portions of Threemile, Steamboat, Sutter, Miner, Georgiana, and Cache Sloughs. Sutter23and Yolo bypass levees are also included in the program area.

24The economic analysis performed for the SRBPP Post Authorization Change Report (PACR)25estimated that there are more than 193,000 structures protected by the SRBPP levees. The value of26these structures and their contents (in 2012 dollars)-is estimated at almost \$100 billion. The SRBPP27levees also protect more than 590,000 acres of agricultural land from flooding, with a-significant28economic damage potential of up to \$630 billion depending on the severity of the flood event.

29 For the purposes of this EIS/EIR, the program area has been divided into four regions, organized 30 south to north by the location of the downstream terminus of each watercourse with the mainstem 31 Sacramento River (Figure 2-1). The four reaches are generally defined in a manner that captures the full range of environmental conditions within the program area while dividing them in a manner 32 33 that recognizes differences in physical structure and species use among these four reaches. Region 34 1a includes the Yolo and Sacramento Bypasses, the Sacramento River below Isleton (RM 20), and a 35 distribution network of sloughs and channels. Region 1b includes the mainstem Sacramento River 36 from Isleton (RM 20) in the Delta, upstream past the city of Sacramento, to the Feather River 37 confluence (RM 80) at Verona. Region 1b also includes the lower American River from the

1 confluence with the Sacramento River upstream to RM 13, Natomas East Main Drain, Natomas Cross 2 Canal, and Coon Creek Group Interceptor Unit 6 (East Side Canal). Within Region 2, the mainstem 3 Sacramento River flows from Colusa (RM 143) downstream of the Colusa Bypass to the confluences 4 with the Feather River and Sutter Bypass at Verona (RM 80). Region 2 also includes the lower 5 Feather River from its confluence with the Sacramento River upstream to RM 61, the lower Yuba 6 River from its confluence with the Feather River upstream to RM 5, and Bear River from its 7 confluence with the Feather River upstream to the end of its levees above State Route 65. Region 3 8 includes the Sacramento River downstream of Chico Landing (RM 194) to Colusa (RM 143) as well 9 as portions of Elder Creek, Deer Creek, Chico Creek, and Mud Creek. Table 2-1 provides the 10 watercourses by region, reach lengths in miles, total length by region, and counties within the 11 program area.

### 12 Table 2-1. Watercourses, Reach Lengths, and Counties within the Program Area by Region

Region	Watercourse	Leveed Reach Length (miles)	Total Length by Region (miles)	Counties
1a	Sacramento River from Collinsville to Isleton	20.7		
	Threemile Slough	3.7		
	Georgiana Slough	12.4		
	Steamboat Slough	13.1		
	Yolo Bypass	37.9		
	Miner Slough	7.7		
	Portions of Lindsey Slough	7.5		
	Cache Slough	10.7		Sacramento,
	Ulatis Creek Bypass Unit	1.6	172.0	Solano,
	Haas Slough	2.8	172.0	Sutter,
	Sutter Slough	6.8		Y 010
	Elk Slough	9.3		
	Putah Creek	8.9		
	Willow Slough Bypass	7.4		
	Sacramento Bypass	1.8		
	Cache Creek from the Yolo Bypass to the upstream limit of the project levees	13.3		
	Knights Landing Ridge Cut	6.4		
1b	Sacramento River from Isleton to Feather River (RM 20–80)	60.3		
	American River from Sacramento River to RM 13	13.2		Dlagon
	Arcade Creek	2.1		Sacramento.
	Dry Creek (South)	1.7	105.0	Solano,
	Pleasant Grove Canal	3.0		Sutter,
	Natomas East Main Drain	14.5		Yolo
	Natomas Cross Canal	5.3		
	Coon Creek Group Interceptor Unit 6 <u>(East Side Canal)</u>	4.9		



Figure 2-1 Program Regions Sacramento River Bank Protection Project

**Project Description** 

Region	Watercourse	Leveed Reach Length (miles)	Total Length by Region (miles)	Counties
2	Sacramento River from Feather River confluence to Colusa (RM 80–143)	62.3		
	Colusa Basin Drain (Sycamore Slough)	35.8		
	Sutter Bypass	37.2		
	Tisdale Bypass	4.3		Butte, Colusa,
	Wadsworth Canal	4.6		Glenn, Placer,
	Colusa Bypass	2.8		Sutter, Yolo, Yuba
	Cherokee Canal	20.4		Tuba
	Cottonwood Creek	0.8	217 (	
	Butte Creek	17.3	317.6	
	Feather River from Sacramento River upstream to RM 31	30.8		
	Bear River from Feather River to upstream end of levees above State Route 65	12.6		
	Yuba River from Feather River upstream to RM 5	4.9		
	Marysville Units 1, 2, and 3	7.5		
	Honcut Creek	4.7		
	Feather River from RM 31 to Honcut Creek right bank	13.2		
	Feather River from Honcut Creek to RM 61	16.2		
	East Interceptor Canal	3.7		
	West Interceptor Canal	1.8		
	Butte Slough	8.0		
	Yankee Slough	4.5		
	Dry Creek (North)	8.4		
	Best Slough	2.0		
	Western Pacific Interceptor Canal	6.2		
	Jack Slough	7.6		
3	Sacramento River from Colusa to Chico (RM 143-194)	50.3		
	Mud Creek	8		Butte, Colusa,
	Chico Creek	4.3	73.3	Glenn,
	Deer Creek	6.7		Tehama
	Elder Creek	4		

Source: Sacramento River Bank Protection Project Extent [shapefile]. SPK-USACE 2009. ArcGIS 9.3, ESRI.

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### 2 2.2.2 Erosion Sites

The Corps' Sacramento District, the proposed program's nonfederal sponsor, the CVFPB, and the
 California Department of Water Resources conduct annual field reconnaissance reviews of the
 SFRCP. Specific criteria are used to identify erosion sites within the system as described in the
 Corps' Field Reconnaissance Report of Bank Erosion Sites and Site Priority Ranking (Ayres
 Associates 2008). In most cases the criteria are based on bank and levee conditions that are

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- threatening the function of individual basins within the system or the flood control system as a
   whole. An erosion site is defined as:
  - A site that is at risk of erosion during floods and/or normal flow conditions; the term *critical* is used to indicate erosion sites that are an imminent threat to the integrity of the flood control system and of the highest priority for repair.

6 A site is typically identified as an erosion site if the erosion has encroached into the projected levee 7 prism (e.g., 35 feet or less of bank). A typical levee prism has a landside slope, a levee crown (top of 8 the levee), and a waterside slope. The projected levee slope is the hypothetical extension of the 9 landside and waterside slopes as the actual levee slopes "project" below the surrounding ground 10 surface, forming the levee foundation. The Corps is currently in the process of updating its process 11 for selecting erosion sites for repair. However, the programmatic analysis in this EIS/EIR is based on 12 the representative sample of sites contained in the "Final Alternatives Report-80,000 LF" 13 (Kleinfelder-Geomatrix 2009). The SRBPP itself relies on annual field reconnaissance reports.

- 14 The representative sites selected for the Final Alternatives Report—80,000 LF were informed by the 15 2008 Field Reconnaissance Report (Ayres Associates 2009), which identified 154 erosion sites. 16 Many of these 154 erosion sites are not classified as critical, but they do pose a substantial risk of 17 erosion and threat to the flood control system and would continue to be considered erosion sites 18 under the new site selection process. The 107 representative sites, totaling approximately 80,000 19 LF, are used for evaluation and identification of suitable design alternatives for bank protection in 20 the Final Alternatives Report-80,000 LF. Sites selected by the Corps for further evaluation and 21 identification of suitable bank protection designs exhibited bank and levee conditions that are 22 threatening the function of the flood control system (Kleinfelder-Geomatrix 2009). After publication, 23 a discrepancy was found in the Final Alternatives Report regarding a site at Natomas Cross Canal 3.0 24 L. The site has since been removed from the evaluation list, leaving 106 sites.
- 25 For purposes of this EIS/EIR, the 106 selected eroding sites along the Sacramento River and its tributaries constitute a representative sample of the sites eventually proposed to be treated under 26 27 the supplemental 80,000 LF. However, the number and extent of documented sites can change from 28 year to year because of various factors, including newly identified sites, increased or decreased rates 29 of erosion, repaired sites, reclassification of erosion sites to maintenance sites, and removed sites. 30 Therefore, because streambank erosion is episodic and new erosion sites can appear each year, the 31 environmental analysis in this EIS/EIR is programmatic in nature, analyzing the 80,000 LF in its 32 entirety, but relying on data associated with the 106 representative sites when appropriate in order 33 to provide the most detailed programmatic analysis possible. Additional project-level environmental 34 documentation, tiering from this programmatic analysis, will be prepared to address those sites that 35 will be constructed.

### **2.3 Proposed Site-Specific Bank Protection Measures**

The suite of SRBPP site-specific bank protection measures in the proposed program is described
below with figures to support each measure. A bank protection measure is a site-specific design
solution to control an existing erosion site while minimizing and/or mitigating environmental
impacts.

The following criteria have been developed for bank protection design, consistent with the project
 purpose and need.

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- Restoring the flood damage risk-reduction capability of the originally constructed levee through the use of structurally reliable erosion-control elements.
- To the extent practicable, maintaining fish and wildlife habitat and scenic and recreational
   values, and replacing habitat losses through the use of on-site mitigation elements overlying or
   integrated with erosion-control elements.
  - Fully mitigating off-site significant residual fish and wildlife habitat losses to the extent justified.
- Minimizing costs of construction and maintaining both erosion-control and on-site habitat mitigation elements.

9 The following measures are intended to meet these criteria while also meeting the Corps vegetation 10 management policy as prescribed in Engineering Technical Letter 1110-2-583, Guidelines for 11 Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and 12 Appurtenant Structures (Vegetation ETL) (U.S. Army Corps of Engineers 2014). The measures will 13 also comply with Implementation Guidance for Section 3013 of the Water Resources Reform and 14 Development Act of 2014, Vegetation Management Policy. For purposes of this EIS/EIR, the 15 vegetation-free zone (VFZ) is defined in the Vegetation ETL and encompasses the existing and new 16 levee footprint area 15 feet outward of each levee toe where vegetation would be restricted to 17 native grass (unless a Vegetation Variance Request is submitted and approved according to Policy 18 Guidance Letter and October 2017 Implementation Guidance Letter for the Water Resources Reform 19 and Development Act of 2014). These measures are conceptual and will be modified to the degree 20 necessary to be suitable for conditions at any given erosion site. As a result, dimensions in the 21 following figures are typical and will vary based on site-specific conditions and designs.

### 22 2.3.1 Bank Protection Measure 1–Setback Levee

23 This measure entails constructing a new levee some distance landward of the existing levee, and 24 avoids or minimizes construction in the waterside or riparian areas. The land between the setback 25 and existing levee would act as a floodplain. Land use in the new floodplain would be determined on 26 a site-by-site basis. The old levee could be breached in several locations or degraded to allow high 27 flows to inundate the new floodplain. Vegetation on the new setback levee, including 15 feet beyond 28 each toe, would be restricted to grass. While vegetation could remain on the existing levee, the 29 setback levee would be managed as a VFZ. New vegetation planted in the setback area could serve as 30 mitigation to offset project losses. Additionally, vegetation on the existing levee could become newly 31 available to aquatic species and contribute to a net increase in floodplain vegetation.

Measure 1 would be most applicable in areas where substantial habitat values exist along the channel and land uses in the setback area are not restrictive. Setback levees can be very effective, but real estate acquisition (including the need for willing sellers), existing land use, and technical issues limit opportunities for setback levees in the program area. Setback levees may offer opportunities for mitigation of riparian, bank swallow, and fish habitat loss at other bank protection sites and restore riverine processes. Setback levees may also provide other flood control benefits, such as addressing seepage issues, that other bank protection measures would not address.



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### 2.3.2 Bank Protection Measure 2–Bank Fill Stone Protection with No On-Site Woody Vegetation

5 This measure, which entails filling the eroded portion of the bank and installing quarry stone along the levee slope, is needed as determined by site-specific analysis. The rock/soil ratio of the fill would 6 7 vary by location and would be determined during site-specific design. Six inches of soil cover would 8 be placed on the revetment above summer mean water surface elevation to support on-site cover 9 vegetation. Vegetation would be limited to native grass, and existing vegetation would be removed 10 within the VFZ. If there is a natural bank distinct from the levee that requires erosion protection, it would be treated with revetment. Measure 2 would be most applicable in areas where there is 11 12 inadequate space or substantial constraints (for example, critical infrastructure, homes, roadways, 13 pump facilities, real estate issues), either landside or waterside, or where hydraulic concerns would 14 make it difficult to implement the other measures, or where existing habitat values are very limited.



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#### 2.3.3 Bank Protection Measure 3–Adjacent Levee 18

19 This measure involves the construction of a new levee embankment adjacent to and landward of the 20 existing levee. The adjacent levee would be constructed to Corps design standards, which require 21 adjacent levees to be constructed with 3:1 slopes (distance width to distance height, or dW:dH) on 22 both the waterside and landside. The landward portion of the existing levee would be an integral, 23 structural part of the new levee. The waterward portion of the existing levee would remain. 24 Vegetation and instream woody material (IWM) could be placed on the old levee if that portion is 25 outside of the VFZ. However, a variance under the Vegetation ETL may be required if the existing 26 levee is considered to be a waterside planting berm based on its dimensions and proximity to the

- 1 new levee. The existing levee may also be degraded to riparian and/or wetland benches that comply
- 2 with the Corps' vegetation management policy. Vegetation on the landward side of the existing levee
- 3 and within the footprint of the new adjacent levee would be removed as a part of construction.
- 4 Measure 3 would be appropriate at many sites where waterside berms are narrow or non-existent
- 5 but landside uses limit the use of a setback levee.



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### 2.3.4 Bank Protection Measure 4–Riparian and Wetland Benches with Revegetation

10Measure 4 consists of three design variations presented as Measures 4a, 4b, and 4c. In general,11Measure 4 involves the placement of clean quarry stone from the toe of the bank up to the12summer/fall waterline and placing quarry stone and soil-filled quarry stone on the levee slope13above the summer/fall waterline. The rock/soil ratio will vary by location and will be determined14during site-specific design. The repairs would involve initial site preparation and construction of15levee embankment. Measures 4a, 4b, and 4c would comply with the Vegetation ETL, requiring all16woody vegetation within the VFZ to be removed.

- 17 Measures 4a, 4b, and 4c vary from one another with regard to the placement and extent of 18 environmental features that are intended to increase habitat quality (bank construction, vegetation, 19 and IWM). These variations are driven by a number of factors, most importantly the types of existing 20 resources and the types of species likely to use those resources. For example, if the existing site is 21 downstream of Sacramento River Mile 30 and likely to be used by delta smelt, the new design would 22 not include IWM below the summer/ fall waterline, because IWM is not considered optimal habitat 23 for delta smelt. New IWM would only be installed downstream of RM 30 to replace existing IWM 24 removed during repair of the bank (1:1 ratio). Upstream of RM 30, new IWM is usually incorporated 25 into the design, because delta smelt aren't likely to be present.
- In general, plantings consistent with the Vegetation ETL and outside of the VFZ at each site could
  include box elder (*Acer negundo*), white alder (*Alnus rhombifolia*), Oregon ash (*Fraxinus latifolia*),
  western sycamore (*Platanus racemosa*), Fremont cottonwood (*Populus fremontii*), Valley oak
  (*Quercus lobata*), Goodding's willow (*Salix gooddingii*), red willow (*Salix laevigata*), arroyo willow
  (*Salix lasiolepis*), California wild rose (*Rosa californica*), and narrowleaf willow (*Salix exigua*).
- These measures are appropriate where the channel is wide enough to accommodate the installation of the stone and soil structure without substantially affecting the hydraulic capacity of the channel.

### 12.3.4.1Bank Protection Measure 4a – Riparian Bench with Revegetation2and Instream Woody Material above Summer/Fall Waterline

Measure 4a entails installing revetment along the waterside levee slope or bank as well as a rock/soil bench to support riparian vegetation and provide a place to anchor IWM. This design provides near-bank, shallow-water habitat and components of shaded riverine aquatic habitat for fish and is typically applicable to sites upstream of Sacramento River Mile 30. Treatment of existing vegetation, site preparation, and installation of revetment on the lower slope would be similar to the description under Measure 2. Measure 4a includes a riparian bench. The bench would be treated with soil-filled quarry stone.

- In this design, the riparian bench is intended to be inundated at river stages corresponding to high tide (where tidally influenced) or during average winter/spring flows. The riparian bench would be revegetated in a manner similar to recent SRBPP projects with riparian bench designs. Species planted would be in compliance with the Vegetation ETL. Planting plans would describe species to be planted within a specific elevation zone and would detail the number, area and spacing of plants to be installed, and whether the plants are from cuttings or containers.
- 16 The riparian bench would be constructed at a slope of 6:1 to 10:1 and the revetment portion above 17 and below the bench would typically be 3:1. The width of the bench would be approximately 10–30 18 feet, depending on site conditions. Anchored IWM would be embedded on top of the riparian bench 19 above the summer/fall waterline. The IWM would be available as accessible habitat along the banks 20 only during winter/spring flows when the bench is inundated. Individual pieces of IWM would be 21 placed to fit the project site's hydraulic conditions and based on other applicable guidance. Exact 22 shoreline coverage amounts and complexity components will be determined during site-specific 23 design.



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### 262.3.4.2Bank Protection Measure 4b–Riparian Bench with Revegetation and27Instream Woody Material above and below Summer/Fall Waterline

This measure entails installing revetment along the waterside levee slope or bank as well as a rock/soil bench (as described for Measure 4a) to support riparian vegetation and provide a place to anchor IWM. In addition to the placement of IWM above the summer/fall waterline as described for Measure 4a, IWM also would be placed beyond the bench and below the summer/fall waterline, thereby increasing the types and extent of shallow-water fish habitat, providing year-round instream habitat for targeted fish species. This design is typically applicable to sites upstream of

- 1 Sacramento River Mile 30. Treatment of existing vegetation, site preparation, and installation of
- 2 lower slope quarry stone would be similar to Measure 2. Installation of soil-filled quarry stone and
- 3 riparian bench would be similar to Measure 4a.



### 6 2.3.4.3 Bank Protection Measure 4c–Riparian and Wetland Benches with 7 Revegetation

Measure 4c entails installing revetment along the waterside levee slope or bank, as well as a
rock/soil bench to support riparian vegetation and provide a place to anchor IWM. Bench slopes
would be the same as those described for Measure 4a. The design also includes a wetland bench
below the summer/fall waterline to further increase habitat quality. This design is intended for sites
downstream of Sacramento River Mile 30 and targets mitigation of impacts on delta smelt habitat.
Because IWM might increase habitat suitability of ambush predators, new IWM would only be
installed to replace existing IWM removed during project construction (1:1 ratio).

15 The riparian and wetland benches are intended to flood at river stages corresponding to

- 16 winter/spring (high) flows and summer/fall (low) flows, respectively. Existing vegetation would be
- 17 removed within VFZ. Both benches would be revegetated in compliance with the Vegetation ETL and
- 18 in accordance with appropriate planting plans. The wetland bench would typically be planted with
- 19 hardstem bulrush (*Scirpus acutus*), California bulrush (*S. californicus*), or giant bur-reed
- 20 (Sparganium eurycarpum ssp. eurycarpum).



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### 2.3.5 Bank Protection Measure 5–Bank Fill Stone Protection with On-Site Vegetation

Measure 5 entails filling the eroded portion of the bank and installing revetment along the waterside
 levee slope and streambank from streambed to a height determined by site-specific analysis.
 <u>Rock/soil combination revetment would be placed above summer mean water surface elevation.</u>
 The revetment would be placed at a slope of 3:1. All IWM would be removed from the bank and
 would not be replaced on the bank fill stone protection.

8 Existing vegetation would be removed within the VFZ; however, grass would be allowed in this area. 9 Approximately 25% of existing vegetation that is outside of the VFZ on the waterside slope is 10 estimated to be retained during construction. This assumption is made for analysis purposes and is based on past construction experience. The actual amount of retained vegetation could vary 11 12 substantially from site to site during implementation. New vegetation would be limited to native 13 grasses within the VFZ, while woody vegetation could be replaced by planting outside of the VFZ, as 14 allowed by specific site conditions. The long-term goal of vegetation planting is to provide riparian 15 and shaded riverine aquatic (SRA) cover habitat as defined by the U.S. Fish and Wildlife Service. 16 Planting plans would describe species to be planted within a specific elevation zone and would

17 detail the number, area and spacing of plants to be installed, and whether the plants are from 18 cuttings or containers. Six inches of soil cover would be placed on the revetment to support on-site 19 vegetation. If there is a natural bank distinct from the levee that requires erosion protection, it 20 would be treated with revetment.

Similar to Measure 2, Measure 5 would be most applicable in areas where there is inadequate space
 or substantial constraints that would limit the applicability of the other measures. However, some
 amount of space to allow for the planting of vegetation is necessary.



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### 26 **2.3.6 Additional Measures**

Additional measures may be considered and found to be appropriate during implementation of the
 site-specific repairs. Design and analysis of any additional measures would be carried out during the
 site-specific planning and design phase.

Examples of additional measures include toe protection, flow modification (e.g., impermeable
 groins) and alternative materials in place of riprap.

### 3 **2.3.6.1 Toe Protection**

4 Toe protection is authorized by SRBPP and could be considered for long-term erosion control. Toe 5 protection entails filling the low-lying eroded portion of the bank with rock to curtail further loss of 6 the toe and subsequent losses of the upper bank typically resulting from toe erosion. Because toe 7 protection doesn't replace existing losses of material on the upper bank, which is often the condition 8 at critical sites, it is not considered a complete solution for critical sites. Consequently, toe 9 protection has not been implemented recently because many erosion sites are considered to be at or 10 near critical. A site is considered "critical" when erosion encroaches into the cross-section of the 11 levee foundation.

### 12 **2.3.6.2** Flow Modification

13 Groins, or spurs, redirect or reduce erosive forces along the channel bank by diverting the stronger 14 currents and deflecting water away from the bank. By deflecting the current away from the bank 15 and causing sediment deposits, a spur or a series of spurs may protect the streambank more 16 effectively and at a lower cost than revetment. Long spurs or groins may also be called spur dikes, 17 and very long spurs can be referred to as dikes and jetties. Spurs are also used to channelize a wide, 18 poorly defined stream into a well-defined channel that neither aggrades nor degrades, thus 19 maintaining its location from year to year. Spurs on streams with suspended sediment induce 20 sedimentation to establish and maintain the new alignment. Dikes fall in the category of an erosion 21 control or flow diversion structure extending roughly perpendicular from a streambank that either 22 diverts flow from the bank or reduces flow velocity adjacent to the bank. Flow diversion also can be 23 accomplished through biotechnical methods in some locations. For example, log brush barriers are 24 densely packed layers of branches and logs that divert stream flow from an eroding bank.

A bendway weir is an upstream-angled underwater sill. Water flowing over the weir is redirected at an angle perpendicular to the weir. When weirs are angled upstream, water is directed away from the outer bank and toward the inner part of the bend, breaking up the river's strong secondary currents. Weirs are typically built in sets (4 to 14 weirs per bend) and are designed to redirect current directions and velocities through the bend and well into the downstream crossing.

### 30 **2.3.6.3** Alternative Materials and Construction Methods

### 31 **Reinforced Soil Slopes and Mechanically Stabilized Earth Walls**

32 Mechanically stabilized earth walls (MSEWs) are internally reinforced soil structures with faces 33 angled 70 degrees to 90 degrees from horizontal. MSEWs stabilize unstable slopes and retain the 34 soil on steep slopes and under crest loads. The wall face is often of precast segmental blocks, panels, 35 or geocells that can tolerate some differential movement. The walls are infilled with granular soil. 36 with or without reinforcement, while retaining the backfill soil. The reinforced soil mass, along with 37 the facing, forms the MSEW. Structures with slope angles less than 70 degrees are termed reinforced 38 soil slopes (RSSs). An RSS is a compacted fill embankment that incorporates the use of horizontally, 39 or both horizontally and vertically, placed geosynthetic reinforcement to enhance the stability of the 40 soil structure.

- 1 MSEWs and RSSs use soil and rock with structural elements, such as geogrids, to provide for steeper
- 2 stable slopes than typically occur naturally. These structures provide long-term stability yet can be
- 3 porous enough to provide filtration and support vegetated growth. Vegetated MSEW and RSS
- 4 structures can become stronger as root systems penetrate and grow throughout the retained mass,
- providing a long-term vegetated solution for erosion and soil retention issues. The engineered
   MSEWs and RSSs remain to provide stability during the time it takes vegetation to become
- MSEWs and RSSs remain to provide stability during the time it takes vegetation to become
   established, as well as into the long term. Engineered MSEWs and RSSs may remain to provide
- 8 stability while vegetation is getting established, or they may remain in place long term. The
- 9 advantage of these structures is a more natural appearance in areas with limited rights-of-way or
- 10 unacceptable encroachment within the channel compared with some other repair methods.

### 11 Artificial Floating Structures

12 Artificial floating structures are modeled after natural floating islands formed when floating 13 vegetation grows and accumulates gas, or nutrient rich peat soil becomes buoyant, rises to the 14 surface, and is colonized by plants. Artificial floating structures are made of a recycled nontoxic 15 plastic mesh injected with marine foam for initial buoyancy. Artificial floating structures can be used 16 to enhance fish habitat by simulating submerged, vegetated undercut banks and providing overhead 17 shaded cover. The resulting underwater root structure may provide important habitat, including 18 forage, refuge from predators, spawning substrate, and brood cover for many fish species. However, 19 the potential for increased predation associated with artificial floating structures is not well 20 understood. Artificial floating structures might be useful in absorbing wave and wake energy, 21 modifying flows and hydraulic processes, complementing shoreline restoration, and providing 22 shallow water habitat. Artificial floating structures might be useful and practical in the Delta along 23 river banks where the current is not strong.

### 24 **2.4 Alternatives Development**

NEPA and CEQA generally require that an EIS and EIR consider all reasonable alternatives that
 would attain the project purpose, need, and objectives while avoiding or substantially lessening
 project effects. A range of reasonable alternatives is analyzed to define the issues and provide a clear
 basis for choice among the options (40 Code of Federal Regulations (CFR) Section 1502.14). The
 NEPA and CEQA analysis also must analyze a no action, or no project, alternative.

30 The Council on Environmental Quality regulations for implementing NEPA require all reasonable 31 alternatives to be objectively evaluated in an EIS (40 CFR Section 1502.14(a)). Alternatives that 32 cannot reasonably meet the project purpose and objectives can be eliminated from further review 33 (CEQ Guidelines 1502.13); however, the environmental document must explain the reason(s) for 34 dismissal (CEQ Guidelines 1502.14(a)). An EIS must also study, develop, and briefly describe 35 appropriate alternatives to the proposed action where there exist unresolved resource conflicts (42 36 United States Code [USC] Section 4332[2][E]). NEPA does not require alternatives to offer some 37 environmental benefit over the proposed action, neither does it discourage consideration of 38 alternatives with lesser effects. NEPA requires that reasonable alternatives be evaluated in the same 39 level of detail (40 CFR Section 1502.14[b]).

Similarly, CEQA requires that the lead agency consider alternatives that would avoid or reduce one
 or more of the significant impacts identified for the project in an EIR. The State CEQA Guidelines
 state that the range of alternatives required to be evaluated in an EIR is governed by the "rule of

- 1 reason;" the EIR needs to describe and evaluate only those alternatives necessary to permit a
- 2 reasoned choice and to foster informed decision making and informed public participation (Section
- 3 15126.6[f]). Consideration of alternatives focuses on those that can either eliminate significant
- 4 adverse environmental impacts or reduce them to less-than-significant levels; alternatives
- 5 considered in this context may include those that are more costly and those that could impede to
- 6 some degree the attainment of all the project objectives (Section 15126.6[b]). CEQA does not require 7
- the alternatives to be evaluated in the same level of detail as the proposed project.
- 8 Consistent with NEPA standards, alternatives at the program level are analyzed at an equal level of 9 detail. As required under NEPA and CEQA, a no action (no project) alternative has been included in 10 this document to allow the Lead Agencies to compare the effects of the proposed alternatives with 11 the effects of taking no action.
- 12 The alternatives were developed using those bank protection measures considered to reasonably 13 meet the project's purpose, need, and objectives. Alternatives development also took into 14 consideration an alternative's ability to eliminate significant adverse environmental impacts or 15 reduce them to less-than-significant levels, as well as minimize any contribution to cumulative 16 effects.
- 17 In addition to the no action alternative, five action alternatives, as well as a sub-alternative of each 18 action alternative, are analyzed. The five action alternatives apply a site-specific bank protection 19 measure (design solution) to each of the 106 representative sites. In general, selection of bank 20 protection measures at specific sites is based on consideration of the likely causes of erosion, local 21 conditions that could impact repair and construction, and site-specific considerations for vegetation, 22 wildlife, land ownership, and access. The site-specific bank protection measure applied to each site 23 may vary from one action alternative to another. For example, a setback levee may be applied to an 24 erosion site under one alternative, while a bench design may be applied to that same site under a 25 different alternative. These variations allow for meeting the objectives of each alternative (e.g., 26 minimizing impacts).
- 27 For bank protection measures to be feasible, they must comply with the Vegetation ETL in 28 accordance with current implementation guidance(U.S. Army Corps of Engineers 2009). The key 29 aspect of the Vegetation ETL that is relevant to the development of feasible alternatives is its 30 requirement for a VFZ surrounding all levees and appurtenant structures. The VFZ must be free of 31 obstructions to ensure access by personnel and equipment for surveillance, inspection, 32 maintenance, monitoring, and flood-fighting. A secondary purpose is to provide a distance between 33 root systems and levees to moderate reliability risks associated with (1) piping and seepage, and (2) 34 structural damage (e.g., wind-driven tree overturning). However, the Vegetation ETL does provide 35 for the use of a variance which, when justified, allows for some vegetation to remain within the VFZ. 36 Alternative 6 includes variations of the previously described bank protection measures in that there 37 is sometimes vegetation within the VFZ. As a result, Alternative 6A and Sub-Alternative 6B would 38 rely on a Vegetation ETL variance.
- 39 All of the alternatives described below could be implemented in a variety of ways. Examples of 40 potential implementation strategy variables are listed below:
- 41 Annual construction rate.
- 42 • Annual geographic distribution (e.g., sites distributed among more than one region, all sites 43 within one region/basin).

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• Use of off-site/out-of-kind mitigation <u>that provides the greatest benefit to the listed species.that</u> contributes to listed species recovery.

Additionally, implementation may be influenced by a benefit-cost analysis. In accordance with Corps
policy, all water resources projects must have a federal interest and be justified by showing
beneficial outputs greater than costs. While the traditional approach has been to look at the erosion
sites in the aggregate (i.e., all 106 representative sites together), and that approach will likely
continue, economic flood damages within individual basins or reclamation districts, maintenance
areas, or levee districts would be a priority consideration in site selection.

9 A preliminary analysis indicates that flood damage reduction in certain less-developed regions in 10 the program area that are primarily agricultural with fewer damageable structures is not likely to 11 meet the benefit-cost criteria. During the implementation phase, it may be difficult to justify bank 12 protection for levees that protect these regions. As a result, bank protection may only be considered 13 economically justified in some portions of the program area. In other areas less developed, risk to 14 life safety can be managed through other means such as the Public Law 84-99 Rehabilitation and 15 Inspection Program, which allows the Corps to undertake activities including advance measures, 16 emergency operations, and rehabilitation of flood control works threatened or destroyed by floods. 17 Accordingly, this EIS/EIR considers a set of sub-alternatives within these "economically justified 18 basins." A subset of the 106 representative sites is analyzed under each action alternative. The 19 subset, or sub-alternative, represents the erosion sites within seven basins that are most likely to 20 satisfy the more restrictive approach to the benefit-cost analysis (Figure 2-2).

- Following is a general description of the six alternatives: the no action alternative, and five action alternatives and their sub-alternatives (i.e., within economically justified basins). As described in Chapter 3, Guide to Effects Analysis, the effects associated with the no action alternative and the action alternatives are discussed by resource in Chapters 4 through 20. Effects associated with the sub-alternatives are discussed in Chapter 21, Effects of Implementation in Economically Justified Basins Only.
- It is important to note that these alternatives are programmatic in nature and have been developed
   for analysis purposes. A design selection process for individual sites will be carried out prior to
   implementation, including additional project-specific environmental review as may be appropriate,
   tiering from this programmatic analysis. The process described below will be followed prior to
   selecting final bank protection measures for specific erosion sites.
- 32 1. Reconnaissance/Erosion Inventory. During the reconnaissance trip, a team reviews the
   33 existing erosion sites, identifies new sites, and checks the previously repaired sites.
- 34 2. Critical Site Decision. This decision step of the site selection procedure allows for a fast-track
   35 path for critical sites.
- 36 3. Engineering Ranking and Report. The third step of the site selection process involves
   37 development of a report and an engineering site ranking based on the information collected
   38 during the erosion reconnaissance inventory.
- 39
   4. Identify Opportunities and Constraints. During this step of the process, all the potential issues and opportunities associated with each site are identified. This step addresses life safety, real estate, environmental, constructability, cultural resources issues, and grouping of sites.
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1 2	Group. This step identifies sites where a Vegetation ETL variance would be applicable and is when the first steps of the variance request process would be initiated.
3	<ol> <li>Conceptual Level Alternatives. Under this step the Project Delivery Team (PDT) develops</li></ol>
4	conceptual-level designs and costs.
5 6 7	6. Site Lock-in Procedure. During step 6, sites are selected for inclusion on the "lock-in" list for site repairs. The sites on the "lock-in" list are generally anticipated to be repaired over the 3-year period that makes up each construction cycle.
8 9 10 11	7. Site Selection Lock-in List and Report. For step 7, the top sites chosen in step 6 and the fast-tracked critical sites are considered the locked-in sites selected for repair in each construction cycle. A report is written to document how and why the "locked-in" sites were selected for repair.
12	8.— <b>Data Collection.</b> For this step, the PDT collects the data needed to develop the repair designs.
13	The exact information and the level of detail collected at each site varies from site to site.
14	9. <b>Preliminary Designs and Draft NEPA/CEQA Document.</b> Step 9 begins the design process and
15	the NEPA/CEQA document (draft EA/IS or draft supplemental EIS/EIR). The design alternatives
16	are selected and 30% designs (plans, specifications, and Design Document Report [DDR]) and
17	cost estimates are completed.
18	10. Draft Final Design, Final NEPA/CEQA Document, and Pre-Construction Activities. After an
19	internal review of the plans, the 90% plans and specifications are developed, and the final
20	NEPA/CEQA document is completed.
21	11. Review and Final Design. The official Agency Technical Review (ATR) and Independent
22	External Peer Review (Type II IEPR, Safety Assurance Review) is performed throughout the
23	development of the Plans and Specifications and the DDR. Revisions to the designs and contract
24	documents are made based on these reviews, resulting in the 100% DDR and Plans and
25	Specifications for Contract advertisement.
26 27 28	12. <b>Contracting Procedure.</b> The Corps compiles the final plans and specifications, provides the signed Biddability, Constructability, Operability and Environmental Review, and processes the funding element for construction.
29 30	13. <b>Construction.</b> Following issuance of the Notice to Proceed, the contractor constructs the bank repair.
31	14. <b>Mitigation Monitoring.</b> On-site mitigation requires monitoring to ensure the establishment
32	criteria is met for vegetation growth and survival. The monitoring period must be sufficient to
33	demonstrate that the compensatory mitigation has met performance standards, but not less
34	than 5 years (see 33 CFR Section 332.6(b)). Monitoring reports are required on a yearly basis.
35 36	15 <b>Site Turn-over.</b> Once the construction and mitigation monitoring is complete, the Corps turns the site over to the CVFPB, which then turns the site over to the local maintaining agency.
37	For more detail on the Corps' site selection process, please refer to the Sacramento River Bank
38	Protection Project, Site Selection Process for Bank Repairs (U.S. Army Corps of Engineers 2011).

### 1 2.4.1 Alternative 1–No Action

2 Under the No Action Alternative, regular operation and maintenance (0&M) of the levee system 3 would continue as presently executed by the local maintaining entities in accordance with the 4 existing governing O&M manual, but the Corps would not implement bank protection along SRFCP 5 levees. The result is likely to be the continued gradual or sporadic loss of remnant floodplain (berm) 6 and the riparian vegetation it supports, and ultimately the erosion could encroach into the cross 7 section of the levee foundation, creating critical erosion sites. It is possible that federal or state flood 8 control agencies or local maintaining agencies eventually would implement bank protection at 9 various sites along SRFCP levees through emergency action. In any case, the risk of levee failure and 10 possibly catastrophic flooding would increase substantially as more erosion sites become critical and repair is limited to emergency response. Continued erosion prior to the federal or state action 11 12 would result in short- and long-term losses of valuable habitat. Although some erosion is natural, the 13 channelization of project reaches increases erosive forces.

### 14 2.4.2 Alternative 2A–Low Maintenance

Alternative 2A applies Bank Protection Measure 2: Bank Fill Stone Protection with No On-Site
Woody Vegetation to all-106 representative sites. This alternative utilizes the simplest engineering
design and would rely almost exclusively on off-site mitigation. Off-site mitigation could consist of a
variety of methods to increase the extent of particular habitat features in selected offsite locations,
including building setback levees, construction of wetland benches or less steeply sloping banks,
planting riparian trees, installation of instream wood, and removal of existing rock in locations that
are deemed acceptable.

### 22 2.4.3 Sub-Alternative 2B–Low Maintenance within Economically 23 Justified Basins

Sub-Alternative 2B applies Bank Protection Measure 2: Bank Fill Stone Protection with No On-Site
 Woody Vegetation to <u>18-erosion</u> sites within the seven economically justified basins <u>only</u>. Of the <u>106</u>
 representative erosion sites, <u>18 are located within the currently identified economically justified</u>
 basins. For the purposes of this programmatic EIS/EIR, these <u>18 sites were analyzed under Sub-</u>
 Alternative <u>2B</u>. The final PACR evaluates <u>15</u> representative sites in the current economically justified
 basins (see Table 2-2 footnotes). For the purposes of the EIS/EIR, the <u>18 sites are still representative</u>
 for the programmatic analysis of environmental effects.

### 31 2.4.4 Alternative 3A-<u>Minimize Habitat ImpactsMaximize</u> 32 <u>Meander Zone</u>

33 Alternative 3A applies Bank Protection Measure 1: Setback Levee or Bank Protection Measure 3: 34 Adjacent Levee to 101 of the 106 representative sites. This alternative minimizes instream 35 construction and would rely heavily on on-site mitigation, potentially creating habitat values that 36 are in excess of what is needed at a given site. These extra habitat values could be used to offset 37 habitat deficits at other SRBPP sites in current or future construction cycles. The Setback Levee 38 measure is applied unless there are substantial constraints that limit the effectiveness or feasibility 39 of that measure, in which case the Adjacent Levee measure is applied. Examples of limited 40 effectiveness or feasibility include floodplain elevations or soil conditions that are not suitable for

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habitat restoration, hydraulic constraints (e.g., would adversely affect flow splits), the presence of
substantial existing development, such as residential neighborhoods or utility infrastructure that
would not meet its intended purpose in an alternative location, or the presence of unwilling sellers.
The Adjacent Levee measure would be applied in these situations. While an adjacent levee would
not create floodplain habitat, it can conserve important waterside habitat such as shaded riverine
aquatic habitat and bank swallow nesting habitat.

### 2.4.5 Sub-Alternative 3B-Minimize Habitat ImpactsMaximize Meander Zone within Economically Justified Basins

Sub-Alternative 3B applies Bank Protection Measure 1: Setback Levee or Bank Protection Measure
3: Adjacent Levee to 18-erosion sites within the seven economically justified basins only. Of the 106
representative erosion sites, 18 are located within the currently identified economically justified
basins. For the purposes of this programmatic EIS/EIR, these 18 sites were analyzed under SubAlternative 3B. The final PACR evaluates 15 representative sites in the current economically justified
basins (see Table 2-2 footnotes). For the purposes of the EIS/EIR, the 18 sites are still representative
for the programmatic analysis of environmental effects.

### 16 2.4.6 Alternative 4A–Habitat Replacement

17 Alternative 4A applies a combination of site-specific bank protection measures (Bank Protection 18 Measures 1-5), and utilizes the bank protection measures recommended in the Final Alternatives 19 Report to the extent that they comply with the Vegetation ETL (Kleinfelder-Geomatrix 2009). Some 20 sites would not be compliant with the Vegetation ETL if the bank protection measures 21 recommended in the Final Alternatives Report were applied. These particular sites were 22 reevaluated and compliant bank protection measures were then applied. Factors taken into account 23 in application of bank protection measures to non-compliant sites included general planning and 24 engineering issues as well as habitat, hydraulic, and land use considerations. Off-site mitigation may 25 be acceptable on a site-specific basis provided that it compensates for the values being lost, and 26 mitigation is provided within the region of impact (i.e., 1a, 1b, 2, or 3).

27 This alternative utilizes the approach taken over the last decade, which primarily focused on re-28 creation of streambank habitats beneficial to target fish species through the use of constructed 29 benches with riparian vegetation. Alternative 4A makes adjustments to the bench designs to account 30 for implementation of the Vegetation ETL. The adjustments include: 1) changes to the areas being 31 planted in order to avoid the VFZ; 2) the use of adjacent levees to avoid or minimize impacts on 32 vegetation by shifting the area subject to the Vegetation ETL landward, thereby allowing more 33 riparian vegetation to remain along the channel; and, 3) the use of setback levees, which also avoid 34 vegetation impacts in addition to creating floodplain areas that may serve as on-site or off-site 35 mitigation for SRBPP impacts. All of these adjustments are intended to avoid, minimize, or mitigate 36 for impacts on various natural resources.

## 37 2.4.7 Sub-Alternative 4B–Habitat Replacement within 38 Economically Justified Basins

Sub-Alternative 4B applies a combination of site-specific bank protection measures to 18 erosion
 sites within the seven economically justified basins only. Of the 106 representative erosion sites, 18

1	are located within the currently identified economically justified basins. For the purposes of this
2	programmatic EIS/EIR, these 18 sites were analyzed under Sub-Alternative 4B. The final PACR
3	evaluates 15 representative sites in the current economically justified basins (see Table 2-2
4	footnotes). For the purposes of the EIS/EIR, the 18 sites are still representative for the
5	programmatic analysis of environmental effects.

## 6 2.4.8 Alternative 5A–Habitat Replacement Reaching 7 Environmental Neutrality

8 The goal of Alternative 5 is to reach "environmental neutrality" with regard to existing habitat, with 9 an emphasis on vegetation that is beneficial to target fish species, while at the same time protecting 10 the bank from erosion. In this case, "environmental neutrality" refers specifically to fish habitat as 11 evaluated using the Standard Assessment Methodology (SAM) (as described in Chapter 11, Fisheries 12 and Aquatics) and riparian habitat. The proposed program will be considered to meet 13 environmental neutrality if the SAM values for the alternative are zero or greater (positive) and the 14 amount of vegetation removed can be adequately replaced on-site or within other program sites 15 within the same region (i.e., Regions 1a, 1b, 2, or 3).

16 Alternative 5A is similar to Alternative 4 in that it relies on the Final Alternatives Report's 17 recommended bank protection measures and modifies those that were not Vegetation ETL 18 compliant. Alternative 5 differs in that it minimizes the use of off-site mitigation through the 19 application of fewer site-specific bank protection measures that result in adverse habitat effects. 20 Alternative 5 builds on the analysis of Alternative 4 and replaces certain site-specific bank 21 protection measures that result in substantial environmental deficits, as calculated by the Corps' 22 Standard Assessment Methodology (SAM), or substantial losses of riparian vegetation. 23 Environmental neutrality is defined as at least full replacement of estimated SAM and riparian 24 vegetation losses. While mitigation outside of SRBPP sites is not anticipated under this alternative, it 25 is considered acceptable if ultimately needed and would be provided within the region of impact 26 (i.e., Region 1a, 1b, 2, or 3).

# 27 2.4.9 Sub-Alternative 5B–Habitat Replacement Reaching 28 Environmental Neutrality within Economically Justified 29 Basins

30Sub-Alternative 5B applies a combination of site-specific bank protection measures to 18-erosion31sites within the seven economically justified basins only. Of the 106 representative erosion sites, 1832are located within the currently identified economically justified basins. For the purposes of this33programmatic EIS/EIR, these 18 sites were analyzed under Sub-Alternative 5B. The final PACR34evaluates 15 representative sites in the current economically justified basins (see Table 2-235footnotes). For the purposes of the EIS/EIR, the 18 sites are still representative for the36programmatic analysis of environmental effects.

### 2.4.10 Alternative 6A–Habitat Replacement with Vegetation ETL Variance

Alternative 6A applies the bank protection measures from the Final Alternatives Report without
 modification (Bank Protection Measures 1, 4a, 4b, 4c, and 5). While setback levees are included in



Figure 2-3 Site-Specific Application of Bank Protection Measures for Alternative 2



### Figure 2-4 Site-Specific Application of Bank Protection Measures for Alternative 3





### Figure 2-5 Site-Specific Application of Bank Protection Measures for Alternative 4





### Figure 2-6 Site-Specific Application of Bank Protection Measures for Alternative 5





### Figure 2-7 Site-Specific Application of Bank Protection Measures for Alternative 6

1 the Final Alternatives Report, they were applied to very few sites as a result of the design selection 2 process utilized in that effort, which required identification of a willing seller prior to a site being 3 considered for a setback levee. As a result, very few setback levees are included in this alternative. A 4 number of the bank protection measures utilized include protection of existing vegetation and 5 placement of on-site mitigation vegetation within the VFZ and would require a Vegetation ETL 6 variance. The area where vegetation would be preserved under a variance is typically that which is 7 on the lower two-thirds of the waterside levee slope and the area within 15 feet of the waterside 8 levee toe. The portion of vegetation within this area that does not need to be removed for 9 construction purposes would be retained. Additionally, this area could be planted as a part of project 10 construction if there are portions without vegetation. Off-site mitigation is acceptable and would be

11 provided within the region of impact (i.e., Region 1a, 1b, 2, or 3).

# 2.4.11 Sub-Alternative 6B – Habitat Replacement with Vegetation ETL Variance within Economically Justified Basins

15 Sub-Alternative 6B applies the bank protection measures from the Final Alternatives Report without 16 modification to erosion 18 sites within the seven economically justified basins only. A number of 17 these bank protection measures include protection of existing vegetation and placement of on-site 18 mitigation vegetation within the VFZ and would require a Vegetation ETL variance. Off-site 19 mitigation is acceptable and would be provided within the region of impact (i.e., Region 1a, 1b, 2, or 20 3). Of the 106 representative erosion sites, 18 are located within the currently identified 21 economically justified basins. For the purposes of this programmatic EIS/EIR, these 18 sites were 22 analyzed under Sub-Alternative 6B. The final PACR evaluates 15 representative sites in the current 23 economically justified basins (see Table 2-2 footnotes). For the purposes of the EIS/EIR, the 18 sites 24 are still representative for the programmatic analysis of environmental effects.

## 25 Site-Specific Bank Protection Measures by Alternative

Table 2-2 identifies the specific bank protection measures assigned to each of the 106
 representative sites for each alternative, and includes a notation for the subset of erosion sites that
 are within the economically justified basins. Figures 2-3 through 2-7 show the distribution of the
 specific bank protection measures for each of the action alternatives.

Sacramento River Bank Protection Project Phase II Supplemental Authorization Final EIS/EIR

### Table 2-2. Site-Specific Application of Bank Protection Measures by Alternative

						Bank Protection Measures by Alternative										
Region	Site Identification				Site Length (feet)	Alt 2A	Alt 2B	Alt 3A	Alt 3B	Alt 4A	Alt 4B	Alt 5A	Alt 5B	Alt 6A	Alt 6B	
1a+ <u>^</u>	Cache Creek	LM	3.9	L	433	2	2	1	1	1	1	1	1	1	1	
1a	Cache Slough	RM	15.9	L	182	2		3		2		1		4c		
1a	Cache Slough	RM	22.8	R	630	2		1		4c		4c		4c		
1a	Cache Slough	RM	23.6	R	1,209	2		3		2		1		4c		
1a	Deep Water Ship Channel	LM	5.0	L	N/A	N/A		N/A		N/A		N/A		N/A		
1a	Deep Water Ship Channel	LM	5.01	L	N/A	N/A		N/A		N/A		N/A		N/A		
1a	Georgiana Slough	RM	0.3	L	1,027	2		1		1*		1		4c		
1a	Georgiana Slough	RM	1.7	L	1,250	2		1		1*		1		4c		
1a	Georgiana Slough	RM	2.5	L	736	2		1		1*		1		4c		
1a	Georgiana Slough	RM	3.6	L	1,364	2		1		1*		1		4c		
1a	Georgiana Slough	RM	3.7a	L	209	2		1		1*		1		4c		
1a	Georgiana Slough	RM	3.7b	L	268	2		1		1*		1		4c		
1a	Georgiana Slough	RM	4.0	L	705	2		1		1*		1		4c		
1a	Georgiana Slough	RM	4.3	L	1,319	2		3		3*		3		4c		
1a	Georgiana Slough	RM	4.5	L	90	2		3		3*		3		4c		

### **Bank Protection Measure Legend**

N/A: No Action

1: Setback Levee

2: Bank Fill Stone Protection with No On-Site Woody Vegetation

3: Adjacent Levee

4a: Riparian Bank with Revegetation and Instream Woody Material above Summer/Fall Waterline

4b: Riparian Bench with Revegetation and Instream Woody Material above and below Summer/Fall Waterline

4c: Riparian and Wetland Benches with Revegetation

							Bank Protection Measures by Alternative										
Region	Site Identification			Site Length (feet)	Alt 2A	Alt 2B	Alt 3A	Alt 3B	Alt 4A	Alt 4B	Alt 5A	Alt 5B	Alt 6A	Alt 6B			
1a	Georgiana Slough	RM	4.6	L	1,346	2		3		3*		3		4c			
1a	Georgiana Slough	RM	5.3	L	3,171	2		3		3*		3		4c			
1a	Georgiana Slough	RM	6.1	L	1,729	2		3		3		3		4c			
1a	Georgiana Slough	RM	6.4	L	398	2		1		1*		1		4c			
1a	Georgiana Slough	RM	6.6	L	744	2		1		1*		1		4c			
1a	Georgiana Slough	RM	6.8	L	1,335	2		1		3		3		4c			
1a	Georgiana Slough	RM	8.3	L	483	2		3		3		3		4c			
1a	Georgiana Slough	RM	9.3	L	1,228	2		3		4c		4c		4c			
1a+ <u>^</u>	Knights Landing Ridge Cut	LM	0.2	R	768	2	2	3	3	2	2	2	2	5	5		
1a	Knights Landing Ridge Cut	LM	3.0	L	1,279	2		2		2		2		5			
1a	Knights Landing Ridge Cut	LM	3.1	L	368	2		2		2		2		5			
1a	Knights Landing Ridge Cut	LM	4.3	L	577	2		2		2		2		5			
1a	Knights Landing Ridge Cut	LM	5.3	L	8,564	2		2		2		2		5			
1a	Steamboat Slough	RM	18.8	R	485	2		3		3		3		4c			
1a	Steamboat Slough	RM	23.2	L	N/A	N/A		N/A		N/A		N/A		N/A			
1a+	Steamboat Slough	RM	23.9	R	369	2	2	3	3	3	3	3	3	4c	4c		

### **Bank Protection Measure Legend**

N/A: No Action

1: Setback Levee

2: Bank Fill Stone Protection with No On-Site Woody Vegetation

3: Adjacent Levee

4a: Riparian Bank with Revegetation and Instream Woody Material above Summer/Fall Waterline

4b: Riparian Bench with Revegetation and Instream Woody Material above and below Summer/Fall Waterline

4c: Riparian and Wetland Benches with Revegetation

						Bank Protection Measures by Alternative									
					Site Length	Alt									
Region	Site Identification				(feet)	2A	Alt 2B	Alt 3A	Alt 3B	Alt 4A	Alt 4B	Alt 5A	Alt 5B	Alt 6A	Alt 6B
1a+	Steamboat Slough	RM	24.7	R	911	2	2	3	3	3	3	3	3	4c	4c
1a	Steamboat Slough	RM	25.0	L	272	2		3		3		3		4c	
1a+	Steamboat Slough	RM	25.8	R	244	2	2	3	3	3	3	3	3	4c	4c
1a	Steamboat Slough	RM	26.0	L	516	2		3		3		3		4c	
1a	Sutter Slough	RM	24.7	R	1,736	2		1		1		1		4c	
1a+	Sutter Slough	RM	26.5	L	568	2	2	3	3	4c	4c	4c	4c	4c	4c
1a	Willow Slough	LM	0.2	L	N/A	N/A		N/A		N/A		N/A		N/A	
1a	Willow Slough	LM	0.7	L	N/A	N/A		N/A		N/A		N/A		N/A	
1a	Willow Slough	LM	6.9	R	869	2		3		2		2		5	
1a	Yolo Bypass	LM	0.1	R	430	2		3		2		2		5	
1a	Yolo Bypass	LM	2.0	R	563	2		3		2		2		5	
1a	Yolo Bypass	LM	2.5	R	148	2		3		5		5		5	
1a	Yolo Bypass	LM	2.6	R	N/A	N/A		N/A		N/A		N/A		N/A	
1a	Yolo Bypass	LM	3.8	R	1,860	2		3		2		2		5	
1b	Lower American River	RM	7.3	R	N/A	N/A		N/A		N/A		N/A		N/A	
1b	Sacramento River	RM	21.5	L	162	2		3		4c		4c		4c	

### **Bank Protection Measure Legend**

N/A: No Action

1: Setback Levee

2: Bank Fill Stone Protection with No On-Site Woody Vegetation

3: Adjacent Levee

4a: Riparian Bank with Revegetation and Instream Woody Material above Summer/Fall Waterline

4b: Riparian Bench with Revegetation and Instream Woody Material above and below Summer/Fall Waterline

4c: Riparian and Wetland Benches with Revegetation

						Bank Protection Measures by Alternative									
					Site Length	Alt									
Region	Site Identification				(feet)	2A	Alt 2B	Alt 3A	Alt 3B	Alt 4A	Alt 4B	Alt 5A	Alt 5B	Alt 6A	Alt 6B
1b	Sacramento River	RM	22.5	L	852	2		3		4c		4c		4c	
1b	Sacramento River	RM	22.7	L	309	2		3		3		3		4c	
1b	Sacramento River	RM	23.2	L	589	2		3		3		3		4c	
1b	Sacramento River	RM	23.3	L	257	2		3		4c		4c		4c	
1b	Sacramento River	RM	24.8	L	782	2		3		2		3		4c	
1b	Sacramento River	RM	25.2	L	338	2		3		4c		4c		4c	
1b	Sacramento River	RM	31.6	R	446	2		3		5		5		5	
1b**	Sacramento River	RM	35.3	R	197	2		3		4a		4a		4a	
1b**	Sacramento River	RM	35.4	R	96	2		3		4a		4a		4a	
1b	Sacramento River	RM	38.5	R	359	2		1		5		5		5	
1b+ <u>^</u>	Sacramento River	RM	56.5	R	373	2	2	3	3	4b	4b	4b	4b	4b	4b
1b+ <u>^</u>	Sacramento River	RM	56.6	L	86	2	2	3	3	4a	4a	4a	4a	4a	4a
1b+ <u>^</u>	Sacramento River	RM	56.7	R	665	2	2	3	3	4b	4b	4b	4b	4b	4b
1b+***	Sacramento River	RM	58.4	L	707	2	2	3	3	5	5	5	5	5	5
1b+	Sacramento River	RM	60.1	L	455	2	2	3	3	4a	4a	3	3	4a	4a
1b+ <u>^</u>	Sacramento River	RM	62.9	R	175	2	2	3	3	4b	4b	4b	4b	4b	4b

#### **Bank Protection Measure Legend**

N/A: No Action

1: Setback Levee

2: Bank Fill Stone Protection with No On-Site Woody Vegetation

3: Adjacent Levee

4a: Riparian Bank with Revegetation and Instream Woody Material above Summer/Fall Waterline

4b: Riparian Bench with Revegetation and Instream Woody Material above and below Summer/Fall Waterline

4c: Riparian and Wetland Benches with Revegetation

						Bank Protection Measures by Alternative									
Region	Site Identification				Site Length (feet)	Alt 2A	Alt 2B	Alt 3A	Alt 3B	Alt 4A	Alt 4B	Alt 5A	Alt 5B	Alt 6A	Alt 6B
1b+^	Sacramento River	RM	63.0	R	87	2	2	3	3	4b	4b	4b	4b	4b	4b
1b	Sacramento River	RM	74.4	R	200	2		3		4b		4b		4b	
1b	Sacramento River	RM	75.3	R	2,761	2		3		5		3		5	
1b	Sacramento River	RM	77.7	R	224	2		3		5		5		5	
1b+ <u>^</u>	Sacramento River	RM	78.3	L	657	2	2	3	3	5	5	4b	4b	5	5
2 <u>^</u>	Bear River	RM	0.8	L	233	2		3		5		5		5	
2	Cherokee Canal	LM	14.0	L	N/A	N/A		N/A		N/A		N/A		N/A	
2	Cherokee Canal	LM	21.9	L	1,800	2		5		5		5		5	
2 <u>^</u>	Feather River	RM	0.6	L	288	2		3		4a		4a		4a	
2 <u>^</u>	Feather River	RM	5.0	L****	910	2		3		4a		4a		4a	
2	Sacramento River	RM	86.3	L	3,134	2		3		5		5		5	
2**	Sacramento River	RM	86.5	R	72	2		3		4b		4b		4b	
2	Sacramento River	RM	86.9	R	289	2		3		4b		4b		4b	
2	Sacramento River	RM	92.8	L	200	2		3		5		5		5	
2	Sacramento River	RM	95.8	L	190	2		3		5		5		5	
2	Sacramento River	RM	96.2	L	560	2		3		5		4b		5	

### **Bank Protection Measure Legend**

N/A: No Action

1: Setback Levee

2: Bank Fill Stone Protection with No On-Site Woody Vegetation

3: Adjacent Levee

4a: Riparian Bank with Revegetation and Instream Woody Material above Summer/Fall Waterline

4b: Riparian Bench with Revegetation and Instream Woody Material above and below Summer/Fall Waterline

4c: Riparian and Wetland Benches with Revegetation

						Bank Protection Measures by Alternative									
Region	Site Identification				Site Length (feet)	Alt 2A	Alt 2B	Alt 3A	Alt 3B	Alt 4A	Alt 4B	Alt 5A	Alt 5B	Alt 6A	Alt 6B
2	Sacramento River	RM	99.0	L	160	2		3		5		5		5	
2	Sacramento River	RM	101.3	R	352	2		1		4b		4b		4b	
2	Sacramento River	RM	103.4	L	N/A	2		N/A		N/A		N/A		N/A	
2	Sacramento River	RM	104.0	L	3,459	2		3		5		4b		5	
2	Sacramento River	RM	104.5	L	301	2		3		4a		4a		4a	
2	Sacramento River	RM	116.0	L	612	2		1		4a		4a		4a	
2	Sacramento River	RM	116.5	L	2,465	2		3		4a		1		4a	
2	Sacramento River	RM	122.0	R	248	2		3		4b		4b		4b	
2	Sacramento River	RM	122.3	R	341	2		1		4b		4b		4b	
2	Sacramento River	RM	123.3	L	208	2		3		4b		4b		4b	
2	Sacramento River	RM	123.7	R	120	2		3		4a		4a		4a	
2	Sacramento River	RM	127.9	R	801	2		1		5		4a		5	
2	Sacramento River	RM	131.8	L	339	2		1		4a		1		4a	
2	Sacramento River	RM	132.9	R	363	2		1		4a		4a		4a	
2	Sacramento River	RM	133.0	L	1,291	2		3		4a		4a		4a	
2	Sacramento River	RM	133.8	L	197	2		3		4a		4a		4a	

### **Bank Protection Measure Legend**

N/A: No Action

1: Setback Levee

2: Bank Fill Stone Protection with No On-Site Woody Vegetation

3: Adjacent Levee

4a: Riparian Bank with Revegetation and Instream Woody Material above Summer/Fall Waterline

4b: Riparian Bench with Revegetation and Instream Woody Material above and below Summer/Fall Waterline

4c: Riparian and Wetland Benches with Revegetation

						Bank Protection Measures by Alternative									
Region	Site Identification				Site Length (feet)	Alt 2A	Alt 2B	Alt 3A	Alt 3B	Alt 4A	Alt 4B	Alt 5A	Alt 5B	Alt 6A	Alt 6B
2	Sacramento River	RM	136.6	L	615	2		3		4a		4a		4a	
2	Sacramento River	RM	138.1	L	1,365	2		1		4a		1		4a	
2	Yuba River	LM	2.3	L	1,356	2		1		1		1		1	
3	Deer Creek	LM	2.4	L	496	2		3		5		3		5	
3	Elder Creek	LM	1.44	L	334	2		3		4a		4a		4a	
3	Elder Creek	LM	3.0	R	65	2		3		4a		4a		4a	
3	Elder Creek	LM	4.1	L	N/A	N/A		N/A		N/A		N/A		N/A	
3+ <u>^</u>	Sacramento River	RM	152.8	L	198	2	2	3	3	4b	4b	4b	4b	4b	4b
3+ <u>^</u>	Sacramento River	RM	163.0	L	1,213	2	2	3	3	4b	4b	1	1	4b	4b
3+ <u>^</u>	Sacramento River	RM	168.3	L	546	2	2	1	1	4b	4b	1	1	4b	4b
3+ <u>^</u>	Sacramento River	RM	172.0	L	525	2	2	1	1	4b	4b	1	1	4b	4b

#### **Bank Protection Measure Legend**

N/A: No Action

1: Setback Levee

2: Bank Fill Stone Protection with No On-Site Woody Vegetation

3: Adjacent Levee

4a: Riparian Bank with Revegetation and Instream Woody Material above Summer/Fall Waterline

4b: Riparian Bench with Revegetation and Instream Woody Material above and below Summer/Fall Waterline

4c: Riparian and Wetland Benches with Revegetation
#### Table 2-2. Continued

			Bank Protection Measures by Alternative									
		Site Length	Alt									
Region	Site Identification	(feet)	2A	Alt 2B	Alt 3A	Alt 3B	Alt 4A	Alt 4B	Alt 5A	Alt 5B	Alt 6A	Alt 6B
+ Site <del>is was</del> located within an economically justified basin <u>at time of analysis</u> .												
<u>^ Site is lo</u>	^ Site is located within an economically justified basin at time of Final EIS/EIR publication.											
* Design (setback or adjacent levee) combined with adjacent sites.												
** Sacramento River 35.3R, 35.4R, and 86.5R have been repaired.												

\*\*\* Though Sacramento River 58.4L is not a currently inventoried erosion site, nor has it ever been, it constitutes a representative site for the purposes of the programmatic SAM and EIS/EIR analyses. As previously described, additional project-level environmental documentation, tiering from this programmatic analysis, will be prepared to address those sites that will be constructed.

\*\*\*\* Feather River 5.0L was mistakenly called Feather River 4.9L in previous documents.

LM = levee mile; RM = river mile; L = left bank; R = right bank.

#### **Bank Protection Measure Legend**

N/A: No Action

1: Setback Levee

2: Bank Fill Stone Protection with No On-Site Woody Vegetation

3: Adjacent Levee

4a: Riparian Bank with Revegetation and Instream Woody Material above Summer/Fall Waterline

4b: Riparian Bench with Revegetation and Instream Woody Material above and below Summer/Fall Waterline

4c: Riparian and Wetland Benches with Revegetation

5: Bank Fill Stone Protection with On-Site Vegetation

1

## 2.6 Site Selection and Implementation Process

2	It is important to note that the alternatives described in Section 2.4 are programmatic in nature and
3	have been developed for analysis purposes. A design selection process for individual sites will be
4	carried out prior to implementation, including additional project-specific environmental review as
5	may be appropriate and tiering from this programmatic analysis. The Site Selection and
6	Implementation Process described below will be followed prior to selecting final bank protection
7	measures for specific erosion sites. The organizational level at which approvals are made could
8	change in the future, but that is not expected to substantively change the site selection process or
9	result in different impacts.
10 <b>2</b>	.6.1 Step 1—Annual Reconnaissance/Erosion Inventory
11	The Site Selection and Implementation Process begins with an erosion inventory. The erosion
12	inventory consists of a visual reconnaissance of the levees and banks of the SRFCP by the
13	Engineering Division of the Corps. The primary inspection method is by boat, which provides the
14	best view of the levees and banks. However, the entire system is not navigable, so some portions are
15	inspected by car.
16	There are two parts to the erosion inventory, and these are typically referred to as the "annual
17	erosion inventory" and the "extended erosion inventory." The annual erosion inventory includes the
18	portions of the system that are inspected every year—the reaches that convey flow through the
19	system on an annual basis. The extended inventory is undertaken only after high flow events or
20	every 5 years. The extended erosion inventory includes portions of the system that either convey
21	seasonal flow or do not typically convey flow on an annual basis, such as the bypasses.
- 22	During the reconnaissance trip, the team reviews the existing erosion sites, identifies new sites, and
22 23	During the reconnaissance trip, the team reviews the existing erosion sites, identifies new sites, and checks the previously repaired sites. Existing sites are checked for changes from the previous year,
22 23 24	During the reconnaissance trip, the team reviews the existing erosion sites, identifies new sites, and checks the previously repaired sites. Existing sites are checked for changes from the previous year, and checked for additional erosion or slumping, exposed tree roots, increased site length, changes in
22 23 24 25	During the reconnaissance trip, the team reviews the existing erosion sites, identifies new sites, and checks the previously repaired sites. Existing sites are checked for changes from the previous year, and checked for additional erosion or slumping, exposed tree roots, increased site length, changes in vegetation, changes in bank width or slope, and to determine if the site is starting to heal (i.e. new
22 23 24 25 26	During the reconnaissance trip, the team reviews the existing erosion sites, identifies new sites, and checks the previously repaired sites. Existing sites are checked for changes from the previous year, and checked for additional erosion or slumping, exposed tree roots, increased site length, changes in vegetation, changes in bank width or slope, and to determine if the site is starting to heal (i.e. new deposition, or erosion has shifted to the opposite bank).
22 23 24 25 26 27	During the reconnaissance trip, the team reviews the existing erosion sites, identifies new sites, and checks the previously repaired sites. Existing sites are checked for changes from the previous year, and checked for additional erosion or slumping, exposed tree roots, increased site length, changes in vegetation, changes in bank width or slope, and to determine if the site is starting to heal (i.e. new deposition, or erosion has shifted to the opposite bank). For new sites, in addition to the erosion details, basic information is collected, such as: location,
22 23 24 25 26 27 28	During the reconnaissance trip, the team reviews the existing erosion sites, identifies new sites, and checks the previously repaired sites. Existing sites are checked for changes from the previous year, and checked for additional erosion or slumping, exposed tree roots, increased site length, changes in vegetation, changes in bank width or slope, and to determine if the site is starting to heal (i.e. new deposition, or erosion has shifted to the opposite bank). For new sites, in addition to the erosion details, basic information is collected, such as: location, berm width, bank slope, site length, soil material, erosion mechanism, revetment details, visible
22 23 24 25 26 27 28 29	During the reconnaissance trip, the team reviews the existing erosion sites, identifies new sites, and checks the previously repaired sites. Existing sites are checked for changes from the previous year, and checked for additional erosion or slumping, exposed tree roots, increased site length, changes in vegetation, changes in bank width or slope, and to determine if the site is starting to heal (i.e. new deposition, or erosion has shifted to the opposite bank). For new sites, in addition to the erosion details, basic information is collected, such as: location, berm width, bank slope, site length, soil material, erosion mechanism, revetment details, visible encroachments, and general notes. The site length is calculated with GPS points, but the berm width
22 23 24 25 26 27 28 29 30	During the reconnaissance trip, the team reviews the existing erosion sites, identifies new sites, and checks the previously repaired sites. Existing sites are checked for changes from the previous year, and checked for additional erosion or slumping, exposed tree roots, increased site length, changes in vegetation, changes in bank width or slope, and to determine if the site is starting to heal (i.e. new deposition, or erosion has shifted to the opposite bank). For new sites, in addition to the erosion details, basic information is collected, such as: location, berm width, bank slope, site length, soil material, erosion mechanism, revetment details, visible encroachments, and general notes. The site length is calculated with GPS points, but the berm width and bank slope are visually estimated using engineering judgment. Photo documentation is taken at
22 23 24 25 26 27 28 29 30 31	During the reconnaissance trip, the team reviews the existing erosion sites, identifies new sites, and checks the previously repaired sites. Existing sites are checked for changes from the previous year, and checked for additional erosion or slumping, exposed tree roots, increased site length, changes in vegetation, changes in bank width or slope, and to determine if the site is starting to heal (i.e. new deposition, or erosion has shifted to the opposite bank). For new sites, in addition to the erosion details, basic information is collected, such as: location, berm width, bank slope, site length, soil material, erosion mechanism, revetment details, visible encroachments, and general notes. The site length is calculated with GPS points, but the berm width and bank slope are visually estimated using engineering judgment. Photo documentation is taken at each of the erosion sites.
22 23 24 25 26 27 28 29 30 31 32	During the reconnaissance trip, the team reviews the existing erosion sites, identifies new sites, and checks the previously repaired sites. Existing sites are checked for changes from the previous year, and checked for additional erosion or slumping, exposed tree roots, increased site length, changes in vegetation, changes in bank width or slope, and to determine if the site is starting to heal (i.e. new deposition, or erosion has shifted to the opposite bank). For new sites, in addition to the erosion details, basic information is collected, such as: location, berm width, bank slope, site length, soil material, erosion mechanism, revetment details, visible encroachments, and general notes. The site length is calculated with GPS points, but the berm width and bank slope are visually estimated using engineering judgment. Photo documentation is taken at each of the erosion sites. Repaired sites are checked to make sure the repairs are still in good condition, no new erosion has
22 23 24 25 26 27 28 29 30 31 32 33	During the reconnaissance trip, the team reviews the existing erosion sites, identifies new sites, and checks the previously repaired sites. Existing sites are checked for changes from the previous year, and checked for additional erosion or slumping, exposed tree roots, increased site length, changes in vegetation, changes in bank width or slope, and to determine if the site is starting to heal (i.e. new deposition, or erosion has shifted to the opposite bank). For new sites, in addition to the erosion details, basic information is collected, such as: location, berm width, bank slope, site length, soil material, erosion mechanism, revetment details, visible encroachments, and general notes. The site length is calculated with GPS points, but the berm width and bank slope are visually estimated using engineering judgment. Photo documentation is taken at each of the erosion sites. Repaired sites are checked to make sure the repairs are still in good condition, no new erosion has formed at the upstream or downstream transitions, and for anything else of concern or significance.
22 23 24 25 26 27 28 29 30 31 32 33 34	During the reconnaissance trip, the team reviews the existing erosion sites, identifies new sites, and checks the previously repaired sites. Existing sites are checked for changes from the previous year, and checked for additional erosion or slumping, exposed tree roots, increased site length, changes in vegetation, changes in bank width or slope, and to determine if the site is starting to heal (i.e. new deposition, or erosion has shifted to the opposite bank). For new sites, in addition to the erosion details, basic information is collected, such as: location, berm width, bank slope, site length, soil material, erosion mechanism, revetment details, visible encroachments, and general notes. The site length is calculated with GPS points, but the berm width and bank slope are visually estimated using engineering judgment. Photo documentation is taken at each of the erosion sites. Repaired sites are checked to make sure the repairs are still in good condition, no new erosion has formed at the upstream or downstream transitions, and for anything else of concern or significance. Sites repaired within the previous year are removed from the erosion inventory and moved to a
22 23 24 25 26 27 28 29 30 31 32 33 34 35	During the reconnaissance trip, the team reviews the existing erosion sites, identifies new sites, and checks the previously repaired sites. Existing sites are checked for changes from the previous year, and checked for additional erosion or slumping, exposed tree roots, increased site length, changes in vegetation, changes in bank width or slope, and to determine if the site is starting to heal (i.e. new deposition, or erosion has shifted to the opposite bank). For new sites, in addition to the erosion details, basic information is collected, such as: location, berm width, bank slope, site length, soil material, erosion mechanism, revetment details, visible encroachments, and general notes. The site length is calculated with GPS points, but the berm width and bank slope are visually estimated using engineering judgment. Photo documentation is taken at each of the erosion sites. Repaired sites are checked to make sure the repairs are still in good condition, no new erosion has formed at the upstream or downstream transitions, and for anything else of concern or significance. Sites repaired within the previous year are removed from the erosion inventory and moved to a revetment database. Occasionally a site will be removed from the erosion inventory based on more
22 23 24 25 26 27 28 29 30 31 32 33 34 35 36	During the reconnaissance trip, the team reviews the existing erosion sites, identifies new sites, and checks the previously repaired sites. Existing sites are checked for changes from the previous year, and checked for additional erosion or slumping, exposed tree roots, increased site length, changes in vegetation, changes in bank width or slope, and to determine if the site is starting to heal (i.e. new deposition, or erosion has shifted to the opposite bank). For new sites, in addition to the erosion details, basic information is collected, such as: location, berm width, bank slope, site length, soil material, erosion mechanism, revetment details, visible encroachments, and general notes. The site length is calculated with GPS points, but the berm width and bank slope are visually estimated using engineering judgment. Photo documentation is taken at each of the erosion sites. Repaired sites are checked to make sure the repairs are still in good condition, no new erosion has formed at the upstream or downstream transitions, and for anything else of concern or significance. Sites repaired within the previous year are removed from the erosion inventory and moved to a revetment database. Occasionally a site will be removed from the erosion inventory based on more detailed information, changing site conditions (e.g. a site has changed from erosional to depositional
22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37	During the reconnaissance trip, the team reviews the existing erosion sites, identifies new sites, and checks the previously repaired sites. Existing sites are checked for changes from the previous year, and checked for additional erosion or slumping, exposed tree roots, increased site length, changes in vegetation, changes in bank width or slope, and to determine if the site is starting to heal (i.e. new deposition, or erosion has shifted to the opposite bank). For new sites, in addition to the erosion details, basic information is collected, such as: location, berm width, bank slope, site length, soil material, erosion mechanism, revetment details, visible encroachments, and general notes. The site length is calculated with GPS points, but the berm width and bank slope are visually estimated using engineering judgment. Photo documentation is taken at each of the erosion sites. Repaired sites are checked to make sure the repairs are still in good condition, no new erosion has formed at the upstream or downstream transitions, and for anything else of concern or significance. Sites repaired within the previous year are removed from the erosion inventory and moved to a revetment database. Occasionally a site will be removed from the erosion inventory based on more detailed information, changing site conditions (e.g. a site has changed from erosional to depositional and no longer qualifies), or a repair under a different program.
22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38	<ul> <li>During the reconnaissance trip, the team reviews the existing erosion sites, identifies new sites, and checks the previously repaired sites. Existing sites are checked for changes from the previous year, and checked for additional erosion or slumping, exposed tree roots, increased site length, changes in vegetation, changes in bank width or slope, and to determine if the site is starting to heal (i.e. new deposition, or erosion has shifted to the opposite bank).</li> <li>For new sites, in addition to the erosion details, basic information is collected, such as: location, berm width, bank slope, site length, soil material, erosion mechanism, revetment details, visible encroachments, and general notes. The site length is calculated with GPS points, but the berm width and bank slope are visually estimated using engineering judgment. Photo documentation is taken at each of the erosion sites.</li> <li>Repaired sites are checked to make sure the repairs are still in good condition, no new erosion has formed at the upstream or downstream transitions, and for anything else of concern or significance. Sites repaired within the previous year are removed from the erosion inventory and moved to a revetment database. Occasionally a site will be removed from the erosion inventory based on more detailed information, changing site conditions (e.g. a site has changed from erosional to depositional and no longer qualifies), or a repair under a different program.</li> </ul>
22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39	During the reconnaissance trip, the team reviews the existing erosion sites, identifies new sites, and checks the previously repaired sites. Existing sites are checked for changes from the previous year, and checked for additional erosion or slumping, exposed tree roots, increased site length, changes in vegetation, changes in bank width or slope, and to determine if the site is starting to heal (i.e. new deposition, or erosion has shifted to the opposite bank). For new sites, in addition to the erosion details, basic information is collected, such as: location, berm width, bank slope, site length, soil material, erosion mechanism, revetment details, visible encroachments, and general notes. The site length is calculated with GPS points, but the berm width and bank slope are visually estimated using engineering judgment. Photo documentation is taken at each of the erosion sites. Repaired sites are checked to make sure the repairs are still in good condition, no new erosion has formed at the upstream or downstream transitions, and for anything else of concern or significance. Sites repaired within the previous year are removed from the erosion inventory and moved to a revetment database. Occasionally a site will be removed from the erosion inventory based on more detailed information, changing site conditions (e.g. a site has changed from erosional to depositional and no longer qualifies), or a repair under a different program. Part of the erosion inventory reconnaissance includes observations for the Corps' Levee Safety Policy for vegetation on levees. During field surveys, vegetation on levees is observed and notes are
22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40	During the reconnaissance trip, the team reviews the existing erosion sites, identifies new sites, and checks the previously repaired sites. Existing sites are checked for changes from the previous year, and checked for additional erosion or slumping, exposed tree roots, increased site length, changes in vegetation, changes in bank width or slope, and to determine if the site is starting to heal (i.e. new deposition, or erosion has shifted to the opposite bank). For new sites, in addition to the erosion details, basic information is collected, such as: location, berm width, bank slope, site length, soil material, erosion mechanism, revetment details, visible encroachments, and general notes. The site length is calculated with GPS points, but the berm width and bank slope are visually estimated using engineering judgment. Photo documentation is taken at each of the erosion sites. Repaired sites are checked to make sure the repairs are still in good condition, no new erosion has formed at the upstream or downstream transitions, and for anything else of concern or significance. Sites repaired within the previous year are removed from the erosion inventory and moved to a revetment database. Occasionally a site will be removed from the erosion inventory based on more detailed information, changing site conditions (e.g. a site has changed from erosional to depositional and no longer qualifies), or a repair under a different program. Part of the erosion inventory reconnaissance includes observations for the Corps' Levee Safety Policy for vegetation on levees. During field surveys, vegetation on levees is observed and notes are recorded for each site. These observations are considered during evaluations of the potential need

levee vegetation supplement cross-sections obtained from the best available topographic data.
 which provide the levee prism for each site. After looking at the levee prism and considering survey
 observations, a preliminary decision is made on the need for a variance request. This preliminary
 decision is either "unlikely," "likely," or "unknown" and will be refined later in the Site Selection and
 Implementation Process.

## 6 2.6.2 Step 2 – Critical and Non-Critical Erosion Site Decision

7 During Step 2 of the Site Selection and Implementation Process, critical erosion sites (if any) are 8 identified throughout the system. Step 2 allows for an expedited path for the critical sites and a non-9 expedited path for non-critical sites. Critical sites are those where a breach may occur, based on 10 engineering judgment. The term "critical" refers only to the likelihood of a breach occurring and not the consequences of a breach. Therefore, it is not a term that describes risk, which is composed of 11 12 both the likelihood of failure and the consequence of failure. Final selection of sites for repair 13 includes both the likelihood of failure and the consequence of the failure. It is therefore possible that 14 critical sites may not be selected for repair if the consequences of failure do not justify construction 15 in accordance with Corps policy. For example, if the site is deemed critical but is located in a basin 16 that is not economically justified, the site will not be selected for repair.

17Sites deemed critical in Step 2 and found in Step 4 to be located in economically justified basins will18follow the same process as all other repair sites, but in an expedited manner. These sites will have19an additional step, Step 4B, and will skip Steps 7 and 8, because they will automatically be selected20for repair, and will already have been recorded in Step 4B. Critical sites which are not located in21economically justified basins will be elevated to Corps management, the CVFPB, and local22maintaining agencies (LMAs) after Step 4B to determine alternative program or project authorities

23 <u>that can conduct the repair.</u>

<u>Critical erosion sites can be selected for repair outside the regular periodic site selection process in</u>
 <u>order to quickly repair these critical sites. Therefore, Step 4B, which records critical sites, is added</u>
 <u>to Step 3 and Step 8 of the regular process for critical sites. However, non-critical sites will wait for</u>
 <u>the next planned site selection cycle before being considered for site-selection and implementation.</u>
 <u>See Steps 4 through 8 for additional details.</u>

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## 30 2.6.3 Step 3 – Engineering Ranking and Report

- During the third step of the Site Selection and Implementation Process, an engineering site ranking
   and report are developed based on the results of the information collected during the annual
   erosion reconnaissance. An aerial atlas providing a visual representation of the erosion sites in the
   system is also created. The Engineering Ranking and Report is prepared annually based on the
   annual field reconnaissance.
   The site prioritization, or ranking, is based on engineering factors that contribute to levee breach or
   failure. These are site length, berm width, bank slope, soil type, velocity, erosion rate, and additional
- 38 <u>factors such as trees with exposed roots, holes, slumping, vertical sections, or cracks. Scores are</u>
- 39 assigned to each factor to compile a total score. The higher the score, the worse the site, and the
- 40 higher priority for repair. There are no tie breakers if two or more sites end up with the same score.
- 41 The score in the engineering ranking is essentially an estimate of the condition of a site relative to

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the other sites and is not a site selection score. Site justification in Step 4 and other opportunities and constraints identified in Step 5 are critical for prioritizing and selecting sites for repair.

## 3 2.6.4 Step 4 – Justification Screening

- 4 This step includes an economic analysis and other work necessary to determine, using a risk-based 5 approach, if repairing a site is justified. While Step 3 looks only at the likelihood of a breach, this step looks at the consequences as well. An Economic Reevaluation Report (ERR) will be prepared prior to 6 7 each draft Design Documentation Report (DDR) for the 80,000 LF. To minimize delays due to the 8 economic analysis, and to avoid expending funds on sites that may not be economically justified, the 9 first DDR will be limited to the seven previously identified economically justified basins. Basins that 10 were previously evaluated and found to not be economically justified will be addressed in the second ERR, and basins that include critical erosion sites, but were not previously evaluated for the 11 12 Post Authorization Change Report, will be addressed in either the second ERR or a subsequent ERR. 13 Thereafter, the ERRs will be updated every five years on average. Critical erosion sites will go
- 14 through this step once a site is identified as critical. The risk--based justification screening for non-
- 14 <u>through this step once a site is identified as critical. The risk--based justification screening for non</u> 15 critical sites will be based on the latest Engineering Ranking and Report from Step 3. Only repair
- 16 <u>sites located in justified basins will be repaired.</u>

### 17 2.6.4.1 Step 4B – Critical Site Memorandum for the Record

18 This step is implemented only in the expedited pathway meant for critical sites. All sites deemed 19 critical are recorded in the Critical Site Memorandum. Because critical sites go through an expedited 20 pathway, this Memorandum serves the purpose of documenting which sites are identified as critical. 21 To maintain consistency and organization in the Site Selection and Implementation Process, the 22 Memorandum is added to the Engineering Ranking Report (Step 3) and the Site Selection Report 23 (Step 8). This step occurs prior to determining if the site is located in a justified basin. This ensures 24 all critical sites are recorded in the Memorandum, not only the ones located in economically justified 25 <u>basins.</u>

## 26 **2.6.5 Step 5 – Identify Opportunities and Constraints**

- During this step of the process, the following potential issues and opportunities associated with each
   site are identified.
- 29 Life safety community and population considerations.
- 30 Real estate right of way issues, easements, encroachments, etc.
  - Environmental affected habitat, mitigation requirements (on-site or off-site mitigation), listed species (federal and state), re-establish habitat, etc.
    - Constructability what types of repairs are feasible or not possible, is there an opportunity to do a setback levee, etc.
    - Cultural resources identify historic and pre-historic properties.
- 36 Whether another program or agency is planning a repair.
- 37 Grouping of sites for more efficient repairs.

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- Other issues and opportunities other conditions observed that could impact or enhance the repair.
- Corps guidance, policies, and budget.

## Under this step, each Corps discipline in the project delivery team (PDT) identifies potential issues and opportunities that may affect, delay, or otherwise influence the repair of the site. The PDT also

- 6 <u>coordinates with and solicits input on opportunities and constraints from other local, state, and</u>
- 7 <u>federal agencies that have interest in or oversight responsibilities for each site.</u>

## 8 2.6.6 Step 6 – Conceptual-Level Alternatives

- 9 Under Step 6, the PDT develops conceptual-level designs and costs. For each site, multiple design
   alternatives are generated based on engineering judgment. Conceptual cross-sections and footprints
   are generated based on the best available topography. If topography does not match the present day
   bankline, estimated present day banklines may be added to the sketch. Preliminary and simplified
   cost estimates are developed. These costs are approximate, based on engineering judgment.
- Historically, sites have been repaired mostly with riprap. As the SRBPP has progressed, a need has
   been identified to repair sites with design alternatives that minimize environmental impact while
   providing bank protection. The PDT now looks at multiple design alternatives such as planting
   benches and setback levees. If a site is selected for repair, further analysis and data collection occurs
   during the preconstruction engineering and design phase to verify and refine conceptual
- 19 <u>alternatives as necessary.</u>
- Setback levees will be considered at each economically justified site. The River Basin Monetary
   Association Act of 1974 authorized the use of bank erosion control and setback levees and urged
   special consideration be given to preserving areas of riparian vegetation "insofar as practicable
   consistent with protecting critical levee areas." If a setback levee is chosen as the design alternative,
   it would be constructed behind the current levee, allowing the current levee to erode, and expanding
   the floodplain to the extent of the setback levee. Feasibility will be determined on a site-by-site basis
   The following criteria are key factors in considering a setback levee alternative:
  - The length of the eroded bank is extensive.
- 28 There are multiple erosion sites in close proximity.
- 29 Channel capacity is limited.
- 30 A setback levee would produce positive hydraulic impact, for example, reduced flow velocity.
- 31 A setback levee would create strategic habitat improvement.
- 32 Real estate is available through the local sponsor.
- 33In addition to the above criteria, a setback levee alternative must be cost-effective in order to be34pursued. If a setback levee alternative were to degrade natural habitat or have negative hydraulic
- 35 <u>impacts, it is unlikely the design alternative would be deemed feasible.</u>

## 36 **<u>2.6.7</u>** Step 7 – Site Selection

37 Sites are selected for repairs during Step 7. Selected sites are generally anticipated to be repaired
 38 over a 3-year period, which makes up a construction cycle. This step starts with the engineering

1	ranking developed in Step 3 for sites that pass the justification screening in Step 4. PDT then
2	investigates the issues identified in Step 5 to see if sites should be moved up or down in the ranking.
3	For example, a site may be moved up if there is a justification for why a repair cannot wait, or if a
4	site is adjacent to a higher ranked site and the two sites could be repaired together. As another
5	example, a site could be moved down on the list if there is a justification that repair could cause
6	more negative impacts than positive impacts. This step has an iterative component in which
7	conceptual-level alternatives in Step 6 may be modified. Selections will be recorded the Site
8	Selection Report (Step 8).
9	In addition, if another program, project, or entity is planning to repair an identified erosion site in
10	the near future, the site will drop out of the site selection list. However, the site will remain in the
11	inventory until repaired.
12	The top identified sites are locked in for repair in the next construction cycle, and the remaining
13	sites will continue to be evaluated in future annual erosion inventories. If a site becomes critical
14	(critical only in terms of likelihood of breach and not considering consequences) before the next site
15	selection and implementation cycle, then it may be fast-tracked to Step 8. If this occurs in the years
16	between site selection cycles, an addendum to the latest Site Selection Report will be prepared for
17	these fast-tracked critical erosion sites. A critical site that is fast-tracked will be moved to
18	<u>construction as quickly as possible. However, construction could be delayed due to site-specific</u>
19	issues and the site may not be repaired for some time as a result. Sites identified as critical between
20	<u>site lock-in documentations will be added to the latest Site Selection Report as an addendum. As</u>
21	noted previously, critical sites are identified in the annual Engineering Ranking and Report, which

## 23 **2.6.8** Step 8 – Site Selection Report

24 For Step 8, the top sites chosen in Step 7 and the fast-tracked critical sites are considered the locked-25 in sites selected for repair in the construction cycles. The number of selected sites will vary 26 depending on a number of factors, such as construction limitations (e.g. funding, location, length, 27 etc.). A report is written to document how and why the locked-in sites were selected for repair. This 28 report is primarily for Corps use and to keep a historical record of the process. The identified sites 29 are grouped into construction cycle-years, based on the required time needed to acquire real estate 30 and similar construction repair methods or site proximity in order to enhance the value per dollar 31 spent.

considers likelihood of breach only and not the consequences of the breach.

## 32 **2.6.9 Step 9 – Data Collection and Analysis**

- 33For this step, the PDT collects data needed to develop the repair designs. The exact information and34the level of detail collected for each site varies from site to site. Some of the data collected includes35topographic surveys, geotechnical explorations, tree inventory, potentially impacted endangered36species and associated habitat, a Hazardous Toxic Radioactive Waste (HTRW) survey, cultural37information, and a utility survey.
- 38 Topographical surveys, including bathymetry of the underwater portion of the river, are needed for 39 each site. The topography covers the entire project area, captures the landside toe, extends to cover
- 40 <u>the opposite bank, and extends far enough upstream and downstream of the site for hydraulic</u>
- 41 <u>modeling needs.</u>

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1	During the survey and follow-up activities, the design team identifies existing visible encroachments
2	on the levee that may interfere with proposed repairs, such as gas/oil pipelines, telecommunication
3	lines, utilities, boat docks, stairs, intake and discharge facilities, and other improvements or
4	structures. The design team notes if removal or relocation is the appropriate option for
5	encroachments. Based on the data collected in the field, Corps and DWR Real Estate departments
6	will develop a timeline and process for an encroachment that needs to be removed or relocated <sup>1</sup> .
7	Geotechnical data may be acquired if needed.
8 9 10 11 12	Topographical surveys, tree surveys, and bathymetry data are used to evaluate if a site will require a variance request. After sites have been selected, the PDT looks at the preliminary evaluation results of unlikely, likely, or unknown made in Step 1 and compares them with the survey data. Then a determination of "yes" or "no" is made to identify which of the selected sites likely requires a variance request, based on the chosen design alternative.
13	<u>A survey and database search of federally and state-listed species and associated habitats is also</u>
14	performed. This includes a survey of threatened and endangered species, special-status species, and
15	sensitive habitat for fish, wildlife, and flora.
16	An HTRW survey determines if there are identified environmental hazards.
17	<u>Cultural resources surveys and database searches are performed to identify cultural resources</u>
18	located in each project footprint.
19	<u>A real estate survey is conducted to identify potential impediments to securing the site for repair.</u>
20	<u>This review includes an in-depth inspection of both the waterside and landside of the levee. It is</u>
21	<u>conducted jointly by Corps and DWR Real Estate personnel, and the responsible Reclamation</u>
22	<u>District or LMA. Representatives from the Corps design team and CVFPB join in the field review.</u>
23 <b>2</b>	.6.10 Step 10 – Preliminary Design and Draft Environmental
24	Assessment/Initial Study
25	Step 10 begins the design process and the draft Environmental Assessment/Initial Study (EA/IS).
26	First, the design alternatives are selected and 30% designs (plans, specifications, DDR, real estate
27	addendum, and cost estimate) are completed. Following that, hydraulic modeling begins. District
28	Quality Control, Agency Technical Review (ATR), and Independent External Peer Review (IEPR) are
29	then conducted in accordance with an approved project Review Plan.
30 31 32 33	Each DDR will address and comply with the most current applicable USACE engineering guidance at the time that it is prepared, including the most recent guidance regarding risk-informed decision- making, climate change, and relative sea level rise. The most appropriate hydrology available will be used in developing each DDR.
34 35 36	Once the 60% designs are complete, subject to Corps procedures, the construction footprints will be handed off to Corps Real Estate to develop the take-letters for DWR Real Estate to begin the certification process.

<sup>&</sup>lt;sup>1</sup> This will include DWR Real Estate once the process to involve them earlier is established.

During this step, the draft EA/IS will be developed and released for public review and comment for
 compliance with NEPA and CEQA. In conjunction with the EA, the cultural resources section consults
 with the State Historic Preservation Office and Native American tribes.

## 4 2.6.11 Step 11 – Draft Final Design, Final EA/IS, and Pre 5 Construction Activities

6 Under this step, the 60% plans and specifications are reviewed, and the cost estimate is updated.
 7 The results of the analyses of the survey(s) and database search of Federal and State listed species
 8 and associated habitats will lead to the development of a site specific biological assessment to be
 9 provided to resource agencies during formal consultation for Section 7 of the Endangered Species

- 10 Act, the Magnuson-Stevens Act, and the Clean Water Act. This will include a survey of threatened
- 11 and endangered species, special status species, and sensitive habitat for fish, wildlife, and flora, and
- 12 assessment of potential impacts to these species or habitats and potential mitigative measures. The
- 13 <u>team will finish writing the draft DDR. After an internal review of the plans, the 90% plans and</u>
- 14 specifications are developed, and the hydraulic modeling, cost estimate, and real estate
- 15 requirements are adjusted as needed. Following an internal review, the 90% plans and
- 16 <u>specifications and DDR are sent for reviews. The final EA/IS is completed with a signed Finding of</u>
- No Significant Impact (FONSI) and Mitigated Negative Declaration (MND), unless an Environmental
   Impact Statement or Report is required. The DDR and NEPA/CEQA document will be approved by
- 19 SPK or SPD. The real estate addendum will be reviewed and approved by SPD.

## 20 2.6.12 Step 12 – Review and Final Design

21The official ATR and IEPR (Type II IEPR, Safety Assurance Review) are performed throughout the22development of the plans and specifications and the DDR. The ATR serves as the Biddability.23Constructability, Operability, Environmental, and Sustainability (BCOES) characteristics review of24the plans, specifications, and EA/IS. Revisions to the designs and contract documents are made25based on these reviews, resulting in the 100% DDR and plans and specifications for contract26advertisement.

## 27 **2.6.13 Step 13 – Contracting Process**

- 28 For this step, the Corps compiles the final plans and specifications, provides the signed BCOES, and
- 29 processes the funding element for construction. Real estate certification is completed with a
- 30 statement from DWR Real Estate and certification by Corps Real Estate. These items are provided to
- 31 <u>Contracting, which then prepares the bid documents and solicits bids based on the chosen</u>
- 32 contracting vehicle. The contract is awarded, and the chosen contractor is given a Notice to Proceed.

## 33 **2.6.14 Step 14 – Construction**

34 For Step 14, the contractor constructs the bank repair following the Notice to Proceed from Step 13.

## 35 **2.6.15 Step 15 – Mitigation Monitoring**

- 36 <u>On-site mitigation requires monitoring to ensure the establishment criteria is met for vegetation</u>
- 37 growth and survival. The monitoring period must be sufficient to demonstrate that the
- 38 compensatory mitigation has met performance standards, but not less than 5 years (see 33 CFR

<u>332.6(b)</u>. Monitoring reports are required on a yearly basis. If the compensatory mitigation has met
 <u>its performance standards in less than 5 years, the monitoring period length can be reduced, as long</u>
 as there are at least two consecutive monitoring reports that demonstrate success.

## 4 2.6.16 Step 16 – Site Turnover

- 5 <u>Once the construction and mitigation monitoring steps are complete, the Corps turns the site over to</u>
- 6 <u>CVFPB</u>, which then turns the site over to the LMA. The Corps provides the as-built drawings, Project
- 7 <u>Cooperation Agreement letter, and addendum to the supplemental Operations, Maintenance, Repair,</u>
- 8 Replacement, and Rehabilitation Manual, and letter of transmittal.

## 9 2.62.7 Construction

## 10 **2.6.1**2.7.1 Construction Activities

11 It is anticipated that construction would take place between April 1 and November 30, with in-water 12 construction activities to be conducted between August 1 and November 30 (July 1 to August 31 in 13 Reach 3). No water-based construction would be permitted during the winter months (December 14 through March). Setback or adjacent levee construction may still occur during the winter months if 15 feasible. The anticipated construction season may need to be modified to respond to high water 16 levels in the river, the presence of special-status species, potential associated habitat disturbance, or 17 other constraints.

18 Construction may take place from the landside or from the water. For water-based construction, 19 work would be conducted from cranes mounted on barges, with the crane (boom) systems 20 mechanically placing the rock along the shore and beneath the water line. Waterside construction 21 typically would result in less noise, less roadway traffic, and less disturbance of vegetation than 22 landside construction. For either landside or water-based construction, the contractor may choose 23 to use excavators, loaders, and other construction equipment once the revetment has reached the 24 manual follower terms.

- 24 summer/fall waterline.
- Protective exclusion fencing would be installed to prevent construction crews from accessing
   sensitive resources, such as riparian habitat or elderberry shrubs, except where required for project
   implementation.
- 28 The Corps or CVFPB would be responsible for implementing the erosion repairs at individual sites.

## 29 **2.6.22.7.2** Real Estate

30 The Corps will furnish to the state right-of-way maps indicting the areas required for construction, operations and maintenance, and on-site mitigation (if required). Prior to advertising of any 31 32 construction contract, the state shall furnish all lands, easements, and rights-of-way, including 33 suitable borrow and dredged material disposal areas or other disposal area as may be determined 34 by the Corps to be necessary for construction and shall furnish to the Corps evidence supporting the 35 state's legal authority to grant rights-of-entry to such lands. The process generally includes parcel 36 research, coordination with landowners, acquisition of appropriate permits to allow further 37 investigation, identifying and addressing existing encroachments, identification of rights to be 38 acquired, appraisal and acquisition of property rights, and final clearing of encroachments. The state

- receives cost share credit for the lands, easements, and rights-of-way acquired. The credit shall be
   the fair market value of the interest at the time such interest is made available to the Corps for
- 3 construction.

## 4 2.6.32.7.3 Staging Areas

5 Staging areas would be identified for each erosion site prior to construction. Staging areas typically 6 are located within the erosion site construction easement or immediately adjacent to the erosion 7 site, preferably in a location that does not affect or has a minimal impact on resources. These areas 8 would be used for staging vehicles, materials, and other associated construction equipment. Staging 9 areas would be subject to the same project-level environmental analysis and documentation as the 10 project construction footprint to ensure that any potential resources would not be adversely 11 affected or that appropriate mitigation is provided.

## 12 2.6.42.7.4 Haul Routes, Borrow Areas, Traffic, and Navigation

13 Depending on the site location, materials would be brought to the sites via waterways for water-14 based construction or via surface roads for land-based construction. Haul routes to those sites 15 requiring landside access would be via Interstate and U.S. highways, state highways, county and city 16 roads, and levee access roads. It is assumed that construction materials, including quarry stone, 17 would be hauled from a commercial or previously permitted quarry or borrow site located within 18 100 miles of the site. Temporary lane closures and, in some instances, full road closures may be 19 required. Adequate detours would be provided during any road closures. Construction signs would 20 be posted along the haul routes, and flaggers would be used, as necessary, to minimize traffic 21 problems and ensure public safety near the construction sites. 22 Barge navigation would be along waterways within the study-program area that are navigable,

primarily along the Sacramento River, and would comply with all applicable navigation and mooring
 regulations.

## 25 2.72.8 Preferred Alternative

26 The Corps and CVFPB have identified Alternative 4A (and Sub-Alternative 4B) as the preferred 27 alternative. The selection was made based on Alternative 4A's ability to meet the project purpose 28 and objectives, engineering and economic feasibility, and mitigation of environmental effects. This 29 alternative utilizes the repair design approach employed over the past decade, which primarily 30 focused on creating waterside benches revegetated with native riparian plants inundated during 31 winter-spring flows to target utilization of migrating fish. Under this alternative, up to 80,000 LF of 32 erosion protection will be constructed within economically justified basins. Based on the latest 33 economic analysis, there are 7 economically justified basins currently identified, and these are 34 represented as Alternative 4B for the purpose of this analysis. The project would be implemented as 35 In the short-term, project implementation would be similar to Sub-Alternative 4B, but the basins 36 <del>that are</del> included in <del>this</del> that alternative <del>may</del> will change <del>as</del> based on subsequent economic analysis 37 is conducted. Erosion protection would only be constructed within economically justified basins. 38 Based on the latest economic analysis, there are 7 economically-justified basins currently identified. 39 The Corps will continue to update the economic analysis approximately every 5 years and/or as 40 erosion sites are identified in areas not evaluated. In addition, there may be some refinement of the

determination of basins as units for this analysis through further engineering and economic
 assessment. Erosion sites identified outside economically justified basins will be referred to the
 nonfederal sponsor and local maintaining agencies for construction, which may require through a
 Section 408 permit (33 USC Section 408) action, which would be triggered by the for alteration of a
 federal project levee.

# 6 2.82.9 Environmentally Preferable 7 Alternative/Environmentally Superior Alternative

NEPA requires identification of the environmentally preferable alternative and CEQA requires
 identification of the environmentally superior alternative. The environmentally preferable
 alternative is the alternative that best promotes NEPA's goals, while the environmentally superior
 alternative is that which substantially avoids or lessens the proposed project's significant
 environmental effects.

Alternative 3A is the environmentally superior alternative under CEQA and the environmentally
 preferable alternative under NEPA. While there are many similarities among the environmental
 effects associated with Alternatives 3A through 6A, Alternative 3A is superior because it minimizes
 construction-related effects associated with water quality, vegetation, fish, and wildlife, and is the
 most consistent with natural resource agency input received during the public scoping process.
 Although the No Action Alternative would cause fewer direct environmental effects than Alternative
 3A, it would not meet the proposed program's purpose and need or objectives.

It should be noted that Alternative 3A is expected to have somewhat greater effects with regard to land use (primarily farmland), traffic and air quality. Additionally, Alternative 3A does not provide the most improvements to fish habitat as determined by the SAM when compared with Alternatives 4A through 6A. However, Alternative 3A would cause the least disruption to existing fish/riparian habitat and provide substantial opportunities for floodplain restoration and the continuation of natural erosion processes. Effects on land use and higher costs associated with land purchase and construction are considered substantial challenges to Alternative 3A.

# 27 2.92.10 Restoration/Mitigation Establishment and 28 Monitoring

29 Vegetation establishment and monitoring would be necessary to ensure that the mitigation 30 vegetation is successfully establishing and that the IWM is functioning as intended. Following 31 completion of construction at an individual site, the Corps would submit a detailed maintenance and 32 monitoring plan (MMP) for the resource agencies to review. The MMP would include: 1) success 33 criteria to provide a standard to assess whether mitigation efforts successfully replace lost habitat 34 value; 2) a program to monitor the development of SRA cover and riparian habitat; 3) a protocol for 35 implementing remedial actions should any success criteria not be met; and 4) the required duration 36 of the monitoring efforts. Monitoring reports that evaluate the progress of each constructed erosion 37 site in meeting the success criteria would be submitted to the resource agencies by December 31 of 38 each monitoring year.

- 1 Vegetation establishment activities for on-site mitigation will be performed by the Corps for a
- 2 minimum of 3 years and until mitigation success criteria has been met following the completion of
- 3 levee repairs. After this time, it is anticipated that the vegetation would be established and self-
- 4 sustaining. Anticipated activities during the 3-year establishment period include removal of
- 5 problematic invasive species, irrigation of vegetation to promote optimal growth, replacement of
- 6 any dead or declining vegetation, and maintenance of beaver barrier fencing.
- 7 Establishment activities also may include monitoring the vegetation and IWM to ensure that hazards
- 8 to navigation are not present, assessing the status of the rock revetment and soil fill during high-
- 9 flow events, and monitoring the sites for vandalism. Any in-water maintenance work would be
- 10 conducted in coordination with the applicable federal and state resource agencies to avoid adverse
- 11 effects on sensitive fish species.
- 12 Long-term maintenance is the responsibility of the project sponsor, which is the CVFPB. In most
- 13 cases, the CVFPB delegates long-term maintenance to a local maintaining agency, such as a
- 14 reclamation or levee district. Maintenance is to be carried out consistent with the Sacramento Flood
- 15 Control Project Operations and Maintenance manual.

## 3 3.1 Introduction

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This chapter provides guidance on NEPA and CEQA requirements, the use of NEPA and CEQA
 terminology, and the structure of the resource chapters.

## 6 3.2 NEPA and CEQA Requirements

An EIS prepared under NEPA is essentially the same as an EIR prepared under CEQA because both
are public disclosure documents to ensure environmental factors are considered during the
government decision-making process.

10 The Council on Environmental Quality regulations for implementing NEPA specify that a federal 11 agency preparing an EIS must consider the effects of the proposed action and alternatives on the 12 environment. These include effects on ecological, aesthetic, historical, and cultural resources, and 13 economic, social, and health effects. Environmental effects are categorized as direct, indirect, and 14 cumulative.

- An EIS also must discuss possible conflicts with the objectives of federal, state, regional, and local land use plans, policies, or controls for the area concerned; energy requirements and conservation potential; urban quality; the relationship between short-term uses of the environment and longterm productivity; and irreversible or irretrievable commitments of resources. An EIS must identify relevant, reasonable mitigation measures not already included in the proposed action or alternatives that could avoid, minimize, rectify, reduce, eliminate or compensate for the project's
- adverse environmental effects (40 CFR Sections 1502.14, 1502.16).
- The State CEQA Guidelines for implementing CEQA provide that the environmental analysis for an
   EIR must evaluate impacts associated with the project and identify mitigation for any potentially
   significant impacts. All phases of a proposed project, including construction and operation, are
   evaluated in the analysis. Section 15126.2 of the State CEQA Guidelines states:
- 26 An EIR shall identify and focus on the significant environmental effects of the proposed project. 27 In assessing the impact of a proposed project on the environment, the lead agency should 28 normally limit its examination to changes in the existing physical conditions in the affected area 29 as they exist at the time the notice of preparation is published, or where no notice of preparation 30 is published, at the time environmental analysis is commenced. Direct and indirect significant 31 effects of the project on the environment shall be clearly identified and described, giving due 32 consideration to both the short-term and long-term effects. The discussion should include 33 relevant specifics of the area, the resources involved, physical changes, alterations to ecological 34 systems, and changes induced in population distribution, population concentration, and human 35 use of the land (including commercial and residential development), health and safety problems 36 caused by the physical changes, and other aspects of the resource base such as water, historical 37 resources, scenic quality, and public services. The EIR shall also analyze any significant 38 environmental effects the project might cause by bringing development and people into the area 39 affected.

- An EIR also must discuss inconsistencies between the proposed project and applicable general plans
   and regional plans (State CEQA Guidelines Section 15125[d]).
- An EIR must describe any feasible measures that could minimize significant adverse impacts, and
   the measures are to be fully enforceable through permit conditions, agreements, or other legally
   binding instruments (State CEQA Guidelines Section 15126.4[a]). Mitigation measures are not
   required for impacts that are found to be less than significant.

Under NEPA, the effects of the proposed action and alternatives under consideration, including the
no action alternative, are determined by comparing effects between alternatives and against effects
from the no action alternative. Consequently, baseline conditions differ between NEPA and CEQA.
Under NEPA, the no action alternative (i.e., expected future conditions without the project) is the
baseline to which the action alternatives are compared, and the no action alternative is compared
with existing conditions. Under CEQA, existing conditions are the baseline with which all
alternatives are compared.

## 3.3 Application of NEPA and CEQA Principles and Terminology

16 NEPA and CEQA are similar in that both laws require the preparation of an environmental study to 17 evaluate the environmental effects of proposed government actions. However, there are several 18 differences between the two regarding terminology, procedures, environmental document content, 19 and substantive mandates to protect the environment. For this environmental evaluation, the more 20 rigorous of the two laws was applied in cases in which NEPA and CEQA differ. In other words, where 21 there are CEQA requirements that go beyond NEPA's requirements, this evaluation follows the CEQA 22 requirements; and where there are NEPA requirements that go beyond CEQA's requirements, this 23 evaluation will follow the NEPA requirements. For example, CEQA requires consideration of non-24 federal listed plants and wildlife in the biological effect analysis; however, NEPA is primarily 25 concerned with only federal listed plants and wildlife. CEOA also requires consideration of local- and state-listed historical resources in the cultural resources analysis, while NEPA is primarily 26 27 concerned with resources on or eligible for the National Register of Historic Places. Additionally, 28 CEQA does not require an environmental justice evaluation, nor does it require compliance with the 29 Section 106 process of the National Historic Preservation Act; however, both are required under 30 NEPA.

- 31 Many concepts are common to NEPA and CEQA; however, the laws sometimes use differing
- terminology for these common concepts. Table 3-1 below provides a comparison of NEPA and CEQA
   terminology.

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Table 3-1. Key to General NEPA and	<b>CEQA Terminology</b>
------------------------------------	-------------------------

NEPA Term	Correlating CEQA Term
Lead Agency	Lead Agency
Cooperating Agency	Responsible Agency
Environmental Impact Statement	Environmental Impact Report
Record of Decision	Findings
Preferred Alternative	Proposed Project
Project Purpose	Project Objectives
No Action Alternative	No Project Alternative
Affected Environment	Environmental Setting
Effect	Impact

2

This EIS/EIR uses both NEPA and CEQA terminology in certain instances (e.g., in Chapter 1 where
 the project purpose and need, and project objectives are discussed).

5 The terms "environmental consequences," "environmental impacts," and "environmental effects" are 6 considered synonymous in this analysis, and "effects" is used for consistency. Similarly, in general, 7 the terms "significant" and "less than significant" are used rather than "adverse" and "not adverse."

8 Technical terms used in the EIS/EIR are typically defined in their first instance of use in the text. A
9 list of acronyms and abbreviations follows the Table of Contents and an index follows Chapter 26.

## **3.4 Resource Chapters**

The resource chapters contain analyses of the environmental effects, by resource area, associated
 with the No Action Alternative and Alternatives 2A through 6A. Effects associated with the sub alternatives (2B through 6B) are discussed in a separate chapter (Chapter 21, Effects of
 Implementation in Economically Justified Basins Only). The resource chapters are as follows:

- 15 Chapter 4, Flood Control and Geomorphology
- 16 Chapter 5, Water Quality and Groundwater Resources
- 17 Chapter 6, Geology, Seismicity, Soils, and Mineral Resources
- 18 Chapter 7, Transportation and Navigation
- 19 Chapter 8, Air Quality and Climate Change
- 20 Chapter 9, Noise and Vibration
- Chapter 10, Vegetation and Wetlands
- Chapter 11, Fisheries and Aquatics
- Chapter 12, Wildlife
- Chapter 13, Land Use and Agriculture
- Chapter 14, Recreation

- 1 Chapter 15, Population and Housing
- 2 Chapter 16, Utilities and Public Services
- 3 Chapter 17, Aesthetics
- 4 Chapter 18, Public Health and Environmental Hazards
- 5 Chapter 19, Cultural Resources
- 6 Chapter 20, Socioeconomics and Environmental Justice

## 7 3.4.1 Contents of Resource Chapters

8 Each resource chapter contains the information listed here. 9 Affected Environment contains two sections, "Environmental Setting" and "Regulatory 10 Setting." These sections include the following information. 11 • **Environmental Setting.** This section provides an overview of the physical environmental 12 conditions in the area at the time of or prior to the publication of the Notice of Preparation 13 that could be affected by implementation of the proposed alternatives in accordance with 14 NEPA regulations (40 CFR Section 1502.15) and State CEQA Guidelines Section 15125. 15 Regulatory Setting. This section refers the reader to Appendix C, Regulatory Background, 16 which lists and describes laws, regulations, policies, and plans that affect the resource or the 17 assessment of impacts on the resource. Often the regulatory framework is the basis for the 18 significance criteria and, therefore, plays a crucial role in impact assessment. Potentially 19 applicable regulations are discussed, including local policies from municipal general plans and 20 ordinances. 21 Environmental Consequences describes the analysis of effects relating to each resource area 22 for each of the alternatives in accordance with NEPA regulations (40 CFR Section 1502.16) and 23 with State CEQA Guidelines Sections 15126, 15126.2, and 15143. This section includes the 24 following information. 25 • Methods and Assumptions describes the methods, models, process, procedures, data 26 sources, and/or assumptions used to conduct the impact analysis. Where possible, impacts 27 are evaluated quantitatively. Where quantification is not possible, impacts are evaluated 28 qualitatively. 29 **Determination of Effects** provides the criteria used in this document to define the level at 30 which an effect would be considered significant in accordance with CEOA. Significance 31 criteria (sometimes called "thresholds of significance") used in this EIS/EIR are based on the 32 checklist presented in Appendix G of the State CEQA Guidelines; factual or scientific 33 information and data; and regulatory standards of federal, state, and local agencies. Under 34 NEPA, preparation of an EIS is triggered if a federal action has the potential to "significantly 35 affect the quality of the human environment," which is based on the context and intensity of 36 each potential effect. The significance thresholds used in this EIS/EIR also encompass the 37 factors taken into account under NEPA to evaluate the context and the intensity of the 38 effects of an action. 39 • Effects and Mitigation Measures. To comply with NEPA and CEQA, the effects/impacts are 40 considered and evaluated as to whether they are direct, indirect, or cumulative. Direct

- effects are those that are caused by the action and occur at the same time and place. Indirect
   effects are reasonably foreseeable consequences to the physical environment that may
   occur at a later time or at a distance from the project area. Cumulative effects are discussed
   in Chapter 22, Growth-Inducing and Cumulative Effects.
- 5 Effects are listed numerically and sequentially throughout each chapter. An effect statement 6 precedes the discussion of each effect and provides a summary of the effect topic. The 7 numbering system provides a mechanism for tracking unique effects by resource area.
- 8 Each effect is accompanied by a finding or conclusion, as required under NEPA and CEQA.
  9 Table 3-2 provides a key for relating the effect findings by relative severity (increasing in
  10 degree of adversity to the environment).

#### 11 Table 3-2. Effect Findings (by increasing adversity)

Finding	
Beneficial	
No Effect	
Less than significant	
Significant	
Significant and Unavoidable	

12

For the purposes of the analyses in this document, the effect findings are defined more specificallybelow.

- **Beneficial.** This effect would provide a benefit to the environment as defined for that resource.
- No Effect. This effect would cause no discernible change in the environment as measured by the applicable significance criterion; therefore, no mitigation would be required.
- Less than Significant: This effect would cause no substantial adverse change in the
   environment as measured by the applicable significance criterion; therefore, no mitigation
   would be required.
- 21 **Significant:** This effect would cause a substantial adverse change in the physical conditions of 22 the environment. Effects determined to be significant based on the significance criteria fall into two categories: those for which there is feasible mitigation available that would reduce the 23 24 environmental effects to less-than-significant levels, and those for which there is either no 25 feasible mitigation available or for which, even with implementation of feasible mitigation 26 measures, there would remain a significant adverse effect on the environment. Those effects 27 that cannot be reduced to a less-than-significant level by mitigation are identified as significant 28 and unavoidable, described below.
- Significant and Unavoidable. This effect would cause a substantial adverse change in the
   environment that cannot be avoided or mitigated to a less-than-significant level if the project is
   implemented. Even if the effect finding is still considered significant with the application of
   mitigation, the Corps and CVFPB are obligated to incorporate all feasible measures to reduce the
   severity of the effect.
- Mitigation Measures. Measures to mitigate (i.e., avoid, minimize, rectify, reduce, eliminate, or compensate for) significant effects accompany each impact discussion. Similar to the effect descriptions, mitigation measures are listed numerically and sequentially throughout each

U.S. Army Corps of Engineers

- 1section. A mitigation measure statement precedes the discussion of each measure and provides2a summary of the measure topic. The numbering system provides a mechanism for tracking
- 3 unique measures by resource area.

Chapter 4
Flood Control and Geomorphology

## **3 4.1 Introduction and Summary**

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4 This chapter describes the environmental setting associated with hydrologic, hydraulic, geomorphic, 5 and flood control issues, the determination of effects, the environmental effects on hydrologic, 6 hydraulic, geomorphic, and flood control issues that would result from implementation of the 7 proposed program, and the mitigation measures that would reduce these effects. 8 Implications of programmatic alternatives for flood control and geomorphic conditions are also 9 addressed within the context of the resources affected by the changes, most notably water quality 10 and groundwater resources (Chapter 5); geology, seismicity, soils, and mineral resources (Chapter 11 6); vegetation and wetlands (Chapter 10); and fisheries and aquatics (Chapter 11). 12 The key sources of data and information used in the preparation of this chapter are listed below. 13 2008—Field Reconnaissance Report of Bank Erosion Sites and Site Priority Ranking, 14 Sacramento River Flood Control Levees, Tributaries, and Distributaries (Ayres Associates, 15 2008). 16 Geomorphic Analysis and Bank Protection Alternatives Report for Sacramento River (RM 78– 194) and Feather River (RM 0-28) (WET 1990a). 17 18 Programmatic Biological Assessment for the Sacramento River Bank Protection Project, Phase II 19 (Final) (Stillwater Sciences 2007). 20 Final EIR/SEIS for the Sacramento River Bank Protection Project (Jones & Stokes Associates) 21 1987). 22 Historic Sediment Loads in the Sacramento–San Joaquin Delta (California Department of Water 23 Resources 1994). 24 West Sacramento Levees System: Problem Identification Report, Erosion Assessment and 25 Treatment Alternatives, Draft for Review (Northwest Hydraulic Consultants 2007). 26 Draft Environmental Assessment/Initial Study for Levee Repair of 25 Erosion Sites: Sacramento 27 River Bank Protection Project (U.S. Army Corps of Engineers 2009). 28 Geomorphic Analysis of Reach from Colusa to Red Bluff Diversion Dam. River Mile 143 to River • 29 Mile 243: Final Phase II Report (WET 1989). 30 Geomorphic Analysis of the Sacramento River, Phase II Report (WET 1990b). • 31 Assessment of Sediment Budget of Sacramento-San Joaquin Delta (Northwest Hydraulic • 32 Consultants 2003). 33 North Delta Sedimentation Study (Northwest Hydraulic Consultants 2006).

 Final Alternatives Report—80,000 LF (107 Sites), Sacramento River Bank Protection Project (Kleinfelder-Geomatrix 2009).

- 1 Table 4-1 summarizes the flood control and geomorphic effects resulting from the implementation
- 2 of the Proposed Action.

Effect	Mitigation Measure	Implementation Period
FCGEOM-1: Decrease in Levee Erosion and Change in Sediment Recruitment	FCGEOM-MM-1: Conduct Site- Specific Studies at Levee Repair Sites and Minimize Changes in Local Hydraulic Conditions through Project Design	As needed before project (site) design and implementation
FCGEOM-2: Increase in Levee Slope Stability	Not applicable	
FCGEOM-3: Decrease in Instream Woody Material Recruitment	FISH-MM-2: Compensate for Loss of Fish Habitat VEG-MM-1: Compensate for the Loss of Woody Riparian Habitat	During and after construction. Develop revegetation plan prior to removal of existing riparian vegetation. Plantings will be monitored over a minimum period of time, as determined by the appropriate state and federal agencies.
FCGEOM-4: Changes in Local Hydraulics and Shear Stress	FCGEOM-MM-1: Conduct Site- Specific Studies at Levee Repair Sites and Minimize Changes in Local Hydraulic Conditions through Project Design	As needed before project (site) design and implementation
FCGEOM-5: Minimization of Stream Energy and Associated Floodplain Scour and/or Deposition	Not applicable	
FCGEOM-6: Substantially Alter the Existing Drainage Pattern of the Site or Area	FCGEOM-MM-2: Coordinate with Owners and Operators, Prepare Drainage Studies as Needed, and Remediate Effects through Project Design	As needed before project (site) design and implementation

#### 3 Table 4-1. Summary of Flood Control and Geomorphology Effects and Mitigation

4

## 5 4.2 Environmental Setting

## 6 4.2.1 Program Area Description

7 The program area encompasses more than 1,000 miles of levees and weirs. This area extends south-

8 to-north along the Sacramento River, from the town of Collinsville (River Mile [RM] 0) upstream to

- 9 Chico at RM 194. The program area also includes Cache Creek, the lower reaches of Elder and Deer
- 10 Creeks, the lower reaches of the American River (RM 0–23), Feather River (RM 0–61), Yuba River

(RM 0-11), and Bear River (RM 0-17), portions of Threemile, Steamboat, Sutter, Miner, Georgiana,
 and Cache Sloughs, as well as a number of flood bypasses and distributaries (Figure 2-1).

## 3 4.2.2 Flood Control

#### 4 4.2.2.1 Sacramento River Flood Control Project

5 The development of flood control along the Sacramento Valley rivers has been described as follows
6 (U.S. Army Corps of Engineers 1972):

7 Prior to the beginning of agricultural development in the highly fertile Sacramento Valley, a large 8 part of the area was subject to periodic inundation by flood flows from Sacramento River and its 9 tributaries. The floodplain, varying in width from about 2 to 30 miles, was about 250 miles long 10 from the mouth of the river to the vicinity of Red Bluff, and covered more than 1 million acres. Much 11 of the floodplain was covered with a dense growth of tule. Between the river bank and the tule lands 12 were areas of higher ground called rimlands, formed by sediment deposits along the channels. The 13 rimlands formed low natural levees which were accessible by water transportation. Because they 14 were susceptible to only occasional flooding, the rimlands were the first to be occupied and 15 developed for agriculture.

Prior to 1850, some low levees were constructed by individual landowners, and by 1894 there were
many miles of levees along the river and along adjacent stream channels. Some areas were formed
into districts around which levees were constructed to provide flood protection. Many such districts
were islands surrounded by leveed waterways. However, as additional levees were constructed,
high water levels were raised and other areas became subject to flooding due to increased flood
heights.

22 Flooding problems were aggravated by hydraulic mining in the upstream areas between 1853 and 23 1884. During this period, millions of tons of mining debris (silt, sand, and gravel) were deposited in 24 the mountain and valley streams. The beds of the Sacramento, Feather, Yuba, Bear, and American 25 Rivers increased as much as 20 feet in some reaches. By the mid-1870s, adjacent agricultural lands 26 were being flooded and covered with hydraulic mining debris to such an extent that agricultural 27 interests filed suit against the mining companies and, in 1884, a United States 9<sup>th</sup> Circuit Court 28 decree, in what became known as the Sawyer Decision in Woodruff v. North Bloomfield Mining and 29 Gravel Company, stopped virtually all hydraulic mining operated without a means of restraining 30 debris. In 1893, the Congress passed the Caminetti Act (33 United States Code Section 661 et seq.), 31 which created the California Debris Commission and gave it the responsibility of regulating 32 hydraulic mining activities, improving the navigability of rivers in the Central Valley, and controlling 33 floodwaters.

A number of alternative plans were considered by the Debris Commission for flood prevention along the Sacramento River and its tributaries, including storage reservoirs, confining the rivers to single main channels, and improving the river channels to maximum capacity supplemented by leveed floodway bypasses. The leveed floodway bypass concept was adopted by the Commission and is the basis for the existing Sacramento River Flood Control Project (SRFCP).

- 39 The SRFCP was authorized by Congress in 1917 (Public Law 64-367, Section 2, 39 Statutes 948, 949
- 40 (1917)). The SRFCP was the major project for flood control on the Sacramento River and its
- 41 tributaries. It was sponsored by The Reclamation Board of the State of California (today

reauthorized as the Central Valley Flood Protection Board, or CVFPB) and was the first federal flood
 control project constructed outside of the Mississippi River Valley.

3 The SRFCP includes more than 1,000 miles of levees, overflow weirs, pumping plants, and bypass 4 channels. Currently, the SRFCP extends from the Sacramento River's mouth near Collinsville in the 5 Sacramento-San Joaquin Delta (Delta) to near Chico Landing in the northern Sacramento Valley. 6 More than 1,000 miles of levees were constructed as part of the project, providing flood protection 7 to roughly 800,000 acres of highly productive agricultural lands, the cities of Sacramento and 8 Marysville, and numerous other small communities. Although SRFCP levees often were constructed 9 of poor foundation materials such as river dredge spoils that would not meet current engineering 10 standards, the levees are relied upon to provide flood protection during major storms to more than 11 2 million people in approximately 50 communities and more than 590,000 acres of agricultural land, 12 with an estimated damage potential of up to \$37-730 billion (in 2012 dollars) in urban and 13 agricultural developmentdepending on the severity of the flood event.

## 14 **4.2.3 Climate**

15 The program area has a mild, Mediterranean-type climate. Mean annual temperature in West 16 Sacramento, which is used as an example because its climate is representative of a majority of the 17 entire program area, is a relatively mild 62.2°F. Average high temperatures during the summer 18 range from 87.1°F–93.1°F. Temperatures sometimes exceed 100°F. Winter temperature maximums 19 vary from 54.5°F–60.6°F. Average low temperatures in the winter range from 40.2°F–43.7°F. 20 Temperatures in the winter only occasionally drop below freezing (Andrews 1972). Farther south in 21 Rio Vista, the temperatures are generally cooler year round due to the influence of cool air 22 movement from the Carquinez Strait (locally referred to as the "Delta breeze"). In the north part of 23 the program area, maximum annual temperatures are higher due to the decreasing influence of cool 24 air movement from the Carquinez Strait. For example, the average high temperature for Chico in July 25 is 94 °F and temperatures frequently exceed 100°F.

26 In West Sacramento, average annual precipitation is about 18 inches, with approximately 80% of the 27 total rainfall occurring between November and March. Cloud-free skies generally prevail throughout 28 the summer months, and in much of the spring and fall. Thunderstorms are relatively infrequent, 29 although occasionally occur in the late summer and other times of the year when unstable air 30 masses are situated over the region. The highest rainfall generally occurs in January, when the 31 average is about 4.2 inches of precipitation. The driest month is July, during which rainfall is rare. 32 Average annual precipitation farther south in Rio Vista is similar to that of West Sacramento; 33 however, average annual precipitation amounts increase farther north in the program area. For 34 example, Chico's average annual precipitation is 27 inches.

35 The temporal variability in precipitation is related to seasonal variation in atmospheric conditions. 36 During the summer months, high pressure systems build over the Pacific Ocean off the California 37 coast, promoting the transport of cool, dry air from the north. This effectively blocks major sources 38 of moisture. During the winter rainy season, the jet stream migrates farther south, allowing low 39 pressure systems off the California coast to create conditions that transport moisture inland. 40 Extreme variability of rainfall averages is indicative of wet and dry cycles. In West Sacramento, 41 during Water Years 1986, 1993, 1995, 1996, and 2005, total rainfall was significantly higher than 42 normal, with annual precipitation measured at 30.15, 29.41, 24.79, 23.74, and 19.95 inches, 43 respectively (California Department of Water Resources 2009). Recent dry periods include the

1 1976–77 and 1987–1992 drought years, with precipitation far below average because of the
 2 prevalence of stable, high-pressure systems during those winter months.

### 3 4.2.4 Hydrology and Hydraulics

#### 4 4.2.4.1 Flood Basins of the Sacramento Valley

As early as 1917, the importance of natural flood basins to the Sacramento Valley river system was
recognized by Gilbert (1917). Flood basins in the Sacramento Valley were originally delineated by
Gilbert (1917). More recently, Ayres Associates (2008) divided the entire Sacramento River basin
into potential flooded areas, based on what land would be flooded if a levee failed. The Sacramento
River basin was divided into 26 subbasins.

- Gilbert (1917) described these flood basins as being inundated annually by floodwaters. The
   Sacramento River was separated from the flood basins by natural levees; however, at high water,
- 12 these levees were easily overtopped. The lower 25 miles of the Feather River is also bounded by
- 13 flood basins (WET 1990a).
- Hall (1880 as cited in WET 1990a) describes the inundation of the flood basins during the flood of1879:
- "During the high water of March 1879, the low lands of the Sacramento Valley, to the extent of
  about 847 square miles, were covered with water; this area includes all flooded for a short
  period of time, as well as that upon which the water rested for several months. Above the mouth
  of the Feather River, in what may be called the upper flood region, the area covered was about
  483 square miles; and below that point, in what is called the lower flood region, the flooded area
  was about 364 square miles in extent."
- Gilbert (1917 as cited in WET 1990a) emphasized the hydrologic significance of the natural floodbasins:
- 24 "The lateral basins affected the channel characters in several ways. They conveyed a large part of 25 the flood discharge and thus left for adjacent portions of the channel only a small part. They 26 acted as reservoirs for the storage of floodwaters and fed them gradually to the lower course of 27 the Sacramento, so that the channels in the delta region were only moderately taxed by the 28 floods. The channels in consequence were adjusted for conveyance of only a fraction of the flood 29 discharge; they were of moderate section and their meanders were of small radius. Between the 30 town of Colusa and the mouth of the Feather River, the Sacramento River grows gradually 31 downstream until its estimated capacity is only 10 percent of the flood discharge."

32 Because the flood basins have been maintained as topographic lows even though there has been 33 extensive overbank deposition, it is evident that the flood basins have been subsiding at a rate equal 34 to or exceeding that of overbank deposition (Gilbert 1917 as cited in WET 1990a; WET 1989 as cited 35 in WET 1990a; Harvey 1988 as cited in WET 1990a). Such widespread subsidence may be driven by ongoing structural deformation of the Sacramento Valley. Offset on the Willows fault may have 36 37 generated an east-dipping topographic gradient on the eastern, upthrust block. Rotation of the 38 downthrust block would generate a similar gradient (WET 1990a). See Chapter 6, Geology, 39 Seismicity, Soils and Mineral Resources, for further information about land subsidence within the 40 program area.

41 In brief, the Sacramento Valley flood basins play a key role in the fluvial geomorphology and 42 hydrology of the Sacramento River (and other water courses in the program area). Most 1 importantly, the overflow areas cause the Sacramento River to get smaller downstream. In addition,

- 2 suspended sediment that has been deposited historically in the flood basins has generated a thick,
- 3 cohesive stratigraphic unit, which adds to the bank stability of the lower Sacramento River. The
- 4 significance of these flood basin deposits increases downstream as the topographic lows become
   5 more pronounced between Chico and Verona (WET 1990a).
- . . .

#### 6 4.2.4.2 Naming Conventions

7 This analysis uses the naming conventions adopted by Stillwater Sciences (2007) to subdivide the 8 program area into regions with similar physical/biological characteristics. For the purposes of this 9 analysis, the program area is divided into four regions, organized south to north by the location of 10 the downstream terminus of each watercourse with the mainstem Sacramento River (Table 2-1 and 11 Figure 2-1). As defined in Table 2-1, Region 1a encompasses the Yolo and Sacramento Bypasses, the 12 Sacramento River from Collinsville to Isleton (RM 0-20), and a distribution network of sloughs and 13 channels; Region 1b encompasses the Sacramento River from Isleton to the Feather River (RM 20-14 80); Region 2 encompasses the Sacramento River from Feather River confluence to Colusa (RM 80– 15 143), as well as the Feather River from the Sacramento River confluence to Oroville (RM 0-67) and 16 its tributaries; and Region 3 encompasses the Sacramento River from Colusa to Chico (RM 143– 17 194).

### 18**4.2.4.3**Regional Hydrology

19 The Sacramento River watershed receives winter/early spring precipitation in the form of rain and 20 snow (at higher elevations) in the northern Sierra Nevada, northern Coast Range, and Southern 21 Cascades. Prior to the construction and operation of reservoirs, winter rainfall events caused 22 extensive flooding and spring snowmelt resulted in high flows during spring and early summer. 23 Summer and fall flows were historically low. Currently, much of the total runoff is captured and 24 stored in reservoirs for gradual release during the summer and fall months. High river flows occur 25 during the winter and spring, but these are usually lower than during pre-European settlement 26 times; summer and fall low flows are sustained by releases from upstream reservoirs (Stillwater 27 Sciences 2007).

- 28 Examined quantitatively, the regulated 10,000 cubic feet per second low flow (in Region 3) is
- 29 increased about five fold during the average annual high flow event (U.S. Army Corps of Engineers
- 30 1981). The average is not typical, however, since both drought years and massive runoff events
- 31 present great streamflow variation. In 1977, for example, the peak runoff was only about 50%
- higher than the average low flow. On the other hand, individual storm sequences, such as those of
- the week of February 7, 1986, can generate runoff some 26 times the average annual flow, and the
   estimated 100-year floodflow would be even higher. Much of the runoff during these large flood
- events is diverted from the main channel to the flood control bypass system (Jones & Stokes
   Associates 1987).
- 30 Associates 1987J.
- 37 There is significant variability in flows for the different rivers and creeks in the program area. This
- 38 variability in flow influences the magnitude of bank erosion for particular rivers and creeks. In
- general, the Sacramento River has the largest flows of any watercourse in the program area and as
   such experiences the highest rates of bank erosion.

## 1 4.2.5 Geomorphic Conditions

2 The Sacramento Valley is the northern portion of the Great Central Valley of California. The river 3 basin is an elongated synclinal trough, which is bounded by the Sierra Nevada plutonic complex to 4 the east and the Coast Ranges to the west. The Sacramento Valley is underlain by marine 5 sedimentary rocks overlain by recent alluvial deposits and, to a lesser extent, some volcanic rocks. 6 The levees and river sediments associated with the program area are composed of Quaternary 7 alluvium deposits that consist of loose to medium-dense, unweathered gravel, sand, silt, and clay. 8 These sediments are estimated to have been deposited 200 to 10,000 years to 200 years before 9 present in naturally formed riverbanks and floodplains along the Sacramento River (Helley and 10 Harwood 1985 as cited in U.S. Army Corps of Engineers 2009).

In geologic history, the Sacramento River migrated frequently and freely within its meander belt, 11 which typically exceeded several thousand feet in width (Buer 1984 as cited in U.S. Army Corps of 12 13 Engineers 2009). Prior to Euro-American settlement, the mainstem Sacramento River and 14 tributaries along the valley floor would naturally overtop its banks at regular cycles and flood the 15 adjacent lands, replenishing wetlands and depositing sediments. Despite overbank sediment 16 deposition, these flood basins have maintained a low topographic profile, which suggests that the 17 flood basins are subsiding at a rate equal to or greater than overbank deposition (Gilbert 1917 as 18 cited in U.S. Army Corps of Engineers 2009; WET 1989 as cited in U.S. Army Corps of Engineers 19 2009). These floodplains have historically provided crucial fluvial geomorphic roles for the 20 Sacramento River and other rivers and creeks in the program area, as the flow loss to the flood 21 basins causes the Sacramento River to downsize in the downstream direction in the lower reaches 22 (WET 1990b as cited in U.S. Army Corps of Engineers 2009).

23 Beginning in the late 1800s, the Sacramento River's channel morphology and sediment transport 24 regime have been progressively altered by human activities, including the clearing of riparian 25 vegetation and the construction of levees and upstream dams for flood control and water supply. 26 Bank armoring of the levees has resulted in lower sinuosity, fewer overbank flows, and an altered 27 pattern of channel migration and meander cutoff (Brice 1977 as cited in U.S. Army Corps of 28 Engineers 2009; Larsen et al. 1997, 2004 as cited in U.S. Army Corps of Engineers 2009; Larsen and 29 Greco 2002). The present-day Sacramento River is a single-thread channel, which transitions from a 30 coarse gravel bed upstream into a sand-bedded channel (by about RM 128), with occasional 31 outcrops of cemented alluvial deposits (such as the Modesto Terrace formation) that historically 32 provided natural constraints to lateral migration (U.S. Army Corps of Engineers 2009).

See Chapter 6, Geology, Seismicity, Soils and Mineral Resources, for a description of sedimentology
 within the program area.

#### 35 **4.2.5.1** Regions 1a and 1b

36 The present geomorphic state of the lower Sacramento River basin and the Delta is a function of the 37 intensity of water management in each of the tributary rivers, local farming practices, intra- and 38 inter-Delta water transfers, and an extensive human-made levee system. Today, channel alignments 39 are largely fixed by artificial levees and erosion control measures. Flooding, except when artificial 40 levees break, no longer occurs on most islands and tracts. Instead, flow and sediment remain 41 confined to the existing channel network. Upstream water diversions for municipalities and 42 agriculture reduce the amount of flow entering the Delta and the amount of sediment transported to 43 the Delta. In addition, conveyance of water within and out of the Delta alters flow directions and

9

10

- 1 affects sedimentation and erosion rates and patterns. The levee system in the Delta restricts flow to
- a network of human-made and natural channels that reduce flood events and inhibit the
   accumulation of soils on the Delta islands.
- Historical changes in the lower Sacramento River basin and Delta that have affected channel
  morphology include land reclamation, levee construction, dredging, hydraulic mining, impoundment
  of water and sediment by upstream dams and other diversions, and the construction of water
  diversion facilities and consequent alteration of flow and sedimentation patterns in the Delta. The
  effects of these changes on channel morphology in the program area are summarized below.
  - Waterways in the program area are largely confined by levees and able to convey significantly greater flow and sediment discharges than during historical times.
- Historical cross-section data indicate that the majority of waterways in the lower portion of the
   program area have experienced some channel incision over the several decades and may be
   experiencing a net sediment loss over time.
- Water regulation, diversions, and the impoundment of water and sediment by dams has resulted
   in a decline in the total annual water and sediment outflows to the Delta from the Central Valley,
   a trend that is expected to continue into the future (Northwest Hydraulic Consultants 2003).
- The construction of large water diversion facilities such as the Delta-Mendota Canal and Delta
   Cross Canal in 1951 and California Aqueduct in 1973 have altered the traditional flow patterns
   in the Delta that affect sedimentation. Water and sediment exhibit a more southerly flow in the
   Delta, somewhat reducing deposition of sediment in the north and central Delta and increasing
   deposition of sediment in the south Delta (Northwest Hydraulic Consultants 2003).
- The combination of overgrazing, deforestation, floodplain reclamation, river channelization, and most importantly, hydraulic mining for gold caused large increases in sediment loads in the Delta system. The historical trend demonstrates a rapid decline of sediment loads in the Delta streams at the beginning of the twentieth century, followed by a gradual, steady increase of sediment loads over the last half century (Northwest Hydraulic Consultants 2003).
- Historically, some deposition of the solids occurred at locations in the Delta channels where
   water velocities were low. During high-flow periods, a high percentage of these solids were re suspended and moved downstream toward San Francisco Bay.
- For a complete review of the historical geomorphology of the Delta region, refer to Northwest
   Hydraulic Consultants' 2006 North Delta Sedimentation Study.

#### 32 Sediment Inputs to the Delta

- Most of the sediment supplied to the Delta (between 80% and 85% in an average year) is carried by the Sacramento River, whereas the San Joaquin River and the Mokelumne-Cosumnes River supply only about 10% and 4%, respectively (Northwest Hydraulic Consultants 2003). The remaining sediment enters the system from the Yolo Bypass and from several other smaller tributaries and sloughs. The Sacramento River is a sand-bed river; sediments transported through the lower portion of the program area include sands, silts, and clays.
- 39 The SRFCP conveys released reservoir waters from various upstream sources and stormwater
- 40 runoff through the Delta and into San Francisco Bay. These waters contain dissolved and
- 41 undissolved solids, both of which are transported through the system. Undissolved solids—

- 1 sediment—consist primarily of clay-, silt-, and sand-sized particles. Before construction of the flood
- 2 control and conveyance system, the natural flow of freshwater runoff from the upstream
- 3 mountainous regions transported significant quantities of silt and clay particles. Because of the wide
- expanse and flat terrain of the program area, these particles would settle and form the sediments of
  the Delta alluvial plain. During the wet season, when the volume of runoff water was much larger,
  the quantity of suspended and unsuspended solids was significant and included sands and, in some
- 7 cases, gravels.
- 8 The natural processes described above continue today but in a modified manner. Much of the
- 9 naturally eroded and transported solid particles now settle out in instream water storage reservoirs.
- A percentage of the fine solids, like silts and clays, still are transported during water releases that
   enter the system from waterways downstream of the reservoirs. These sediments enter the Delta
- channels, and rather than settling out in the alluvial plain (as occurred before the channels were
   constructed), they now remain within the leveed channels.
- For a description of total suspended sediment and turbidity see Chapter 5, Water Quality andGroundwater Resources.

#### 16 **Region-Specific Description (Region 1a)**

- 17 Below Isleton (RM 20), the Sacramento River flows into the Delta, forming a distribution network of 18 sloughs and channels. Flow is additionally received via the Yolo Bypass, which is a leveed, wide 19 floodplain that flows parallel to the west of the mainstem Sacramento River during high flows. 20 Additional flow comes from several water courses that feed into the bypass, including Knights 21 Landing Ridge Cut, Cache Creek, Willow Slough Bypass, Sacramento Bypass, and Putah Creek. 22 Seasonal high flows enter the Yolo Bypass from the Sacramento River via the Fremont Weir (RM 83) 23 and the Sacramento Bypass Weir (RM 63). Flow velocities are low because flow is distributed 24 throughout the Delta channels and sloughs that are bordered by relatively low levees consisting of 25 both natural bank materials and revetment (Jones & Stokes Associates 1987). These levees and bank 26 protection structures currently prevent the river's access to historical tidal wetlands and islands. 27 Tidal influence extends up the Sacramento River for 80 miles to Verona, with the greatest tidal 28 variation concentrated in the Delta. The major tidal sloughs included within the program area are 29 Threemile, Georgiana, Steamboat, Miner, Lindsay, Cache, Haas, and Sutter sloughs.
- 30 Sloughs and channels in this region are generally confined on both sides by natural levees enhanced 31 by decades of man-made improvements. The individual channels and sloughs are moderately 32 sinuous, of uniform width, and do not migrate. Compared with the upper regions (Regions 2 and 3), 33 impacts of seasonal flood events are much less due to both tidal action and the diversion of flow 34 through the upstream flood bypasses and outtakes (U.S. Fish and Wildlife Service 2001 as cited in 35 Stillwater Sciences 2007). Historically, channel and slough morphology actively adjusted throughout 36 the Delta in response to seasonal variations in flow and sediment load. The decrease in flow 37 velocities caused the deposition of a gradient of coarser to finer material from upstream to 38 downstream (fine sand to clayey silt). The intertidal deposits that border the Delta channels and 39 sloughs are typically characterized by shallow, alternating layers of fine sandy silt and clayey silt, 40 with occasional peaty muds. Artificial fill from hydraulic dredge spoils was placed after 1900 41 throughout the Delta along channel margins and upon various island surfaces (Atwater 1982 as
- 42 cited in Stillwater Sciences 2007).

1 Bank revetments are common throughout this region. Based on a query of the Corps revetment

- 2 database, bank revetments account for approximately two-thirds of the shoreline's linear distance.
- The revetments are composed of various material types and sizes, including medium to large
   (quarry) rock, small and large rubble, and medium to large cobbles. The majority of revetments
- 5 consist of large (>20 in) rock (Stillwater Sciences 2007).

#### 6 **Region-Specific Description (Region 1b)**

7 Region 1b includes the mainstem Sacramento River from Isleton in the Delta, upstream past the City 8 of Sacramento, to the Feather River confluence (RM 80) at Verona. The region also includes the 9 lower American River from the confluence with the Sacramento River upstream to RM 13, Natomas 10 East Main Drain, Natomas Cross Canal, and Coon Creek Group Interceptor Unit 6 (East Side Canal). 11 Seasonal high flows enter the adjacent Yolo Bypass from this reach of the Sacramento River via the 12 Sacramento Bypass Weir. Tidal influence emanating from Suisun Bay extends up the Sacramento 13 River for 80 miles to Verona, with greater tidal variations occurring downstream during low river 14 stages in summer and fall (Stillwater Sciences 2007).

15 Downstream from the Feather River confluence, the Sacramento River is moderately sinuous (average sinuosity of 1.3), with the channel confined on both sides by natural levees enhanced by 16 17 decades of man-made additions. The channel in this reach is of uniform width, is not able to migrate, 18 and is typically narrower and deeper relative to the upstream reach due to scour caused by the 19 concentration of shear forces acting against the channel bed (Brice 1977 as cited in Stillwater 20 Sciences 2007). Channel migration is similarly limited along the lower American River (discussed in 21 more detail below) due to the combined influence of closely spaced levees upon the river banks and 22 flow regulation upstream by Folsom Dam (Stillwater Sciences 2007).

23 The natural banks and adjacent floodplains of the Sacramento and American rivers are composed of 24 silt- to gravel-sized particles with poor to high permeability. Historically, the flow regimes caused 25 the deposition of a gradient of coarser to finer material, and longitudinal fining directed 26 downstream (sand to bay muds). The deposition of these alluvial soils historically accumulated to 27 form extensive natural levees and splays along the rivers, 5–20 feet above the floodplain for as far as 28 10 miles from the channel (Thompson 1961 as cited in Stillwater Sciences 2007). The present day 29 channels are flanked by fine-grained cohesive banks with erosion due to both mass failures and 30 fluvial erosion (C. Harvey, pers. comm., 2002 as cited in Stillwater Sciences 2007).

Bank revetments currently account for two-thirds of the region-wide shorelines, which is equivalent
 to revetment proportions within Region 1a, based on data obtained from the SRBPP revetment
 database. The bank revetment composition includes medium to large (quarry) rock, rubble, and
 cobbles. The majority of revetments present at the erosion sites and along the banks without
 erosion sites is large (>20 in) rock.

Instream woody material (IWM) loading in the Sacramento River along the channel shoreline is
 estimated at 10% of the shoreline from RM 0–20 and 16% from RM 20–80, which is similar to other
 regions on the Sacramento River (see Table 3-12 in U.S. Army Corps of Engineers 2009).

#### 39 4.2.5.2 Regions 2 and 3

In Region 2, above the confluence of the Feather River, constrained reaches alternate with
unconstrained ones where levees are set back more than 500 feet from the high water channel edge.
In Region 3, levees are set back farther, often more than 2,000 feet from the channel's edge. Since

- 1 Regions 2 and 3 are somewhat less constrained, lateral migration and the formation of back 2 channels and oxbows occur, though rarely, in these areas. In areas with natural banks, the presence 3 of oxbows, floodplains, point bars, islands, and in-channel IWM suggests that river meander 4 migration and erosion still occur, providing more dynamic and diverse habitat. For example, point 5 bars formed by active channel migration provide shallow water and important aquatic invertebrate 6 habitat. Chute cutoffs form when high flows breach and cut off a moderately sinuous bend. 7 Eventually, the new chute cutoff channel captures the entire river flow, leaving the remnant 8 meander bend as an oxbow that provides important backwater habitat for amphibians and aquatic 9 invertebrates. During such channel adjustments, large woody material can be dislodged from 10 adjacent riparian forests and deposited in the channel as IWM, creating another habitat feature. 11 These more complex riparian features are uncommon in Region 3, and are generally absent along 12 the more constrained sections of the Sacramento River in Regions 1a and 1b (Jones & Stokes
- 13 Associates 1987; Stillwater Sciences 2007).

#### 14 **Region-Specific Description (Region 2)**

15 Within Region 2, the mainstem Sacramento River flows from Colusa (RM 143), downstream of the 16 Colusa Bypass, to the confluences with the Feather River and Sutter Bypass at Verona. The channel 17 is generally confined by levees along the river banks except in a few locations where they are set 18 back to provide overflow across point bars of major meander bends (Jones & Stokes Associates 19 1987). Contributing flows into this reach are provided by Butte Creek, the Sutter Bypass, and the 20 Feather River (RM 80). To provide flood capacity, overflows at the Tisdale Weir (RM 119) are 21 conveyed into the Tisdale Bypass, which routes the water into the Sutter Bypass. Upstream of the 22 reach, floodwaters may overflow the left bank into Butte Basin via three locations near Chico 23 Landing and through the Moulton (RM 158) and Colusa (RM 146) Weirs. At extremely high river 24 stages, floodwaters may also overflow the right bank of the river and drain into the Colusa Basin, 25 which eventually connects to the Sacramento River and Yolo Bypass via the Colusa Main Drain. The 26 Feather River has a relatively large drainage basin along the Sierra foothills that receives input from 27 several key tributaries, including Honcut Creek, the Yuba River, and the Bear River. Floodwaters 28 may alternatively exit this reach of the Sacramento River via the Fremont Weir into the upper Yolo 29 Bypass (Stillwater Sciences 2007).

30 Within Region 2, the mainstem Sacramento River is primarily a sinuous single-thread channel with 31 uniform width, an average sinuosity of about 1.8 (Brice 1977 as cited in Stillwater Sciences 2007), 32 and an average slope of 0.00003 to 0.0001 (one-tenth to one-half the slope of Region 3, RM 143-33 194). Adjacent levees and revetment are present on both sides of the channel. A narrow berm of 34 natural substrate inside of the levees occurs in some reaches, providing some erodible substrate; 35 however, erosion and deposition are probably greatly diminished from pre-European settlement 36 conditions, compared to the mainstem channel within Region 3 (U.S. Fish and Wildlife Service 2001, 37 as cited in Stillwater Sciences 2007). The adjacent floodplain and natural bank sediments are 38 composed of alluvium consisting of clay- to gravel-sized particles. In contrast to downstream 39 reaches located between the Feather River confluence and the Delta, floodplain sediments in Region 40 2 are generally much finer and cohesive. The toes of the banks also tend to be composed of fine-41 grained and cohesive sediments, and erosion of the banks is due to both mass failures and fluvial 42 erosion at the coarser sediment contact above the cohesive toe material (C. Harvey, pers. comm., 43 2002 as cited in Stillwater Sciences 2007). Available region-wide floodplain habitats have been 44 greatly reduced compared to historical conditions, due to the presence of channel confining levees 45 (Stillwater Sciences 2007).

- 1 The proportion of revetment coverage within Region 2 is approximately 40%, based on data queries
- 2 of the SRBPP revetment database, which is considerably less than revetment coverage of the two
- 3 downstream regions (Regions 1a and 1b). Greater revetment coverage is present along the
- 4 mainstem Sacramento River than along the lower Feather. Bank revetment composition includes
- 5 various material types and sizes, such as medium to large rock, rubble, and cobbles. Revetments at
- 6 the erosion sites and along banks without erosion sites are primarily composed of medium cobble
  - 7 (Stillwater Sciences 2007).
  - 8 IWM input (16% for the Sacramento River; 22% for the Feather River) is only a fraction of the
  - 9 historical rates that occurred prior to levee construction and the clearing of floodplain forests (U.S.
- Fish and Wildlife Service 2001, as cited in Stillwater Sciences 2007). Riparian vegetation is limited to relict stands and individual trees that have taken root on sands deposited over bank revetment. The
- relict stands and individual trees that have taken root on sands deposited over bank revetment. The
   elimination of channel migration, chute cutoffs, and overbank deposition has reduced the
- availability of suitable riparian recruitment areas that are essential for developing and maintaining
- 14 the riparian ecosystem and maintaining IWM recruitment to the Sacramento River over the long-
- 15 term (Nanson and Beach 1977 as cited in Stillwater Sciences 2007). However, several areas north of
- 16 the Feather River confluence include setback levees where some channel meander and associated
- 17 habitat complexity has been restored (Stillwater Sciences 2007; U.S. Army Corps of Engineers 2009).

#### 18 **Region-Specific Description (Region 3)**

- 19 Downstream of Chico Landing (RM 194) to Colusa (143), the Sacramento River meanders between 20 widely spaced setback levees, which allow the river to continue its lateral migration processes 21 within a narrow floodplain. Levees of the SRFCP begin downstream from Ord Ferry (RM 184) on the 22 right bank and downstream from Butte City (RM 176) on the left bank. In the uppermost section of 23 this region, overbank flows drain into the Butte Basin along the left bank at three locations: RM 191 24 (M & T Bend), RM 186.5 (3B's, a natural overflow), and RM 179 (Goose Lake). Floodwaters may also 25 flow over the right bank and drain into the Colusa Basin. Just upstream of Colusa, floodwaters are 26 diverted over Moulton Weir and Colusa Weir into the lower Butte Basin. Also included within Region 27 3 are lower segments of Mud, Deer, and Elder Creeks (discussed in more detail below) that join the 28 Sacramento River at RM 193, 220, and 230, respectively (Stillwater Sciences 2007).
- 29 Within Region 3, the Sacramento River is a meandering single-thread channel bordered by setback
- 30 levees. The average sinuosity is about 1.4–1.5 (Brice 1977 as cited in Stillwater Sciences) and
- average energy grade slopes from the Corps Hydrologic Engineering Center's River Analysis System
   (HEC-RAS) modeling ranged from 0.0002 to 0.0003 (U.S. Army Corps of Engineers 2004 as cited in
- 33 Stillwater Sciences 2007).
- 34 Morphologic features that can be found along this reach of the Sacramento River in Region 3 include 35 natural overflow areas, point bars, cut-banks, islands, and oxbows. The channel is bounded by 36 natural stream channel and levee alluvium consisting of unconsolidated silt- to cobble-sized 37 particles (Saucedo and Wagner 1992 as cited in Stillwater Sciences 2007). The median bed material 38 size (D<sub>50</sub>) is approximately 15 millimeters (WET 1988 as cited in Stillwater Sciences 2007) that 39 provides a non-cohesive sand or gravel toe to the banks. Channel migration is limited by revetment 40 and other bank protection structures even within the uppermost portion of this region. The highest 41 rates of migration occur in the unconstrained sections and appear to depend upon channel cross
- 42 section asymmetry and toe scour (C. Harvey, pers. comm., 2002 as cited in Stillwater Sciences 2007).
- 43 Additionally, bank erosion tends to be faster in sections where riparian vegetation has been reduced

U.S. Army Corps of Engineers

- (Micheli et al. 2004). Chute cutoffs that lead to oxbow formations still occur within this reach when
   high flows breach and cut off a sinuous river bend (Stillwater Sciences 2007).
- 3 Region 3 contains the smallest proportion of revetted banks. Revetment composition includes small
- 4 to large rock, rubble, and cobble, with medium (12–20 in) rock and cobble accounting for the
- 5 majority of revetment materials present in this region (Stillwater Sciences 2007).
- 6 Despite the relatively higher frequency of channel migration and, therefore, the potentially high
- 7 IWM recruitment, IWM loading in this region (17%) is comparable to the two lower regions along
- 8 the Sacramento River. This low level of IWM recruitment is attributable to the conversion of riparian
- 9 forests to agriculture over the last 100 years (Katibah 1984 as cited in U.S. Army Corps of Engineers
- 10 2009). The bank material at the one proposed repair site on the Sacramento River within Reach 3
- (SAC 157.7R) is un-revetted and composed of cohesive silt and clay near the low-flow water
   elevation (see Table 3-13 of U.S. Army Corps of Engineers 2009). In the vicinity of this site, the banks
- in straight reaches are generally un-revetted, while most outer bank areas are revetted; therefore,
- 14 the river is not free to laterally migrate at historical rates (U.S. Army Corps of Engineers 2009).
- 15 Deer Creek is a relatively unregulated stream draining the high-relief southern Cascades (the Lassen 16 Volcanic National Park area). Prior to levee construction along the lower reach, the creek historically 17 flowed and migrated across an alluvial fan with multiple overflow channels (Deer Creek Watershed 18 Council 1998, as cited in U.S. Army Corps of Engineers 2009). The creek has retained an active 19 single-thread channel with ample energy to erode streambanks and to transport a wide distribution 20 of sediment, ranging in size from silt to cobbles (Tompkins and Kondolf 2007, as cited in U.S. Army 21 Corps of Engineers 2009). The lower reach is bordered by low-lying (<3 feet high) levees that are 22 slightly set back from the channel margins in some areas and are constructed of locally derived silt 23 to cobble-sized sediments that are similar in composition to the surrounding streambanks. The 24 SRBPP revetment database indicates that the frequency of bank revetment is high; however, the 25 database indicates that the majority of this revetment is composed of medium (6–10 inches) to 26 small (<6 inches) cobble.
- Based on the relatively small size of the material and observations made during a field visit in 2008,
  a significant portion of this material is likely coarse-grained alluvial deposits and not installed
  revetment. IWM loading in lower Deer Creek within the program area is relatively low (5%)
  compared to the average for the Sacramento River (17%) in Region 3 (U.S. Army Corps of Engineers
  2009).

## 32 **4.2.6** Review of Alluvial River Systems Processes

The following sections provide the geomorphic context for the various water courses in the program
 area, focusing on the channel network, meander belt dynamics, and bank retreat on the Sacramento
 River.

### 36 4.2.6.1 Channel Network Classification

Valley morphology varies going downstream in most watersheds, such as the Sacramento River
 watershed. Because of this variation, watersheds are divided into valley segments and channel
 reaches. Valley segments are distinctive sections of the valley network that possess geomorphic
 properties and hydrologic transport characteristics that distinguish them from adjacent reaches

41 (Bisson and Montgomery 1996).

- 1 Valley segments can be classified into three classes based on their position within the watershed
- 2 and the relative ratios of transport capacity to sediment supply (Montgomery and Buffington 1998).
- 3 Headwater source areas are typically transport-limited (often due to limited channel runoff) but do
- 4 offer sediment storage that is intermittently initiated under large flow events, debris flows, or other
- 5 gravitational events (e.g., landslides). Transport segments are composed of morphologically
- 6 resilient, supply-limited reaches (e.g., bedrock, cascade, and step-pool) that rapidly convey 7 increased sediment inputs. Response segments consist of lower-gradient, more transport-limited
- 8 depositional reaches (e.g., plane-bed, pool-riffle, and step-pool sequences) where channel
- 9 adjustments occur in response to changes in sediment supply delivered from upstream.
- 10 Based on field observations and the stream classification methodology of Montgomery and
- 11 Buffington (1998), the Sacramento River in the program area is an alluvial valley segment
- 12 dominated by plane-bed and pool-riffle reaches. Plane-bed and pool-rifle reaches are transport-
- 13 limited; therefore, the Sacramento River (and other watercourses) behave as a response segment, 14 theoretically adjusting their bed morphology to water and/or sediment.

#### 4.2.6.2 **Review of Alluvial Meander Belt Dynamics** 15

- 16 Deposition in river systems that are predominantly aggradational (i.e., depositional) is accomplished 17 by both lateral and vertical accretion (build-up of sediment). In-channel, or channel-fill facies (layers 18 or strata) tend to be dominated by lateral accretion, whereas the channel-margin facies tend to be 19 dominated by vertical accretion. The net result of both the vertical and lateral accretion is a general 20 fining-upward sequence in both grain size and the scale of the depositional units. However, the 21 fining-upward sequences can be punctuated, in both the channel-fill and the channel-margin facies, 22 by coarsening upward facies (WET 1990a).
- 23 With the channel-fill facies, coarser sediment can overlie finer sediments as a result of deposition 24 during high flow events. The depositional ramp that is often observed at the upstream end of a point 25 bar can introduce coarser sediments to the upper portion of the point bar surface. Similarly, chutes 26 that cut through the upper point bar surface can cause coarse sediments to overlie finer ones (WET 27 1990a).
- 28 In the channel-margin facies that include natural levees and crevasse splays, large floods can cause
- 29 coarse sediment deposition on top of the normally finer-grained flood basin deposits. Such
- 30 deposition can result in coarsening upwards grain size trends during the progradational (flowing)
- 31 phase and fining upwards trends during the abandonment (ebbing) phase. On a local scale,
- 32 progradation in deltas into inter-channel lakes or abandoned channel segments can typically
- 33 produce coarsening upwards deltaic sequences (WET 1990a).
- 34 Once coarser sediments are introduced to the flood basin as a result of sheetflooding or crevassing,
- 35 the sediments have a high potential for being reworked by recessional flows of the same flood event
- 36 or by both rising and recessional flows of subsequent flood events. Therefore, sediments deposited 37 by one major flood event may be subsequently reworked by numerous lesser floods, giving the
- 38 impression that all overbank floods cause significant overbank deposition (WET 1990a).

#### 4.2.6.3 39 **Bank Retreat Terminology**

40 Gravitational forces acting on in situ bank material act in concert with hydraulic forces at the bank 41 toe to determine rates of bank erosion, and it is the interaction of these forces that control 42

streambanks in any manner, and is defined as the net linear recession of streambanks as a result of
 erosion and/or failure (Lawler et al. 1997). Table 4-2 contains the terms that are often used when
 describing bank processes. Not all bank retreat is the result of flowing water in the channel, and it is
 restrictive to interpret all bank retreat simply as a function of excess boundary shear stress (Lawler
 et al. 1997).

6

Terminology	Definition
Bank erosion	Detachment, entrainment and removal of bank material as individual grains or aggregates by fluvial and sub-aerial processes.
Bank failure	Collapse of part or all of the bank en masse, in response to geotechnical instability processes.
Bank retreat	Net linear recession of bank as a result of erosion and/or failure.
Bank advance	The opposite of bank retreat, i.e., net linear streamwise change in bank surface position, as a result of deposition of sediment or in situ swelling of bank materials (often referred to as vertical and/or lateral accretion).
Bank erodibility	The ease with which bank material particles and aggregates can be detached, entrained and removed (normally by fluvial erosion processes).
Source: Lawler et al. 1997	

7

As a result, bank retreat types are grouped into three categories: weakening processes (otherwise
referred to as sub-aerial preparation processes), fluvial erosion, and mass-failure processes (Lawler
10
1992). In brief, weakening processes are any bank or near-bank processes that act to erode or
prepare banks for further erosion (Lawler 1992). Fluvial erosion is closely related to boundary
shear stress, which can be loosely approximated by stream power variations, and mass failure is
collapse of all or part of the bank in situ (Lawler 1995).

14 Fluvial erosion is probably the most dominant process eroding banks with non-cohesive banks 15 where individual grains are dislodged or shallow slips occur along almost planar surfaces (Thorne 1982). The effectiveness of fluvial erosion against cohesive banks depends upon the moisture 16 17 content and degree of pre-conditioning (i.e., weakening processes) of the material. Similar 18 observations hold true for mass failure as well, where the susceptibility of banks to it depends on 19 weakening processes, bank shape, structure, and material. The significance of mass failure is 20 thought to increase as drainage basin size increases; basins greater than approximately 120 km<sup>2</sup> in 21 area are more prone to mass failure processes than basins below this amount due to the increase in 22 bank height associated with larger basins (Lawler 1995). In general, smaller basins are dominated 23 by sub-aerial preparation processes, middle-order basins are dominated by fluvial entrainment, and

24 larger basins (over 120 km<sup>2</sup>) are dominated by mass failure.

## 4.2.6.4 Bank Retreat as a Function of Longitudinal Position in the Drainage Network

- Sub-aerial preparation, fluvial, and mass-failure processes have the potential to act in accordance
  with each other at various points along a stream system (Hooke 1979) (Figure 4-1). For example, it
  is common knowledge that weakening processes, such as wetting and drying cycles, prepare banks
  for additional mass failure processes (Knighton 1999). The overlap of the curves in Figure 4-1
- 31 illustrates the importance of process combinations. Scale (i.e., position in the drainage network),

1 however, is an important control of bank retreat processes, as the relative influence of these processes differs throughout the length of a channel.

2



Distance downstream -->

Sub-aerial preparation processes dominate within the uppermost reaches of a channel; fluid entrainment processes dominate within the mid-reaches; mass failure processes dominate within the lowest reaches. All processes have the potential to act in accordance with each other. Modified from Lawler (1995).

7

#### Figure 4-1. Conceptual Model of Downstream Changes in Bank Erosion Processes

8 Weakening, sub-aerial processes are dominant within the uppermost reaches of a drainage basin, 9 and these processes are predominantly controlled by soil property characteristics (Abernethy and 10 Rutherford 1998; Lawler 1995; Lawler et al. 1997). In general, discharge and stream power are 11 relatively low in upper reaches of stream systems, suggesting the erosive effects of flow are small in 12 relation to the geomorphic effects of non-fluvial processes. Influential factors that control the extent 13 and location of bank retreat in upper reaches include bank properties, such as composition, 14 cohesion, strength, and vegetation cover (Lawler et al. 1997). Sub-aerial processes are active on 15 streambanks throughout entire catchments, but are particularly apparent in upper reaches 16 (Abernethy and Rutherford 1998; Lawler 1995). These weakening mechanisms include windthrow 17 of streamside trees, damming by large woody debris, frost heave, desiccation, rainsplash, and micro-18 rill development. All of these processes directly influence channel and bank form and size 19 (Abernethy and Rutherford 1998).

20 Vegetation is also a strong control of stability in general, and unstable areas typically have 21 considerably less bank vegetation than stable areas (Rutherford et al. 1995). The dominant 22 vegetation type is also important. Prevalent thought is that thick, dense vegetation common in 23 forests provides greater roughness and resistance to fluvial entrainment through both direct 24 interaction with growth and binding of bank material by root systems (Ryan 1992). Ryan (1992) 25 argues, however, that grasses, which tend to colonize finer sediments, can provide more resistance 26 than larger forest species or willows. Though the roots of grasses are not too deep, they cover a 27 larger surface area, and, the rooting depth of grasses has the ability to stabilize the banks when bank 28 height values are relatively low, (Rutherford et al. 1995). In addition, a study conducted by the 29 Engineer Research and Development Center (ERDC) for the Corps found that slope stability is

- 1 slightly reduced when trees are located at the crest and mid-slope locations on the land side of
- 2 levees, and larger reductions in slope stability are expected as tree mass increases due to the added
- 3 weight on the levee slope (Engineer Research and Development Center 2011).
- 4 Desiccation and cycles of wetting and drying promote bank instability in a similar manner. Sediment 5 grains are mobilized and gravitational forces route the sediment into the channel. Rainsplash and 6 micro-rill development also contribute to destabilization of streambanks. Direct rainfall has the 7 potential to loosen sediment particles and create micro-rills (Luk 1982). The development of micro-8 rills has the potential to destabilize banks and increase the lateral conveyance of water into the 9 channel (Luk 1982).
- 10 In mid-reaches (such as Regions 2 and 3 of the program area), discharge and channel slope often 11 combine to produce peak levels of stream power and flow erositivity (Abernethy and Rutherford 12 1998; Lawler 1995), as shown in Figure 4-1. As a result, the dominant mechanisms of bank retreat 13 are by direct fluid entrainment processes. Flow properties, such as discharge, boundary shear stress, 14 and stream power, regulate the potential work available for erosion (Graf 1983). Since discharge 15 and channel slope combine in the mid-reaches of a channel to produce erosive flows, the stability of 16 banks here is largely determined by bank characteristics (Annandale 1995; Annandale and Parkhill 17 1995). Bank properties, especially the presence or absence of stabilizing vegetation are important. 18 (Rutherford et al. 1995). The resultant forms of bank failure in the mid-reaches depend on the 19 sedimentological nature of the streambanks (Lawler 1992), and are discussed below along with 20 bank failure forms in the lowest reaches of stream channels.
- 21 Where it is a result of fluvial erosion, bank retreat is well predicted by stream power and its 22 associated variables (Annandale and Parkhill 1995). In mid-reaches, valley and channel slope, valley 23 width, and bend morphology are all influential in controlling bank retreat (Lawler et al. 1997; 24 Magilligan 1992; Miller 1995). In general, higher unit stream power values are associated with 25 higher channel slopes and lower valley widths (Graf 1983). Other studies have also shown that 26 valley morphology exerts a strong control over flow patterns; these patterns, in turn, influence the 27 amount of erosion performed (Baker and Costa 1987; Miller 1990; Miller 1995). When valley width 28 and channel slope vary as a function of lithology, an irregular pattern of downstream erosion rates 29 as a result of variable flood power will emerge (Magilligan 1992). Variations in valley morphology 30 are most important in influencing bank instability in middle and lower reaches of a stream system, 31 where there is usually more available discharge and stream power (Graf 1983).
- 32 Bank retreat increases at bends in the channel as well. Hooke (1980) concludes that important bank 33 retreat is more likely to occur at bends in the channel where flow is deflected and stream power and 34 shear stress are increased. Schumm (1977) and Thorne and Osman (1987) also suggest that 35 unstable areas commonly occur at bends in the channel, and stable areas are more often found in 36 straighter reaches. Whether the adjacent geomorphic surface is a floodplain, a steep, colluvial valley, 37 or a terrace, bank height and the active channel width also importantly influence unit stream power 38 and instability. In other words, the relationship between a channel and its floodplain is important in 39 determining unit stream power, and therefore bank instability. Brizga and Finlayson (1990) state 40 that active channels within incised areas surrounded by terraces have importantly high stream 41 power values during flow events. Conversely, rivers which flood over their banks onto floodplains 42 have lower stream power.
- While variations in unit stream power and its associated variables dominate bank retreat within the
   mid-reaches of a channel, they can also be important in the lowest reaches (such as Regions 1a and

- 1 1b on the program area) (Lawler 1995). Streambanks in lower reaches of streams, however, are
- 2 usually typified by bank materials that are more resistant to fluvial action and have higher cohesion
- 3 than upstream banks (Lawler 1992). Lawler (1992) suggests that, where there is a gradual
- 4 downstream increase in channel size, there should be a point where bank height exceeds some
- 5 critical value for the boundary material and mass failure assumes dominance in the erosion process.
- Simon et al. (2000) also suggest that the presence of overly steep banks has the potential to
   destabilize banks. Other studies suggest that unstable, eroding banks typically have high bank angles
- 8 and high bank heights (Thorne 1982; Thorne and Tovey 1981). Thus, the primary mechanism of
- 9 bank retreat in the lowest reaches of stream systems is bank failure, rather than fluvial erosion.
- 10 Influential factors in these mass failure processes include the height, angle, composition,
- 11 stratigraphy, and moisture content of the banks (Lawler et al. 1997).

## 12 **4.2.7** Erosion Mechanisms in the Program Area

13 Bank material is generally removed in proportion to streamflow along the upper Sacramento River 14 (U.S. Army Corps of Engineers 1981), but wind and boat-wave erosion may become dominant along 15 the lower river and sloughs (Limerinos and Smith 1975 as cited in Jones & Stokes Associates 1987). 16 Both brief, very large runoff events and sustained high-water periods can remove substantial 17 material from the river's banks. The initiator of floodflow bank erosion can be the tractive force of 18 floodflow itself, as magnified by channel obstructions and reduced capacity, or the collapse of 19 saturated bank materials after rapid reduction of the water surface elevation. Erosion below 20 Sacramento is often initiated by the removal of bank vegetation at low and moderate water 21 shoreline from repeated wind wave or boat wake attack. Headward erosion of overbank inflows also 22 initiates bank erosion (Jones & Stokes Associates 1987).

Within the program area, the Sacramento River passes from a continuously eroding and depositing,
 meandering stream at RM 194, with moderate flow velocities, to a series of low-velocity distributary
 channels in the Delta, closely bordered by levees. Thus, erosional regimes differ between regions
 within the program area (Jones & Stokes Associates 1987).

## 27 **4.2.7.1** Regions 1a and 1b

Below Sacramento, relatively low velocity floodflows (<6 feet per second [fps]) predominate (Veres pers. comm. as cited in Jones & Stokes Associates 1987). Channels of the main river and sloughs are relatively straight, as the river flow is distributed in the network of Delta channels. These channels are bordered by relatively low and narrow "berms," or remnant floodplains, enclosed by levees closely paralleling them.

- Bank erosion is gradually removing the berms throughout most of the lower regions, and in many places erosion has completely removed the berm and encroached on the levee itself. The primary initiator of this streambank erosion appears to be boat wake and wind wave attack of the bank vegetation and soils at the low flow water surface elevation. Once vegetation is removed, this wave action, or sloughing of saturated columns of bank materials following reductions in the water surface elevation, continues to undermine the banks. Floodflows exacerbate the situation by
- removing exposed bank materials and scouring additional material (Jones & Stokes Associates
   1987).
- The relationship of boat wake, wind wave, and floodflow erosion in the Georgiana Slough was
  evaluated by the U. S. Geological Survey (Limerinos and Smith 1975 as cited in Jones & Stokes
- Associates 1987). Although the proportion of observed erosion due to each of these causes on an
   annual basis could not be accurately estimated, it was observed that fully one-half of the bank
   erosion occurred during low flow months when floodflows did not occur. Boat wake erosion was
- 4 identified as a significant factor in bank erosion along the Delta waterways (Jones & Stokes
   5 Associates 1987).
- The wavewash attack is aided by a tidal influence, extending to Sacramento. Diurnally, the low water
  surface rises and falls, causing the wavewash zone to fluctuate accordingly (Jones & Stokes
  Associates 1987).
- Flood stage berm or levee erosion, above erosion initiated at the low flow water surface elevation, is
  apparently not widespread in Delta channels. At some sites, floodwaters have scoured the berm
  surface or the levee slope above the berm, but for the most part berm vegetation has successfully
  resisted floodflows. At riprapped sites, erosion above the revetment has sometimes occurred, but
  usually where compacted embankment was placed above the rock and revegetation was not secure
  (Jones & Stokes Associates 1987).
- A more recent study performed by Northwest Hydraulic Consultants (2007) supports the
   statements above regarding the relationship of boat wake, wind wave, and floodflow erosion, and
   indicates the four most common bank failure mechanisms along Sacramento River in this region.
- Wave erosion, particularly from waves generated by recreational boat traffic on the Sacramento River. The erosion from boat traffic occurs during the summer and fall, when water levels are near their annual minima, and results in wave cut benches, steep eroding banks, and slow bank retreat. Erosion from wind-generated waves also occurs on the upper levee slopes during high flow events.
- Failures or slides on the berm, possibly as a result of over-steepening, saturation, toe scour, or
   other factors.
- Levee encroachment from scour at the toe of the bank where banks are steep below the water
   level and erosion has progressed into the 3:1 projected waterside slope of the levee template.
- Tree roots can bind and strengthen soils in some cases, but undermined or undercut trees that
   result in over-steepened and eroded sections on the bank that eventually may fall over, could
   result in loss of bank or levee and further erosion as flows accelerate around the root ball.
- These observations are consistent with previous reports on bank erosion along the Sacramento
   River in this region (see Northwest Hydraulic Consultants 2005, 2006; U.S. Army Corps of Engineers
   2006).
- As discussed earlier, much of the Sacramento River is protected by riprap revetment. These revetments are in reasonable repair and have withstood floods for 30 or 40 years and have been assumed to continue to provide erosion protection, given adequate maintenance. As such, they have a low risk of failure and a low priority for treatment. However, the rock placed on these slopes has been damaged by wave erosion, it is often smaller than currently recommended for protection from boat wakes and waves (U.S. Army Corps of Engineers 2006), and it is not known whether adequate toe rock was installed to protect against scour.

### 1 **4.2.7.2 Region 2**

As in the lower regions, levees border the Sacramento River, except where they are set back across the base of a few major meander loops. Even here, the stream is no longer free to migrate. Berms in this region are generally present, and are wider and higher above the channel than in the lower regions (Jones & Stokes Associates 1987).

6 Although the channel no longer migrates, bank erosion continues from impingement of the primary

- 7 flow energy at channel bends; this process is described for the upper region to follow. Boat wake
- 8 and windwave erosion are also sometimes operative in this region, as just described for the lower
- 9 regions. The erosional regime is most similar to the upper region, but in this region is a composite of
- 10 both the upstream and downstream environments (Jones & Stokes Associates 1987).

### 11 **4.2.7.3 Region 3**

In the uppermost region, the Sacramento River is a single-thread meandering channel migrating
 through alluvial deposits until constrained by setback levees. Floodflows are commonly of higher
 velocity (>5 fps), and significant flow energy is constantly impinging on banks at the outsides of
 meander bends during all levels of flow and at the inside of bends during floodflow (Jones & Stokes
 Associates 1987).

Because levees are set back, berms in the upper reaches are generally wide. The berms also tend to
be at higher elevation above the channel, so that eroded, near-vertical banks more than 15 feet in
height are common. In the uppermost reach of this region (above RM 176 in the east bank and RM
184 on the west bank), levees have not been constructed; floodflows overtopping the high banks
drain easterly to Butte Basin (Jones & Stokes Associates 1987).

Bank erosion in this region is almost entirely due to streamflow. As the primary flow energy sweeps
past banks on the outside of river banks, a secondary, helicoidal (spiraling) flow deepens the
channel at the outside edge. Thus, the bank is undermined, and the larger, local velocities attack the
bank materials (Odgaard and Kennedy 1983 as cited in Jones & Stokes Associates 1987). Erosion
and sediment transport increase with flow velocity, which in turn increases with stream discharge.
Flood flow scour of berm surfaces and levees beyond the channel banks also occasionally occurs
(Jones & Stokes Associates 1987).

29 Although levees are typically set back from the river in the upper region, stream meandering 30 occasionally brings active bank erosion toward the toes of the levees, thus requiring bank protection 31 work under the proposed program. Other bank protection work has been proposed where the 32 channel is migrating in proximity to flood relief structures and weirs. These structures are intended 33 to allow overflow of floodwaters into basins and bypasses when streamflow exceeds the 34 downstream capacity of the leveed river. To maintain the proper "flow split" at these locations, some 35 channel stabilization has been pursued (Woodward-Clyde Consultants 1986). However, subsequent 36 studies have concluded that bank protection is not needed in certain areas (M&T Flood Relief 37 Structure at RM 191, a natural overflow area referred to as the 3-B's overflow at RM 186.5, and the 38 Goose Lake Flood Relief Structure at RM 179) in order to maintain the flow split because other 39 factors are equally important in controlling planform changes, and revetment of channel bends with 40 a low ratio of bend radius of curvature to channel width does not prevent cutoffs (Ayres Associates

41 1997).

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### 1 4.2.8 Projected Incision Estimates (Regions 1a and 1b Only)

Northwest Hydraulic Consultants (2007) examined the thalweg profiles for 1908, 1933, and 1997 for bed elevation trends by drawing smoothed upper and lower envelopes for each survey year, for the reach extending from Verona (RM 79) to Freeport (RM 46). The analysis indicated the following:

- Over the greater part of the reach that extends downstream from RM 79 (Verona Gage) to RM 46 (Freeport Gage), thalweg levels dropped by an average of about 5 ft. over the period 1908–33. This is equivalent to an average of about 0.2 ft./year.
- In the period 1933–1997, levels over the lower two-thirds of the same reach appear to have fallen on average by another 4 ft. This is equivalent to an average of about 0.06 ft./year.
- When these assumed rates of incision are plotted as block averages against time and fitted by a smooth descending curve, they suggest a current incision rate of around 0.02 to 0.03 ft./year, probably declining to zero in less than 50 years. Even if the future rate is assumed to average 0.02 ft./year over a period of 50 years, the total future incision would amount to only 1 ft.
- Information from various sources indicates that the low-water surface profile falls from about +
   6 ft. National Geodetic Vertical Datum of 1929 at Verona to +2 ft. at Freeport. These elevations
   yield average low-water gradients at mean tide level of about 0.12 ft./mile (0.023 m/km) from
   Verona to Freeport, and 0.043 ft./mile (0.008 m/km) from Freeport to the Delta. These
   gradients are extremely flat in general terms, and further significant lowering of the quoted low-water levels is unlikely to occur.
- In brief, given the apparent rates of incision in the second half of the 20th century and present
   low-water elevations, further significant incision of the Sacramento River downstream of
   Verona is unlikely to occur. Any further incision could hardly exceed 1 foot or so, an amount that
   is negligible compared to potential river-bed scour resulting from major floods.

### 24 **4.2.9** Erosion Sites Summary

As described in Chapter 2, Project Description, the Corps (Sacramento District) and the California
 Department of Water Resources (DWR), conduct an annual field reconnaissance review of the
 SRFCP (Ayres Associates 2008). Specific criteria are used to identify erosion sites within the system
 as described in Ayres Associates (2008). In most cases the criteria are based on bank and levee
 conditions that are threatening the function of the flood control system. An erosion site is defined as:

- 30A site that is at risk of erosion during floods and/or normal flow conditions; the term "critical" is31used to indicate erosion sites that are an imminent threat to the integrity of the flood control32system and of the highest priority for repair.
- Ayres Associates (2008) identified 154 erosion sites, of which the Corps selected 107 sites for
   further evaluation and design of bank protection in the Final Alternatives Report—80,000 LF (107
   Sites), Sacramento River Bank Protection prepared by Kleinfelder-Geomatrix (2009).
- As previously described in Chapter 1, Introduction, 106 of these sites along the Sacramento River and its tributaries have been carried forward for programmatic analysis in this EIS/EIR and
- 38 constitute a representative sample of the sites to eventually be treated.

### 1 4.2.9.1 Final Alternatives Report

2 The 107 erosion sites evaluated in the Final Alternatives Report (Kleinfelder-Geomatrix 2009) 3 include a total of about 80,000 linear feet. The physical upstream and downstream boundaries of 4 each site were extracted from the Sacramento Riverbank Protection Project Database (SRBPPD). 5 which is maintained by the Corps, in the form of a digital shapefile for each site. The digital 6 measurements of the length for each site from upstream boundary to downstream boundary along 7 the shoreline of the levee amount to about 85,000 linear feet. Each site, identified by River Name ID, 8 River Mile (RM) or Levee Mile (LM), and placement on the left or right bank (relative to facing the 9 downstream direction) is presented in Table 1.0-1 of the Final Alternatives Report (Kleinfelder-10 Geomatrix 2009). Also included in this table are the lengths of each erosion site as given by: a) the 11 task order description, b) the SRBPPD shapefiles, and c) the recommended adjusted repair length. 12 The evaluated alternatives, recommended repair alternative, and budget-level construction cost 13 estimate for the recommended repair alternative for each site are also provided in Table 1.0-1 of the 14 Final Alternatives Report.

The survey of the 107 sites was based on visual inspection only, from both the landside and the
 waterside. Based on the best professional judgment of the Kleinfelder-Geomatrix team, measures
 were selected from the Corps-proposed four types of bank protection measures. Other bank
 protection measures, such as setback levees, biotechnical fixes, or back-side levee construction, also
 were considered, as appropriate.

- 20 The scope of the alternatives survey for each site included the following information.
- A brief description of the existing conditions.
- Photos of each site, including aerial photography showing the site extent.
- A discussion of the different alternatives, and the basis for selecting the preferred alternative.
- A conceptual cross-section for repair.
- Preliminary cost estimates using current unit prices.
- A summary of a survey of potential affected landowners to determine their willingness to sell
   their land for project purposes.
- A summary of comments received from the California Department of Fish and Wildlife, DWR,
   National Marine Fisheries Service, and the United States Fish and Wildlife Service concerning
   the site and/or design alternative.
- Refer to Kleinfelder-Geomatrix (2009) for a complete description of the 107 erosion sites within the
   program area.

### 33 **4.2.10** Flooding

Levees along the Sacramento River and other waterways in the program area provide flood control for numerous rural residences and farms, towns, and cities, as well as conveyance for waters from upstream to the Delta. High winter flows can stress levees and berms. Longer flood durations can contribute to levee seepage and potentially structural levee failure. Flood water surface elevations also can exceed levee heights and cause overtopping and partially controlled flooding of the protected areas behind the levee. Overtopped levees may maintain structural integrity and would not be considered failed levees. However, the erosive forces that occur during overtopping

- 1 eventually may cause a structural failure and uncontrolled flooding in the protected areas behind
- 2 the levee. To maintain the integrity of the flood control system, locations with the potential for
- 3 failure have been and are being identified and remedied.

4 The intent of the proposed program is not to increase the current level of flood protection. The 5 proposed program is remedial in nature and is intended to correct and address changed conditions, 6 including reservoir construction and the removal of hydraulic mining debris, which no longer 7 require levees to be close to channels. All bank protection/levee construction or modification 8 conducted as part of the proposed program of improvements would be designed based on the 9 results of detailed geotechnical engineering studies and would be required to comply with standard 10 engineering practices for levee design. The CVFPB standards are the primary state standards 11 applicable to SRBPP levee improvements; these are stated in Title 23, Division 1, Article 8, Sections 12 111–137 of the California Code of Regulations. The CVFPB standards direct that levee design and 13 construction be in accordance with Engineering Design and Construction of Levees, the primary 14 federal standard applicable to levee improvements, and other applicable Corps standards. Because 15 the design and construction of flood control improvements and maintenance of the facilities must 16 comply with the regulatory standards of these agencies, it is assumed that the design and 17 construction of all modifications to the flood control system under the proposed program would 18 meet or exceed applicable design standards for maintaining or exceeding existing levee height 19 requirements to protect persons and property from flooding.

### 20 4.3 Regulatory Setting

Appendix C, Regulatory Background, describes the federal, state and local laws, regulations, and
 policies that pertain to hydrology, hydraulics, geomorphic conditions, and flood control issues
 within the program area. The pertinent laws, regulations, and policies are listed below.

24 Federal: 25 0 National Environmental Policy Act 26 0 Clean Water Act 27 National Flood Insurance Program Ο 28 U.S. Army Corps of Engineers Levee Design Criteria 0 29 Executive Order 11988 (Floodplain Management) 0 30 Code of Federal Regulations, Title 40, Part 131, Water Quality Standards 0 31 Flood Control and Coastal Emergency Act (Public Law 84-99) 0 32 State: 33 0 California Environmental Quality Act 34 ⊖ Fish and Game Code Section 1602: Streambed Alteration Agreements 35 0 California Code of Regulations, Title 23 36 **Central Valley Flood Protection Board guidance** Ο 37 Delta Protection Act of 1992 0

1		0	Safe, Clean, Reliable Water Supply Act
2	•	Lo	cal:
3		0	American River Parkway Plan
4		0	Butte County General Plan
5		0	Butte County Multi-Jurisdictional All-Hazard Pre-Disaster Mitigation Plan
6		0	Butte County Flood Mitigation Plan
7		0	Colusa County General Plan
8		0	Glenn County General Plan
9		0	Placer County General Plan
10		0	Sacramento County General Plan
11		0	Solano County General Plan
12		0	Sutter County General Plan
13		0	Tehama County General Plan
14		0	Yolo County General Plan
15		0	Yuba County General Plan

### 16 **4.4 Determination of Effects**

This section lists the thresholds for significance used to assess proposed program effects on flood
control and geomorphology. In this joint federal and state EIS/EIR, reference to "significant effects"
is made to fulfill the requirements under CEQA and NEPA (40 Code of Federal Regulations Section
1502.16). Regardless of level of significance, all potentially significant environmental effects have
been analyzed and are discussed.

### 22 **4.4.1** Assessment Methods

Assessment of environmental effects associated with hydrology, hydraulics, geomorphology, and
 flood control issues has been accomplished in three ways.

- An evaluation of existing conditions of program area levees and projected incision and scour
   estimates in the adjacent waterways.
- Qualitative assessments of sedimentation/scour potential based on existing federal and state
   channel hydraulic design standards and guidelines.
- 29 Determination of effects through professional judgment.

### 30 4.4.2 Significance Criteria

- 31 The criteria used for determining the significance of an effect on hydrology, hydraulics,
- 32 geomorphology, and flood control are primarily based on Appendix G of the State CEQA Guidelines
- 33 (Environmental Checklist) and professional standards and practices. The significance criteria have

been modified as appropriate to be specific to the proposed program. All bank protection/levee
 construction or modification conducted as part of the proposed program of improvements would be
 designed based on the results of detailed geotechnical engineering studies and would be required to
 comply with standard engineering practices for levee design. The intent of the proposed program is
 not to increase the current level of flood protection. Effects on hydrologic or geomorphic conditions
 may be considered significant if implementation of an alternative would:

- Substantially alter the existing drainage pattern of the site or area, including the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on or off site.
- An effect on the levee system is considered significant if an alternative would substantially increaseany of the following:
- 12 Bank erosion or bed scour
- 13 Sediment deposition.
- In addition, an effect on the levee system is considered significant if an alternative wouldsubstantially decrease any of the following:
- 16 Levee stability.
- 17 Current level of levee slope protection.
- 18 Channel conveyance capacity.
- Finally, an effect to the geomorphic regime is considered significant if an alternative would result inthe following:
- Increase in channel and/or bank erosion.
- Substantial alteration in existing migration processes.
- Changes in the local hydraulics, including shear stress.
- Loss of sediment supply.
- Loss of IWM loading and recruitment.

### **4.5 Effects and Mitigation Measures**

### 27 **4.5.1** Alternative 1–No Action

Under Alternative 1, no activities would be conducted to halt erosion and protect the levees in the
 program area and flood control and geomorphic regimes would not change relative to existing
 conditions. However, the streambanks in the program area would remain susceptible to bank

- 31 failure, increasing the risk of levee failure and subsequent flooding in the surrounding areas.
- 32 Eventually, emergency repair measures would likely need to be implemented to protect the levee
- 33 system from failing. Levee repairs under these circumstances would likely involve the placement of
- 34 bare rock revetment without the advantages of contouring riparian benches with IWM embedded in
- 35 the rock, minimal protection and replanting of the riparian forest, and rock being placed without the
- 36 advantage of planned or coordinated hydraulic modeling efforts to design and guide the installation

- 1 in a manner that minimizes velocity and water surface elevation differentials between pre- and
- post-project scenarios. These steps may adequately protect the flood control system but could have
   substantial significant effects on many other resources.

### 4 **4.5.2** Alternative 2A–Low Maintenance

### 5 Effect FCGEOM-1: Decrease in Levee Erosion and Change in Sediment Recruitment

6 Alternative 2A entails installing revetment along the levee slope and streambank. No significant 7 flood control or geomorphic-related effects are associated with this bank protection measure, as it 8 would provide material with a greater resistance to erosion, thus helping to decrease relative 9 erosion amounts. Additionally, the roughness associated with the rock slope protection would 10 counter the increased shear stresses of larger flow events that otherwise would increase erosion of 11 the levee fills.

- Alternative 2A would not result in any long-term changes to the overall existing drainage pattern of the erosion repair site. However, unless the proposed repairs can be transitioned into existing revetment geometry, this alternative could indirectly affect the existing potential for levee erosion upstream or downstream of a particular erosion site. With implementation of Mitigation Measure FCGEOM-MM-1, this indirect effect would be less than significant.
- 17 While the arrest of levee/bank erosion at the repair sites is one of the intended consequences of this 18 alternative, the results could have some geomorphic implications. The new bank revetment would 19 contribute to fixing the channel planform position by limiting lateral channel migration at the 20 erosion repair sites; the rivers are already similarly constrained by levees and revetment in other 21 locations. In many cases, proposed bank repairs would not alter the overall geomorphic trajectory of 22 the reaches affected by the proposed action. Within Regions 1a, 1b, and 2 along the Sacramento 23 River (RM 0-143), where existing bank revetment is well documented, the planform position of the 24 Sacramento River is essentially fixed in place, with limited opportunity for lateral migration or 25 sediment recruitment from channel banks irrespective of the proposed action. Upstream in Region 3 26 where the Sacramento River laterally migrates more freely, the new bank revetments would 27 contribute to fixing the channel planform position by limiting lateral channel migration at the 28 erosion repair sites to a greater degree than downstream.
- Overall, direct effects related to arrest of bank erosion are considered to be less than significant
   because of the generally fixed nature of the river's planform. Implementation of Mitigation Measure
   FCGEOM-MM-1 would ensure that any indirect effects to upstream and downstream areas would be
   less than significant.

# 33Mitigation Measure FCGEOM-MM-1: Conduct Site-Specific Studies at Levee Repair Sites34and Minimize Changes in Local Hydraulic Conditions through Project Design

- The agencies implementing program components and agencies' primary contractors for
   engineering design and construction will ensure that the following measures are implemented
   to avoid significant effects associated with changes in local hydraulics and shear stress.
- During project design, a project engineer and a geomorphologist will determine if site-specific
   studies are warranted to avoid significant effects associated with changes in local hydraulics and
   shear stress. Design specifications will be developed that minimize changes in pre- and post project implementation velocity fields and water surface elevations. Depending on the scale of

1 the project repair, either professional judgment or hydraulic modeling that computes either 2 steady state 1-dimensional (HEC-RAS) or 2-dimensional flow (SMS/RMA2) analysis for the 100-3 vear flow rate for each bank repair site will be performed. If modeling is performed, design 4 specifications will be developed based on the model results that minimize changes in pre- and 5 post-project implementation velocity fields and water surface elevations. The maximum 6 allowable tolerance for change in water surface elevation for a 100-year flood event will be 7 developed based on existing federal and state channel hydraulic design standards and 8 guidelines between pre-and post-project model scenarios. Velocity differentials between pre-9 and post-project scenarios will not be allowed to exceed levels that would cause bank erosion 10 (evaluated based on the composition of nearby streambanks). Designs will also be adjusted to 11 limit bed scour.

### 12 Effect FCGEOM-2: Increase in Levee Slope Stability

13The flatter slopes associated with this alternative (3:1 [H:V] on the waterside and 2:1 on the

- 14 landward side) would provide more slope stability for the levee. Effects related to increase in levee
- 15 slope stability are considered to be beneficial. No mitigation is required.

### 16 Effect FCGEOM-3: Decrease in Instream Woody Material Recruitment

Existing shrubby vegetation and trees on the waterside slope and on the natural bank within 15 feet of the waterside toe would not be in compliance with Corps's Guidelines for Landscape Planting and Vegetation Management at Floodwalls, Levees, Embankment Dams, and Appurtenant Structures and would be removed. Vegetation removal would occur on the waterside slope of the levee section that receives bank protection.

22 Consequently, the proposed construction-related activities would result in loss of the riparian 23 vegetation communities at the erosion repair sites and thus to downstream reaches. The presence of 24 in-channel IWM provides more geomorphic complexity and habitat diversity at the erosion repair 25 sites and downstream. These onsite direct and downstream indirect effects related to decrease in 26 IWM recruitment are considered to be significant. Mitigation Measure FISH-MM-2: Compensate for 27 Loss of Fish Habitat, and Mitigation Measure VEG-MM-1: Compensate for the Loss of Woody 28 Riparian Habitat would reduce this effect to a level that is less than significant by providing more 29 geomorphic complexity and habitat diversity.

### 30 Effect FCGEOM-4: Changes in Local Hydraulics and Shear Stress

31 The proposed erosion site repairs would change the channel geometry at the erosion sites and alter 32 the local hydraulics (i.e., flow velocity fields and water surface elevations). The erosion site repairs 33 under this alternative include placing additional revetment onto the waterside of the existing levees, 34 which would build out the levee prism and reduce the channel cross-sectional area. The physical 35 response to a reduction in cross-sectional area for a given discharge is for flow velocity to increase 36 and/or water stage to rise. Both effects increase boundary shear stress, and an alluvial river channel 37 would typically respond by laterally eroding and/or vertically incising to a new quasi-equilibrium 38 channel that would transport the same amount of sediment at a given discharge as the original 39 channel.

Additionally, for many of the proposed repair sites, limited opportunity exists for the channel to
laterally adjust due to extensive revetment in the vicinity of the sites, which would imply that
vertical erosion may result due to the proposed activities.

- 1 However, the roughness associated with the rock slope protection would counter the increased
- 2 shear stresses of larger flow events that otherwise would increase erosion of the levee fills.
- Furthermore, potential erosion effects from changes in river hydraulics would likely be localized
   and not reach-wide gradient or channel width adjustments (which could be considered indirect
- 5 effects).
- Overall, this effect would be significant. With Implementation of Mitigation Measure FCGEOM-MM-1,
   this effect would be less than significant.

# 8 4.5.3 Alternative 3A–Maximize Meander Zone (Environmentally 9 Superior Alternative)

10 Alternative 3A consists almost entirely of setback levees and adjacent levees, with four of the 11 representative sites assessed in this programmatic analysis requiring revetment. Effects from

- 12 setback levees and revetment at the four sites are discussed below. There would be little to no
- 13 effects on flood control and geomorphology associated with the construction of adjacent levees,
- 14 because the existing levee would remain in place and erosion would be allowed to continue.
- 15 Recruitment of IWM, to the extent it is available at the site, would also continue.

### 16 Effect FCGEOM-1: Decrease in Levee Erosion and Change in Sediment Recruitment

- 17 Alternative 3A consists almost entirely of setback and adjacent levees. However, of the
- 18 representative sites selected for analysis in this programmatic document, four of the sites (totaling
- 19 over 10,000 linear feet) would require application of Bank Protection Measure 2 (Bank Fill Stone
- 20 Protection with No On-Site Woody Vegetation). At these sites, Effect FCGEOM-1 as described under
- 21 Alternative 2A would apply. Overall, direct effects related to arrest of bank erosion are considered to
- be less than significant because of the generally fixed nature of the river's planform. Implementation
- of Mitigation Measure FCGEOM-MM-1 would ensure that any indirect effects to upstream and
- 24 downstream areas would be less than significant.

### 25 Effect FCGEOM-2: Increase in Levee Slope Stability

- 26 While the structural changes are substantially different, the effects on flood control and
- 27 geomorphology under Alternative 3A would be similar to Effect FCGEOM-2 described under
- Alternative 2A in that levee slope stability would be improved. Effects related to increase in levee
- 29 slope stability are considered to be beneficial. No mitigation is required.

### 30 Effect FCGEOM-3: Decrease in Instream Woody Material Recruitment

- 31 Alternative 3A consists almost entirely of setback and adjacent levees. However, of the
- 32 representative sites selected for analysis in this programmatic document, four of the sites (totaling
- 33 over 10,000 linear feet) would require application of Bank Protection Measure 2 (Bank Fill Stone
- 34 Protection with No On-Site Woody Vegetation). At these sites, Effect FCGEOM-3 as described under
- 35 Alternative 2A would apply. The onsite direct and downstream indirect effects related to decrease in
- 36 IWM recruitment are considered to be significant. Mitigation Measure FISH-MM-2: Compensate for
- 37
   Loss of Fish Habitat and Mitigation Measure VEG-MM-1: Compensate for the Loss of Woody Riparian

   38
   Weight and Mitigation Measure VEG-MM-1: Compensate for the Loss of Woody Riparian
- 38 Habitat would reduce this effect to a level that is less than significant by providing more geomorphic
- 39 complexity and habitat diversity.

#### 1 Effect FCGEOM-4: Changes in Local Hydraulics and Shear Stress

2 At the four sites requiring application of Bank Protection Measure 2 under Alternative 3A, the

3 changes in local hydraulics and shear stress would be similar to those described above for

4 Alternative 2A. Overall, this effect would be considered significant. With Implementation of

5 Mitigation Measure FCGEOM-MM-1, this effect would be reduced to a less than significant level.

## 6 Effect FCGEOM-5: Minimization of Stream Energy and Associated Floodplain Scour and/or 7 Deposition

A setback levee is an entirely new section of levee constructed at some distance landside of the
existing levee. For restoring geomorphic function to a river segment, a setback levee provides
several benefits. A setback levee would provide more floodplain capacity. This increase in floodplain
capacity would decrease the stream energy associated with higher flows on the river by allowing the
river to access its floodplain under these higher flows. An increase in floodplain capacity represents
an increase in hydraulic capacity, a beneficial effect from a flood control standpoint.

- Because of the increased conveyance area associated with the setback conditions, the magnitude of
  boundary shears within the reach would be generally slightly less than that of the existing condition,
  but would remain adequate to transport the input sediment load, similar to the existing condition.
  Indirect changes upstream and downstream of the project reach are anticipated to be negligible.
- 18 Although variability in the magnitude of both floodplain scour and deposition associated with high 19 flows is unknown, it is assumed that deposition would be the predominant geomorphic process 20 associated with a setback levee because of the associated decrease in stream energy. Any amount of 21 scour most likely would be limited to the upstream end. It is assumed that bank erosion on the 22 newly reshaped bank (i.e., former levee surface) on the waterside would remain stable because 23 features associated with this treatment would be engineered to withstand the forces of erosion by 24 flowing water. Associated deposition of fine sediments is considered a beneficial effect as deposition 25 would encourage natural recruitment of woody material and increase the habitat diversity on the 26 floodplain. Floodplain trees would eventually serve as an IWM source as the stream continued its 27 gradual migration into the floodplain. Furthermore, deposition of a significant amount of fine 28 sediment in the channel is considered unlikely because the channel-forming flow regime would be 29 unchanged.
- Additionally, the existing bank and levee erosion adjacent to the stream channel would be allowed to
   continue at present rates, thereby providing for sediment and IWM recruitment.
- The proposed levee setbacks may affect the location and size of in-stream depositional features (i.e.,
   natural bar features which support mature riparian vegetation) if project construction activities
   disrupt these features. Mitigation Measure FCGEOM-MM-1 would reduce this indirect effect to a
- 35 less-than-significant level.

### 36 Effect FCGEOM-6: Substantially Alter the Existing Drainage Pattern of the Site or Area

This alternative would involve earthwork on the landward side of the levee. The new material on
 the landside could cross drainage infrastructure maintained by local landowners or local agencies in

- 39 some locations or alter surface runoff patterns. Because interference with drainage could cause or
- 40 exacerbate local flooding, this effect would be significant.

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#### Mitigation Measure FCGEOM-MM-2: Coordinate with Owners and Operators, Prepare Drainage Studies as Needed, and Remediate Effects through Project Design

The agencies implementing program components and their primary contractors for engineering
design and construction will ensure that the following measures are implemented to avoid,
minimize, and rectify significant effects associated with disruption of local drainage systems.

6 During project design, project engineers will coordinate with owners and operators of local 7 drainage systems and landowners served by the systems to evaluate pre- and post-project 8 drainage needs and design features to remediate any program-related substantial drainage 9 disruption or alteration in runoff that would increase the potential for local flooding. If 10 substantial alteration of runoff patterns or disruption of a local drainage system could result 11 from a project feature, a drainage study will be prepared as part of project design. The study will 12 consider the design flows of any existing facilities that would be crossed by project features and 13 develop appropriate plans for relocation or other modification of these facilities and 14 construction of new facilities, as needed, to ensure equivalent functioning of the system during 15 and after construction. If no drainage facilities (e.g., ditches, canals) would be affected, but 16 project features would have a substantial significant effect on runoff amounts and/or patterns, 17 new drainage systems will be included in the design of project improvements to ensure that the 18 project would not result in new or increased local flooding. Any necessary features to remediate 19 project-induced drainage problems will be constructed before the project is completed or as 20 part of the project, depending on site-specific conditions. Implementation of this mitigation 21 measure will avoid, minimize, or rectify any significant effects.

# 4.5.4 Alternative 4A—Habitat Replacement (Preferred Alternative)

### 24 Effect FCGEOM-1: Decrease in Levee Erosion and Change in Sediment Recruitment

This effect would be the same as under Alternative 2A. Overall, direct effects related to arrest of
bank erosion are considered to be less than significant because of the generally fixed nature of the
river's planform. With implementation of Mitigation Measure FCGEOM-MM-1, indirect effects would
be less than significant.

- 29 Effect FCGEOM-2: Increase in Levee Slope Stability
- 30 This effect would be the same as under Alternative 2A.

### 31 Effect FCGEOM-3: Decrease in Instream Woody Material Recruitment

The low riparian bench with revegetation and IWM above the summer/fall waterline design entails installing revetment along the levee toe and upper bank, as well as a rock/soil bench to support riparian vegetation and provide a place to anchor IWM. Treatment of existing vegetation would be similar to Alternative 2A. Consequently, the proposed construction-related activities would result in loss and replacement of the riparian vegetation communities at the erosion repair sites and downstream areas. As described above, the presence of in-channel IWM provides more geomorphic complexity and habitat diversity.

- 1 However, as part of the project design, riparian vegetation would be planted to anchor IWM. The
- 2 effects on the riparian vegetation would likely persist for 5–10 years before newly planted
- 3 vegetation reaches sufficient height to provide shaded riverine and riparian habitat. IWM
- 4 recruitment to the rivers would be affected during the reestablishment of the woody vegetation.
- 5 Bank stabilization would result in the arrest of bank erosion and channel migration; thus, the
- primary mechanisms for natural IWM recruitment in the future would be wind-throw and tree
   mortality. Recruitment from newly planted trees would not occur until trees reach maturity and
- 8 begin to senesce, about 25–50 years after planting.
- 9 To reduce the effects related to the loss of existing IWM during construction and tree
- 10 reestablishment, the proposed construction activities include installation of IWM above the
- 11 summer/fall waterline, which would significantly increase short-term IWM loading levels from
- 12 current levels. However, the losses in IWM recruitment for the 25–50 years following construction
- 13 would be a significant effect. Implementation of Mitigation Measure FISH-MM-2: Compensate for
- Loss of Fish Habitat and Mitigation Measure VEG-MM-1: Compensate for the Loss of Woody Riparian
- 15 Habitat would reduce this effect to a level that is less than significant.

#### 16 Effect FCGEOM-4: Changes in Local Hydraulics and Shear Stress

- 17 This effect would be similar to that described under Alternative 2A, but the effects would likely be of
- 18 a greater magnitude as a result of riparian benches with vegetation extending into the channel.
- 19 Regardless, any changes in hydraulics and shear stress would require analysis and consideration of
- results. With Implementation of Mitigation Measure FCGEOM-MM-1, this effect would be less than
   significant.

# Effect FCGEOM-5: Minimization of Stream Energy and Associated Floodplain Scour and/or Deposition

This effect would be similar in type as Alternative 3A, but at a lesser magnitude because fewer
 setback levees would be constructed under Alternative 4A.

### 26 Effect FCGEOM-6: Substantially Alter the Existing Drainage Pattern of the Site or Area

This effect would be similar to Alternative 3A, but at a lesser magnitude because less landside work
would be required, which would reduce the potential to interfere with drainage infrastructure. With
Implementation of Mitigation Measure FCGEOM-MM-2, this effect would be less than significant.

# 4.5.5 Alternative 5A—Habitat Replacement Reaching Environmental Neutrality

### 32 Effect FCGEOM-1: Decrease in Levee Erosion and Change in Sediment Recruitment

This effect would be the same as under Alternative 2A. Overall, direct effects related to arrest of
 bank erosion are considered to be less than significant because of the generally fixed nature of the
 river's planform. With implementation of Mitigation Measure FCGEOM-MM-1, indirect effects would
 be less than significant.

### 37 Effect FCGEOM-2: Increase in Levee Slope Stability

38 This effect would be the same as under Alternative 2A.

#### 1 Effect FCGEOM-3: Decrease in Instream Woody Material Recruitment

2 This effect would be the same as under Alternative 4A.

#### 3 Effect FCGEOM-4: Changes in Local Hydraulics and Shear Stress

This effect would be the same as under Alternative 2A. With implementation of Mitigation Measure
 FCGEOM-MM-1, this effect would be less than significant.

## 6 Effect FCGEOM-5: Minimization of Stream Energy and Associated Floodplain Scour and/or 7 Deposition

8 This effect would be similar in type as Alternative 3A, but at a lesser magnitude because fewer
9 setback levees would be constructed under Alternative 5A.

#### 10 Effect FCGEOM-6: Substantially Alter the Existing Drainage Pattern of the Site or Area

- 11 This effect would be similar to the effect described under Alternative 3A, but at a lesser magnitude
- 12 because less landside work would be required, which would reduce the potential to interfere with
- 13 drainage infrastructure. With implementation of Mitigation Measure FCGEOM-MM-2, this effect
- 14 would be less than significant.

# 4.5.6 Alternative 6A—Habitat Replacement with Vegetation ETL Variance

#### 17 Effect FCGEOM-1: Decrease in Levee Erosion and Change in Sediment Recruitment

18 This effect would be the same as under Alternative 2A. Overall, direct effects related to arrest of 19 bank erosion are considered to be less than significant because of the generally fixed nature of the 20 river's planform. With implementation of Mitigation Measure FCGEOM-MM-1, indirect effects would 21 be less than significant

21 be less than significant.

#### 22 Effect FCGEOM-2: Increase in Levee Slope Stability

23 This effect would be the same as under Alternative 2A.

#### 24 Effect FCGEOM-3: Decrease in Instream Woody Material Recruitment

- 25 This effect would be similar in type to the effect under Alternative 4A, but to a lesser extent because
- 26 much of the existing vegetation and trees on the waterside slope and on the natural bank within 15
- 27 feet of the waterside toe would be protected. Overall, this effect would be significant. With
- 28 implementation of Mitigation Measure FISH-MM-2: Compensate for Loss of Fish Habitat and
- 29 Mitigation Measure VEG-MM-1: Compensate for the Loss of Woody Riparian Habitat, this effect
- 30 would be less than significant.

#### 31 Effect FCGEOM-4: Changes in Local Hydraulics and Shear Stress

This effect would be the same as under Alternative 2A. With implementation of Mitigation Measure
 FCGEOM-MM-1, this effect would be less than significant.

## Effect FCGEOM-5: Minimization of Stream Energy and Associated Floodplain Scour and/or Deposition

This effect would be similar in type as under Alternative 3A, but at a lesser magnitude because fewer
 setback levees would be constructed under Alternative 6A.

#### 5 Effect FCGEOM-6: Substantially Alter the Existing Drainage Pattern of the Site or Area

- 6 This effect would be similar to the effect described in Alternative 3A, but at a lesser magnitude
- 7 because less landside work would be required, reducing the potential to interfere with drainage
- 8 infrastructure. With implementation of Mitigation Measure FCGEOM-MM-2, this effect would be less
- 9 than significant.

### **5.1 Introduction and Summary**

This chapter describes the environmental setting associated with water quality and groundwater
resources, the determination of effects, the environmental effects on surface water and groundwater
quality that would result from implementation of the proposed program, and the mitigation
measures that would reduce these effects.

- 8 The key sources of data and information used in the preparation of this chapter are listed below.
- 9 Program area county general plans.

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- 10 American River Parkway Plan (Sacramento County 2008).
- 11 Existing Sacramento River Bank Protection Project (SRBPP) documents:
  - Draft Environmental Assessment/Initial Study for Levee Repair of 25 Erosion Sites: Sacramento River Bank Protection Project (U.S. Army Corps of Engineers 2009).
  - Final Environmental Assessment/Initial Study for the Erosion Repairs of 13 Bank Protection Sites, 2008 and 2009: Sacramento River Bank Protection Project, Sacramento River and Tributaries, California (U.S. Army Corps of Engineers 2008).
- Environmental Assessment/Initial Study for Five Critical Erosion Sites, River Miles 26.9 Left,
   34.5 Right, 72.2 Right, 99.3 Right, and 123.5 Left Sacramento River Bank Protection Project,
   Draft (U.S. Army Corps of Engineers 2006a).
- 20•Environmental Assessment for levee repair of 14 Winter 2006 critical sites, Sacramento21River Bank Protection Project, Final Report (U.S. Army Corps of Engineers 2006b).
- Table 5-1 summarizes the water quality effects resulting from the implementation of the proposedprogram.
- 24 Table 5-1. Summary of Water Quality Effects and Mitigation

Effect	Mitigation Measure	Implementation Period
WQ-1: Temporary Increase in Turbidity and Suspended Solids During Construction	WQ-MM-1: Monitor Turbidity during Construction	During construction
WQ-2: Release of Hazardous Materials to Adjacent Water Body or Groundwater during Construction	WQ-MM-2: Implement Measures to Maintain Surface Water and Groundwater Quality	Prior to and during construction

### **5.2 Environmental Setting**

This section discusses the existing conditions related to surface water quality and groundwater quality in the program area. The program area extends south-to-north along the Sacramento River from the town of Collinsville (just north of Antioch) at river mile (RM) 0, upstream to Chico at RM 194, and includes reaches of lower Elder and Deer creeks, Cache Creek, the lower reaches of the American River (RM 0–23), Feather River (RM 0–61), Yuba River (RM 0–11), Bear River (RM 0–17), as well as portions of Threemile, Steamboat, Sutter, Miner, Georgiana, and Cache sloughs (Figure 2-1).

9 The program area is located in the drainage basin of the Sacramento River system. The Sacramento 10 River drainage area covers approximately 27,000 square miles, including the Feather River drainage 11 basin, which totals approximately 5,500 square miles, and the American River drainage basin, which 12 totals approximately 2,100 square miles (U.S. Army Corps of Engineers 2009).

13 The Feather River, the largest tributary to the lower Sacramento River, originates in the Sierra 14 Nevada and Cascade Mountains. The combined flows of the Feather River and its tributaries 15 (including Honcut Creek, and Yuba and Bear Rivers) enter the Sacramento River near Verona 16 (approximately 5 miles northwest of the Sacramento International Airport). The three forks of the 17 American River originate in the Sierra Nevada; the lower American River joins the Sacramento River 18 in the city of Sacramento. Deer Creek, in Tehama County, is an eastside tributary to the Sacramento 19 River and drains 134 square miles (Travers 1998). Elder Creek, the northernmost erosion site in the 20 program area, joins the Sacramento River 12 miles south of the town of Red Bluff; the stream is 21 normally dry from July to late fall (Sacramento River Watershed Program 2012). Cache Creek flows 22 from Clear Lake across Yolo County into a settling basin in the Yolo Bypass west of the Sacramento 23 River. The Yolo Bypass and Sutter Bypass are part of an engineered flood management system. The 24 Yolo Bypass also receives water from the Sacramento River, the Knight's Landing Ridge Cut, Willow 25 Slough, and Putah Creek; the Sacramento Bypass receives water from the Butte Creek drainage 26 system and from the Sacramento River at flood stage via the Tisdale Weir (U.S. Army Corps of 27 Engineers 2009). The Delta sloughs, Threemile, Steamboat, Sutter, Miner, Georgiana, and Cache, are 28 located at the southernmost boundary of the program area in the Sacramento-San Joaquin Delta.

### 29 **5.2.1** Existing Conditions

### 30 **5.2.1.1** Surface Water Quality

31 Water management operations at Shasta Dam and other flow-regulating facilities substantially 32 influence the flow regime of the Sacramento River. Water quality dynamics also have been 33 influenced by the operation of these flow-regulating facilities. The Sacramento River and its 34 tributaries are generally characterized as having good overall water quality, with relatively cool 35 water temperatures, low biochemical oxygen demand, medium to high dissolved oxygen (DO), and 36 low mineral and nutrient content. Snowmelt serves as the primary water source for the river 37 system. Further downstream, as water flows through the Central Valley, the river receives various 38 pollutants and constituents associated with human activities, and water quality typically decreases. 39 Major sources of added constituents include eroded soils, agricultural return flows, urban runoff, 40 and discharges from municipal wastewater treatment facilities.

- 1 Known contaminants in the Sacramento River include dioxin (from paper mills), mercury,
- 2 organophosphate pesticides, and constituents in acid mine drainage, agricultural runoff, and
- 3 municipal non-point source pollution (U.S. Geological Survey 2009a). Both total mercury and
- methyl-mercury have been detected at elevated levels in samples from the American, Feather, and
   Sacramento Rivers by the California State Toxic Substance Monitoring Program (U.S. Geological
- 6 Survey 2009a).
- 7 Section 303(d) of the Clean Water Act (CWA) 33 United States Code Section 1313(d)) requires 8 states, territories, or authorized tribes to identify water bodies with impaired water quality (i.e., 9 affected by the presence of pollutants or contaminants). These impaired water bodies are too 10 polluted or otherwise degraded to meet the water quality standards set by states, territories, or 11 authorized tribes. The law requires that these jurisdictions establish priority rankings for waters on 12 the lists and develop Total Maximum Daily Loads (TMDLs) for 303(d)-listed waters. A TMDL is the 13 maximum quantity of a particular contaminant that a water body can receive and still meet water 14 quality standards. Several reaches of the Sacramento River and its tributaries have been classified as 15 impaired. California's 2006 303(d) list indicates that the Sacramento River and its tributaries within 16 the program area are impaired for mercury, diazinon and chlorpyrifos (organophosphate pesticides), pH, and Group A pesticides<sup>1</sup> (California State Water Resources Control Board 17 18 <del>2006).</del>Table 5-2 lists the constituents identified in the 2014-2016 Section 303(d) list for impaired 19 waters in the program area. The Delta waterways in the program area, including Threemile, 20 Steamboat, Sutter, Miner, Georgiana, and Cache Sloughs, are impaired for diazinon, chlorpyrifos, 21 DDT (dichlorodiphenyltrichloroethane), mercury, Group A pesticides, and PCBs (polychlorinated 22 biphenyls) (California State Water Resources Control Board 2006).

## Table 5-2. Clean Water Act Section 303(d) Listed Pollutants and Sources for Surface Waters in the Program Area

Pollutant/Stressor	Water Body
Azinphos-methyl <sup>a</sup>	Colusa Basin Drain
<u>Bifenthrin</u>	Lower American River
Boron	Willow Slough Bypass; and Lower Cache Creek
<u>Carbofuran</u>	Colusa Basin Drain
Chlordane	Sacramento River (Knights Landing to the Delta)
<u>Chlorpyrifos<sup>a</sup></u>	Willow Slough Bypass; Wadsworth Canal; Lower Feather River; Yankee Slough; Elder Creek; Ulatis Creek; and Arcade Creek
<u>Copper</u>	Arcade Creek and Lower Yuba River
<u>Diazinon<sup>a</sup></u>	<u>Colusa Basin Drain; Wadsworth Canal; Jack Slough; Elder Creek;</u> <u>Ulatis Creek; Arcade Creek; and Natomas East Main Drain</u>
Dichlorodiphenyltrichloroethane (DDT)	<u>Colusa Basin Drain; Sacramento River (Knights Landing to the</u> Delta); and Sacramento River (Red Bluff to Knights Landing)
Dichlorvos	Butte Slough
Dieldrin	<u>Colusa Basin Drain; Sacramento River (Knights Landing to the</u> Delta); and Sacramento River (Red Bluff to Knights Landing)
Diuron	Willow Slough Bypass and Ulatis Creek
Indicator Bacteria (Fecal)	Colusa Basin Drain; Wadsworth Canal; Honcut Creek; Lower

<sup>4</sup> Group A pesticides are aldrin, dieldrin, endrin, endosulfan, heptachloroepoxide, toxaphene, chlordane, lindane, and heptachlor.

Pollutant/Stressor	Water Body
	American River; and Willow Slough Bypass
Group A Pesticides <sup>b</sup>	Colusa Basin Drain and Lower Feather River
Low Dissolved Oxygen	Colusa Basin Drain; Honcut Creek; Butte Slough; Jack Slough; and Knights Landing Ridge Cut
<u>Malathion<sup>a</sup></u>	Colusa Basin Drain; Willow Slough Bypass; and Arcade Creek
<u>Mercury</u>	Colusa Basin Drain; Sutter Bypass; Butte Creek; Lower Feather River; Lower Yuba River; Putah Creek; Lower Cache Creek; Lower American River; Natomas East Main Drain; Natomas Cross Canal; Sacramento River (Knights Landing to the Delta); and Sacramento River (Red Bluff to Knights Landing)
Polychlorinated biphenyls (PCBs)	Lower Feather River: Lower American River: Natomas East Main Drain: Sacramento River (Knights Landing to the Delta): and Sacramento River (Red Bluff to Knights Landing)
<u>pH</u>	Butte Creek
<u>Propanil</u>	Butte Slough
Pyrethroids	Elder Creek; Lower American River; and Arcade Creek
<u>Salinity</u>	Knights Landing Ridge Cut; Willow Slough Bypass
<u>Selenium</u>	Willow Slough Bypass
<u>Unknown Toxicity</u>	Colusa Basin Drain; Willow Slough Bypass; Lower Feather River; Butte Slough; Elder Creek; Yankee Slough; Jack Slough; Mud Creek; Lower Cache Creek; Arcade Creek; Lower American River; Ulatis Creek; Sacramento River (Knights Landing to the Delta); and Sacramento River (Red Bluff to Knights Landing)
Source: California State Water Resou	rces Control Board 20128
<ul> <li><u>a</u> Organophosphate pesticide</li> <li><u>b</u> Group A pesticides are aldrin, dield lindane, and heptachlor.</li> </ul>	rin, endrin, endosulfan, heptachloroepoxide, toxaphene, chlordane,
Vith the exception of pH, salinity ( he following sections, the impairm vould not be expected to be made onstruction activities would not d netalloids (e.g., boron), or pesticid construction areas may contain leg nethylmercury, disruption of these result in the substantial release of to be exceeded.	also electrical conductivity [EC]), and DO, which are discussed in nents for program area surface waters identified in Table 5-2 worse as a result of implementing the program because irectly introduce fecal bacteria, metals (e.g., mercury and copper), es to these surface waters. Although soils and sediment in facy pesticides, such as DDT and dieldrin, and mercury or e substrates during construction would not be such that it would these pollutants to the water column such that the TMDLs would
The following sections discuss spe the proposed program on the Sacra	cific contaminants of concern in relation to the implementation of amento River and relevant program area tributaries and water
bodies.	
As described in Appendix C, Regula Control Board's (Central Valley RW peneficial uses of the state's major quality standards adopted by the s	tory Background, the Central Valley Regional Water Quality /QCB's) Water Quality Control Plan (Basin Plan) designates rivers and groundwater basins, which are protected by water tate pursuant to the Clean Water Act and the Porter-Cologne
<u>Nater Quality Control Act. The des</u>	ignated beneficial uses for surface waters in the program area are
<u>dentified in Table 5-3 for those wa</u>	iters listed in the Basin Plan.

#### Table 5-3. Beneficial Uses for Surface Waters in the Program Area

	_						Beneficial	Use <sup>a</sup>					
Surface Water Body	MUN	AGR	PROC	IND	POW	<u>REC-1</u>	REC-2	WARM	COLD	MIGR	<u>SPWN</u>	WILD	NAV
<u>Sacramento River</u> (Shasta Dam to Colusa Basin Drain)	<u>X</u>	<u>X</u>		<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>
Deer Creek	<u>X</u>	<u>X</u>				<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	
Butte Creek (sources to Chico)	<u>X</u>	<u>X</u>			<u>X</u>	<u>X</u>		<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	
<u>Butte Creek</u> (below Chico, including Butte Slough)		X				<u>X</u>		<u>X</u>	X	X	X	<u>X</u>	
Colusa Basin Drain		<u>X</u>				<u>X</u>		<u>X</u>	<u>P</u>	<u>X</u>		<u>X</u>	
<u>Sacramento River</u> (Colusa Basin Drain to "I" Street Bridge)	<u>X</u>	<u>X</u>				<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>
Sutter Bypass		<u>X</u>				<u>X</u>		<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	
Feather River (fish barrier dam to Sacramento River	X	<u>X</u>				<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	
Bear River	<u>X</u>	<u>X</u>			<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>P</u>	<u>P</u>	<u>X</u>	
<u>Yuba River</u> (Englebright Dam to Feather River)		<u>X</u>			<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	
<u>American River</u> (Folsom Dam to Sacramento Rover)	<u>X</u>	<u>X</u>		<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	
Yolo Bypass		<u>X</u>				<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	
<u>Cache Creek</u> (Clear Lake to Yolo Bypass)	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>		<u>X</u>	<u>X</u>	<u>X</u>	<u>P</u>	<u>X</u>	<u>X</u>	<u>X</u>	

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

	Beneficial Use <sup>a</sup>												
Surface Water Body	MUN	AGR	PROC	IND	POW	REC-1	REC-2	WARM	COLD	MIGR	<u>SPWN</u>	WILD	NAV
Putah Creek	<u>X</u>	<u>X</u>				X	<u>X</u>	<u>X</u>	<u>P</u>		<u>X</u>	<u>X</u>	
(Lake Berryessa to Yolo Bypass)													
Sacramento San Joaquin Delta	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>		<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>
Source: California Regional Water Qua	ality Contr	rol Board	2016										
X = existing beneficial use													
<u>P – potential beneficial use</u>													
<sup>a</sup> The beneficial uses listed here are star	ndard Basi	n Plan de	signations:										
MUN: Municipal and Domestic Supply													
AGR: Agricultural Supply													
PROC: Industrial Process Supply													
IND: Industrial Service Supply													
POW: Hydropower Generation													
REC-1: Water Contact Recreation													
REC-2: Non-Contact Water Recreation													
WARM: Warm Freshwater Habitat													
COLD: Cold Freshwater Habitat													
MIGR: Migration of Aquatic Organisms													
SPWN: Spawning, Reproduction, and/or Early Development													
WILD: Wildlife Habitat													
NAV: Navigation													

1The following sections discuss specific contaminants of concern in relation to the implementation of2the proposed program on the Sacramento River and relevant program area tributaries and water3bodies.

### 4 Total Suspended Solids and Turbidity

5 Total suspended solids (TSS) are suspended or colloidal particles in water which do not settle out by 6 gravity. In surface water, TSS is indicative of upstream scouring, bank erosion, and agricultural 7 return flow transporting and depositing sediment. Suspended sediment is considered a pollutant by 8 the Central Valley Regional Water Quality Control Board (Central Valley RWQCB) and can transport 9 other contaminants (e.g., phosphorus) and hydrophobic contaminants (e.g., organochlorine 10 pesticides). Typical TSS concentrations in the upper reaches of the Sacramento River range from 1 to 5 milligrams per liter during summer and fall months to 50–100 milligrams per liter during 11 12 winter and spring months (U.S. Army Corps of Engineers 2006a). Seasonal and storm-event 13 variability in TSS is due to increased overland flow and erosion with increased precipitation.

Mean monthly TSS for water samples taken from the Sacramento River at Colusa, Verona, and Freeport U.S. Geological Survey gages ranges from 19.4 milligrams per liter (October at Freeport) to 413.5 milligrams per liter (February at Colusa) (U.S. Army Corps of Engineers 2006a). With the exception of October, total suspended solids were greatest at Colusa than at Verona and Freeport (Table 5-<u>24</u>).

	Colusa		Verona		Freeport		
	(USGS gage 11389500)		(USGS gage 11425	500)	(USGS gage 11447650)		
	TSS		TSS		TSS		
Month	(milligrams/liter)	Count	(milligrams/liter)	Count	(milligrams/liter)	Count	
January	366	26	122	5	154	81	
February	414	24	93	3	134	70	
March	218	22	82	3	105	97	
April	103	8	76	3	57	80	
Мау	83	6	62	2	45	82	
June	57	5	42	2	28	119	
July	41	5	33	2	27	72	
August	41	5	40	30	32	54	
September	42	5	31	2	34	74	
October	36	4	38	2	19	59	
November	141	11	33	3	56	64	
December	260	9	139	3	81	103	

#### 19 Table 5-<u>42</u>. Monthly Average TSS for Sacramento River at Colusa, Verona, and Freeport

TSS = total suspended solids.

Count: Number of data points on which TSS statistic is based.

Source: U.S. Army Corps of Engineers (2006a)

Note: The range of years for which the TSS values were averaged was not provided in the referenced 2006 Corps document.

- 1 Turbidity is the reduction of water clarity due to the presence of suspended or colloidal particles
- and is commonly used as an indicator for the general condition of water clarity. Turbidity in surface
   water is comprised of naturally occurring and/or introduced organic matter and inorganic minerals.
- water is comprised of naturally occurring and/or introduced organic matter and inorganic minerals,
   such as silt, clay, industrial waste, sewage, and algae. It is quantified according to the amount of light
- 5 that is reflected by the suspended particles and is measured in nephelometric turbidity units
- 6 (NTUs). Turbidity is closely related to TSS, but also includes plankton and other organisms (Murphy
   7 2009).
- 8 The Central Valley RWQCB's Water Quality Control Plan (Basin Plan [California Regional Water
   9 Quality Control Board 2011]) states increases in turbidity attributable to controllable water quality
   10 factors shall not exceed the following limits.
- Where natural turbidity is less than 1 NTU, controllable factors shall not cause downstream
   turbidity to exceed 2 NTU.
- Where ambient turbidity is 1–5 NTUs, increases shall not exceed 1 NTU.
- Where natural turbidity is 5–50 NTUs, increases shall not exceed 20%.
- Where natural turbidity is 50–100 NTUs, increases shall not exceed 10 NTUs.
- Where natural turbidity is greater than 100 NTUs, increases shall not exceed 10%.
- 17 The Basin Plan states that averaging periods can be applied as long as beneficial uses are fully 18 protected. The turbidity objectives for the American River (Folsom Dam to Sacramento River) 19 indicate that turbidity shall be less than or equal 10 NTUs, except during periods of storm runoff; 20 should there be any conflict with the general turbidity objective, the more stringent limit applies 21 (California Regional Water Quality Control Board 2011). For Delta waters, the general objectives for 22 turbidity apply except during periods of storm runoff; during these periods, the turbidity of Delta 23 waters shall not exceed 50 NTUs in the Central Delta and 150 NTUs in the surrounding Delta areas 24 (California Regional Water Quality Control Board 2011). Specific construction projects that are part 25 of the proposed program will need to comply with the above-stated thresholds for turbidity.
- Monthly mean turbidity data for two locations along the Sacramento River (Verona and Hood) is presented in Table 5-<u>35</u>. This data provide a generalized determination of baseline turbidity along the Sacramento River. In many cases turbidity data is not available for other program area locations and was not included in this setting. Data for Verona are 15-minute data from February 2008 to August of 2009. Data for Hood are hourly data from March of 2007 to August of 2009. Turbidity at Verona tends to be higher than turbidity near Hood. This is likely due to the Feather River inflow iust unstream of the gauge
- 32 just upstream of the gauge.

	Sacran	nento River at Verona	Sacram	iento River at Hood
	Mean	Count	Mean	Count
January	98	2,826	45	1,477
February	185	4,266	58	1,364
March	108	5,768	21	1,485
April	37	5,745	11	2,077
Мау	23	5,951	13	2,230
June	12	5,539	14	2,145
July	9	5,308	17	2,231
August	10	3,956	9	1,728
September	11	2,859	10	1,437
October	17	2,895	6	1,485
November	56	2,875	10	1,422
December	23	2,492	14	1,482

#### Table 5-<u>35</u>. Monthly Average Turbidity for Sacramento River at Verona and near Hood

Note: "Count" values represent the total number of samples collected for each mean calculation. Source: California Data Exchange Center, <a href="http://cdec.water.ca.gov/">http://cdec.water.ca.gov/</a>>.

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### 3 Dissolved Oxygen, Temperature, Electrical Conductivity, and pH

4 DO is a critical component for all forms of aquatic life. DO concentrations can be highly variable and 5 are subject to large oscillations over short time periods. Factors that affect DO concentrations 6 include: water volume and velocity; climate and season; type and number of aquatic organisms 7 present; altitude; dissolved or suspended solids; nutrient concentrations; riparian vegetation; 8 organic waste; and groundwater inflow. For example, in slow stagnant waters, much of the oxygen is 9 confined to the top layer of water, and deeper water is often low in DO due to bacterial 10 decomposition of organic matter. Additionally, high levels of nutrient loading can cause algal 11 blooms. These blooms can cause large swings in DO levels as the algae populations fluctuate in size, 12 producing oxygen while growing and consuming it while decaying. When DO concentrations fall 13 below certain limits, the resulting low-DO zones can act as a barrier to fish migration and potentially 14 adversely affect spawning success. In extreme cases, persistent low concentrations of DO can result 15 in mortality of benthic organisms and other less-mobile aquatic species.

16 The Basin Plan objective for DO in the Sacramento River, from the I Street Bridge to the Delta, is 7 17 milligrams per liter. In general, for surface water bodies outside the legal Delta boundaries, DO 18 concentrations must meet the following minimum levels: warm waters, 5 milligrams per liter; cold 19 and spawning waters, 7 milligrams per liter (Central Valley Regional Water Quality Control Board 20 2011). More stringent Basin Plan DO objectives apply to the Sacramento River from Keswick Dam to 21 Hamilton City (9 milligrams per liter from June 1 to August 31, or at or above 95% of saturation 22 when DO is lower than 9 milligrams per liter due to natural conditions). The Sacramento River DO 23 concentration near Freeport averages as high as 10.5 during the storm season and as low as 7.8 24 milligrams per liter during the dry season when flow is lower (Table 5-46). Discharges of fuel, oil, 25 solvents and other petroleum-based products during construction activities could potentially affect

- 1 DO concentrations in the immediate program vicinity by creating a film on the water's surface and
- 2 limiting oxygen exchange.

Month	Temperature (°F)	pH (Standard)	DO (milligrams /liter)	EC (µs/cm)
January	48.7	7.5	10.5	170
February	50.9	7.4	10.1	170
March	55.3	7.5	9.7	154
April	58.3	7.4	9.6	138
Мау	64.3	7.4	8.6	145
June	68.8	7.3	8.2	139
July	71.1	7.3	7.9	134
August	71.0	7.4	7.8	156
September	67.9	7.5	8.0	166
October	62.5	7.2	8.6	145
November	55.9	7.4	8.9	186
December	49.5	7.4	10.2	186

#### Table 5-46. Monthly Average Physical Data for the Sacramento River at Freeport (2003 to 2009)

EC = electrical conductivity.

Source: California Data Exchange Center data: <a href="http://cdec.water.ca.gov/">http://cdec.water.ca.gov/</a>.

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5 Water temperature affects the concentration of dissolved oxygen and is an important water quality 6 variable for aquatic life. The Basin Plan water temperature objective requires that the temperature 7 not exceed 56°F in the Sacramento River from Keswick Dam to Hamilton City, and not exceed 68°F 8 from Hamilton City to the I Street Bridge during periods when temperature increases would be 9 detrimental to the fishery (California Regional Water Quality Control Board 2007). In addition, the 10 Basin Plan water temperature objective also requires that the temperature not deviate more than 5° 11 F from ambient river temperature. Annual water temperatures for the Sacramento River at Freeport 12 range from approximately 49°F (January) to 71°F (August) (Table 5-46). While an unlikely scenario, 13 excessive sedimentation resulting from the proposed program's construction activities could affect 14 the temperature of the Sacramento River and other program area water bodies.

15Electrical conductivity (The EC) of water is directly related to the concentration of dissolved ionized16solids in the water; the higher the EC of a particular sample of water, the higher the concentration of17total dissolved solids (TDS). TDS and EC are general indicators of salinity and are regulated under18the Basin Plan. Basin Plan objectives for EC on the Sacramento River are 340 microsiemens per19centimeter ( $\mu$ S/cm). Annual EC values for the Sacramento River at Freeport range from 138  $\mu$ S/cm20(April) to 186  $\mu$ S/cm (December) (Table 5-46).

Potential of hydrogen (pH) represents the effective concentration (activity) of hydrogen ions in
water is reported on a scale from 0 (acidic) to 14 (alkaline), with pure water at 7 (neutral). The
Basin Plan objective for pH is between 6.5 and 8.5, and discharges cannot result in changes of pH
that exceed 0.5 above normal ambient pH with designated cold or warm beneficial uses. The pH of
the Sacramento River is generally stable throughout the year (Table 5-<u>64</u>), and ranges from 7.2 to
7.5. Because no strong acids, bases, or concrete would be used during construction activities,

27 significant effects on pH in the program area are not anticipated.

### 1 **5.2.1.2 Groundwater Resources**

2 The California Department of Water Resources (DWR) delineates groundwater basins throughout 3 California under the state's Groundwater Bulletin 118 (California Department of Water Resources 4 2003). The program area is located in the Sacramento Valley Groundwater Basin, which is in the 5 Sacramento River Hydrologic Region. The Sacramento Valley Groundwater Basin is subdivided into 6 18 subbasins: Red Bluff, Corning, Colusa, Bend, Antelope, Dye Creek, Los Molinos, Vina, West Butte, 7 East Butte, North Yuba, South Yuba, Sutter, North American, South American, Solano, Yolo, and 8 Capay Valley. In the Central Valley, of which the Sacramento Valley comprises approximately one-9 third and the San Joaquin Valley comprises approximately two-thirds, the surface-water delivery 10 system redistributes a significant portion of the water from north to south (U.S. Geological Survey 11 2009b).

- Due to the relative abundance of surface water in the Sacramento Valley, the Sacramento Valley and
  the Delta generally experience relatively minimal groundwater-storage depletion; groundwater
  accounts for less than 30% of the annual supply used for agricultural and urban purposes in this
  area (U.S. Geological Survey 2009b). In the Sacramento Valley, groundwater that is pumped can be
  replenished annually during the non-irrigation season by recharge from precipitation and streams;
  groundwater recharge in the Sacramento Valley primarily is from precipitation (U.S. Geological
  Survey 2009b).
- 19 Groundwater quality in the Sacramento River Hydrologic Region is considered excellent overall 20 (California Department of Water Resources 2003). However, there are areas with local groundwater problems. For example, water quality impairments occur at the north end of the Sacramento Valley 21 22 in the Redding subbasin and along the margins of the valley, as well as around the Sutter Buttes, 23 where Cretaceous-age marine sedimentary rocks containing brackish to saline water are near the 24 surface; water quality is degraded from the older underlying sediments mixing with the fresh water 25 in the younger alluvial aquifer (California Department of Water Resources 2003). Wells constructed in these areas typically have high TDS. 26
- In the western portion of the Sacramento River Hydrologic Region, the groundwater in the volcanic
  and geothermal areas is impaired by moderate levels of hydrogen sulfide (California Department of
  Water Resources 2003). Human-induced impairments of groundwater quality are generally
  associated with individual septic system development in shallow unconfined sections of aquifers, or
  in areas of fractured hard rock where soil depths are insufficient to effectively leach effluent before
  it reaches the local groundwater supply.
- 33 In general, calcium-magnesium bicarbonate and magnesium-calcium bicarbonate are the
- 34 predominant groundwater types throughout the 18 subbasins in the Sacramento Valley
- 35 Groundwater Basin (California Department of Water Resources 2003). Total dissolved solids
- 36 concentrations vary somewhat between subbasins, and range from 24 to 1660 milligrams per liter;
- 37 mean TDS concentrations throughout the 18 subbasins range from 207 to 574 milligrams per liter
- 38 (California Department of Water Resources 2003).

### 1 5.3 Regulatory Setting

Appendix C, Regulatory Background, provides the federal, state and local laws, regulations, and
 policies that pertain to water quality and groundwater within the program area. The pertinent laws,
 regulations, and policies are listed below.

- 5 Federal:
- 6 O National Environmental Policy Act
- 7 O Clean Water Act
- 8 State:

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- California Environmental Quality Act
- 10 O California Fish and Game Code
- 11 O Porter-Cologne Water Quality Control Act
- 12 Local:
- 13 O American River Parkway Plan
- 14 O Butte County General Plan
- 15 O Colusa County General Plan
- 16 O Glenn County General Plan
- 17 O Placer County General Plan
- 18 O Sacramento County General Plan
- 19 O Solano County General Plan
- 20 O Sutter County General Plan
- 21 O Tehama County General Plan
- 22 O Yolo County General Plan
- 23 O Yuba County General Plan

### 24 **5.4 Determination of Effects**

### 25 **5.4.1** Assessment Methods

Effects on water quality that could result from construction activities were qualitatively evaluated on the basis of construction designs and practices, construction materials, the location and duration of the activities, and the potential for water-quality or beneficial-use degradation of water bodies near the proposed program. Operational effects on surface water quality and groundwater quality were evaluated qualitatively on the basis of the proposed program's potential to significantly alter the surface runoff patterns, increase the quantity of runoff, or generate additional sources of

32 pollution.

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### 1 5.4.2 Significance Criteria

For the purposes of this analysis, an effect was considered to be significant and to require mitigation if it would result in one or more of the following, which are based on professional practice and Appendix G of the CEQA Guidelines (14 California Code of Regulations 15000 et seq.):

- Alteration in the quantity and quality of surface runoff;
- 6 Degradation of water quality;
- 7 Reduction in groundwater quality.

8 Change or alteration of downstream drainage patterns is addressed in Chapter 4, Flood Control and 9 Geomorphology. For the purposes of this analysis, it was determined that implementation of any of 10 the action alternatives would not result in any indirect effects to surface water hydrology, 11 hydrogeology and groundwater quality and therefore indirect effects are not discussed further. This 12 determination was made because the nature of the actions, while they may affect local hydraulics 13 (as previously discussed in Chapter 4, Flood Control and Geomorphology), they will not alter the 14 amount or timing of flows and therefore would not affect hydrology. Similarly, none of the actions 15 incorporate features that will alter the permeability of soils at a scale that would affect 16 hydrogeology. Finally, due to the localized nature of the actions and the relatively minor potential 17 for direct effects to groundwater quality at a local scale (as discussed below), the potential for 18 indirect effects to groundwater quality will not result from implementation of the proposed 19 program.

### 20 **5.5 Effects and Mitigation Measures**

### 21 5.5.1 Alternative 1—No Action

22 Under Alternative 1, regular 0&M of the levee system would continue as presently executed by the 23 local maintaining entities (subject to revision of the governing O&M manual), but the Corps would 24 not implement bank protection along Sacramento River Flood Control Project levees. As a result, 25 erosion would continue and the risk of levee failure and subsequent flooding would increase. If a 26 levee breach were to occur, emergency construction and repair activities would be implemented 27 without the use of Best Management Practices (BMPs) and could result in release of contaminants 28 into the soil (groundwater) and adjacent surface water, as well as increased erosion, which could 29 raise TSS and turbidity in adjacent water bodies. If floodwaters were conveyed beyond the levees 30 throughout the program area, water quality could be significantly affected due to increases in total 31 suspended solids and turbidity. Additionally, water quality effects due to levee failure in which 32 flooding occurs in urban, suburban, and agricultural areas would likely be significant and could 33 include bacterial and chemical (e.g., pesticides, petroleum products, heavy metals) contamination.

### 34 **5.5.2** Alternative 2A—Low Maintenance

#### 35 Effect WQ-1: Temporary Increase in Turbidity and Suspended Solids during Construction

Alternative 2A entails installing revetment along the levee slope and streambank; if the bank is
 revegetated, vegetation would be limited to non-woody vegetation, such as grass. The placement of
 revetment within the channel would temporarily generate increased turbidity in the immediate

1 vicinity of the construction area. Additionally, placement of revetment in the water could result in a 2 sediment plume, generated from the channel bottom and levee side, becoming suspended in the 3 water and could generate turbidity levels above those identified as acceptable by the Basin Plan 4 (California Regional Water Quality Control Board 2007). Waterside construction would include the 5 potential for additional turbidity impacts from erosion due to wave action generated during boat 6 and barge operations. Turbidity effects on water quality from landside construction (e.g., vehicle 7 staging, placement of construction equipment) would be limited to stormwater runoff carrying loose 8 soil from staging areas and construction vehicle access areas. To limit erosion potential, the 9 following measures are the types of erosion control measures that would be considered for 10 implementation under the Stormwater Pollution Prevention Plan (SWPPP), as required by the State 11 Water Resources Control BoardState Water Board as part of the National Pollutant Discharge 12 Elimination System (NPDES) permitting process (including any Waste Discharge Requirements 13 (WDRs)) for any construction activities that disturb more than 1 acre. These measures would avoid 14 or minimize increases in turbidity and suspended solids.

- Timing of construction. Conduct earthwork during low flow periods (July 1–November 30) for
   those sites within the program area that are outside of the Delta.
- Staging of construction equipment and materials. To the extent possible, stage construction
   equipment and materials on the landside of the subject levee reaches in areas that have already
   been disturbed.
- Soil and vegetation disturbance. Minimize ground and vegetation disturbance during project construction by establishing designated equipment staging areas, ingress and egress corridors, spoils disposal and soil stockpile areas, and equipment exclusion zones prior to the commencement of any grading operations. Do not remove soil below the mean summer water line in order to minimize the mobilization of contaminated sediments (e.g., mercury).
- Grading spoils. Stockpile soil and grading spoils on the landside of the subject levee reaches,
   and install sediment barriers (e.g., silt fences, fiber rolls, and straw bales) around the base of
   stockpiles to intercept runoff and sediment during storm events. If necessary, cover stockpiles
   with geotextile fabric to provide further protection against wind and water erosion.
- Sediment barriers. Install sediment barriers on graded or otherwise disturbed slopes as
   needed to prevent sediment from leaving the project site and entering nearby surface waters.
- Site stabilization. Install plant materials to stabilize cut and fill slopes and other disturbed areas once construction is complete. Plant materials may include an erosion control seed mixture or shrub and tree container stock. Temporary structural BMPs, such as sediment barriers, erosion control blankets, mulch, and mulch tackifier, may be installed as needed to stabilize disturbed areas until vegetation becomes established.
- In addition, implementation of Mitigation Measure WQ-MM-1 would ensure that effects would be
   less than significant.
- 38 Mitigation Measure WQ-MM-1: Monitor and Control Turbidity during Construction
- The Corps or its contractor will conduct water quality tests specifically for increases in turbidity
   and sedimentation caused by construction activities. If increases in turbidity above the
   identified limits are found then additional site-specific turbidity control measures will be
- 42 implemented that avoid the effect and return turbidity levels to less than the identified limits.

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The primary measure is to slow the rate of construction and placement of revetment. Depending on the site-specific conditions, using additional sediment barriers may also reduce turbidity.

- **Sampling location**. Water samples for determining background levels shall be collected in the Sacramento River or affected adjacent water body (depending on erosion site) within the general vicinity for each erosion construction site. Testing to establish background levels shall be performed at least once a day when construction activity is in progress. Water samples for determining down current conditions shall be collected in the Sacramento River (or affected adjacent water body) at a point 5 feet out from the shoreline and 300 feet down current of each erosion site. During periods when there are no in-water construction activities, random, weekly water monitoring will be performed. During periods of in-water construction, water monitoring will occur hourly.
- 12 **Turbidity**. During working hours, the construction activity shall not cause the turbidity in 13 the Sacramento River (or affected adjacent water body) down current from the construction 14 sites to exceed the Basin Plan turbidity objectives. Specifically, where natural turbidity is 15 between 0 and 5 NTUs, increases shall not exceed 1 NTU; where natural turbidity is between 16 5 and 50 NTUs, increases shall not exceed 20%; where natural turbidity is between 50 and 17 100 NTUs, increases shall not exceed 10 NTUs; and where natural turbidity is greater than 18 100 NTUs, increases shall not exceed 10% (California Regional Water Quality Control Board 19 2007). In determining compliance with these limits, appropriate averaging periods may be 20 applied provided that beneficial uses will be fully protected.

# Effect WQ-2: Release of Hazardous Materials to Adjacent Water Body or Groundwater during Construction

- 23 Fuel, oils, grease, solvents and other petroleum-based products are commonly used in construction 24 activities. Accidental releases of the products could degrade surface water and groundwater quality. 25 As described in Appendix C, Regulatory Background, implementation of the proposed program 26 would adhere to a SWPPP and Spill Prevention, Control, and Countermeasure Plan (SPCCP). The 27 purpose of an SPCCP is to minimize the potential for and effects from spills of hazardous, toxic, or 28 petroleum substances during construction and operation activities so that water quality and 29 beneficial uses are not compromised. An SPCCP would be completed before any construction 30 activities begin, and implementation of the SPCCP would comply with the Porter-Cologne Water 31 Quality Control Act of 1969 and the Clean Water Act. The SPCCP will describe spill sources and spill 32 pathways in addition to the actions that would be taken in the event of a spill (e.g., an oil spill from 33 engine refueling will be immediately cleaned up with oil absorbents). The SPCCP will outline 34 descriptions of containment facilities and practices such as double-walled tanks, containment berms 35 and other secondary control measures, emergency shutoffs, drip pans, fueling procedures, and spill 36 response kits. It will describe how and when employees are trained in proper handling and spill 37 prevention and response procedures.
- The Corps would review and approve the SPCCP before onset of construction activities and
   routinely inspect the construction area to verify that the measures specified in the SPCCP are
   properly implemented and maintained. The Corps would notify its contractors immediately if there
   is a noncompliance issue and will require compliance.

- The federal reportable spill quantity for petroleum products, as defined in 40 Code of Federal
   Regulations (CFR) Section 110.3<sup>2</sup>, is any oil spill that:
- 3 Violates applicable water quality standards.
- Causes a film or sheen on or discoloration of the water surface or adjoining shoreline.
- Causes a sludge or emulsion to be deposited beneath the surface of the water or adjoining shorelines.

If a spill is reportable, the contractor's superintendent would notify the Corps, and the Corps would
take action to contact the appropriate safety and cleanup crews to ensure that the SPCCP is followed.
A written description of reportable releases must be submitted to the Central Valley RWQCB. This
submittal must contain a description of the release, including the type of material and an estimate of
the amount spilled, the date of the release, an explanation of why the spill occurred, and a
description of the steps taken to prevent and control future releases. The releases would be
documented on a spill report form.

If a significant spill were to occur, even with implementation of the SPCCP, and it was determined
 that the surface water or groundwater quality have been significantly affected, Mitigation Measure
 WQ-MM-2 would minimize the significant effect to less than significant.

# Mitigation Measure WQ-MM-2: Implement Measures to Maintain Surface Water and Groundwater Quality

19 If an appreciable spill occurs and results determine that project activities have adversely 20 affected surface or groundwater quality, a detailed analysis will be performed immediately by a 21 registered environmental assessor or professional engineer to determine the extent of 22 contamination. This analysis will conform to American Society for Testing and Materials 23 standards, and will include recommendations for reducing or eliminating the source or 24 mechanisms of contamination. Based on this analysis, the Corps and its contractors will select and implement measures to control the contamination, with a performance standard that 25 26 surface water quality and groundwater quality must be returned to baseline conditions. 27 Remedial measures that would be implemented when the spill has already come into contact 28 with surface or groundwater may include, but are not limited to, the following:

- Absorbent booms and pads can be used to contain the spread of the spill and soak up oil or other chemical that sorbs to solids as opposed to liquids.
- Mechanical skimmers, draglines, or dredges can be used to recover floating oil from the water surface where substantial oil has accumulated.
- If remaining oil/chemical cannot be removed, dispersants can be used to reduce impact to
   sensitive shoreline habitats and animals that use the water surface by chemically dispersing
   oil into the water column.

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<sup>&</sup>lt;sup>2</sup> According to the Clean Water Act, Section 311, Section1321(b)(5), a spill must be reported if it is in violation of Section1321(b)(3), which prohibits spills of a quantity that "may be harmful" to the public health or welfare or the environment of the United States. 40 CFR Section 110.3 defines what a quantity that "may be harmful" to the public health or welfare or the environment of the United States is. Therefore, 40 CFR Section110.3 defines reportable spill quantity.

- According to the SPCCP, samples must be collected within the first two hours of discharge at all affected discharge locations, as well as an area unaffected by the release, when a spill occurs that exposes pollutants to runoff.
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• For a significant or hazardous spill that cannot be controlled by personnel in the immediate vicinity, the local emergency agency should be contacted by dialing 911 and notifying the proper county officials.

# 5.5.3 Alternative 3A—Maximize Meander Zone (Environmentally Superior Alternative)

9 Effect WQ-1: Temporary Increase in Turbidity and Suspended Solids during Construction

Construction-related effects associated with Alternative 3A would be comparable in type, but of a lower magnitude, to those described above for Alternative 2A. Because the majority of construction activities would take place some distance landward of the existing levee, there would be less potential for significant effects on water quality due to excessive turbidity or TSS. Incorporation of

- 14 SWPPP measures, as described above for Alternative 2A, would limit erosion potential.
- 15 Implementation of Mitigation Measure WQ-MM-1 would ensure that effects would be less than16 significant.

# Effect WQ-2: Release of Hazardous Materials to Adjacent Water Body or Groundwater during Construction

19 Construction-related effects associated with Alternative 3A would be comparable in type, but of a 20 lower magnitude, to those described above for Alternative 2A. Because a majority of construction 21 activities would take place some distance landward of the existing levee, there would be less 22 potential for significant effects on water quality due to the accidental release of hazardous materials. 23 Mitigation Measure WQ-MM-2 would minimize the significant effect on water quality potentially 24 resulting from the accidental release of hazardous materials to surface or groundwater, and protect 25 beneficial uses. Consequently, construction-related effects on water quality would be less than 26 significant.

# 27 5.5.4 Alternative 4A—Habitat Replacement (Preferred 28 Alternative)

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29 Effect WQ-1: Temporary Increase in Turbidity and Suspended Solids during Construction

30 Effects associated with Alternative 4A would be comparable in type and magnitude to those 31 described above for Alternative 2A. Placement of rock and soil during construction of the riparian 32 and wetland benches, as well as placement of instream woody material (IWM), could potentially 33 result in the generation of additional turbidity; this effect, however, would be temporary. 34 Additionally, the inclusion of setback and adjacent levees could potentially lessen the generation of 35 turbidity, as described above for Alternative 3A. Incorporation of SWPPP measures, as described 36 above for Alternative 2A, would limit erosion potential. Implementation of Mitigation Measure WQ-37 MM-1 would ensure that effects would be less than significant.

# Effect WQ-2: Release of Hazardous Materials to Adjacent Water Body or Groundwater during Construction

3 Effects associated with Alternative 4A would be comparable in type and magnitude to those

- 4 described above for Alternative 2A. Mitigation Measure WQ-MM-2 would minimize the significant
- 5 effect on water quality potentially resulting from the accidental release of hazardous materials to
- surface or groundwater, and protect beneficial uses. Consequently, construction-related effects on
   water quality would be less than significant.

# 8 5.5.5 Alternative 5A—Habitat Replacement Reaching 9 Environmental Neutrality

### 10 Effect WQ-1: Temporary Increase in Turbidity and Suspended Solids during Construction

11 Effects associated with Alternative 5A would be comparable in type and magnitude to those

12 described above for Alternative 2A. Placement of rock and soil during construction of the riparian

13 and wetland benches, as well as placement of IWM, could potentially result in the generation of

14 additional turbidity; this effect, however, would be temporary. Additionally, the inclusion of setback

15 and adjacent levees could potentially lessen the generation of turbidity, as described above for

16 Alternative 3A. Incorporation of SWPPP measures, as described above for Alternative 2A, would

17 limit erosion potential. Implementation of Mitigation Measure WQ-MM-1 would ensure that effects

18 would be less than significant.

# Effect WQ-2: Release of Hazardous Materials to Adjacent Water Body or Groundwater during Construction

Effects associated with Alternative 5A would be comparable in type and magnitude to those
 described above for Alternative 2A. Mitigation Measure WQ-MM-2 would minimize the significant
 effect on water quality potentially resulting from the accidental release of hazardous materials to
 surface or groundwater, and protect beneficial uses. Consequently, construction-related effects on
 water quality would be less than significant.

# 26 5.5.6 Alternative 6A—Habitat Replacement with Vegetation ETL 27 Variance

### 28 Effect WQ-1: Temporary Increase in Turbidity and Suspended Solids during Construction

29 Effects associated with Alternative 6A would be comparable in type and magnitude to those 30 described above for Alternative 2A. Placement of rock and soil during construction of the riparian 31 and wetland benches, as well as placement of IWM, could potentially result in the generation of 32 additional turbidity; this effect, however, would be temporary. Additionally, the inclusion of setback 33 levees could potentially lessen the generation of turbidity, as described above for Alternative 3A. 34 Incorporation of SWPPP measures, as described above for Alternative 2A, would limit erosion 35 potential. Implementation of Mitigation Measure WQ-MM-1 would ensure that effects would be less 36 than significant.

## Effect WQ-2: Release of Hazardous Materials to Adjacent Water Body or Groundwater during Construction

- 3 Effects associated with Alternative 6A would be comparable in type and magnitude to those
- 4 described above for Alternative 2A. Mitigation Measure WQ-MM-2 would minimize the significant
- 5 effect on water quality potentially resulting from the accidental release of hazardous materials to
- 6 surface or groundwater<u>, and protect beneficial uses</u>. Consequently, construction-related effects on
- 7 water quality would be less than significant.

### **6.1 Introduction and Summary**

This chapter describes the environmental setting associated with geology, seismicity, soils, and
mineral resources, the determination of effects, the environmental effects on geology, seismicity,
soils, and mineral resources that would result from implementation of the proposed action, and the
mitigation measures that would reduce these effects.

8 Implications of programmatic alternatives for geology, seismicity, soils, and mineral resources 9 conditions are also addressed within the context of the resources affected by the changes, most 10 notably water quality and groundwater resources (Chapter 5); geomorphology and flood control 11 (Chapter 4); vegetation and wetlands (Chapter 10); and fisheries and aquatics (Chapter 11).

- 12 The key sources of data and information used in the preparation of this chapter are listed below.
- Geologic map of the late Cenozoic deposits of the Sacramento Valley and northern Sierran foothills, California (Helley and Harwood 1985).
- Geomorphic Analysis and Bank Protection Alternatives Report for Sacramento River (RM 78-194) and Feather River (RM 0-28) (WET 1990).
- Table 6-1 summarizes the geology, seismicity, soils, and mineral resources effects resulting from the
   implementation of the proposed program.

#### 19 Table 6-1. Summary of Geology, Seismicity, Soils, and Mineral Resources Effects

Effect	Mitigation	Implementation Period
GEO-1: Potential Adverse Effects Resulting from Surface Fault Rupture	Not applicable	
GEO-2: Increase Exposure of People or Structures to Hazards Related to Strong Seismic Ground Shaking	Not applicable	
GEO-3: Potential Accelerated Erosion and Sedimentation Resulting from Construction- Related Ground Disturbance	Not applicable	
GEO-4: Loss of Significant Mineral Resources as a Result of Program Implementation	Not applicable	

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2

### **6.2 Environmental Setting**

### 2 6.2.1 Program Area Description

As described in Chapter 2, Project Description, the program area encompasses more than 1,000 miles of levees and weirs. This area extends south-to-north along the Sacramento River, from the town of Collinsville (River Mile [RM] 0) upstream to Chico at RM 194. The program area also encompasses Cache Creek, the lower reaches of Elder and Deer creeks, the lower reaches of the American River (RM 0–23), Feather River (RM 0–61), Yuba River (RM 0–11), and Bear River (RM 0– 17), portions of Threemile, Steamboat, Sutter, Miner, Georgiana, and Cache sloughs, as well as a number of flood bypasses and distributaries.

### 10 6.2.2 Geologic Conditions

# 116.2.2.1Regional Physiographic Setting and Topography of the Program12Area

13 The program area is located in the central and northern portions of the Sacramento Valley within 14 California's Great Valley geomorphic province (California Geological Survey 2002). The Great Valley 15 of California, also called the Central Valley of California, is a nearly flat alluvial plain extending from 16 the Tehachapi Mountains in the south to the Klamath Mountains in the north and from the Sierra 17 Nevada on the east to the Coast Ranges on the west. The valley is about 450 miles long and has an 18 average width of about 50 miles. Elevations of the alluvial plain are generally just a few hundred feet 19 above mean sea level (MSL), with extremes ranging from a few feet below MSL to about 1,000 feet 20 above MSL (Hackel 1966).

The Sacramento Valley contains thousands of feet of accumulated fluvial, overbank, and fan deposits resulting from erosion of these surrounding ranges. The sediments vary from a thin veneer at the edges of the valley to 50,000 feet in the west-central portion and are estimated to be about 8,000 feet thick in the program area (Northwest Hydraulic Consultants 2007).

- The Sacramento River is the main drainage of the region, flowing generally south from the Klamath Mountains to its discharge point into the Suisun Bay in the San Francisco Bay area. Many of the water courses in the program area have been confined by human-made levees since the turn of the last century. In the program area, these levees generally were constructed on Holocene age (less than 11,000 years old) alluvial and fluvial deposits deposited by the current and historical Sacramento River and its tributaries (Kleinfelder 2007).
- The topography in the program area is mainly flat, with minimal rolling terrain towards the northern portion of the program area.

### 33 6.2.2.2 Regional Structural Geology

Geologically, the Great Valley geomorphic province is a large elongate northwest-trending
 asymmetric structural trough that, as described above, has been filled with a tremendously thick
 sequence of sediments ranging in age from Jurassic to Recent. This asymmetric geosyncline has a
 long stable eastern shelf supported by the subsurface continuation of the granitic Sierran slope and
 a short western flank expressed by the upturned edges of the basin sediments (Hackel 1966).
- 1The structural patterns of the late Cenozoic era (65 million years before present) deformation in the2Sacramento Valley differ significantly from that in the Coast Ranges to the west and that in the3northern Basin and Range geomorphic province to the east (WET 1990). Deformation in the4Sacramento Valley has occurred in a regional stress field with a maximum horizontal component of5compressive stress that is oriented approximately east to west (Jordan and Minster 1988 as cited in6WET 1990; Zoback et al. 1987 as cited in WET 1990).
- 7 In the past 5.2 million years (approximately the Pliocene, Pleistocene, and Holocene epochs), the 8 compressive deformation has progressed northward so that resultant geologic structures in the 9 northern part of the Sacramento Valley near Red Bluff are a million years younger than those near 10 Sutter Buttes. Further south, near Sacramento, the observed deformation is older than 3.4 million 11 years. Consequently, the effects of active tectonics on alluvial rivers in the program area should 12 decrease southward. Harwood and Helley (1987 as cited in WET 1990) have divided the Sacramento 13 Valley into what they refer to as "structural domains" (Figure 3.2 in WET 1990). In the program 14 area, these domains include the Battle Creek, Corning, Chico, Sutter Buttes, and Sacramento 15 domains.
- 16 The Battle Creek domain, at the northern end of the Sacramento Valley, contains late Cenozoic 17 structures generated less than 0.5 million years ago. The Corning domain contains late Cenozoic structures generated between 0.5 and 1.0 million years ago. These structures range in orientation 18 19 from northwest to north. Northwest-trending structures include the Willows fault (Figure 3.3 of 20 WET 1990) and a fault along the flank of the South Corning dome. Structures that trend northward 21 include the Corning fault, the Corning domes, and Los Molinos and Glenn Synclines. All of these 22 structures deform the Red Bluff Formation, which is between 0.45 and 1.09 million years old (WET 23 1990). The Chico domain contains late Cenozoic structures generated between 1.0 and 2.6 million 24 years ago.
- Due to the unique style of tectonism, the Sutter Buttes are considered a single structural domain by Harwood and Helley (1987 as cited in WET 1990). The Sutter Buttes consist of a volcanic intrusion and associated faults and folds. The volcanics have been dated at 1.4 to 2.4 million years old. The intrusion extends beneath the buried Colusa dome – localization of the intrusion has been suggested to be due to offset on the Willows fault (Harwood and Helley 1987 as cited in WET 1990).
- The Sacramento domain includes the possible southwest extension of the Willows fault beneath the Feather River near Nicolaus. None of the structures of the Sacramento domain have been shown to offset rocks younger than 3.4 million years old. Other structures in the Sacramento domain besides the Willows fault include the Stockton fault, the Midland fault, and the Thornton anticline (WET 1990).

### 356.2.2.3Regional Surface Geology

36 The program area has been mapped by a number of geologists at a regional scale (Helley and 37 Harwood 1985; Jennings 1977; Jennings and Strand 1960; Saucedo and Wagner 1992; Wagner and 38 Bortugno 1982; Wagner et al. 1987). Jennings (1977), Jennings and Strand (1960), Saucedo and 39 Wagner (1992), and Wagner et al. (1987) are compilation maps that reflect mapping by previous 40 authors and accordingly portray geologic interpretations similar to Helley and Harwood (1985). 41 Helley and Harwood's (1985) mapping focused on Quaternary geologic units based on geomorphic 42 surfaces and was performed at a scale of 1:62,500, making this mapping the most relevant 43 information for engineering properties of near-surface deposits in the program area.

- Helley and Harwood's (1985) mapping shows the Sacramento River in the program area crossing a
   number of Quaternary-age geologic units.
- The riverine soils of the program area are discussed in Chapter 4, Flood Control and
   Geomorphology.

### 5 6.2.3 Seismic Hazards

6 Seismic hazards refer to earthquake fault ground rupture and ground shaking (primary hazards), as

- 7 well as liquefaction and earthquake-induced slope failure (secondary hazards). Localized ground
- 8 shaking and liquefaction are the most substantial seismic hazards in the program area.

### 9 6.2.3.1 Surface Fault Rupture and Faulting

10The purpose of the Alquist-Priolo Earthquake Fault Zoning Act1 (Alquist-Priolo Act) is to regulate11development near active faults to mitigate the hazard of surface rupture. Faults in an Alquist-Priolo12Earthquake Fault Zone are typically active faults. As defined under the Alquist-Priolo Act, an active13fault is one that has had surface displacement within Holocene time (about the last 11,000 years).14An early Quaternary fault is one that has had surface displacement during Quaternary time (the last151.6 million years). A pre-Quaternary fault is one that has had surface displacement before the

16 Quaternary period.

17 There is no evidence of recent (i.e., Holocene) faulting within the program area and no faults are 18 mapped to cut valley alluvium at or near the program area (Hart and Bryant 1997; International 19 Conference of Building Officials 1997; Jennings 1994; U.S. Geological Survey 2009). Furthermore, 20 review of aerial photographs does not indicate the presence of lineations or other features that 21 would suggest the presence of recent faulting on or trending towards the program area.

22 However, the program area is subject to seismic hazards because of its proximity to active faults, 23 fault systems, and fault complexes. Some of the officially recognized (e.g., by the State of California or 24 Uniform Building Code [UBC]) active faults are located within a 20-mile radius of the program area. 25 The closest active faults to the program area are the Dunnigan Hills Fault about 19 miles to the west, 26 and the Cleveland Hill Fault (western splay of the Foothills Fault System) as close as 2.5 miles east of 27 the program area (Hart and Bryant 1997; International Conference of Building Officials 1997; 28 Jennings 1994; U.S. Geological Survey 2009). All of these faults are in Alquist-Priolo Earthquake 29 Fault Zones (Hart and Bryant 1997).

- 30 The closest fault to the program area is the Willows Fault Zone, located less than 2 miles from the
- 31 southern end of the program area. This fault zone is mapped as a pre-Quaternary fault zone;
- 32 however, according to Kleinfelder (2008), it is defined as potentially capable of generating
- 33 infrequent and moderate magnitude earthquakes along its northern extent north of the Sutter
- 34 Buttes and is mapped on the basis of offset, deep (i.e., 1,500 feet) bedrock strata and associated
- 35 groundwater elevation anomalies in that region.

<sup>&</sup>lt;sup>1</sup> The Alquist-Priolo Earthquake Fault Zoning Act (Public Resources Code Section 2621 et seq.) is a state law originally enacted in 1972 to mitigate the hazard of surface faulting to structures for human occupancy. It is intended to prevent the construction of buildings used for human occupancy on the surface trace of active faults. Local agencies must regulate most development in fault zones established by the State Geologist known as Alquist-Priolo Earthquake Fault Zones. The proposed program's improvements would not entail the construction of buildings for human occupancy. Therefore, this law is not applicable to the proposed program.

### 1 6.2.3.2 Ground-Shaking Hazard

The program area is located in UBC Seismic Hazard Zone 3. The UBC recognizes no active seismic
 sources in the immediate vicinity of the program area (International Conference of Building Officials
 1997).

5 The measurement of the energy released at the point of origin, or epicenter, of an earthquake is 6 referred to as the magnitude, which is generally expressed in the Richter Magnitude Scale or as 7 moment magnitude. The scale used in the Richter Magnitude Scale is logarithmic so that each 8 successively higher Richter magnitude reflects an increase in the energy of an earthquake of about 9 31.5 times. Moment magnitude is the estimation of an earthquake magnitude by using seismic 10 moment, which is a measure of an earthquake size utilizing rock rigidity, amount of slip, and area of 11 rupture.

- The greater the energy released from the fault rupture, the higher the magnitude of the earthquake.
   Earthquake energy is most intense at the fault epicenter; the farther an area from an earthquake
   epicenter, the less likely that ground shaking will occur there. Geologic and soil units comprising
   unconsolidated, clay-free sands and silts can reach unstable conditions during ground shaking,
- 16 which can result in extensive damage to structures built on them (see Liquefaction Hazard section
- 17 below).

18 Ground shaking is described by two methods: ground acceleration as a fraction of the acceleration of 19 gravity (g) or the Modified Mercalli scale, which is a more descriptive method involving 12 levels of

- gravity (g) or the Modified Mercalli scale, which is a more descriptive method involving 12 levels of
   intensity denoted by Roman numerals. Modified Mercalli intensities range from I (shaking that is not
- 21 felt) to XII (total damage).

The intensity of ground shaking that would occur within the program area as a result of a nearby earthquake is partly related to the size of the earthquake, its distance from the program area, and the response of the geologic materials within the program area. As a rule, the earthquake magnitude and the closer the fault rupture to the site, the greater the intensity of ground shaking. When various earthquake scenarios are considered, ground-shaking intensities will reflect both the effects of strong ground accelerations and the consequences of ground failure.

### 28 **6.2.3.3** Liquefaction Hazard

Liquefaction is a phenomenon in which the strength and stiffness of unconsolidated sediments are
 reduced by earthquake shaking or other rapid loading. Poorly consolidated, water-saturated fine
 sands and silts having low plasticity and located within 50 feet of the ground surface are typically
 considered to be the most susceptible to liquefaction. Soils and sediments that are not water saturated and that consist of coarser or finer materials are generally less susceptible to liquefaction
 (California Division of Mines and Geology 1997).

- Geologic mapping by Helley and Harwood (1985) shows significant portions of the program area to
   be underlain by basin and Holocene age alluvial deposits. These units generally consist of
   unconsolidated gravel, sand, silt, and clay. Depending on groundwater levels and the intensity of a
   seismic event, these units have the potential to liquefy during a seismic event.
- 39 For example, in Butte County, areas paralleling the Sacramento River that contain clean sand layers
- 40 with low relative densities are estimated to have generally high liquefaction potential. Granular
- 41 layers underlying most of the remaining Sacramento Valley area of Butte County have higher

- 1 relative densities and thus have moderate liquefaction potential. Clean layers of granular materials
- 2 older than Holocene are of higher relative densities and are thus of low liquefaction potential. Figure
- 3 16-4 of the Butte County General Plan Technical Update, Background Report shows that the
- 4 Sacramento River generally traverses areas of moderate liquefaction potential (Butte County 2005).
- 5 In Yuba and Sutter counties, areas with a high liquefaction potential are similar to those areas
- 6 described for Butte County (Sutter County 2008; Yuba County 2008). In other words, areas
- 7 paralleling the Sacramento, Feather, and Bear Rivers which contain clean sand layers with low
- 8 relative densities coinciding with a relatively high water table are estimated to have generally high
- 9 liquefaction potential. Granular layers underlying certain areas in the Sacramento Valley have
- 10 higher relative densities and thus have moderate liquefaction potential.

### 11 Other Ground Failure Types Associated with Liquefaction

12 Two potential ground failure types associated with liquefaction in the program area are lateral 13 spreading and differential settlement (Association of Bay Area Governments 2001). Lateral 14 spreading involves a layer of ground at the surface being carried on an underlying layer of liquefied 15 material over a gently sloping surface toward a river channel or other open face. Lateral spreading is

- 16 expected to locally be a concern within the program area.
- Another common hazard in the region is differential settlement (also called ground settlement and, in extreme cases, ground collapse) as soil compacts and consolidates after the ground shaking ceases. Differential settlement occurs when the layers that liquefy are not of uniform thickness, a common problem when the liquefaction occurs in artificial fills. Settlement can range from 1% to 5%, depending on the cohesiveness of the sediments (Tokimatsu and Seed 1984). Within the program area, differential settlement is also expected to be a concern locally.

### 23 6.2.4 Landslide Hazards

Aerial photographs were analyzed for the presence of landslides along and adjacent to waterways in
 the program area. No landslides were observed along the waterways in the program area. No
 geomorphic features indicative of landsliding were observed (e.g., scarps, hummocky topography).

### 27 6.2.5 Volcanic Hazards

28 The only county in the program area subject to volcanic hazards is the northern portion in Butte 29 County. Some of the most striking topographic features of Butte County, including Table Mountain 30 north of Oroville, are volcanic in origin. The lava flows which now cap Table Mountain and most of 31 the other volcanic features in the county are, however, tens of millions of years old. The geologic 32 activity producing this volcanism has long since ceased and thus there are virtually no volcanic 33 hazards in most of Butte County. However, northern Butte County is an exception to this 34 generalization because Lassen Peak, an active volcano, is only about 25 miles north of the Butte 35 County line.

- Lassen Peak is the southernmost volcano in the Cascade Range and last erupted in the period
   between 1914 and 1921; this period of volcanic activity included steam and ash eruptions as well as
- a small lava flow. Like the other volcanoes in the Cascades, Mount Lassen is considered dormant,
- 39 which means that it is not currently erupting but is expected to erupt again in the future. Lassen
- 40 Peak has erupted at least seven times within the past 1,200 years.

- 1 There are four main hazards that may accompany volcanic eruptions: 1) ash and cinder falls, 2)
- 2 explosive blasts, 3) lava flows, and 4) mud flows. Despite the general severity of volcanic hazards,
- 3 potential volcanic hazards for Butte County are limited to the northernmost portions of the county.
- 4 Even here, the hazards are relatively modest because of the distance between Butte County and
- Lassen Peak. In historic times, there are no records of significant ash falls, explosive effects, lava
   flows or mud flows reaching Butte County. Furthermore, impending volcanic eruptions generally
- give numerous advance warning signs and thus it is usually possible to evacuate residents in areas
- 8 subject to volcanic hazards (Butte County 2005).

### 9 6.3 Regulatory Setting

Appendix C, Regulatory Background, describes the state regulations, laws, and policies that pertain
 to geology, seismicity, soils, and mineral resources within the program area. Pertinent laws,
 regulations, and policies are listed below.

- 13 Federal:
- 14 O National Environmental Policy Act
- 15 State:
- 16 O California Environmental Quality Act
- 17 O California Seismic Hazards Mapping Act
- 18 O California Surface Mining and Reclamation Act
- 19 Local:
- 20 County grading and erosion control ordinances
- 21 O County general plans

### 22 6.4 Determination of Effects

This section lists the thresholds for significance under CEQA. In this joint federal and state EIS/EIR,

reference to "significant impacts" is made to fulfill the requirement under CEQA, pursuant to
 standards of California law, and requirements of NEPA (40 Code of Federal Regulations Section)

standards of California law, and requirements of NEPA (40 Code of Federal Regulations Section
 1502.16).

### 27 6.4.1 Assessment Methods

Evaluation of the geology, seismicity, soils, and mineral resources effects in this section is based on the information provided by technical maps, reports, and other documents that describe the geologic, seismic, soil, and mineral resource conditions of the program area. This information was

31 then compared to the type of proposed improvements to determine whether effects would occur.

### 32 6.4.2 Significance Criteria

Criteria for determining the significance of effects related to geology, soils, and mineral resources
 were developed based on the environmental checklist form in Appendix G of the State CEQA

1 2	Gu sei	idelines (14 California Code of Regulations 15000 et seq.). An effect related to geology, soils, smicity, and mineral resources was considered significant if it would:
3 4	•	Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
5 6 7 8		<ul> <li>rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the state geologist for the area or based on other substantial evidence of a known fault (refer to Division of Mines and Geology Special Publication 42);</li> </ul>
9		<ul> <li>strong seismic ground shaking;</li> </ul>
10		• seismic-related ground failure, including liquefaction; or
11		• landslides;
12	•	Result in substantial soil erosion or the loss of topsoil;
13 14 15	•	Be located on a geologic unit or soil that is unstable or that would become unstable as a result of the project and potentially result in an on-site or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse;
16 17	•	Be located on expansive soil, as defined in Table 18-1-B of the UBC (1994), creating substantial risks to life or property;
18 19	•	Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems in areas where sewers are not available for the disposal of wastewater;
20 21	•	Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state; or
22 23	•	Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan.

### 24 6.5 Effects and Mitigation Measures

See Chapter 4, Flood Control and Geomorphology, for additional effects that are closely related to
 geology and soils.

Additionally, landslides are not a concern in relation to the proposed program because the program area is relatively flat. The proposed improvements would not involve the construction of any structures intended for human occupancy or the construction or modification of any structure in an area subject to seismic ground shaking or seismic-related ground failure. Therefore, the proposed program of improvements would not expose people to potential substantial adverse effects, including the risk of loss, injury, or death, involving rupture of a known earthquake fault, strong

- 33 seismic ground shaking, seismic-related ground failure, or landslides.
- 34 All bank protection/levee construction or modification conducted as part of the proposed program
- of improvements would be designed based on the results of detailed geotechnical engineering
- 36 studies and would be required to comply with standard engineering practices for levee design. The
- 37 CVFPB standards are the primary state standards applicable to SRBPP levee improvements; these
- are stated in Title 23, Division 1, Article 8, Sections 111–137 of the California Code of Regulations. As

- 1 explained in Chapter 4, Flood Control and Geomorphology, the CVFPB standards direct that levee
- 2 design and construction be in accordance with the Corps' Engineering Design and Construction of
- 3 Levees, the primary federal standard applicable to levee improvements, and other applicable Corps
- 4 standards. Because the design and construction of flood control improvements and maintenance of
- 5 the facilities must comply with the regulatory standards of these agencies, it is assumed that the
- design and construction of all modifications to the flood control system under the proposed
   program would meet or exceed applicable design standards for static and dynamic stability,
- 8 expansive soils, secondary effects related to ground shaking, and seepage.
- Because the individual flood control projects would not involve the use of wastewater disposal
  systems of any kind, there would be no impact related to the ability of project site soils to support
  the use of septic systems. Therefore, these issues are not addressed further in this EIS/EIR. No
  indirect effects related to geology, soils, seismicity, and mineral resources have been identified in
  this analysis. The effects described below are all direct in nature.

### 14 6.5.1 Alternative 1—No Action

- Under Alternative 1, no construction-related effects involving direct ground-disturbing activities or
   changes to flood control facilities that could result in changes in geology, seismicity, soils, or mineral
   resources would occur. Therefore, there would be no effects on these resources attributable to
   implementation of Alternative 1.
- 19 Furthermore, the beneficial effects attributable to proposed program implementation, such as 20 improved bank stability and decrease of bank retreat, would not be realized under the Alternative 1 21 condition. Without proposed program improvements, the streambanks in the program area would 22 remain susceptible to bank failure, increasing the risk of levee failure and subsequent flooding in the 23 surrounding areas. A catastrophic levee failure would result in flooding and inundation that could 24 result in severe damage to local soils, result in the formation of scour holes, and produce eroded and 25 unstable landforms. However, given the uncertainty of the occurrence or magnitude of such an event 26 in the immediate future and the next 50 years, the effects cannot be quantified based on available 27 information.
- 28 Compliance with future vegetation management policy enforcement on the program area
- 29 streambanks would not have any noteworthy program area-wide effects on geology, seismicity,
- 30 soils, or mineral resources. However, local increases in velocity as a result of a decrease in bank
- 31 roughness associated with vegetation removal may occur. These local increases in velocity would
- 32 have the potential to exert greater forces on the streambanks in the downstream direction, locally
- 33 promoting streambank instability and possibly introducing excess sediment into the system.

### 34 **6.5.2** Alternative 2A—Low Maintenance

### 35 Effect GEO-1: Potential Adverse Effects Resulting from Surface Fault Rupture

- 36 There are no active faults or Alquist-Priolo Earthquake Fault Zones located in or immediately
- adjacent to the program area. Furthermore, the proposed program would not increase the present
- 38 risk of fault rupture in the program area. Therefore, there would be no effect.

#### 1 Effect GEO-2: Increase Exposure of People or Structures to Hazards Related to Strong Seismic 2 **Ground Shaking**

- 3 Although the risk of strong ground shaking in the program area is relatively low for California, a
- 4 large earthquake on a nearby fault could cause ground shaking in the program area that could result
- 5 in levee deformation, liquefaction, or secondary ground failure, such as lateral spreading or
- 6 differential settlement, which could result in structural loss, injury, and death.
- 7 Implementation of Alternative 2A would not substantially alter the overall composition of the levees 8 or foundation soils. The risk associated with levee deformation would occur only when river levels 9 were high and the potential for levee failure from ground shaking would depend on the degree of 10 the levee saturation during an earthquake. High water levels and a high level of saturation would 11 likely occur only during a major flood event. The probability that a large regional earthquake would 12 occur during a major flood event is relatively low, but such coincidence is not impossible.
- 13 Regardless, the purpose of the proposed program is to strengthen the levee against the threat of
- 14 erosion. As a result, the overall strength of the levee would be increased to some extent rather than
- 15 decreased. As a result, this effect is considered less than significant. No mitigation is required.

#### 16 Effect GEO-3: Potential Accelerated Erosion and Sedimentation Resulting from Construction-17 **Related Ground Disturbance**

- 18 The earthwork that would be required during construction of the various program improvements
- 19 could result in substantial ground and vegetation disturbance. These disturbances would increase 20 the hazard of erosion and could temporarily increase erosion, runoff, and sedimentation rates above
- 21 existing levels. Because most of the earthwork would be conducted on and immediately adjacent to
- 22 the program area streambanks, accelerated erosion, runoff, and sedimentation resulting from
- 23 construction-related ground and vegetation disturbance would not result in the loss of appreciable
- 24 quantities of topsoil resources. In addition, most ground-disturbing activities would occur during
- 25 the dry season, further reducing the potential for construction-related erosion.
- 26 Site-specific measures to control erosion would be included in the SWPPP, as described in Chapter 5, 27 Water Quality and Groundwater Resources, under Effect WO-1. The SWPPP is a requirement of the
- 28 National Pollutant Discharge Elimination System General Construction Permit.
- 29 Furthermore, compliance with the various county grading ordinances would minimize any negative 30 effects associated with erosion, runoff, and sedimentation.
- 31 Finally, consistent with Mitigation Measures WQ-MM-1 and WQ-MM-2 (see Chapter 5, Water Quality 32
- and Groundwater Resources) the program proponent or its contractor would monitor turbidity in
- 33 the program area waterways to determine whether turbidity is being affected by construction and
- 34 ensure that construction does not affect turbidity levels or acceptable sedimentation loads. These
- 35 actions would reduce erosion, runoff, and sediment-related effects to a level that is less than 36
- significant.

#### 37 Effect GEO-4: Loss of Significant Mineral Resources as a Result of Program Implementation

- 38 Construction of Alternative 2A would require large amounts of important mineral resources, such as
- 39 quarry stone and soil. The program area is located in the Central Valley region, where, although
- 40 there are numerous permitted mineral resource supplies, they do not exceed the projected need
- 41 over the next 50 years (Clinkenbeard 2012). However, there are substantial amounts of permitted

- 1 aggregate resources available to supply the project needs. For example, permitted resources are 392
- 2 million tons in the Yuba City-Marysville region, 128 million tons in the Sacramento-Fairfield region
- 3 (which includes Yolo County), and 42 million tons in Sacramento County (Clinkenbeard 2012). The
- 4 amount of quarry stone and soil needed for the proposed program is, therefore, not expected to
- 5 substantially affect the availability of these resources. Additionally, the proposed program would be 6 implemented only along leveed river banks—areas in which mineral resource recovery is already
- 6 implemented only along leveed river banks—areas in which mineral resource recovery is already
   7 prohibited because such activities would undermine the structural integrity of the SRFCP—which
- 8 are not considered existing mineral resource recovery sites. This effect would be less than
- 9 significant. No mitigation is required.

# 10**6.5.3Alternative 3A—Maximize Meander Zone**11(Environmentally Superior Alternative)

- 12 Effect GEO-1: Potential Adverse Effects Resulting from Surface Fault Rupture
- 13 Effects associated with Alternative 3A would be similar to those described under Alternative 2A.

## Effect GEO-2: Increase Exposure of People or Structures to Hazards Related to Strong Seismic Ground Shaking

16 Effects associated with Alternative 3A would be similar to those described under Alternative 2A.

## Effect GEO-3: Potential Accelerated Erosion and Sedimentation Resulting from Construction Related Ground Disturbance

- 19 Effects associated with Alternative 3A would be similar to those described under Alternative 2A.
- However, a setback levee would require more substantial soil disturbance. Nonetheless, the water
   quality environmental commitment and mitigation measures (described in Chapter 5, Water Quality
- 22 and Groundwater Resources) would apply and the effect would remain less than significant.

### 23 Effect GEO-4: Loss of Significant Mineral Resources as a Result of Program Implementation

24 Effects associated with Alternative 3A would be similar to those described under Alternative 2A.

## 25 6.5.4 Alternative 4A—Habitat Replacement (Preferred 26 Alternative)

### 27 Effect GEO-1: Potential Adverse Effects Resulting from Surface Fault Rupture

28 Effects associated with Alternative 4A would be similar to those described under Alternative 2A.

## 29 Effect GEO-2: Increase Exposure of People or Structures to Hazards Related to Strong Seismic 30 Ground Shaking

31 Effects associated with Alternative 4A would be similar to those described under Alternative 2A.

### Effect GEO-3: Potential Accelerated Erosion and Sedimentation Resulting from Construction Related Ground Disturbance

34 Effects associated with Alternative 4A would be similar to those described under Alternative 3A.

1	Effect GEO-4: Loss of Significant Mineral Resources as a Result of Program Implementation
2	Effects associated with Alternative 4A would be similar to those described under Alternative 2A.
3 4	6.5.5 Alternative 5A—Habitat Replacement Reaching Environmental Neutrality
5	Effect GEO-1: Potential Adverse Effects Resulting from Surface Fault Rupture
6	Effects associated with Alternative 5A would be similar to those described under Alternative 2A.
7 8	Effect GEO-2: Increase Exposure of People or Structures to Hazards Related to Strong Seismic Ground Shaking
9	Effects associated with Alternative 5A would be similar to those described under Alternative 2A.
10 11	Effect GEO-3: Potential Accelerated Erosion and Sedimentation Resulting from Construction- Related Ground Disturbance
12	Effects associated with Alternative 5A would be similar to those described under Alternative 3A.
13	Effect GEO-4: Loss of Significant Mineral Resources as a Result of Program Implementation
14	Effects associated with Alternative 5A would be similar to those described under Alternative 2A.
15 16	6.5.6 Alternative 6A—Habitat Replacement with Vegetation ETL Variance
17	Effect GEO-1: Potential Adverse Effects Resulting from Surface Fault Rupture
18	Effects associated with Alternative 6A would be similar to those described under Alternative 2A.
19 20	Effect GEO-2: Increase Exposure of People or Structures to Hazards Related to Strong Seismic Ground Shaking
21	Effects associated with Alternative 6A would be similar to those described under Alternative 2A.
22 23	Effect GEO-3: Potential Accelerated Erosion and Sedimentation Resulting from Construction- Related Ground Disturbance
24	Effects associated with Alternative 6A would be similar to those described under Alternative 3A.
25	Effect GEO-4: Loss of Significant Mineral Resources as a Result of Program Implementation

26 Effects associated with Alternative 6A would be similar to those described under Alternative 2A.

### **7.1 Introduction and Summary**

This chapter describes the environmental setting associated with transportation and navigation, the
determination of effects, the environmental effects on transportation systems that would result
from implementation of the proposed program, and the mitigation measures that would reduce
these effects.

#### 8 The key sources of data and information used in the preparation of this chapter are listed below.

9 • Butte County General Plan, 2010.

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- 10 Colusa County General Plan, 2011.
- 11 Glenn County General Plan, 1993.
- 12 Placer County General Plan, <u>19942013</u>.
- Sacramento County General Plan, 2011.
- Solano County General Plan, 2008.
- Sutter County General Plan Policy Document, 2011.
- Tehama County General Plan, 2009.
- 17 Yolo County General Plan, 2009.
- Yuba County General Plan, 2011.
- Table 7-1 summarizes the transportation, circulation and navigation effects resulting from theimplementation of the program alternatives.

#### 21 Table 7-1. Summary of Transportation, Circulation and Navigation Effects and Mitigation

Effect		Implementation Period
TN-1: Temporary Increase in Traffic Volumes from Construction- Generated Traffic and Potential Degradation of level-of-service (LOS) for Roadways in the Vicinity of the Program		Before and during construction
TN-2: Potential Increase in Safety Hazards Attributable to Construction-Generated Traffic	TN-MM-1: Implement a Traffic Control and Road Maintenance Plan	Before and during construction
TN-3: Increase Emergency Response Times	TN-MM-1: Implement a Traffic Control and Road Maintenance Plan	Before and during construction

Effect		Implementation Period
TN-4: Potential Inadequate Parking Supply to Meet Parking Demand for Construction Equipment and Construction Workers	None required	N/A
TN-5: Potential Conflict with Alternative Transportation Modes because of Temporary Road Closures	TN-MM-1: Implement a Traffic Control and Road Maintenance Plan	Before and during construction
TN-6: Temporary Changes to Navigation	None required	N/A
TN-7: Potential Rerouting of Roads	TN-MM-1: Implement a Traffic Control and Road Maintenance Plan	Before and during construction

### **7.2 Environmental Setting**

### 2 7.2.1 Existing Conditions

3 The highways and roads that would be used to transport materials, equipment, and personnel to the 4 erosion sites receive widely varying levels of traffic. Existing traffic volumes not only vary widely 5 among the road systems in the four regions <u>(the regions are shown in Figure 2-1)</u>, but they also vary 6 in accordance with time of day and season of the year. Some areas receive little traffic because they 7 are located on levee roads behind locked gates where public travel is restricted. Other areas are 8 located along highways that receive substantial use. Some levees are located closer to urban areas 9 and would require haul routes that include busy local roads. Other levees are located in sparsely 10 populated agricultural areas, and haul routes would use roads with lower existing traffic levels. Roadway capacities also vary widely, as they are decided by factors such as alignment, shoulder 11 12 width, passing sight distance, and the percentage of trucks, agricultural equipment, and other large 13 vehicles that uses the roadway system.

### 14 **7.2.1.1 Region 1**a

15 Levees in Region 1a are located in parts of Yolo, Sacramento, and Solano Counties. Roads adjacent to 16 the levees in this region are generally two-lane county roads, two-lane highways, or access roads, as 17 the levees are primarily located in parts of the above counties that do not yet have urban 18 development. The only city in Region 1a that is adjacent to a levee is the City of West Sacramento; 19 however, only South River Road provides access to the levees in this area. Highways adjacent to 20 levees in Region 1a, or that may be used as haul routes, include State Route (SR)12, SR 160, and SR 21 113, which are all two-lane highways. Interstate 5 (I-5) intersects two sections of the levees near the 22 city of Woodland, and I-80 intersects sections located from west of the City of Davis to the northern 23 side of the City of West Sacramento. I-5 is a four-lane highway in the areas where it intersects levees. 24 I-80 has six lanes where it intersects the levees east of Davis, and eight lanes where it intersects the 25 levees located west of Davis. Both I-5 and I-80 would be used as part of haul routes for the proposed 26 program, because they are key components of the region's transportation system. While it is not 27 currently known where specific project sites will be located, local roads that could provide hauling

- access to large sections of SRBPP levees in Region 1a include SR 84 (Jefferson Boulevard) and 1980
   Stat Boundary Road.
- 3 Navigation in Region 1a is primarily recreational, with areas in the southern part of the region
- 4 accessible to commercial ships using the Sacramento River Deep Water Ship Channel to access the
- 5 Port of West Sacramento, which is the farthest north commercial ships can reach within the region.
- 6 Parts of the waterways in the region are also accessed by construction barges. Under Section 10 of
- 7 the Rivers and Harbors Act, the Deep Water Ship Channel is considered a navigable water, as are
- 8 portions of the Sacramento River that lie within the region.

### 9 **7.2.1.2** Region 1b

10 Levees in Region 1b are located in parts of Sutter, Yolo, and Sacramento Counties. Roads adjacent to 11 the levees in the program area are generally two-lane county roads, two-lane highways, or access 12 roads; however, some city streets are adjacent to the levees as well, as the cities of Sacramento and 13 West Sacramento are within the region. Highways adjacent to the levees in Region 1b, or that may 14 be used as haul routes, include SR 160, SR 275, SR 99, and SR 70. SR 160 ranges from a two- to six-15 lane highway in areas near program reaches. SR 275 is a four-lane highway that runs from Highway 16 50 (US-50) to downtown Sacramento, and crosses the Sacramento River. SR 99 ranges from ten 17 lanes where it is merged with I-5, to four lanes where it crosses SRBPP levees in the northern part of 18 the region. SR 70 is a two-lane highway that runs parallel to the northernmost part of Region 1b 19 levees. I-5 and 80, as well as US-50, cross levee sections in the region. I-5 ranges from ten lanes to 20 four lanes in areas that are adjacent to, or perpendicular to, SRBPP levees. I-80 is a six-lane highway 21 where it crosses the Sacramento River. US-50 is an eight-lane highway where it crosses the 22 Sacramento River levees. I-5, I-80, and US-50 would be used as part of haul routes for the proposed 23 program, because they are key components of the region's transportation system. While it is not 24 currently known where specific project sites will be located, local roads that could provide hauling 25 access to large sections of SRBPP levees in Region 1b include Garden Highway, South River Road, 26 Old River Road, and Pacific Avenue.

- Navigation in Region 1b is primarily recreational, with most areas accessible by construction barges.
  The Sacramento River is considered a navigable water from its mouth through the extent of the
  program area. The American River is considered a navigable water from its confluence with the
  Sacramento River up to Bradshaw Avenue, which is near the eastern end of the SRBPP levees that lie
  along the American River. However, barge access along the American River is typically very limited
  due to shallow depths.
- The Sacramento International Airport is located near the northern part of Region 1b in Sacramento
   County, approximately 0.5 mile east of the Sacramento River. The Sacramento International Airport
   is the primary source of air travel in the Sacramento region.

### 36 7.2.1.3 Region 2

Levees in Region 2 are located in parts of Sutter, Colusa, Yuba, Glenn, and Butte Counties. Roads adjacent to the levees in the program area are generally two-lane county roads, two-lane highways, or access roads; however, some city streets are also adjacent to the levees. Highways adjacent to the levees in Region 2, or that may be used as haul routes, include SR 70, SR 65, SR 20, SR 99, SR 113, and SR 45. SR 70, SR 65, SR 113, and SR 45 are two-lane highways in areas where they run adjacent to or cross SRBPP levees. SR 20 ranges from a two-lane to a four-lane highway in the program area.

- 1 SR 99 ranges from a two-lane to a four-lane highway in the program area, and would also be used as
- 2 a haul route for construction equipment and materials. I-5 is not located adjacent to SRBPP levees in
- 3 Region 2 but could be used as a haul route. While it is not currently known where specific project
- sites will be located, local roads that could provide hauling access to large sections of SRBPP levees
   in Region 2 include Garden Highway, Jackson Road, Live Oak Boulevard, Lower Honcut Road, Colusa
- in Region 2 include Garden Highway, Jackson Road, Live Oak Boulevard, Lower Honcut Road, Colusa
   County Highway, Traynham Road, Cranmore Road, Wilson Bend Road, South Meridian Road, and
- 7 Butte Slough Road.
- 8 Navigation in Region 2 is primarily recreational, with some areas accessible to construction barges
- 9 depending on seasonal flows. The Sacramento River is considered a navigable water from its mouth 10 through the extent of the program area. The Feather River is considered a navigable water from its
- 10 through the extent of the program area. The Feather River is considered a navigable wate 11 confluence with the Sacramento River to the railroad bridge that crosses it in Marysville.

### 12 **7.2.1.4 Region 3**

13 Levees in Region 3 are located in parts of Colusa, Glenn, Butte, and Tehama Counties. Roads adjacent 14 to the levees in the program area are primarily two-lane county roads, two-lane highways, or access 15 roads. Highways adjacent to the levees in Region 3, or that may be used as haul routes, include 16 SR 45, SR 162, SR 32, SR 99, and SR 99W. SR 45, SR 162, SR 32, and SR 99W are two-lane highways 17 in areas where they run adjacent to or cross SRBPP levees. SR 99 is a four-lane highway where it 18 crosses SRBPP levees, and would also be used as a haul route for construction equipment and 19 materials. I-5 is not located adjacent to SRBPP levees in Region 3 but could be used as a haul route. 20 While it is not currently known where specific project sites will be located, local roads that could 21 provide hauling access to large sections of SRBPP levees in Region 3 include River Road and Ord 22 Ferry Road.

Navigation in Region 3 is primarily recreational. Seasonal flows limit navigation in the region;
 however, some areas may be accessible by construction barge depending on water levels. The
 portions of the Sacramento River that lie within Region 3 are considered navigable waters.

### 26 7.3 Regulatory Setting

Appendix C, *Regulatory Background*, describes the federal, state, and local laws, regulations, and
 policies that pertain to transportation and navigation within the program area. The pertinent laws,
 regulations, and policies are listed below.

- 30 Federal:
- 31 O National Environmental Policy Act
- 32 O River and Harbors Appropriation Act of 1899
- **3**3 State:

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- California Environmental Quality Act
- 35 California Department of Transportation standards
- 36 Local:
- 37 O Butte County General Plan

1	0	Colusa County General Plan
2	0	Glenn County General Plan
3	0	Placer County General Plan
4	0	Sacramento County General Plan
5	0	Sutter County General Plan
6	0	Tehama County General Plan
7	0	Yolo County General Plan
8	0	Yuba County General Plan

### 9 7.4 Determination of Effects

10 This section describes the analysis of effects relating to transportation and navigation for the 11 proposed program. It describes the methods used to determine the effects of the proposed program 12 and lists the thresholds used to conclude whether an effect would be significant. Measures to 13 mitigate (i.e., avoid, minimize, rectify, reduce, eliminate, or compensate for) significant effects 14 accompany the discussion of each effect. How effects differ among reaches is discussed as applicable.

### 15 **7.4.1** Assessment Methods

16 The proposed program comprises the construction of levee improvements along multiple separate 17 reaches throughout Regions 1a, 1b, 2, and 3. Because of the earthwork involved and the need for 18 materials deliveries, construction would intermittently generate substantial volumes of traffic. Once 19 the construction is completed, maintenance needs would be very limited. Analysis of traffic effects, 20 therefore, concentrates on the construction of levee improvements.

For the purposes of analysis, the effects of these proposed program activities were divided into two impact mechanism categories: (1) truck and worker trip effects on roadway operation and circulation, and (2) temporary partial obstructions in navigable waterways from barge trips and waterside levee construction activities.

- 25 Because of uncertainties of erosion site location from year to year, the uncertain timing and extent 26 of linear footage of work to be constructed, and the short-term duration of construction at any 27
- particular site, no quantitative level of service analysis was performed. Quantitative information
  (truck trips, treatment location, and number of workers) will be developed at a project-level as
- 29 individual projects are proposed and analyzed.

### 30 7.4.2 Significance Criteria

For this analysis, a transportation effect was considered significant if it would result in any of the following outcomes, which are based on professional practice, State CEQA Guidelines Appendix G, and general plan policies of the counties involved:

cause an increase in traffic that is substantial in relation to the existing traffic load and capacity
 of the street system (i.e., result in a substantial increase in the number of vehicle trips, the
 volume to capacity ratio on roads, or congestion at intersections);

1 • cause, either individually or cumulatively, exceedance of a level-of-service (LOS) standard 2 established by the counties and/or Caltrans for designated roads or highways; 3 substantially alter present patterns of circulation or movement; • 4 substantially increase hazards because of a design feature (e.g., sharp curves or dangerous • 5 intersections) or incompatible uses (e.g., slow-moving vehicles); 6 result in inadequate emergency access; • 7 result in inadequate parking capacity; ٠ 8 conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., 9 bus turnouts, bicycle racks); or 10 substantially impede navigation of watercraft as a result of the staging of barges within • navigable sections of the surrounding waterways. 11 12 Although some of the proposed levee improvements would take place near the Sacramento 13 International Airport, the proposed improvements in these areas would be restricted to levee 14 improvements and related construction activity, and implementation of the proposed program 15 would not alter traffic patterns or result in substantial safety risks associated with airport operations. Effects on air transportation and circulation are not addressed further in this chapter. 16

### **7.5 Effects and Mitigation Measures**

### 18 **7.5.1** Alternative 1—No Action

19 Under the No Action Alternative, there would be no change in the characteristics of the regional 20 transportation system, local roadways, or navigation in and around the program area as a result of 21 this proposed program. It is likely that the levee roads and other roads in the program area would 22 continue to be maintained by the various cities, counties, and state agencies responsible for roads 23 adjacent to SRBPP levees. No road modifications, including the raising and building of new roads, 24 would result as part of the proposed program, and navigation would not change under the No Action 25 Alternative. However, if the levees are not fixed, it is possible that breaching could occur, which 26 could severely damage or destroy roadways near the levees and cause inundation of nearby 27 roadways. This type of levee failure could potentially result in a significant effect on traffic and 28 circulation, and limit the transport of people and goods through the program area.

### 29 **7.5.2** Alternative 2A—Low Maintenance

## Effect TN-1: Temporary Increase in Traffic Volumes from Construction-Generated Traffic and Potential Degradation of LOS for Roadways in the Vicinity of the Program

Implementation of Alternative 2A would require hauling of construction equipment and materials
 along highways and local roads that provide access to SRBPP levees. The construction schedule,
 exact treatment location, number of required workers, and number of trucks have not been
 determined at this time. The roadways used by construction traffic would vary, depending on the
 specific construction site. Nonetheless, the trucks and workers required would temporarily increase

37 the daily and peak hour traffic along specified routes and could potentially worsen the traffic

1 operation along these roadways, particularly if numerous trips are made during the morning or

afternoon peak traffic periods. Traffic levels would return to normal levels once construction is
 completed. However, this effect would still be considered significant during construction.

Implementation of Mitigation Measure TN-MM-1 would reduce this effect to less than significant.

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#### Mitigation Measure TN-MM-1: Implement a Traffic Control and Road Maintenance Plan

6 A traffic control plan describes the methods of traffic control to be used during construction. All 7 on-street construction traffic will be required to comply with the local jurisdiction's standard 8 construction specifications. The plan will minimize the effects of construction on the roadway 9 system in the program area throughout the construction period. Construction contractors will 10 follow the standard construction specifications of affected jurisdictions and obtain the 11 appropriate encroachment permits, if required. The conditions of the encroachment permit will 12 be incorporated into the construction contract and the permit will be enforced by the issuing 13 agency.

14 Proposed lane closures during the morning and evening commuting hours will be coordinated 15 with the appropriate jurisdiction and minimized during the morning and evening peak traffic periods. Standard construction specifications also typically limit lane closures during 16 17 commuting hours. Lane closures will be kept as short as possible. If a road must be closed, 18 detour routes and/or temporary roads will be made to accommodate traffic flows. Detour signs 19 will be provided to direct traffic through detours. Advance notice signs of upcoming 20 construction activities will be posted at least 1 week in advance so that motorists are able to 21 avoid traveling through the program area during these times.

- Safe pedestrian and bicyclist access, if any exists on the current roadway, will be maintained in
   or around the construction areas, to the extent feasible. Construction areas will be secured as
   required by the applicable jurisdiction to prevent pedestrians and bicyclists from entering the
   work site, and all stationary equipment will be located as far away as possible from areas where
   bicyclists and pedestrians are present.
- The construction contractor will notify and consult with emergency service providers to
   maintain emergency access and facilitate the passage of emergency vehicles on city streets.
- The construction contractor will provide adequate parking for construction trucks, equipment,
   and construction workers within the designated staging areas throughout the construction
   period. If inadequate space for parking is available at a given work site, the construction
   contractor will provide an off-site staging area and, as needed, coordinate the daily transport of
   construction vehicles, equipment, and personnel to and from the work site.
- The construction contractor will assess damage to roadways used during construction and will
   repair all potholes, fractures, and other damages.

## Effect TN-2: Potential Increase in Safety Hazards Attributable to Construction-Generated Traffic

- 38 The maneuvering of construction-related vehicles and equipment among the general purpose traffic
- 39 on local roads could cause safety hazards. However, implementation of Mitigation Measure TN-MM-
- 40 1 would minimize construction-related traffic hazards, and would reduce this effect to less than
- 41 significant.

#### 1 Effect TN-3: Increase Emergency Response Times

- 2 Emergency access to the program area could be affected by construction of the proposed program,
- 3 and construction-related traffic could delay or obstruct the movement of emergency vehicles.
- However, implementation of Mitigation Measure TN-MM-1 would minimize construction-related
   traffic hazards, and would reduce this effect to less than significant.

### 6 Effect TN-4: Potential Inadequate Parking Supply to Meet Parking Demand for Construction 7 Equipment and Construction Workers

A parking area for construction workers and trucks would be provided at staging areas adjacent to a
work site or areas within the levee right-of-way; therefore, there would be no effect related to
inadequate parking.

### Effect TN-5: Potential Conflict with Alternative Transportation Modes because of Temporary Road Closures

13 Although most of the construction of the proposed program would take place within the SRBPP

14 right-of-way, temporary road closures might be needed in some areas, which could interfere with

15 transit services or bicycle travel along these roads. However, implementation of Mitigation Measure

- 16 TN-MM-1 would minimize construction-related traffic hazards, and would reduce this effect to less
- 17 than significant.

### 18 Effect TN-6: Temporary Changes to Navigation

- 19 Implementation of this alternative could require in-water work that could cause temporary 20 reduction in navigability in waters within the program area. Construction barges may be used for 21 the hauling and placing of rock slope protection, which would decrease available space for 22 navigation along the various water bodies within the program area. Water body widths vary greatly 23 throughout the program area, and because construction locations have not yet been determined, it is 24 not definitively known whether the use of barges would obstruct navigation within the program 25 area. For example, areas such as the Sacramento River in the southern portion of the program area 26 are wide enough to accommodate barges without impeding navigation. Other areas involving levees 27 in the northern sections of the program area would only impede recreational watercraft because the 28 waterways in this area cannot accommodate commercial vessels.
- 29 Although navigation may slow on water bodies within the program area during in-water work, 30 construction activities would never completely obstruct navigation, and commercial vessels and 31 recreational watercraft would have the ability to move around the barges. Additionally, to minimize 32 construction-related effects on navigation and increase safety along program waterways, warning 33 signs and buoys would be posted at, upstream of, and downstream of all construction equipment, 34 sites, and activities by the Corps' contractor in accordance with the Federal Regulations Concerning 35 Private Aids to Navigation (33 CFR Section 86). Navigation would return to normal following 36 completion of in-water work.
- This effect is considered less than significant because in-water construction would not substantially
   impede navigation of watercraft as a result of the staging of barges within navigable sections of the
   surrounding waterways, and implementation of appropriate warning signs and buoys would
- 40 minimize effects on navigation and increase safety along program waterways.

# 1**7.5.3**Alternative 3A—Maximize Meander Zone2(Environmentally Superior Alternative)

3 Effects associated with Alternative 3A would be comparable in type, but of a greater magnitude, to 4 those described above for Alternative 2A. The setback levee and adjacent levee treatments would 5 involve additional construction equipment and vehicles, as well as increased hauling of materials. 6 This increase in trips and vehicles could reduce LOS on local transportation systems even lower 7 than Alternative 2A, although the effects involved would be temporary as they would only occur 8 during construction. Effects TN-1 through TN-6 would apply to Alternative 3A; however, as 9 explained above under Alternative 2A, only Effects TN-1, TN-2, TN-3, and TN-5 would be considered 10 potentially significant. Implementation of Mitigation Measure TN-MM-1 described above, would aid 11 traffic circulation and navigation during the construction period, and would reduce these effects to 12 less than significant. Additionally, habitat expansion is an important consideration near the 13 Sacramento International Airport. However, because of the ongoing and proposed type of flood 14 control work to be completed under the Natomas Landside Improvement Project, as well as the 15 application of adjacent levee bank protection measures within the vicinity of the airport under this 16 alternative (Table 2-2), there would not be an expansion of habitat attracting wildlife. The flood 17 control work in the vicinity of the airport, including the proposed program, would preserve and/or 18 replace existing habitat rather than substantially increase habitat.

#### 19 Effect TN-7: Potential Rerouting of Roads

20 Implementation of a combination of setback levees and adjacent levees under Alternative 3A would 21 require extensive earthmoving that would potentially include existing levee material. In many parts 22 of the program area, roads run on top of the levee crown or adjacent to it. Construction of a setback 23 levee or adjacent levee may necessitate the removal of these roads. Additionally, in the case of the 24 setback levees, some roads may end up within the floodplain created between the new levee and the 25 old one. These roads may need to be removed as well. Roads to be removed or that would no longer 26 be accessible would be reconstructed outside of the floodplain, and would maintain the routing and 27 circulation capacity of the original roads following construction completion. While some roads 28 would not be removed until new roadways are completed in order to maintain circulation, in some 29 cases it may be necessary to remove roads before or during construction of the setback levee so the 30 existing levee can be used as a borrow site, which would reduce hauling trips but would also reduce 31 circulation. Therefore, this effect is considered potentially significant. Implementation of Mitigation 32 Measure TN-MM-1 would reduce this effect to less than significant, because detour routes would be 33 provided as part of the mitigation measure.

# 34 7.5.4 Alternative 4A—Habitat Replacement (Preferred 35 Alternative)

Effects associated with Alternative 4A would be comparable in type, but of a lesser magnitude, to
those described above for Alternative 3A, but greater than those described under Alternative 2A.
The setback levee and adjacent levee treatments would involve additional construction equipment
and vehicles, as well as increased hauling of materials compared with Alternative 2A. However,
there would be fewer setback levees and adjacent levees constructed under Alternative 4A than
there would be under Alternative 3A, and, therefore, the extent of the effects related to increases in
truck trips and vehicles would not be as great. These effects would be temporary as they would only

occur during construction. Effects TN-1 through TN-7 would apply to Alternative 4A; however, only
 Effects TN-1, TN-2, TN-3, TN-5, and TN-7 would be considered potentially significant, as explained
 above under Alternative 2A (for Effects TN-1 through TN-6) and Alternative 3A (for Effect TN-7).
 Implementation of Mitigation Measure TN-MM-1 described above under Alternative 2A would aid
 traffic circulation and navigation during the construction period, and would reduce these effects to
 less than significant.

# 7 7.5.5 Alternative 5A—Habitat Replacement Reaching 8 Environmental Neutrality

9 Effects associated with Alternative 5A would be comparable in type, but of a lesser magnitude, to 10 those described above for Alternative 3A, but greater than those described under Alternative 2A. 11 The setback levee and adjacent levee treatments would involve additional construction equipment 12 and vehicles, as well as increased hauling of materials compared with Alternative 2A. However, 13 there would be fewer setback levees and adjacent levees constructed under Alternative 5A than 14 there would be under Alternative 3A, and, therefore, the extent of the effects related to increases in 15 truck trips and vehicles would not be as great. These effects would be temporary as they would only 16 occur during construction. Effects TN-1 through TN-7 would apply to Alternative 5A; however, only 17 Effects TN-1, TN-2, TN-3, TN-5, and TN-7 would be considered potentially significant, as explained 18 above under Alternative 2A (for Effects TN-1 through TN-6) and Alternative 3A (for Effect TN-7). 19 Implementation of Mitigation Measure TN-MM-1 described above under Alternative 2A would aid 20 traffic circulation and navigation during the construction period, and would reduce these effects to 21 less than significant.

# 7.5.6 Alternative 6A—Habitat Replacement with Vegetation ETL Variance

24 Effects associated with Alternative 6A would be comparable in type, but of a lesser magnitude, to 25 those described above for Alternative 3A, but greater than those described under Alternative 2A. 26 The setback levee treatment would involve additional construction equipment and vehicles, as well 27 as increased hauling of materials compared with Alternative 2A. However, there would be fewer 28 setback levees constructed under Alternative 6A than there would be under Alternative 3A, and, 29 therefore, the extent of the effects related to increases in truck trips and vehicles would not be as 30 great. These effects would be temporary as they would only occur during construction. Effects TN-1 31 through TN-7 would apply to Alternative 6A; however, only Effects TN-1, TN-2, TN-3, TN-5, and 32 TN-7 would be considered potentially significant, as explained above under Alternative 2A (for 33 Effects TN-1 through TN-6) and Alternative 3A (for Effect TN-7). Implementation of Mitigation 34 Measure TN-MM-1 described above under Alternative 2A would aid traffic circulation and

35 navigation during the construction period, and would reduce these effects to less than significant.

### **8.1 Introduction and Summary**

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This chapter describes the environmental setting associated with air quality and climate change, the
determination of environmental effects on air quality and climate change that would result from
implementation of the proposed program, and the mitigation measures that would reduce these
effects.

8 The key sources of data and information used in the preparation of this chapter are listed below.

- Indirect Source Review Guidelines (Feather River Air Quality Management District 2010).
  - Air Resources Board (ARB) Air Quality Databases: Aerometric Data Analysis and Management System (ADAM) (California Air Resources Board 2012a2016a).
- Area Designation Maps/State and National (California Air Resources Board 2012b2016b).
- Bay Area Air Quality Management District CEQA Guidelines (Bay Area Air Quality Management District 2012).
- CEQA Air Quality Handbook: Guidelines for Assessing Air Quality Impacts for Projects Subject to CEQA Review (Butte County Air Quality Management District 2008).
  - Guide to Assessing Air Quality in Sacramento County (Sacramento Metropolitan Air Quality Management District <u>20112016</u>).
  - Green Book (U.S. Environmental Protection Agency 2012a2016a).
- Handbook for Assessing and Mitigating Air Quality Impact (Yolo-Solano Air Quality Management District 2007).
- Table 8-1 summarizes the air quality and climate change effects resulting from the implementationof the program alternatives.
- 24 Table 8-1. Summary of Air Quality and Climate Change Effects and Mitigation

Effect	Mitigation Measures	Implementation Period
AQ-1: Generation of Direct and Indirect Construction Emissions in Excess of Federal <i>de minimis</i> Threshold Levels	AQ-MM-1a: Apply Applicable Air District's Mitigation Measures to Reduce Construction Emissions below <i>de minimis</i> Threshold Levels	Before and during construction
	AQ-MM-1b: Offset Construction- Generated NO <sub>x</sub> Emissions to Net Zero (0) for <u>ROG</u> , NO <sub>x</sub> , <u>PM10</u> , and <u>PM2.5</u> Emissions in Excess of <i>de minimis</i> Thresholds	

Effect	Mitigation Measures	Implementation Period
AQ-2: Generation of Direct and Indirect Operational Emissions in Excess of Federal <i>de minimis</i> Threshold Levels	AQ-MM-2: Apply Applicable Air District's Mitigation Measures to Reduce Operational Emissions below Federal <i>de minimis</i> Thresholds	During post-project operational activities
AQ-3: Temporary Increase in Construction-Related Emissions in Excess of Applicable Standards	AQ-MM-3: Apply Applicable Air District's Mitigation Measures to Reduce Construction Emissions below Applicable Air District's Thresholds	Before and during construction
AQ-4: Elevated Health Risks from the Exposure of Nearby Sensitive Receptors to Construction- Related HAPs/TACs	AQ-MM-4: Apply Applicable Air District's Mitigation Measures to Reduce HAP/TAC Emissions below the Applicable Air District's HAP/TAC Thresholds	Before and during construction
AQ-5: Generation of Operational Emissions in Excess of Applicable Standards	AQ-MM-5: Apply Applicable Air District's Mitigation Measures to Reduce Operational Emissions below Applicable Air District's Thresholds	During post-project operational activities
AQ-6: Generation of Construction GHG Emissions that May Have a Significant Impact on the Environment	AQ-MM-6: Implement Measures to Minimize GHG Emissions from Construction Activities	Before and during construction
AQ-7: Generation of Operational GHG Emissions that May Have a Significant Impact on the Environment	AQ-MM-6: Implement Measures to Minimize GHG Emissions from Construction Activities	During post-project operational activities

### **8.2 Environmental Setting**

### 2 8.2.1 Existing Conditions

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The program area is located along the Sacramento River and its tributaries and spans Butte, Colusa,
Glenn, Placer, Sacramento, Solano, Sutter, Tehama, Yolo, and Yuba Counties. These counties (or
portions of some counties) fall under jurisdiction of the following air districts.

- Bay Area Air Quality Management District (BAAQMD): The portion of Solano County west of the Coast Ranges.
- Butte County Air Quality Management District (BCAQMD): Butte County.
- Colusa County Air Pollution Control District (CCAPCD): Colusa County.
- 10 Feather River Air Quality Management District (FRAQMD): Sutter and Yuba Counties.
- 11 Glenn County Air Pollution Control District (GCAPCD): Glenn County.
- 12 Placer County Air Pollution Control District (PCAPCD): Placer County.
- Sacramento Metropolitan Air Quality Management District (SMAQMD): Sacramento County.

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- Tehama County Air Pollution Control District (TCAPCD): Tehama County.
- Yolo-Solano Air Quality Management District (YSAQMD): Yolo County and the portion of Solano County east of the Coast Ranges.
- 4 In addition, these air districts are divided into two air basins, which are discussed in more detail below.
- 5 All of the air districts, except for the BAAQMD, are located within the Sacramento Valley Air Basin
- 6 (SVAB). The BAAQMD shares its boundaries with the San Francisco Bay Area Air Basin (SFBAAB).

### 7 8.2.1.1 Regional Climate and Meteorology

8 Although the primary factors that determine air quality are the locations of air pollutant sources and 9 the amount of pollutants emitted from those sources, meteorological conditions and topography are 10 also important factors—atmospheric conditions, such as wind speed, wind direction, and air 11 temperature gradients, interact with the physical features of the landscape to determine the movement 12 and dispersal of air pollutants. A large majority of construction at the identified erosion sites would 13 occur within the SVAB, and a very small portion of construction would occur in the SFBAAB.

### 14 Sacramento Valley Air Basin

15 The SVAB is surrounded by the Coast Ranges on the west and by the Sierra Nevada range on the east.

- The Carquinez Strait is a sea-level gap in the Coast Ranges located approximately 50 miles southwest
   of Sacramento. Marine breezes through the Carquinez Strait result in a predominantly southwesterly
   wind direction in the SVAB. Sea breezes lessen in the winter, and northerly winds occur more
- 19 frequently, but southerly winds are still predominant (Parus Consulting and Avres Associates 2008).
- Storms are diverted north, away from California, during the spring, summer, and early fall by a
  comparatively stable high pressure weather system off the coast. During this time, there are
- frequent subsidence inversions (warm air over cooler air) in the region. Subsidence inversions, along with strong sunlight, combine to produce smog, of which ozone is the main component. In
- along with strong sunlight, combine to produce smog, of which ozone is the main component. In
   addition to this high-pressure zone, a thermal trough is frequently positioned over the Central
- 25 Valley. A thermal trough is a low-pressure zone caused by intense surface heating. The relative
- 26 positions of the pressure zones help increase the movement of cool ocean air through the Carquinez
- 27 Strait into the Sacramento Valley. This helps cool the region, but it also carries pollutants from
- 28 upwind sources (Parus Consulting and Ayres Associates 2008). During the summertime (July), the
- average high temperature in the region is 94°F, and the average low temperature is 61°F. The
- 30 average high precipitation during this period is 0.05 inches (The Weather Channel 2009a).
- The position of the summertime high-pressure system shifts to the south during the late fall, winter,
   and early spring, which allows storm fronts to move through the region. These storms account for a
- large majority of precipitation in the region (Parus Consulting and Ayres Associates 2008).
- 34 Wintertime (January) average precipitation in the SVAB is 4.18 inches. Average wintertime
- temperatures range from a low of 41°F to a high of 55°F (The Weather Channel 2009a). Periods of
- 36 stagnation occur between storms. During these periods, there are very light winds, which allow
- 37 surface inversions to form (Parus Consulting and Ayres Associates 2008).

### 38 San Francisco Bay Area Air Basin

Bay area topography consists of coastal mountain ranges, inland valleys, and bays. The parts of the
 program area in the SFBAAB are in Solano County. It is in the Carquinez Strait subregion of the

41 SFBAAB (Bay Area Air Quality Management District 2012).

- 1 The Carquinez Strait is the only sea-level gap between the San Francisco Bay and the Central Valley.
- 2 Prevailing winds originate from the west, particularly during the summer and fall months high
- 3 offshore pressure, combined with low pressure in the Central Valley, cause marine air to flow
- 4 eastward through the Carquinez Strait. Winds are strongest in the afternoon, and afternoon wind
- 5 speeds of 15 to 20 mph are common throughout the region. Annual average wind speeds range from
- 8 mph in Martinez to 10 mph further east. During the summer and fall months, this can cause
  elevated pollutant levels to move into the central Bay Area. These high-pressure periods are usually
- 8 accompanied by low wind speeds, shallow mixing depths, higher temperatures, and little or no
- 9 rainfall. (Bay Area Air Quality Management District 2012).
- Annual average wintertime (January) temperatures in the Carquinez Strait region range from a low of 39°F to a high of 54°F, and the average precipitation is 4.25 inches. Annual average summertime
- 12 (July) temperatures in the region range from a low of 55°F to a high of 87°F, and the average
- 13 precipitation is 0.02 inches (The Weather Channel 2009b).

### 14 8.2.1.2 Criteria Pollutants

15 The federal and state governments have established ambient air quality standards for the following six criteria pollutants: ozone, CO, NO<sub>2</sub>, SO<sub>2</sub>, particulate matter (particulate matter smaller than 10 16 17 microns or less in diameter [PM10] and particulate matter smaller than 2.5 microns or less in 18 diameter [PM2.5]), and lead. Ozone, NO<sub>2</sub>, and particulate matter are generally considered to be 19 "regional" pollutants, as these pollutants or their precursors affect air quality on a regional scale. 20 Pollutants such as CO, SO<sub>2</sub>, lead, and particulate matter are considered to be local pollutants that 21 tend to accumulate in the air locally. Particulate matter is considered to be a localized pollutant as 22 well as a regional pollutant. Within the program area, ozone, PM10, and PM2.5 are considered 23 pollutants of concern. TACs are also discussed below, although no state or federal ambient air 24 quality standards exist for these pollutants. Brief descriptions of these pollutants are provided below, and a complete summary of California and national ambient air quality standards (CAAQS 25 26 and NAAQS, respectively) is provided in Table 8-2.

### 27 **Ozone**

- Ozone is a respiratory irritant that increases susceptibility to respiratory infections. It is also an
   oxidant that can cause substantial damage to vegetation and other materials.
- Ozone is not emitted directly into the air but is formed by a photochemical reaction in the atmosphere.
   Ozone precursors (reactive organic gases [ROG] and nitrogen oxides [NO<sub>X</sub>]) react in the atmosphere in
   the presence of sunlight to form ozone. Because photochemical reaction rates depend on the intensity
- of ultraviolet light and air temperature, ozone is primarily a summer air pollution problem.
- 34 State and federal standards for ozone have been set for 1- and 8-hour averaging times. The state 1-
- 35 hour ozone standard is 0.09 parts per million (ppm), not to be exceeded. The Environmental
- 36 Protection Agency (EPA) in 200<u>85</u> replaced the 1-hour ozone standard with an 8-hour standard of
- 37 0.07<del>5</del>0 ppm. However, the California 1-hour standard will remain in effect. The state 8-hour
- 38 standard is <u>also</u> 0.070 ppm, not to be exceeded.

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

#### 1 Table 8-2. National and California Ambient Air Quality Standards

			Standard	d (ppm)	Standard (µg/m <sup>3</sup> )		California	National
Pollutant	Symbol	Average Time	California	National	California	National		Violation Criteria
Ozone	03	1 hour	0.09	-	180	-	If exceeded	-
		8 hours	0.070	0.07 <u>0</u> 5	137	1 <u>3</u> 47	If exceeded	If fourth-highest 8-hour concentration in a year, averaged over 3 years, is exceeded at each monitor in an area
Carbon	CO	8 hours	9.0	9	10,000	10,000	If exceeded	If exceeded on more than 1 day per year
monoxide		1 hour	20	35	23,000	40,000	If exceeded	If exceeded on more than 1 day per year
Inhalable particulate	PM10	Annual arithmetic mean	-	_	20	-	If exceeded	-
matter		24 hours	_	-	50	150	If exceeded	If the expected number of days per calendar year with a 24-hour average concentration above $150 \ \mu g/m^3$ is equal to or less than one.
	PM2.5	Annual arithmetic mean	-	-	12	1 <u>2.0</u> 5	If exceeded	If 3-year average from single or multiple community-oriented monitors is exceeded
		24 hours	-	-	-	35	-	If 3-year average of 98 <sup>th</sup> percentile at each population-oriented monitor in an area is exceeded
Nitrogen dioxide	NO <sub>2</sub>	Annual arithmetic mean	0.030	0.053	57	100	If exceeded	If exceeded
		1 hour	0.18	0.100	339	188	If exceeded	If exceeded on more than 1 day per year
Sulfur dioxide	SO <sub>2</sub>	Annual arithmetic mean	-	0.030**	-	- <u>80</u>	-	If exceeded
		24 hours	0.04	0. <del>0</del> 14**	105	- <u>365</u>	If exceeded	If exceeded on more than 1 day per year
		3 hour	<u>-0.50*</u>	<u>0.50</u> –	<u>-1,300</u> *	<u>1,300-*</u>	-	-
		1 hour	0.25	0.075	655	196	If exceeded	If 3-year average of the annual 99th percentile of 1-hour daily maximum concentration exceed.
Lead particles	Pb	Calendar quarter	-	_	-	1.5**	-	If exceeded no more than 1 day per year
		30-day average	-	_	1.5	_	If equaled or exceeded	-
		Rolling 3-month average	-	-	-	0.15		Averaged over a rolling 3-month period

Source: California Air Resources Board 2012c2016c.

\* = secondary standard; \*\* = for certain areas; ppm = parts per million;  $\mu g/m^3$  = micrograms per cubic meter.

#### 1 Carbon Monoxide

- CO is a public health concern because it combines readily with hemoglobin and reduces the amount
   of oxygen transported in the bloodstream. CO can cause health problems such as fatigue, headache,
   confusion, dizziness, and even death.
- 5 Motor vehicles are the dominant source of CO emissions in most areas. High CO levels develop
- 6 primarily during winter when periods of light winds combine with the formation of ground-level
- 7 temperature inversions (typically from the evening through early morning). These conditions result
- 8 in reduced dispersion of vehicle emissions. Motor vehicles also exhibit increased CO emission rates
- 9 at low air temperatures.
- 10 State and federal CO standards have been set for 1- and 8-hour averaging times. The state 1-hour 11 standard is 20 ppm, not to be exceeded, whereas the federal 1-hour standard is 35 ppm, not to be
- 12 exceeded more than 1 day per year. The state 8-hour standard is 9.0 ppm, while the federal standard
- 13 is 9 ppm. This means that a monitored 8-hour CO concentration from 9.1 to 9.4 ppm violates the
- 14 state but not the federal standard.

### 15 Inhalable Particulates

- Particulates can damage human health and retard plant growth. Health concerns associated with
  suspended particulate matter focus on those particles small enough to reach the lungs when inhaled.
  Particulates also reduce visibility and corrode materials. Particulate emissions are generated by a
  wide variety of sources, including agricultural activities, industrial operations, vehicles (e.g., dust
  suspended by vehicle traffic and construction equipment), and secondary aerosols (formed by
  reactions in the atmosphere).
- The federal and state ambient air quality standard for particulate matter applies to two classes of
  particulates: PM10 and PM2.5. The state PM10 standards are 50 µg/m<sup>3</sup> as a 24-hour average and 20
  µg/m<sup>3</sup> as an annual arithmetic mean. The federal PM10 standard is 150 µg/m<sup>3</sup> as a 24-hour average.
  For PM2.5, the state has adopted a standard of 12 µg/m<sup>3</sup> for the annual arithmetic mean. The federal
  PM2.5 standards are 35 µg/m<sup>3</sup> for the 24-hour average and 152.0 µg/m<sup>3</sup> for the annual arithmetic
  mean.

#### 28 Nitrogen Dioxide

- Nitrogen oxides (NO<sub>x</sub>) are a family of highly reactive gases that are primary precursors to the
  formation of ground-level ozone, reacting in the atmosphere to form acid rain. NO<sub>x</sub>, a mixture of NO
  and NO<sub>2</sub>, are produced from natural sources, motor vehicles, and other fuel combustion processes.
  NO is colorless and odorless and is in the atmosphere to form NO<sub>2</sub>. NO<sub>2</sub> is an odorous, brown, acidic,
  highly corrosive gas that can affect human health and environment. s-NO<sub>x</sub> are critical components of
  photochemical smog. NO<sub>2</sub> produces the yellowish-brown color of the smog.
- NO<sub>X</sub> can irritate the lungs, cause lung damage, and lower resistance to respiratory infections such as
   influenza. The effects of short-term exposure are still unclear, but continued or frequent exposure to
   concentrations that are typically much higher than those normally found in the ambient air may
   cause increased incidence of acute respiratory illness in children. Health effects associated with NO<sub>X</sub>
   are an increase in the incidence of chronic bronchitis and lung irritation. Chronic exposure to NO<sub>2</sub>
   may lead to eye and mucus membrane aggravation along with pulmonary dysfunction. NO<sub>X</sub> can

- cause fading of textile dyes and additives, deterioration of cotton and nylon, and corrosion of metals
   due to the production of particulate nitrates. Airborne NO<sub>X</sub> can impair visibility.
- 3 NO<sub>X</sub> is a major component of acid deposition in California. NO<sub>X</sub> may affect both terrestrial and

4 aquatic ecosystems. NO<sub>x</sub> in the air is a potentially significant contributor to a number of
5 environmental effects, such as acid rain and eutrophication in coastal waters. Eutrophication occurs
6 when a body of water suffers an increase in nutrients that reduces the amount of oxygen in the
7 water, producing an environment that is destructive to fish and other animal life.

- 8 The ARB and the EPA have set CAAQS and NAAQS standards, respectively, for NO<sub>2</sub> but not for NO.
- 9 The state NO<sub>2</sub> standards are 0.030 ppm as an annual arithmetic mean and 0.18 ppm as a 1-hour 0 standard, not to be exceeded. The federal NO<sub>2</sub> standard is 0.053 ppm as an annual arithmetic mean,
- standard, not to be exceeded. The federal NO<sub>2</sub> standard is 0.05
  not to be exceeded more than one day per year.

### 12 Sulfur Dioxide

- Sulfur Oxides (SO<sub>X</sub>) gases are a family of colorless, pungent gases, which include SO<sub>2</sub> and are formed
   primarily by combustion of sulfur-containing fossil fuels (mainly coal and oil), metal smelting, and
   other industrial processes. SO<sub>X</sub> can react to form sulfates, which significantly reduce visibility. SO<sub>X</sub> is
   a precursor to particulate matter formation.
- 17The major health concerns associated with exposure to high concentrations of SOx include effects18related to breathing, respiratory illness, alterations in pulmonary defenses, and aggravation of19existing cardiovascular disease. Major subgroups of the population that are most sensitive to SOx20include individuals with cardiovascular disease or chronic lung disease (such as bronchitis or21emphysema), as well as children and the elderly. SOx emissions can also damage tree foliage and22agricultural crops. Together, SOx and NOx are the major precursors to acid rain, which is associated23with the acidification of lakes and streams and accelerated corrosion of buildings and monuments.
- The ARB and the EPA have set CAAQS and NAAQS standards for SO<sub>2</sub>. The state standards are 0.04
  ppm as a 24-hour average and 0.25 ppm as a 1-hour average, not to be exceeded. The federal
  standards are 0.030 ppm as an annual arithmetic mean, not to be exceeded, and-0.14 ppm as a 24hour average, not to be exceeded more than one day per year, and 0.075 ppm as a 1-hour average,
  not to be exceeded.

### 29 Lead

Lead is a natural constituent of air, water, and the biosphere. Lead is neither created nor destroyed in the environment, so it essentially persists forever. Several decades ago lead was used as an automotive fuel additive to increase the octane rating. Because gasoline-powered automobile engines were a major source of airborne lead through the use of leaded fuels, and the use of leaded fuel has been mostly phased out the ambient concentrations of lead have dropped dramatically

- 34 fuel has been mostly phased out, the ambient concentrations of lead have dropped dramatically.
- 35 Short-term exposure to high levels of lead can cause vomiting, diarrhea, convulsions, coma, or even 36 death. However, even small amounts of lead can be harmful, especially to infants, young children,
- 37 and pregnant women. Symptoms of long-term exposure to lower lead levels may be less noticeable
- but are still serious. Anemia is common, and damage to the nervous system may cause impaired
- 39 mental function. Other symptoms are appetite loss, abdominal pain, constipation, fatigue,
- 40 sleeplessness, irritability, and headache. Continued excessive exposure, as in an industrial setting,
- 41 can affect the kidneys.

- 1 Lead exposure is most serious for young children because they absorb lead more easily than adults
- 2 and are more susceptible to its harmful effects. Even low-level exposure may harm the intellectual
- 3 development, behavior, size, and hearing of infants. Mothers with high levels of lead in their bodies
- 4 can expose their developing fetuses, resulting in serious and developmental problems including low
- 5 birth weight and slowed postnatal neurobehavioral development.
- The state standard for lead is 1.5 μg/m<sup>3</sup> as a 30-day average, not to be equaled or exceeded. The
  federal standards are 1.5 μg/m<sup>3</sup> averaged over a calendar quarter, not to be exceeded more than one
  day per year, and 0.15 μg/m<sup>3</sup> as a rolling 3-month average, not to be exceeded over a 3-month
  period.

### 10 8.2.1.3 Greenhouse Gases and Climate Change

- 11 The phenomenon known as the greenhouse effect keeps the earth's atmosphere near the surface 12 warm enough for the successful habitation by humans and other forms of life. Greenhouse gases 13 (GHGs) present in the earth's lower atmosphere play a critical role in maintaining the earth's 14 temperature as they trap some of the long-wave infrared radiation emitted from the earth's surface 15 that otherwise would have escaped to space.
- 16 The accelerated increase of fossil fuel combustion and deforestation since the industrial revolution
- 17 of the 19th century has exponentially increased concentrations of GHGs in the atmosphere.
- Increases in the atmospheric concentrations of GHGs in excess of natural ambient concentrations
   increase the natural greenhouse effect.
- 20 This increased greenhouse effect has contributed to global warming, which is an increased rate of
- 21 warming of the earth's surface temperature. Specifically, increases in GHGs lead to increased
- 22 absorption of long-wave infrared radiation by the earth's atmosphere and further warm the lower
- 23 atmosphere, thereby increasing evaporation rates and temperatures near the surface. Warming of
- 24 the earth's lower atmosphere induces large-scale changes in ocean circulation patterns,
- precipitation patterns, global ice cover, biological distributions, and other changes to the earth
   system that are collectively referred to as climate change.
- 27 The Intergovernmental Panel on Climate Change (IPCC) has been established by the World
- 28 Meteorological Organization and United Nations Environment Programme to assess scientific,
- technical, and socioeconomic information relevant to the understanding of climate change, its
- 30 potential impacts, and options for adaptation and mitigation. The IPCC estimates that the average
- 31 global temperature rise between the years 2000 and 2100 could range from 1.1°C, with no increase
- 32 in GHG emissions above year 2000 levels, to 6.4°C, with substantial increase in GHG emissions
- 33 (Rogner et al. 2007). Large increases in global temperatures could have massive deleterious impacts
- 34 on the natural and human environments.

### 35 **Principal Greenhouse Gases**

- 36 GHGs are gases that trap heat in the atmosphere. GHGs are both naturally occurring and artificial.
- 37 Examples of GHGs that are produced both by natural processes and industry are carbon dioxide
- 38 (CO<sub>2</sub>), Methane (CH<sub>4</sub>), and Nitrous oxide (N<sub>2</sub>O). Examples of GHGs created and emitted primarily
- 39 through human activities are hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. The
- 40 primary GHGs generated by the proposed program—CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O—are discussed below.

1The IPCC estimates that CO2 accounts for more than 75% of all anthropogenic (human-made) GHG2emissions. Three-quarters of anthropogenic CO2 emissions are the result of fossil fuel burning, and3approximately one-quarter result from land use change (Rogner et al. 2007). CH4 is the second4largest contributor of anthropogenic GHG emissions and is the result of growing rice, raising cattle,5combustion, and mining coal (National Oceanic and Atmospheric Administration 2005). N2O, while6not as abundant as CO2 or CH4, it is a powerful GHG. Sources of N2O include agricultural processes,7nylon production, fuel-fired power plants, nitric acid production, and vehicle emissions.

8 In order to simplify reporting and analysis, methods have been set forth to describe emissions of

GHGs in terms of a single gas. GHG emissions other than CO<sub>2</sub> are commonly converted into carbon
 dioxide equivalents (CO<sub>2</sub>e), which takes into account the differing global warming potential (GWP)

of different gases. GWP is a measure of a gas's heat-absorbing capacity and lifespan relative to a

12 reference gas,  $CO_2$  ( $CO_2$  has a GWP of 1 by definition).

### 13 Greenhouse Gas Emissions Inventories

14A GHG inventory is a quantification of GHG emissions and sinks within a selected physical and/or15economic boundary over a specified time. GHG inventories can be performed on a large scale (i.e.,16for global and national entities) or on a small scale (i.e., for a particular building or person). GHG17sinks typically refer to removal of GHGs from the atmosphere as a result of carbon sequestration.18Carbon sequestration is the process by which atmospheric CO2 is absorbed by flora and stored as19carbon in biomass, and mostly takes place in tress and forests.

- 20 Table 8-3 outlines the most recent global, national, and statewide GHG inventories to help
- 21 contextualize the magnitude of potential program-related emissions. Worldwide, California is the
- 22 14th to 19th largest emitter of GHGs and; nationwide, California is the second largest emitter of
- 23 GHGs behind Texas (California Air Resources Board 2012d).

### 24 Table 8-3. Global, National, and State GHG Emissions Inventories

Emissions Inventory	Total GHG Emissions and Sinks in CO2e (metric tons)
2004-2010 IPCC Global GHG Emissions Inventory	<del>49<u>52</u>,000,000,000</del>
201 <del>0</del> 4 EPA National GHG Emissions Inventory	<u>56,747870,10</u> 00,000
2009-2014 ARB State GHG Emissions Inventory	4 <u>52441</u> , <del>970</del> 500,000
2005 Sacramento County GHG Emissions Inventory	12,422,425
Sources: <u>Intergovernmental Panel on Climate Change 2014</u> Protection Agency <del>2012b</del> 2016b; California Air Resour 2009.	<del>1Rogner et al. 2007</del> ; U.S. Environmental rces Board <del>2012d<u>2016d</u>;</del> ICF Jones & Stokes

25

GHG emissions in California are attributable to human activities associated with industrial/
 manufacturing, utilities, transportation, residential, and agricultural sectors, as well as natural
 processes. Transportation is responsible for 378% of the state's GHG emissions, followed by the
 industrial sector (240%), electricity generation (230%), agriculture and forestry (87%) and other
 sources (121%) (California Air Resources Board 2012d2016d).

### 1 Climate Change Effects on State Climate Trends

Climate change is a complex phenomenon that has the potential to alter local climatic patterns and
 meteorology. Although modeling indicates that climate change will result in sea level rise, changes in
 regional climate and rainfall, and other things, a high degree of scientific uncertainty still exists with
 regard to characterizing future climate characteristics and predicting how various ecological and social
 systems will react to any changes in the existing climate at the local level. Regardless of this uncertainty,
 it is widely understood that some form of climate change is expected to occur in the future.

- 8 Several recent studies have attempted to characterize future climatic scenarios for the state. While
- 9 specific estimates and statistics on the severity of changes vary, sources agree that the San Joaquin
- Valley and the Delta will witness warmer temperatures, increased heat waves, and changes in
   rainfall patterns. In addition, reduced snow pack and stream flow in the Sierra Nevada mountains,
- 12 could lead to changes in water supply into the Delta region. Specifically, the California Energy
- 13 Commission (CEC) estimates that average annual temperatures in the State will increase by
- 14 approximately 1°C to 3°C between 2010 and mid-century, according the model for the Sacramento
- 15 region. Climatic models also predict that between 2035 and 2064, the number of heat wave days
- 16 modeled for the Sacramento region will increase by more than 100, relative to the previous 30-year
- 17 period between 2005 and 2034. Annual precipitation may experience a declining trend, but remain
- 18 highly variable, suggesting that the valley will be vulnerable to increased drought. Warmer
- 19 temperatures and increased precipitation in the form of rain are expected to result in decreased
- 20 snowpack in the Sierra Nevada. Such effects will translate into earlier snowmelt and increased
- 21 potential for flooding as a result of insufficient reservoir capacity to retain earlier snowmelt.
- 22 (Rogner et al. 2007; California Natural Resources Agency 2009; California Energy Commission 2009)

Sea level rise during the next 50 years is expected to increase dramatically over historical rates. The
CEC predicts that by 2050, sea level rise, relative to the 2000 level, will range from 30 centimeters
(cm) to 45 cm. Coastal sea level rise could result in saltwater intrusion to the Delta and associated
biological impacts in the San Joaquin Valley. Changes in soil moisture and increased risk of wildfires
also may dominate future climatic conditions in the program area. (Rogner et al. 2007; California
Natural Resources Agency 2009; California Energy Commission 2009).

- The changes in temperature, precipitation and sea level may have substantial effects on other
   resources areas. The primary effects of climate change anticipated in California are listed below
   (California Natural Resources Agency 2009).
- Increased average temperatures (air, water, and soil).
- Reduced or slightly increased annual precipitation amounts.
- Change from snowfall (and spring snowmelt) to rainfall.
- Decreased Sierra snowpack (earlier runoff, reduced maximum storage).
- **•** Increased evapotranspiration.
- Increased frequency and intensity of Pacific storms (flood events).
- Increased severity of droughts.
- Increased frequency and severity of extreme heat events.
- 40 Increased frequency and severity of wildfire events.
- Sea level rise (with increased salt water intrusion in the Delta).

- 1 Changes in species distribution and ranges.
- 2 Decreased number of species.
- 3 Increased number of vector-borne diseases and pests (including impacts to agriculture).
- Altered timing of animal and plant lifecycles (phenology).
- Disruption of biotic interactions (e.g., predator prey relationships amongst species or increased
   invasive species abundance).
- Changes in physiological performance, including reproductive success and survival of plants and animals.
- 9 Increase in invasive species.
- Altered migration patterns of fishes, aquatic-breeding amphibians, birds and mammals.
- 11 Changes in food (forage) base.
- Changes in habitat, vegetation structure, and plant and animal communities.
- These changes have significant implications for water quality, water supply, flooding, aquatic
   ecosystems, energy generation, and recreation throughout the state. Guidance documents have been
   drafted or have been published to discuss strategies to protect resources from climate change in
   California (e.g., the State of California Sea-Level Rise Interim Guidance Document [Coastal and Ocean
- 17 Working Group of the California Climate Action Team 2010]).

### **8.2.1.4 Toxic Air Contaminants/Hazardous Air Pollutants**

19 Toxic Air Contaminants (TACs) and Hazardous Air Pollutants (HAPs) are pollutants that may result 20 in an increase in mortality or serious illness, or that may pose a present or potential hazard to 21 human health. The Clean Air Act (CAA) identified 188 pollutants as being air toxics. Air toxics are 22 referred to as HAPs under the CAA and are referred to as TACs under the California Clean Air Act 23 (CCAA). Health effects of TACs include cancer, birth defects, neurological damage, damage to the 24 body's natural defense system, and diseases that lead to death. In 1998, following a 10-year 25 scientific assessment process, ARB identified diesel particulate matter (DPM) from diesel-fueled 26 engines as a TAC. In the ARB's Risk Reduction Plan to Reduce Particulate Matter Emissions from 27 Diesel-Fueled Engines and Vehicles, the ARB said that "Compared to other air toxics CARB has 28 identified and controlled, diesel particulate matter emissions are estimated to be responsible for 29 about 70% of the total ambient air toxics risk" (California Air Resources Board 2000).

### 30 8.2.1.5 Local Area Conditions

#### 31 Monitoring Data

Existing conditions for air quality in the program area can be further described with summary statistics for criteria air pollutants. Tables 8-4 and 8-5 summarize monitoring data for criteria air pollutant levels from all monitoring stations in the SVAB and SFBAAB, respectively. These numbers represent air quality monitoring data for the last three years (20092013–20415) in which complete data are available.

As indicated in Table 8-4, the SVAB has experienced 120 violations of the national 8-hour ozone
 standard and 23 violations of the national PM2.5 standard during the three-year monitoring period.
 There were no reported violations of the national 1- and 8-hour CO standards or national PM10

1 standard. The SVAB has experienced 70 violations of the state 1-hour ozone standard, 170 violations

2 of the state 8-hour ozone standard, and 9 violations of the state PM10 standard during the three-

3 year monitoring period. There have been no violations of the state 1-and 8-hour CO standards.

#### 4 Table 8-4. Ambient Air Quality Monitoring Data for the Sacramento Valley Air Basin

Pollutant Standards	<del>2009</del> 2013	<del>2010</del> 2014	<del>2011</del> 2015
1-Hour Ozone			
State maximum 1-hour concentration (ppm)	0.117 <del>0.122</del>	<del>0.124</del> 0.116	<del>0.123</del> 0.122
State second-highest 1-hour concentration (ppm)	0.105 <del>0.122</del>	$\frac{0.121}{0.121}$ 0.107	<del>0.118</del> 0.114
Number of days standard exceeded <sup>a</sup>	<u></u>		
CAAOS 1-hour (>0.09 ppm)	8 <del>29</del>	<del>15</del> 12	<del>26</del> 9
8-Hour Ozone			
National maximum 8-hour concentration (ppm)	0.093 <del>0.104</del>	<del>0.112</del> 0.088	<del>0.098</del> 0.100
National second-highest 8-hour concentration (ppm)	0.1030.087	<u>0.1040.086</u>	0.0970.094
State maximum 8-hour concentration (ppm)	0.094 <del>0.104</del>	<u>0.112</u> 0.088	0.0980.100
State second-highest 8-hour concentration (ppm)	0.1040.088	0.1040.086	0.0980.094
Number of days standard exceeded <sup>a</sup>			
NAAQS 8-hour (>0.075 ppm)	<u>12</u> 45	<del>29</del> 23	<u>4618</u>
CAAQS 8-hour (>0.070 ppm)	<u>32</u> 65	<u>4649</u>	<u>5940</u>
Carbon Monoxide (CO)			
Maximum 8-hour concentration (ppm)	<u>2.4</u> 2.84	<u>2.1</u> 1.89	<u>2.0</u> 2.83
Second-highest 8-hour concentration (ppm)	<u>2.4</u> 2.84	<u>1.9</u> 1.86	<u>1.9</u> 2.43
Maximum 1-hour concentration (ppm)	<u>3.0</u> 3.3	<u>2.5</u> 2.9	<u>2.2</u> 3.0
Second-highest 1-hour concentration (ppm)	<u>2.8</u> 3.2	<u>2.3<del>2.6</del></u>	<u>2.1</u> 3.0
Number of days standard exceeded <sup>a</sup>			
NAAQS 8-hour ( <u>&gt;</u> 9 ppm)	0	0	0
CAAQS 8-hour ( <u>&gt;</u> 9.0 ppm)	0	0	0
NAAQS 1-hour ( <u>&gt;</u> 35 ppm)	0	0	0
CAAQS 1-hour ( <u>&gt;</u> 20 ppm)	0	0	0
Particulate Matter (PM10) <sup>d</sup>			
National <sup>b</sup> maximum 24-hour concentration (µg/m³)	<u>96.4</u> 76.0	<del>87.4<u>105.7</u></del>	<del>73.5<u>114.6</u></del>
National <sup>b</sup> second-highest 24-hour concentration (µg/m³)	<u>68.6</u> 74.0	<u>49.183.5</u>	<u>48.593.1</u>
State <sup>c</sup> maximum 24-hour concentration (µg/m <sup>3</sup> )	<u>92.3</u> 76.0	<del>87.4<u>106.4</u></del>	<del>73.0<u>118.0</u></del>
State <sup>c</sup> second-highest 24-hour concentration (µg/m <sup>3</sup> )	<u>66.8</u> 74.0	<u>49.186.4</u>	<del>58.0</del> 91.8
National annual average concentration (µg/m³)	<u>26.8</u> 25.6	<del>20.5</del> 28.0	<u>24.227.0</u>
State annual average concentration (μg/m <sup>3</sup> ) <sup>e</sup>	<u>24.8<del>26.4</del></u>	<del>21.0</del> 22.2	<del>25.1</del> 24.9
Number of days standard exceeded <sup>a</sup>			
NAAQS 24-hour (>150 μg/m³) <sup>f</sup>	<u>0</u> 0	<u>00</u>	<u>00</u>
CAAQS 24-hour (>50 $\mu$ g/m <sup>3</sup> ) <sup>f</sup>	<u>23</u> 3	<del>2<u>13</u></del>	4 <u>25</u>
Particulate Matter (PM2.5)			
National <sup>b</sup> maximum 24-hour concentration (µg/m <sup>3</sup> )	<u>75.6</u> 49.8	<del>72.2</del> 190.2	<del>57.0</del> 109.8
National <sup>b</sup> second-highest 24-hour concentration (µg/m <sup>3</sup> )	73.445.9	<del>33.9</del> 130.6	<del>54.3</del> 64.6
State <sup>c</sup> maximum 24-hour concentration (µg/m <sup>3</sup> )	<u>75.671.7</u>	<del>92.3</del> 190.2	<del>66.0</del> 109.8
State <sup>c</sup> second-highest 24-hour concentration (µg/m <sup>3</sup> )	<u>73.4</u> 59.2	43.0 <u>1</u> 30.6	<del>62.8</del> 64.4
National 98 <sup>th</sup> percentile of 24-hour concentration	<u>39.7</u> 38.7	<del>29.0</del> 28.1	4 <del>6.2</del> 37.8
National annual average concentration $(ug/m^3)$	11.5 <del>10.7</del>	<del>8.8</del> 8.8	$\frac{12.1}{10.4}$
State annual average concentration $(\mu g/m^3)^e$	13.4 <del>15.5</del>	<del>10.9</del> 10.5	<del>14.6</del> 12.3
Number of days standard exceeded <sup>a</sup>			
NAAOS 24-hour (>35 $\mu$ g/m <sup>3</sup> )	13 <del>6</del>	<del>1</del> 4	<del>16</del> 9

1

Pollutant	Standards	<del>2009</del> 2013	<del>2010</del> 2014	<del>2011</del> 2015
Sources:	California Air Resources Board 2012a2016a; U.S. Environment	al Protection Agen	cy <del>2012c<u>2016cd</u>.</del>	

#### Notes: CAAQS = California ambient air quality standards.

NAAQS = national ambient air quality standards.

= insufficient data available to determine the value.

<sup>a</sup> An exceedance is not necessarily a violation.

<sup>b</sup> National statistics are based on standard conditions data. In addition, national statistics are based on samplers using federal reference or equivalent methods.

<sup>c</sup> State statistics are based on local conditions data, except in the South Coast Air Basin, for which statistics are based on standard conditions data. In addition, State statistics are based on California approved samplers.

<sup>d</sup> Measurements usually are collected every 6 days.

• State criteria for ensuring that data are sufficiently complete for calculating valid annual averages are more stringent than the national criteria.

<sup>f</sup> Mathematical estimate of how many days' concentrations would have been measured as higher than the level of the standard had each day been monitored.

#### Table 8-5. Ambient Air Quality Monitoring Data for the San Francisco Bay Area Air Basin

Pollutant Standards	20002012	20102014	20112015
1-Hour Ozono	20072015	<del>2010<u>2014</u></del>	<del>2011</del> 2013
State maximum 1 hour concentration (nnm)	0 0060 112	0 1 5 0 0 0 7	0 1150 106
State maximum 1-nour concentration (ppm)	<u>0.090</u> 0.113 0.095 <u>0.1</u> 09	<u>0.130<u>0.097</u> 0.1270 096</u>	<u>0.1130.100</u> 0.0000 105
Number of days standard exceededa	0.0750.107	0.127 0.090	0.0770.103
CAAOS 1-hour (>0.09 nnm)	211	<u>8</u> 3	57
8-Hour Ozone	<u>5</u> 11	0 <u>5</u>	<u>57</u>
National <sup>b</sup> maximum 8-hour concentration (nnm)	0 079 <del>0 094</del>	<del>0 097</del> 0 080	<del>0 084</del> 0 084
National <sup>b</sup> second-highest 8-hour concentration (ppm)	0.077 <del>0.085</del>	0.0910.078	0.001 <u>0.001</u>
State <sup>c</sup> maximum 8-hour concentration (ppm)	0.0800.095	0.0980.081	0.0850.085
State <sup>c</sup> second-highest 8-hour concentration (ppm)	0.0770.086	0.0920.079	0.0790.085
Number of days standard exceeded <sup>a</sup>			
NAAQS 8-hour (>0.075 ppm)	<u>3</u> 8	<del>9</del> 5	<u>47</u>
CAAQS 8-hour (>0.070 ppm)	<u>313</u>	$\frac{1110}{11}$	<u>1012</u>
Carbon Monoxide (CO)			
Maximum 8-hour concentration (ppm)	<u>2.3</u> 2.86	<u>2.1</u> 2.19	<u>1.9<del>2.65</del></u>
Second-highest 8-hour concentration (ppm)	<u>2.0</u> 2.50	<u>2.0</u> 1.94	<u>1.8</u> 2.62
Maximum 1-hour concentration (ppm)	<u>2.8</u> 4.6	<u>2.5</u> 3.3	<u>2.4</u> 4.1
Second-highest 1-hour concentration (ppm)	<u>2.6</u> 3.8	<u>2.4</u> 3.0	<u>2.2</u> 3.7
Number of days standard exceeded <sup>a</sup>			
NAAQS 8-hour (≥9 ppm)	0	0	0
CAAQS 8-hour (≥9.0 ppm)	0	0	0
NAAQS 1-hour (≥35 ppm)	0	0	0
CAAQS 1-hour (≥20 ppm)	0	0	0
Particulate Matter (PM10) <sup>d</sup>			
National <sup>b</sup> maximum 24-hour concentration (µg/m <sup>3</sup> )	<u>55.8</u> 51.7	<u>69.157.8</u>	<del>72.4<u>58.8</u></del>
National <sup>b</sup> second-highest 24-hour concentration ( $\mu$ g/m <sup>3</sup> )	<u>53.7</u> 31.0	<u>45.031.4</u>	<u>46.847.2</u>
State <sup>c</sup> maximum 24-hour concentration (µg/m <sup>3</sup> )	<u>58.1</u> 55.4	<del>69.6<u>61.3</u></del>	<del>73.4<u>58.0</u></del>
State <sup>c</sup> second-highest 24-hour concentration ( $\mu$ g/m <sup>3</sup> )	<u>57.1</u> 32.4	4 <u>6.2</u> 33.0	<u>40.049.3</u>
National annual average concentration (µg/m <sup>3</sup> )	<u>21.6</u> 19.5	<del>20.3<u>19.5</u></del>	<del>19.7</del> 21.3
State annual average concentration (µg/m <sup>3</sup> ) <sup>e</sup>	<u>22.2</u> 20.3	<u>19.520.0</u>	<del>20.21</del> 21.9
Number of days standard exceeded <sup>a</sup>			
NAAQS 24-hour (>150 μg/m <sup>3</sup> ) <sup>f</sup>	<u>0</u> 0	<u>00</u>	<u>00</u>
CAAQS 24-hour (>50 μg/m <sup>3</sup> ) <sup>f</sup>	<u>15</u> 1	4 <u>3</u>	<u>13</u>
Particulate Matter (PM2.5)			
National <sup>b</sup> maximum 24-hour concentration (µg/m <sup>3</sup> )	<u>57.7</u> 45.7	<u>46.560.4</u>	<del>50.5<u>49.4</u></del>
National <sup>b</sup> second-highest 24-hour concentration (µg/m <sup>3</sup> )	<u>45.9</u> 39.0	4 <u>5.3</u> 42.9	4 <del>0.3</del> 42.2
State <sup>c</sup> maximum 24-hour concentration (µg/m <sup>3</sup> )	<u>57.7</u> 49.8	<u>41.560.4</u>	<del>50.5</del> 49.4
State <sup>c</sup> second-highest 24-hour concentration ( $\mu$ g/m <sup>3</sup> )	<u>48.0</u> 45.7	<del>36.4<u>42.9</u></del>	<u> 39.742.2</u>
National 98 <sup>th</sup> percentile of 24-hour concentration	<u>35.1</u> 33.5	<del>26.8</del> 27.2	<del>30.5</del> <u>30.7</u>
National annual average concentration ( $\mu$ g/m <sup>3</sup> )	<u>12.8</u> 10.1	<del>10.5<u>12.0</u></del>	<del>10.1<u>10.8</u></del>
State annual average concentration $(\mu g/m^3)^e$	<u>12.4</u> 10.1	<u>9.012.0</u>	<del>9.9</del> 10.8

Pollutant Standards	<del>2009</del> 2013	<del>2010</del> 2014	<u>20112015</u>
Number of days standard exceeded <sup>a</sup>			
NAAQS 24-hour (>35 μg/m³)	<u>6</u> 11	<u>62</u>	<del>5</del> 3
Commence Collifornia Air December December 2012-2016 - U.C. F.		A	20161

Sources: California Air Resources Board 2012a2016a; U.S. Environmental Protection Agency 2012c2016d. Notes: CAAOS = California ambient air quality standards.

NAAOS = national ambient air quality standards.

<sup>a</sup> An exceedance is not necessarily a violation.

<sup>b</sup> National statistics are based on standard conditions data. In addition, national statistics are based on samplers using federal reference or equivalent methods.

<sup>c</sup> State statistics are based on local conditions data, except in the South Coast Air Basin, for which statistics are based on standard conditions data. In addition, State statistics are based on California approved samplers.

<sup>d</sup> Measurements usually are collected every 6 days.

<sup>e</sup> State criteria for ensuring that data are sufficiently complete for calculating valid annual averages are more stringent than the national criteria.

f Mathematical estimate of how many days' concentrations would have been measured as higher than the level of the standard had each day been monitored.

- 1 As indicated in Table 8-5, the SFBAAB has experienced 21 violations of the national 8-hour ozone 2 standard and 22 violations of the national 24-hour PM2.5 standard over the three-year monitoring
- period. There have been no violations of the national 1- and 8-hour CO standards or the national
- 3 4
- PM10 standard. The SFBAAB has experienced 24 violations of the state 1-hour ozone standard, 34
- violations of the state 8-hour ozone standard, and 6 violations of the state PM10 standard. There 5
- have been no violations of the state 1- and 8-hour CO standards. 6

#### **Attainment Status** 7

- 8 If monitored pollutant concentrations meet state or federal standards over a designated period of
- 9 time, the area is classified as being in attainment for that pollutant. If monitored pollutant
- 10 concentrations violate the standards, the area is considered a nonattainment area for that pollutant.
- 11 If data are insufficient to determine whether a pollutant is violating the standard, the area is
- 12 designated unclassified. If monitored pollutant concentrations violated the standards in the past but
- 13 are no longer in violation, the area is considered a maintenance area.
- Construction of the proposed program would take place in the following counties: Butte, Colusa, 14
- 15 Glenn, Placer, Sacramento, Solano, Sutter, Tehama, Yolo, and Yuba. Table 8-6 summarizes the
- 16 national and state criteria pollutant attainment status for the counties in the program area.

#### 17 Table 8-6. Criteria Pollutant Attainment Status in Program Area Counties

County	Pollutant	National	State	
Butte	1-hour Ozone	N/A <sup>a</sup>	Moderate-Nonattainment	
	8-hour Ozone	Marginal Nonattainment <u>(P)</u> b	Nonattainment	
	СО	Moderate Maintenance <u>(P)</u>	Attainment	
	PM10	Unclassified/Attainment	Nonattainment	
	PM2.5	<u>Moderate Nonattainment (P)</u>	Nonattainment	
	SO <sub>2</sub>	Unclassified/Attainment	Attainment	
	NO <sub>2</sub>	Unclassified/Attainment	Attainment	
	Pb	Unclassified/Attainment	Attainment	
Colusa	1-hour Ozone		Moderate	
		N/A <sup>a</sup>	Nonattainment <u>Attainment</u>	
	8-hour Ozone	Unclassified/Attainment	<u>Attainment</u> Nonattainment- Transitional	

County	Pollutant	National	State
	СО	Unclassified/Attainment	Unclassified
	PM10	Unclassified/Attainment	Nonattainment
	PM2.5	Unclassified/Attainment	Attainment
	SO <sub>2</sub>	Unclassified/Attainment	Attainment
	NO <sub>2</sub>	Unclassified/Attainment	Attainment
	Pb	Unclassified/Attainment	Attainment
	1-hour Ozone		<u>Attainment</u> Moderate
		N/A <sup>a</sup>	Nonattainment
	8-hour Ozone	Unclassified/Attainment	<u>AttainmentNonattainment</u>
	CO	Unclassified/Attainment	Unclassified
Glenn	PM10	Unclassified/Attainment	Nonattainment
	PM2.5	Unclassified/Attainment	<u>Attainment</u> Unclassified
	$SO_2$	Unclassified/Attainment	Attainment
	NO <sub>2</sub>	Unclassified/Attainment	Attainment
	Pb	Unclassified/Attainment	Attainment
	1-hour Ozone	N/A <sup>a</sup>	<del>Moderate-</del> Nonattainment <sup>€</sup>
	8-hour Ozone	Severe Nonattainment <u>(P)</u>	Nonattainment
	CO	Moderate Maintenance <u>(P)</u>	Unclassified/Attainment <sup>bd</sup>
	PM10	Unclassified/Attainment	Nonattainment
Placer	PM2.5	<u>Moderate</u> Nonattainment <u>(P)</u> and Unclassified/Attainment <sup>e</sup>	Unclassified/Attainment <sup><sub>bd</sub></sup>
	SO <sub>2</sub>	Unclassified/Attainment	Attainment
	NO <sub>2</sub>	Unclassified/Attainment	Attainment
	Pb	Unclassified/Attainment	Attainment
	1-hour Ozone	N/A <sup>a</sup>	Serious Nonattainment
	8-hour Ozone	Severe Nonattainment	Nonattainment
	СО	Moderate Maintenance <u>(P)</u>	Attainment
C	PM10	<u>Moderate NonaA</u> ttainment	Nonattainment
Sacramento	PM2.5	<u>Moderate</u> Nonattainment	<u>Attainment</u> Nonattainment
	SO <sub>2</sub>	Unclassified/Attainment	Attainment
	NO <sub>2</sub>	Unclassified/Attainment	Attainment
	Pb	Unclassified/Attainment	Attainment
Solano	1-hour Ozone	N/A <sup>a</sup>	Serious Nonattainment
	8-hour Ozone	<del>Severe∕</del> Marginal Nonattainment <sup>∉</sup> <u>(P)</u>	Nonattainment
	CO	Moderate Maintenance (P)	Attainment
	PM10	Unclassified/Attainment	Nonattainment
	PM2.5	<u>Moderate</u> Nonattainment <u>(P)</u>	Unclassified
	SO <sub>2</sub>	Unclassified/Attainment	Attainment
	NO <sub>2</sub>	Unclassified/Attainment	Attainment
	Pb	Unclassified/Attainment	Attainment
Sutter	1-hour Ozone	N/A <sup>a</sup>	<u>Nonattainment-</u> <u>TransitionalSerious/Moderate</u> <del>Nonattainment<sup>g</sup></del>

County	Pollutant	National	State			
	8-hour Ozone	<del>Unclassified/Attainment and</del> Severe Nonattainment <u><sup>h</sup>(P)</u>	Nonattainment-Transitional			
	СО	Unclassified/Attainment	Attainment			
	PM10	Unclassified/Attainment	Nonattainment			
	PM2.5	<del>Nonattainment<u>Moderate</u> <u>Maintenance (P)</u></del>	Attainment			
	$SO_2$	Unclassified/Attainment	Attainment			
	NO <sub>2</sub>	Unclassified/Attainment	Attainment			
	Pb	Unclassified/Attainment	Attainment			
	1-hour Ozone	N/A <sup>a</sup>	Moderate-Nonattainment			
	8-hour Ozone	Unclassified/Attainment	Nonattainment			
	CO	Unclassified/Attainment	Unclassified			
Tohomo	PM10	Unclassified/Attainment	Nonattainment			
renama	PM2.5	Unclassified/Attainment	Unclassified			
	SO <sub>2</sub>	Unclassified/Attainment	Attainment			
	NO <sub>2</sub>	Unclassified/Attainment	Attainment			
	Pb	Unclassified/Attainment	Attainment			
	1-hour Ozone	N/A <sup>a</sup>	<del>Serious </del> Nonattainment			
	8-hour Ozone	Severe Nonattainment	Nonattainment			
	СО	Moderate Maintenance <u>(P)</u>	Attainment			
Vala	PM10	Unclassified/Attainment	Nonattainment			
1010	PM2.5	<u>Moderate Nonattainment (P)</u>	Unclassified			
	SO <sub>2</sub>	Unclassified/Attainment	Attainment			
	NO <sub>2</sub>	Unclassified/Attainment	Attainment			
	Pb	Unclassified/Attainment	Attainment			
	1-hour Ozone	N/Aa	<u>Nonattainment-</u> <u>Transitional</u> Moderate Nonattainment			
	8-hour Ozone	Unclassified/Attainment	Nonattainment-Transitional			
	CO	Unclassified/Attainment	Unclassified			
Vuha	PM10	Unclassified/Attainment	Nonattainment			
ruba	PM2.5	Nonattainment <u>Moderate</u> Maintenance (P)	Attainment			
	SO2	Unclassified/Attainment	Attainment			
	NO <sub>2</sub>	Unclassified/Attainment	Attainment			
	Ph	Unclassified / Attainment	Attainment			
County	Pollutant	National	State			
----------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	----------------------------------	--	--
Source:	Adapted from: Californ <del>2012a</del> 2016a	a Air Resources Board <del>20</del>	42b2016b; U.S. Environmental Protection Agen	ncy		
Notes: N	/A = Not Available/Appl	icable				
<u>(P) = De</u>	signation applies to a pop	<u>rtion of the county.</u>				
a The E → On Ju The S is fina ← The p SVAB & The p	EPA revoked the 1-hour of ne 8, 2007, the United St Subpart 1 areas in the Gre alized. Proposed reclassi portion of Placer County i t is moderate nonattainm portion of Placer County i	zone standard on June 15 ates Court of Appeals vac enbook are listed as "For fications were published of n the Mountain Counties ent. n the Mountain Counties	5, 2005. Ated the Subpart 1 portion of the Phase 1 Rule. Mer Subpart 1" until reclassification of the area M January 16, 2009 (74 FR 2936). Air Basin is nonattainment, and the portion in t Air Basin is unclassified, and the portion in the	<del>as</del> t <del>he</del>		
SVAB	is in attainment.			.l		
<del>portion</del>	The portion of Placer County in the Mountain Counties Air Basin is unclassified/attainment, and the portion in the SVAB is in nonattainment.					
f	The portion of Solano Co	unty in the SVAB is desig	nated as severe nonattainment area, and the			

portion in the SFBAAB is designated as marginal nonattainment.

The north portion of Sutter is moderate nonattainment and the south portion serious nonattainment.

h-The north portion of Sutter is unclassified/attainment and the south portion is severe nonattainment.

1

#### Sensitive Land Uses 2

3 Air quality-sensitive land uses are generally defined as locations where sensitive receptors reside.

4 Sensitive receptors are more susceptible to health problems associated with air pollutants (e.g.,

5 children and the elderly). Some examples of sensitive land uses include schools, elderly housing,

6 hospitals, and clinics. Land uses in the program area where sensitive receptors may be exposed to

7 increased levels of pollutants during construction activities, include, but are not limited to,

8 residences, schools, and parks that may be located near levees and close to access roads used for 9

haul truck traffic.

#### 8.3 Regulatory Setting 10

11 Appendix C, Regulatory Background, describes the federal, state, regional, and local laws,

- 12 regulations, and policies that pertain to air quality and climate change issues within the program 13 area.
- 14 The program area is subject to air quality regulations developed and implemented at the federal,
- 15 state, and local levels. At the federal level, the EPA is responsible for implementation of the CAA.
- 16 Some portions of the CAA (e.g., certain mobile-source and other requirements) are enforced directly
- 17 by EPA. Other portions of the CAA (e.g., stationary-source requirements) are enforced by state and 18 local agencies.
- 19 Responsibility for attaining and maintaining air quality in California is divided between the
- 20 California Air Resources Board (ARB) and regional air quality districts. Areas of control for the
- 21 regional districts are set by ARB, which divides the state into air basins. These air basins are defined

U.S. Army Corps of Engineers

1 by topography that limits air flow access, or by county boundaries. Plans, policies, and regulations 2 relevant to the proposed program are discussed in Appendix C. 3 The pertinent laws, regulations, and policies are listed below. 4 Federal: • 5 0 National Environmental Quality Act 6 Clean Air Act and National Ambient Air Quality Standards Ο 7 Mandatory Greenhouse Gas Reporting Rule 0 8 Council on Environmental Quality Draft NEPA Guidance 0 9 State: 10 0 California Environmental Quality Act 11 California Clean Air Act and California Ambient Air Quality Standards 0 12 Executive Order S-3-05 0 13 California Global Warming Solutions Act of 2006 0 14 **ARB Climate Change Scoping Plan** 0 15 0 **CEOA** Guidelines 16 • Executive Order S-01-07, Low Carbon Fuel Standards 17 • Senate Bill 32 18 Local: 19 Bay Area Air Quality Management District standards 0 20 Butte County Air Quality Management District standards Ο 21 Colusa County Air Pollution Control District standards Ο 22 Feather River Air Quality Management District standards 0 23 0 Glenn County Air Pollution Control District standards 24 Placer County Air Pollution Control District standards 0 25 Sacramento Metropolitan Air Quality Management District standards Ο Tehama County Air Pollution Control District standards 26 0 27 Yolo-Solano Air Quality Management District standards 0

### 28 8.4 Determination of Effects

This section describes the effect analysis relating to air quality and climate change for the proposed program. It describes the methods used to determine the effects of the proposed program and lists the thresholds used to conclude whether an effect would be significant. Measures to mitigate (i.e., avoid, minimize, rectify, reduce, eliminate, or compensate for) significant effects accompany each

33 effect discussion.

Potential air quality effects from the proposed program would result primarily from two activities
 associated with the proposed program: (1) construction of the proposed program and (2)

- 3 maintenance workers' vehicle and equipment use (operation) once construction of the program is
- 4 complete. The effects associated with construction would be short-term, temporary effects, while
- 5 the effects associated with maintenance workers' activities would also be short term but occur
- 6 periodically over the life of the project.

### 7 8.4.1 Assessment Methods

#### 8 **8.4.1.1 Construction Emissions**

9 Construction of the proposed program has the potential to generate air quality and GHG emissions 10 through the use of heavy-duty construction equipment in the program area, through vehicle trips 11 related to construction workers traveling to and from the program area, and through the delivery of 12 buttress rock materials to the program area. Different alternatives may utilize different 13 combinations and amounts of construction equipment for different time periods and under different 14 operating conditions. Pollutant emissions are highly dependent on the total amount of disturbed 15 area, the duration of construction, and the intensity of construction activity. Thus, program effects 16 would vary significantly depending on the alternative.

- 17 Construction emissions resulting from the proposed program would include ozone precursors (ROG 18 and NO<sub>x</sub>), PM10, PM2.5, and GHGs associated with fugitive dust, heavy construction equipment, and 19 construction workers commuting to and from the site. Pollutant emissions would result from the 20 following typical construction activities: (1) demolition and site preparation as needed; (2) 21 grading/cut/fill; (3) construction workers traveling to and from program sites; (4) delivery and 22 hauling of construction supplies and debris to and from program sites; and (5) fuel combustion by 23 on-site construction equipment. These activities may vary by alternative. These construction 24 activities would create temporary emissions of fugitive dust, fumes, equipment exhaust, and other 25 air contaminants. During site preparation, grading, and other earthmoving activities, fugitive 26 emissions of PM10 and PM2.5, as well exhaust emissions, would be the most significant air 27 pollutants generated from construction activities, while exhaust emissions would be primarily 28 associated with other activities.
- 29The magnitude and precise location of construction activities, as well as construction schedule, is30currently unknownIt is currently unknown the level of activity, scheduling, and activity locations of31potential construction activities. Therefore, a quantified analysis of potential construction emissions32is not feasible. However, possible construction equipment types associated with implementation of33the proposed program are listed below.
- Waterside construction of levee improvements: cranes mounted on barges, excavators, loaders.
- Landside construction of levee improvements: crane system on levee, excavators, bulldozers,
   loaders, scrapers, haul trucks, and water trucks.
- This list of construction equipment is not all-inclusive, and other equipment may be necessary to
  construct the levee improvements. The assessment of construction air quality and climate change
  effects considers each of the potential sources noted above. A qualitative assessment of air quality
  and climate change effects resulting from the alternatives was performed, taking into account the
  pollutant sources listed below.

- 1 Combustion emissions from construction equipment.
- 2 Combustion emissions from delivery and haul trucks.
- 3 Combustion emissions from construction worker trips.
- Fugitive dust from excavation and rock hauling.
  - Fugitive dust from heavy-equipment travel on unpaved areas.

#### 6 8.4.1.2 Operational Emissions

Long-term air quality effects are associated with changes in the permanent, continued daily use of
the program area. Operational emissions from the proposed program would result from
maintenance activities, landscaping activities, and emergency levee repairs. These activities are
expected to be sporadic, transitory, and short-term in nature (a few days every month), but the
extent of these activities is unknown at this time. Consequently, quantification of operational
emissions is not possible at this juncture. Depending upon the alterative, pollutant emissions
resulting from the proposed program may increase.

14 Possible operational emissions resulting from the proposed program would include ozone 15 precursors (ROG and NO<sub>x</sub>), PM10, PM2.5, and GHG emissions associated with fugitive dust, heavy 16 equipment, landscaping equipment, and maintenance workers commuting to and from the site. The 17 assessment of operational air quality and climate change effects considers each of these potential 18 sources. It is currently unknown the level of potential operational activities that may result with 19 implementation of the proposed program. Therefore, a quantified analysis of potential construction 20 emissions is not possible, and a qualitative analysis of operational emissions was performed. The 21 qualitative analysis took into account the pollutant sources listed below.

- Combustion emissions from construction equipment.
- Combustion emissions from landscaping equipment.
- Combustion emissions from maintenance worker trips.
- Fugitive dust from heavy-equipment travel on unpaved areas.
- Fugitive dust from landscaping activities.

#### 27 **8.4.1.3** Hazardous Air Pollutants/Toxic Air Contaminants

Diesel particulate matter (DPM) is the HAP/TAC associated with the proposed program. Emissions
 of DPM would result from the operation of diesel-powered construction equipment activity during
 program implementation. A qualitative analysis of HAP/TAC emissions was performed.

#### 31 **8.4.1.4 Greenhouse Gas Emissions**

GHG emissions from program construction and operation would result from fuel usage by on\_site
 equipment, on-road vehicles, and on-water towboats. Certain criteria must be examined to
 determine if a project will have a significant effect on the environment. However, as of the writing of
 this report, the all agencies with jurisdiction over air quality regulation and GHG emissions, such as
 EPA, ARB, and the various air districts, have had not established quantitative significance thresholds
 for the assessment of GHG emissions and climate change. Instead, mMost districts recommend that
 GHG emissions associated with the project's construction and operational activities be quantified

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and disclosed using the most up to date calculation and analysis methods. Applicable to the program
 area, the BAAQMD recommends measures to reduce construction-related GHG emissions, which
 include the following:

- Alternative-fueled (e.g., biodiesel, electric) construction vehicles/equipment of at least 15 percent of the fleet;
- Local building materials of at least 10 percent; and
- Recycle at least 50 percent of construction waste or demolition materials.

BAAQMD has also adopted mass emission thresholds and efficiency metrics to help lead agencies
 determine the significance of operational GHG emissions generated by land use development and
 stationary source projects. In October 2014, SMAQMD adopted GHG significance thresholds which
 will be used in subsequent environmental documents prepared for the project and which will be
 tiered from this programmatic EIS/EIR. These thresholds were subsequently updated in 2015 and
 include the following criteria.

- 14 Construction phase of projects: 1,100 metric tons of CO<sub>2</sub>e per year.
- 15 Operational phase of land development projects: 1,100 metric tons of CO<sub>2</sub>e per year.
- 16 Stationary source projects: 10,000 direct metric tons of CO<sub>2</sub>e per year.

The SMAQMD standards require mitigation for significant projects to be consistent with AB 32 and
 the California Air Resources Board's Climate Change Scoping Plan goal to reduce GHG emissions,
 which is currently a 21.7% reduction. PCAPCD has released a draft construction GHG threshold of
 10,000 MT CO<sub>2</sub>e and tiered operational GHG thresholds of 1,100 MT CO<sub>2</sub>e/year, 10,000 MT
 CO<sub>2</sub>e/year, and various efficiency metrics. However, as of September 2016, these thresholds have

21 <u>CO<sub>2</sub>e/year, and various efficiency metrics. However, as of September 2016, these thresholds have</u>
 22 <u>not been adopted by the PCAPCD board.</u>

Most districts also recommended that lead agencies include a discussion of feasible construction and
 operational mitigation necessary to reduce GHG emissions. As discussed in construction and
 operation emissions sections above, a quantified analysis of potential construction and operation
 emissions is not possible, and a qualitative analysis of GHG emissions and impacts was performed
 according to the State CEQA Guidelines.

- The Governor's Office of Planning and Research's Amendments to the CEQA Guidelines, which
   became effective March 18, 2010, indicate that projects should be evaluated based on their
- 30 cumulative contribution to climate change impacts, and other air quality agencies likewise concur
- that GHG and climate change should be evaluated as a potentially significant cumulative impact
- 32 rather than a project-specific impact. Consequently, the proposed program's potential to result in a
- 33 cumulative increase in GHG contaminant emissions is addressed towards the end of this chapter.

### 34 8.4.2 Significance Criteria

#### 35 **8.4.2.1** NEPA

The NEPA review process must be integrated with other regulatory review processes and consider applicable regulations. A non-transportation project located in a nonattainment or maintenance area is subject to the General Conformity Rule (42 United States Code Section 7596 (c) (Section

39 176(c)) and it's implementing regulation at 40 Code of Federal Regulations (CFR) Section 93. A

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- proposed project must undergo a general conformity analysis to ensure that the following criteria in
   the Clean Air Act, Section 176(c), are not violated by the project:
  - cause or contribute to new violations of any standard in any area;
  - increase the frequency or severity of an existing violation of any standard; or
  - delay timely attainment of any standard, required interim emission reduction, or other milestones.
- As part of the general conformity process, a conformity analysis is required if a federal actionsatisfies the following condition.
  - The action's direct and indirect emissions have the potential to emit one or more of the six criteria pollutants at or above emission rates shown in Tables 8-7 and 8-8.

11 Therefore, if the total direct and indirect emissions associated with the proposed program are below 12 the *de minimis* levels for criteria pollutants indicated in Tables 8-7 and 8-8, general conformity 13 requirements do not apply, and the proposed program is considered in conformity and would not 14 result in an significant impact. Table 8-6 summarizes the attainment status of counties in the 15 program area for criteria pollutants and indicates that at least one county in the program area is classified as a federal nonattainment or maintenance area with respect to ozone, CO, PM10, and 16 17 PM2.5.According to Table 8-6, a general conformity determination must be made for ozone, CO, and 18 PM2.5. in Butte County; ozone, CO, and PM2.5 in Placer County; ozone, CO, PM10, and PM2.5 in 19 Sacramento County; ozone, CO, and PM2.5 in Solano County; ozone and PM2.5 in Sutter County; 20 ozone, CO, and PM2.5 in Yolo County; and PM2.5 in Yuba County. Colusa, Glenn, and Tehama 21 Counties are all designated as unclassified/attainment for all criteria pollutants listed in Tables 8-7 22 and 8-8, so unless the attainment status changes before program implementation, no conformity 23 determination would be required for these counties. The general conformity evaluation must 24 consider both direct and indirect sources of emissions for all nonattainment and maintenance 25 pollutants, which include regulated precursor emissions. Regulated precursor emissions for ozone 26 include ROG and NO<sub>x</sub>. Regulated precursor emissions for PM2.5 include SO<sub>2</sub>, NO<sub>x</sub>, and ROG.

27 Table 8-7. Federal *de minimis* Threshold Levels for Criteria Pollutants in Nonattainment Areas

	Emission Rate
Pollutant	(Tons per Year)
Ozone (ROG/VOC or NO <sub>x</sub> )	
Serious nonattainment areas	50
Severe nonattainment areas	25
Extreme nonattainment areas	10
Other ozone nonattainment areas outside an ozone transport region <sup>a</sup>	100
Other ozone nonattainment areas inside an ozone transport region <sup>a</sup>	
ROG/VOC	50
NOx	100
CO: All nonattainment areas	100
SO <sub>2</sub> or NO <sub>2</sub> : All nonattainment areas	100
PM10	
Moderate nonattainment areas	100
Serious nonattainment areas	70
PM2.5	
Direct emissions	100
SO <sub>2</sub>	100

NO <sub>x</sub> (unless determined not to be a significant precursor)	100	
ROG/VOC or ammonia (if determined to be significant precursors)	100	
Pb: All nonattainment areas	25	

Source: 40 CFR 93.153.

Note: *de minimis* threshold levels for conformity applicability analysis.

<sup>a</sup> Ozone Transport Region is comprised of the States of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, the Consolidated Metropolitan Statistical Area that includes the District of Columbia and northern Virginia (Section 184 of the Clean Air Act).

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#### Table 8-8. Federal de minimis Threshold Levels for Criteria Pollutants in Maintenance Areas

	Emission Rate
Pollutant	(Tons per Year)
Ozone (NO <sub>x</sub> , SO <sub>2</sub> or NO <sub>2</sub> )	
All maintenance areas	100
Ozone (ROG/VOC)	
Maintenance areas inside an ozone transport region <sup>a</sup>	50
Maintenance areas outside an ozone transport region <sup>a</sup>	100
CO: All maintenance areas	100
PM10: All maintenance areas	100
PM2.5	
Direct emissions	100
SO <sub>2</sub>	100
NO <sub>x</sub> (unless determined not to be a significant precursor)	100
ROG/VOC or ammonia (if determined to be significant precursors)	100
Pb: All maintenance areas	25

Source: 40 CFR 93.153.

Note: *de minimis* threshold levels for conformity applicability analysis.

<sup>a</sup> Ozone Transport Region is comprised of the States of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, the Consolidated Metropolitan Statistical Area that includes the District of Columbia and northern Virginia (Section 184 of the Clean Air Act).

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#### 4 8.4.2.2 CEQA

5 For this analysis, an impact was considered significant under CEQA if it would result in any of the

- following environmental impacts, which are based on professional practice and Appendix G of the
   State CEQA Guidelines:
- 8 The proposed program would result in a significant effect on air quality if it would:
- 9 Conflict with or obstruct implementation of the applicable air quality plan;
- Violate any air quality standard or contribute substantially to an existing or projected air quality violation;
- Result in a cumulatively considerable net increase of any criteria pollutant for which the
   program region is nonattainment under an applicable federal or state ambient air quality
   standard (including releasing emissions that exceed quantitative thresholds for ozone
   precursors);
- Expose sensitive receptors to substantial pollutant concentrations; or

1 • Create objectionable odors affecting a substantial number of people. 2 The proposed program would result in a significant effect on climate change if it would: 3 • Generate GHG emissions that may have a significant impact on the environment. 4 Conflict with an applicable plan adopted for the purpose of reducing GHG emissions. • 5 In addition, the State CEQA Guidelines state that the significance criteria established by the 6 applicable air quality management or air pollution control district may be relied upon to make the 7 determinations above (see Appendix C, Regulatory Background). Significant criteria for each of the 8 various air districts are summarized in Table 8-9. Impacts related to air quality are determined 9 using the local thresholds identified in Table 8-9 based on the appropriate air district the program 10 activity is located within.

#### 1 Table 8-9. Air Quality Districts and Counties Affected by the Proposed Program and Associated Significance Thresholds

	Affected							
Air District	Counties	Threshold Type	ROG	NOx	PM10	PM2.5	CO	GHGs
Bay Area Air Quality Management District (BAAQMD)ª	Solano	Construction	54 lbs/day	54 lbs/day	82 lbs/day (exhaust) BMP (dust) <sup>ь</sup>	54 lbs/day (exhaust) BMP (dust) <sup>b</sup>	N/A	N/A
		Operational	54 lbs/day	54 lbs/day	82 lbs/day (exhaust)	54 lbs/day (exhaust)	Violation of CAAQS	<u>1.100 MT</u> <u>CO<sub>2</sub>e/year</u> <u>(land use);</u> 10,000 MT CO <sub>2</sub> e/year (stationary sources)
Butte County Air Quality	Butte	Construction	N/A <sup>c</sup>	N/A <sup>c</sup>	N/A <sup>c</sup>	N/A	N/A	N/A
Management District (BCAQMD)		Operational	137 lbs/day <sup>d</sup>	137 lbs/day <sup>d</sup>	137 lbs/day <sup>d</sup>	N/A	N/A	N/A
Colusa County Air Pollution	Colusa	Construction	25.0 lbs/day	25.0 lbs/day	80.0 lbs/day	N/A	500.0 lbs/day	N/A
Control District (CCAPCD)		Operational	25.0 lbs/day	25.0 lbs/day	80.0 lbs/day	N/A	500.0 lbs/day	N/A
Feather River Air Quality	Sutter	Construction	25 lbs/day <sup>e</sup>	25 lbs/day <sup>e</sup>	80 lbs/day	N/A	N/A	N/A
Management District (FRAQMD)	Yuba	Operational	25 lbs/day	25 lbs/day	80 lbs/day	N/A	N/A	N/A
Glenn County Air Pollution	Glenn	Construction	N/A	N/A	N/A <sup>f</sup>	N/A <sup>f</sup>	N/A	N/A
Control District (GCAPCD)		Operational	N/A	N/A	N/A	N/A	N/A	N/A
Placer County Air Pollution Control District (PCAPCD)	Placer	Construction	82 lbs/day	82 lbs/day	82 lbs/day	N/A	<u>N/A</u> 550 <del>lbs/day<sup>g</sup></del>	N/A <sup>g</sup>
		Operational	82 lbs/day <u>b</u>	82 lbs/day <u>b</u>	82 lbs/day	N/A	<u>N/A</u> 550 <del>lbs/day</del> ®	N/A <sup>g</sup>
Sacramento Metropolitan Air Quality Management District	Sacramento	Construction	N/A	85 lbs/day	Violation of CAAQS	Violation of CAAQS	Violation of CAAQS	<del>N/A<u>1,100 MT</u> <u>CO2e</u></del>
(SMAQMD)		Operational	65 lbs/day	65 lbs/day	Violation of CAAQS	Violation of CAAQS	Violation of CAAQS	1.100 MT <u>CO<sub>2</sub>e/year N/A</u> <u>(land use):</u> 10.000 MT <u>CO<sub>2</sub>e/year</u> <u>(stationary</u> <u>sources)</u>

	Affected							
Air District	Counties	Threshold Type	ROG	NO <sub>X</sub>	PM10	PM2.5	CO	GHGs
Tehama County Air Pollution	Tehama	Construction	137 lbs/day <sup>d</sup>	137 lbs/day <sup>d</sup>	137 lbs/day <sup>d</sup>	N/A	N/A	N/A
Control District (TCAPCD)		Operational	137 lbs/day <sup>d</sup>	137 lbs/day <sup>d</sup>	137 lbs/day <sup>d</sup>	N/A	N/A	N/A
Yolo-Solano Air Quality Management District (YSAQMD)	Solano Yolo	Construction	10 tons/year	10 tons/year	80 lbs/day	N/A	Violation of CAAQS	N/A
		Operational	10 tons/year	10 tons/year	80 lbs/day	N/A	Violation of CAAQS	N/A

Source: Adapted from: Bay Area Air Quality Management District 2012; Butte County Air Quality Management District 2008; Chang pers. comm.; Feather River Air Quality Management District 2010; Gomez pers. comm.; Ledbetter pers. comm.; Sacramento Metropolitan Air Quality Management District 2009; Williams pers. comm.; Yolo-Solano Air Quality Management District 2007.

Notes: This table includes mass-emissions thresholds only. Thresholds for TACs and odors are not included.

N/A = Not Applicable; lbs/day = pounds per day; BMP = Best Management Practices; MT = metric tons.

<sup>a</sup> In March 2012, an Alameda County Superior Court ruled that BAAQMD needed to comply with CEQA prior to adopting their 2010 Air Quality CEQA Guidelines. As a result, the most recent guidelines are not formally adopted and are considered draft. The court ruling addressed the process of adoption of the guidelines, not the technical justification for the BAAQMD recommended thresholds. Although the most recent guidelines can only be considered draft, this document uses the recommended thresholds because the BAAQMD has provided evidence based justifications for all proposed thresholds that the City finds them to be well- grounded, based on the best available on scientific evidence and reasoning concerning air quality and greenhouse gas emissions, and therefore appropriate for use in CEQA evaluations.

<sup>b</sup> Construction activities would be required to implement the applicable dust control BMPs according to BAAQMD CEQA Guidelines.

<sup>c</sup> Operational emission thresholds apply to construction if construction will last 6 months to a year. (BCAQMD)

- <sup>d</sup> The thresholds shown are the Level C Threshold for projects that may result in potential significant air quality impacts. (BCAQMD and TCAPCD)
- e NO<sub>X</sub> and ROG construction emissions may be averaged over the life time of the project, but may not exceed 4.5 tons/year. (FRAQMD)
- <sup>f</sup> Although GCAPCD does not have specific construction and operational emission thresholds, they require water trucks on<u>-</u>site during construction, and they require any earth-moving activities to be suspended during wind events exceeding 15 mph.

<sup>g</sup> If CO thresholds are exceeded, modeling can be done to demonstrate that state and federal criteria will not be exceeded. (PCAPCD)PCAPCD has published draft ROG and NOx thresholds of 55 pounds per day. The air district also proposes a construction GHG threshold of 10,000 MT CO<sub>2</sub>e and tiered operational GHG thresholds of 1,100 MT CO<sub>2</sub>e/year, 10,000 MT CO<sub>2</sub>e/year, and various efficiency metrics. However, as of September 2016, these thresholds had not been adopted by the PCAPCD board.

## **8.5 Effects and Mitigation Measures**

### 2 8.5.1 Alternative 1–No Action

3 Under Alternative 1, construction activities associated with the proposed program would not occur. 4 Therefore, direct and indirect construction and operational emissions would not occur as a result of 5 the proposed program. As described above, construction-related HAP/TAC exposure is typically 6 related to DPM exhaust emissions from construction equipment. While pre-scheduled levee 7 maintenance would continue to be conducted under current policies, there would be no change 8 compared with current (baseline) conditions. However, although no construction associated with 9 the proposed program would occur, current policy is to protect eroding sites during emergencies. 10 This policy may result in construction and operational emissions associated with emergency actions. 11 Consequently, this alternative has the potential to result in significant effects pertaining to air 12 quality and climate change under NEPA and CEQA.

### 13 8.5.2 Alternative 2A—Low Maintenance

## Effect AQ-1: Generation of Direct and Indirect Construction Emissions in Excess of Federal *de minimis* Threshold Levels

Under Alternative 2A, construction emissions would result from materials delivery, construction 16 17 equipment activity, and hauling debris away from the program area. The excavation amounts, 18 materials required, acreage disturbed, type and number of construction equipment pieces, haul 19 routes, and duration of construction activities associated with Alternative 2A are not known at this 20 time. Therefore, it is not possible to make a definite quantitative conformity determination. As 21 discussed in Chapter 2, Project Description, the environmental analysis in this EIS/EIR is 22 programmatic in nature, analyzing the 80,000 (linear feet) LF in its entirety. Additional project-level 23 environmental documentation, tiering from this programmatic analysis, will be conducted to 24 address erosion sites that will be constructed. Construction emissions associated with Alternative 25 2A would have a significant effect under NEPA if they exceed the *de minimis* levels shown in Tables 26 8-7 and 8-8. Depending on the jurisdiction, scale, and construction activities of an individual project, 27 implementation of Mitigation Measure AO-MM-1a that includes the applicable mitigation measures 28 to reduce on-site emissions from fugitive dust and tailpipe exhaust could reduce the severity of this 29 effect to a level that is less than significant. However, it is possible that Mitigation Measure AQ-MM-30 1a would not be sufficient to reduce the construction emissions of a project to quantities below the 31 de minimis thresholds. For projects with <u>ROG. NO<sub>X</sub>, PM10, or PM2.5</u> emissions exceeding the de 32 minimis thresholds after the implementation of Mitigation Measure AQ-MM-1a and all feasible on-33 site measures, the NO<sub>x</sub>-emissions effect would be mitigated to a less than significant level through 34 the implementation of Mitigation Measure AQ-MM-1b, which will requires the project to offset the 35 ROG, NO<sub>x</sub>, PM10, and PM2.5<sub>NO<sub>x</sub></sub> emissions generated by construction activities to net zero (0). 36 Implementation of Mitigation Measure AO-MM-1b would ensure conformity requirements are met 37 for ROG, NO<sub>X</sub>, PM10, and PM2.5.

Pursuant to the general conformity regulation, Section 93.158 (a)(3), general conformity cannot be
 satisfied for CO through the purchase of offsets. Accordingly, F for projects with ROG, CO, and PM
 emissions exceeding the *de minimis* thresholds after the implementation of Mitigation Measure AQ-

1 MM-1a, there would be no other applicable measures to further reduce or offset the emissions; 2 therefore, the effect would be significant and unavoidable under NEPA. Additional project-level 3 environmental documentation, tiering from this programmatic analysis, will be conducted. In the 4 event Alternative 2A is selected as the Applicant Preferred Alternative (APA) and if construction-5 related CO emissions would exceed the *de minimis* threshold, the Corps would need to demonstrate 6 that conformity is met for CO through a local air quality modeling analysis (i.e., dispersion modeling) 7 or other acceptable methods to ensure project emissions do not cause or contribute to any 8 violations of the NAAQS or increase the frequency or severity of any existing violations.

9 Mitigation Measure AQ-MM-1a: Apply Applicable Air District's Mitigation Measures to
 10 Reduce Construction Emissions below *de minimis* Threshold Levels

11 Appropriate construction mitigation measures from the applicable air district will be applied to 12 reduce this effect to less than significant. Applicable mitigation measures are presented in 13 Appendix D, Air Quality Mitigation Measures by Air District, which lists measures from the 14 following air districts with jurisdiction in the program area: BAAQMD, BCAQMD, CCAPCD, 15 FRAQMD, GCAPCD, PCAPCD, SMAQMD, TCAPCD, and YSAQMD. Mitigation measures vary by air 16 district, but some examples of mitigation measures are implementation of a Fugitive Dust 17 Control Plan, minimization of vehicle and equipment idling time, maintaining all construction 18 equipment in proper working condition according to manufacturer's specifications, using a 19 modern equipment fleet or installing emission control devices on older equipment to reduce 20 exhaust emissions, and use of low-emission diesel equipment.

## Mitigation Measure AQ-MM-1b: Offset Construction-Generated NO<sub>x</sub> Emissions to Net Zero (0) for <u>ROG. NO<sub>x</sub>, PM10, and PM2.5</u> Emissions in Excess of *de minimis* Thresholds

23 If on-site mitigation measures identified in Mitigation Measure AQ-MM-1a are not sufficient to 24 reduce the ROG, NO<sub>x</sub>, PM10, and/or PM2.5 NO<sub>x</sub>-emissions below the *de minimis* thresholds, the 25 project sponsor will coordinate with air districtsSMAQMD and BAAQMD with jurisdiction to 26 offset the <u>ROG, NO<sub>x</sub>, PM10, and PM2.5</u> <u>NO<sub>x</sub>-emissions generated by construction activities to net</u> 27 zero (0). SMAOMD manages and implements the Heavy-Duty Low-Emission Vehicle Incentive 28 Programs (HDLEVIP), which include the Carl Mover and Sacramento Emergency Clean Air 29 Transportation Programs, on behalf of all air districts within the SVAB. More than \$7 million are 30 awarded annually to emissions reduction projects through the HDLEVIP. The BAAOMD supports 31 incentive programs to reduce criteria pollutant emissions within the SFBAAB. Similar to 32 SMAOMD, the BAAOMD's Carl Mover Program funds control projects for offroad and onroad 33 emission sources. The Transportation Fund for Clean Air Program likewise provides financial 34 incentives for onroad vehicle retrofits.

## Effect AQ-2: Generation of Direct and Indirect Operational Emissions in Excess of Federal *de minimis* Threshold Levels

Under Alternative 2A, operational emissions would result from minor amounts of routine
maintenance and landscaping. Because these activities are expected to be relatively minor and
would not generate elevated levels of pollutant emissions, these operational activities are not
expected to exceed federal *de minimis* thresholds, but the extent of these activities is not known at
this time. Therefore, no definite conformity determination can be made. As discussed in Chapter 2,
Project Description, the environmental analysis in this EIS/EIR is programmatic in nature, analyzing
the 80,000 LF in its entirety. Additional project-level environmental documentation, tiering from

- 1 this programmatic analysis, will be conducted to address erosion sites that will be constructed. 2 Operational emissions associated with Alternative 2A would have a significant effect under NEPA if
- 3 they exceed the *de minimis* levels shown in Tables 8-7 and 8-8. However, implementation of
- 4 Mitigation Measure AQ-MM-2 would reduce the severity of this effect to a level that is less than
- 5 significant. This conclusion will be quantitatively confirmed in subsequent project-level
- 6 environmental analyses, which will be tiered from this programmatic EIS/EIR, to satisfy general
- 7 conformity requirements.

#### Mitigation Measure AQ-MM-2: Apply Applicable Air District's Mitigation Measures to Reduce Operational Emissions below Federal de minimis Thresholds

10 Appropriate operational mitigation measures from the applicable air district will be applied to 11 reduce this effect to less than significant. Applicable mitigation measures are presented in 12 Appendix D, Air Quality Mitigation Measures by Air District, which lists measures from the 13 following air districts with jurisdiction in the program area: BAAQMD, BCAQMD, CCAPCD, 14 FRAQMD, GCAPCD, PCAPCD, SMAQMD, TCAPCD, and YSAQMD. Mitigation measures vary by air 15 district, but some examples of mitigation measures are implementation of a Fugitive Dust 16 Control Plan, minimization of vehicle and equipment idling time, maintaining all construction 17 equipment in proper working condition according to manufacturer's specifications, using a 18 modern equipment fleet or installing emission control devices on older equipment to reduce 19 exhaust emissions, and use of low-emission diesel equipment.

#### 20 Effect AQ-3: Temporary Increase in Construction-Related Emissions in Excess of Applicable 21 Standards

22 Under Alternative 2A, construction emissions would result from materials delivery, construction 23 equipment activity, and hauling debris away from the program area. The excavation amounts, 24 materials required, acreage disturbed, type and number of construction equipment pieces, haul 25 routes, and duration of construction activities associated with Alternative 2A are not known at this 26 time. Therefore, it is not possible to determine the construction-related effects based on a 27 quantitative analysis. As discussed in Chapter 2, Project Description, the environmental analysis in 28 this EIS/EIR is programmatic in nature, analyzing the 80,000 LF in its entirety. Additional project-29 level environmental documentation, tiering from this programmatic analysis, will be conducted to 30 address erosion sites that will be constructed. Under CEQA, construction emissions associated with 31 Alternative 2A would have a significant effect if they exceed any of the applicable air districts' 32 threshold levels shown in Table 8-9. Implementation of Mitigation Measure AQ-MM-3 would reduce 33 the severity of this effect. However, because the jurisdiction, scale, and construction activities of an 34 individual project are unknown, it is possible that construction emissions may not be reduced below 35 the air districts' threshold levels after implementing mitigation measures required by air districts. 36 Therefore, the effect would be significant and unavoidable under CEQA.

#### 37 Mitigation Measure AQ-MM-3: Apply Applicable Air District's Mitigation Measures to 38 **Reduce Construction Emissions below Applicable Air District's Thresholds**

- 39 Appropriate construction mitigation measures from the applicable air district will be applied to 40 reduce this effect to less than significant. Applicable mitigation measures are presented in 41 Appendix D, Air Quality Mitigation Measures by Air District, which lists measures from the 42 following air districts with jurisdiction in the program area: BAAQMD, BCAQMD, CCAPCD,
- 43 FRAQMD, GCAPCD, PCAPCD, SMAQMD, TCAPCD, and YSAQMD. Mitigation measures vary by air

1district, but some examples of mitigation measures are implementation of a Fugitive Dust2Control Plan, minimization of vehicle and equipment idling time, maintaining all construction3equipment in proper working condition according to manufacturer's specifications, using a4modern equipment fleet or installing emission control devices on older equipment to reduce5exhaust emissions, use of low-emission diesel equipment, and acquisition of emission reduction6credits.

## 7 Effect AQ-4: Elevated Health Risks from the Exposure of Nearby Sensitive Receptors to 8 Construction-Related HAPs/TACs

9 As previously mentioned, the TAC/HAP resulting from the proposed program would be DPM 10 emissions resulting from diesel-powered construction equipment. Sensitive receptors near 11 construction sites could be affected by DPM emissions. The extent of construction activities is not 12 known at this time, so a determination of effects is not possible based on a quantitative analysis. As 13 discussed in Chapter 2, Project Description, the environmental analysis in this EIS/EIR is 14 programmatic in nature, analyzing the 80,000 LF in its entirety. Additional project-level 15 environmental documentation, tiering from this programmatic analysis, will be conducted to 16 address erosion sites that will be constructed. Under CEQA, this would be considered a potentially 17 significant effect. However, implementation of Mitigation Measure AQ-MM-4 would reduce the 18 severity of this effect to a level that is less than significant.

## 19Mitigation Measure AQ-MM-4: Apply Applicable Air District's Mitigation Measures to20Reduce HAP/TAC Emissions below the Applicable Air District's HAP/TAC Thresholds

21 Appropriate HAP/TAC mitigation measures from the applicable air district will be applied to 22 reduce this effect to less than significant. Applicable mitigation measures that will help reduce 23 HAP/TAC emissions are presented in Appendix D, Air Quality Mitigation Measures by Air 24 District, which lists measures from the following air districts with jurisdiction in the program 25 area: BAAQMD, BCAQMD, CCAPCD, FRAQMD, GCAPCD, PCAPCD, SMAQMD, TCAPCD, and 26 YSAQMD. Mitigation measures vary by air district, but some examples of mitigation measures 27 are minimization of vehicle and equipment idling time, maintaining all construction equipment 28 in proper working condition according to manufacturer's specifications, using a modern 29 equipment fleet or installing emission control devices on older equipment to reduce exhaust 30 emissions, use of low-emission diesel equipment, and acquisition of emission reduction credits.

#### 1 Effect AQ-5: Generation of Operational Emissions in Excess of Applicable Standards

2 Under Alternative 2, operational emissions would result from routine maintenance and landscaping. 3 These operational activities are not expected to exceed air district thresholds, but the extent of these 4 activities is not known at this time. Therefore, effects resulting from operational activities cannot be 5 determined based on a quantitative analysis. As discussed in Chapter 2, Project Description, the 6 environmental analysis in this EIS/EIR is programmatic in nature, analyzing the 80,000 LF in its 7 entirety. Additional project-level environmental documentation, tiering from this programmatic 8 analysis, will be conducted to address erosion sites that will be constructed. Under CEQA, 9 operational emissions associated with Alternative 2A would have a significant effect if they exceed 10 the applicable air district's operational thresholds shown in Table 8-9. However, implementation of 11 Mitigation Measure AQ-MM-5 would reduce the severity of this effect to a level that is less than 12 significant.

## Mitigation Measure AQ-MM-5: Apply Applicable Air District's Mitigation Measures to Reduce Operational Emissions below Applicable Air District's Thresholds

15 Appropriate operational mitigation measures from the applicable air district will be applied to reduce this effect to less than significant. Applicable mitigation measures are presented in 16 17 Appendix D, Air Quality Mitigation Measures by Air District, which lists measures from the 18 following air districts with jurisdiction in the program area: BAAQMD, BCAQMD, CCAPCD, 19 FRAQMD, GCAPCD, PCAPCD, SMAQMD, TCAPCD, and YSAQMD. Mitigation measures vary by air 20 district, but some examples of mitigation measures are implementation of a Fugitive Dust 21 Control Plan, minimization of vehicle and equipment idling time, maintaining all construction 22 equipment in proper working condition according to manufacturer's specifications, using a 23 modern equipment fleet or installing emission control devices on older equipment to reduce 24 exhaust emissions, use of low-emission diesel equipment, and acquisition of emission reduction 25 credits.

## Effect AQ-6: Generation of Construction GHG Emissions that May Have a Significant Impact on the Environment

- 28 Under Alternative 2A, construction GHG emissions would result from materials delivery,
- construction equipment activity, and hauling debris away from the program area. The excavation
   amounts, materials required, acreage disturbed, type and number of construction equipment pieces,
   haul routes, and duration of construction activities associated with Alternative 2A are not known at
   this time. As discussed in Chapter 2, Project Description, the environmental analysis in this EIS/EIR
   is programmatic in nature, analyzing the 80,000 LF in its entirety. Additional project-level
   environmental documentation, tiering from this programmatic analysis, will be conducted to
- 35 address erosion sites that will be constructed.
- 36 <u>SMAQMD is the only air district in the program area that has formally adopted No air quality</u>
- districts in the program area have formally adopted GHG thresholds for construction-related
   emissions.<sup>1</sup>, and only BAAOMD has established GHG thresholds for operational related emission
- emissions.<sup>1</sup>, and only BAAQMD has established GHG thresholds for operational related emissions
   (i.e. stationary sources and land use developments). Because the construction activities, specific
- 40 project locations, and air districts with jurisdiction are not known at this time and there are <del>no</del>

<sup>&</sup>lt;sup>1</sup> PCAPCD released draft construction GHG thresholds in September 2016, although they have not been formally adopted.

1 2 3 4 5 6 7 8 9 10	<u>limited</u> applicable GHG thresholds for construction activities, it is not possible to determine the construction-related GHG effects based on a quantitative analysis. However, because construction GHG emissions for large earthmoving and bank protection projects are likely to be substantial and because of the cumulative nature of GHGs, construction GHG emissions associated with Alternative 2A could result in a significant contribution to regional GHG emission levels and are considered to have a significant effect on climate change under NEPA and CEQA. Implementation of Mitigation Measure AQ-MM-6 would reduce GHG emissions during construction. However, until the all air districts develop appropriate significance thresholds for the evaluation of construction GHG emissions for the project-level analysis, the effect is considered significant and unavoidable under NEPA and CEQA.
11 12	Mitigation Measure AQ-MM-6: Implement Measures to Minimize GHG Emissions from Construction Activities
13 14 15	The following measures will be considered to lower GHG emissions from construction activities. These mitigation measures combine the currently proposed mitigation measures published by SMAQMD (201 <u>6</u> +) and BAAQMD (2012).
16	• Improve fuel efficiency from construction equipment.
17 18	• Perform on-site material hauling with trucks equipped with on-road engines (if determined to be less emissive than the off-road engines).
19	• Use electricity from utility power lines rather than fossil fuel, where appropriate.
20	• Encourage construction workers to carpool.
21 22 23	• Reduce electricity use in the construction office by using compact fluorescent bulbs, powering off computers every day, and replacing heating and cooling units with more efficient ones.
24 25	• Use alternative-fueled (e.g., biodiesel, electric) construction vehicles/equipment for at least 15% of the fleet.
26	• Recycle at least 75% of construction waste and demolition debris.
27	• Use at least 20% locally sourced or recycled materials for construction materials.
28	• Develop a plan to efficiently use water for adequate dust control.
29 30	• Comply with all applicable future GHG regulations at the time of project-level permitting and construction.
31 32	Effect AQ-7: Generation of Operational GHG Emissions that May Have a Significant Impact on the Environment
33 34 35 36 37	Under Alternative 2A, operational emissions would result from routine maintenance and landscaping. These operational activities are not expected to generate substantial GHG emissions, but the extent of these activities is not known at this time. Therefore, GHG effects resulting from operational activities cannot be determined based on a quantitative analysis. As discussed in Chapter 2, Project Description, the environmental analysis in this EIS/EIR is programmatic in

- 38 nature, analyzing the 80,000 LF in its entirety. Additional project-level environmental
- 39 documentation, tiering from this programmatic analysis, will be conducted to address erosion sites
- 40 that will be constructed.

1 No air quality districts in the program area have formally adopted GHG thresholds for emissions 2 related to operations, and oOnly BAAQMD and SMAOMD have has established GHG thresholds for 3 operational-related emissions (i.e. stationary sources and land use developments). Because the 4 extent of the maintenance activities, specific project locations, and air districts with jurisdictions are 5 not known at this time and there are no-limited applicable GHG thresholds for operation activities, it 6 is not possible to determine the GHG emission effects based on a quantitative analysis. However, 7 because of the cumulative nature of GHGs, for this programmatic assessment, GHG emissions 8 associated with Alternative 2A during operation are considered to have a significant effect on 9 climate change. Implementation of Mitigation Measure AQ-MM-6, which is also applicable to 10 operational maintenance activities, would reduce GHG emissions. However, until the all air districts 11 develop appropriate significance thresholds for the evaluation of construction GHG emissions for 12 the project-level analysis, the effect is considered significant and unavoidable under NEPA and 13 CEQA.

# 148.5.3Alternative 3A—Maximize Meander Zone15(Environmentally Superior Alternative)

## Effect AQ-1: Generation of Direct and Indirect Construction Emissions in Excess of Federal *de minimis* Threshold Levels

18 The effects of Alternative 3A would be similar to those described under Alternative 2A, because 19 construction emissions would also result from materials delivery, construction equipment activity, 20 and hauling debris away from the program area. Under Alternative 3A, construction emissions 21 would result from materials delivery, construction equipment activity, and hauling debris away 22 from the program area associated with construction of a setback levee or an adjacent levee. The 23 excavation amounts, materials required, acreage disturbed, type and number of construction 24 equipment pieces, haul routes, and duration of construction activities associated with Alternative 3A 25 are not known at this time. Therefore, it is not possible to make a definite quantitative conformity 26 determination. As discussed in Chapter 2, Project Description, the environmental analysis in this 27 EIS/EIR is programmatic in nature, analyzing the 80,000 LF in its entirety. Additional project-level 28 environmental documentation, tiering from this programmatic analysis, will be conducted to 29 address erosion sites that will be constructed. Construction emissions associated with Alternative 30 3A would have a significant effect if they exceed the *de minimis* levels shown in Tables 8-7 and 8-8. 31 Depending on the jurisdiction, scale, and construction activities of an individual project, 32 implementation of Mitigation Measure AO-MM-1a that includes the applicable mitigation measures 33 to reduce on-site emissions from fugitive dust and tailpipe exhaust could reduce the severity of this 34 effect to a level that is less than significant. However, it is possible that Mitigation Measure AQ-MM-35 1a would not be sufficient to reduce the construction emissions of a project to quantities below the de minimis thresholds. For projects with ROG, NO<sub>X</sub>, PM10, or PM2.5 emissions exceeding the de 36 37 minimis thresholds after the implementation of Mitigation Measure AQ-MM-1a and all feasible on-38 site measures, the NO<sub>x</sub>-emissions effect would be mitigated to a less than significant level through 39 the implementation of <u>Mitigation</u> Measure AQ-MM-1b, which will requires the project to offset the 40 ROG, NO<sub>x</sub>, PM10, and PM2.5<sub>NO<sub>x</sub></sub> emissions generated by construction activities to net zero (0). 41 Implementation of Mitigation Measure AQ-MM-1b would ensure conformity requirements are met for ROG, NO<sub>x</sub>, PM10, and PM2.5. 42

## 43Pursuant to the general conformity regulation, Section 93.158 (a)(3), general conformity cannot be44satisfied for C0 through the purchase of offsets. Accordingly, F for projects with ROG, CO, and PM

- 1 emissions exceeding the *de minimis* thresholds after the implementation of Mitigation Measure AQ-
- 2 MM-1a, there would be no other applicable measures to further reduce or offset the emissions;
- therefore, the effect would be significant and unavoidable under NEPA. <u>Additional project-level</u>
   environmental documentation, tiering from this programmatic analysis, will be conducted. In the
- 4 <u>environmental documentation, tiering from this programmatic analysis, will be conducted. In the</u>
   5 <u>event Alternative 3A is selected as the APA and if construction-related CO emissions would exceed</u>
- 6 <u>event Alternative 3A is selected as the APA and if construction-related CO emissions would exceed</u> 6 the *de minimis* threshold, the Corps would need to demonstrate that conformity is met for CO
- the *de minimis* threshold, the Corps would need to demonstrate that conformity is met for CO
   through a local air quality modeling analysis (i.e., dispersion modeling) or other acceptable methods.
- 8 <u>to ensure project emissions do not cause or contribute to any violations of the NAAQS or increase</u>
- 9 the frequency or severity of any existing violations.

## Effect AQ-2: Generation of Direct and Indirect Operational Emissions in Excess of Federal *de minimis* Threshold Levels

- 12 The effects of Alternative 3A would be similar to those described under Alternative 2A, because 13 Alternative 3A would also result in operational emissions from routine maintenance and
- 14 landscaping. Because these activities are expected to be relatively minor and would not generate
- elevated levels of pollutant emissions, these operational activities are not expected to exceed federal *de minimis* thresholds, but the extent of these activities is not known at this time. Therefore, no definite conformity determination can be made. As discussed in Chapter 2, Project Description, the environmental analysis in this EIS/EIR is programmatic in nature, analyzing the 80,000 LF in its entirety. Additional project-level environmental documentation, tiering from this programmatic
- analysis, will be conducted to address erosion sites that will be constructed. Operational emissions
   associated with Alternative 3A would have a significant effect under NEPA if they exceed the *de minimis* levels shown in Tables 8-7 and 8-8. Implementation of Mitigation Measure AQ-MM-2 would
- reduce the severity of this effect to a level that is less than significant. <u>This conclusion will be</u>
   <u>quantitatively confirmed in subsequent project-level environmental analyses</u>, which will be tiered
- 25 from this programmatic EIS/EIR, to satisfy general conformity requirements.

## 26 Effect AQ-3: Temporary Increase in Construction-Related Emissions in Excess of Applicable 27 Standards

- 28 The effects of Alternative 3A would be similar to those described under Alternative 2A, because 29 Alternative 3A would also result in construction emissions from materials delivery, construction 30 equipment activity, and hauling debris away from the program area. The excavation amounts, 31 materials required, acreage disturbed, type and number of construction equipment pieces, haul 32 routes, and duration of construction activities associated with Alternative 3A are not known at this 33 time. Therefore, it is not possible to determine the construction-related effects based on a 34 quantitative analysis. As discussed in Chapter 2, Project Description, the environmental analysis in 35 this EIS/EIR is programmatic in nature, analyzing the 80,000 LF in its entirety. Additional project-36 level environmental documentation, tiering from this programmatic analysis, will be conducted to 37 address erosion sites that will be constructed. Under CEQA, construction emissions associated with 38 Alternative 3A would have a significant effect if they exceed any of the applicable air districts' 39 threshold levels shown in Table 8-9. Implementation of Mitigation Measure AQ-MM-3 would reduce 40 the severity of this effect. However, because the jurisdiction, scale, and construction activities of an 41 individual project are unknown, it is possible that construction emissions may not be reduced below 42 the air districts' threshold levels after implementing mitigation measures required by air districts.
- 43 Therefore, the effect would be significant and unavoidable under CEQA.

## Effect AQ-4: Elevated Health Risks from the Exposure of Nearby Sensitive Receptors to Construction-Related TACs/HAPs

3 The effects of Alternative 3A would be similar to those described under Alternative 2A. As 4 previously mentioned, the TAC/HAP resulting from the proposed program would be DPM emissions 5 resulting from diesel-powered construction equipment. Sensitive receptors near construction sites 6 could be affected by DPM emissions. The extent of construction activities is not known at this time, 7 so a determination of effects is not possible based on a quantitative analysis. As discussed in Chapter 8 2, Project Description, the environmental analysis in this EIS/EIR is programmatic in nature, 9 analyzing the 80,000 LF in its entirety. Additional project-level environmental documentation, 10 tiering from this programmatic analysis, will be conducted to address erosion sites that will be 11 constructed. Under CEOA, this would be considered a potentially significant effect. Implementation of Mitigation Measure AQ-MM-4 would reduce the severity of this effect to a level that is less than 12 13 significant.

#### 14 Effect AQ-5: Generation of Operational Emissions in Excess of Applicable Standards

- 15 The effects of Alternative 3A would be similar to those described under Alternative 2A, because
- 16 Alternative 3A would also result in operational emissions from routine maintenance and
- 17 landscaping. These operational activities are not expected to exceed air district thresholds, but the
- extent of these activities is not known at this time. Therefore, effects resulting from operational
   activities cannot be determined based on a quantitative analysis. As discussed in Chapter 2, Project
- 20 Description, the environmental analysis in this EIS/EIR is programmatic in nature, analyzing the
- 20 Description, the environmental analysis in this Eloy Environmental documentation, tiering from this 21 80,000 LF in its entirety. Additional project-level environmental documentation, tiering from this
- programmatic analysis, will be conducted to address erosion sites that will be constructed. Under
   CEQA, operational emissions associated with Alternative 3A would have a significant effect if they
   exceed the applicable air district's operational thresholds shown in Table 8-9. Implementation of
- Mitigation Measure AQ-MM-5 would reduce the severity of this effect to a level that is less than
   significant.

## Effect AQ-6: Generation of Construction GHG Emissions that May Have a Significant Impact on the Environment

- 29 The effects of Alternative 3A would be similar to those described under Alternative 2A, because 30 Alternative 3A would also result in construction emissions from materials delivery, construction 31 equipment activity, and hauling debris away from the program area. The excavation amounts, 32 materials required, acreage disturbed, type and number of construction equipment pieces, haul 33 routes, and duration of construction activities associated with Alternative 2A are not known at this 34 time. As discussed in Chapter 2, Project Description, the environmental analysis in this EIS/EIR is 35 programmatic in nature, analyzing the 80,000 LF in its entirety. Additional project-level 36 environmental documentation, tiering from this programmatic analysis, will be conducted to 37 address erosion sites that will be constructed.
- 38 <u>SMAQMD is the only air district in the program area that has formally adopted No air quality</u>
   39 <u>districts in the program area have formally adopted GHG thresholds for construction-related</u>
   40 emissions<u>, and only BAAQMD has established GHG thresholds for operational related emissions (i.e.</u>
  - 41 stationary sources and land use developments). Because at this time and there are no-limited
  - 42 applicable GHG thresholds for construction activities, it is not possible to determine the
  - 43 construction-related GHG effects based on a quantitative analysis. However, because construction

- 1 GHG emissions for large earthmoving and bank protection projects are likely to be substantial and
- 2 because of the cumulative nature of GHGs, construction GHG emissions associated with Alternative
- 3 3A could result in a significant contribution to regional GHG emission levels and are considered to
- 4 have a significant effect on climate change. Implementation of Mitigation Measure AQ-MM-6 would
- reduce GHG emissions during construction. However, until the all air districts develop appropriate
   significance thresholds for the evaluation of construction GHG emissions for the project-level
- analysis, the effect is considered significant and unavoidable under NEPA and CEQA.

## 8 Effect AQ-7: Generation of Operational GHG Emissions that May Have a Significant Impact on 9 the Environment

- The effects of Alternative 3A would be similar to those described under Alternative 2A, because
   Alternative 3A would also result in operational emissions from routine maintenance and
- 12 landscaping. These operational activities are not expected to generate substantial GHG emissions,
- 13 but the extent of these activities is not known at this time. Therefore, GHG effects resulting from
- 14 operational activities cannot be determined based on a quantitative analysis. As discussed in
- 15 Chapter 2, Project Description, the environmental analysis in this EIS/EIR is programmatic in
- 16 nature, analyzing the 80,000 LF in its entirety. Additional project-level environmental
- documentation, tiering from this programmatic analysis, will be conducted to address erosion sites
   that will be constructed.
- 19 No air quality districts in the program area have formally adopted GHG thresholds for emissions 20 related to operations, and oOnly BAAQMD and SMAOMD havehas established GHG thresholds for 21 operational-related emissions (i.e. stationary sources and land use developments).<sup>2</sup> Because the 22 extent of the maintenance activities, specific project locations, and air districts with jurisdictions are 23 not known at this time and there are no limited applicable GHG thresholds for construction 24 activities, it is not possible to determine the GHG emission effects based on a quantitative analysis. 25 However, because of the cumulative nature of GHGs, GHG emissions associated with Alternative 3A 26 during operation are considered to have a significant effect on climate change. Implementation of 27 Mitigation Measure AO-MM-6, that is also applicable to operational maintenance activities, would 28 reduce GHG emissions. However, until the <u>all</u> air districts develop appropriate significance 29 thresholds for the evaluation of construction GHG emissions for the project-level analysis, the effect 30 is considered significant and unavoidable under NEPA and CEQA.

# 8.5.4 Alternative 4A—Habitat Replacement (Preferred Alternative)

The effects of Alternative 4A would be similar to those described above under Alternatives 2A and 3A, because this alternative applies a combination of site-specific bank protection measures (Bank 3A, because this alternative applies a combination of site-specific bank protection measures (Bank 35 Protection Measures 1–5) and because construction emissions would also result from materials 36 delivery, construction equipment activity, and hauling debris away from the program area. Under 37 this alternative, off-site mitigation is acceptable and mitigation would be provided within the region 38 of impact (i.e., Region 1a, 1b, 2, or 3).

<sup>&</sup>lt;sup>2</sup> PCAPCD released draft operational GHG thresholds in September 2016, although they have not been formally adopted.

## Effect AQ-1: Generation of Direct and Indirect Construction Emissions in Excess of Federal *de minimis* Threshold Levels

3 This would be considered a potentially significant effect. Implementation of Mitigation Measures 4 AQ-MM-1a and AQ-MM-1b would reduce the severity of this effect. However, depending on the 5 jurisdiction, scale, and construction activities of an individual project, the mitigation measure may 6 not be sufficient to reduce the ROG, <u>NOx.</u>CO, and PM<u>10, or PM2.5</u> emissions below the *de minimis* 7 thresholds. Therefore, the effect would be significant and unavoidable under NEPA. Additional 8 project-level environmental documentation, tiering from this programmatic analysis, will be 9 conducted. Alternative 4A is the APA. If implementation of Alternative 4A would result in 10 construction-related CO emissions that exceed the *de minimis* threshold, the Corps would need to demonstrate that conformity is met for CO through a local air quality modeling analysis (i.e., 11 12 dispersion modeling) or other acceptable methods to ensure project emissions do not cause or 13 contribute to any violations of the NAAQS or increase the frequency or severity of any existing 14 violations.

## Effect AQ-2: Generation of Direct and Indirect Operational Emissions in Excess of Federal *de minimis* Threshold Levels

- 17 This would be considered a potentially significant effect. However, implementation of Mitigation
- 18 Measure AQ-MM-2 would reduce the severity of this effect to a level that is less than significant
- 19 under NEPA. <u>This conclusion will be quantitatively confirmed in subsequent project-level</u>
- 20 environmental analyses, which will be tiered from this programmatic EIS/EIR, to satisfy general
   21 conformity requirements.

## Effect AQ-3: Temporary Increase in Construction-Related Emissions in Excess of Applicable Standards

- 24 This would be considered a potentially significant effect. Implementation of Mitigation Measure AQ-
- 25 MM-3 would reduce the severity of this effect. However, because the jurisdiction, scale, and
- construction activities of an individual project are unknown, it is possible that construction
   emissions may not be reduced below the air districts' threshold levels after implementing mitigation
   measures required by air districts. Therefore, the effect would be significant and unavoidable under
- 29 CEQA.

## Effect AQ-4: Elevated Health Risks from the Exposure of Nearby Sensitive Receptors to Construction-Related HAPs/TACs

This would be considered a potentially significant effect. However, implementation of Mitigation
 Measure AQ-MM-4 would reduce the severity of this effect to a level that is less than significant
 under CEQA.

#### 35 Effect AQ-5: Generation of Operational Emissions in Excess of Applicable Standards

- 36 This would be considered a potentially significant effect. However, implementation of Mitigation
- 37 Measure AQ-MM-5 would reduce the severity of this effect to a level that is less than significant
- 38 under CEQA.

## Effect AQ-6: Generation of Construction GHG Emissions that May Have a Significant Impact on the Environment

3 SMAOMD is the only air district in the program area that has formally adopted GHG thresholds for 4 construction-related emissions. Because the construction activities, specific project locations, and 5 air districts with jurisdiction are not known at this time and there are limited applicable GHG 6 thresholds for construction activities, it is not possible to determine the construction-related GHG 7 effects based on a quantitative analysis. However, because construction GHG emissions for large 8 earthmoving and bank protection projects are likely to be substantial and because of the cumulative 9 nature of GHGs, construction GHG emissions associated with Alternative 4A could result in a 10 significant contribution to regional GHG emission levels and are considered to have a significant effect on climate change under NEPA and CEQA. This would be considered a potentially significant 11 effect.-Implementation of Mitigation Measure AQ-MM-6 would reduce the severity of this effect. 12 13 However, until the all air districts develop appropriate significance thresholds for the evaluation of 14 construction GHG emissions for the project-level analysis, the effect is considered significant and 15 unavoidable under NEPA and CEQA.

## Effect AQ-7: Generation of Operational GHG Emissions that May Have a Significant Impact on the Environment

18 BAAOMD and SMAOMD are the only air districts in the program area that have established GHG 19 thresholds for operational emissions (i.e. stationary sources and land use developments). Because 20 the extent of the maintenance activities, specific project locations, and air districts with jurisdiction 21 are not known at this time and there are limited applicable GHG thresholds for operation activities. 22 it is not possible to determine the GHG emission effects based on a quantitative analysis. However, 23 because of the cumulative nature of GHGs, for this programmatic assessment, GHG emissions 24 associated with Alternative 4A operation are considered to have a significant effect on climate 25 change. This would be considered a potentially significant effect. Implementation of Mitigation 26 Measure AQ-MM-6, that which is also applicable to operational maintenance activities, would reduce 27 the severity of this effect. However, until the all air districts develop appropriate significance 28 thresholds for the evaluation of construction GHG emissions for the project-level analysis, the effect 29 is considered significant and unavoidable under NEPA and CEQA.

# 30 8.5.5 Alternative 5A—Habitat Replacement Reaching 31 Environmental Neutrality

The effects of Alternative 5A would be similar to those described under Alternative 4A and would also apply a combination of site-specific bank protection measures (Bank Protection Measures 1–5). However, Alternative 5A differs in that it minimizes the use of off-site mitigation through the application of fewer site-specific bank protection measures that result in significant habitat effects.

## Effect AQ-1: Generation of Direct and Indirect Construction Emissions in Excess of Federal *de minimis* Threshold Levels

- 38 This would be considered a potentially significant effect. Implementation of Mitigation Measures
- 39 AQ-MM-1a and AQ-MM-1b would reduce the severity of this effect. However, depending on the
- 40 jurisdiction, scale, and construction activities of an individual project, the mitigation measure may
- 41 not be sufficient to reduce the ROG, <u>NO<sub>X</sub></u>, CO, <del>and </del>PM<u>10</u>, or PM2.5 emissions below the *de minimis*

- 1 thresholds. Therefore, the effect would be significant and unavoidable under NEPA. <u>Additional</u>
- 2 project-level environmental documentation, tiering from this programmatic analysis, will be
- 3 <u>conducted. In the event Alternative 5A is selected as the APA and if construction-related CO</u>
- 4 <u>emissions would exceed the *de minimis* threshold, the Corps would need to demonstrate that</u>
- 5 conformity is met for CO through a local air quality modeling analysis (i.e., dispersion modeling) or
- 6 <u>other acceptable methods to ensure project emissions do not cause or contribute to any violations of</u>
- 7 the NAAQS or increase the frequency or severity of any existing violations.

## 8 Effect AQ-2: Generation of Direct and Indirect Operational Emissions in Excess of Federal *de* 9 *minimis* Threshold Levels

10This would be considered a potentially significant effect. However, implementation of Mitigation11Measure AQ-MM-2 would reduce the severity of this effect to a level that is less than significant12under NEPA. This conclusion will be quantitatively confirmed in subsequent project-level13environmental analyses, which will be tiered from this programmatic EIS/EIR, to satisfy general14conformity requirements.

## Effect AQ-3: Temporary Increase in Construction-Related Emissions in Excess of Applicable Standards

17This would be considered a potentially significant effect. Implementation of Mitigation Measure AQ-18MM-3 would reduce the severity of this effect. However, because the jurisdiction, scale, and19construction activities of an individual project are unknown, it is possible that construction20emissions may not be reduced below the air districts' threshold levels after implementing mitigation21measures required by air districts. Therefore, the effect would be significant and unavoidable under22CEQA.

## Effect AQ-4: Elevated Health Risks from the Exposure of Nearby Sensitive Receptors to Construction-Related HAPs/TACs

This would be considered a potentially significant effect. However, implementation of Mitigation
 Measure AQ-MM-4 would reduce the severity of this effect to a level that is less than significant
 under CEQA.

#### 28 Effect AQ-5: Generation of Operational Emissions in Excess of Applicable Standards

This would be considered a potentially significant effect. However, implementation of Mitigation
 Measure AQ-MM-5 would reduce the severity of this effect to a level that is less than significant
 under CEQA.

## Effect AQ-6: Generation of Construction GHG Emissions that May Have a Significant Impact on the Environment

- 34 <u>SMAQMD is the only air district in the program area that has formally adopted GHG thresholds for</u>
- 35 <u>construction-related emissions. Because the construction activities, specific project locations, and</u>
- 36 <u>air districts with jurisdiction are not known at this time and there are limited applicable GHG</u>
- 37 <u>thresholds for construction activities, it is not possible to determine the construction-related GHG</u>
- 38 effects based on a quantitative analysis. However, because construction GHG emissions for large
- 39 earthmoving and bank protection projects are likely to be substantial and because of the cumulative
- 40 nature of GHGs, construction GHG emissions associated with Alternative 5A could result in a

significant contribution to regional GHG emission levels and are considered to have a significant
 effect on climate change under NEPA and CEQA. This would be considered a potentially significant
 effect. Implementation of Mitigation Measure AQ-MM-6 would reduce the severity of this effect.
 However, until the all air districts develop appropriate significance thresholds for the evaluation of
 construction GHG emissions for the project-level analysis, the effect is considered significant and
 unavoidable under NEPA and CEQA.

## 7 Effect AQ-7: Generation of Operational GHG Emissions that May Have a Significant Impact on 8 the Environment

9 BAAQMD and SMAQMD are the only air districts in the program area that have established GHG 10 thresholds for operational emissions (i.e. stationary sources and land use developments). Because the extent of the maintenance activities, specific project locations, and air districts with jurisdiction 11 12 are not known at this time and there are limited applicable GHG thresholds for operation activities. 13 it is not possible to determine the GHG emission effects based on a quantitative analysis. However, 14 because of the cumulative nature of GHGs, for this programmatic assessment, GHG emissions 15 associated with Alternative 5A operation are considered to have a significant effect on climate 16 change. This would be considered a potentially significant effect. Implementation of Mitigation 17 Measure AQ-MM-6, that is also applicable to operational maintenance activities, would reduce the 18 severity of this effect. However, until the all air districts develop appropriate significance thresholds 19 for the evaluation of construction GHG emissions for the project-level analysis, the effect is 20 considered significant and unavoidable under NEPA and CEQA.

# 8.5.6 Alternative 6A—Habitat Replacement with Vegetation ETL Variance

The effects of Alternative 6A would be similar to those described under Alternative 4A. Alternative 6A applies the bank protection measures from the 2009 Alternatives Report without modification (Bank Protection Measures 1, 4a, 4b, 4c, and 5). A number of these bank protection measures include protection of existing vegetation and placement of on-site mitigation vegetation within the VFZ and would require an ETL variance. Off-site mitigation is acceptable and would be provided within the region of impact (e.g., Region 1a, 1b, 2, or 3).

## 29 Effect AQ-1: Generation of Direct and Indirect Construction Emissions in Excess of Federal *de* 30 *minimis* Threshold Levels

31 This would be considered a potentially significant effect. Implementation of Mitigation Measures 32 AQ-MM-1a and AQ-MM-1b would reduce the severity of this effect. However, depending on the 33 jurisdiction, scale, and construction activities of an individual project, the mitigation measure may 34 not be sufficient to reduce the ROG, NOx, CO, and PM10 and PM2.5 emissions below the de minimis 35 thresholds. Therefore, the effect would be significant and unavoidable under NEPA. Additional 36 project-level environmental documentation, tiering from this programmatic analysis, will be conducted. If Alternative 6A is selected as the APA and if it would result in construction-related CO 37 38 emissions that exceed the *de minimis* threshold, the Corps would need to demonstrate that 39 conformity is met for CO through a local air quality modeling analysis (i.e., dispersion modeling) or 40 other acceptable methods to ensure project emissions do not cause or contribute to any violations of the NAAOS or increase the frequency or severity of any existing violations. 41

#### 1 Effect AO-2: Generation of Direct and Indirect Operational Emissions in Excess of Federal de 2 minimis Threshold Levels

- 3 This would be considered a potentially significant effect. However, implementation of Mitigation
- 4 Measure AQ-MM-2 would reduce the severity of this effect to a level that is less than significant
- 5 under NEPA. This conclusion will be quantitatively confirmed in subsequent project-level
- 6 environmental analyses, which will be tiered from this programmatic EIS/EIR, to satisfy general
- 7 conformity requirements.

#### 8 Effect AQ-3: Temporary Increase in Construction-Related Emissions in Excess of Applicable 9 Standards

- 10 This would be considered a potentially significant effect. Implementation of Mitigation Measure AQ-
- 11 MM-3 would reduce the severity of this effect. However, because the jurisdiction, scale, and
- 12 construction activities of an individual project are unknown, it is possible that construction
- 13 emissions may not be reduced below the air districts' threshold levels after implementing mitigation 14 measures required by air districts. Therefore, the effect would be significant and unavoidable under CEQA.
- 15

#### 16 Effect AO-4: Elevated Health Risks from the Exposure of Nearby Sensitive Receptors to 17 **Construction-Related HAPs/TACs**

18 This would be considered a potentially significant effect. However, implementation of Mitigation 19 Measure AQ-MM-4 would reduce the severity of this effect to a level that is less than significant 20 under CEQA.

#### 21 Effect AO-5: Generation of Operational Emissions in Excess of Applicable Standards

22 This would be considered a potentially significant effect. However, implementation of Mitigation 23 Measure AQ-MM-5 would reduce the severity of this effect to a level that is less than significant 24 under CEQA.

#### 25 Effect AQ-6: Generation of Construction GHG Emissions that May Have a Significant Impact on 26 the Environment

27 SMAOMD is the only air district in the program area that has formally adopted GHG thresholds for 28 construction-related emissions. Because the construction activities, specific project locations, and 29 air districts with jurisdiction are not known at this time and there are limited applicable GHG 30 thresholds for construction activities, it is not possible to determine the construction-related GHG 31 effects based on a quantitative analysis. However, because construction GHG emissions for large 32 earthmoving and bank protection projects are likely to be substantial and because of the cumulative 33 nature of GHGs, construction GHG emissions associated with Alternative 6A could result in a 34 significant contribution to regional GHG emission levels and are considered to have a significant 35 effect on climate change under NEPA and CEOA. This would be considered a potentially significant 36 effect. Implementation of Mitigation Measure AQ-MM-6 would reduce the severity of this effect. 37 However, until the all air districts develop appropriate significance thresholds for the evaluation of 38 construction GHG emissions for the project-level analysis, the effect is considered significant and 39 unavoidable under NEPA and CEQA.

## Effect AQ-7: Generation of Operational GHG Emissions that May Have a Significant Impact on the Environment

- 3 BAAQMD and SMAQMD are the only air districts in the program area that have established GHG
- 4 thresholds for operational emissions (i.e. stationary sources and land use developments). Because
- 5 the extent of the maintenance activities, specific project locations, and air districts with jurisdiction
- 6 are not known at this time and there are limited applicable GHG thresholds for operation activities,
- 7 <u>it is not possible to determine the GHG emission effects based on a quantitative analysis. However,</u>
- 8 because of the cumulative nature of GHGs, for this programmatic assessment, GHG emissions
- 9 associated with Alternative 6A operation are considered to have a significant effect on climate
- 10 <u>change.</u> This would be considered a potentially significant effect. Implementation of Mitigation
- 11 Measure AQ-MM-6, that which is also applicable to operational maintenance activities, would reduce
- 12 the severity of this effect. However, until the all air districts develop appropriate significance 13 thresholds for the evaluation of construction GHG emissions for the project-level analysis, the effect
- 14 is considered significant and unavoidable under NEPA and CEQA.

### **9.1 Introduction and Summary**

This section addresses noise effects associated with the proposed program. It describes the affected environment, the noise and vibration effects that would result from the proposed program, and the mitigation measures that would reduce these e key sources of data and information used in the preparation of this chapter are as follows:

8 • Program area county general plans.

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- Program area local noise ordinances.
- Roadway Construction Noise Model User's Guide (Federal Highway Administration 2006).
- 11 Technical Noise Supplement (California Department of Transportation 2013).
- Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving
   on Fish (California Department of Transportation 2009).
- Transportation and Construction-Induced Vibration Guidance Manual (California Department of Transportation 2013).
- Transit Noise and Vibration Impact Assessment (Federal Transit Administration 2006).
- Community Noise (Environmental Protection Agency 1971).
- Table 9-1 summarizes the noise and vibration effects resulting from the implementation of theaction alternatives.

#### 20 Table 9-1. Summary of Noise and Vibration Effects and Mitigation

Effect	Mitigation Measures	Implementation Period
Effect NOI-1: Exposure of Sensitive Receptors Adjacent to Levee Construction Sites to Temporary Construction-Related Noise	NOI-MM-1: Employ Noise- Reducing Construction Practices to Comply with Applicable Noise Criteria	Prior to and during construction
Effect NOI-2: Exposure of Sensitive Receptors along Truck Haul Routes to Substantial Temporary Traffic Noise Increases	None required	Not applicable
Effect NOI-3: Exposure of Sensitive Receptors to Temporary Construction-Related Vibration	NOI-MM-2: Conduct Vibration Monitoring at Buildings within 40 feet of Construction Equipment	During construction

Effect	Mitigation Measures	Implementation Period
Effect NOI-4: Exposure of Sensitive Receptors to Intermittent Noise Due to Long-Term Maintenance Activity including Emergency Repair Activities	NOI-MM-1: Employ Noise- Reducing Construction Practices to Comply with Applicable Noise Criteria	Prior to and during construction
	NOI-MM-3: Employ Emergency Repair Practices to Reduce Noise Where Feasible	

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### 2 9.1.1 Noise Terminology

A brief background discussion of noise terminology follows.

- **Sound.** A vibratory disturbance created by a vibrating object, which, when transmitted by pressure waves through a medium such as air, is capable of being detected by a receiving mechanism, such as the human ear or a microphone.
  - **Noise.** Sound that is loud, unpleasant, unexpected, or otherwise undesirable.
- **Decibel (dB).** A unitless measure of sound on a logarithmic scale, which indicates the squared ratio of sound pressure amplitude to a reference sound pressure amplitude. The reference pressure is 20 micro-pascals.
- A-Weighted Decibel (dBA). An overall frequency-weighted sound level in decibels that
   approximates the frequency response of the human ear. Table 9-2 shows the range of typical
   dBA noise levels.
- Equivalent Sound Level (Leq). The equivalent steady state sound level that in a stated period of
   time would contain the same acoustical energy.
- Maximum and minimum sound levels (L<sub>max</sub> and L<sub>min</sub>). The maximum and minimum sound
   levels measured during a measurement period.
- Peak Sound Level (L<sub>peak</sub>). The highest instantaneous noise level (typically lasting less than about 1/32 of a second) during the measurement period.
- Percentile-Exceeded Sound Level (L<sub>xx</sub>). The sound level exceeded "x" percent of a specific
   time period. For example, L<sub>10</sub> is the relatively loud sound level exceeded only 10% of the time,
   while the L<sub>90</sub> is a relatively quiet sound exceeded 90% of the time.

	Noise Level	
<b>Common Outdoor Activities</b>	(dBA)	<b>Common Indoor Activities</b>
	—110—	Rock band
Jet flyover at 1,000 feet		
	—100—	
Gas lawnmower at 3 feet		
	—90—	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	—80—	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawnmower, 100 feet	—70—	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	—60—	
		Large business office
Quiet urban daytime	—50—	Dishwasher in next room
Quiet urban nighttime	—40—	Theater, large conference room (background)
Quiet suburban nighttime		
	—30—	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	—20—	
		Broadcast/recording studio
	—10—	· -
	—0—	

#### Table 9-2. Typical A-Weighted Sound Levels

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3 The perceptibility of a new noise source that intrudes into a background noise environment 4 depends on the nature of the intruding sound compared to the background sound. In general, if the 5 intruding sound has the same character as the background sound (e.g., an increase in continuous 6 traffic noise compared to background continuous traffic noise), human sound perception is such that 7 a change in sound level of 3 dB is just noticeable, a change of 5 dB is clearly noticeable, and a change 8 of 10 dB is perceived as doubling or halving the sound level. However, if the intruding sound is of a 9 character different from the background sound (e.g., construction noise in an otherwise quiet 10 neighborhood), the intruding sound can be clearly discernible even if it raises the overall dBA noise 11 level by less than 1 dB.

All of the alternatives (including Alternative 1—No Action) would require use of conventional construction equipment to either construct levee improvements or to maintain the levees. Table 9-3 lists noise levels generated by representative types of construction equipment. For some of the alternatives all construction equipment would operate on land, but some alternatives would include waterside equipment, such as tugs and barge-mounted cranes and loaders, to transfer delivered rock and soil to the levee.

Equipment	Typical Noise Level (L <sub>max</sub> ) <sup>1</sup>
Air Compressor	78
Backhoe	78
Compactor	83
Crane	81
Dozer	82
Dump Truck	76
Excavator	81
Forklift <sup>3</sup>	75
Front-End Loader	79
Grader	85
Haul Truck <sup>2</sup>	76
Maintainer <sup>5</sup>	77
Paver	77
Pickup Truck	75
Impact Pile Driver	101
(Will not be used for proposed program, included here only for comparison purposes)	
Trackhoe <sup>4</sup>	78
Scraper	84
Tugboat	82
	Continuous $L_{eq}$ at 50 feet
Water Truck <sup>2</sup>	76

#### Table 9-3. Typical Construction Equipment Noise Emission Levels

Source: Federal Highway Administration 2006 and Federal Transit Administration 2006.

<sup>1</sup> dBA, A-weighted decibel level, measured at 50 feet.

<sup>2</sup> Based on data for dump truck.

<sup>3</sup> Based on data for pickup truck.

<sup>4</sup> Based on data for backhoe.

<sup>5</sup> Based on data for paver.

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### **9.1.2 Vibration Terminology**

4 Operation of heavy construction equipment, particularly pile driving and other impulsive devices 5 such as pavement breakers, create seismic waves that radiate along the surface of the earth and 6 downward into the earth. These surface waves can be felt as ground vibration. Vibration from 7 operation of this equipment can result in effects ranging from annoyance of people to damage of 8 structures. Varying geology and distance will result in different vibration levels containing different 9 frequencies and displacements. In all cases, vibration amplitudes will decrease with increasing 10 distance. As seismic waves travel outward from a vibration source, they excite the particles of rock 11 and soil through which they pass and cause them to oscillate. The actual distance the soil particles 12 move is usually only a few ten-thousandths to a few thousandths of an inch. The rate or velocity (in 13 inches per second) at which these particles move is the commonly accepted descriptor of the 14 vibration amplitude, referred to as the "peak particle velocity" (PPV).

- 1 Table 9-4 summarizes typical human response to prolonged steady state vibration such as that
- 2 produced by typical nonimpact construction activity during earthmoving activity.

#### 3 Table 9-4. Human Response to Steady State Vibration

PPV	Human Response	
3.6 (at 2 Hz)–0.4 (at 20 Hz) Very disturbing		
0.7 (at 2 Hz)–0.17 (at 20 Hz)	Disturbing	
0.20	Potential damage to interior plaster walls	
0.10	Strongly perceptible	
0.035	Distinctly perceptible	
0.012	Slightly perceptible	
Source: California Department of Transportation 2004.		

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5 Table 9-5 summarizes ground vibration levels generated by typical construction equipment.

#### 6 Table 9-5. Vibration Source Levels for Construction Equipment

Equipment	PPV at 25 feet			
Vibratory roller	0.210			
Large bulldozer	0.089			
Loaded trucks	0.076			
Jackhammer	0.035			
Small bulldozer	0.003			
Sources: Federal Transit Administration 2006.				

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8 Vibration amplitude attenuates over distance and is a complex function of how energy is imparted 9 into the ground and the soil conditions through which the vibration is traveling. Historically, 10 vibration effects caused by construction activity occur mainly in cases where both the construction 11 site and the receptor are on bedrock, which readily transmits vibration. With regards to the 12 proposed program, ground vibration propagates weakly through loose, alluvial soil such as that 13 found in the program area (Federal Transit Administration 2006). Therefore, ground vibration from

- 14 construction equipment is expected to be discernible only for very short distances from the15 construction site (roughly 40 feet away).

## 16 9.2 Environmental Setting

### 17 9.2.1 Existing Noise Environment

Background noise levels at the rural project sites are generally low, governed primarily by light boat
 traffic on the Sacramento River, heavy traffic near high-volume highways and freeways near the
 river, light traffic on roads atop the levees, use of tractors and aircraft on agricultural lands behind

21 the levee<u>s</u>, and aircraft departure and landing activity associated with the Sacramento International

22 Airport.

- 1 Based on historical measured noise levels taken at representative rural and urban settings (U.S.
- 2 Environmental Protection Agency 1971), it is assumed that existing 1-hour  $L_{eq}$  noise levels at the
- 3 remote rural sites are in the range of 35–50 dBA during the day and 30–40 dBA at night. Daytime
- 4 noise levels at sites located within small towns (Rio Vista, Walnut Grove, Hood, Knights Landing,
- 5 Yuba City) are assumed to be 50 to 55 dBA. Daytime noise levels at sites within 100 feet of high-
- 6 volume freeways or highways are assumed to be 55 to 65 dBA (California Department of
- 7 Transportation 2013).
- 8 Existing ground vibration levels are presumed to be undiscernible at locations beyond the road
- 9 shoulders of high-speed roads near the levees. Proposed construction activity could generate 10
- significant vibration levels, so this effect is discussed later in this analysis.
- 11 The proposed program has a negligible potential to generate ground-borne noise. In a limited
- number of unusual cases (e.g., a railroad tunnel constructed underneath a concert hall) ground 12
- 13 vibration transmitted through bedrock can cause nearby structures to vibrate and generate a low
- 14 frequency rumble inside the structure. However, that unusual case is not relevant to the proposed
- 15 program. Therefore, this effect is not discussed further.

#### 9.2.2 **General Types of Noise-Sensitive Land Uses** 16

17 Noise-sensitive land uses generally are defined as locations where people reside or where the 18 presence of elevated noise emissions could significantly affect the use of the land. Noise-sensitive 19 locations can include riverside or landside areas close to individual construction sites and staging 20 areas, or locations close to access roads used for substantial haul truck traffic. Typical sensitive 21 receptors include riverside or landside residents, school children, hospital patients, and the elderly, 22 among others. Noise sensitive receptors can also include riverside parks where quiet conditions are 23 important for normal conversation between park users, and outdoor use areas at riverside 24 businesses (e.g., outdoor dining areas at restaurants) where quiet conditions are important for 25 businesses and customers.

#### 9.3 Regulatory Setting 26

27 Appendix C, Regulatory Background, describes the local noise regulations, ordinances, and policies 28 that define allowable noise limits for program construction and operation. There are no federal 29 noise regulations applicable to the proposed program. However, construction noise impact criteria 30 recommended by the Federal Transit Administration is presented here for consideration when local 31 numerical noise criteria are not applicable or available. The Federal Transit Administration 32 suggests that the 8-hour Leq during daytime hours should be limited to 80 dBA during daytime 33 hours and 70 dBA during nighttime hours (Federal Transit Administration 2006).

- 34 Pertinent laws, regulations, and policies are listed below.
- 35 Federal:
  - National Environmental Policy Act
- 37 State: •

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0 California Environmental Quality Act

1	•	Lo	cal:
2		0	Butte County General Plan Health and Safety Element
3		0	Colusa County General Plan Noise Element
4		0	Glenn County Noise Ordinance
5		0	Placer County Code
6		0	City of Sacramento Noise Ordinance
7		0	Sacramento County Noise Ordinance
8		0	City of Rio Vista General Plan Safety and Noise Element
9		0	Solano County General Plan Noise Element
10		0	Sutter County General Plan
11		0	City of Yuba City Municipal Code
12		0	Tehama County General Plan Noise Element
13		0	City of West Sacramento Municipal Code
14		0	Yolo County General Plan Health and Safety Element
15		0	City of Marysville Municipal Code
16		0	Yuba County Noise Ordinance

## 17 9.4 Determination of Effects

### 18 **9.4.1** Assessment Methods

19 Construction activities (including construction equipment used for long-term maintenance) are the 20 predominant source of noise and vibration associated with the program. Construction noise effects 21 have been assessed using an analysis method recommended by the U.S. Department of 22 Transportation for construction of large public works infrastructure projects (Federal Transit 23 Administration 2006). Based on anticipated construction equipment types and methods of 24 operation, construction noise levels for various elements of the construction process have been 25 calculated. These predicted levels were compared to significance criteria to determine whether 26 significant effects are predicted to occur. Where significant noise effects have been identified, 27 mitigation measures to reduce noise effects have been specified.

28 The magnitude of construction noise effects at noise-sensitive land uses depends on the type of 29 construction activity, the noise level generated by various pieces of construction equipment, the 30 distance between the activity and noise-sensitive land uses, and whether the ground between the 31 source and the receiver is " acoustically hard" (e.g., pavement, reflective water) or "acoustically soft" 32 (e.g., unpaved soil). For this analysis noise levels at various distances from the construction 33 equipment were estimated using calculation procedures recommended by the Federal Transit Administration (2006). The calculations used for this analysis include distance attenuation (6 dB per 34 35 doubling of distance) and attenuation from ground absorption for and soft ground (an additional 1.5 36 dB per doubling of distance).

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### 1 9.4.2 Significance Criteria

The assessment of potential effects takes into consideration the significance of an action in terms of its context and its intensity as required under NEPA and CEQA. The environmental checklist in the State CEQA Guidelines Appendix G provides guidance to be used in determining the significance of noise effects. A noise effect is considered significant if it would:

- Expose persons to or generate noise levels in excess of standards established in the local general
   plan or noise ordinance, or applicable standards of other agencies;
  - Expose persons to or generate excessive groundborne vibration. This criterion is relevant because the program could require temporary levee construction in close proximity to existing structures;
- Result in a substantial permanent increase in ambient noise levels in the project vicinity above
   levels existing without the project;
- Result in a substantial temporary or periodic increase in ambient noise levels in the project
   vicinity above levels existing without the project;
- For a project located within an airport land use plan or, where such a plan has not been adopted,
   within 2 miles of a public airport or public use airport, expose people residing or working in the
   project area to excessive noise levels. This significance criterion is only relevant for projects or
   programs that would attract new residents and businesses to parcels near airports. The
   proposed program would not do this, so this criterion is not relevant for the proposed program,
   and it is not discussed further;
- For a project within the vicinity of a private airstrip, expose people residing or working in the
   project area to excessive noise levels. Similar to the discussion above, this significance criterion
   is not applicable for the proposed program, so it is not discussed further;

Program-specific significance criteria were developed for this effects analysis. These criteria were
 developed based on the CEQA guidelines listed above and on site-specific or other applicable noise
 standards. The program was considered to result in a- significant noise or vibration effect if one or
 more of the following were predicted to occur:

- Exterior or interior noise levels caused by levee improvements or levee maintenance activity exceed allowable daytime or nighttime noise levels specified in the local noise ordinance or the General Plan noise element applicable to the given location.
- 31 If there is no numerical noise standard for a given location, or if temporary construction activity 32 is exempted from numerical noise standards, then a significant noise effect is considered to 33 occur if construction noise is predicted to exceed a daytime (7 a.m. to 7 p.m.) exterior noise level 34 (1-hour Leg) of 70 dBA, or an evening/nighttime (7 p.m. to 7 a.m.) exterior noise level of 60 dBA 35 (1-hour L<sub>eq</sub>). These criteria were derived by subtracting 10 dBA from the construction noise 36 limits specified the Federal Transit Administration for construction of transit projects (Federal 37 Transit Administration 2006). The 10 dBA adjustment was made to Federal Transit 38 Administration's suggested- criteria to account for the rural nature of the program area, where 39 background noise levels are likely much lower than the urban areas where most Federal Transit 40 Administration transit projects are usually constructed.
- Project-related haul truck traffic is predicted to cause traffic noise to increase of 12 dBA (peak hour L<sub>eq</sub>) or more compared to- the existing peak-hour L<sub>eq</sub> at any noise sensitive receptor within

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500 feet of the access road. The California Department of Transportation defines a 12 dB noise increase as a "substantial" noise increase. (California Department of Transportation 2011).

• Construction equipment is predicted to cause PPV ground vibration at an occupied building to exceed 0.10 inches/second. That PPV vibration level is considered to be "strongly discernible" during prolonged construction activity using nonimpact equipment (California Department of Transportation 2013). A significant vibration effect- is also considered to occur if construction activity is predicted to cause PPV vibration- at structures to exceed 0.2 inches/second. This is the vibration threshold that Federal Transit Administration suggests for non-engineered timber and masonry buildings. (Federal Transit Administration 2006).

Noise effects- on fish and wildlife associated with the proposed program are discussed further in
Chapter 11, Fisheries and Aquatics, and Chapter 12, Wildlife.

## **9.5 Effects and Mitigation Measures**

### 13 **9.5.1** Alternative 1—No Action

Under Alternative 1, construction activities associated with the proposed program would not occur.
Consequently, -the proposed program would not- result in the exposure of sensitive receptors to
temporary construction-related noise effects, including traffic noise increases and constructionrelated vibration. While scheduled levee maintenance and any required emergency repairs would
continue to be conducted under current policies, there would be no change compared with current
(baseline) conditions.

### 20 9.5.2 Alternative 2A—Low Maintenance

## Effect NOI-1: Exposure of Sensitive Receptors Adjacent to the Levee Construction Sites to Temporary Construction-Related Noise

This alternative would involve installing revetment along the levee slope and streambank from the levee's toe to crest. Although construction under Alternative 2A could take place on the waterside or the landside, construction equipment assumed for use under this alternative includes a bargemounted clamshell unloading rock onto the water side of the levee, and one excavator spreading the emplaced rock. Table 9-6 summarizes noise levels projected from these pieces of equipment at

28 various distances.

Distance Between Source and Receiver (ft.)	Calculated 1–Hour Leq Sound Level (dBA)
50	82
100	74
200	66
300	61
400	58
500	56
1,000	48
1,500	43
2,000	40
3,000	35

Table 9-6.	Noise Levels	during	Construction	of Bank	Fill Rock Slope
		o u u i i i i g	construction	OI Dailk	I III NOCK SIOPC

Calculations based on Federal Transit Administration 2006.

Note: This calculation does not include the effects, if any, of local shielding provided by walls, topography or other barriers that may reduce sound levels further.

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Noise-sensitive land uses are located throughout the program area and include residences on the waterside and landside of the existing levees. In most cases, construction activity would be short-term, intermittent, and located far from any noise-sensitive receptors. Therefore, construction-related noise effects would generally be less than significant.

7 However, temporary construction noises could result in significant effects on effects on residents, 8 recreationists, and other noise-sensitive groups, if levee construction activity was required near 9 those receptors. For purposes of comparing noise effects for the alternatives, the forecast radial 10 distance to the 60 dBA noise contour is used as an indicator of the relative noise effects. The 60 dBA 11 level is the nighttime significance criterion that has been adopted for this specific noise analysis for 12 cases where numerical local noise ordinances standards are not applicable or available (see 13 discussion in Appendix C, Regulatory Background). For this alternative, intermittent noise levels 14 generated by construction could exceed 60 dBA at distances up to 300 feet from the construction 15 zone.

As discussed in Chapter 2, Project Description, the environmental analysis in this EIS/EIR is-be
 programmatic in nature, analyzing the 80,000 linear feet (LF) of the program area in its entirety.
 Additional project-level environmental documentation, tiering from this programmatic analysis, will

- 19 be conducted to address erosion sites that will be constructed.
- 20 Because it is possible that bank protection activities may occur within 300 feet of noise-sensitive
- 21 land uses (i.e., residences adjacent to construction sites), this effect is considered significant.
- 22 Implementation of Mitigation Measure NOI-MM-1 would reduce this effect. However, -it may not be
- 23 feasible in all cases to reduce noise to a less-than-significant level. This effect is, therefore,
- 24 considered to be significant and unavoidable.
| 1<br>2                     | Mitigation Measure NOI-MM-1: Employ Noise-Reducing Construction Practices to Comply with Applicable Noise Criteria                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3<br>4<br>5<br>6<br>7<br>8 | The Corps and its contractors will employ noise-reducing construction practices such that construction noise complies with applicable local noise ordinance requirements. Where there is no local noise ordinance, outdoor construction noise (1-hour $L_{eq}$ ) at the closest noise-sensitive receptor will be limited to 70 dBA between the hours of 7 a.m. and 10 p.m., and 60 dBA between the hours of 10 p.m. and 7 a.m. (see discussion under Significance Criteria for derivation of this criterion). |
| 9<br>10<br>11<br>12        | Prior to the start of construction, the Corps' contractor will prepare a noise control plan that will identify feasible measures that will be employed to reduce construction noise where necessary. The following is a list of measures that may be employed to reduce construction noise when construction activities will occur within 500 feet of a noise-sensitive receptor.                                                                                                                             |
| 13<br>14<br>15             | • Provide written notice to residents within 1,000 feet of the construction zone, advising them of the estimated construction schedule. This written notice will be provided within 1 week to 1 month of the start of construction at that location.                                                                                                                                                                                                                                                          |
| 16<br>17<br>18             | • Display notices with information including contractor contact telephone number and proposed construction dates and times in a conspicuous manner, such as on construction site fences.                                                                                                                                                                                                                                                                                                                      |
| 19<br>20                   | • Schedule the loudest and most intrusive construction activities during daytime hours (7 a.m. to 7 p.m.) where feasible.                                                                                                                                                                                                                                                                                                                                                                                     |
| 21<br>22<br>23             | • Require that construction equipment be equipped with factory-installed muffling devices or better, and that all equipment be operated and maintained in good working order to minimize noise generation.                                                                                                                                                                                                                                                                                                    |
| 24                         | • Locate stationary noise-generating equipment as far as practical from noise-sensitive uses.                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 25<br>26                   | • Limit unnecessary engine idling (i.e., more than 5 minutes) as required by state air quality regulations.                                                                                                                                                                                                                                                                                                                                                                                                   |
| 27                         | • Employ equipment that is specifically designed for low noise emission levels, where feasible.                                                                                                                                                                                                                                                                                                                                                                                                               |
| 28<br>29                   | • Employ equipment that is powered by electric or natural gas engines as opposed to those powered by gasoline fuel or diesel, where feasible.                                                                                                                                                                                                                                                                                                                                                                 |
| 30<br>31<br>32<br>33       | • If the construction zone is within 500 feet of a noise-sensitive receptor, place temporary barriers between stationary noise equipment and noise-sensitive receptors (where feasible based on access constraints) or take advantage of existing barrier features (terrain, structures, edge of trench) to block noise transmission.                                                                                                                                                                         |
| 34<br>35<br>36             | • If the construction zone is within 500 feet of a noise-sensitive receptor, prohibit use of backup alarms and provide an alternate warning system, such as a flagman or radar-based alarm, that is compliant with state and federal worker safety regulations.                                                                                                                                                                                                                                               |
| 37                         | • Locate construction staging areas as far as practical from noise-sensitive receptors.                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 38                         | • Design truck haul routes to avoid sensitive receptors, to the extent practical.                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

#### 1 Effect NOI-2: Exposure of Sensitive Receptors along Truck Haul Routes to Substantial 2 **Temporary Traffic Noise Increases**

3 This alternative is not expected to generate high volumes of haul truck traffic along public roads.

4 Although each passing truck might cause intermittent discernible noise, it is unlikely that haul truck

5 traffic would cause the hourly average Leq noise levels at homes near the haul route to increase

- 6 enough to exceed existing peak-hour background noise by more than 12 dBA ( the Caltrans criterion
- 7 for a substantial noise increase). Therefore, this effect is considered to be less than significant and
- 8 no mitigation is necessary.

#### 9 Effect NOI-3: Exposure of Sensitive Receptors to Temporary Construction-Related Vibration

- 10 This alternative would not involve pile driving, which is the type of construction activity that can
- 11 cause the most severe vibration effects. Ground vibration generated by construction equipment
- 12 planned for the proposed program would be discernible only at residences within about 40 feet of
- 13 the construction equipment. Table 9-7 shows estimated ground vibration levels generated by a
- vibratory compactor, which is the type of equipment (other than pile drivers) most likely to cause 14
- 15 vibration effects at a construction site. As listed in Table 9-7, the vibration level is expected to
- 16 dissipate to less than the impact criterion of 0.10 inches/second (the strongly discernible level) at 17

distances more than 40 feet from the compactor. If the vibratory roller was used within 30 feet of a 18 building, then it is possible vibration could damage interior plaster walls. Based on this analysis, it is

19 concluded that ground vibration could cause a significant effect if construction is required within 40 20 feet of a vibration-sensitive building. Implementation of Mitigation Measure NOI-MM-2 would 21 reduce this effect, but it may not be feasible in all cases to reduce vibration below the significance

22 threshold. This effect is, therefore, significant and unavoidable.

Distance from Construction Equipment (feet)	Ground Vibration PPV (inches/second)
25	0.21
30	0.20—Potential damage to interior plaster walls
40	0.10—"Strongly discernible" impact criterion
50	0.07
100	0.026
Based on Federal Transit Administration 2006,	and California Department of Transportation 2004.

#### 23 Table 9-7. Estimated Ground Vibration Levels Caused by Vibratory Roller

Assumes a single vibratory roller, with a source vibration level (PPV) of 0.210 inches/second at a reference distance of 25 feet.

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#### Mitigation Measure NOI-MM-2: Conduct Vibration Monitoring at Buildings within 40 feet of Construction Equipment

Prior to the start of construction within 40 feet of any occupied building the Corps' contractor will prepare a vibration control plan with the goal of limiting ground vibration at the building to less than 0.2 inches/second at the building structure. Measures that can be implemented to limit vibration may include:

Provide written notice to the owner and occupants of the subject buildings, advising them of • 32 the estimated construction schedule. This written notice will be provided within 1 week to 1 33 month of the start of construction at that location.

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- Display notices with information including contractor contact telephone number and proposed construction dates and times in a conspicuous manner, such as on construction site fences.
  - Prior to construction within 40 feet, inspect building structures and plaster or wallboard walls inside the building to inventory pre-existing cracks.
  - Retain a qualified vibration specialist to measure vibration levels outside the building to ensure that vibration limits are not exceeded.
- Following completion of construction within 40 feet, inspect the building structure and
   plaster or wallboard walls inside the building to inventory new cracks in plaster or paint, if
   any.
  - If new cracks are identified, the Corps' contractor shall work with the building owner to promptly arrange for appropriate repairs.

# Effect NOI-4: Exposure of Sensitive Receptors to Intermittent Noise Due to Long-Term Maintenance Activity including Emergency Repair Activities

- This section describes potential effects caused by routine, scheduled maintenance activity, as well aspotential noise effects during emergency levee repairs.
- Routine scheduled maintenance under this alternative is expected to use the same types of
  equipment that would be used for the initial construction (see Table 9-3). Similar to Effect NOI-1, the
  routine maintenance could subject sensitive receptors close to the construction zone to excessive
  noise. Implementation of Mitigation Measure NOI-MM-1 would reduce this effect. However, it may
  not be feasible in all cases to reduce noise to a less-than-significant level. This effect is, therefore,
  considered to be significant and unavoidable.
- 23 In addition, emergency repair activities might require rapid mobilization of construction equipment, 24 which would have the potential to generate excessive noise levels at nearby sensitive receptors 25 within about 400 feet (see the noise modeling for Alternative 4). This effect is considered significant. 26 Options for feasible mitigation identified in Mitigation Measure NOI-MM-1 may be more limited 27 during emergency repair activities than for scheduled routine maintenance. Consequently, 28 implementation of Mitigation Measure NOI-MM-1 would not likely be feasible. Implementation of 29 Mitigation Measure NOI-MM-3 would reduce this effect but not to a less-than-significant level. This 30 effect is, therefore, considered to be significant and unavoidable.

# 31Mitigation Measure NOI-MM-3: Employ Emergency Repair Practices to Reduce Noise32Where Feasible

- The Corps and its contractors in charge of emergency preparedness will prepare a noise control plan that will identify feasible measures that will be employed to reduce construction noise where necessary and feasible given the available schedule before emergency levee repairs must begin. Emergency noise measures will apply to emergency construction activity within 400 feet of a noise-sensitive building. These measures may include those listed below.
- Require that construction equipment be equipped with factory-installed muffling devices or
   better, and that all equipment be operated and maintained in good working order to
   minimize noise generation.

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- If feasible based on limited time frames, use equipment that is specifically designed for low noise emission levels.
  - If feasible based on limited time frames, use equipment that is powered by electric or natural gas engines as opposed to equipment powered by gasoline fuel or diesel.

# 5 9.5.3 Alternative 3A—Maximize Meander Zone 6 (Environmentally Superior Alternative)

# 7 Effect NOI-1: Exposure of Sensitive Receptors Adjacent to the Levee Construction Sites to 8 Temporary Construction-Related Noise

9 This alternative would involve construction of a second levee some distance landward of the existing 10 levee, or the construction of a second levee immediately adjacent to the landward side of the existing 11 levee. For this noise analysis it was assumed imported soil would be delivered to a staging area near 12 the levee site, using either haul trucks or barges. Soil would be transferred from the staging area to the 13 levee construction site using either scrapers or haul trucks. The soil would then be spread, watered,

- 14 and compacted using on-land equipment to shape the new levee. The three loudest pieces of
- 15 construction equipment assumed for the noise analysis are a scraper, a dozer, and a roller/compactor.
- 16 Table 9-8 summarizes noise levels projected from these pieces of equipment at various distances.

Distance Between Source and Receiver (ft.)	Calculated 1-Hour L <sub>eq</sub> Sound Level (dBA)
50	84
100	76
200	68
300	63
400	60
500	58
1,000	50
1,500	45
2,000	42
3,000	37

#### 17 Table 9-8. Estimated Noise Levels for Setback Levee and Adjacent Levee Construction

Calculations based on Federal Transit Administration 2006.

Note: This calculation does not include the effects, if any, of local shielding provided by walls, topography or other barriers that may reduce sound levels further.

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19 The direct on-site noise effects for this alternative would be similar to those described previously 20 for Alternative 2A, although the number of pieces of construction equipment and the overall level of 21 construction noise would be greater than Alternative 2A. For purposes of comparing noise, the 22 modeled distance to the 60 dBA noise contour is about 400 feet from the construction zone. The 23 direct on-site noise effect would be significant if the construction was done in the immediate vicinity 24 of existing dwellings. Implementation of Mitigation Measure NOI-MM-1 would reduce this effect. 25 However, it may not be feasible in all cases to reduce noise to a less-than-significant level. This effect 26 is therefore considered to be significant and unavoidable.

# Effect NOI-2: Exposure of Sensitive Receptors along Truck Haul Routes to Substantial Temporary Traffic Noise Increases

3 The indirect off-site traffic noise effects for this alternative would generally be similar to those

4 described previously for Alternative 2A, but Alternative 3A might require a higher daily volume of

5 soil haul trucks due to the large cross-sectional area for the new setback levees and adjacent levees.

- 6 Regardless, it is unlikely the haul trucks would cause the peak-hour traffic noise to increase by more
- 7 than the 12 dBA substantial increase criterion. Therefore, the traffic noise effect would be less than
- 8 significant and no mitigation is necessary.

#### 9 Effect NOI-3: Exposure of Sensitive Receptors to Temporary Construction-Related Vibration

- 10 The vibration effects for this alternative would be similar to those described previously for
- 11 Alternative 2A. This effect would be significant. Implementation of Mitigation Measure NOI-MM-2
- 12 would reduce this effect but it may not be feasible in all cases to reduce vibration below the
- 13 significance threshold. This effect is, therefore, significant and unavoidable.

# Effect NOI-4: Exposure of Sensitive Receptors to Intermittent Noise Due to Long-Term Maintenance Activity including Emergency Repair Activities

- 16The direct on-site noise effects for this alternative would be similar to those described previously17for Alternative 2A. The noise effect would be significant. Options for feasible mitigation identified in18Mitigation Measure NOI-MM-1 may be more limited during emergency repair activities than for19scheduled routine maintenance. Consequently, implementation of Mitigation Measure NOI-MM-120would not likely be feasible. Implementation of Mitigation Measure NOI-MM-321effect but not to a less-than-significant level. This effect is, therefore, considered to be significant and
- 22 unavoidable.

# 9.5.4 Alternative 4A—Habitat Replacement (Preferred Alternative)

# Effect NOI-1: Exposure of Sensitive Receptors Adjacent to the Levee Construction Sites to Temporary Construction-Related Noise

- This alternative would potentially involve the use of all five bank protection measures at erosion
  sites in the program area. For this noise analysis it was assumed imported construction materials
  would be delivered to a staging area near the levee site, using either haul trucks or barges. The three
- 30 loudest pieces of construction equipment assumed for the noise analysis are a scraper, a dozer, and
- 31 a roller/compactor. Table 9-9 summarizes noise levels projected from these pieces of equipment at
- 32 various distances.

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Distance Between Source and Receiver (ft.)	Calculated 1-Hour Leq Sound Level (dBA)
50	84
100	76
200	68
300	63
400	60
500	58
1,000	50
1,500	45
2,000	42
3.000	37

#### Table 9-9. Estimated Noise Levels for Adjacent Levee Construction

Calculations based on Federal Transit Administration 2006.

Note: This calculation does not include the effects, if any, of local shielding provided by walls, topography or other barriers that may reduce sound levels further.

2 The direct on-site noise effects for this alternative would be similar to those described previously

- 3 for Alternative 2A. For purposes of comparing noise, the modeled distance to the 60 dBA noise
- 4 contour is about 400 feet from the construction zone. The noise effect for this effect would be
- 5 significant if the construction was done in the immediate vicinity of existing dwellings.
- 6 Implementation of Mitigation Measure NOI-MM-1 would reduce this effect. However, it may not be
- 7 feasible in all cases to reduce noise to a less-than-significant level. This effect is, therefore,
- 8 considered to be significant and unavoidable.

## 9 Effect NOI-2: Exposure of Sensitive Receptors along Truck Haul Routes to Substantial 10 Temporary Traffic Noise Increases

The indirect off-site traffic noise effects for this alternative would generally be similar to those described previously for Alternative 2A, but Alternative 4A might require a higher daily volume of soil haul trucks in areas where a setback levee or adjacent levee would be constructed due to the large cross-sectional area. Regardless, it is unlikely the haul trucks would cause the peak-hour traffic noise to increase by more than the 12 dBA substantial increase criterion. Therefore, the traffic noise effect would be less than significant and no mitigation is necessary.

#### 17 Effect NOI-3: Exposure of Sensitive Receptors to Temporary Construction-Related Vibration

- 18 The vibration effects for this alternative would be similar to those described previously for
- 19 Alternative 2A. This effect would be significant. Implementation of Mitigation Measure NOI-MM-2
- 20 would reduce this effect but it may not be feasible in all cases to reduce vibration below the
- 21 significance threshold. This effect is therefore considered significant and unavoidable.

## Effect NOI-4: Exposure of Sensitive Receptors to Intermittent Noise Due to Long-Term Maintenance Activity including Emergency Repair Activities

- The direct on-site noise effects for this alternative would be similar to those described previously for Alternative 2A. This noise effect would be significant. Options for feasible mitigation identified in
- for Alternative 2A. This noise effect would be significant. Options for feasible mitigation identified in
   Mitigation Measures NOI-MM-1 may be more limited during emergency repair activities than for
- 27 scheduled routine maintenance. Consequently, implementation of Mitigation Measure NOI-MM-1

would not likely be feasible. Implementation of Mitigation Measure NOI-MM-3 would reduce this
 effect but not to a less-than-significant level. This effect is, therefore, considered to be significant and
 unavoidable.

# 4 9.5.5 Alternative 5A—Habitat Replacement Reaching 5 Environmental Neutrality

# 6 Effect NOI-1: Exposure of Sensitive Receptors Adjacent to the Levee Construction Sites to 7 Temporary Construction-Related Noise

8 This alternative would potentially involve the use of all five bank protection measures at erosion 9 sites in the program area. For this noise analysis it was assumed imported construction materials 10 would be delivered to a staging area near the levee site, using either haul trucks or barges. The three 11 loudest pieces of construction equipment assumed for the noise analysis are a scraper, a dozer, and 12 a roller/compactor. Table 9-9, above, summarizes noise levels projected from these pieces of 13 equipment at various distances.

14The direct on-site noise effects for this alternative would be similar to those described previously15for Alternative 2A. For purposes of comparing noise, the modeled distance to the 60 dBA noise16contour is about 400 feet from the construction zone. The noise effect would be significant if the17construction was done in the immediate vicinity of existing dwellings. Implementation of Mitigation18Measure NOI-MM-1 would reduce this effect. However, it may not be feasible in all cases to reduce19noise to a less-than-significant level. This effect is, therefore, considered to be significant and20unavoidable.

# Effect NOI-2: Exposure of Sensitive Receptors along Truck Haul Routes to Substantial Temporary Traffic Noise Increases

The indirect off-site traffic noise effects for this alternative would generally be similar to those described previously for Alternative 2A, but this alternative might require a higher daily volume of soil haul trucks in areas where a setback levee or adjacent levee would be constructed due to the large cross-sectional area. Regardless, it is unlikely the haul trucks would cause the peak-hour traffic noise to increase by more than the 12 dBA substantial increase criterion. Therefore, the traffic noise effect would be less than significant and no mitigation is necessary.

#### 29 Effect NOI-3: Exposure of Sensitive Receptors to Temporary Construction-Related Vibration

- 30 The vibration effects for this alternative would be similar to those described previously for
- 31 Alternative 2A. This effect would be significant. Implementation of Mitigation Measure NOI-MM-2
- 32 would reduce this effect but it may not be feasible in all cases to reduce vibration below the
- 33 significance threshold. This effect is therefore considered significant and unavoidable.

# Effect NOI-4: Exposure of Sensitive Receptors to Intermittent Noise Due to Long-Term Maintenance Activity including Emergency Repair Activities

- 36 The direct on-site noise effects for this alternative would be similar to those described previously
- 37 for Alternative 2A. This noise effect would be significant. Options for feasible mitigation identified in
- 38 Mitigation Measures NOI-MM-1 may be more limited during emergency repair activities than for
- 39 scheduled routine maintenance. Consequently, implementation of Mitigation Measure NOI-MM-1

would not likely be feasible. Implementation of Mitigation Measure NOI-MM-3 would reduce the
 effect, but not to a less-than-significant level. This effect is, therefore, considered to be significant
 and unavoidable.

# 4 9.5.6 Alternative 6A—Habitat Replacement with Vegetation ETL 5 Variance

# 6 Effect NOI-1: Exposure of Sensitive Receptors Adjacent to the Levee Construction Sites to 7 Temporary Construction-Related Noise

8 This alternative would potentially involve the use of the setback levee, riparian and wetland bench, 9 and bank fill stone bank protection measures at erosion sites in the program area. For this noise 10 analysis it was assumed imported construction materials would be delivered to a staging area near 11 the levee site, using either haul trucks or barges. The three loudest pieces of construction equipment 12 assumed for the noise analysis are a scraper, a dozer, and a roller/compactor. Table 9-9, above, 13 summarizes noise levels projected from these pieces of equipment at various distances.

14The direct on-site noise effects for this alternative would be similar to those described previously15for Alternative 2A. For purposes of comparing noise, the modeled distance to the 60 dBA noise16contour is roughly 400 feet from the construction zone. This noise effect would be significant if the17construction was done in the immediate vicinity of existing dwellings. Implementation of Mitigation18Measure NOI-MM-1 would reduce this effect. However, it may not be feasible in all cases to reduce19noise to a less-than-significant level. This effect is, therefore, considered to be significant and20unavoidable.

# Effect NOI-2: Exposure of Sensitive Receptors along Truck Haul Routes to Substantial Temporary Traffic Noise Increases

The indirect off-site traffic noise effects for this alternative would generally be similar to those described previously for Alternative 2A, but this alternative might require a higher daily volume of soil haul trucks in areas where a setback levee would be constructed due to the large cross-sectional area. It is unlikely the haul trucks would cause the peak-hour traffic noise to increase by more than the 12 dBA substantial increase criterion. Therefore, this traffic noise effect would be less than significant and no mitigation is necessary.

#### 29 Effect NOI-3: Exposure of Sensitive Receptors to Temporary Construction-Related Vibration

- 30 The vibration effects for this alternative would be similar to those described previously for
- 31 Alternative 2A. This effect would be significant. Implementation of Mitigation Measure NOI-MM-2
- 32 would reduce this effect but it may not be feasible in all cases to reduce vibration below the
- 33 significance threshold. This effect is therefore significant and unavoidable.

# Effect NOI-4: Exposure of Sensitive Receptors to Intermittent Noise Due to Long-Term Maintenance Activity including Emergency Repair Activities

- 36 The direct on-site noise effects for this alternative would be similar to those described previously
- 37 for Alternative 2A. This noise effect would be significant. Options for feasible mitigation identified in
- 38 Mitigation Measures NOI-MM-1 may be more limited during emergency repair activities than for
- 39 scheduled routine maintenance. Consequently, implementation of Mitigation Measure NOI-MM-1

U.S. Army Corps of Engineers

- 1 would not likely be feasible. Implementation of Mitigation Measure NOI-MM-3 would reduce this
- 2 effect but not to a less-than-significant level. This effect is, therefore, considered to be significant and
- 3 unavoidable.

### **3 10.1 Introduction and Summary**

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This chapter describes the environmental setting associated with vegetation and wetlands, the
determination of effects, the environmental effects on vegetation and wetlands that would result
from implementation of the proposed program, and the mitigation measures that would reduce
these effects.

- 8 The key sources of data and information used in the preparation of this chapter are listed below.
- A California Natural Diversity Database (CNDDB) records search of the counties within 10 miles
   of the program area, which includes portions of Butte, Colusa, Contra Costa, Glenn, Placer,
   Sacramento, Yolo, Sutter, Solano, Yuba, and Tehama Counties (California Department of Fish and
   Game-Wildlife 2018a09).
  - A U.S. Fish and Wildlife Service (USWFS) list of endangered, threatened, and proposed species for the counties in the program area: Butte, Colusa, Glenn, Placer, Sacramento, Yolo, Sutter, Solano, Yuba, and Tehama (U.S. Fish and Wildlife Service 20<u>18</u>09).
    - A list from the California Native Plant Society's (CNPS's) 20<u>1809</u> online Inventory of Rare and Endangered Plants (California Native Plant Society 20<u>1809</u>).
  - The California Department of Food and Agriculture's (CDFA's) Pest Ratings of Noxious Weed Species and Noxious Weed Seed (California Department of Food and Agriculture 2009).
  - The California Invasive Plant Council's (Cal-IPC's) California Invasive Plant Inventory (California Invasive Plant Council 2006, 2007).
- Program area county general plans:
  - Butte County General Plan (Butte County 2010).
- 24 Colusa County General Plan (Colusa County 2011).
- 25 O Glenn County General Plan (Glenn County 1993).
- 26 Placer County General Plan (Placer County 19942013).
- 27 O Sacramento County General Plan (Sacramento County 2011).
- 28 O Solano County General Plan (Solano County 2008).
- 29 O Sutter County General Plan (Sutter County 2011).
- 30 Tehama County General Plan (Tehama County 2009).
- 31 Yolo County General Plan (Yolo County 2009).
- 32 Yuba County General Plan (Yuba County 2011).

Program area habitat conservation plans (HCPs) and Natural Community Conservation Plans
 (NCCPs):

1	0	Butte Regional Conservation Plan (in preparation).
2	0	Natomas Basin HCP (City of Sacramento et al. 2003).
3	0	Yuba-Sutter HCP/NCCP (in preparation).
4	0	Yolo Natural Heritage Program (in preparation).
5	• An	nerican River Parkway Plan (Sacramento County 2008)
6	• Ex	isting SRBPP program- and project-level documents:
7 8	0	Draft Environmental Assessment/Initial Study for Levee Repair of 25 Erosion Sites: Sacramento River Bank Protection Project (U.S. Army Corps of Engineers 2009).
9 10 11	0	Final Environmental Assessment/Initial Study for the Erosion Repairs of 13 Bank Protection Sites, 2008 and 2009: Sacramento River Bank Protection Project, Sacramento River and Tributaries, California (U.S. Army Corps of Engineers 2008).
12 13	0	Programmatic Biological Assessment for the Sacramento River Bank Protection Project Phase II, Final (Stillwater Sciences 2007).
14 15 16	0	Environmental Assessment/Initial Study for Five Critical Erosion Sites, River Miles 26.9 Left, 34.5 Right, 72.2 Right, 99.3 Right, and 123.5 Left Sacramento River Bank Protection Project, Draft (U.S. Army Corps of Engineers 2006a).
17 18	0	Environmental Assessment for levee repair of 14 Winter 2006 critical sites, Sacramento River Bank Protection Project, Final Report (U.S. Army Corps of Engineers 2006b).
19 20	Table propos	10-1 summarizes the vegetation and wetland effects resulting from the implementation of the sed program.

### 21 Table 10-1. Summary of Vegetation and Wetland Effects and Mitigation

Effect	Mitigation Measures	Implementation Period
VEG-1: Permanent Loss of Woody Riparian Vegetation Resulting from Compliance with the Vegetation ETL	VEG-MM-1: Compensate for the Loss of Woody Riparian Habitat	Develop revegetation plan prior to removal of existing riparian vegetation. Plantings will be monitored over a minimum period of time, as determined by the appropriate state and federal agencies.
	VEG-MM-2: Retain Qualified Botanists to Conduct Floristic Surveys for Special-Status Plants during Appropriate Identification Periods	As part of project-level environmental review
	VEG-MM-3: Redesign Proposed Projects to Avoid Substantial Effects on and/or Transplant Special-Status Plants	As part of project-level environmental review

Effect	Mitigation Measures	Implementation Period
	VEG-MM-4: Conduct Mandatory Contractor/Worker Awareness Training for Construction Personnel	Prior to any construction work
VEG-2: Potential Loss of Special- Status Plant Populations as a	VEG-MM-2, VEG-MM-3, and VEG- MM-4	
Result of Program Construction	VEG-MM-5: Install Construction Barrier Fencing to Protect Sensitive Biological Resources Adjacent to the Construction Zone	Prior to any construction work
	VEG-MM-6: Retain a Biological Monitor	Prior to any construction work, and during construction.
VEG-3: Potential Disturbance or Removal of Riparian Habitat as a Result of Program Construction	VEG-MM-1, VEG-MM-2, VEG-MM-3, and VEG-MM-4	
VEG-4: Loss of Waters of the United States, Including	VEG-MM-4, VEG-MM-5, and VEG- MM-6	
Wetlands, as a Result of Program Construction	VEG-MM-7: Redesign Proposed Projects to Avoid and Minimize Effects on Sensitive Biological Resources	As part of project-level environmental review.
	VEG-MM-8: Compensate for the Loss of Wetlands and Other Waters	Develop revegetation plan prior to removal of existing emergent wetland vegetation. Plantings will be monitored over a minimum period of time, as determined by the appropriate state and federal agencies.
VEG-5: Potential Disturbance or Removal of Protected Trees as a	VEG-MM-4, VEG-MM-5, VEG-MM- 6, and VEG-MM-7	
Result of Program Construction	VEG-MM-9: Conduct a Tree Survey	As part of project-level environmental review
	VEG-MM-10: Compensate for the Loss of Protected Trees	Replacement trees will be planted upon completion of project construction and will be monitored for a period of 5 years following installation.
VEG-6: Potential Introduction or Spread of Invasive Plants as a Result of Program Construction	VEG-MM-11: Conduct a Survey to Document Invasive Plant Infestations	

Effect	Mitigation Measures	Implementation Period
	VEG-MM-12: Avoid and Minimize the Spread or Introduction of Invasive Plant Species	As part of project-level environmental review. During construction.
	VEG-MM-13: Conduct a Follow- Up Weed Survey and Implement Eradication Methods if New Infestations Are Present	Approximately 1 year after construction.
VEG-7: Potential Opportunity for Habitat Restoration in Enlarged Floodplain following Program Construction	None required	Not applicable

### **10.2 Environmental Setting**

2 The environmental setting for the proposed program is discussed in terms of the general program 3 area, the program study area, and the four program regions (1a, 1b, 2, and 3). The program study 4 <del>area and program regions are shown in Figure 2-1. The general program area consists of the</del> 5 watercourse reaches expected to contain SRBPP erosion protection sites as described in Chapter 2, 6 Project Description. For the purposes of this chapter, the program study area consists of the general 7 program area plus a 0.5-mile buffer within which direct or indirect impacts on resources may occur. 8 The program study area is further divided into four program regions to provide smaller assessment 9 areas and facilitate identifying the types and magnitude of effects that could occur within each 10 program region as a result of the proposed program. The geographical extent of each program region is described in detail in Chapter 2, Project Description. 11

### 12 **10.2.1 Existing Conditions**

### 13 **10.2.1.1 Program Study Area Land Cover Types**

- Information about land cover types known to occur within the program study area was obtained
   from four project-level assessment documents and an existing programmatic biological assessment
- (BA) for the SRBPP. The following eight land cover types have been documented in one or more
   regions within the program study area.

### 18 **Riparian Forest**

- 19 Riparian forests are typically associated with rivers, low gradient streams, and floodplains but also
- 20 occur adjacent to ponds and canals. The vegetative composition of plant species in riparian forests is
- highly variable and dependent on geographic location, elevation, substrate, and groundwater
   elevation.
- 23 Riparian forests are characterized by an overstory of mature native and nonnative trees that form a
- 24 canopy that can range from fairly open to mostly closed. The dominant overstory species are valley
- 25 oak (*Quercus lobata*) or Fremont cottonwood (*Populus fremontii* ssp. *fremontii*). Other trees

- 1 observed in riparian forests are box elder (*Acer negundo* var. *californicum*), Oregon ash (*Fraxinus*
- 2 *latifolia*), white alder (*Alnus rhombifolia*), western sycamore (*Platanus racemosa*), coast live oak
- 3 (*Quercus agrifolia*), Goodding's black willow (*Salix gooddingii*), red willow (*Salix laevigata*), and
- 4 yellow willow (*Salix lucida* ssp. *lasiandra*). Nonnative tree species that are known to occur in
- 5 riparian forests are black locust (*Robinia pseudoacacia*), English walnut (*Juglans regia*), edible fig 6 (*Ficus carica*), and acacia (*Acacia* spp.). The shrub layer of riparian forests is also highly variable and
- *can range from extremely sparse to well-developed. Representative species that occur in the shrub*
- 8 understory of riparian forests are buttonbush (*Cephalanthus occidentalis*), California blackberry
- 9 (*Rubus ursinus*), Himalayan blackberry (*Rubus armeniacus*), California wild rose (*Rosa californica*),
- 10 poison oak (*Toxicodendron diversilobum*), and California wild grape (*Vitis californica*). Blue
- elderberry (*Sambucus mexicana*), the host plant for the federally threatened valley elderberry
- 12 longhorn beetle, is also commonly present in riparian areas.
- 13 The herbaceous understory of riparian forests typically contains a mixture of native and introduced
- species. Representative grasses and forbs observed were mugwort (*Artemisia douglasiana*),
- 15 horsetail (*Equisetum* spp.), horseweed (*Conyza canadensis*), and Santa Barbara sedge (*Carex*
- 16 *barbarae*). Common nonnative species include white sweet-clover (*Melilotus alba*), wild oats (*Avena*
- 17 spp.), ripgut brome (*Bromus diandrus*), black mustard (*Brassica nigra*), Bermuda grass (*Cynodon*
- 18 *dactylon*), yellow star-thistle (*Centaurea solstitalis*), prickly lettuce (*Lactuca serriola*), and curly dock
- 19 (*Rumex crispus*).

### 20 Riparian Scrub

- Riparian scrub is typically associated with the toe of levees and along the banks of rivers and streams and other drainages in the <u>program</u> study area. This land cover type is distinguished from riparian forest by the dominance of shrubs and smaller trees (i.e., less than 20 feet tall), particularly willows, and it lacks a well-developed overstory of tall trees. Dominant species are frequently arroyo
- willow (*Salix lasiolepis*), Goodding's black willow, and narrowleaf willow (*Salix exigua*). Other
   species commonly observed in riparian scrub are California buttonbush, California wild rose,
- 27 California blackberry, Himalayan blackberry, buttonbush, and blue elderberry.

### 28 Oak Woodlands

Oak woodlands generally occur on the upper portion or landside of levees in the <u>program</u> study area
outside of riparian zones. This land cover type is dominated by oaks (*Quercus* spp.) such as valley
oak and interior live oak (*Q. wislizeni*). The canopy density ranges from relatively open to more
closed. The shrub layer is typically sparse or absent, but the herbaceous layer is generally well
developed. Representative grasses and forbs present in the herbaceous understory are wild oats,
Santa Barbara sedge, horsetail, and ripgut brome.

### 35 Ruderal Herbaceous Vegetation

- 36 Ruderal herbaceous areas typically occur on the mid- to upper-slopes of levees and within levee
- 37 crowns but also on the waterside of levees within gaps in the riparian forest canopy and as the
- 38 herbaceous understory of riparian forest and riparian scrub. This land cover type is characterized by
- 39 a dominance of nonnative grasses and forbs that opportunistically colonize areas subject to past
- 40 and/or ongoing disturbance (e.g., plowing, mowing, herbicidal spraying). Representative ruderal
- 41 species know to occur in the <u>program study</u> area are ripgut brome, Bermuda grass (*Cynodon*
- 42 *dactylon*), Johnson grass (*Sorghum halapense*), ryegrass (*Lolium multiflorum*), wild oats, broadleaf

- 1 filaree (*Erodium botrys*), whitestem filaree (*E. moschatum*), wild cudweed (*Gnaphalium* spp.),
- 2 bedstraw (*Galium aparine*), fennel (*Foeniculum vulgare*), yellow star-thistle, and milk thistle
- 3 (Silybum marianum).

#### 4 Emergent Marsh

5 Emergent marsh is restricted to a relatively narrow saturation zone along toes of levee slopes, and 6 occasionally on the landside of levees, and is characterized by the presence of hydrophytic (i.e., 7 "water-loving") herbaceous plant species that are able to tolerate fluctuating water levels and 8 persist in continuously saturated soils. Vegetative cover of this community type is generally sparse 9 due to bankline erosion caused by watercraft and high flow events, especially along major 10 waterways. Representative species observed in emergent marsh in the program study area are 11 cattails (*Typha* spp.), tule (*Schoenoplectus* spp.), common rush (*Juncus effusus*), Santa Barbara sedge, 12 Vasey's grass (Paspalum urvillei), smartweed (Polygonum lapathifolium), creeping water-primrose 13 (Ludwigia peploides ssp. montevidensis), purple-top vervain (Verbena bonariensis), western 14 goldenrod (Euthamia occidentalis), wild licorice (Glycyrrhiza lepidota), and bitter dogbane

15 (Apocynum androsaemifolium).

### 16 Agricultural Lands

17Agricultural lands occur at the outer boundary of the program study area on the landside of levees.18They include orchards, vineyards, row and field crops (e.g., sweet corn, tomatoes, alfalfa), and19pasturelands. Pasturelands typically contain a variety of native and nonnative grasses and forbs20such as tall fescue (*Festuca arundiaceae*), white clover (*Trifolium repens*), dallis grass (*Paspalum*21dilatatum), and chicory (*Chichorium intybus*).

#### 22 Barren

Barren areas within the <u>program</u> study area include paved and dirt roads, dirt lots, revetment areas
dominated by quarry stone or rock, and other areas that are essentially devoid of vegetation, usually
through vegetation management practices such as burning or discing (i.e., turning and loosening
soil). Barren substrates consist primarily of rock, pavement, and bare soil. Vegetation is typically
absent; however, sparse weedy grasses and forbs may be present. Classes of revetment include
angular rock, cobble, and concrete rubble.

#### 29 **Open Water**

30 Open water within the program study area consists of rivers, creeks, sloughs, canals, and other 31 unnamed drainages and ponds. Watercourses within the program study area are listed in Table 2-1 32 in Chapter 2 and include the Sacramento, American, Feather, Bear, and Yuba Rivers; Putah Creek; 33 and Natomas East Main Drain. Riparian forest, riparian shrub, and emergent marsh land cover types 34 are generally located adjacent to open water areas at the outboard toes of land slopes, but areas 35 designated as open water are essentially unvegetated. Instream woody material (IWM) (i.e., any 36 piece of dead wood, 6 inches diameter at breast height (dbh) or larger that extends into the water at 37 the mean summer water level) can occur within areas of open water and is an important component 38 of many rivers and creeks in the program study area.

#### 1 Other Land Cover Types in the Program Study Area

The program study area also has the potential to contain additional land cover types (e.g., annual
grassland, vernal pools) that were not present in the study areas for the project-level assessments
listed above. Subsequent project-level analyses that tier off this programmatic document may
identify additional land cover types that could be present in future project study areas; however, for
the purposes of this programmatic document, discussion will be limited to the eight land cover types
known to occur in the program area.

#### 8 **10.2.1.2 Baseline Conditions**

9 For the purposes of this programmatic document, the baseline conditions for each program region
10 are discussed in terms of percentage cover of land cover types, distribution of riparian vegetation,
11 and bank revetments.

12 A broad-scale analysis of existing vegetation within the program area was previously conducted by 13 Stillwater Sciences (2007) and is summarized here. The methodology for this analysis is included in 14 Appendix E, Riparian Vegetation Analysis. The analysis used seven vegetation cover type categories 15 to describe the existing vegetation in the program area. These categories are based on a simplified 16 classification of plant community types delineated in the program area by the Sacramento River 17 Riparian Vegetation (SRRV) Project (Nelson et al. 2000). For this analysis, agricultural lands and 18 ruderal vegetation have been added to the original SRRV classes. Therefore, the seven vegetation 19 cover types used in this assessment are riparian forest, riparian scrub/shrub, riparian herbaceous, 20 emergent marsh, bare ground, agricultural, and ruderal vegetation, and are described above. The 21 classified area includes lands between the high water channel edge and the levee crest, and for areas 22 lacking levees, a 100-foot buffer along the high water channel edge. Several sensitive plant 23 community types occur within the program area. Sensitive natural plant communities are vegetation 24 cover types that are especially diverse, regionally uncommon, or of special concern to local, state, 25 and federal agencies. Riparian forest and riparian scrub/shrub communities qualify as sensitive 26 natural communities, while the riparian herbaceous community generally does not (California 27 Department of Fish and Game Wildlife 2018b03). The only riparian community types dominated by 28 exotic plant species identified within the program area in the SRRV database are monocultures of 29 giant reed (Arundo donax). The area mapped as giant reed totals 9.4 acres, but is a small fraction of 30 the overall area included in the riparian herbaceous vegetation cover type, and is mapped only along 31 Region 1a.

32 Information on riparian vegetation is unevenly distributed among the four regions (Table 10-2). 33 Most of the mapped natural riparian vegetation lies in the upper portion of the program area within 34 Regions 2 and 3. Apparently, this bias occurs for two reasons: (1) most of the coverage does not 35 include sloughs and other human-made canals that are more common in the lower regions (e.g., Yolo 36 Bypass); and (2) the amount of land within the levees is greater per river mile where the levees are 37 set farther back from the channel edge, a situation more common in the northern than in the 38 southern regions. Only a small percentage of the program area in Region 1a is represented in the 39 SRRV coverage because the Yolo Bypass, which comprises more than 88% of the area, is not 40 included in the coverage.

Region	Total Area of Region (acres)	Area of Region Covered in SRRV Database (acres)	Percent of Total Region Covered in SRRV Database			
1a	69,446	4,700	7			
1b	4,482	3,646	81			
2	55,638	50,691	91			
3	14,007	14,007	100			
Total	143,573	73,040	51			
Source: Nelson et al. 2000.						

#### Table 10-2. Distribution of Riparian Vegetation Information within the Program Regions<sup>a</sup>

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3 Of the total area mapped within the program area, more than 33% is classified as a natural riparian 4 vegetation cover type (Table 10-3). Based on aerial photo interpretation of 1-meter resolution 5 imagery from the National Agriculture Imagery Program (U.S. Department of Agriculture Farm 6 Service Agency 2007), much of the remaining lands currently support a thin cover of ruderal 7 herbaceous vegetation; however, other disturbed riparian types are also mapped, including 8 agricultural land and disturbed bare ground. Approximately 66% of the natural riparian 9 communities that have been mapped are riparian forest, while riparian herbaceous and riparian 10 scrub/shrub compose nearly all of the remaining natural riparian vegetation area. Approximately 11 10% of the total mapped area, exclusively in the upper two regions, is classified as agricultural lands 12 supporting herbaceous crops and orchards.

#### 13 Region 1a

14 The majority of the natural riparian vegetation mapped with Region 1a is confined to a narrow strip 15 along the Sacramento River (Stillwater Sciences 2007). The riparian vegetation contains

16 approximately equal amounts of riparian forest and riparian scrub. The majority of the remaining

17 mapped area of Region 1a consists of ruderal herbaceous vegetation with a small area of invasive

18 giant reed. As reported in the programmatic BA, bank revetments comprise approximately 66% of

- the shoreline length and vary in composition (e.g., quarry rock, cobbles, rubble) and component size
   (e.g., small, medium, or large) (Stillwater Sciences 2007). However, revetments typically consist of
- 21 large rock (i.e., greater than 20 inches in size) (Stillwater Sciences 2007).

#### 22 Region 1b

Region 1b includes approximately equal proportions of both natural and disturbed riparian
 vegetation (Stillwater Sciences 2007). The majority of the natural riparian vegetation consists of

- 25 riparian forest and most of the rest is riparian scrub. Ruderal herbaceous vegetation occurs between
- smaller areas of natural riparian vegetation. Similar to Region 1b, bank revetments in Region 1b
   account for approximately 66% of the shoreline length, and are variable in composition (e.g., quarry)
- rock, cobbles, rubble) and component size (e.g., medium or large), although they generally consist of
- 29 large rock (i.e., greater than 20 inches in size).

#### 1 Table 10-3. Existing Extent of Vegetation Cover Types between Current Levees and Channel, or 2 between Channel and 100-Foot Buffer

Vegetation Cover Type	Region 1a	Region 1b	Region 2	Region 3	Program Area Total
Dinarian forest	434	1,572	10,607	5,065	17,677
Riparian lorest	9%	43%	21%	36%	24%
Dinarian caruh (abruh	303	117	2,284	698	3,401
Riparian scrub/snrub	6%	3%	5%	5%	5%
Dinarian harbona aug	74	85	1,702	1,229	3,090
Riparian nerbaceous	2%	2%	3%	9%	4%
Em organt march	27	12	1,096	21	1,155
Emergent marsh	1%	0%	2%	0%	2%
Total natural vinavian	838	1,786	15,689	7,013	25,323
Total natural riparian	18%	48%	31%	50%	35%
Para ground	0	0	446	0	446
Bare ground	0%	0%	0.88%	0%	1%
	0.0	0.0	5,486	1,743	7,228
Agricultural	0%	0%	11%	12%	10%
Dudavalucantation	3,862	1,860	29,070	5,251	40,043
Ruderal vegetation	82%	51%	57%	37%	55%
Tatal distants during and an	3,862	1,860	35,002	6,994	47,717
l otal disturbed riparian	82%	51%	69%	49%	66%
Total acres of SRRV	4,700	3,646	50,691	14,007	73,040
coverage	100%	100%	100%	100%	100%
Note: Values are presented	d in acres and n	ercentage of eac	h region		

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#### 4 **Region 2**

5 The majority of Region 2 has been mapped, and natural riparian vegetation comprises slightly less than 31% of the mapped area. The distribution of riparian vegetation in Region 2 is confined to 6 7 remnant stands and individual trees that have become established in sandy areas over bank 8 revetment (Stillwater Sciences 2007). Of the natural riparian vegetation, most is classified as 9 riparian forest, but areas of riparian scrub, emergent marsh, and riparian herbaceous vegetation are 10 also present. Large areas within the levee confines are also classified as agricultural lands; many 11 occur on or along the beds of bypasses and sloughs in the region (e.g., the Sutter Bypass). The 12 remaining area is primarily classified as ruderal. Revetments comprise approximately 40% of the 13 shoreline length in Region 2, and higher revetment coverage occurs along the mainstem Sacramento 14 River compared to the lower Feather and Yuba Rivers. Bank revetments vary in composition (e.g., 15 rock, cobbles, rubble) and component size (e.g., medium or large). However, revetments typically consist of medium cobble. 16

#### 17 Region 3

18 Approximately half of Region 3 is mapped as natural riparian vegetation. The natural riparian

- 19 vegetation in Region 3 is composed of approximately 72% riparian forest and 10% riparian scrub,
- 20 which typically occurs in a narrow strip along meanders (Stillwater Sciences 2007). Herbaceous
- 21 vegetation communities (e.g., ruderal herbaceous vegetation along banks) are also present in Region
- 22 3. Bank revetments in Region 3 comprise approximately 16% of the shoreline length, the lowest
- 23 coverage of the four program regions. The bank revetments are variable in composition (e.g., quarry

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rock, cobbles, rubble) and component size (e.g., small, medium, or large), although the revetments
 generally consist of medium (i.e., 12–20 inches in size) rock or cobble.

#### 3 **10.2.1.3** Special-Status Plant Species

Special-status plant species are plants that are legally protected under the California Endangered
 Species Act (CESA), the federal Endangered Species Act (ESA), or other regulations, as well as
 species considered sufficiently rare by the scientific community to qualify for such listing. For the
 purposes of this programmatic-level document, special-status plant species fall into one or more of
 the categories listed below.

- Species listed or proposed for listing as threatened or endangered under the ESA (Title 50 Code of Federal Regulations [CFR], Section 17.12 [listed plants] and various notices in the Federal Register [FR] [proposed species]).
- Species that are candidates for possible future listing as threatened or endangered under the
   ESA (<u>81 FR 87246 December 2, 201673 FR 75178, December 10, 2008</u>).
- Species listed or proposed for listing by the State of California as threatened or endangered
   under CESA (Title 14 California Code of Regulations [CCR], Section 670.5).
  - Species that meet the definitions of rare or endangered under the California Environmental Quality Act (CEQA) (State CEQA Guidelines Section 15380).
  - Plants listed as rare under the California Native Plant Protection Act (California Fish and Game Code Section 1900 et seq.).
  - Plants considered by the California Native Plant Society (CNPS) to be "rare, threatened, or endangered in California" (<u>Lists-California Plant Rank</u> 1B and 2, California Native Plant Society 20<u>1809</u>).
  - Plants listed by the CNPS as those about which more information is needed to determine their status, and those of limited distribution (<u>California Plant Rank Lists</u>-3 and 4), which may be included as special-status species on the basis of local significance or recent biological information (California Native Plant Society 20<u>1809</u>).

27 There were 92-108 special-status plant species identified as occurring within 10 miles of the 28 program area (California Department of Fish and Game-Wildlife 2018a09). Table 10-4 lists the 29 scientific name, common name, status, distribution, habitat requirements, known presence within 30 the program study area, and associated program regions for each of these species. Of these 92108 31 species, 342 species have been reported in the program study area (Table 10-4). Table 10-5 lists the 32 number of special-status plants known from within 10 miles of the program area for each program 33 region and the number of species located within the program study area at each region (California 34 Department of Fish and Game-Wildlife 2018a09).

#### Table 10-4. Special-Status Plants Identified as Occurring Within 10 Miles of the Program Area

Common and	Legal Status <sup>a</sup> Federal/			Blooming	Known within Program Study	Potential Program Area Region/s for
Scientific Name	State/CNPS	Geographic Distribution/Floristic Province <sup>b</sup>	Habitat Requirements	Period	Area?	Occurrence
Henderson's bent grass Agrostis hendersonii	-/-/3.2	Scattered locations in Central Valley and adjacent foothills: Butte, Calaveras, Merced, Placer, Shasta, Tehama, and Tuolumne Counties; Oregon	Moist places in valley and foothill grassland, vernal pools; 70–305 meters	Apr–Jun	No	2, 3
Large-flowered fiddleneck <i>Amsinckia grandiflora</i>	E/E/1B.1	Historically known from Mt. Diablo foothills in Alameda, Contra Costa, and San Joaquin Counties; currently known from three natural occurrences	Cismontane woodland, valley and foothill grassland; 275–550 meters	Apr–May	No	1a
Bent-flowered fiddleneck Amsinckia lunaris	<u>-/-/1B.2</u>	Inner North Coast Ranges. San Francisco Bay Area. west-central Great Valley	<u>Coastal bluff scrub, valley and foothill</u> <u>grasslands, cismontane woodlands; 3–500</u> <u>meters</u>	<u>Mar-Jun</u>	<u>No</u>	<u>1a, 2</u>
Slender silver moss Anomobryum julaceum	-/-/2.2	Scattered occurrences in California from Humboldt and Shasta south to Los Angeles Counties; Oregon and elsewhere	On damp rock and soil on outcrops, usually on roadcuts in broadleafed upland forest, lower montane coniferous forest, North Coast coniferous forest; 100–1,000 meters	N/A	No	1a
Mt. Diablo manzanita Arctostaphylos auriculata	-/-/1B.3	Endemic to Contra Costa County especially Mt Diablo area, San Francisco Bay area	Chaparral and cismontane woodland in canyons and on slopes on sandstone; 135– 650 meters	Jan–Mar	No	1a
Contra Costa manzanita Arctostaphylos manzanita ssp. laevigata	-/-/1B.2	Eastern San Francisco Bay region, Mount Diablo, southern Inner North Coast Range, Vaca Mountains in Contra Costa County	Rocky sites in chaparral; 500–1,100 meters	Jan–Mar (uncommonly Apr)	No	1a
Ferris's milk-vetch Astragalus tener var. ferrisiae	-/-/1B.1	Historical range included the Central Valley from Butte to Alameda County but currently only occurs in Butte, Glenn, Colusa, and Yolo Counties	Seasonally wet areas in meadows and seeps, subalkaline flats in valley and foothill grassland; 2–75 meters	Apr–May	Yes–Regions 2, 3	1a, 1b, 2, 3
Alkali milk-vetch Astragalus tener var. tener	-/-/1B.2	Southern Sacramento Valley, northern San Joaquin Valley, eastern San Francisco Bay	Playas, on adobe clay in valley and foothill grassland, vernal pools on alkali soils; 1–60 meters	Mar–Jun	Yes–Regions 1a, 1b	1a, 1b, 2
Heartscale Atriplex cordulata <u>var.</u> <u>cordulata</u>	-/-/1B.2	Western Central Valley and valleys of adjacent foothills	Saline or alkaline soils in chenopod scrub, meadows and seeps, sandy areas in valley and foothill grassland; 1–375 meters	Apr-Oct	Yes–Regions 1a, 1b	1a, 1b, 2, 3
Brittlescale Atriplex depressa	-/-/1B.2	Western and eastern Central Valley and adjacent foothills on west side of Central Valley	Alkaline or clay soils in chenopod scrub, meadows and seeps, playas, valley and foothill grassland, vernal pools; 1–320 meters	Apr-Oct	No	1a, 1b, 2, 3
<mark>San Joaquin spearscale</mark> Atriplex joaquiniana	<del>-/-/1B.2</del>	Western edge of the Central Valley from Glenn to Tulare Counties	Alkaline soils in chenopod scrub, meadows and seeps, playas, valley and foothill grassland; 1–835 meters	Apr-Oct	<del>Yes–Regions</del> <del>1a, 1b, and 2</del>	<del>1a, 1b, 2, 3</del>

	Legal Status <sup>a</sup>				Known within	Potential Program
Common and	Federal/			Blooming	Program Study	Area Region/s for
Scientific Name	State/CNPS	Geographic Distribution/Floristic Province <sup>®</sup>	Habitat Requirements	Period	Area?	Occurrence
Lesser saitscale Atriplex minuscula	-/-/1B.1	and from Merced County to Kern County	Sandy alkaline soils in chenopod scrub, playas, valley and foothill grassland; 15– 200 meters	May-Oct	NO	2, 3
Vernal pool smallscale Atriplex persistens	-/-/1B.2	Central Valley from Glenn to Tulare Counties	Alkaline vernal pools; 10–115 meters	Jun-Oct	No	1a, 3
Subtle orache Atriplex subtilis	-/-/1B.2	Central Valley, especially San Joaquin Valley with occurrences in Butte, Fresno, Kings, Kern, Madera, Merced, and Tulare Counties	Alkali scalds and alkali grasslands, often near vernal pools; 40–100 meters	Jun–Aug (uncommonly Oct)	No	2
Big-scale balsamroot Balsamorhiza macrolepis var. macrolepis	-/-/1B.2	Scattered occurrences in the Coast Ranges and Sierra Nevada foothills	Sometimes on serpentine soils in chaparral, cismontane woodland, valley and foothill grassland;90–1,555 meters	Mar–Jun	No	2
Big tarplant Blepharizonia plumosa	-/-/1B.1	San Francisco Bay area with occurrences in Alameda, Contra Costa, San Joaquin*, Stanislaus, and Solano Counties	Valley and foothill grassland; 30–505 meters	Jul-Oct	No	1a
<u>Watershield</u> Brasenia schreberi	<u>-/-/2B.3</u>	<u>Scattered occurrences in north and central</u> <u>California; widespread across U.S.</u>	Freshwater marshes: 30–2,200 meters	<u>Jun-Sep</u>	<u>No</u>	<u>1a, 1b, 2, 3</u>
Round-leaved filaree California macrophylla formerly Erodium macrophyllum)	-/-/1B.1	Scattered occurrences in the Central Valley, southern North Coast Ranges, San Francisco Bay area, South Coast Ranges, Channel Islands, Transverse Ranges, and Peninsular Ranges	Clay soils in cismontane woodland, valley and foothill grassland; 15–1,200 meters	Mar-May	Yes-Region 2	1a, 2, 3
<u>Mount Diablo fairy-</u> <u>antern</u> <u>Calochortus pulchellus</u>	<u>-/-/1B.2</u>	Alameda, Contra Costa, and Solano Counties	Cismontane woodland: chaparral, riparian woodland, valley and foothill grassland: 30–840 meters	<u>Apr-Jun</u>	No	<u>1a</u>
Butte County morning- glory Calystegia atriplicifolia ssp. buttensis	-/-/1B.2	Cascade Range and North Coast Range foothills: Butte, Del Norte, Mendocino (?), Shasta, and Tehama Counties	Rocky sites, sometimes roadsides, in chaparral and lower montane coniferous forest; 600–1,524 meters	May–Jul	No	2
Flagella-like atractylocarpus Campylopodiella stenocarpa	-/-/2.2	Known in California from Butte and Trinity Counties; elsewhere	Cismontane woodland; 100–500 meters	N/A	No	2, 3
<u>Dissected-leaved</u> toothwort Cardamine pachystigma var. dissectifolia	<u>-/-/1B.2</u>	<u>Sierra Nevada foothills and interior North Coast</u> <u>Ranges: Butte, Glenn, Mendocino, Placer, Sonoma,</u> <u>and Tehama Counties</u>	<u>Typically rocky serpentine soils in</u> <u>chaparral and lower montane coniferous</u> <u>forest: 255–2,100 meters</u>	<u>Feb-May</u>	<u>No</u>	2

Common and	Legal Status <sup>a</sup> Federal/	Community Distribution (Distriction Description)		Blooming	Known within Program Study	Potential Program Area Region/s for
Bristly sedge Carex comosa	_/_/2.1	Inner North Coast Ranges, High Cascade Range, Central Valley, northern Central Coast, San Francisco Bay, San Bernadino mountains, Modoc Plateau	Coastal prairie, marshes and swamps (lake margins), valley and foothill grassland; below 625 meters	May-Sep	Area? Yes–Regions 1a, 1b	1a, 1b
Brown fox sedge <i>Carex vulpinoidea</i>	-/-/2.2	Scattered locations in the southeast Klamath Range, northern High Cascade Range, and northern Sacramento Valley; Arizona, Oregon	Freshwater marshes and swamps, riparian woodland; 25–1,200 meters	May–Jun	Yes–Regions 2, 3	1a, 2, 3
Pink creamsacs <i>Castilleja rubicundula</i> ssp. <i>rubicundula</i>	-/-/1B.2	Inner North Coast Ranges with occurrences in Butte, Colusa, Glenn, Lake, and Napa Counties	Serpentine soils in chaparral openings, cismontane woodland, meadows and seeps, valley and foothill grassland; 20– 900 meters	Apr–Jun	Yes-Region 2	2, 3
Pappose tarplant <i>Centromadia parryi</i> ssp. <i>parryi</i>	-/-/1B.2	Southern North Coast Ranges, southern Sacramento Valley, northern and central Western California	Coastal prairie, chaparral, meadows and seeps, coastal salt marshes and swamps, vernally mesic valley and foothill grassland, often in alkaline soils; 2–420 meters	May–Nov	No	1a, 2
<del>Hoover's spurge</del> <del>Chamaesyce hooveri</del>	<del>T/-/1B.2</del>	Central Valley from Butte to Tehama Counties	Below high water marks of large northern hardpan and volcanic vernal pools; 25– 250 meters	<del>Jul–Sep</del> <del>(uncommonly Oct)</del>	Yes-Region 3	<del>2,3</del>
Stony Creek spurge Chamaesyce ocellata ssp. rattanii	<del>-/-/1B.2</del>	<del>Northern Sacramento Valley in Colusa, Glenn, and</del> <del>Tehama Counties</del>	<del>Chaparral, sandy or rocky areas in valley</del> <del>and foothill grassland; 85–800 meters</del>	May Oct	No	3
Hispid bird's-beak Chloropyron molle ssp. hispidum	<u>-/-/1B.1</u>	<u>Central Valley: Alameda, Fresno, Kern, Merced,</u> <u>Placer, and Solano Counties</u>	Meadow and seeps, valley and foothill grassland, playa, on alkaline soils; 1–155 meters	<u>Jun-Sep</u>	<u>No</u>	<u>1a</u>
Soft bird's-beak Chloropyron molle ssp. molle	<u>E/R/1B.2</u>	San Francisco Bay region: Suisun Marsh, Contra Costa, Marin*, Napa, Solano, Sacramento*, and Sonoma* Counties	Tidal salt marsh; below 3 meters	<u>Jul-Nov</u>	<u>No</u>	<u>1a</u>
Palmate-bracted bird's- beak Chloropyron palmatum	<u>E/E/1B.1</u>	Livermore Valley and scattered locations in the Central Valley from Colusa County to Fresno County	Alkaline sites in grassland and chenopod scrub; 5–155 meters	<u>May-Oct</u>	<u>Yes–all 4</u> <u>Regions</u>	<u>1a, 1b, 2, 3</u>
Bolander's water- hemlock <u>Cicuta maculata var.</u> bolanderi	<u>-/-/2B.2</u>	Contra Costa, Los Angeles*, Marin, Sacramento, Santa Barbara*, San Luis Obispo*, and Solano Counties; also Arizona, New Mexico, Washington	<u>Marshes and swamps, coastal, fresh or</u> brackish water: 0–200 meters	<u>Jul-Sep</u>	<u>Yes-Regions</u> <u>1a, 1b</u>	<u>1a, 1b</u>
Brandegee's clarkia Clarkia biloba ssp. brandegeeae	-/-/1B.2	Northern Sierra Nevada foothills from Butte to El Dorado Counties	Chaparral, cismontane woodland, lower montane coniferous forest, often on roadcuts; 73–915 meters	May–Jul	Yes-Region 2	1b, 2
Sacramento River Bank Protect	tion Project	Va	lumo l			March 2020

Common and	Legal Status <sup>a</sup> Federal/			Blooming	Known within Program Study	Potential Program Area Region/s for
Scientific Name	State/CNPS	Geographic Distribution/Floristic Province <sup>b</sup>	Habitat Requirements	Period	Area?	Occurrence
White-stemmed clarkia Clarkia gracilis ssp. albicaulis	-/-/1B.2	Southern Cascade Range foothills with occurrences in Butte and Tehama Counties	Chaparral and cismontane woodland, sometimes on serpentine soils; 245– 1,085 meters	May–Jul	No	2, 3
Mosquin's clarkia <i>Clarkia</i> mosquinii	-/-/1B.1	Northern Sierra Nevada foothills in vicinity of Feather River Canyon near Pulga in northeast Butte County	Rocky, roadside areas in cismontane woodland and lower montane coniferous forest; 185–1,219 meters	May–Jul	No	2
Hispid bird's-beak <del>Cordylanthus mollis ssp.</del> <del>hispidus</del>	<del>-/-/1B.1</del>	Central and southern Central Valley with occurrences in Alameda, Fresno, Kern, Merced, Placer, and Solano Counties	Alkaline soils in meadows and seeps, playas, valley and foothill grassland; 1–155 meters	<del>Jun-Sep</del>	No	<del>1a</del>
<del>Soft bird's beak</del> Cordylanthus mollis ssp. mollis	<del>E/R/1B.2</del>	Northern Central Coast with occurrences in Contra Costa, Marin*, Napa, Sacramento*, Solano, and Sonoma* Counties	Coastal salt marshes and swamps; below 3 meters	<del>Jul Nov</del>	No	<del>1a</del>
Palmate bracted bird's- beak <i>Cordylanthus palmatus</i>	<del>E/E/1B.1</del>	Livermore Valley and scattered locations in the Central Valley from Colusa to Fresno Counties	Alkaline grassland, alkali meadow, chenopod scrub; 5–155 meters	<del>May Oct</del>	<del>Yes_all 4</del> <del>Regions</del>	<del>1a, 1b, 2, 3</del>
Silky cryptantha Cryptantha crinita	<u>-/-/1B.2</u>	Shasta and Tehama Counties	<u>Cismontane woodland, lower montane</u> <u>coniferous forest, riparian forest and</u> <u>woodland, valley and foothill grassland on</u> gravelly streambeds; 61–1,215 meters	<u>Apr-May</u>	<u>No</u>	3
Hoover's cryptantha Cryptantha hooveri	-/-/1A	Known historically from Alameda, Contra Costa, Madera, Merced, San Joaquin, and Stanislaus Counties	Inland dunes, sandy soils in valley and foothill grassland; 9–150 meters	Apr-May	No	1a
<u>Peruvian dodder</u> <u>Cuscuta obtusiflora var.</u> glandulosa	<u>-/-/2B.2</u>	Not seen since 1948; occurrences in Butte, Los Angeles, Merced, Sacramento (?), San Bernardino*, and Sonoma Counties: Baja California and elsewhere	<u>Freshwater marshes and swamps; 15–280</u> meters	<u>Iul-Oct</u>	<u>No</u>	<u>1b, 2</u>
Recurved larkspur Delphinium recurvatum	-/-/1B.2	Central Valley from Colusa* to Kern Counties	Alkaline soils in valley and foothill grassland, saltbush scrub, cismontane woodland; 3–750 meters	Mar–Jun	No	2, 3
Norris' beard moss Didymodon norrisii	-/-/2.2	Scattered occurrences in Contra Costa, Colusa, Humboldt, Lake, Madera, Monterey, Nevada, Plumas, San Benito, Santa Cruz, Sierra, Tehama, Tulare, and Tuolumne Counties; Oregon	Intermittently wet areas in rock outcrops in cismontane woodland, lower montane coniferous forest; 600–1,973 meters	N/A	No	2, 3
Dwarf downingia Downingia pusilla	-/-/2.2	Inner North Coast Ranges, southern Sacramento Valley, northern and central San Joaquin Valley	Mesic areas in valley and foothill grassland, vernal pools; 1–445 meters	Mar-May	No	1a, 1b, 2, 3

	Legal Statusa				Known within	Potential Program
Common and	Federal/			Blooming	Program Study	Area Region/s for
Scientific Name	State/CNPS	Geographic Distribution/Floristic Province <sup>b</sup>	Habitat Requirements	Period	Area?	Occurrence
Antioch Dunes	-/-/1B.1	Known from a single occurrence in the Antioch	Inland dunes; 0–20 meters	Jul-Oct	No	1a
buckwheat		<u>Dunes, Contra Costa County</u>			_	—
<i>Eriogonum nudum</i> var.						
<u>psychicola</u>						
Mt. Diablo buckwheat	-/-/1B.1	Historically known from northeastern San	Sandy soils in chaparral, coastal scrub,	Apr–Sep	No	1a
Eriogonum truncatum		Francisco Bay in Alameda and Contra Costa	valley and foothill grassland; 3-350 meters	(uncommonly		
		Counties. Presumed extinct until recent		Nov–Dec)		
		rediscovery on Mt. Diablo. Also historically known				
		from deltaic Sacramento Valley.				(1
epson's covote thistle	<u>-/-/1B.12</u>	Alameda, Amador, Calaveras, Contra Costa, Fresno,	Vernal pools and mesic valley and foothill	<u>Apr-Aug</u>	<u>No</u>	<u>1b, 2</u>
<u>Eryngium jepsonii</u>		Napa, San Mateo, Solano, Stanislaus, Tuolumne, and	grassiand; 10–100 meters			
Contra Costa wallflower	E/E/1D1	<u>1010 Counties</u>	Inland dunosi 2, 20 motors	Mar Jul	No	10
Ervsimum canitatum yar	E/E/10.1	Kilowii olify if olif Coliffa Costa Coulity	manu umes, 3-20 meters	Mai – Jui	NO	14
anaustatum						
Diamond-petaled	-/-/1B.1	Inner North and South Coast Ranges, eastern San	Alkaline or clay soils in valley and foothill	Mar-Apr	No	1a
California poppy	, , ====	Francisco Bay, eastern Outer South Coast Ranges	grassland; below 975 meters			
Eschscholzia						
rhombipetala						
<u>Hoover's spurge</u>	<u>T/-/1B.2</u>	<u>Central Valley from Butte County to Tulare County</u>	Below the high-water mark of large	<u>Jul-Sep</u>	Yes-Region 3	<u>2, 3</u>
<u>Euphorbia hooveri</u>			northern hardpan and volcanic vernal	<u>(uncommonly</u>		
			pools: 25–250 meters	<u>0ct)</u>		
<u>Stony Creek spurge</u>	<u>-/-/1B.2</u>	Northern Sacramento Valley in Colusa, Glenn, and	<u>Chaparral, sandy or rocky areas in valley</u>	<u>May–Oct</u>	<u>No</u>	<u>3</u>
<u>Euphorbia</u>		<u>Tehama Counties</u>	and foothill grassland; 85–800 meters			
San Joaquin spearscale	<u>-/-/1B.2</u>	Western edge of the Central Valley from Glenn to	Alkaline soils in chenopod scrub, meadows	<u>Apr–Oct</u>	<u>Yes-Regions</u>	<u>1a, 1b, 2, 3</u>
<u>Extriplex joaquiniana</u>		<u>Tulare Counties</u>	and seeps, playas, valley and foothill		<u>1a, 1b, and 2</u>	
Minuto no alcot more	/ /10.2	Known from Dutte Del Nerte Humbeldt	grassland; 1–835 meters	NI / A	No	2
Final dens naun angulus	-/-/1B.Z	Known from Butte, Del Norte, Humbolat,	Damp, coastal soll in North Coast	N/A	NO	Z
Stinkholls	1 11 2	Outor North Coast Pangos, Siorra Novada foothills	Clay comptimes corporting soils in	Mar Jun	No	1a 1h
Fritillaria aarostis	-/-/4.2	Central Valley, Central Western California	chaparral cismontane woodland ninvon-	Mai – Juli	NO	14, 10
Tritiliaria agrestis		Central valley, Central Western Camorina	iuniner woodland, valley and foothill			
			grassland: 10–1.555 meters			
Butte County fritillarv	-/-/3.2	Sierra Nevada foothills from Shasta to Yuba	Chaparral, cismontane woodland. and	Mar-Jun	Yes-	2,3
Fritillaria eastwoodiae	, ,	Counties	openings in lower montane coniferous	<b>,</b> -	Regions 2, 3	,
			forest, sometimes on serpentine; 50–		<u> </u>	
			1,500 meters			

Common and	Legal Status <sup>a</sup> Federal/			Blooming	Known within Program Study	Potential Program Area Region/s for
Scientific Name	State/CNPS	Geographic Distribution/Floristic Province <sup>b</sup>	Habitat Requirements	Period	Area?	Occurrence
Fragrant fritillary Fritillaria liliacea	-/-/1B.2	Central Western California with occurrences in Alameda, Contra Costa, Monterey, Marin, San Benito, Santa Clara, San Francisco, San Mateo, Solano, and Sonoma Counties	Coastal prairie, coastal scrub, valley and foothill grassland, cismontane woodland, often on serpentine; 3–410 meters	Feb-Apr	No	la
Adobe-lily Fritillaria pluriflora	-/-/1B.2	Northern Sierra Nevada foothills, Inner North Coast Ranges, edges of Sacramento Valley	Often adobe soils in chaparral, cismontane woodland, valley and foothill grassland; 60–705 meters	Feb–Apr	Yes– Regions 2, 3	1a, 2, 3
Boggs Lake hedge hyssop Gratiola heterosepala	-/E/1B.2	Inner North Coast Ranges, central Sierra Nevada foothills, Sacramento Valley, Modoc Plateau	Clay soils in marshes and swamps along lake margins and vernal pools; 10–2,375 meters	Apr-Aug	No	1a, 1b, 2, 3
Diablo helianthella Helianthella castanea	-/-/1B.2	San Francisco Bay area in Alameda, Contra Costa, Marin*, San Francisco*, and San Mateo Counties	Broadleafed upland forest, chaparral, cismontane woodland, coastal scrub, riparian woodland, valley and foothill grassland; 60–1,300 meters	Mar-Jun	No	1a
Brewer's western flax Hesperolinon breweri	-/-/1B.2	Southern North Inner Coast Range, northeast San Francisco Bay region, especially Mt. Diablo: Contra Costa, Napa, and Solano Counties	Chaparral, cismontane woodland, valley and foothill grassland usually on soils derived from serpentinite; 30–900 meters	May–Jul	No	1a
<u>Water star-grass</u> <u>Heteranthera dubia</u>	<u>-/-/2B.2</u>	All occurrences are historical and some are possibly extirpated; Butte, Colusa, Lassen, Mendocino, Modoc, Marin, San Francisco, Shasta, San Mateo Counties; also many states across the U.S.	Alkaline, still or slow-moving water of marshes and swamps; requires a pH of 7 or higher, usually in slightly eutrophic waters; 30–1,495 meters	<u>Jul-Oct</u>	<u>No</u>	<u>2.3</u>
Rose-mallow Hibiscus lasiocarpus <u>var.</u> occidentalis	-/-/2.2	Central and southern Sacramento Valley, deltaic Central Valley, and elsewhere in the U.S.	Freshwater marshes and swamps; below 120 meters	Jun-Sep	Yes–all 4 Regions	1a, 1b, 2, 3
California satintail Imperata brevifolia	-/-/2.1	San Joaquin Valley, South Coast, San Gabriel Mountains, San Bernadino Mountains, Mojave Desert; Texas, Mexico	Mesic areas in chaparral, coastal scrub, Mojavean desert scrub, meadows and seeps (often alkaline), riparian scrub; below 500 meters	Sep–May	No	2, 3
Carquinez goldenbush Isocoma arguta	-/-/1B.1	Deltaic Sacramento Valley in the Suisun Slough	Alkaline valley and foothill grassland; 1–20 meters	Aug-Dec	Yes–Region 1a	1a
Northern California black walnut Juglans hindsii	-/-/1B.1	Last two native stands in Napa and Contra Costa Counties; historically widespread through southern Inner North Coast Ranges, southern Sacramento Valley, northern San Joaquin Valley, San Francisco Bay	Riparian scrub and riparian woodland; below 440 meters	Apr–May	Yes–Regions 1a, 1b	1a, 1b

Common and	Legal Status <sup>a</sup>			Blooming	Known within	Potential Program
Scientific Name	State/CNPS	Geographic Distribution/Floristic Province <sup>b</sup>	Habitat Requirements	Period	Area?	Occurrence
Ahart's dwarf rush Juncus leiospermus var. ahartii	-/-/1B.2	Eastern Sacramento Valley, northeastern San Joaquin Valley with occurrences in Butte, Calaveras, Placer, Sacramento, and Yuba Counties	Mesic areas in valley and foothill grassland, vernal pool margins; 30–229 meters	Mar-May	Yes-Region 2	1b, 2, 3
Red Bluff dwarf rush Juncus leiospermus var. leiospermus	-/-/1B.1	Northern Sacramento Valley and Cascade Range foothills with occurrences in Butte, Shasta, and Tehama Counties	Seasonally wet areas in chaparral, cismontane woodland, meadows and seeps, valley and foothill grassland, vernal pools; 35–1,020 meters	Mar-May	No	2, 3
Contra Costa goldfields Lasthenia conjugens	E/-/1B.1	North Coast, southern Sacramento Valley, San Francisco Bay, South Coast	Mesic areas in cismontane woodland, alkaline playas, valley and foothill grassland, vernal pools; below 470 meters	Mar–Jun	No	1a
Coulter's goldfields Lasthenia glabrata ssp. coulteri	-/-/1B.1	Scattered locations in southern California from San Luis Obispo County to San Diego County, in the outer South Coast Ranges, south coast, northern Channel Islands, Peninsular Rangess, western Mojave desert	Coastal salt marshes and swamps, vernal pools, playas; 1–1,220 meters	Feb–Jun	No	2, 3
Delta tule pea Lathyrus jepsonii var. jepsonii	-/-/1B.2	Central Valley, San Francisco Bay	Freshwater and brackish marshes and swamps; below 4 meters	May–Jul (uncommonly Sep)	Yes–Regions 1a, 1b	1a, 1b
Colusa layia Layia septentrionalis	-/-/1B.2	Inner North Coast Range: Colusa, Glenn, Lake, Mendocino, Napa, Sonoma, Sutter, Tehama, and Yolo Counties	Sandy or serpentine soils in valley and foothill grassland, chaparral, and cismontane woodland; 100–1,095 meters	Apr–May	Yes-Region 2	1a, 2, 3
Legenere Legenere limosa	-/-/1B.1	Sacramento Valley, North Coast Ranges, northern San Joaquin Valley and Santa Cruz mountains	Vernal pools; 1–880 meters	Apr–Jun	No	1a, 1b, 2, 3
Heckard's pepper-grass Lepidium latipes var. heckardii	-/-/1B.2	Southern Sacramento Valley	Alkaline flats in valley and foothill grassland; 2–200 meters	Mar-May	Yes–Regions 1a, 1b	1a, 1b, 2, 3
Mason's lilaeopsis Lilaeopsis masonii	-/R/1B.1	Southern Sacramento Valley, northeastern San Francisco Bay	Riparian scrub, brackish or freshwater marshes and swamps; below 10 meters	Apr–Nov	Yes–Regions 1a, 1b	1a, 1b
Butte County meadowfoam Limnanthes floccosa ssp. californica	E/E/1B.1	Endemic to Butte County	Mesic areas in valley and foothill grassland, vernal pools and swales; 46–930 meters	Mar–May	No	2, 3
Woolly meadowfoam Limnanthes floccosa ssp. floccosa	-/-/4.2	Northern Sacramento Valley and Cascade Range foothills, from Siskiyou County to Butte County; Oregon	Seasonally wet areas in chaparral, cismontane woodland, valley and foothill grassland, vernal pools; 60–1,095 meters	Mar–May (uncommonly Jun)	No	2, 3

Common and	Legal Status <sup>a</sup> Federal/			Blooming	Known within Program Study	Potential Program Area Region/s for
Scientific Name	State/CNPS	Geographic Distribution/Floristic Province <sup>b</sup>	Habitat Requirements	Period	Area?	Occurrence
Delta mudwort Limosella <del>subulata<u>australis</u></del>	-/-/2 <u>B</u> .1	Deltaic Central Valley with occurrences in Contra Costa, Sacramento, San Joaquin, and Solano Counties; Oregon	<u>Muddy or sandy intertidal flats and</u> marshes, streambanks in riparian scrub; generally at sea levelMarshes and swamps; below 3 meters	May-Aug	Yes–Regions 1a, 1b	1a, 1b
\$howy madia Madia radiata	<u>-/-/1B.1</u>	Scattered populations in the interior foothills of the South Coast Ranges: Contra Costa*, Fresno, Kings*, Kern, Monterey*, Santa Barbara*, San Benito, San Joaquin*, San Luis Obispo, and Stanislaus Counties	Cismontane woodland, valley and foothill grassland, slopes; 25–900 meters	Mar-May	No	1a
<u>Hall's bush-mallow</u> <u>Malacothamnus hallii</u>	<u>-/-/1B.2</u>	<u>Alameda, Contra Costa, Mendocino, Merced, Santa</u> <u>Clara, San Mateo, and Stanislaus Counties</u>	<u>Chaparral and coastal scrub; 10–760</u> meters	<u>May-Sep</u> (uncommonly <u>Oct)</u>	<u>No</u>	<u>1a</u>
<u>Marsh microseris</u> <u>Microseris paludosa</u>	<u>-/-/1B.2</u>	<u>Coastal California from Mendocino County to San</u> <u>Luis Obispo County</u>	<u>Grassland, coastal scrub, closed-cone-</u> <u>coniferous forest, cismontane woodland;</u> <u>5–300 meters</u>	<u>Apr-Jun</u> (uncommonly Jul)	<u>No</u>	<u>1a</u>
Veiny monardella Monardella douglasii ssp. venosa	-/-/1B.1	Occurrences in the northern and central Sierra Nevada foothills; also historically known from the Sacramento Valley	Heavy clay soils in cismontane woodland, valley and foothill grassland; 60–410 meters	May–Jul	Yes–Regions 1a, 1b, and 2	1a, 1b, 2, 3
Baker's navarretia Navarretia leucocephala ssp. bakeri	-/-/1B.1	Inner North Coast Ranges, western Sacramento Valley	Mesic areas in cismontane woodland, lower montane coniferous forest, meadows and seeps, valley and foothill grassland, vernal pools; 5–1,740 meters	Apr–Jul	Yes-Region 2	1a, 1b, 2, 3
Pincushion navarretia Navarretia myersii ssp. myersii	-/-/1B.1	Central Sierra Nevada foothills, central Great Valley	Vernal pools, often acidic; 20–330 meters	Мау	No	1b, 2
Adobe navarretia Navarretia nigelliformis ssp. nigelliformis	<u>-/-/4.2</u>	<u>Alameda, Butte, Contra Costa, Colusa, Fresno, Kern,</u> <u>Merced, Monterey, Placer, Sutter, and Tulare</u> <u>Counties</u>	<u>Clay soils, sometimes serpentinite, in</u> <u>vernally mesic valley and foothill</u> <u>grassland, vernal pools; 100–1,000 meters</u>	<u>Apr-Jun</u>	<u>No</u>	<u>1a, 1b, 2</u>
Colusa grass Neostapfia colusana	T/E/1B.1	Central Valley with scattered occurrences from Colusa to Merced Counties	Adobe soils of vernal pools; 5–200 meters	May-Aug	No	1a, 1b, 2, 3
Antioch Dunes evening primrose Oenothera deltoides ssp. howellii	E/E/1B.1	Known from three native occurrences in northeastern San Francisco Bay	Inland dunes; below 30 meters	Mar-Sep	Yes–Region 1a	1a
San Joaquin Valley Orcutt grass Orcuttia inaequalis	T/E/1B.1	Scattered locations along east edge of the San Joaquin Valley and adjacent foothills, from Stanislaus County to Tulare County	Vernal pools; 10–755 meters	Apr–Sep	No	1a

Common and	Legal Statusª Federal/			Blooming	Known within Program Study	Potential Program Area Region/s for
Scientific Name	State/CNPS	Geographic Distribution/Floristic Province <sup>b</sup>	Habitat Requirements	Period	Area?	Occurrence
Hairy Orcutt grass Orcuttia pilosa	E/E/1B.1	Scattered locations along east edge of Central Valley and adjacent foothills from Tehama to Merced Counties	Vernal pools; 46–200 meters	May–Sep	No	2, 3
Slender Orcutt grass Orcuttia tenuis	T/E/1B.1	Inner North Coast Ranges, Cascade Range foothills, Sacramento County	Vernal pools; 35–1,760 meters	May–Sep; uncommonly Oct	No	1b, 2, 3
Sacramento Orcutt grass Orcuttia viscida	E/E/1B.2	Known only from Sacramento County	Vernal pools; 30–100 meters	Apr–Jul	No	1b
Lewis Rose's ragwort Packera eurycephala var. lewisrosei	-/-/1B.2	Northern High Sierra Nevada, including the Feather River Drainage, eastern Butte and Plumas Counties	Serpentine soils in chaparral, cismontane woodland, and lower montane coniferous forest; 285–1,890 meters	Mar–Jul (uncommonly Sep)	No	2
Ahart's paronychia Paronychia ahartii	-/-/1B.1	Northern Central Valley in Butte, Shasta, and Tehama Counties	Cismontane woodland, valley and foothill grassland, vernal pools; 30–510 meters	Mar–Jun	No	2, 3
Bearded popcorn-flower Plagiobothrys hystriculus	-/-/1B.1	Presumed extinct until recent rediscovery in the Montezuma Hills	Often vernal swales in mesic valley and foothill grassland, vernal pool margins; below 274 meters	Apr-May	No	1a
Slender-leaved pondweed Potamogeton filiformis	-/-/2.2	Scattered locations in California: Contra Costa, El Dorado, Lassen, Merced, Mono, Modoc, Mariposa, Placer, Santa Clara*, and Sierra Counties; Arizona, Nevada, Oregon, Washington	Freshwater marsh, shallow emergent wetlands and freshwater lakes, drainage channels; 300–2,150 meters	May–Jul	No	2, 3
Eel-grass pondweed Potamogeton zosteriformis	-/-/2.2	Southern Inner North Coast Ranges, Central Valley, Modoc Plateau; Idaho, Oregon, Utah, Washington	Assorted freshwater marshes and swamps; below 1,860 meters	Jun–Jul	No	1a
Hartweg's golden sunburst Pseudobahia bahiifolia	E/E/1B.1	Central Sierra Nevada foothills, eastern San Joaquin Valley	Clay soils in cismontane woodland, valley and foothill grassland; 15–150 meters	Mar–Apr	Yes–Regions 1a, 2	1a, 2
<u>California alkali grass</u> <u>Puccinellia simplex</u>	<u>-/-/1B.2</u>	Alameda, Butte, Contra Costa, Colusa, Fresno, Glenn, Kings*, Kern, Lake, Los Angeles, Madera, Merced, Napa, San Bernardino, Santa Clara, Santa Cruz, San Luis Obispo, Solano, Stanislaus, Tulare, and Yolo Counties; Utah.	Alkaline soils, vernally mesic; sinks, flats, lake margins, chenopod scrub, meadows and seeps, valley and foothill grassland, vernal pools; 2–930 meters	<u>Mar-May</u>	Yes-Region 1a	<u>1a. 2, 3</u>
California beaked-rush Rhynchospora californica	-/-/1B.1	Scattered occurrences in Northwestern California, northern and central Sierra Nevada Foothills, and northern San Francisco Bay	Bogs and fens, meadows and seeps, lower montane coniferous forest, freshwater marshes and swamps; 45–1,010 meters	May–Jul	No	2, 3
Brownish beaked-rush Rhynchospora capitellata	-/-/2.2	Scattered occurrences in Northwestern California and northern Sierra Nevada Foothills	Wet areas in lower and upper montane coniferous forest, meadows and seeps, marshes and swamps; 455–2,000 meters	Jul–Aug	No	2

Common and	Legal Status <sup>a</sup> Federal/			Blooming	Known within Program Study	Potential Program Area Region/s for
Scientific Name	State/CNPS	Geographic Distribution/Floristic Province <sup>b</sup>	Habitat Requirements	Period	Area?	Occurrence
Sanford's arrowhead Sagittaria sanfordii	-/-/1B.2	Scattered locations in Central Valley and Coast Ranges from Del North to Fresno Counties	Freshwater marshes, sloughs, canals, and other slow-moving water habitats; below 2,132 feet	May-Oct	Yes–Regions 1a, 1b	1a, 1b, 2, 3
Marsh skullcap Scutellaria galericulata	-/-/2.2	Northern High Sierra Nevada, Modoc Plateau; Oregon	Lower montane coniferous forest, mesic meadows and seeps, marshes and swamps; below 2,100 meters	Jun–Sep	No	1a, 1b
Side-flowering skullcap Scutellaria lateriflora	-/-/2.2	Northern San Joaquin Valley, east of Sierra Nevada; New Mexico, Oregon	Mesic meadows and seeps, marshes and swamps; below 500 meters	Jul–Sep	Yes–Regions 1a, 1b	1a, 1b
Chaparral ragwort Senecio aphanactis	-/-/2.2	Scattered locations in central western and southwestern California, from Alameda County to San Diego County	Cismontane woodland, coastal scrub, chaparral, sometimes on alkaline soils; 15– 800 meters	Jan–Apr	No	1a
Butte County checkerbloom Sidalcea robusta	-/-/1B.2	Endemic to Butte County	Chaparral, cismontane woodland; 90– 1,600 meters	Apr–Jun	Yes–Regions 2, 3	2, 3
San Francisco campion Silene verecunda ssp. verecunda	-/-/1B.2	Northern Central Coast, San Francisco Bay area: San Francisco, San Mateo, Santa Cruz, and Sutter Counties	Sandy soils in coastal bluff scrub, chaparral, coastal prairie, coastal scrub, valley and foothill grassland; 30–645 meters	Mar-Aug	No	1a, 2, 3
<u>Slender-leaved</u> pondweed <u>Stuckenia filiformis ssp.</u> alpina	<u>-/-/2B.2</u>	Scattered locations in California: Contra Costa, El Dorado, Lassen, Merced, Mono, Modoc, Mariposa, Placer, Santa Clara*, and Sierra Counties; Arizona, Nevada, Oregon, Washington	Freshwater marsh, shallow emergent wetlands and freshwater lakes, drainage channels; 300–2,150 meters	<u>May-Jul</u>	<u>No</u>	<u>1a, 1b, 2</u>
Suisun Marsh aster Symphyotrichum lentum (formerly Aster lentus)	-/-/1B.2	Sacramento Valley, Central Coast, San Francisco Bay	Brackish and freshwater marshes and swamps; below 3 meters	May-Nov	Yes–Regions 1a, 1b	1a, 1b
Wright's trichocoronis Trichocoronis wrightii var. wrightii	-/-/2.1	Scattered locations in the Central Valley and Southern Coast; Texas	On alkaline soils in floodplains, meadows and seeps, marshes and swamps, riparian forest, vernal pools; 5–435 meters	May-Sep	Yes–Regions 1a, 2	1a, 2
Showy rancheria clover Trifolium amoenum	E/-/1B.1	Coast Range foothills in the San Francisco Bay region, currently known from only two recent occurrences in Marin County	Valley and foothill grassland, coastal bluff scrub, sometimes on serpentinite soils; 5– 415 meters	Apr-Jun	No	1a
<u>Saline clover</u> Trifolium hydrophilum	<u>-/-/1B.2</u>	Sacramento Valley, central western California	Salt marsh, mesic alkaline areas in valley and foothill grasslands, vernal pools, marshes and swamps; below 300 meters	<u>Apr-Jun</u>	No	<u>1a, 1b, 2</u>
Butte County golden clover <i>Trifolium jokerstii</i>	-/-/1B.2	Endemic to Butte County	Mesic areas in valley and foothill grassland, vernal pools; 50–385 meters	Mar–May	No	2

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	Legal Status <sup>a</sup>				Known within	Potential Program
Common and	Federal/			Blooming	Program Study	Area Region/s for
Scientific Name	State/CNPS	Geographic Distribution/Floristic Province <sup>b</sup>	Habitat Requirements	Period	Area?	Occurrence
Greene's tuctoria	E/R/1B.1	Scattered distribution along eastern Central Valley	Dry vernal pools; 30–1,070 meters	May–Jul	No	2, 3
Tuctoria greenei		and foothills from Shasta to Tulare Counties		(uncommonly		
				Sep)		
Crampton's tuctoria	E/E/1B.1	Southwestern Sacramento Valley, Solano and Yolo	Mesic areas in valley and foothill grassland,	Apr-Aug	No	1a, 1b
Tuctoria mucronata		Counties	vernal pools; 5–10 meters			
Brazilian watermeal	-/-/2.3	Few occurrences along Sacramento River in Butte	Assorted shallow freshwater marshes and	Apr–Dec	Yes-Regions 2,	2, 3
Wolffia brasiliensis		and Glenn Counties; elsewhere	swamps; 30–100 meters		3	

#### <sup>a</sup> Status explanations:

#### Federal

- E = listed as endangered under the federal Endangered Species Act.
- T = listed as threatened under the federal Endangered Species Act.

#### – = no listing.

#### State

- E = listed as endangered under the California Endangered Species Act.
- R = listed as rare under the California Native Plant Protection Act (this category is no longer used for newly listed plants, but some plants previously listed as rare retain this designation.
- = no listing.

#### California Native Plant Society (CNPS)

- 1A = List 1A species: presumed extinct in California and elsewhere.
- 1B = List 1B species: rare, threatened, or endangered in California and elsewhere.
- 2 = List 2 species: rare, threatened, or endangered in California but more common elsewhere.
- 3 = List 3 species: more information is needed about this plant
- 4 = List 4 species: limited distribution and on a watch list.
- 0.1 = seriously endangered in California.
- 0.2 = fairly endangered in California.
- 0.3 = not very endangered in California.
- \* = presumed extirpated from that County.
- ? = occurrence within County needs to be confirmed
- <sup>b</sup> Floristic provinces as defined in Hickman 1993Baldwin et al. 2012

Program Region	Special-Status Plants <u>Outside, but</u> within 10 Miles of <u>,</u> the Program Area	Special-Status Plants within the Program Study Area
1a	<del>57<u>68</u></del>	<del>19<u>21</u></del>
1b	<del>30<u>37</u></del>	<u>1516</u>
2	<del>56<u>66</u></del>	<u>1817</u>
3	44 <u>48</u>	9

#### Table 10-5. Number of Special-Status Plant Species by Region

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Of the 92108 special-status plant species identified within 10 miles of the program area, 17 are federally listed. According to the programmatic BA, the federally listed plant species are associated with habitats that are either absent from the program area levees (i.e., vernal pools, dunes) or very unlikely to occur along or adjacent to the levees (e.g., salt marsh, cismontane woodland, valley and foothill grassland) (ICF International 2012). Therefore, potential impacts on federally listed plants were not evaluated in the programmatic BA due to the lack of potential habitat. However, for the installation of a setback levee, construction, staging, and access would likely extend outside the aforementioned areas and could encroach on land cover types (e.g., annual grassland, vernal pools) that represent potential habitat for special-status plants.

#### 12 **10.2.1.4** Sensitive Natural Communities

13 Sensitive natural communities are designated as such because of their high level of species diversity, 14 high productivity, unusual nature, limited distribution, or declining status. Local, state, and federal 15 agencies consider these habitats important. The CNDDB maintains a current list of rare natural 16 communities throughout the state, and seven of these communities have been reported in the 17 program study area (California Department of Fish and Game-Wildlife 2018b09): coastal and valley 18 freshwater marsh, elderberry savanna, Great Valley cottonwood riparian forest, Great Valley mixed 19 riparian forest, Great Valley valley oak riparian forest, Great Valley willow scrub, and northern 20 hardpan vernal pool. The coastal and valley freshwater marsh, three types of riparian forest, and 21 Great Valley willow scrub fit within the categories of the land cover types (i.e., riparian forest, 22 emergent marsh, riparian scrub) identified in one or more of the existing project-level assessment 23 documents that cover 57 of the levee repair sites included in the proposed program. Although 24 elderberry savanna and northern hardpan vernal pool were not observed in the study areas of at the 25 57 levee repair sites, they may be present in the study area and would be identified in subsequent 26 project-level analyses that tier off this programmatic document.

- Additionally, the U.S. Fish and Wildlife Service (USFWS) considers certain habitats (such as
  wetlands) important to wildlife, and the U.S. Army Corps of Engineers (Corps) and U.S.
  Environmental Protection Agency (EPA) consider wetland habitats important for water quality and
  wildlife. The state protects wetlands and other waters under the Porter-Cologne Water Quality
- 31 Control Act (see Appendix C, Regulatory Background).
- 32 In contrast to sensitive natural communities, common natural communities have little diversity of
- 33 species, and are habitats that are widespread, able to reestablish naturally after disturbance, or
- 34 capable of supporting primarily nonnative species. These communities are not generally protected
- 35 by agencies unless the specific site is habitat for special-status species or capable of supporting such

- 1 species (e.g., raptor foraging or nesting habitat or upland habitat in a wetland watershed). The
- 2 ruderal herbaceous land cover type in the program study area is considered a common natural
- 3 community. The agricultural lands and barren areas are not natural communities.

#### 4 **10.2.1.5** Invasive Plant Species

- 5 Plant species that are considered invasive by the CDFA and Cal-IPC have been documented in the
- 6 program study area (California Invasive Plant Council 2006, 2007; California Department of Food
- 7 and Agriculture 2009). Giant reed, ripgut brome, black locust, yellow star-thistle, Himalayan
- 8 blackberry, prickly lettuce, edible fig, fennel, and milk thistle are examples of invasive plant species
- 9 that are known to occur in the program study area.

### 10 **10.2.1.6** Native Tree Resources

- 11 Native trees such as Fremont cottonwood, valley oak, interior live oak, Goodding's black willow,
- 12 arroyo willow, white alder, western Sycamore, box elder, and Oregon ash are known to occur in the13 program study area.

## 14 **10.3 Regulatory Setting**

Appendix C, Regulatory Background, describes the federal, state, and local environmental laws,
 regulations, and policies that apply to vegetation and wetlands in the program area. The pertinent
 laws, regulations, and policies are listed below.

- 18 Federal:
- 19 O National Environmental Policy Act
- 20 Endangered Species Act
- 21 O Clean Water Act
- 22 O Rivers and Harbors Appropriation Act of 1899
- 23 Executive Order 11990: Protection of Wetlands
- 24 O Executive Order 13112: Invasive Species
- 25 State:
- 26 O California Environmental Quality Act
- 27 California Endangered Species Act
- 28 O California Native Plant Protection Act
- 29 O California Fish and Game Code
- 30 O Porter-Cologne Water Quality Control Act
- 31 Local:
- 32 Butte County General Plan
- 33• Butte Regional Conservation Plan
- Colusa County General Plan

U.S. Army Corps of Engineers

- 1 Glenn County General Plan 2 Placer County General Plan 3 Placer County Tree Preservation Ordinance 4 American River Parkway Plan • 5 Natomas Basin Habitat Conservation Plan • 6 Sacramento County General Plan • 7 Sacramento County Tree Preservation Ordinance • 8 Solano County General Plan • 9 Sutter County General Plan
- 10 Yuba-Sutter Habitat Conservation Plan/Natural Communities Conservation Plan
- 11 Tehama County General Plan
- 12 Yolo County General Plan
- 13 Yolo County Oak Woodland Conservation and Enhancement Plan
- 14 Yolo Natural Heritage Program
- 15 Yuba County General Plan

### **16 10.4 Determination of Effects**

This section describes the effects analysis relating to vegetation and wetlands for the program study area. It describes the methods used to determine the effects of the proposed program and lists the thresholds used to conclude whether an effect would be significant. How this effect differs among reaches is discussed, if applicable. Measures to mitigate (i.e., avoid, minimize, rectify, reduce,

21 eliminate, or compensate for) significant effects accompany each effect discussion.

### 22 **10.4.1 Assessment Methods**

23 The effects on vegetation and wetlands were identified based on the review of information sources 24 listed in the Introduction and Summary section of this chapter. This effects analysis for vegetation 25 and wetlands is qualitative and programmatic and is intended as a reference for subsequent project-26 level analyses within the program area. Project-level analyses will be conducted to identify, assess, 27 and quantify the effects of future individual levee repair projects within the program area based on 28 site-specific information. Effects on vegetation and wetlands that could result from the 29 implementation of the proposed program are listed below, and measures to mitigate significant 30 effects (where feasible) accompany each effect discussion. The California Rapid Assessment Method 31 and the Surface Water Ambient Monitoring Program may be used for site-specific, project-level 32 environmental analyses.

A site-specific analysis was conducted to determine approximate amounts of riparian woodland and
 scrub/shrub vegetation that would be removed as a result of implementing an additional 80,000 LF
 of bank protection under SRBPP Phase II. A description of the analysis follows with additional detail

36 included in Appendix E, Riparian Vegetation Analysis. The analysis utilized 2008 Digital Globe aerial

- imagery (1-foot resolution) in addition to levee centerline and upstream/downstream site limit data
   for the 106 <u>representative</u> sites.
- Vegetation was mapped if it was considered to be riparian woodland or riparian scrub/shrub.
  Distinctions were made between these two types of vegetation to the extent practicable, and
  mapped as distinct GIS shape files by digitizing polygons representing areas with tree canopy (either
  woodland or scrub/shrub).
- 7 The extent of vegetation mapped included the area within the upstream and downstream site limits
- and from the levee centerline waterward to the low flow channel and landward approximately
   100 feet. Vegetation within these site "boundaries" was designated and calculated as "existing
- 9 100 feet. Vegetation within these site "boundaries" was designated and calculated as "existing 10 vegetation."
- Lines representing the approximate locations of the levee toes at each site were digitized based on aerial photo interpretation. A 15-foot buffer was applied to the outward edge of each levee toe. The area between the outermost edges of the waterside and landside 15-foot buffers is considered to be the vegetation-free zone under Guidelines for Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and Appurtenant Structures, ETL 1110-2-583 (Vegetation ETL), as applicable to each bank protection measure.
- 17 For purposes of assessing effects of the alternatives, vegetation was assumed to be removed
- 18 (referred to as "removed vegetation") if it was within the footprint of features to be constructed 19 (e.g., placement of rock or soil). Vegetation within the entire vegetation-free zone (VFZ) of each site 20 was mapped but only the vegetation within the VFZ and project footprint is included in the removed 21 vegetation calculation, as the proposed program is assumed to apply Vegetation ETL standards only 22 within the construction footprint. The local maintaining agencies (LMAs) are responsible for 23 operation and maintenance (O&M) and applying the Vegetation ETL standards to the levees; however, the Corps would apply the Vegetation ETL standards to the levee repair and within the 24 25 project footprint during construction. When the site is turned over to the LMA after levee repair 26 construction, the LMA would assume responsibility for O&M and applying ETL standards to the 27 repair site footprint.
- 28 It is important to note that during project implementation at any individual site, all native trees 29 within the construction footprint, but outside of the VFZ, that are greater than 4 inches dbh shall be 30 retained to the greatest extent practicable. Tree removal shall be limited to situations where access, 31 required equipment maneuverability, worker and public safety, and levee integrity are not 32 reasonably possible without removal of trees. However, for purposes of this programmatic analysis 33 a conservative approach was taken to assess the amount of riparian vegetation that will be 34 impacted. As a result, actual tree removal during implementation is likely to be less than that 35 quantified in this analysis.
- More specifically, vegetation to be removed was calculated based on the features of each measure's
   design. Bank protection measure assumptions were applied as explained below.
- Bank Protection Measure 1: Setback Levee. Vegetation removal encompasses the areas where
   the new levee transitions into the existing levee at the upstream and downstream ends of the
   site.
- Bank Protection Measure 2: Rock Slope with No On-Site Woody Vegetation.: All vegetation on
   the waterward levee slope and extending to the low-flow river channel is removed.

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- Bank Protection Measure 3: Adjacent Levee. All vegetation landward of the levee centerline and extending 50 feet is removed.
- Bank Protection Measures 4a, 4b, 4c: Riparian Benches with Revegetation. Same assumptions as under Bank Protection Measure 2.
- Bank Protection Measure 5: Bank Fill Stone Protection with On-Site Vegetation. Same as Bank
   Protection Measure 2 except that 25% of existing vegetation is retained.
- 7 Alternative 6, which relies on a variance from the Vegetation ETL, utilizes the following8 assumptions.
- 9 Bank Protection Measures 1, 2 and 3 are the same as described above.
- Bank Protection Measures 4a, 4b, 4c, and 5 remove vegetation only in the area from the low flow channel up to 15 feet from the waterside of the levee toe. Vegetation on the waterside levee
   slope and within 15 feet of the waterside levee toe is not removed.
- Additionally, Bank Protection Measure 5 under Alternative 6 assumes that 25% of vegetation within
   the vegetation removal area is retained. Retained vegetation was calculated by subtracting removed
   vegetation from existing vegetation.
- 16 "Plantable area created" was calculated for each bank protection measure based on the amount of 17 surface area that is suitable for planting riparian vegetation and outside of the VFZ. For example, 18 bank protection measures with riparian benches were assumed to provide a planting surface that is 15 feet wide and the length of the entire site. Setback levees were assumed to provide a planting 19 20 area 100 feet wide and the length of the entire site except for those areas at the upstream and 21 downstream portions of the site where the new levee transitions into the existing levee. Rock slope 22 with vegetation was assumed to create a plantable area equal to an area 15 feet wide for the length 23 of the site. No plantable area created was assumed for rock slope without vegetation. While it is 24 recognized that adjacent levees may provide opportunities for planting riparian vegetation on the 25 waterside because the VFZ would shift landward with the footprint of the new adjacent levee, the 26 plantable area depends on site-specific detail. Consequently, the assumption is that adjacent levees 27 create no plantable areas.

### 28 **10.4.2** Significance Criteria

- For this analysis, an effect pertaining to vegetation and wetlands was considered significant if it
  would result in any of the following environmental effects, which are based on State CEQA
  Guidelines Appendix G (14 CCR 15000 et seq.).
- Have a substantial adverse effect, either directly or through habitat modification, on any species
   identified as a candidate, sensitive, or special-status species in local or regional plans, policies,
   or regulations or by the California Department of Fish and Wildlife (DFW) or USFWS.
- Have a substantial adverse effect on any riparian habitat or other sensitive natural community
   identified in local or regional plans, policies, or regulations, or by the DFW or USFWS.
- Have a substantial adverse effect on jurisdictional wetlands as defined by Clean Water Act
   (CWA) Section 404 (including, but not limited to, marshes and vernal pools) or waters of the
   state through direct removal, filling, hydrological interruption, or other means.

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- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.
- Conflict with the provisions of an adopted HCP, NCCP, or other approved local, regional, or state habitat conservation plan.

5 Activities associated with the proposed program may occur in the planning area of a number of 6 HCPs or NCCPs, though at this time, the Butte Regional Conservation Plan, Yuba Sutter HCP/NCCP, 7 Feather River HCP, and Yolo Natural Heritage Program are still under development. The intent of the 8 proposed program is to protect the species covered by such plans through related compliance 9 processes (e.g., Section 7 of the ESA, the Fish and Wildlife Coordination Act, NEPA and CEOA 10 mitigation measures). Regardless, completed HCPs and NCCPs will be consulted on a site-specific basis during project-level environmental review to ensure consistency. HCPs and NCCPs are not 11 12 addressed further in this chapter.

### 13 **10.4.3 Effect Assumptions**

- The following assumptions regarding program effects on vegetation and wetlands in the programstudy area have been made for this analysis.
- All proposed program construction activities, including equipment staging and access, would take place only within the program area.
- Project-level analyses would be conducted to assess the effects of future individual levee repair
   projects within the program area.
- The proposed program would comply with the Corps' maintenance policy on vegetation and
   levees (i.e., no vegetation is permitted within the levee's operation and maintenance zone, which
   includes the levee itself and an area extending 15 feet from the landside and waterside levee
   toes and 8 feet from toe drains or wells), unless specifically noted (e.g., Alternative 6). These
   areas would be maintained free of woody vegetation in perpetuity.
- Construction, staging, and project access associated with the installation of a setback levee
   would likely extend outside the area accompanied by existing levees, established roadways, and
   previously disturbed areas and could encroach on land cover types (e.g., annual grassland,
   vernal pools) that represent potential habitat for special-status plants.
- Fill or borrow material would be obtained from a quarry or other authorized location.
- There would be effects related to the routine operation or maintenance activities under the
   proposed program as required by the project's existing or future maintenance manual. The
   program proponent would continue with the current levee maintenance actions.
- Discharge of fill into waters of the United States associated with the proposed program would require a CWA Section 401 certification from the Central Valley Regional Water Quality Control Board. In addition, any dredge or fill impacts on nonfederal waters of the state would require a permit under the state's Waste Discharge Requirement Program. Before construction begins, the program proponent would obtain all necessary permits pertaining to affected waters of the United States or waters of the state. The permitting process would also require compensation for construction-, operation-, and maintenance-related effects.
- Grading would require a CWA Section 402 permit and preparation of a storm water pollution
   prevention plan.
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### 1 10.4.4 Effect Mechanisms

Vegetation and wetland resources could be directly and indirectly affected by the proposed
program. The following types of activities could cause varying degrees of effects on these resources.

- Grading and fill placement during construction of levee improvements.
  - Channel dewatering or installation of temporary water-diversion structures.
- Temporary stockpiling and sidecasting of soil, construction materials, or other construction
   wastes.
  - Soil compaction, dust, and water runoff from the construction site into adjacent areas.
- 9 Introduction or spread of invasive plant species into adjacent open space areas.
- Runoff of herbicides, fertilizers, diesel fuel, gasoline, oil, raw concrete, or other toxic materials
   used for levee improvements, operations, and maintenance into sensitive biological resource
   areas (e.g., riparian habitat, wetlands).
- Introduction of substrate that has a limited capacity to support vegetation.

### 14 **10.5 Effects and Mitigation Measures**

#### 15 **10.5.1 Alternative 1—No Action**

16 As described in Chapter 2, under the No Action Alternative regular O&M of the levee system would 17 continue as presently executed by the local maintaining entities in accordance with the existing 18 governing project 0&M manual. Any effects due to routine 0&M would not differ from current 19 (baseline) conditions. The Corps would not implement bank protection along SRFCP levees under 20 Alternative 1. The result would likely be the continued gradual or sporadic loss of remnant 21 floodplain (berm) and the riparian vegetation it supports, and ultimately, the erosion could 22 encroach into the cross-section of the levee foundation, creating critical erosion sites. It is possible 23 that federal, state, or local flood control agencies would eventually implement bank protection at 24 various sites along SRFCP levees through emergency action. In any case, the risk of levee failure and 25 possibly catastrophic flooding would increase substantially as more erosion sites become critical 26 and repair is limited to emergency response. Continued erosion prior to federal or state action 27 would result in short- and long-term losses of valuable habitat. Although some erosion is natural, the

28 channelization of project reaches increases erosive forces.

### **10.5.2 Alternative 2A—Low Maintenance**

### Effect VEG-1: Permanent Loss of Woody Riparian Vegetation Resulting from Compliance with the Vegetation ETL

- All bank protection proposed under Alternative 2A would follow the Vegetation ETL, which forbids
   all woody vegetation on the crown, slopes, and within 15 feet of the waterside and landside levee
   toes. The Vegetation ETL would be applied to the footprints of the erosion sites, with those
   footprints defined by the area needed to access and construct the bank protection. These zones
- 36 would be maintained free of woody vegetation in perpetuity. Thus, the removal of a substantial

- 1 amount of mature trees and vegetation from the banks of the program study area waterways may be 2 required. The woody riparian community in the program study area (i.e., riparian forest) is
- 3 considered a sensitive natural community.
- 4 Permanent loss of the woody vegetation as a result of compliance with the Vegetation ETL could
- 5 result in a substantial adverse effect on riparian habitat. The full extent of this effect would be
- 6 dependent on what portion of the existing levee the Corps deems as the levee prism. In some cases,
- 7 the morphology of an existing levee may exceed the minimum requirements (or may result in
- 8 exceedance with the implementation of program improvements such as construction of an adjacent 9 levee) and existing vegetation may fall outside of the VFZ. Moreover, dependent upon site
- 10 conditions, variances may be issued on a case-by-case basis that would allow vegetation to remain.
- 11 Because the loss of riparian habitat as a result of the proposed program would be substantial, the
- 12 disturbance and removal of riparian habitat would be considered a significant effect.
- 13 Implementation of Mitigation Measures VEG-MM-1, VEG-MM-2, VEG-MM-3, and VEG-MM-4 would
- 14 reduce this effect to a lesser level. However, due to the likely need to mitigate off site and the length
- 15 of time required for newly planted trees to reach mature size, this impact would remain significant.
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#### Mitigation Measure VEG-MM-1: Compensate for the Loss of Woody Riparian Habitat

- 17 For direct effects on woody riparian habitat that cannot be avoided, the program proponent will 18 compensate for the loss of riparian habitat (including temporal loss) to ensure no net loss of 19 habitat functions and values. Compensation ratios will be based on site-specific information and 20 determined through coordination with the appropriate state and federal agencies during the 21 permitting process. Compensation will be provided based on the ratio determined (e.g., 2:1 = 222 acres restored/created or credits purchased for every 1 acre removed). Compensation may be a 23 combination of on-site and off-site restoration or mitigation credits. The program proponent 24 will develop a restoration and monitoring plan that describes how riparian habitat will be 25 recreated and monitored over a minimum period of time as determined by the appropriate state 26 and federal agencies.
- 27 The program proponent will identify appropriate mitigation areas that are outside the 28 vegetation-free zone and will prepare a revegetation plan. The revegetation plan will be 29 developed prior to the removal of existing riparian vegetation and will be implemented on site 30 or in the project vicinity and within the same region of impact (e.g., 1a, 1b, 2, or 3) to the extent 31 feasible; however, mitigation site selection will avoid areas where future flood control 32 maintenance is likely. The revegetation plan will be prepared by a qualified restoration ecologist 33 or landscape architect, and reviewed by the appropriate agencies. The revegetation plan will 34 specify the planting stock appropriate for each riparian land cover type and each mitigation site, 35 ensuring the use of genetic stock from the program area and may include targeted special-status 36 species. The plan will employ the most successful techniques available at the time of planting. 37 Success criteria will be established as part of the plan and will include the following performance standards for herbaceous and woody vegetation (also listed in Table 10-6): 38
- 39 Native herbaceous cover no less than 75 percent within zones predominantly planted with 40 native herbaceous species should be attained in Year 1. In Years 2 and 3, native herbaceous 41 cover should be no less than 50 percent. It is expected that native herbaceous cover will 42 decline as shrub and tree cover matures; however, native herbaceous cover no less than 25 43 percent should be attained at program sites at the end of Year 5.

- Nonnative herbaceous cover should be minimal and account for no more than 10 percent of total herbaceous cover after Year 1, and no more than 20 percent of total herbaceous cover during Years 3 through 5.
  - Program sites should have at least 10 percent cover of native tree and shrub plantings at the end of Year 1; 25 percent at the end of Year 2; 50 percent in Years 3 and 4; and 75 percent at the end of Year 5. Planted woody species should also be healthy and vigorous. At least 80 percent of the planted woody species should have a vigor of "4" in all monitoring years.

#### Table 10-6. Performance Standards for Herbaceous and Woody Vegetation

Monitoring Variable <sup>a</sup>	Year 1	Year 2	Year 3	Year 4	Year 5
Native Herbaceous Vegetation Cover	75%	50%	50%	25%	20%
Nonnative Herbaceous Vegetation Cover	10%	20%	20%	20%	20%
Woody Species Overhead Canopy Cover	10%	25%	50%	50%	75%
Woody Species Vigor	80%	80%	80%	75%	70%

Based on 2012 Vegetation and Habitat Monitoring Methodology Protocol for Sacramento River Bank Protection Project Sites

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If the revegetation plan includes success criteria that are different than the aforementioned criteria, then it would be analyzed in site-specific documentation. The program proponent will provide vegetation establishment and monitoring services as necessary for 3 years (and additional years when success criteria have not been met within the first 3 years), until success criteria are fully achieved. The program proponent will submit annual monitoring reports of survival to the regulatory agencies issuing permits related to habitat effects, including DFW, USFWS, and the National Marine Fisheries Service. Replanting will be necessary if success criteria are not met, and replacement plants will subsequently be monitored and maintained to meet the success criteria. The riparian habitat mitigation will be considered successful when the sapling trees established meet the success criteria, the habitat no longer requires active management, and vegetation is arranged in groups that, when mature, replicate the area, natural structure, and species composition of similar riparian habitats in the region.

### Mitigation Measure VEG-MM-2: Retain Qualified Botanists to Conduct Floristic Surveys for Special-Status Plants during Appropriate Identification Periods

24 The program proponent will retain qualified botanists to survey the potentially affected areas of 25 the program study area to document the presence of special-status plants before program 26 implementation. This will allow the program proponent to implement Mitigation Measure VEG-27 MM-3: Redesign Proposed Projects to Avoid Substantial Effects on and/or Transplant Special-28 Status Plants. The botanists will conduct a floristic survey that follows the DFW botanical survey 29 guidelines (California Department of Fish and Game 20090). All plant species observed will be 30 identified to the level necessary to determine whether they qualify as special-status plants or 31 are plant species with unusual or significant range extensions. The guidelines also require that 32 field surveys be conducted when special-status plants that could occur in the area are evident 33 and identifiable, generally during the blooming period. To account for different special-status 34 plant identification periods, one or more series of field surveys may be required in spring and 35 summer.

Special-status plant populations identified during the field surveys will be mapped and
 documented as part of the public record.

### Mitigation Measure VEG-MM-3: Redesign Proposed Projects to Avoid Substantial Effects on and/or Transplant Special-Status Plants

- If one or more special-status plants are identified in the program study area during
  preconstruction surveys, the program proponent will redesign or modify proposed project
  components, if necessary, to avoid indirect or direct effects on special-status plants to the extent
  feasible.
- 9 If special-status plants can be avoided by redesigning proposed projects consistent with this 10 mitigation measure, it shall be implemented in combination with Mitigation Measures VEG-MM-11 4, VEG-MM-5, and VEG-MM-6 to ensure avoidance of significant effects on special-status plants. 12 Avoidance, minimization, and compensation measures for riparian habitat, wetlands, and 13 protected trees are discussed separately under their respective effects (Effects VEG-3, VEG-4, 14 and VEG-5).
- If direct impacts cannot be avoided, the plants (including their root balls or rhizomes) will be
   transplanted to an appropriate location under the supervision of a qualified biologist or
   landscape architect. The qualified biologist or landscape architect will coordinate with the DFW
   regarding transplantation techniques and locations prior to implementation of transplantation
   efforts.
- 20 If transplantation of plants is required, a monitoring program (with performance requirements) 21 will be implemented to evaluate the success of the transplantation effort. The monitoring 22 program will be developed by a qualified biologist in coordination with DFW and will be 23 implemented for a minimum of 3 years. If transplantation efforts are determined to be 24 unsuccessful during the monitoring period, remedial actions will be identified and implemented 25 in coordination with DFW. Remedial actions may include, but are not limited to, providing 26 replacement plantings with, and continued monitoring of, plants obtained from a local native 27 plant nursery, participating in the improvement of habitat conditions at off-site locations known 28 to support the species, and implementing or providing financial support to conservation efforts 29 in the watershed that would benefit regionally occurring special-status plants.

### 30Mitigation Measure VEG-MM-4: Conduct Mandatory Contractor/Worker Awareness31Training for Construction Personnel

- This mitigation measure relates to sensitive biological resources in general, which include
   vegetation as well as wildlife.
- 34 Before any work occurs in the program study area, including grading, a qualified biologist will 35 conduct mandatory contractor/worker awareness training for construction personnel. The 36 awareness training will be provided to all construction personnel to brief them on the need to 37 avoid effects on sensitive biological resources (e.g., riparian habitat, special-status species, 38 special-status wildlife habitat) and the penalties for not complying with permit requirements. 39 The biologist will inform all construction personnel about the life history of special-status 40 species with potential for occurrence on site, the importance of maintaining habitat, and the 41 terms and conditions of the biological opinion or other authorizing document. Proof of this 42 instruction will be submitted to USFWS, DFW, or other overseeing agency, as appropriate. If new

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construction personnel are added to the program, the contractor will ensure that the personnel
 receive the mandatory training before starting work.

The training will also cover the restrictions and guidelines that must be followed by all construction personnel to reduce or avoid effects on special-status species during project construction. The crew foreman will be responsible for ensuring that crew members adhere to the guidelines and restrictions. Educational training will be conducted for new personnel as they are brought on the job during the construction period. General restrictions and guidelines for vegetation and wildlife that must be followed by construction personnel are listed below.

- Project-related vehicles will observe the posted speed limit on hard-surfaced roads and a 10-mile-per-hour speed limit on unpaved roads during travel in the project site.
  - Project-related vehicles and construction equipment will restrict off-road travel to the designated construction area.
- All food-related trash will be disposed of in closed containers and removed from the <u>project</u> <u>sitestudy area</u> at least once a week during the construction period. Construction personnel will not feed or otherwise attract fish or wildlife to the project site.
- No pets or firearms will be allowed in the project site.
- To prevent possible resource damage from hazardous materials such as motor oil or gasoline, construction personnel will not service vehicles or construction equipment outside designated staging areas.
- For special-status wildlife, any worker who inadvertently injures or kills a special-status wildlife
  species (discussed in Chapter 12, Wildlife) or finds one dead, injured, or entrapped will
  immediately report the incident to the biological monitor. The monitor will immediately notify
  the program proponent, who will provide oral notification to the USFWS Endangered Species
  Office or the local DFW warden or biologist within 3 working days. The program proponent will
  follow up with written notification to USFWS or DFW within 5 working days.

### Effect VEG-2: Potential Loss of Special-Status Plant Populations as a Result of Program Construction

28 Construction activities associated with the proposed program would result in ground disturbance 29 that would remove one or more habitats that could potentially contain special-status plant 30 populations. Program construction activities could result in the direct loss or indirect disturbance of 31 special-status plants that are known to grow or that could occur in the program area (see Table 10-4 32 for a list of these species). Effects on special-status plants could result in a substantial reduction in 33 local population size, lowered reproductive success, or habitat fragmentation. If the special-status 34 plants would not be avoided during construction activities, this alternative treatment could result in 35 a significant impact on special-status plants. Depending on the plant (listed versus unlisted) and the 36 extent of impact on the population, implementation of Mitigation Measures VEG-MM-2 and, if 37 applicable, Mitigation Measures VEG-MM-3, VEG-MM-4, VEG-MM-5, and VEG-MM-6 may avoid or 38 reduce this effect to a less-than-significant level. Substantial losses of a listed plant could result in a 39 significant effect. Because the final significance determination will need to be made on a site-specific 40 basis during project-level implementation of the proposed program after field surveys have been 41 conducted (Mitigation Measure VEG-MM-2) and through consultation with the appropriate resource 42 agency (the USFWS and/or DFW), this effect is considered significant and unavoidable.

### 1Mitigation Measure VEG-MM-5: Install Construction Barrier Fencing to Protect Sensitive2Biological Resources Adjacent to the Construction Zone

The construction specifications will require that the program proponent retain a qualified biologist or landscape architect to identify sensitive biological resources (e.g., special-status species, riparian habitat, wetlands, elderberry shrubs) adjacent to the construction zone that are to be avoided during construction. Sensitive biological resources located adjacent to the directly affected area required for construction, including staging and access, will be fenced off to avoid disturbance in these areas.

9 Before project construction, the contractor will work with the program engineer and a resource 10 specialist to identify the locations for the barrier fencing and will place stakes around the 11 sensitive biological resources to indicate their locations. The protected area will be clearly 12 identified on the construction specifications. The fencing will be installed at a minimum of 25 13 feet from the drip-line of each sensitive biological resource area and will be in place before 14 construction activities are initiated. The fencing will be maintained by the program proponent 15 or its contractor throughout the duration of the construction period. If the fencing is removed, 16 damaged, or otherwise compromised during the construction period, construction activities will 17 cease until the fencing is replaced by the program proponent or its contractor.

#### 18 Mitigation Measure VEG-MM-6: Retain a Biological Monitor

19Before any work occurs in the project construction area, including grading, the program20proponent will retain qualified biologists to monitor construction activities adjacent to sensitive21biological resources (e.g., special-status species, riparian habitat, wetlands, elderberry shrubs).22The biologists will assist the construction crew, as needed, to comply with all project23implementation restrictions and guidelines. In addition, the biologists will be responsible for24ensuring that the program proponent or its contractors maintain the construction barrier25fencing adjacent to sensitive biological resources.

### 26 Effect VEG-3: Potential Disturbance or Removal of Riparian Habitat as a Result of Program 27 Construction

- 28 Under Alternative 2, riparian habitat that occurs outside of the VFZ but within each site's project
- footprint would be removed based on the analysis assumptions previously described. While the
- 30 actual quantity of vegetation loss outside of the VFZ but within the project footprint may be less
- 31 than assumed as a result of avoidance measures applied on a site-by-site basis during
- 32 implementation, Table 10-7 summarizes the amount of riparian vegetation that would be lost as a
- 33 result of Effects VEG-1 and VEG-3.

	Existing Ve	getation	Removed Ve	Removed Vegetation		<b>Retained Vegetation</b>		
Region	Woodland	Scrub	Woodland	Scrub	Woodland	Scrub	Created	
Region 1a	11.48	6.01	6.78	4.79	4.69	1.22	0.00	
Region 1b	10.26	2.11	7.63	2.11	2.63	0.00	0.00	
Region 2	9.04	0.68	4.73	0.68	4.31	0.00	0.00	
Region 3	4.94	0.00	3.95	0.00	0.99	0.00	0.00	
Subtotal	35.72	8.80	23.09	7.58	12.63	1.22		
Total	44.52		30.6	30.67		13.85		

#### 1 Table 10-7. Summary of Site-Specific Vegetation Analysis for Alternative 2A (acres)

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As previously identified in Effect FCGEOM-1, there could be indirect effects to areas upstream and
 downstream of an erosion site including indirect effects on vegetation. However, implementation of
 Mitigation Measure FCGEOM-MM-1 would ensure that indirect effects, including those on
 vegetation, would be avoided or be negligible.

Because the direct loss of riparian habitat as a result of the proposed program could be substantial
and permanent, the disturbance and removal of riparian habitat would be considered a significant
effect on riparian habitat.

10 Implementation of Mitigation Measures VEG-MM-1, VEG-MM-2, VEG-MM-3, and VEG-MM-4 would

11 reduce this effect to a lesser level. However, given the likely need to mitigate off site because

12 Alternative 2 would create no plantable area and because of the length of time required for newly

13 planted trees to reach mature size, this effect would remain significant after mitigation.

### Effect VEG-4: Loss of Waters of the United States, Including Wetlands, as a Result of Program Construction

16 The program study area contains numerous features that are or have the potential to be waters of 17 the United States, including wetlands, or waters of the state. These features consist of those listed in 18 Table 2-1. Construction activities associated with this alternative would result in the loss of waters 19 of the United States, including wetlands, and possibly waters of the state. This effect would be 20 considered significant because the proposed program would have a substantial adverse effect on 21 wetlands and other waters that are protected under state and federal law through direct removal, 22 filling, hydrological interruption, or other means. Implementation of Mitigation Measures VEG-MM-23 4, VEG-MM-5, VEG-MM-6, VEG-MM-7, and VEG-MM-8 would reduce this effect to a level that is less 24 than significant.

### Mitigation Measure VEG-MM-7: Redesign Proposed Projects to Avoid and Minimize Effects on Sensitive Biological Resources

The program proponent will redesign proposed projects to avoid and minimize effects on
sensitive biological resources (e.g., riparian areas outside the VFZs, wetlands, protected trees) to
the extent feasible.

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#### Mitigation Measure VEG-MM-8: Compensate for the Loss of Wetlands and Other Waters

Compensation for the loss of wetlands <u>and other waters of the United States and any non-federal</u> <u>waters of the state</u> will include restoring or enhancing in-kind <del>wetland</del> habitat at a minimum ratio of 1:1; however, the final ratio will be determined through the project-specific permitting process and through coordination with resource agencies to ensure no net loss of <del>wetland</del> habitat functions and values. <u>Site-specific, project-level assessment of existing habitat functions</u> and values of wetlands and other waters will be conducted prior to any construction disturbance of these features. Assessment methods may include California Rapid Assessment Method, bioassessment methods proposed by the State Water Resources Control Board's <u>Surface Water Ambient Monitoring Program, or other ecosystem-based assessments. The</u> methods used will be subject to resource agency approval prior to use of any specific method, and the habitat assessment results will be provided to the appropriate resource agencies in support of determining the final mitigation ratios for wetlands and other waters.

14 Before the removal of existing emergent wetland vegetation (i.e., emergent marsh), the program 15 proponent will prepare a revegetation plan to compensate for the loss of wetland habitat and 16 submit the plan to the appropriate regulatory agencies for review. The revegetation plan will be 17 prepared by a qualified restoration ecologist or landscape architect. The revegetation plan will 18 specify the planting stock appropriate for each wetland type and each mitigation site, ensuring 19 the use of genetic stock from the program area and may include targeted special-status species. 20 The plan will employ the most successful techniques available at the time of planting. Success 21 criteria will be established as part of the plan. The revegetation will be conducted on site or in 22 the vicinity to the extent feasible, but mitigation site selection will avoid areas where future 23 levee improvements or maintenance would be likely. If off-site mitigation is necessary, a 24 location that does not currently support wetlands but is capable of supporting wetland habitats 25 should be selected. An area that currently supports minimal habitat value would be desirable. 26 The program proponent will implement the revegetation plan, maintain plantings for a 27 minimum of 3 years (including weed removal within the construction footprint, irrigation, and 28 herbivory protection), and conduct annual monitoring for 3 years, followed by monitoring every 29 2 years for the next 6 years. Existing native wetland vegetation from the affected sites should be 30 harvested and maintained for replanting after construction.

### Effect VEG-5: Potential Disturbance or Removal of Protected Trees as a Result of Program Construction

The <u>program</u> study area contains numerous trees that may qualify for protection under a local tree
 ordinance. Construction activities associated with this alternative could potentially result in the loss
 of protected trees, which could conflict with a local ordinance. Implementation of Mitigation
 Measures VEG-MM-4, VEG-MM-5, VEG-MM-6, VEG-MM-7, VEG-MM-9, and if necessary, VEG-MM-10
 would reduce this effect to a level that is less than significant.

38 Mitigation Measure VEG-MM-9: Conduct a Tree Survey

39For program study areas located in areas where a local ordinance is in place to protect trees, the40program proponent will retain a certified arborist, biologist, or landscape architect to conduct a41tree survey to identify protected trees in the study area. This will allow the program proponent42to implement Mitigation Measure VEG-MM-10: Compensate for the Loss of Protected Trees. The43arborist/biologist/landscape architect will document the results of the tree survey in a report

that includes the location, species, size (dbh), overall health, and dripline diameter of the trees. If 2 the arborist's survey does not identify any protected trees that would be removed or damaged 3 as a result of the proposed program, no additional mitigation would be necessary. If protected 4 trees are present, the program proponent will implement Mitigation Measure VEG-MM-10.

#### 5 Mitigation Measure VEG-MM-10: Compensate for the Loss of Protected Trees

6 The program proponent will apply for the applicable tree permit(s) for the removal of any 7 protected trees during construction and will comply with all permit conditions. The program 8 proponent will retain a qualified professional (i.e., landscape architect, certified arborist, urban 9 forester) to develop a replacement tree planting plan that is consistent with local ordinance 10 policies regarding protected trees. The replacement tree planting plan will include sufficient replacement plantings and will effectively constitute a minimum of inch-for-inch replacement 11 12 for protected trees that are damaged or removed as a result of the proposed project. 13 Replacement trees planted on site will not be planted until completion of project construction 14 and will be monitored for a period of 10 years following installation; failed plantings will be 15 replaced with new plantings until success criteria has been met. If on-site replanting 16 commensurate with the number of trees being disturbed or removed is not feasible, the 17 program proponent will use off-site mitigation (e.g., donation to the Sacramento Tree 18 Foundation).

#### 19 Effect VEG-6: Potential Introduction or Spread of Invasive Plants as a Result of Program 20 Construction

21 Invasive plants are already present in the program study area. However, the locations and 22 distributions of the invasive plants in the program study area are not wholly known at this time, 23 because site specific surveys have not yet been performed and there is no existing fine-scale 24 invasive plant data available for the entire program study area at the current time. Construction 25 activities associated with this treatment could introduce new invasive plants to the program study 26 area or contribute to the spread of existing invasive plants to uninfested areas outside the program 27 study area. Invasive plants or their seeds may be dispersed by construction equipment if 28 appropriate prevention measures are not implemented. This impact is potentially significant 29 because the introduction or spread of invasive plants as a result of the proposed program could 30 have a substantial adverse effect on sensitive natural communities or special-status species within 31 and outside the program study area by displacing native flora. Implementation of Mitigation 32 Measures VEG-MM-11, VEG-MM-12, and VEG-MM-13 would ensure that the proposed program 33 would not have a substantial adverse effect on sensitive natural communities or special-status 34 species from the introduction or spread of invasive plants, and that this effect would be less than 35 significant.

#### 36 Mitigation Measure VEG-MM-11: Conduct a Survey to Document Invasive Plant 37 Infestations

38 As part of future project-level environmental review for program elements, the program 39 proponent will retain a qualified botanist, weed ecologist, or landscape architect to address 40 noxious weed impacts. This will allow the program proponent to implement Mitigation Measure 41 VEG-MM-12: Avoid and Minimize the Spread or Introduction of Invasive Plant Species, if 42 necessary. The botanist/weed ecologist/landscape architect will determine whether noxious 43 weeds are an issue for the project and whether they could displace native plants and natural

1 habitats, affect the quality of forage on rangelands, or affect cropland productivity. If the 2 botanist/weed ecologist/landscape architect determines that noxious weeds are an issue, the 3 program proponent will review the appropriate county agricultural commissioner's noxious 4 weed list, and lists of invasive plants maintained by the CDFA and Cal-IPC. These lists will be 5 used to identify weeds that are considered locally important for documentation and control 6 purposes, and which will be targeted during field surveys. A list of the target weeds will be 7 provided to the botanist/weed ecologist/landscape architect prior to the field surveys. 8 If invasive plant infestations are located during the field surveys, they will be mapped and 9 documented as part of CEOA and NEPA compliance. The program proponent will implement 10 Mitigation Measure VEG-MM-12. 11 Mitigation Measure VEG-MM-12: Avoid and Minimize the Spread or Introduction of 12 **Invasive Plant Species** 13 The program proponent will implement one or more of the following measures to avoid and 14 minimize the spread or introduction of invasive plant species. In addition, the program 15 proponent will coordinate with the appropriate county agricultural commissioner to ensure that 16 the appropriate best management practices are implemented for the duration of the 17 construction of proposed projects. 18 Clean construction equipment and vehicles in a designated wash area prior to entering and • 19 exiting the project site. 20 Educate construction supervisors and managers about invasive plant identification and the • 21 importance of controlling and preventing the spread of invasive plant infestations. 22 Treat small, isolated invasive plant infestations in project footprints with eradication 23 methods that have been approved by or developed in conjunction with the appropriate 24 county agricultural commissioner to prevent and/or destroy viable plant parts or seeds. 25 Treatment and removal of invasive plant species infestations in areas disturbed by the 26 SRBPP will continue until all revegetation plans have been implemented and the new 27 vegetation is established. 28 Minimize surface disturbance to the greatest extent feasible to complete the work. 29 Use native, noninvasive species, and nonpersistent or sterile nonnative hybrids in erosion-• 30 control plantings to stabilize site conditions and prevent invasive plant species from 31 colonizing. 32 Use weed-free imported erosion-control materials (or rice straw in upland areas). 33 Mitigation Measure VEG-MM-13: Conduct a Follow-Up Weed Survey and Implement 34 **Eradication Methods if New Infestations Are Present** 35 Approximately 1 year after construction, during the appropriate season, the program proponent 36 will retain a qualified botanist, weed ecologist, or landscape architect to conduct a follow-up 37 weed survey to determine if any new invasive plant infestations of the target weeds identified 38 under VEG-MM-11 have become established. If new infestations are present, the program 39 proponent will contact the appropriate county agricultural commissioner to determine 40 appropriate eradication methods. The program proponent will implement those methods until

the county agricultural commissioner determines that the new infestations have been successfully eradicated.

# 10.5.3 Alternative 3A—Maximize Meander Zone (Environmentally Superior Alternative)

### 5 Effect VEG-1: Permanent Loss of Woody Riparian Vegetation Resulting from Compliance with 6 the Vegetation ETL

7 Under Alternative 3A, either a setback levee would be constructed some distance behind the existing 8 levee or an adjacent levee embankment would be constructed along the landside of the existing 9 levee. In either case, the bank repair methods would shift the levee prism and VFZ landward. Within 10 the VFZ of the new levee, the loss of vegetation would likely result in fewer effects as compared with 11 Alternative 2A, though the degree of the effect would depend upon the type and extent of vegetation 12 present within the levee construction area. Riparian habitat losses due to compliance with the 13 Vegetation ETL under Alternative 3A have the potential to be significant, but implementation of 14 Mitigation Measures VEG-MM-1, VEG-MM-2, VEG-MM-3, and VEG-MM-4 would ensure that this 15 effect is reduced to a level that is less than significant.

### Effect VEG-2: Potential Loss of Special-Status Plant Populations as a Result of Program Construction

18This effect is similar to Effect VEG-2 described under Alternative 2A and is considered significant19and unavoidable. However, the magnitude of Effect VEG-2 under Alternative 3A is expected to be20substantially less than under Alternative 2A because substantially less vegetation overall, and as a21result, less special-status plant populations, would be removed under Alternative 3A.

- result, less special-status plant populations, would be removed under Alternative 3A.
   Implementation of Mitigation Measures VEG-MM-2 and, if applicable, Mitigation Measures VEG-MM-
- 3, VEG-MM-4, VEG-MM-5, and VEG-MM-6 may avoid or reduce this effect to a less-than-significant
- 24 level. Substantial losses of a listed plant could result in a significant effect. A further significance
- determination will be made on a site-specific basis during project-level implementation of theproposed program.

### 27 Effect VEG-3: Potential Disturbance or Removal of Riparian Habitat as a Result of Program 28 Construction

29 Construction of setback levees and adjacent levees under Alternative 3A would, for the most part, 30 allow woody vegetation along existing erosion repair sites to be retained. Where setback levees are 31 constructed, the loss of habitats (particularly woody habitats) would likely result in substantially 32 fewer effects on vegetation resources as compared with Alternative 2A because substantially less 33 vegetation would need to be removed, though the degree of the effect would depend upon the type 34 and extent of vegetation present within the setback levee construction area. The breaching of the 35 existing levee and creation of an enlarged floodplain could provide moderate to substantial areas of 36 new riparian vegetation (see beneficial effect, Effect-VEG-7), though the degree of the benefit would 37 depend on the type of restoration that occurs within these new floodplain areas.

- 38 Where adjacent levees are constructed, woody vegetation along existing erosion repair sites would
- 39 be retained along the waterside, though existing vegetation along the landside of the levee would be
- 40 removed. Table 10-8 summarizes the amount of riparian vegetation that would be lost as a result of
- 41 Effects VEG-1 and VEG-3.

	Existing Ve	egetation	Removed Vegetation Retaine		Retained V	egetation	Plantable Area
Region	Woodland	Scrub	Woodland	Scrub	Woodland	Scrub	Created
Region 1a	11.48	6.01	3.67	0.83	7.81	5.17	14.04
Region 1b	10.26	2.11	1.27	0.00	9.00	2.11	0.48
Region 2	9.04	0.68	1.81	0.00	7.23	0.68	9.61
Region 3	4.94	0.00	0.02	0.00	4.92	0.00	2.86
Subtotal	35.72	8.80	6.77	0.83	28.95	7.97	
Total	44.52		7.6	7.60		36.92	

#### 1 Table 10-8. Summary of Site-Specific Vegetation Analysis for Alternative 3A (acres)

Indirect effects are not expected under this alternative. The direct loss of approximately 7.6 acres of
 riparian vegetation is considered a significant effect because riparian vegetation is an important
 component of the riverine ecosystem. Riparian vegetation has been identified by state and federal

component of the river me ecosystem. Riparan vegetation has been identified by state and rederar
 resource agencies as having important value to wildlife, and very little remains in comparison with
 its historic extent. However, this would be compensated by the creation of approximately 27 acres of
 plantable area, allowing for on-site mitigation. With the implementation of Mitigation Measures
 VEG-MM-1, VEG-MM-2, VEG-MM-3, and VEG-MM-4 this effect would be reduced to a level that is less

9 than significant.

### Effect VEG-4: Loss of Waters of the United States, Including Wetlands, as a Result of Program Construction

This effect is similar to Effect VEG-4 as described under Alternative 2A and is considered significant.
 Implementation of mitigation measures VEG-MM-4, VEG-MM-5, VEG-MM-6, VEG-MM-7, and VEG MM-8 would reduce this effect to a level that is less than significant.

### Effect VEG-5: Potential Disturbance or Removal of Protected Trees as a Result of Program Construction

This effect is similar to Effect VEG-5 as described under Alternative 2A and is considered potentially
significant. However, the magnitude of Effect VEG-5 under Alternative 3A is expected to be
substantially less than under Alternative 2A because substantially less vegetation would need to be
removed under Alternative 3A. Implementation of Mitigation Measures VEG-MM-4, VEG-MM-5, VEGMM-6, VEG-MM-7, VEG-MM-9, and, if necessary, VEG-MM-10 would reduce this effect to a level that
is less than significant.

### Effect VEG-6: Potential Introduction or Spread of Invasive Plants as a Result of Program Construction

This effect is the same as described under Alternative 2A and is considered potentially significant.
 Implementation of Mitigation Measures VEG-MM-11, VEG-MM-12, and VEG-MM-13 would reduce
 this effect to a level that is less than significant.

### Effect VEG-7: Potential Opportunity for Habitat Restoration in Enlarged Floodplain following Program Construction

If the existing levee is breached in several places during installation of setback levees, the enlarged
 floodplains created between the water's edge and setback levee could be dedicated to habitat

restoration (e.g., riparian habitat) and revegetated accordingly. However, the land use in the new
 floodplains would be determined on a site-by-site basis. The program proponent could retain a
 qualified restoration ecologist or landscape architect to develop a restoration plan that would
 ensure the long-term duration of the function and value of the restored habitat. Therefore, this effect
 would be beneficial.

# 10.5.4 Alternative 4A—Habitat Replacement (Preferred Alternative)

### 8 Effect VEG-1: Permanent Loss of Woody Riparian Vegetation Resulting from Compliance with 9 the Vegetation ETL

Under Alternative 4A, all of the available bank protection measures would be utilized to varying
extents (see Table 2-2). While Bank Protection Measure 2 would remove all vegetation within the
project footprint, the remaining bank protection measures would retain vegetation to the extent
feasible and consistent with the Vegetation ETL and/or create plantable space that would support
riparian vegetation. As previously discussed in Chapter 2, Project Description, the goal of Alternative
4 is to replace the existing habitat, with an emphasis on vegetation that is beneficial to target fish
species, while at the same time protecting the bank from erosion.

- 17The amount of woody riparian vegetation removed under Alternative 4A due to compliance with the18Vegetation ETL would be less than under Alternative 2A but more than under Alternative 3A. These19losses have the potential to be significant, but the creation of plantable space at many of the sites20and implementation of Mitigation Measures VEG-MM-1, VEG-MM-2, VEG-MM-3, and VEG-MM-421would ensure that this effect would be reduced to a level that is less than significant. Off-site22mitigation may be required if on-site mitigation alone cannot achieve the required compensation
- ratio, and would be provided as described in Mitigation Measure VEG-MM-1.

### Effect VEG-2: Potential Loss of Special-Status Plant Populations as a Result of Program Construction

- 26 This effect is similar to Effect VEG-2 described under Alternatives 2A and 3A and is considered 27 significant. The magnitude of Effect VEG-2 under Alternative 4A is expected to be less than under
- Alternative 2A, but greater than under 3A. Implementation of Mitigation Measure VEG-MM-2 and, if
- 29 applicable, Mitigation Measures VEG-MM-3, VEG-MM-4, VEG-MM-5, and VEG-MM-6 would
- 30 potentially avoid or reduce this effect to a less than significant level. Substantial losses of a listed
- 31 plant could result in a significant and unavoidable effect. The final significance determination would 22 mode to be made on a site apositic basis during project level implementation of the proposed
- need to be made on a site-specific basis during project-level implementation of the proposed
   program.

# Effect VEG-3: Potential Disturbance or Removal of Riparian Habitat as a Result of Program Construction

- 36 Under Alternative 4A, riparian habitat that occurs outside of the VFZ but within each site's project
- 37 footprint would be removed where specific bank protection measures are constructed based on the
- 38 analysis previously described. Where setback levees and adjacent levees (Bank Protection Measures
- 39 1 and 3, respectively) are constructed, the types of effects on vegetation would be similar to that
- 40 described above for Alternative 3A. Bank Protection Measure 2, which would be used sparingly
- 41 under Alternative 4A, would remove all vegetation within an erosion site's construction and access

- 1 footprint. Bank Protection Measures 4a through 4c would involve the removal of vegetation but also
- 2 include the creation of benches that are specifically designed to support the creation of riparian
- 3 vegetation. Bank Protection Measure 5, which does not include a riparian bench, would allow for
- 4 some vegetation planting along its slope in areas consistent with the Vegetation ETL. While the
- actual quantity of vegetation loss outside of the VFZ but within the project footprint may be reduced
   with avoidance measures applied on a site-by-site basis during implementation, Table 10-9
- summarizes the amount of riparian vegetation that would be lost as a result of Effects VEG-1 and
- 8 VEG-3. The removal of riparian habitat under Alternative 4A would have a significant effect.
- 9 As previously identified in Effect FCGEOM-1, there could be indirect effects to areas upstream and
- 10 downstream of an erosion site including indirect effects on vegetation. However, implementation of
- 11 Mitigation Measure FCGEOM-MM-1 would ensure that indirect effects, including those on
- 12 vegetation, would be avoided or be less than significant

	Existing Ve	egetation	<b>Removed Vegetation</b>		<b>Retained Vegetation</b>		Plantable Area
Region	Woodland	Scrub	Woodland	Scrub	Woodland	Scrub	Created
Region 1a	11.48	6.01	4.16	1.28	7.32	4.72	14.56
Region 1b	10.26	2.11	6.80	1.97	3.46	0.15	1.95
Region 2	9.04	0.68	6.39	0.68	2.65	0.00	7.85
Region 3	4.94	0.00	3.94	0.00	1.00	0.00	1.19
Subtotal	35.72	8.80	21.29	3.93	14.43	4.87	
Total	44.52		25.22		19.30		25.55

#### 13 Table 10-9. Summary of Site-Specific Vegetation Analysis for Alternative 4A (acres)

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15 Slightly more than 25 acres would be directly affected and removed, which would be considered

16 significant. However, an almost equal amount of plantable area would be created, and

17 implementation of Mitigation Measures VEG-MM-1, VEG-MM-2, VEG-MM-3, and VEG-MM-4 would

18 ensure that this effect is reduced to a level that is less than significant. It is important to note that the

19 acreage of the removed vegetation represents actual vegetation canopy. The plantable area may or

- 20 may not support that same amount of canopy, depending on site-specific design and planting
- 21 densities, and reaching 100% canopy coverage is oftentimes not feasible. Off-site mitigation may be
- 22 required if on-site mitigation alone cannot achieve the required compensation ratio and would be

23 provided as previously described in Mitigation Measure VEG-MM-1.

# Effect VEG-4: Loss of Waters of the United States, Including Wetlands, as a Result of Program Construction

- This effect is similar to Effect VEG-4 as described under Alternative 2A and is considered significant.
   Implementation of Mitigation Measures VEG-MM-4, VEG-MM-5, VEG-MM-6, VEG-MM-7, and VEG-
- 28 MM-8 would reduce this effect to a level that is less than significant.

# 29 Effect VEG-5: Potential Disturbance or Removal of Protected Trees as a Result of Program 30 Construction

This effect is similar to Effect VEG-5 as described under Alternative 2A and is considered potentially significant. Implementation of Mitigation Measures VEG-MM-4, VEG-MM-5, VEG-MM-6, VEG-MM-7,

VEG-MM-9, and, if necessary, VEG-MM-10 would reduce this effect to a level that is less than
 significant.

### Effect VEG-6: Potential Introduction or Spread of Invasive Plants as a Result of Program Construction

5 This effect is the same as described under Alternative 2A and is considered potentially significant. 6 Implementation of Mitigation Measures VEG-MM-11, VEG-MM-12, and VEG-MM-13 would reduce 7 this effect to a level that is less than significant.

### 8 Effect VEG-7: Potential Opportunity for Habitat Restoration in Enlarged Floodplain following 9 Program Construction

For sites where a setback levee would be constructed, this effect is the same as described underAlternative 3A and is considered beneficial.

# 10.5.5 Alternative 5A—Habitat Replacement Reaching Environmental Neutrality

# Effect VEG-1: Permanent Loss of Woody Riparian Vegetation from Compliance with the Vegetation ETL

16 Under Alternative 5A, all of the available bank protection measures would be utilized to varying 17 extents (see Table 2-2 in Chapter 2). Although Bank Protection Measure 2 would remove all 18 vegetation within the project footprint, the remaining bank protection measures would retain 19 vegetation to the extent feasible and consistent with the Vegetation ETL and/or create plantable 20 space that would support riparian vegetation. As previously discussed in Chapter 2, the goal of 21 Alternative 5 is to reach "environmental neutrality" with regard to existing habitat, with an 22 emphasis on vegetation that is beneficial to target fish species, while at the same time protecting the 23 bank from erosion. In this case, "environmental neutrality" refers specifically to fish habitat as 24 evaluated using the Standard Assessment Methodology (SAM) (as described in Chapter 11, Fisheries 25 and Aquatics) and riparian habitat. The proposed program will be considered to meet 26 "environmental neutrality" if the SAM values for the alternative are zero or greater (positive) and 27 the amount of vegetation removed can be adequately replaced on-site or within other program sites 28 within the same region (e.g., 1a, 1b, 2, or 3).

The amount of woody riparian vegetation removed under Alternative 5A due to compliance with the Vegetation ETL would be similar to, though slightly less than, under Alternative 4A. These losses have the potential to be significant, but the creation of plantable space at many of the sites and implementation of Mitigation Measures VEG-MM-1, VEG-MM-2, VEG-MM-3, and VEG-MM-4 would ensure that this effect is reduced to a level that is less than significant. Off-site mitigation may be required if on-site mitigation alone cannot achieve the required compensation ratio and would be provided as described in Mitigation Measure VEG-MM-1.

# Effect VEG-2: Potential Loss of Special-Status Plant Populations as a Result of Program Construction

This effect is similar to Effect VEG-2 described under Alternative 4A and is considered significant.
 However, the magnitude of Effect VEG-2 under Alternative 5A is expected to be slightly less than

1 under Alternative 4A. Implementation of Mitigation Measure VEG-MM-2 and, if applicable,

- 2 Mitigation Measures VEG-MM-3, VEG-MM-4, VEG-MM-5, and VEG-MM-6 may avoid or reduce this
- 3 effect to a less-than-significant level. Substantial losses of a listed plant could result in a significant
- 4 and unavoidable effect. A further significance determination will be made on a site-specific basis
- 5 during project-level implementation of the proposed program.

### 6 Effect VEG-3: Potential Disturbance or Removal of Riparian Habitat as a Result of Program 7 Construction

- 8 Under Alternative 5A, riparian habitat that occurs outside of the VFZ but within each site's 9 construction footprint would be removed based on the analysis assumptions previously describe
- 9 construction footprint would be removed based on the analysis assumptions previously described.
   10 This effect is similar to Effect VEG-3 as described under Alternative 4A. Where setback levees and
- adjacent levees (Bank Protection Measures 1 and 3, respectively) are constructed, the types of
- 12 effects on vegetation would be similar to that described above for Alternative 3A. Bank Protection
- 13 Measure 2, which would be used very sparingly under Alternative 5A, would remove all vegetation
- 14 within an erosion site's construction and access footprint, and its effects would be similar to those
- 15 described under Alternative 2A. Bank Protection Measures 4a through 4c would involve the removal
- 16 of vegetation but also include the creation of benches that are specifically designed to support the
- 17 creation of riparian vegetation. Bank Protection Measure 5, while it does not include a riparian
- bench, allows for some vegetation planting along its slope in areas consistent with the Vegetation
   ETL. While the actual quantity of vegetation loss outside of the VFZ but within the project footprint
- may be less as a result of avoidance measures applied on a site-by-site basis during implementation,
   Table 10-10 summarizes the amount of riparian vegetation that would be lost as a result of Effects
- 22 VEG-1 and VEG-3.

	Evicting V	gotation	Domoved Vegetation		Retained Vegetation			
	Existing ve	getation	Removed vegetation		Retained v	Retained vegetation		
Region	Woodland	Scrub	Woodland	Scrub	Woodland	Scrub	Created	
Region 1a	11.48	6.01	4.16	0.98	7.32	5.03	16.11	
Region 1b	10.26	2.11	5.03	0.84	5.23	1.27	1.88	
Region 2	9.04	0.68	6.21	0.68	2.82	0.00	16.28	
Region 3	4.94	0.00	0.38	0.00	4.56	0.00	5.49	
Subtotal	35.72	8.80	16.66	2.50	19.95	8.30		
Total	44.52		18.2	18.27		26.25		

#### 23 Table 10-10. Summary of Site-Specific Vegetation Analysis for Alternative 5A (acres)

24

As previously identified in Effect FCGEOM-1, there could be indirect effects to areas upstream and
 downstream of an erosion site including indirect effects on vegetation. However, implementation of
 Mitigation Measure FCGEOM-MM-1 would ensure that indirect effects, including those on
 vegetation, would be avoided or be less than significant.

29 Slightly more than 18 acres of vegetation would be directly affected and removed, which would be 30 considered a significant effect because riparian vegetation is an important component of the riverine

31 ecosystem. Riparian vegetation has been identified by state and federal resource agencies as having

32 important value to wildlife, and very little remains in comparison with its historic extent. However,

33 implementation of the environmentally neutral alternative would create a greater amount of

34 plantable space (nearly 40 acres) than was lost, and implementation of Mitigation Measures VEG-

1 MM-1, VEG-MM-2, VEG-MM-3, and VEG-MM-4 would ensure that this effect is reduced to a level that

- 2 is less than significant. The ability of this amount of created plantable area to fully mitigate for
- 3 effects would depend on site-specific designs and planting densities. It is important to note that the
- 4 acreage of the removed vegetation represents actual vegetation canopy. The plantable area may or
- may not support that same amount of canopy, depending on site-specific design and planting
   densities. Reaching 100% canopy coverage is oftentimes not feasible. Off-site mitigation may be
- required as previously described in VEG-MM-1, and would be provided as described in Mitigation
- 8 Measure VEG-MM-1.

### 9 Effect VEG-4: Loss of Waters of the United States, Including Wetlands, as a Result of Program 10 Construction

This effect is similar to Effect VEG-4 as described under Alternative 2A and is considered significant.
 Implementation of Mitigation Measures VEG-MM-4, VEG-MM-5, VEG-MM-6, VEG-MM-7, and VEG MM-8 would reduce this effect to a level that is less than significant.

### Effect VEG-5: Potential Disturbance or Removal of Protected Trees as a Result of Program Construction

- 16This effect is similar to Effect VEG-5 as described under Alternative 2A and is considered potentially17significant. Implementation of Mitigation Measures VEG-MM-4, VEG-MM-5, VEG-MM-6, VEG-MM-7,18VEG-MM-9, and, if necessary, VEG-MM-10 would reduce this effect to a level that is less than10significant
- 19 significant.

# 20 Effect VEG-6: Potential Introduction or Spread of Invasive Plants as a Result of Program 21 Construction

This effect is the same as described under Alternative 2A and is considered potentially significant.
 Implementation of Mitigation Measures VEG-MM-11, VEG-MM-12, and VEG-MM-13 would reduce
 this effect to a level that is less than significant.

# Effect VEG-7: Potential Opportunity for Habitat Restoration in Enlarged Floodplain following Program Construction

For sites where a setback levee would be constructed, this effect is the same as described underAlternative 3A and is considered beneficial.

# 10.5.6 Alternative 6A—Habitat Replacement with Vegetation ETL Variance

Effect VEG-1 would not apply to Alternative 6A because this alternative would obtain a variance
 from the Vegetation ETL, and removal of vegetation in the VFZ would not be implemented.

### Effect VEG-2: Potential Loss of Special-Status Plant Populations as a Result of Program Construction

- 35 This effect is similar to Effect VEG-2 described under Alternative 4A and is considered significant.
- 36 Implementation of Mitigation Measures VEG-MM-2 and, if applicable, Mitigation Measures VEG-MM-
- 37 3, VEG-MM-4, VEG-MM-5, and VEG-MM-6 may result in avoidance of this effect or reduce this effect
- to a level that is less than significant. Substantial losses of a listed plant could result in a significant

and unavoidable effect. Further significance determinations will be made on a site-specific basis
 during project-level implementation of the proposed program.

### Effect VEG-3: Potential Disturbance or Removal of Riparian Habitat as a Result of Program Construction

5 Under Alternative 6A, all of the available Bank Protection Measures 1, 4a, 4b, 4c, and 5 would be 6 utilized to varying extents (see Table 2-2 in Chapter 2). Although Bank Protection Measure 2 would 7 remove all vegetation within the construction footprint, the remaining bank protection measures 8 would retain vegetation to the extent feasible and/or create plantable space that would support 9 riparian vegetation. As previously discussed in Chapter 2, the goal of Alternative 6 is to retain as 10 much vegetation as feasible, through use of a variance from the Vegetation ETL.

- In the limited situations where setback levees would be constructed under Alternative 6A, the types
   of effects on vegetation would be similar to those described above for Alternative 3A. Bank
   Protection Measures 4a through 4c would involve the removal of vegetation but also include the
- 14 creation of benches that are specifically designed to support the creation of riparian vegetation.
- 15 Bank Protection Measure 5, which does not include a riparian bench, does allow for some vegetation
- 16 planting along its slope in areas consistent with the Vegetation ETL. While the actual quantity of
- 17 vegetation loss outside of the VFZ but within the project footprint may be reduced as a result of
- 18 avoidance measures applied on a site-by-site basis during implementation, Table 10-11 summarizes
- 19 the amount of riparian vegetation that would be lost as a result of Effect VEG-3.

#### 20 Table 10-11. Summary of Site-Specific Vegetation Analysis for Alternative 6A (acres)

	Existing Ve	getation	<b>Removed Vegetation</b>		Retained V	Plantable Area	
Region	Woodland	Scrub	Woodland	Scrub	Woodland	Scrub	Created
Region 1a	11.48	6.01	4.03	3.39	7.45	2.62	8.01
Region 1b	10.26	2.11	5.62	1.61	4.64	0.51	2.59
Region 2	9.04	0.68	5.14	0.68	3.90	0.00	7.85
Region 3	4.94	0.00	3.95	0.00	0.99	0.00	1.19
Subtotal	35.72	8.80	18.75	5.68	16.97	3.12	
Total	44.52		24.4	24.43		20.09	

#### 21

As previously identified in Effect FCGEOM-1, there could be indirect effects to areas upstream and
 downstream of an erosion site including indirect effects on vegetation. However, implementation of
 Mitigation Measure FCGEOM-MM-1 would ensure that indirect effects, including those on
 vegetation, would be avoided or be negligible.

Approximately 24.5 acres of vegetation would be directly affected and removed, which would be considered a significant effect because riparian vegetation is an important component of the riverine ecosystem. Riparian vegetation has been identified by state and federal resource agencies as having important value to wildlife, and very little remains in comparison with its historic extent. However, implementation of Alternative 6A would create approximately 19.5 acres of plantable area. The planting of 19.5 acres is not likely to fully mitigate for effects; therefore, off-site mitigation may be required and would be provided as described in Mitigation Measure VEG-MM-1. In addition, implementation of Mitigation Measures VEC MM-2, VEC MM-4, and VEC MM-4 would further

33 implementation of Mitigation Measures VEG-MM-2, VEG-MM-3, and VEG-MM-4 would further

reduce the magnitude of this impact on riparian vegetation. Accordingly, Wwith mitigation, the
 effect would be less than significant.

### Effect VEG-4: Loss of Waters of the United States, Including Wetlands, as a Result of Program Construction

This effect is similar to Effect VEG-4 as described under Alternative 2A and is considered significant.
 Implementation of Mitigation Measures VEG-MM-4, VEG-MM-5, VEG-MM-6, VEG-MM-7, and VEG MM-8 would reduce this effect to a level that is less than significant.

### 8 Effect VEG-5: Potential Disturbance or Removal of Protected Trees as a Result of Program 9 Construction

This effect is similar to Effect VEG-5 as described under Alternative 2A and is considered potentially
 significant. Implementation of Mitigation Measures VEG-MM-4, VEG-MM-5, VEG-MM-6, VEG-MM-7,
 VEG-MM-9, and, if necessary, VEG-MM-10 would reduce this effect to a level that is less than
 significant.

### Effect VEG-6: Potential Introduction or Spread of Invasive Plants as a Result of Program Construction

- 16 This effect is the same as described under Alternative 2A and is considered potentially significant.
- 17 Implementation of Mitigation Measures VEG-MM-11, VEG-MM-12, and VEG-MM-13 would reduce
- 18 this effect to a level that is less than significant.

### 19 Effect VEG-7: Potential Opportunity for Habitat Restoration in Enlarged Floodplain following 20 Program Construction

For sites where a setback levee would be constructed, this effect is the same as described under Alternative 3A and is considered beneficial.

### 3 **11.1 Introduction and Summary**

1

2

This chapter describes the environmental setting associated with fisheries and aquatics, the
determination of effects, the environmental effects on fisheries and aquatics that would result from
implementation of the proposed program, and the mitigation measures that would reduce these
effects. This chapter does not address take of critical habitat or take of endangered species. Those
topics are addressed in the Programmatic Biological Assessment identified below.

#### 9 The key sources of data and information used in the preparation of this chapter are listed below.

- Programmatic Biological Assessment for the Sacramento River Bank Protection Project.
   Administrative draft report (Stillwater Sciences 2007<del>a</del>).
- Standard Assessment Methodology for the Sacramento River Bank Protection Project (U.S. Army Corps of Engineers 2004).
- Section 7 Programmatic Formal Consultation on the Sacramento River Bank Protection Project
   Phase II, Contra Costa, Sacramento, Solano, Sutter, Yolo, Yuba, Placer, San Joaquin, Butte, Colusa,
   Glenn, and Tehama Counties, California (U.S. Fish and Wildlife Service 2008).
- Programmatic Consultation for Phase II of the Sacramento River Bank Protection Project (National Marine Fisheries Service 2008).
- 19 Published and unpublished scientific reports and peer-reviewed literature.
- Table 11-1 summarizes the fisheries and aquatics effects resulting from the implementation of the
   program alternatives.

#### 22 Table 11-1. Summary of Fisheries and Aquatics Effects and Mitigation

		Implementation Period
Effect	Mitigation Measures	
Effect FISH-1: Short-Term Effects of Rock Placement into Nearshore Aquatic Habitat during Construction	FISH-MM-1: Limit Construction Activity to Periods of the Year That Minimize Effects on Fish	During construction
Effect FISH-2: Increases in Sedimentation, Suspended Sediments, and Turbidity during Construction	WQ-MM-1: Monitor Turbidity during Construction FISH-MM-1: Limit Construction Activity to Periods of the Year That Minimize Effects on Fish	During construction
Effect FISH-3: Spillage and Leakage of Contaminants during Construction	WQ-MM-2: Implement Measures to Maintain Surface Water and Groundwater Quality	Prior to and during construction
	FISH-MM-1: Limit Construction Activity to Periods of the Year That Minimize Effects on Fish	

		Implementation Period
Effect	Mitigation Measures	
Effect FISH-4: Long-Term Effects on Fish from Loss of Habitat	FISH-MM-2: Compensate for Loss of Fish Habitat FISH-MM-3: Compensate for the Loss of Spawning Habitat	During and after construction

### **11.2 Environmental Setting**

The program area encompasses more than 1,000 miles of levees and weirs. This area extends southto-north along the Sacramento River, from the town of Collinsville (RM 0) upstream to Chico at RM
194 (the levees end at RM 184). The program area also includes Cache Creek, the lower reaches of
Elder and Deer Creeks, the lower reaches of the American River (RM 0–23), Feather River (RM 0–
61), Yuba River (RM 0–11), and Bear River (RM 0–17), portions of Threemile, Steamboat, Sutter,
Miner, Georgiana, and Cache Sloughs, as well as a number of flood bypasses and distributaries.

### 8 **11.2.1** Existing Conditions

9 The Sacramento River watershed receives winter/early spring precipitation in the form of rain and 10 snow (at higher elevations). Prior to the construction and operation of any reservoirs, winter rainfall 11 events caused extensive flooding and spring snowmelt resulted in high flows during spring and early 12 summer. Summer and fall flows were historically low. Currently, much of the total runoff is captured 13 and stored in reservoirs for gradual release during the summer and fall months. High river flows occur 14 during the winter and spring, but these are usually lower than during pre-European settlement times; 15 summer and fall low flows are sustained by releases from upstream reservoirs.

#### 16 **11.2.1.1** Sacramento River

In pre-settlement times, the Sacramento River's floodplain was occupied by dense riparian forest,
 likely extending a few miles from the river until wetland and marsh communities of the Natomas
 Basin prevailed to the east and Yolo Basin to the west. The remnant riparian forest above the bank
 protection sites generally supports the same species as were present in the pre-settlement period.

- Because of clearing for agriculture, the riparian forest corridor along the Sacramento River is discontinuous and highly variable in width, species dominance, and ecological integrity. In reaches some distance upstream of the Fremont Weir, as well as through Sacramento and downstream through the Delta, forest gaps dominate over patches, and long lengths of the riverbank are nearly devoid of woody vegetation. Above Colusa a vast, dynamic riparian forest generally dominates the riverine landscape, although it is fragmented from place to place by agriculture.
- The riparian corridor along the Sacramento River is generally continuous, narrow—but sufficiently wide to be considered a *corridor* rather than a *strand*—and dominated by diverse native woody species. Although narrow, it provides functional riparian habitat and undoubtedly serves as reproduction and foraging habitat and as a corridor for dispersal and migration for several species. This native riparian vegetation patch extends from the urban Sacramento limits to upstream riparian corridors along both the Sacramento and Feather Rivers at and above their confluence and
- 33 the Fremont Weir overflow to the Yolo Basin.

The Sacramento River serves as an important migration and juvenile rearing corridor for anadromous

- 2 fish species, which have been the focus of many restoration programs for the Sacramento River system.
- 3 <u>Federally listed Chinook salmon, steelhead, and Anadromous steelhead and Chinook salmon, as well as</u>
- resident green sturgeon, are endangered fish species known to use the program area. Habitat suitability
   for juveniles of these species is characterized by several variables, assessed for flow levels during
- seasons when juvenile salmonids pass through the sites: amount of nearshore shallow-water zones,
  presence of instream vegetation and instream woody material (IWM) in these zones, amount of shading
  bank vegetation over these zones, substrate type, and amount of adjacent floodplain during frequent
- 9 flood flows (i.e., 1.5- to 3-year return period).

10 The Sacramento River supports the following special-statusfish species listed species under the 11 federal Endangered Species Act (ESA): Sacramento River winter-run Chinook salmon (endangered), Central Valley spring-run Chinook salmon (threatened), California Central Valley steelhead 12 13 (threatened), Central Valley fall-/late fall-run Chinook, late fall , and spring run Chinook salmon 14 (species of concern), Sacramento winter run salmon, delta smelt (threatened), and green sturgeon 15 southern distinct population segment (DPS) (threatened). Special-status species Fish species 16 protected under the California Endangered Species Act (CESA) areinclude winter-run Chinook 17 salmon (endangered), spring-run Chinook salmon (threatened), delta smelt (endangered), longfin 18 smelt (threatened), and Sacramento splittail, hardhead, and river lamprey (species of special

19 <u>concern</u>].

### 20 **11.2.1.2 Delta Sloughs**

The major tidal sloughs within the program area are Threemile, Georgiana, Steamboat, Miner,
Lindsay, Cache, Haas, and Sutter Sloughs. Sloughs and channels in this region are generally confined
on both sides by natural levees enhanced by decades of man-made improvements. The individual
channels and sloughs are moderately sinuous, of uniform width, and do not migrate.

25 The effects of seasonal flood events are much lesser in Delta sloughs than in the upper regions 26 because of both tidal action and the diversion of flow through the upstream flood bypasses and 27 outtakes (U.S. Fish and Wildlife Service 2001). Historically, channel and slough morphology actively 28 adjusted throughout the Delta in response to seasonal variations in flow and sediment load. The 29 decrease in flow velocities caused the deposition of a gradient of coarser to finer material from 30 upstream to downstream (fine sand to clayey silt). The intertidal deposits that border the Delta 31 channels and sloughs are typically characterized by shallow, alternating layers of fine sandy silt and 32 clayey silt, with occasional peaty muds. Artificial fill from hydraulic dredge spoils was placed after 33 1900 throughout the Delta along channel margins and upon various island surfaces (Atwater 1982).

The riparian community in the Delta has been altered significantly since pre-European settlement times. Broad floodplains near the Delta that were once occupied by tule marshes and vernal pools have become isolated from the channel because of revetment along the levees. Several patches of tule habitat still occur at the mouths of sloughs and several areas downstream of Rio Vista (RM 12–13). However, riparian vegetation along the major sloughs is restricted to scattered narrow bands typically less than 30 feet wide on banks, berms, and levee faces (U.S. Army Corps of Engineers 2004).

- 40 The Delta provides habitat for all special-status fish species (listed as threatened, endangered or
- 41 species of concern under ESA or CESA) known to occur in the program area. Adult fish species
- 42 migrate through the Delta to upstream areas of the Sacramento River and its tributaries and spawn
- 43 in the river. Delta smelt, longfin smelt, green sturgeon and juvenile salmonids rear in the Delta.

#### 1 **11.2.1.3** Yolo, Sacramento, Tisdale, and Sutter Bypasses

Seasonal high flows from the Sacramento River enter the Yolo Bypass via the Sacramento Bypass
(RM 63). To provide flood capacity, overflows at the Tisdale Weir (RM 119) are conveyed into the
Tisdale Bypass, which routes the water into the Sutter Bypass. Upstream of the reach, floodwaters
may overflow the left bank into Butte Basin via three locations near Chico Landing and through the
Moulton (RM 158) and Colusa (RM 146) Weirs. At extremely high river stages, floodwaters may also
overflow the right bank of the river and drain into the Colusa Basin, which eventually connects to the
Sacramento River and Yolo Bypass via the Colusa Main Drain (U.S. Army Corps of Engineers 2007).

- When inundated during high winter and spring flows, the Yolo and Sacramento Bypasses provide
   migratory and rearing habitat for emigrating juvenile salmonids, green sturgeon, and river lamprey.
- 11 Sacramento splittail also use the Yolo and Sacramento Bypasses for spawning and juvenile rearing.

#### 12 **11.2.1.4** American River

- 13 The American River is the second largest tributary of the Sacramento River. The American River is
- 14 designated as a recreational river in the state and federal wild and scenic river systems. Below
- 15 Nimbus Dam, the lower American River flows through a parkway, surrounded by urban
- 16 development and is a major recreational area for the Sacramento region.
- 17 The lower American River provides a diversity of aquatic habitats, including shallow, fast-water 18 rifles glides runs peaks and off shannel backwater babitats. The lower American River from
- riffles, glides, runs, pools, and off-channel backwater habitats. The lower American River from
   Nimbus Dam (RM 23) to approximately Goethe Park (RM 14) is primarily unrestricted by levees but
- 20 is bordered by some developed areas. Natural bluffs contain this reach of the river and terraces cut
- is bordered by some developed areas. Natural bluffs contain this reach of the river and terraces c
   into the side of the channel. The river reach downstream of Goethe Park, and extending to its
   confluence with the Sacramento River (RM 0), is bordered by levees. The construction of levees
- changed the channel geomorphology and has reduced river meanders and increased depth (U.S.
  Bureau of Reclamation et al. 2003: 9-33).
- The lower American River supports two special-status fish species: fall-run Chinook salmon and
  steelhead. The Central Valley fall-run Chinook salmon is currently designated a species of concern
  under ESA. The Central Valley steelhead is listed as threatened under ESA. The American River also
  supports a mixed run of hatchery and naturally produced fall-run Chinook salmon. On average, tens
  of thousands of hatchery or naturally produced Chinook salmon return each year to spawn.

#### 30 **11.2.1.5** Feather River

- The Feather River drains 3,222 square miles of land base from the Sierra crest westward into the Sacramento River. The Feather River has a relatively large drainage basin along the Sierra foothills that receives input from several key tributaries, including Honcut Creek, the Yuba River, and the Bear River. Approximately 67 miles downstream of the City of Oroville, the Feather River flows into the Sacramento River, near the town of Verona, about 21 river miles upstream of Sacramento (California Department of Water Resources 2007). The program area extends from the confluence of the Sacramento River (Feather River Mile 0) to RM 61.
- 38 The Feather River watershed has been affected by 140 years of intense human use. Past mining,
- 39 grazing and timber harvest practices, wildfire, and railroad and road construction have contributed
- 40 to the degradation of more than 60% of the watershed, resulting in accelerated erosion, degraded

- 1 water quality, decreased vegetation and soil productivity, and degraded terrestrial and aquatic 2 habitats (Feather River Coordinated Resource Management 2009).
- 3 The lower Feather River from the Fish Barrier Dam to Honcut Creek supports a variety of
- 4 anadromous and resident fish species. The Feather River maintains spawning, rearing, and
- 5 migration habitat for four special-status species: fall-run Chinook salmon, spring-run Chinook
- 6 salmon, Gentral Valley steelhead, and Sacramento splittail (California Department of Water
- 7 Resources 2001). Adult green sturgeon have been reported in the Feather River, and recent egg
- 8 sampling surveys documented spawning in the Feather River in 2011 (Poytress et al. 2015;
- 9 Seesholtz et al. 2014). - The occasional capture of larval green sturgeon in outmigrant traps suggests 10
- that green sturgeon spawn in the Feather River (Moyle 2002). However, Adams et. al (2002) report 11 that evidence of green sturgeon spawning in the Feather River is unsubstantiated. The National
- 12 Marine Fisheries Service (NMFS) (2008b) states that the presence of adult, and possibly subadult,
- 13 green sturgeon within the lower Feather River has been confirmed by incidental sightings
- 14 (California Department of Water Resources 2005), photographs, anglers' descriptions of fish catches
- 15 (P. Foley, pers. comm. cited in California Department of Fish and Game 2002), and occasional
- catches of green sturgeon reported by fishing guides (Beamesderfer et al. 2004). 16

#### 11.2.1.6 **Bear River** 17

18 The Bear River is the second largest tributary of the Feather River. The Bear River has been heavily 19 affected by water imports and diversions, barriers, gravel mining, and municipal and residential 20 effluent (Johnson 2002).

21 Historically, the Bear River may have had a large fall-run Chinook salmon population (Johnson 22 2002). Anadromous fish have access to 15 miles of the Bear River, but the habitat is of limited 23 quality because of inadequate stream flow. As a result, there are no self-sustaining populations of 24 salmon in the Bear River. However, during heavy rain events, salmon and steelhead will migrate up 25 and spawn in the lower Bear River (National Marine Fisheries Service 2001).

#### 11.2.1.7 Yuba River 26

- 27 The Yuba River joins the Feather River near the City of Marysville (California Department of Water 28 Resources 2007). The Yuba River Basin drains approximately 1,350 square miles of the western 29 Sierra Nevada slope, including portions of Sierra, Placer, Yuba, and Nevada Counties (CALFED Bay-30 Delta Program 1999). The primary watercourses of the upper watershed are the South, Middle, and 31 North Yuba Rivers, which flow into Englebright Reservoir, which then releases water into the lower 32 Yuba River. Both the upper and lower watersheds (above and below Englebright Dam, respectively) 33 have been extensively developed for water supply, hydropower production, and flood control. 34 Operators of upper watershed projects include The Pacific Gas and Electric Company (PG&E),
- Nevada Irrigation -District and Oroville-Wyandotte Irrigation District. 35
- 36 The lower Yuba River consists of the approximately 24-mile stretch of river extending from
- 37 Englebright Dam, the first impassible fish barrier along the river, downstream to the confluence of the
- 38 Feather River near Marysville (U.S. Bureau of Reclamation et al. 2003). Habitat near the confluence of
- 39 the Feather River is deep, slow water and becomes more complex moving upstream. Riffles, pools, and
- 40 runs are present up to Daguerre Dam, although water temperatures are warmer than upstream of 41
- Daguerre Dam. Most salmonid spawning and rearing occurs upstream of Daguerre Dam.

The Yuba River supports fall- and late fall-run Chinook salmon, a small run of spring-run Chinook salmon,
 and Central Valley-steelhead. Lamprey and hardhead are also present in the lower Yuba River. Five green
 sturgeon were observed below Daguerre Dam in 2006 and 2011 (National Marine Fisheries Service 2012).

#### 4 **11.2.1.8** Assessment of Fish Habitat

Historically, the floodplain provided areas for riparian vegetation recruitment and for rearing of
special-status fish species. However, throughout the program area watersheds, altered flow regimes,
flood control, and bank protection efforts have reduced sediment transport, channel migration and
avulsion, and IWM recruitment, and have isolated the channel from its floodplain. Levees and armored
banks prevent fish from accessing productive floodplain habitats and limit nutrient exchange between
the river and flooded riparian areas (U.S. Army Corps of Engineers 2004). Reach-scale habitat features
related to special-status fish species habitat requirements are discussed below.

12The lowermost portion of the program area (Sacramento River RM 0-80) has limited channel margin13and floodplain habitat, but includes the Sutter and Yolo bypasses. Seasonal inundation of these bypass14areas provides highly productive rearing habitat for juvenile salmonids. However, the bypass flood

control structures are only flooded under certain conditions (i.e., high flows) and may not provide
 floodplain habitat during the typical months of juvenile salmonid rearing. The floodplain access may

17 not provide the same benefits as natural bank areas (U.S. Army Corps of Engineers 2004).

- 18 The Delta slough area between Sacramento River Mile 0 and RM 20 extends into the shallow, open-19 water estuarine habitat that defines the boundary between the fresh water and saltwater portions of 20 the Delta. Although this area is used primarily as a migration corridor for anadromous fish, it 21 provides habitat for delta smelt throughout most of the year. Depending on salinity, still water 22 habitats such as backwaters, sloughs, agricultural drainage canals, and wetlands found on flooded 23 Delta islands are used for spawning by delta smelt, and as rearing habitat by juvenile Chinook 24 salmon and steelhead (U.S. Army Corps of Engineers 2004). Riprap habitat in the Delta appears to be 25 dominated by introduced centrarchids such as bluegill and largemouth bass (Chotkowski 1999), 26 which may prey on eggs and young of special-status fish species.
- 27 The middle portion of the program area (Sacramento River Miles 80–143) also has limited channel 28 margin and floodplain habitats because of levees lining the bank. The reach remains important as an 29 upstream and downstream migration corridor for anadromous fish such as Chinook salmon and 30 steelhead. Although access to floodplains is limited to the locations of flood control weirs (e.g., 31 Tisdale, Moulton, Butte Slough), flooded portions of the Sutter Bypass provide vast expanses of 32 potential rearing habitat for juvenile salmonids. Because the flood control structures were not 33 specifically designed for the same inundation timing typical of juvenile salmonid rearing, the 34 floodplain access may not provide the same benefits as natural bank areas with no levees (U.S. Army 35 Corps of Engineers 2004).
- The uppermost portion of the program area (Sacramento River Miles 143–194) has good channel margin habitat and is important as juvenile rearing habitat for all fish species except delta smelt. Near-shore and secondary channel habitats offer hydraulic complexity, cover from predation, and food resources important to juvenile fish. Specific habitat characteristics that benefit juvenile Chinook salmon and steelhead include shallow water with cover provided by overhanging riparian and aquatic vegetation, and IWM (U.S. Army Corps of Engineers 2004).
- Table 11-2 shows existing habitat conditions of the reaches throughout the program area and
   includes percentage of revetment, dominant bank type, slope, median substrate size, instream

U.S. Army Corps of Engineers

- 1 woody material, emergent vegetation, ground cover on shoreline, and overhead shading (U.S. Army
- 2 Corps of Engineers 2007).

#### 1 Table 11-2. Existing Conditions in Program Reaches

						Median	lian Linear Distance of Bank Attribute Coverage in Feet			ge in Feet
Reach	Portion of Reach	Shoreline Length (feet)	Revetment Length (feet) (% Shoreline)	Dominant Bank Type (% of all Revetment)	Bank Slope (dW:dH)	Bank Substrate Size, D50 (inches)	Instream Woody Material (% Shoreline)	Emergent Vegetation (% Shoreline)	Ground Cover Vegetation (% Shoreline)	Shade from Overhead Cover (% Shoreline)
	Entire region	1,507,343	563,255 (37%)	Large rock, >20 in. (64%)	3.2	11.9	131,580 (9%)	133,857 (9%)	1,232,483 (82%)	205,395 (14%)
Sacramento River E RM 0–20 W	Erosion sites	27,738	8,647 (31%)	Large rock, >20 in. (91%)	2.5	17.6	11,872 (43%)	3,891 (14%)	23,530 (85%)	12,208 (44%)
	Without erosion sites	1,479,604	554,608 (37%)	Large rock, >20 in. (63%)	3.2	11.8	119,708 (8.1%)	129,966 (9%)	1,208,953 (82%)	193,187 (13%)
Commente Disco	Entire region	977,301	532,970 (55%)	Large rock, >20 in. (66%)	2.4	12.2	126,212 (13%)	13,169 (1.3%)	757,199 (76%)	178,251 (18%)
Sacramento River RM 20–80 and American River	Erosion sites	28,092	8,506 (30%)	Large rock, >20 in. (64%)	2.3	5.9	10,664 (38%)	0 (0%)	23,607 (84%)	9,548 (34%)
	Without erosion sites	949,209	524,464 (55%)	Large rock, >20 in. (66%)	2.3	12.4	115,548 (12%)	13,169 (1.4%)	733,592 (83%)	168,703 (18%)
	Entire region	2,604,779	554,325 (21%)	Medium cobble, 6– 10 in. (53%)	1.5	6.9	285,708 (11%)	13,402 (0.5%)	2,166,020 (83%)	413,254 (16%)
Sacramento River RM 80–143	Erosion sites	39,822	22,224 (56%)	Medium cobble, 6– 10 in. (68%)	1.8	7.4	3,981 (10%)	12 (0.03%)	32,579 (82%)	3,553 (9%)
	Without erosion sites	2,564,957	532,100 (21%)	Medium cobble, 6– 10 in. (52%)	1.5	6.8	281,727 (11%)	13,390 (0.5%)	2,133,442 (83%)	409,701 (16%)
	Entire region	678,724	107,084 (16%)	Medium rock, 12– 20 in. (60%)	1.7	2.6	98,600 (15%)	2,126 (0.3%)	314,831 (46%)	145,593 (22%)
Sacramento River RM 143–194	Erosion sites	6,885	3,494 (51%)	Medium cobble, 6– 10 in. (91%)	1.7	4.7	1,275 (19%)	0 (0%)	4,200 (61%)	1,242 (18%)
	Without erosion sites	671,839	103,523 (15%)	Medium rock, 12– 20 in. (62%)	1.7	2.6	97,325 (15%)	2,126 (0.3%)	310,631 (46%)	144,351 (22%)
	Entire reach	568,197	320,520 (56%)	Large rock, >20 in. (78%)	2.1	10.7	105,903 (19%)	52,294 (9%)	458,999 (81%)	166,219 (29%)
Delta Slough Reach	Erosion sites	23,777	7,091 (30%)	Large rock, >20 in. (89%)	1.6	5.7	11,638 (49%)	3,010 (13%)	20,626 (87%)	12,199 (51%)
	Without erosion sites	544,420	313,429 (58%)	Large rock, >20 in. (77%)	2.1	11.0	94,265 (17%)	49,284 (9%)	438,373 (81%)	154,019 (28%)

Fisheries and Aquatics

						Median	Linear Distance of Bank Attribute Coverage in Feet			
						Bank	Instream			Shade from
		Shoreline	Revetment	Dominant Bank	Bank	Substrate	Woody	Emergent	Ground Cover	Overhead
_	Portion of	Length	Length (feet)	Type (% of all	Slope	Size, D50	Material	Vegetation	Vegetation	Cover
Reach	Reach	(feet)	(% Shoreline)	Revetment)	(dW:dH)	(inches)	(% Shoreline)	(% Shoreline)	(% Shoreline)	(% Shoreline)
Bunass Reach	Entire reach	775,633	159,615	Medium rock, 12–	3.0	2.5	26,804	8,708	651,734	19,280
			(21%)	20 in. (49%)			(4%)	(1%)	(84%)	(3%)
	Entire reach	284,152	34,550	Small rock, <12 in.	2.7	0.9	1,184	2,097	244,739	2,267
			(12%)	(90%)			(0.4%)	(1%)	(86%)	(1%)
Yolo Bypass	Erosion sites	2,193	0	Natural bank	2.9	0.3	0	0	1,747	9
Tributaries			(0%)	(100%)			(0%)	(0%)	(80%)	(0.4%)
	Without	281,959	34,550	Small rock, <12 in.	2.7	0.9	1,184	2,097	242,992	2,258
	erosion sites		(12%)	(90%)			(0.4%)	(1%)	(86%)	(1%)
Canal Datash	Entire reach	746,539	13,393	Medium rock, 12–	2.7	0.5	6,682	14,054	645,514	10,894
Canal Reach			(2%)	20 in. (54%)			(1%)	(2%)	(87%)	(2%)
	Entire reach	895,895	73,669	Medium cobble, 6-	2.1	1.4	149,779	6,575	694,710	264,129
			(8%)	10 in. (37%)			(17%)	(1%)	(78%)	(30%)
Feather River and	Erosion sites	8,346	1,256	Large rock, >20 in.	2.3	3.2	2,619	13	6,396	2,269
Tributaries			(15%)	(97%)			(31%)	(0.1%)	(77%)	(27%)
	Without	887,549	72,413	Medium cobble, 6-	2.1	1.4	147,160	6,563	688,314	261,860
	erosion sites		(8%)	10 in. (38%)			(17%)	(1%)	(78%)	(30%)
Upper	Entire reach	260,243	17,881	Medium cobble, 6-	2.7	0.9	892	2,126	148,179	11,833
Sacramento River			(7%)	10 in. (41%)			(0.3%)	(1%)	(57%)	(5%)
Tributaries										

In. = inches.

Source: U.S. Army Corps of Engineers 2007

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#### 1 **11.2.1.9** Status and Occurrence of Fish Species

Special-status fish species (listed as threatened, endangered or species of concern under ESA or
 CESA) that are known to occur in the program area are shown in Table 11-3.

				Likelihood of	
	Status <sup>a</sup>	<u>-</u>		Occurrence in	Critical
	Fed/			the Program	habitat
Species Name	State	Distribution	Habitat	Area	designated
Central Valley	T/CT	<del>Upper-</del> Sacramento	Occurs in well-oxygenated,	High –	Yes
spring-run		River <u>and tributaries,</u>	cool, riverine habitat with	documented	
Chinook salmon		<u>including</u> and Feather	water temperatures from 8.0	occurrences in	
Oncorhynchus		<u>and</u> River Yuba Rivers.	to 12.5°C. Coldwater pools are	the program	
tshawytscha			needed for holding adults	area.	
			<del>(Moyle 2002)</del> .		
Sacramento River	E/CE	Mainstem Sacramento	Occurs in well-oxygenated,	High –	Yes
winter-run		River below Keswick	cool, riverine habitat with	documented	
Chinook salmon		Dam <del> (Moyle 2002)</del>	water temperatures from 8.0	occurrences in	
Oncorhynchus			to 12.5°C. Habitat types are	the program	
tshawytscha			riffles, runs, and pools (Moyle	area.	
		2 12	<del>2002)</del> .	1	
Central Valley	SC/	Sacramento and San	Occurs in well-oxygenated,	High –	No
fall- and late	CSC	Joaquin Rivers and	cool, riverine habitat with	documented	
fall-run		tributar <u>ies<del>y Central</del></u>	water temperatures from 8.0	occurrences in	
Chinook salmon		Valley rivers	to 12.5°C. Habitat types are	the program	
Oncorhynchus			riffles, runs, and pools (Moyle	area.	
tshawytscha	m (		<del>2002)</del> .		
Central Valley	Т/-	Sacramento <u>and San</u>	Occurs in well-oxygenated,	High –	Yes
steelhead		Joaquin Rivers and	cool, riverine habitat with	documented	
Oncorhynchus		tributar <u>ies<del>y Central</del></u>	water temperatures from 7.8	occurrences in	
mykiss		Valley rivers	to 18°C <del>(Moyle 2002)</del> . Habitat	the program	
			types are riffles, runs, and	area.	
Courses atomas a	TT / C C C	Commune Doub	pools.	II: -l-	V
Green sturgeon	1/636	Sacramento <u>, Featner,</u>	spawn in large river systems	nign –	res
(southern DPS)		And ruba Kiver,	with term enstrung from 2.0 to	accumented	
Acipenser		Kiamath and Frinity	with temperatures from 8.0 to	occurrences in	
meairostris		<del>Kivers<u>s</u> (Moyie 2002)</del>	14-0.	the program	
				area.	

#### 4 Table 11-3. Special-Status Fish Species with the Potential to Occur in the Program Area

	Status <sup>a</sup> Fed/	-		Likelihood of Occurrence in the Program	Critical habitat
Species Name	, State	Distribution	Habitat	Area	designated
Delta smelt Hypomesus transpacificus	T/CE	Primarily in the Sacramento-San Joaquin estuary, but has been found <u>in the</u> <u>Sacramento River</u> as far upstream as the <u>Feather River</u> <u>confluence and on the</u> <u>San Joaquin River as far</u> <u>upstream as-mouth of</u> the American River on the Sacramento River and Mossdale on the <u>San Joaquin River</u> ; range extends downstream to San Pablo Bay	Occurs in estuary habitat in the Delta where fresh and brackish water mix in the salinity range of 2–7 parts per thousand <del>(Moyle 2002)</del> .	High – documented occurrences in the program area in the lower Sacramento River.	Yes
Longfin smelt Spirinchus thaleichthys	-/T	Within California, mostly in the Sacramento–San Joaquin Delta, but also in Humboldt Bay, Eel River estuary, and Klamath River estuary.	Salt or brackish estuary waters with freshwater inputs for spawning.	High – documented occurrences in the program area in the lower Sacramento River.	No
Sacramento splittail Pogonichthys macrolepidotus	-/CSC	Occurs throughout the year in low-salinity waters and freshwater areas of the Sacramento–San Joaquin Delta, Yolo <u>and Sutter Bypasses-Bypass</u> , Suisun Marsh, Napa River, and Petaluma River <u>. (Moyle 2002).</u>	Spawning takes place among submerged and flooded vegetation in sloughs and the lower reaches of rivers.	High – documented occurrences in the program area.	No
Hardhead (Mylopharodon conocephalus)	-/CSC	Tributary streams in the San Joaquin drainage; large tributary streams in the Sacramento River and the main stem.	Reside in low to mid-elevation streams and prefer clear, deep pools and runs with slow velocities. Also occur in reservoirs.	High – documented occurrences in the program area.	No
River lamprey Lampetra ayresi	-/CSC	Sacramento, San Joaquin, and Napa Rivers <u>and tributaries;</u> tributaries of San Francisco Bay <del>(Moyle</del> <del>2002; Moyle et al.</del> <del>1995)</del>	Adults live in the ocean and migrate into fresh water to spawn	High – documented occurrences in the program area.	No

		_			Likelihood of						
		Status <sup>a</sup>	_		Occurrence in	Critical					
		Fed/	the Program	habitat							
Species 1	Nan	ne State	Distribution	Habitat	Area	designated					
<u>Sources</u>	(Mo	oyle 2002, Moyl	le et al. 1995, Natio	onal Marine Fisheries Service 2	2015, Merz et al., 2011 <u>)</u>						
a <u> </u>	IS:										
Fede	ral										
Е	<ul> <li>Listed as endangered under the federal Endangered Species Act (ESA).</li> </ul>										
Т	=	Listed as threatened under ESA.									
SC	=	Listed as a species of concern.									
-	=	No federal status.									
State											
CE	=	Listed as enda	ngered under the	California Endangered Species	Act (CESA).						
СТ	=	Listed as threatened under CESA.									
CSC	=	California spec	cies of special cond	cern.							
_	=	No state status	S.								
Cł	inc	ook salmon, ste	eelhead, green stu	irgeon, delta smelt, longfin sr	nelt and splittail have exp	perienced					
de	ecli	nes in abundar	nce as a result of r	natural and human-related fa	ctors. Major factors that						

4 contributed to the decline of salmon and steelhead include blockage of fish from spawning and

5 rearing habitat by dams, deleterious water temperature, altered flows and flow fluctuations

- 6 downstream of dams, entrainment in unscreened and poorly screened diversions, previous hatchery
- 7 practices, and harvest (Busby et al. 1996; Good et al. 2005). Declines in green sturgeon populations
- 8 may be a result of loss of spawning grounds, deleterious water temperature, entrainment, and toxins
- 9 (Adams et al. 2002, 19). The decline in delta smelt abundance has been attributed to reduced Delta
- 10 outflow, entrainment losses to water diversions, changes in food organisms, toxic substances,
- 11 disease, competition and predation by nonnative species, and potential inbreeding with the
- 12 nonnative wakasagi. Splittail have been adversely affected by loss of floodplain attributable to levees
- 13 and channelization (Moyle 2002).
- 14 Other species that occur in Central Valley streams and rivers are white sturgeon, striped bass,
- 15 American shad, largemouth bass, and several species of minnows, sunfish, and catfish (see Table 11-
- 16 4. The lower portions of Central Valley rivers and the Delta are dominated by nonnative species, a
- 17 contributing factor in the decline in abundance of native species (Moyle 2002).

### **18 11.2.2** Life Histories of Special-Status Fish Species

### 19 **11.2.2.1** Chinook Salmon

Chinook salmon are anadromous fish, meaning that adults live in marine environments and return
 to their natal freshwater streams to spawn. Juveniles rear in freshwater for a period of up to 1 year
 until smoltification (i.e., a physiological preparation for survival in marine environs) and subsequent
 ocean residence.

- 24 Four distinct runs of Chinook salmon occur in the Sacramento River system: winter-run, spring-run,
- 25 fall-run, and late fall-run. The runs are named after the season of adult migration, with each run
- 26 having a distinct combination of adult migration, spawning, juvenile residency, and smolt migration
- 27 periods. In general, fall- and late fall-run Chinook salmon spawn soon after entering their natal

- streams, while spring- and winter-run Chinook salmon typically hold in their natal streams for up to
   several months before spawning.
- 3 All four Central Valley Chinook salmon runs are subject to the Magnuson-Stevens Fishery
- 4 Conservation and Management Act (MSA) and their harvest is regulated by the Pacific Coast Salmon
- 5 Fishery Management Plan (salmon FMP). The salmon FMP includes designation of essential fish
- 6 habitat (EFH) and requires consultation with NMFS if a project or action would potentially affect
- 7 EFH. All of the program areas are within EFH for all four Chinook salmon runs (Pacific Fishery
- 8 Management Council 1999).

#### 9 Winter-Run

- 10 Both ESA and CESA list the winter-run Chinook salmon Evolutionarily Significant Unit (ESU) as an
- 11 endangered species. Critical habitat for winter-run Chinook salmon includes the Sacramento River
- 12 from Keswick Dam (RM 302) to Chipps Island (RM 0) in the Delta (National Marine Fisheries Service
- 13 1997).

#### Table 11-4. Central Valley Fish Species Potentially Affected by the Proposed Program

Common Name—Origin	Scientific Name
Lamprey (two species)—native	Lampetra spp.
Chinook salmon (winter, spring, fall-, and late fall-runs)—native	Oncorhynchus tshawytscha
Chum salmon (rare)—native	Oncorhynchus keta
Steelhead/rainbow trout—native	Oncorhynchus mykiss
White sturgeon—native	Acipenser transmontanus
Green sturgeon—native	Acipenser medirostris
Delta smelt—native	Hypomesus transpacificus
Wakasagi—nonnative	Hypomesus nipponensis
Sacramento sucker—native	Catostomus occidentalis
Sacramento pikeminnow—native	Ptychocheilus grandis
Sacramento splittail—native	Pogonichthys macrolepidotus
Sacramento blackfish—native	Orthodon microlepidotus
Hardhead—native	Mylopharodon conocephalus
Speckled dace—native	Rhinichthys osculus
California roach—native	Lavinia symmetricus
Hitch—native	Lavina exilicauda
Golden shiner—nonnative	Notemigonus crysoleucas
Fathead minnow—nonnative	Pimephales promelas
Goldfish—nonnative	Carassius auratus
Carp—nonnative	Cyprinus carpio
Threadfin shad—nonnative	Dorosoma petenense
American shad—nonnative	Alosa sapidissima
Black bullhead—nonnative	Ameiurus melas
Brown bullhead—nonnative	Ameiurus nebulosus
White catfish—nonnative	Ameiuruscatus
Channel catfish—nonnative	Ictalurus punctatus
Mosquito fish—nonnative	Gambusia affinis
Inland silverside—nonnative	Menidia audena
Threespine stickleback—native	Gasterosteus aculaetus
Striped bass—nonnative	Morone saxatilis
Bluegill—nonnative	Lepomis macrochirus
Green sunfish—nonnative	Lepomis cyanellus
Redear sunfish—nonnative	Lepomis microlophus
Warmouth—nonnative	Lepomis gulosus
White crappie—nonnative	Pomoxis annularis
Black crappie—nonnative	Pomoxis nigromaculatus
Largemouth bass—nonnative	Micropterus salmoides
Redeye bass—nonnative	Micropterus coosae
Spotted bass—nonnative	Micropterus punctulatus
Small mouth bass—nonnative	Micropterus dolomieu
Bigscale logperch—nonnative	Percina macrolepida
Prickly sculpin—native	Cottus asper
Tule perch—native	Hysterocarpus traski

Historically, winter-run Chinook salmon spawned in cold tributary streams upstream of present-day

- 2 Shasta Reservoir, including the Little Sacramento, Pit, McCloud, and Fall Rivers and Battle Creek.
- 3 Presently, winter-run Chinook salmon persist in the Sacramento River below Keswick Dam and are
- sustained by coldwater releases from Shasta Reservoir. The upper Sacramento River is the only
   spawning area used by winter-run, although occasional strays have been reported in Battle Creek
   and Clear Creek.

Adult winter-run Chinook salmon immigration (upstream migration) through the Delta and into the
Sacramento River occurs from December through July, with peak immigration from January through
April. Winter-run Chinook salmon spawn primarily in the mainstem Sacramento River between
Keswick Dam (RM 302) and the Red Bluff Diversion Dam (RBDD) (RM 242). Winter-run Chinook
salmon spawn between late April and mid-August, with peak spawning generally occurring in June
(Snider et al. 2000) (Table 11-5).

13 Following emergence, Jjuvenile winter-run Chinook salmon exhibit an extended rearing and 14 emigration period in the Sacramento River and Delta prior to entering the ocean. Daily catch data 15 indicate that juveniles emigrate past RBDD (RM 242) between July and March, past Knights Landing (RM 89) betweenemigration (downstream migration) past the RBDD (RM 242) begins in late July, 16 peaks during September, and may extend through mid-March (National Marine Fisheries Service 17 1997). The peak period of juvenile emigration through the lower Sacramento River into the Delta 18 19 generally occurs between January and April (National Marine Fisheries Service 1997) (Table 11-5). 20 October and April, and past Chipps Island (RM 18) between December through May (del Rosario et 21 al. 2013). These data show substantial variation in the peak time of emigration that is strongly 22 associated with the first high flows of the migration season, typically in November or December. 23 Based on scale analysis, winter-run smolts enter the ocean at an average fork length of 118 mm, 24 indicating a freshwater residence time of approximately 5 to 9 months, most of which is presumed 25 to occur upstream between RBDD and the Delta (National Marine Fisheries Service 2009) Little information is available on the distribution of juveniles in the lower reaches of the Sacramento River 26 27 and Delta during this period, although winter-run are known to use the Yolo Bypass (depending on 28 the timing, duration, and magnitude of spills that inundate the floodplain) (del Rosario et al. 2013) 29 and small, intermittent tributaries and off-channel areas during the winter months (Maslin et al. 30 1997). Otolith microchemistry studies indicate that approximately 47–65% of adult winter-run that 31 returned to spawn in 2007-2009 reared as juveniles in non-natal habitats (i.e., outside the 32 Sacramento River upstream of Knights Landing), of which approximately 11–36% were within the 33 Delta. The time period spent within the Delta by these fish ranged from approximately 2 to 8 weeks 34 (Phillis, pers. comm.), which contrasts with estimates of residence time of approximately 40–120 35 days for winter-run-sized juveniles captured in rotary screw traps at Knights Landing and Chipps 36 Island (del Rosario et al. 2013). Differences in peak emigration periods between these two locations 37 suggest that juvenile winter run Chinook salmon may exhibit a sustained residence in the upper or 38 middle reaches of the Sacramento River before entering the lower Sacramento River and the Delta. 39 Although the location and extent of rearing in these lower or middle reaches is unknown, it is 40 believed that the duration of fry presence in an area is directly related to the magnitude of river flows during the rearing period (Stevens 1989). 41

Historical winter-run population estimates were as high as 230,000 adults in 1969, but declined to
under 200 fish in the 1990s (Good et al. 2005). A rapid decline occurred from 1969 to 1979 after
completion of the RBDD. Over the next 20 years, the population eventually reached a low point of
only 186 adults in 1994. At that point, winter-run was at a high risk of extinction (Lindley et al.

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

1 2007). If not for a very successful captive broodstock program, construction of a temperature 2 control device (TCD) on Shasta Dam, having the RBDD gates up for much of the year, and restrictions 3 in the ocean harvest, the population would have likely failed to exist in the wild (National Marine 4 Fisheries Service 2009). In recent years, the carcass survey population estimates of winter-run 5 included a high of 17,205 (Table 11-6) in 2006, followed by a precipitous decline in 2007 that 6 continued in 2008, when less than 3,000 adult fish returned to the upper Sacramento River. The 7 preliminary estimate of the winter-run in 2008 is 2,850 fish (California Department of Fish and 8 Game 2009). 9

#### 1 Table 11-5. Assumed Life Stage Timing and Distribution of Selected Species Potentially Affected by the 2 Proposed Program

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	0ct	Nov	Dec	
Late Fall-Run Chinook Salmon													
Adult	SF Bay to Upper Sac												
Migration	River and Tributaries												
Spawning	Upper Sacramento River and Tributaries												
Egg	Upper Sacramento												
Incubation	River and Tributaries												
Juvenile	e Upper Sacramento												
Rearing	River and Tributaries												
(Natal Stream)													
Smolt	Sacramento River												
Outmigration	and tributaries, Delta												
Juvenile	Upper Sacramento												
Movement	River and Tributaries												
and Rearing													
Fall-Run Chinoc	ok Salmon	1					1						
Adult	SF Bay to Upper												
Migration and	Sacramento River												
понания	United for the second s												
Spawning <sup>a</sup>	River and Tributaries												
Egg	Upper Sacramento												
Incubation <sup>a</sup>	River and Tributaries												
Juvenile	Upper Sacramento												
Rearing	River and Tributaries												
(Natal Stream)													
Smolt	Sacramento River												
Outmigration	and tributaries, Delta												
Juvenile	Upper Sacramento												
Movement	to SE Boy												
Chring Dun Chinack Selmon													
Adult CE Dauta Hunar													
Migration and	Sacramento River												
Holding	and Tributaries												
norung	Unner Sacramento												
Spawning	River and Tributaries												
Egg	Upper Sacramento												
Incubation	<b>River and Tributaries</b>												
Juvenile	Upper Sacramento												
Rearing	River and Tributaries												
(Natal Stream)													
Smolt	Sacramento River												
Outmigration	and tributaries, Delta												
	Distribution	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
---------------------------------------	--------------------------------------------------------	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Juvenile Movement	Upper Sacramento River and Tributaries to SF Bay								_	_			
Winter-Run Chi	nook Salmon												
Adult Migration and Holding	SF Bay to Upper Sacramento River												
Spawning	Upper Sacramento River												
Egg Incubation	Upper Sacramento River												
Juvenile Rearing (Natal Stream)	Upper Sacramento River to SF Bay												
Smolt Outmigration	Sacramento River and tributaries, Delta												
Juvenile Movement and Rearing	Upper Sacramento River to SF Bay												
Steelhead													
Adult Migration	SF Bay to Upper Sacramento River and Tributaries												
Spawning	Upper Sacramento River and Tributaries												
Egg Incubation	Upper Sacramento River and Tributaries												
Juvenile Rearing	Upper Sacramento River and Tributaries to SF Bay												
Smolt Outmigration	Sacramento River and tributaries, Delta												
Juvenile Movement	Upper Sacramento River and Tributaries to SF Bay												
Longfin Smelt				-		-			-	-			
Adult Migration	Suisun Bay												
Spawning	Downstream of Rio Vista on the Sacramento Riverª												
Juvenile Rearing	Suisun Marsh/Delta												
Juvenile Movement	Delta												

	Distribution	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sacramento Spl	ittail												
Adult Migration	Suisun Marsh, Upper Delta, Yolo and Sutter Bypasses, Sacramento River and SJR												
Spawning	Suisun Marsh, Upper Delta, Yolo and Sutter Bypasses, Lower Sacramento and SJ Rivers												
Larval and Early Juvenile Rearing and Movement	Suisun Marsh, Upper Delta, Yolo Bypass, Sutter Bypass, Lower Sacramento and San Joaquin Rivers												
Adult and Juvenile Rearing	Delta, Suisun Bay												
Delta Smelt													
Adult Migration	Delta												
Spawning	Delta, Suisun Marsh												
Larval and Early Juvenile Rearing	Delta, Suisun Marsh												
Estuarine Rearing: Juveniles and Adults	Lower Delta, Suisun Bay												
Hardhead													
Adult Migration and Spawning	Sacramento River, San Joaquin River, Central Valley Reservoirs												
Adult, Larval and Juvenile Rearing	Sacramento and San Joaquin Rivers and Tributaries												
River Lamprey													
Adult Migration	Sacramento River, San Joaquin River, and tributaries												
Spawning	Sacramento River San Joaquin River, and tributaries												

	Distribution	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ammocoete Rearing	Sacramento River San Joaquin River, and tributaries												
Notes:													

SF Bay = San Francisco Bay.

SJR = San Joaquin River.

<sup>a</sup> Spawning and incubation occurs from October to February in the Feather, American, and Mokelumne Rivers Sources: Brown 1991; Wang and Brown 1993; U.S. Fish and Wildlife Service 1996; McEwan 2001; Moyle 2002; Hallock 1989; U.S. Army Corps of Engineers 2006.

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#### Table 11-6. Winter-Run Chinook Salmon Population Estimates and Corresponding Cohort Replacement Rates since 1986

Year	Population Estimate <sup>a</sup>	5-Year Moving Average of Population Estimate
1986	2,596	-
1987	2,186	-
1988	2,885	-
1989	696	-
1990	433	1,759
1991	211	1,282
1992	1,240	1,092
1993	387	593
1994	186	491
1995	1,297	664
1996	1,337	889
1997	880	817
1998	3,002	1,340
1999	3,288	1,961
2000	1,352	1,972
2001	8,224	3,349
2002	7,441	4,661
2003	8,218	5,705
2004	7,701	6,587
2005	15,730	9,463
2006	17,205	11,259
2007	2,488	10,268
2008	2,850	9,195
median	2,488	1,961
<sup>a</sup> Population	estimates were based on Red B	luff Diversion Dam counts until 2001. Starting in 2001.

Population estimates were based on Red Bluff Diversion Dam counts until 2001. Starting in 2001, population estimates were based on carcass surveys.
 Source: California Department of Fish and Game 2009.

#### 5 Spring-Run

6 The Central Valley spring-run Chinook salmon ESU, which includes populations spawning in the

7 Sacramento River and its tributaries, is listed as threatened under ESA and CESA. Critical habitat for

8 spring-run Chinook salmon includes the Sacramento River, American River, Feather River, Bear

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- River, Yuba River, and Cache and Miner Sloughs (70 Federal Register [FR] 52488, September 2, 2005).
- Spring-run Chinook salmon historically occurred from the upper tributaries of the Sacramento River
  to the upper tributaries of the San Joaquin River. However, they have been extirpated from the
  San Joaquin River system. The only streams in the Central Valley with remaining wild spring-run
  Chinook salmon populations are the Sacramento River and its tributaries, including the Yuba River,
  Mill Creek, Deer Creek, and Butte Creek.
- 8 Spring-run Chinook salmon enter the Sacramento River from late March through September 9 (Reynolds et al. 1993), but peak abundance of immigrating adults in the Delta and lower Sacramento 10 River occurs from April through June (Table 11-5). Adult spring-run Chinook salmon remain in 11 deep-water habitats downstream of spawning areas during summer until their eggs fully develop 12 and become ready for spawning. This is the primary characteristic that distinguishes spring-run 13 Chinook salmon from the other runs. Spring-run Chinook salmon spawn primarily upstream of the 14 RBDD and in the aforementioned tributaries. Spawning occurs from mid-August through early 15 October (Reynolds et al. 1993) (Table 11-5). A small portion of an annual year-class may emigrate as 16 post-emergent fry (less than 1.8 inches long) and reside in the Delta undergoing smoltification. 17 However, most are believed to rear in the upper river and tributaries during winter and spring, 18 emigrating as juveniles (more than 1.8 inches long). The timing of juvenile emigration from the 19 spawning and rearing reaches can vary depending on tributary of origin and can occur from 20 November through June (Table 11-5).
- 21 On the Feather River, significant numbers of spring-run, as identified by run timing, return to the 22 Feather River Hatchery (FRFH). From 1986 to 2007, the average number of spring-run returning to 23 the FRFH was 3,992, compared with an average of 12,888 spring-run returning to the entire 24 Sacramento River Basin (Table 11-7). Coded wire tag (CWT) information from these hatchery 25 returns indicates substantial hybridization has occurred between spring-run and fall-run 26 populations within the Feather River system because of hatchery practices. Because Chinook salmon 27 have not always been temporally separated in the hatchery, spring-run and fall-run have been 28 spawned together, thus compromising the genetic integrity of the spring-run and early fall-run 29 stocks. The number of naturally spawning spring-run in the Feather River has been estimated only 30 periodically since the 1960s, with estimates ranging from 2 fish in 1978 to 2,908 in 1964 (National 31 Marine Fisheries Service 2009).

32 The spring-run ESU has displayed broad fluctuations in adult abundance, ranging from 1.403 in 33 1993 to 25,890 in 1982 (Table 11-7). Sacramento River tributary populations in Mill, Deer, and 34 Butte Creeks are probably the best trend indicators for the spring-run ESU as a whole because these 35 streams contain the primary independent populations within the ESU. Generally, these streams have 36 shown a positive escapement trend since 1991. Escapement numbers are dominated by Butte Creek 37 returns, which have averaged more than 7,000 fish since 1995. During this same period, adult 38 returns on Deer Creek have averaged 1,463 fish. Although recent trends are positive, annual 39 abundance estimates display a high level of fluctuation, and the overall number of spring-run 40 remains well below estimates of historic abundance. In 2008, adult escapement of spring-run 41 declined in several of the region's watersheds. Deer Creek had an estimated 140 fish return to the 42 watershed. These fluctuations may be attributable to poor ocean conditions that existed when the 43 returning 2008 adults entered the ocean as smolts (spring of 2006) and led to poor ocean survival in 44 the critical ocean entry phase of their life history. Additional factors that have limited adult

spawning populations are in-river water quality conditions (National Marine Fisheries Service
 2009).

#### 3 Fall- and Late Fall–Run

- 4 Central Valley fall-run and late fall-run Chinook salmon are commercially and recreationally
- 5 important. These ESUs are federal species of concern. Because the fall-run Chinook salmon is
- 6 currently the largest run of Chinook salmon in the Sacramento River system, it continues to support
- 7 commercial and recreational fisheries of significant economic importance.

8	Table 11-7. Central Valley Spring-Run Chinook Salmon Population Estimates with Corresponding
9	Cohort Replacement Rates since 1986

	Sacramento River Basin		
Year	Escapement Run Size <sup>a</sup>	FRFH Population	Tributary Populations
1986	25,696	1,433	24,263
1987	13,888	1,213	12,675
1988	18,933	6,833	12,100
1989	12,163	5,078	7,085
1990	7,683	1,893	5,790
1991	5,927	4,303	1,624
1992	3,044	1,497	1,547
1993	6,075	4,672	1,403
1994	6,187	3,641	2,546
1995	15,238	5,414	9,824
1996	9,082	6,381	2,701
1997	5,086	3,653	1,433
1998	31,471	6,746	24,725
1999	9,835	3,731	6,104
2000	9,234	3,657	5,577
2001	17,698	4,135	13,563
2002	17,409	4,189	13,220
2003	17,570	8,662	8,908
2004	13,986	4,212	9,774
2005	16,117	1,771	14,346
2006	10,652	1,952	8,700
2007	10,571	2,752	7,819
Median	10,652	3,731	7,819

 <sup>a</sup> National Marine Fisheries Service included both the escapement numbers from the Feather River Fish Hatchery (FRFH) and the Sacramento River and its tributaries in this table. Sacramento River Basin run size is the sum of the escapement numbers from the FRFH and the tributaries.
 Source: California Department of Fish and Game 2009.

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- 11 All Central Valley streams that had adequate flows in the fall, even if they were intermittent during
- 12 the summer, probably supported fall-run Chinook salmon. Unlike spring- and winter-run Chinook
- 13 salmon that migrated to higher elevation streams, fall-run Chinook salmon likely were limited to

streams of the valley floor and lower foothill reaches because of their egg-laden and generally
 deteriorated physical condition.

3 In general, adult fall-run Chinook salmon migrate into the Sacramento River and its tributaries from 4 July through December, with immigration peaking from mid-October through November (Table 11-5 5). Fall-run Chinook salmon spawn in numerous tributaries of the Sacramento River, including the 6 lower American River, lower Yuba River, Feather River, and tributaries of the upper Sacramento 7 River. Most mainstem Sacramento River spawning occurs between Keswick Dam and the RBDD. A 8 greater extent of fall-run spawning, relative to the other three runs, occurs below the RBDD, with 9 limited spawning potentially occurring as far downstream as Tehama (RM 220) (Yoshiyama et al. 10 1996). Spawning generally occurs from October through December, with fry emergence typically 11 beginning in late December and January (Table 11-5). Fall-run Chinook salmon emigrate as post-12 emergent fry, juveniles, and smolts after rearing in their natal streams for up to 6 months. 13 Consequently, fall-run emigrants may be present in the lower Sacramento River from January 14 through June (Reynolds et al. 1993) (Table 11-5) and remain in the Delta for variable lengths of time 15 before ocean entry.

16 Adult immigration of late fall-run Chinook salmon into the Sacramento River generally begins in 17 October, peaks in December, and ends in April (Moyle et al. 1995) (Table 11-5). Primary spawning 18 areas for late fall-run Chinook salmon are located in tributaries of the upper Sacramento River (e.g., 19 Battle Creek, Cottonwood Creek, Clear Creek, Mill Creek), although late fall-run Chinook salmon are 20 believed to return to the Feather and Yuba Rivers as well (Moyle et al. 1995). Spawning in the 21 mainstem Sacramento River occurs primarily from Keswick Dam to the RBDD, generally from 22 January through April (Moyle et al. 1995). Juveniles emigrate through the lower Sacramento River 23 primarily from October through April (Table 11-5).

24 After 2–5 vears in the ocean, adult Chinook salmon leave the ocean and migrate upstream to the 25 Sacramento River and its tributaries to spawn. Chinook salmon take advantage of the diversity and 26 variability of river systems through variable life history adaptations (Moyle 2002). The names of the 27 Chinook salmon runs (i.e., fall, late fall, spring, and winter) reflect the variability in life history timing 28 of the adult fish. Spawning occurs in cool reaches of Central Valley rivers that, with few exceptions, 29 are just downstream of the terminal dams. Adult salmonids either spawn soon after entering fresh 30 water, as in the case of fall-run Chinook salmon, or spend time in fresh water before reaching 31 maturity, like spring and winter-run Chinook salmon. Chinook salmon deposit their eggs in gravel 32 nests, called redds, located on riffles, runs, and pool tails. Eggs generally hatch in 6–9 weeks, and 33 volk-sac larvae remain in the gravel for several more weeks. After emergence, juvenile Chinook 34 salmon may rear along the channel edge or begin their movement downstream. Juvenile Chinook 35 salmon may remain in fresh water for 3 to 14 months or even longer.

- Fall-run Chinook salmon adults and juveniles occur in all of the program reaches, although smaller
   numbers occur in Elder Creek and Bear River which depend on flows. Juveniles of all runs may occur
   in the Delta sloughs as they migrate downstream to the Pacific Ocean.
- 39 The total number of natural fall-run Chinook salmon counted from the Feather, Yuba and American
- 40 rivers was 13,075 in 2008. The total including the upper Sacramento River was 51,504 fish in 2008.
- The high in 2002 was a total of 720,782 fish including the Feather, Yuba, American and Sacramento
- 42 Rivers. The year 2008 had the lowest recorded number of fall-run Chinook returns on record
- 43 (Pacific Fishery Management Council 2009).

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## 11.2.2.2 Steelhead

The Central Valley steelhead <del>distinct population segment (</del>DPS<del>)</del> is listed under the ESA as threatened (63 FR 13347, March 19, 1998). Critical habitat for Central Valley steelhead includes the Sacramento River, Elder Creek, Deer Creek, American River, Feather River, Bear River, Yuba River, and Cache and Miner Sloughs (70 FR 52448, September 2, 2005).

6 Steelhead have one of the most complex life histories of any salmonid species. Steelhead are
7 anadromous, but some individuals may never leave fresh water—hatching, rearing, and spawning
8 within a given river reach. Freshwater residents typically are referred to as rainbow trout, while
9 anadromous individuals are called steelhead (National Marine Fisheries Service 1996a).

- 10 Adult Central Valley steelhead migrate upstream from the ocean during July through March in the 11 Sacramento River; most adults enter the freshwater system in September and October (Table 11-5) 12 (Busby et al. 1996; Hallock 1989). Spawning in the program area peaks in January and February and 13 can occur from December through May. Individual steelhead may spawn more than once, returning 14 to the ocean between each spawning migration. Steelhead spawn in relatively clean, cool (less than 15 57°F) water and build their redds and lay their eggs in clean gravel at the heads of riffles. The eggs 16 hatch between 19 days and 80 days after spawning, depending on water temperature. Larvae 17 remain in the gravel for several weeks before emerging as fry (National Marine Fisheries Service 18 1996a).
- 19Juvenile Central Valley steelhead typically rear 1 or 2 years in fresh water before migrating to the20ocean. Juvenile (smolt-sized fish greater than 4 inches) steelhead migrate to the ocean from21December through August (Table 11-5). The peak months of juvenile migration are January to May22(McEwan 2001). After 1-2 years of ocean residence, adult steelhead return to their natal stream to23spawn as 3- or 4-year-olds (Hallock et al. 1961).
- Central Valley steelhead occur in the program area, either as adults migrating upstream to their
   spawning habitat, or as juveniles rearing and migrating toward the ocean. Juvenile steelhead tend to
   use bank habitat more frequently than the main channel, because bank habitat provides increased
   protection, shade, and food.
- 28 Over the past 30 years, the naturally spawned steelhead populations in the upper Sacramento River 29 have declined substantially. Hallock et al. (1961) estimated an average of 20,540 adult steelhead 30 through the 1960s in the Sacramento River, upstream of the Feather River. Steelhead counts at the 31 RBDD declined from an average of approximately 8,000 for the period of 1967 to 1977, to an 32 average of approximately 2,000 through the early 1990s, with an estimated total annual run size for 33 the entire Sacramento–San Joaquin system, based on RBDD counts, to be no more than 10,000 34 adults (McEwan and Jackson 1996; McEwan 2001). Steelhead escapement surveys at RBDD ended in 35 1993 because of changes in dam operations.
- Wild steelhead stocks in the Central Valley are mostly confined to the upper Sacramento River and its tributaries, including Antelope, Deer, and Mill Creeks and the Yuba River. Populations may exist in Big Chico and Butte Creeks and a few wild steelhead are produced in the American and Feather Rivers (McEwan and Jackson 1996). There is still a nearly complete lack of steelhead monitoring in the Central Valley (Good et al. 2005); therefore, data are lacking regarding a definitive population size for Central Valley steelhead. However, the little data that exist indicate that the population continues to decline (Good et al. 2005).

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## 11.2.2.3 Delta Smelt

2 The delta smelt is listed as threatened under both the ESA and CESA as a threatened species (58 FR 3 12854, March 5, 1993) and endangered under CESA (January 20, 2010). The designated critical 4 habitat for delta smelt encompasses the Delta and the Sacramento River upstream to the mouth of 5 American River (RM 60). Delta smelt occur in a wide range of habitats, ranging from freshwater to 6 brackish areas, and in habitats that include bay, marsh, and riverine habitat within the tidal zone 7 (Sommer and Mejia 2013). Most delta smelt spend the majority of their lives in or near the low-8 salinity zone (LSZ; 1–6 parts per thousand [ppt]) (Feyrer et al. 2007, Kimmerer et al. 2009) but 9 survey data indicate that their overall distribution varies by life stage, season, and water year, 10 extending from Suisun Bay to the upper limits of the tidal zone in the upper Delta and lower Sacramento and San Joaquin Rivers (Sommer and Mejia 2013; Merz et al. 2011). 11 12 Rearing habitat for juvenile and adult delta smelt typically is found in the estuarine waters of the 13 lower Delta and Suisun Bay where salinity is between 2 and 7 parts per thousand (ppt), although 14 delta smelt tolerate 0 ppt to 19 ppt salinity. They typically occupy open shallow waters but also 15 occur in the main channel in the region where fresh water and brackish water mix. The zone may be 16 hydraulically conducive to their ability to maintain position and metabolic efficiency (Moyle 2002). 17 Adult delta smelt begin a spawning migration, which may encompass several months, and move into 18 the upper Delta during December or January (Table 11–5). Delta smelt typically undergo an annual 19 spawning migration from the LSZ between late December and late February, typically during "first 20 flush" periods when inflow and turbidity increase on the Sacramento and San Joaquin Rivers 21 (Grimaldo et al. 2009, Sommer et al. 2011). - Spawning occurs between January and July, with peak 22 spawning during April through mid-May (Moyle 2002). Most spawning appears to occur in tidally 23 influenced backwater channels and sloughs of the upper Delta, including the Sacramento River 24 above Rio Vista, Cache Slough, Lindsev Slough, and Barker Slough. Spawning occurs in shallow 25 edgewaters in the upper Delta channels, including the Sacramento River above Rio Vista, Cache 26 Slough, Lindsey Slough, and Barker Slough. Spawning also was observed in the Sacramento River up 27 to Garcia Bend during drought conditions, possibly attributable to adults moving farther inland in 28 response to saltwater intrusion (Wang and Brown 1993). A portion of the delta smelt population 29 may reside in the Cache Slough complex throughout the year and may not undergo the annual 30 migration typical of the species (Sommer et al. 2011). 31 -Eggs are broadcast over the bottom, where they may attach to firm sediment, woody material, and 32 vegetation. ;The substrate preferences of delta smelt are not known; however, many other smelt 33 species are known to favor sandy substrate for spawning (Bennett 2005). however, spawning in the 34 wild has not been observed and so the actual substrates used are not known.\_Hatching takes 35 approximately 9 to 13 days, and larvae begin feeding 4 to 5 days later. Newly hatched larvae contain 36 a large oil globule that makes them semi-buoyant and allows them to stay off the bottom. Dege and 37 Brown (2004) found that larvae less than 20 mm rear 3–12 miles (5–20 kilometers) upstream of X2<sup>1</sup> 38 (Dege and Brown 2004; Sommer and Mejia 2013). As larvae grow and water temperatures increase 39 in the Delta (approximately 73°F [23 °C]), their distribution shifts towards the LSZ (Dege and Brown 2004: Nobriga et al. 2008). By fall, the center of delta smelt distribution is tightly coupled with X2 40

<sup>&</sup>lt;sup>1</sup>X2 represents the approximate center of the low salinity zone and is defined as the position of the 2 parts per thousand isohaline, measured by its distance (in kilometers) from the Golden Gate Bridge along the axis of the estuary.

- 1 (Sommer et al. 2011; Sommer and Mejia 2013). Larval smelt feed on rotifers and other zooplankton. 2 As their fins and swim bladder develop, they move higher into the water column. Larvae and 3 juveniles gradually move downstream toward rearing habitat in the estuarine mixing zone (Wang 4 1986). A portion of the delta smelt population may reside in the Cache Slough complex throughout 5 the year and may not undergo the annual migration typical of the species (Sommer et al. 2009). 6 Delta smelt occur in the lower Sacramento River, downstream of the confluence with the American 7 River, and in the Delta sloughs. Delta smelt critical habitat is designated in the Sacramento River 8 downstream of the American River and in the Delta. Adults may occur into the Sacramento River 9 during the winter and early spring and most spawning appears to occur downstream in tidally 10 influenced backwater sloughs and channel edgewaters of the upper Delta, including the Sacramento River above Rio Vista, Cache Slough, Lindsey Slough, and Barker Slough. 11 The Fall Midwater Trawl (FMWT) provides the best available long-term index of the relative 12 13 abundance of delta smelt (Moyle et al. 1992; Sweetnam 1999). The indices derived from these 14 surveys closely mirror trends in catch per unit effort (Kimmerer and Nobriga 2005), but do not at 15 present support statistically reliable population abundance estimates, though substantial progress has recently been made (Newman 2008). FMWT derived data are generally accepted as providing a 16 17 reasonable basis for detecting and roughly scaling interannual trends in delta smelt abundance. The population abundance of delta smelt has been declining and abundance has been at record lows 18 19 during the recent drought (2013–2015). From 1969 to 1981, the mean summer tow net survey (STN) and fall midwater trawl (FMWT) indices were 22.5 and 894, respectively. Both indices suggest 20 21 the delta smelt population declined abruptly in the early 1980s (Moyle et al. 1992). From 1982 to 22 1992, the mean TNS and FMWT indices dropped to 3.2 and 272, respectively. The population 23 rebounded somewhat during the mid-1990s (Sweetnam 1999); the mean STN and FMWT indices 24 were 7.1 and 529, respectively, during the 1993–2002 period. However, delta smelt numbers have 25 trended precipitously downward since about 2000 (U.S. Fish and Wildlife Service 2008). Although 26 there was a spike in the population in 2011, the continued decline of the population is evident. The 2014 FMWT index was the second lowest ever (9); the 2015 index was the lowest ever (7). The 27 28 2016 spring kodiak trawl index is the lowest since the survey began in 2002, and the 2015 20-mm 29 survey index is also the lowest since the survey began in 1995. The 2015 STN age-0 delta smelt 30 abundance index was 0.0, which is the lowest index reported in the history of this survey (implemented in 1959). The FMWT derived indices have ranged from a low of 27 in 2005 to 1,653 in 31 32 1970. For comparison, Townet Survey (TNS) derived indices have ranged from a low of 0.3 in 2005 33 to a high of 62.5 in 1978. Although the peak high and low values have occurred in different year, the 34 TNS and FMWT indices show a similar pattern of delta smelt relative abundance; higher prior to the 35 mid-1980s and very low in the past seven years (U.S. Fish and Wildlife Service 2008). 36 From 1969–1981, the mean delta smelt TNS and FMWT indices were 22.5 and 894, respectively. 37 Both indices suggest the delta smelt population declined abruptly in the early 1980s (Moyle et al. 38 1992). From 1982–1992, the mean delta smelt TNS and FMWT indices dropped to 3.2 and 272 39 respectively. The population rebounded somewhat in the mid 1990s (Sweetnam 1999); the mean 40 TNS and FMWT indices were 7.1 and 529, respectively, during the 1993–2002 period. However, 41 delta smelt numbers have trended precipitously downward since about 2000 (U.S. Fish and Wildlife 42 Service 2008).
- 43 Currently, the delta smelt population indices are two orders of magnitude smaller than historical
   44 highs and recent population abundance estimates are up to three orders of magnitude below

- 1 historical highs (Newman 2008). After 1999 both the FMWT and the TNS population indices showed
- 2 declines, and from 2000 through 2007 the median FMWT index was 106.5. The lowest FMWT
- 3 abundance indices ever obtained were recorded during 2004–2007 (74, 27, 41, and 28,
- 4 respectively) (U.S. Fish and Wildlife Service 2008).
- 5The median TNS index during the period from 2000 through 2008 fell similarly to 1.6, and has also6dropped to its lowest levels during the last four years with indexes of 0.3, 0.4, 0.4, and 0.6 during72005 through 2008, respectively. It is highly unlikely that the indices from 2004–2007 can be8considered statistically different from one another (Sommer et al. 2007), but they are very likely9lower than at any time prior in the period of record. The total number of delta smelt collected in the1020-millimeter Survey decreased substantially during the years from 2002 to 2008 (4,917 to 58711fish) compared to the period 1995 through 2001 (98 to 1,084 fish) (U.S. Fish and Wildlife Service
- 12 <del>2008).</del>

#### 13 **11.2.2.4** Green Sturgeon

14 The southern DPS of North American green sturgeon (Acipenser medirostris) currently is listed as 15 threatened under the federal ESA and is a California species of special concern (Moyle et al. 1995). 16 The southern DPS is defined as green sturgeon populations originating from coastal watersheds 17 south of the Eel River, with the only known spawning population in the Sacramento River southern DPS (71 FR 17757; April 7, 2006). Designated critical habitat includes the Sacramento 18 19 River, lower Feather River, and lower Yuba River; the Delta; and Suisun, San Pablo, and San 20 Francisco Bays (74 FR 52300; October 9, 2009). boundary currently includes all populations of green 21 sturgeon south of the Eel River, with the only known population being in the Sacramento River 22 (Adams et al. 2002). Critical habitat for green sturgeon has not yet been defined.

23 In addition, evidence of spawning has been documented in the Feather River Green sturgeon are the 24 most widely distributed sturgeon species, known to range from nearshore waters of Mexico to the 25 Bering Sea (Adams et al. 2002: 1). Despite this large geographic range, the only known spawning 26 locations for green sturgeon are in the Klamath, Sacramento, and Rogue Rivers (Povtress et al. 2015: 27 Seesholtz 2014). Adams et al. 2002: 1). In the southern DPS, adults and juveniles occur in the upper 28 Sacramento River, where the majority of spawning occurs. Incidental capture of larval green 29 sturgeon in salmon outmigrant traps indicates that the lower Feather River may be a principal 30 spawning area, but spawning there has never been substantiated (Adams et al. 2002: 5). Juveniles 31 are captured annually at trapping facilities at the RBDD and the Glenn-Colusa Irrigation District 32 (GCID) diversion on the Sacramento River (Adams et al. 2002: 5). Adams et al. (2002) found no 33 evidence that green sturgeon currently spawn in the San Joaquin River, although modeling indicates 34 that spawning could have been supported based on the habitat that existed in this system 35 historically (Mora et al. 2009). Young green sturgeon have been taken at Santa Clara Shoal, Brannan 36 Island State Recreational Area, but these fish may have originated from another location (Adams et 37 al. 2002).

Green sturgeon are the most marine species of sturgeon, making extensive oceanic migrations and only coming into freshwater rivers to spawn. Adults migrate into rivers to spawn from April to July, with May to June being the peak season. Green sturgeon first reach sexual maturity at age 15 for males and 17 for females, with spawning thought to occur every 3 to 5 years (Tracy 1990 in Adams et al. 2002). Preferred spawning substrate likely is large cobble but can range from clean sand to bedrock (Moyle 1992 in Adams et al. 2002: 8). Eggs are broadcast and externally fertilized in relatively fast water and probably in depths of more than 3 meters (about 10 feet). Specific water quality requirements are unknown, but a small amount of silt is known to prevent the eggs from
 adhering to each other, thus increasing survival (Moyle 2002, 111).

3 Juveniles are captured annually at trapping facilities at the RBDD (RM 242) and the Glenn-Colusa

Irrigation District (GCID) diversion (RM 205) on the Sacramento River (Adams et al. 2002: 5).
 Young green sturgeon grow rapidly, reaching 74 millimeter (mm) (about 3 inches) 45 days post-

6 hatching. Based on trapping data from the RBDD and the GCID trap (downstream of RBDD), juvenile

- green sturgeon average 29 mm in length during June and July at RBDD and 36 mm in July at GCID
  (Adams et al. 2002: 9). Juvenile sturgeon may spend between 1 and 3 years in fresh water before
- 9 migrating to the ocean (Adams et al. 2002: 9) but may spend time near estuaries at first to rear
- 10 (Moyle 2002: 111). Juvenile green sturgeon have been collected in the Sacramento River, near
- Hamilton City, and in the Delta and San Francisco Bay. According to Kohlhorst et al. (1991), juveniles
   inhabit the estuary until they are approximately 4 to 6 years old, when they migrate to the ocean.
- Adult and juvenile sturgeon are benthic (bottom) feeders, but may also take small fish. Juveniles in
  the Sacramento-San Joaquin Estuary feed primarily on opossum shrimp and amphipods (Moyle
  2002: 110).

16 Green sturgeon adults occur in the program area when migrating to and from upstream spawning 17 habitat. Juveniles occur in the program area during downstream migration. Juveniles also may rear 18 in the area. The general behavior and distribution patterns indicate that the earliest life stages 19 (larvae and post-larvae) rear upstream of the program area for several months before migrating to 20 the Delta and estuary. Salvage and trawling records from the Delta suggest that most juveniles in the 21 program area are likely to be more than 200 millimeters long and at least 9 months old. Juveniles 22 move downstream in the Sacramento River from May to August (Beamesderfer et al. 2006) (Table 23 11-5).

24 Population abundance information concerning the Southern DPS of green sturgeon is described in 25 the NMFS status reviews (Adams et al. 2002; National Marine Fisheries Service 2005). Limited 26 population abundance information comes from incidental captures of North American green 27 sturgeon from the white sturgeon monitoring program by the California Department of Fish and 28 Wildlife (DFW) sturgeon tagging program (California Department of Fish and Game 2002). By 29 comparing ratios of white sturgeon with green sturgeon captures, DFW provides estimates of adult 30 and sub-adult North American green sturgeon abundance. Estimated abundance between 1954 and 31 2001 ranged from 175 fish in 1993 to more than 8,421 in 2001, and averaged 1,509 fish per year. 32 Unfortunately, there are many biases and errors associated with these data, and DFW does not 33 consider these estimates reliable because the population estimates are based on small sample sizes, 34 intermittent reporting, and inferences made from white sturgeon catches. Fish monitoring efforts at 35 RBDD and GCID on the upper Sacramento River have captured between 0 and 2,068 juvenile

36 Southern DPS of green sturgeon per year (Adams et al. 2002).

## 37 **11.2.2.5** Longfin Smelt

DFW has designated longfin smelt as a state threatened species (June 26, 2009). Historically, longfin
smelt populations were found in the Klamath, Eel, and San Francisco estuaries, and in Humboldt
Bay. From recent sampling, populations reside at the mouth of the Klamath River and the Russian
River estuary. In the Central Valley, longfin are rarely found upstream of Rio Vista or Medford Island

42 in the Delta. Adults concentrate in Suisun, San Pablo, and North San Francisco Bays (Moyle 2002).

1 Longfin smelt are anadromous, euryhaline, and nektonic (free-swimming). Adults and juveniles are 2 found in estuaries and can tolerate salinities from 0 <del>parts per thousand (ppt)</del> to pure seawater. The 3 salinity tolerance of longfin smelt larvae and early juveniles ranges from 1.1 to 18.5 ppt. After the 4 early juvenile stage, they prefer salinities in the 15–30 ppt range (Moyle 2002). Longfin smelt in the 5 San Francisco estuary spawn in fresh or slightly brackish water (Moyle 2002: 236). Prior to 6 spawning, these fish aggregate in deepwater habitats available in the northern Delta, including 7 primarily the channel habitats of Suisun Bay and the Sacramento River (Rosenfield and Baxter 8 2007). Catches of gravid adults and larval longfin smelt indicate that the primary spawning locations 9 for these fish are in or near the Suisun Bay channel, the Sacramento River channel near Rio Vista, 10 and (at least historically) Suisun Marsh (Wang 1991; Moyle 2002; Rosenfield and Baxter 2007). 11 Moyle (2002) indicated that longfin smelt may spawn in the San Joaquin River as far upstream as 12 Medford Island. Two sampling programs operated by DFW during the spawning season—the Fall 13 Mid-Water Trawl and the Bay Study—found most of the juveniles were caught in the lower 14 Sacramento River and Suisun Bay. In the Delta, longfin smelt spend most of their life cycle in deep, 15 cold, brackish-to-marine waters of the Delta and nearshore environments (Moyle 2002; Rosenfield 16 and Baxter 2007). They are capable of living their entire life cycle in fresh water, as demonstrated by 17 landlocked populations.

Prespawning adults are generally restricted to brackish (2–35 ppt salinity) or marine habitats. In the fall and winter, yearlings move upstream into fresh water to spawn. Spawning may occur as early as November, and larval surveys indicate it may extend into June (Moyle 2002). The exact nature and extent of spawning habitat are still unknown for this species (Moyle 2002), although major aggregations of gravid adults occur in the northwestern Delta and eastern Suisun Bay (Rosenfield and Baxter 2007).

24 Embryos hatch in 40 days at 7°C and are buoyant. They move into the upper part of the water 25 column and are carried into the estuary. High outflows transport the larvae into Suisun and San 26 Pablo Bays. In low outflow years, larvae move into the western Delta and Suisun Bay. Higher 27 outflows are reflected positively in juvenile survival and adult abundance. Rearing habitat is highly 28 suitable in Suisun and San Pablo Bays in part because juveniles require brackish water in the 2-18 29 ppt salinity range. Longfin smelt are pelagic foragers that feed extensively on copepods, amphipods, 30 and shrimp (U.S. Fish and Wildlife Service 1996; Moyle 2002). Severe alterations in the composition 31 and abundance of the primary producer and primary/secondary consumer assemblages in the Delta 32 have been implicated in the recent decline of longfin smelt and other native fish species (U.S. Fish 33 and Wildlife Service 1996; Kimmerer 2002).

The abundance of longfin smelt in the San Francisco Estuary has fluctuated over time. However, abundance has been in decline since the early 1980's and was very low during the drought years of the 1990's and recent wet years (Rosenfield and Baxter 2007; Sommer et al. 2007). The decline has been seen in the reduction of longfin smelt captured in the percent of trawls throughout the Bay (Rosenfield and Baxter 2007). The 2007 FMWT had the lowest index (13) recorded since the survey began in 1967. The highest index between 1988 and 2008 was 8,205 in 1995. The index in 2008 was 139 (California Department of Fish and Game 2008).

## 41 **11.2.2.6** Sacramento Splittail

The Sacramento splittail was previously listed under the ESA as a threatened species; however, in
2003, the U.S. Fish and Wildlife Service (USFWS) remanded the listing of the species, removing its
special status. The splittail is identified as a species of special concern by DFW.

- 1 Adult splittail migrate from Suisun Bay and the Delta to upstream spawning habitat during
- 2 December through April (Table 11-5). Surveys conducted by the DFW and the DWR in 1995 indicate
- 3 that the Yolo and Sutter Bypasses provide important spawning habitat (Sommer et al. 1997). Adult
- 4 splittail deposit adhesive eggs over flooded terrestrial or aquatic vegetation when water
- 5 temperature is between 9°C and 20°C (Moyle 2002; Wang 1986). Splittail spawn in late April and
- May in Suisun Marsh and between early March and May in the upper Delta and lower reaches and
   flood bypasses of the Sacramento and San Joaquin Rivers (Moyle et al. 1995). Spawning has been
- 8 observed to occur as early as January and may continue through early July (Table 11-5) (Wang
- 9 1986; Moyle 2002).
- Larval splittail are commonly found in shallow, vegetated areas near spawning habitat. Larvae
  eventually move into deeper and more open-water habitat as they grow and become juveniles.
  During late winter and spring, young-of-year juvenile splittail (i.e., production from spawning in the
  current year) are found in sloughs, rivers, and Delta channels near spawning habitat (Table 11-5).
  Juvenile splittail gradually move from shallow, nearshore areas to deeper, open-water habitat of
  Suisun and San Pablo Bays (Wang 1986). In areas upstream of the Delta, juvenile splittail can be
  expected to be present in the flood bypasses when these areas are inundated during the winter and
- 17 spring (Jones & Stokes Associates 1993; Sommer et al. 1997).
- Sacramento splittail were captured in the annual Yolo Bypass surveys. Adult splittail were captured
   at the highest rate since the project started 10 years ago, although juvenile numbers were low. Small
   numbers of juveniles may be attributable to dry winter conditions of 2008 (Reece and Sommer
- 21 2008).

### 22 **11.2.2.7** Hardhead

- Hardhead are a special-status species that are not listed as threatened or endangered under the
  federal ESA or CESA, but are listed in California as a species of special concern. Hardhead are widely
  distributed in low- to mid-elevation streams in the Sacramento River and San Joaquin River Basins.
  In the San Joaquin River Basin, the species is scattered in tributary streams. The species is absent
  from valley reaches of the Lower San Joaquin River. Hardhead are also abundant in a few midelevation reservoirs used largely for hydroelectric power generation, such as Redinger and Kerkhoff
  Reservoirs in the SJR basin (Moyle 2002).
- 30 Most streams in which they occur have summer temperatures in excess of 68°F, and optimal 31 temperatures for hardhead are determined to be 75°F to 83°F. At higher temperatures hardhead are
- temperatures for hardhead are determined to be 75°F to 83°F. At higher temperatures hardhead are
   relatively intolerant of low oxygen levels, a factor that may limit their distribution to well-
- 33 oxygenated streams and to surface water of reservoirs. They prefer clear, deep (>80 cm) pools and
- 34 runs with sand-gravel-boulder substrates and slow velocities (20 to 40 cm/sec). Hardhead are
- 35 always found in association with Sacramento pikeminnow and usually with Sacramento sucker, and
- 36 tend to be absent from streams where introduced species, especially centrarchids, predominate.
- Hardhead are omnivores that consume drifting insects and algae in the water column, and forage for
  benthic invertebrates and aquatic plant material on the bottom of the river floor (Alley and Li 1977).
- 39 Hardhead mature in their third year and spawn mainly in April and May (Grant and Maslin 1999).
- 40 Juvenile recruitment patterns suggest that spawning may extend into August in some foothill
- 41 streams. Fish from larger rivers or reservoirs may migrate 30 to 75 kilometers or more upstream in
- 42 April and May, usually into tributary streams (Moyle et al. 1995). In small streams hardhead may

move only a short distance from their home pools for spawning, either upstream or downstream
 (Grant and Maslin 1999).

### 3 11.2.2.8 River Lamprey

4 River lamprey is currently designated by DFW as a species of special concern (California 5 Department of Fish and Game 2012). Although river lamprey is widely believed to be in decline, the 6 exact status of this species is uncertain. Currently, very little information describing the abundance 7 and distribution of river lamprey is available, perhaps because the species is often overlooked and 8 seldom studied. River lamprey is thought to occur throughout Pacific coast streams. In California, its 9 distribution includes tributaries of San Francisco Bay, such as the Napa River, Sonoma Creek, 10 Alameda Creek, Sacramento River, San Joaquin River, and Russian River (Moyle et al. 1995; Moyle 11 2002).

12 Limited information is available regarding the life history of this species in California. Current 13 accounts are based largely on information from Canadian populations (Moyle 2002). River lamprey 14 is a semelparous (i.e., individuals spawn once, then die) anadromous fish with long freshwater 15 rearing periods. Adults return to fresh water to spawn in fall and winter, with spawning usually 16 occurring from February through March in gravely riffles in small tributary streams (Moyle 2002). 17 Juvenile river lamprey (ammocoetes) remain in silty backwater habitats, where they filter feed on 18 various microorganisms for approximately 3–5 years before migrating to the ocean during late 19 spring periods (Moyle et al. 1995, Moyle 2002). Adult lamprey prey on other fish and may reach a 20 total length of around 7 inches (Moyle et al. 1995).

### 21 **11.2.2.9** Commercially Important Fish

Striped bass, American shad, and largemouth bass are all sport fish species and were introduced
into rivers for that purpose. Striped bass and largemouth bass are regulated by DFW for recreational
fishing. Threadfin shad are nonnative fish species that were introduced as forage fish for game fish.
Striped bass are not recognized as spawning or rearing in the Sacramento River and American shad
reportedly migrate upstream. Sportfishing for striped bass, American shad, Chinook salmon,
steelhead, sturgeon, and warmwater fish occurs seasonally throughout the lower Sacramento River.

## **11.2.3 Factors Affecting Abundance of Central Valley Fishes**

Information relating species abundance to environmental conditions is most available for listed fish species and species of concern, especially Chinook salmon. This section focuses on factors that have contributed to declines in these species or identified as major factors currently affecting the abundance of listed fish species in the Central Valley. Although not specifically referenced, many of the factors discussed for listed fish species also have affected the abundance of other native and nonnative species.

## 35 **11.2.3.1** Spawning Habitat

The amount of spawning habitat may limit the production of juveniles and subsequent adult
 abundance of some species. Spawning habitat area for fall- and late fall-run Chinook salmon, which
 make up more than 90% of the Chinook salmon returning to the Central Valley streams, has been
 identified as limiting their population abundance. Spawning habitat area has not been identified as a

40 limiting factor for the less abundant winter-run and spring-run Chinook salmon (National Marine

- Fisheries Service 1996b; U.S. Fish and Wildlife Service 1996), although spawning habitat may be
   limiting in some streams during years of high adult abundance (e.g., Butte Creek).
- The effect of spawning habitat availability as a limiting factor has not been determined for longfin
   smelt, steelhead or green sturgeon.
- Delta smelt spawn in fresh water at low tide on aquatic plants, submerged and inshore plants, and
   over sandy and hard bottom substrates of sloughs and shallow edges of channels in the upper Delta
   and Sacramento River above Rio Vista (Wang 1986; Moyle 2002). The amount of spawning habitat
- 8 has not been identified as a limiting factor for delta smelt.
- 9 A lack of sufficient seasonally flooded vegetation may limit splittail spawning during dry years
- 10 (Young and Cech 1996). Splittail spawn over flooded vegetation and debris mostly, on floodplains
- 11 that are inundated by high flow from February to early July in the Sacramento River and San Joaquin
- 12 River. The onset of spawning appears to be associated with rising water levels, increasing water
- 13temperature and day length (Moyle 2002). The Sutter and Yolo Bypasses along the Sacramento
- 14 River are important spawning habitat areas during high flow.

## 15 **11.2.3.2 Rearing Habitat**

- 16 The amount of rearing habitat may limit the production of juveniles and subsequent adult
- abundance of some species. USFWS (1996) has indicated that rearing habitat area limits the
  abundance of juvenile fall-run and late fall-run Chinook salmon and juvenile steelhead. Rearing
  habitat for salmonids is defined by environmental conditions such as water temperature, dissolved
  oxygen, turbidity, substrate, water velocity, water depth, and cover (Jackson 1992; Bjornn and
  Reiser 1991; Healey 1991).
- Environmental conditions and interactions among individuals, predators, competitors, and food
   sources determine habitat quantity and quality and the productivity of the stream (Bjornn and
   Reiser 1991). Everest and Chapman (1972) found juvenile Chinook salmon and steelhead of the
   same size using similar in-channel rearing area.
- Rearing area varies with flow. High flow increases the area available to juvenile Chinook salmon
  because they extensively use submerged terrestrial vegetation on the channel edge and the
  floodplain. Deeper inundation provides more overhead cover and protection from avian and
  terrestrial predators than shallow water (Everest and Chapman 1972).
- 30 Rearing habitat has not been cited as a limiting factor in green sturgeon population abundance. It is 31 unknown what specific habitat juvenile green sturgeon use as they migrate from the upper
- 32 Sacramento River down into San Pablo Bay.
- 33 Rearing habitat for delta smelt encompasses the lower reaches of the Sacramento River below
- 34 Isleton, the San Joaquin River below Mossdale, throughout the Delta, and into Suisun Bay. USFWS
- 35 (1996) has indicated that loss of rearing habitat area would adversely affect the abundance of larval
- 36 and juvenile delta smelt. The area and quality of estuarine rearing habitat is assumed to be
- dependent on the downstream location of approximately 2-ppt salinity (Moyle et al. 1992). Where 2-
- 38 ppt salinity is located in the Delta is assumed to provide less and lower-quality habitat than 2-ppt
- 39 salinity farther downstream in Suisun Bay. During years of average and high outflow delta smelt
- 40 may concentrate anywhere from the Sacramento River around Decker Island to Suisun Bay (Moyle
- 41 2002).

- 1 Rearing habitat has not been cited as a limiting factor in Sacramento splittail population abundance,
- 2 but, as with spawning, a lack of sufficient seasonally flooded vegetation may be limiting population
- 3 abundance and distribution (Young and Cech 1996). Rearing habitat for splittail encompasses the
- 4 Delta, Suisun Bay, Suisun Marsh, the lower Napa River, the lower Petaluma River, and other parts of
- 5 San Francisco Bay (Moyle 2002). In Suisun Marsh, splittail concentrate in the dead-end sloughs that
- have small streams feeding into them (Daniels and Moyle 1983; Moyle et al. 1986 in Moyle 2002). As
   splittail grow, salinity tolerance increases (Young and Cech 1996). Salinity is not a limiting factor as
- 8 splittail is able to tolerate salinity concentrations as high as 29 ppt (Moyle 2002).

## 9 **11.2.3.3** Migration Habitat

10 The Sacramento River provides a migration pathway between freshwater and ocean habitats for 11 adult and juvenile steelhead, all runs of Chinook salmon, and green sturgeon. Migration habitat 12 conditions include stream flows that provide suitable water velocities and depths that provide 13 successful passage. Flows in the Sacramento River provide the necessary depth, velocity, and 14 suitable water temperature.

- 15 Larval and early juvenile delta smelt and longfin smelt are transported by currents that flow
- downstream into the upper end of the mixing zone of estuary where incoming saltwater mixes with
   outflowing fresh water (Moyle et al. 1992). Reduced flow may adversely affect transport of larvae
   and juveniles to rearing habitat.
- Adult splittail gradually move upstream during the winter and spring months to spawn. Year class
- 20 success of splittail is positively correlated with wet years, high Delta outflow, and floodplain
- inundation (Sommer et al. 1997; Moyle 2002). Low flow impedes access to floodplain areas to
   spawn.

### 23 **11.2.3.4** Water Temperature

- Fish species have different responses to water temperature conditions depending upon their
   physiological adaptations. Salmonids in general, have evolved under conditions where water
   temperatures are fairly cool. Green sturgeon also prefer cool water temperatures.
- Delta smelt, longfin smelt and splittail can tolerate warmer temperatures. In addition to speciesspecific thresholds, different life stages have different water temperature requirements. Eggs and
  larval fish are the most sensitive to warm water temperature.
- Unsuitable water temperatures for adult salmonids during upstream migration lead to delayed
   migration and potentially lower reproduction. Juvenile salmonid survival, growth, and vulnerability
   to disease are affected by water temperature. In addition, water temperature affects prey species
   abundance and predator occurrence and activity. Juvenile salmonids alter their behavior depending
   on water temperature, including movement to take advantage of local water temperature refugia
   (e.g., movement into stratified pools, shaded habitat, and subsurface flow) and to improve feeding
   efficiency (e.g., movement into riffles).
- Water temperature in Central Valley rivers frequently exceeds the tolerance of Chinook salmon and
  steelhead life stages. Based on a literature review, it is assumed that conditions supporting adult
  Chinook salmon migration deteriorate as temperature warms between 53.6°F and 69.8°F (12°C to
  21°C) (Hallock 1970 in McCullough 1999). For juvenile Chinook salmon, survival is assumed to
- 41 decline as temperature warms from 64.4°F to 75.2°F (18°C and 24°C) (Myrick and Cech 2001; Rich

- 1 1987). Relative to rearing, Chinook salmon require cooler temperatures to complete the parr-smolt
   2 transformation and to maximize their saltwater survival. Successful smolt transformation is
- assumed to deteriorate at temperatures ranging from 62.6°F to 73.4°F (17°C to 23°C) (Marine 1997
   in Myrick and Cech 2001; Baker et al. 1995).

5 For steelhead, successful adult migration and holding are assumed to deteriorate as water 6 temperature warms between 52°F and 69.8°F (14°C to 21°C). Adult steelhead appear to be much 7 more sensitive to thermal extremes than are juveniles (National Marine Fisheries Service 2009; 8 McCullough 1999). Juvenile rearing success is assumed to deteriorate at water temperatures 9 ranging from 62.6°F to 77°F (17°C to 25°C) (Raleigh et al. 1984; Myrick and Cech 2001). Relative to 10 rearing, smolt transformation requires cooler temperatures, and successful transformation occurs at 11 temperatures ranging from 42.8°F to 50°F (6°C to 10°C). Juvenile steelhead have been captured at 12 Chipps Island in June and July and at water temperatures exceeding 68°F (20°C) (Nobriega and 13 Cadrett 2001). Juvenile Chinook salmon also have been observed to migrate at water temperatures 14 warmer than expected based on laboratory experimental results (Baker et al. 1995).

- 15Green sturgeon prefer cool water temperatures for spawning, embryonic development, and16rearing. Spawning typically occurs when water temperatures are 46 to 57°F, and embryonic17development is optimal when water temperatures are 52 to 66°F. Temperatures above 68°F are18lethal for embryos (Cech et al. 2004), and overwintering juveniles stop migrating downstream19when temperatures reach 46°F or below (Kynard et al. 2005).
- Delta smelt and splittail populations are adapted to water temperature conditions in the Delta. Delta smelt may spawn at temperatures as high as 22°C (U.S. Fish and Wildlife Service 1996) and can rear and migrate at temperatures as warm as 28°C (Swanson and Cech 1995). Splittail may withstand temperatures as warm as 33°C and prefer a temperature range between 19°C and 24°C (Young and Cech 1996). Longfin smelt prefer summer water temperatures between 16–18°C, but can tolerate temperatures up to 20°C (Moyle 2002, 236).

## 26 **11.2.3.5** Contaminants

27 In the Sacramento River and San Joaquin River Basins, industrial and municipal discharge and 28 agricultural runoff introduce contaminants into rivers and streams that ultimately flow into the 29 Delta. Organophosphate insecticides, such as carbofuran, chlorpyrifos, and diazinon, are present 30 throughout the Central Valley and are dispersed in agricultural and urban runoff. These 31 contaminants enter rivers in winter runoff and enter the estuary in concentrations that can be toxic 32 to invertebrates (CALFED Bay-Delta Program 2000). Because they accumulate in living organisms, 33 these contaminants may become toxic to fish species, especially those life stages that remain in the 34 system year-round and spend considerable time during the early stages of development, such as 35 Chinook salmon, steelhead, green sturgeon, splittail, and delta smelt.

## 36 **11.2.3.6 Predation**

Nonnative species cause substantial predation mortality on native species. Studies at Clifton Court
Forebay estimated predator-related mortality of hatchery-reared fall-run Chinook salmon from
about 60% to more than 95%. Although the predation contribution to mortality is uncertain, the
estimated mortality suggests that striped bass and other predatory fish, primarily nonnative, pose a
threat to juvenile Chinook salmon moving downstream, especially where the stream channel has
been altered from natural conditions (California Department of Water Resources 1995). Predators

- 1 such as striped bass, largemouth bass, and catfish also prey on delta smelt, splittail (U.S. Fish and
- 2 Wildlife Service 1996) and possibly longfin smelt. The extent that predation may affect delta smelt,
- 3 longfin smelt, and splittail populations is unknown. Predation effects on green sturgeon is unknown.

## 4 **11.2.3.7** Food

Food availability and type affect survival of fish species. Species such as threadfin shad and wakasagi
may affect delta smelt survival through competition for food. Introduction of nonnative food
organisms also may have an effect on survival of delta smelt and other species. Nonnative
zooplankton species are more difficult for small smelt and striped bass to capture, increasing the
likelihood of larval starvation (Moyle 2002). Splittail feed on opossum shrimp, which in turn feed on
native copepods that have shown reduced abundance potentially attributable to the introduction of
nonnative zooplankton and the Asiatic clam Potemorror bulg amuransis. Severe alterations in the

- nonnative zooplankton and the Asiatic clam *Potamorcorbula amurensis*. Severe alterations in the
   composition and abundance of the primary producer and primary/secondary consumer
- assemblages in the Delta have been implicated in the recent decline of longfin smelt and other native
   fish species (U.S. Fish and Wildlife Service 1996; Kimmerer 2002).
- 15 In addition, flow affects the abundance of food in the Delta and Suisun Bay. In general, higher flows 16 result in higher productivity, including the higher input of nutrients from channel margin and
- result in higher productivity, including the higher input of nutrients from channel margin and
   floodplain inundation and higher production resulting when low salinity occurs in the shallows of
- 17 noouplain mundation and lighter production resulting when low salinity occurs in the shallows of
   18 Suisun Bay. Higher productivity increases the availability of prey organisms for delta smelt and
- 19 other fish species.

## 20 **11.2.3.8 Entrainment**

All fish species are entrained to varying degrees by the State Water Project (SWP) and the Central Valley Project (CVP) Delta export facilities and other diversions in the Delta and Central Valley rivers. Fish entrainment and subsequent mortality is a function of the size of the diversion, the location of the diversion, the behavior and size of the fish, and other factors, such as fish screens, presence of predatory species, and water temperature. Low approach velocities are assumed to minimize stress and protect fish from entrainment.

27 The CVP and SWP fish facilities indicate entrainment of adult delta smelt during spawning migration 28 from December through April (U.S. Fish and Wildlife Service 1994). Juveniles are entrained 29 primarily from April through June. Young-of-year splittail are entrained between April and August 30 when fish are moving downstream into the estuary (Cech et al. 1979 in Moyle 2002). Juvenile 31 Chinook salmon are entrained in all months, but primarily from November through June when 32 juveniles are migrating downstream. Green sturgeon are entrained at both facilities during all 33 months of the year, although at low levels (California Department of Fish and Game 2012). Highest 34 entrainment of juvenile longfin smelt at the SWP and CVP pumps occurs during April and May and 35 lowest entrainment of both juveniles and adults is between September and December. Adult 36 entrainment occurs during the fall to winter months (November to January).

## 37 **11.3 Regulatory Setting**

Appendix C, Regulatory Background, describes the federal, state, and local laws, regulations, and
 policies that pertain to fisheries and aquatics within the program area. Pertinent laws, regulations,

40 and policies are listed below.

1	•	Fee	deral:
2		0	National Environmental Policy Act
3		0	Endangered Species Act
4		0	Magnuson-Stevens Fishery Conservation and Management Act
5		0	Sustainable Fisheries Act
6	٠	Sta	ite:
7		0	California Environmental Quality Act
8		0	California Endangered Species Act
9		0-	Fish and Game Code Section 1602: Streambed Alteration Agreements
10	٠	Lo	cal:
11		0	American River Parkway Plan
12		0	Butte County General Plan
13		0	Butte Regional Conservation Plan
14		0	Colusa County General Plan
15		0	Glenn County General Plan
16		0	Placer County General Plan
17		0	Sacramento County General Plan
18		0	Solano County General Plan
19		0	Sutter County General Plan
20		0	Tehama County General Plan
21		0	Yolo County General Plan
22		0	Yuba County General Plan

## 23 **11.4 Determination of Effects**

The proposed program would involve short-term construction activities and long-term changes to
 bank structure that potentially could affect aquatic species, including fish, and fish habitat in the
 program area. Although other fish species potentially would be affected by the proposed program,
 this chapter focuses primarily on fish species listed under ESA and CESA.

The specific environmental conditions and fish species included in this analysis adequately addresses the full range of conditions and fish species potentially affected because the response of the selected species to program actions is an indicator of the potential response by other species. Mitigation measures that reduce effects on the species discussed are also likely to reduce effects on the other species. Where the location and timing of program actions and the potential effects on a fish species or habitat are not captured by the analysis for the selected species, the specific effects on other species are described.

## 1 **11.4.1 Assessment Methods**

The effects assessment consists of two main sections. The first section is a qualitative evaluation of
 short-term effects occurring during construction. The second section uses the Standard Assessment
 Methodology (SAM) (U.S. Army Corps of Engineers 2004) to quantitatively estimate program effects
 immediately after construction and up to 50 years in the future.

## 6 **11.4.1.1** Qualitative Evaluation of Short-Term Effects during Construction

A qualitative evaluation of potential short-term effects during construction was made. This
evaluation describes the potential short-term effects associated with construction and relates them
to associated changes in fish ecology that may be significant, based on a review of relevant
literature.

11 **11.4.1.2** Standard Assessment Methodology for Long-Term Effects

12 The SAM was used to determine potential program-level effects of the SRBPP Phase II Additional 13 Authorization and compensation requirements. SAM assesses changes in habitat condition for 14 various focus fish species as a result of levee improvement or bank protection actions within the 15 program area. The habitat variables included in the analysis describe features of the river bank and 16 nearshore habitat that are important to fish survival: bank slope, floodplain availability, bank 17 substrate size, instream structure, aquatic vegetation, and overhanging shade. The SAM Electronic 18 Calculation Template (ECT) Version 3.0 beta edition (June 2009) developed for and in conjunction 19 with the Corps and the Central Valley Flood Protection Board by Stillwater Sciences was used in the 20 analysis. The focus fish species included in the analysis were the Sacramento River winter-run 21 Chinook salmon ESU, the Central Valley spring-run Chinook salmon ESU, the Central Valley fall- and 22 late fall-run Chinook salmon ESU, the Central Valley steelhead DPS, delta smelt, and the green 23 sturgeon southern DPS.

24 Data for the SAM analysis were derived from the Corps revetment database (2007). GIS data from 25 the revetment database were merged with GIS data for the more than 150 erosion sites (Ayres 26 Associates and U.S. Army Corps of Engineers 2008) to derive values for individual sites within each 27 program region (1a, 1b, 2, and 3). Following Stillwater Sciences (2007), data for each program 28 region were averaged from all the sites within each region (with a weighting for site length) to give 29 regional averages for the existing conditions. The change in fish habitat in each program region was 30 compared with baseline conditions, beginning from the time of construction to 50 years into the 31 future, with changes at 1, 5, 10, 15, and 25 years post-construction also included.

32 Alternatives for potential bank protection designs to be used within each region were determined 33 from the assessment of 106 representative sites originally evaluated in the SRBPP Alternatives 34 Analysis (Kleinefelder-Geomatrix 2009) and further evaluated and refined in the Engineering 35 Documentation Report (EDR) (HDR 2009). Site designs presented in the EDR reflect the Guidelines 36 for Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and 37 Appurtenant Structures, ETL 1110-2-583 (Vegetation ETL), resulting in the identification of sites 38 that would not be planted with vegetation and where the vegetation-free state would be maintained 39 throughout the life of the site in order to comply with the Vegetation ETL (U.S. Army Corps of 40 Engineers 2014). The No Action Alternative was compared with baseline conditions in all regions; 41 the remaining alternatives were considered only if they were deemed to be feasible or desirable in a 42 given region based on the EDR assessment. For the No Action Alternative it was assumed that a

- 1 certain amount of erosion would occur over time, leading to changes in bank slope, shade, and
- 2 quantity of woody debris in each region. Submerged vegetation was also assumed to change, 3 generally increasing.
- 4 Full methods and region-specific results of the SAM analysis are provided in Appendix F, Standard 5 Assessment Methodology (SAM) Analysis Process.

#### 11.4.2 Significance Criteria 6

7 Populations of fish and other aquatic organisms may be reduced because of increased mortality and 8 changes in habitat availability and suitability that affect survival, growth, migration, and reproduction. In general, effects on fish populations are significant when the project causes or 9 10 contributes to substantial short- or long-term reductions in abundance and distribution. The 11 assessment of potential effects takes into consideration the significance of an action based on its 12 context and its intensity, as required by NEPA. Based on CEQA Guidelines (Section 15065), 13 Appendix G of the State CEQA Guidelines, and NEPA regulations an effect is found to be significant if it:

- 14
- 15 • Has a substantial adverse effect, either directly or through habitat modifications, on any species 16 identified as a candidate, sensitive, or special status species in local or regional plans, policies, or 17 regulations, or by the DFW or USFWS;
- 18 • Interferes substantially with the movement of any native resident or migratory fish or wildlife 19 species or with established native resident or migratory wildlife corridors, or impede the use of 20 native wildlife nursery sites;
- 21 Substantially reduces the habitat of a fish population;
- 22 Causes a fish population to drop below self-sustaining levels; •
- 23 Threatens to eliminate an animal community; •
- 24 Reduces the number or restricts the range of a rare or endangered fish species; or
- 25 Has considerable cumulative effects when viewed with past, current, and reasonably foreseeable • 26 future projects.

27 In this effect assessment, effects were considered significant if it was determined that existing 28 conditions would be worsened by program construction, resulting in a substantial reduction in 29 population abundance, movement, and distribution. The definition of a "substantial" reduction 30 varies with each species, depending on the ability of the population to maintain or exceed current 31 production levels through mechanisms that compensate for reduced abundance of earlier life stages. 32 Many fish populations are resilient in the face of mortality caused by human activities and can 33 sustain high levels of exploitation. Given the focus on listed species, a precautionary approach was 34 adopted in which even small effects were regarded as potentially significant. The quantitative 35 analysis using SAM took into consideration different fish life stages and also the life span of the 36 species when considering the significance of the effects. The proposed program could be considered 37 to be self-mitigating if, because of site design, short-term habitat deficits were fully compensated by 38 subsequent increases over a period approximating the life span or time to maturity of each species. 39 These periods were 5 years (Chinook salmon), 4 years (steelhead), 2 years (delta smelt), and 15 40 years (green sturgeon).

Sacramento River Bank Protection Project

## **11.5 Effects and Mitigation Measures**

## 2 11.5.1 Short-Term Effects

### 3 **11.5.1.1** Alternative 1—No Action

Under Alternative 1, it is assumed that there would be no short-term effects on fisheries and
aquatics. Current bank and levee maintenance activities, such as mowing and application of
herbicides, would continue, and any effects from these activities would not be different from current

7 (baseline) conditions. Potential long-term effects (e.g., because of gradual erosion) are discussed

8 below in *Long-Term Effects*.

## 9 **11.5.1.2** Alternative 2A—Low Maintenance

# Effect FISH-1: Short-Term Effects of Rock Placement into Nearshore Aquatic Habitat during Construction

12 Rock placement may directly kill fish by crushing but is most likely to disturb fish by increasing 13 noise, water turbulence, and turbidity, causing them to move away from the area of placement.

#### 14 Salmonids

15 Rock placement may cause juvenile salmonids to avoid the construction area and make them more susceptible to predation. NMFS (2008a) describes various studies suggesting that juvenile Chinook 16 17 salmon are more susceptible to predation after avoiding construction areas. The effect is likely to be 18 similar for juvenile steelhead, although most individuals are somewhat larger than juvenile Chinook 19 during migration and so may be less susceptible to predation. NMFS (2008a) also notes that, of the 20 various races of Chinook salmon, wWinter-run may be most susceptible to crushing by placed rocks 21 (in Region 3) because fry-sized individuals fry-sized individuals are present from August to 22 December in Region 3 may be present in the program area from October through December with 23 peaks in abundance following the first major flow events of the season (typically in November or 24 <u>December</u>) of the program area. Increased noise because of construction could affect migrating 25 salmonid adults but the effect is not likely to be severe because salmonid adults tend to migrate 26 during crepuscular periods and occupy deeper waters of the mid channel (NMFS-National Marine 27 Fisheries Service 2008a).

#### 28 Green Sturgeon

As with salmonids, adult or juvenile green sturgeon could be killed or injured by rock placement but
 NMFS (2008a) did not expect this to affect many individuals because the species is generally benthic
 and less susceptible to activities at the shoreline.

#### 32 Delta Smelt

33 As with salmonids, delta smelt could be killed or injured by rock placement or may be more

34 susceptible to predation. However, this effect is probably minimal because the species tends to

35 occupy pelagic areas away from the shoreline (Nobriga et al. 2004) and construction activities

- 36 would not occur during spawning (January–July), which is the period during which adults may be
- 37 closer to shore (Moyle 2002).

#### 1 Longfin Smelt

- As with delta smelt, longfin smelt are unlikely to be affected by rock placement activities. However,
   spawning may occur as early as November (Moyle 2002) and so could potentially be affected during
- 4 the final month of construction activity. The bulk of spawning activity is from December to June and
- 5 would avoid the construction period; juvenile rearing would not be likely to be affected because
- construction in the Delta region would commence in August, by which time juveniles will have
   migrated downstream of the program area.
- inigrated downstream of the progra

#### 8 Sacramento Splittail

9 The potential exists for adult or juvenile Sacramento splittail to be significantly affected by rock 10 placement for the same reasons given for salmonids and smelts above. The species spawns in 11 nearshore habitats of the Delta and lower Sacramento River, which is also where larvae are found, 12 and juveniles move to areas away from the shore (Wang 1986). The primary period of nearshore 13 occupation is during the spring and would avoid the construction period.

#### 14 Conclusion

The short-term effect of rock placement is significant for salmonids, steelhead, delta smelt, longfin
 smelt, and Sacramento splittail but would be adequately mitigated by Mitigation Measure FISH-MM 1 to a level that is less than significant.

## 18 Mitigation Measure FISH-MM-1: Limit Construction Activity to Periods of the Year That 19 Minimize Effects on Fish

20Construction will be limited to the period from July 1 to November 30 at all sites except those in21the Delta. This will minimize project effects by avoiding the main periods of migration for22juvenile salmonids. Construction will be limited to the period from August 1 to November 30 at23sites in the Delta (below RM 60 of the Sacramento River), which will minimize effects on most24spawning and rearing delta smelt, longfin smelt, and Sacramento splittail, as well as minimizing25effects on salmonids.

## Effect FISH-2: Increases in Sedimentation, Suspended Sediments, and Turbidity during Construction

- Program construction may disturb soils and the nearshore environment, leading to increases in
   sediment in the nearshore aquatic habitat. This in turn may increase sedimentation (i.e., deposition
- 30 of sediment on the substrate), suspended sediments, and turbidity. Increases in suspended solids
- 31 and turbidity would generally be short-term in nature. Very high concentrations of suspended solids
- 32 may interfere with respiration.

#### 33 Salmonids

- 34 Increased sedimentation and turbidity as a result of program construction activities may affect fish
- 35 behavior by influencing spawning, feeding, or migratory behavior. The survival to emergence of
- 36 fertilized salmonid eggs decreases with increased sedimentation (Shapovalov and Taft 1954,
- 37 Cordone and Kelley 1961, Bjornn and Reiser 1991). Sedimentation could, therefore, reduce the
- 38 quantity of available spawning habitat. However, little salmonid spawning habitat is located within
- 39 the program area and is instead mostly upstream. The amount of habitat for juvenile fish

- 1 (particularly salmonids) may decrease as sediment settles and fills in spaces between larger cobbles
- 2 and boulders that are normally used for refuge (Cordone and Kelley 1961, Bjornn and Reiser 1991).
- 3 Easily accessible invertebrate prey normally found on rocks may be replaced by burrowing
- organisms, reducing the amount of prey for juvenile salmonids (Bjornn and Reiser 1991). This effect
   is most relevant to areas upstream of the program area but, nevertheless, could be locally important
- 6 within the program area.
- 7 Program construction may increase turbidity in the adjacent water bodies. Short-term periods of 8 higher turbidity generally do not affect larger juveniles and adults (Cordone and Kelley 1961). For 9 smaller juvenile salmonids, increased turbidity may result in decreased growth because of reduced 10 visual foraging ability and earlier emigration from a water body (Sigler et al. 1984). Smaller size at 11 emigration may increase vulnerability to predation. Migrating adult salmonids may avoid highly 12 turbid water and may not be able to access suitable spawning habitat. For example, Cordone and 13 Kelley (1961: 195) cite studies documenting avoidance of turbid Yuba River waters by migrating 14 Chinook salmon adults; the movement of the salmon into a small tributary of the Yuba River led to 15 considerable disturbance of previously constructed redds (nests) by subsequent spawners because the number of spawners exceeded the amount of habitat. 16
- 17 Increased construction-related suspended sediments may produce a variety of behavioral and physiological effects in salmonids. Newcombe and Jensen (1996) noted that concentration and 18 19 duration of exposure were of importance in determining effects and modeled response exposure in 20 terms of behavioral effects (ranging from an alarm reaction to avoidance), sublethal effects (ranging 21 from short-term reductions in feeding success to long-term reductions in feeding success), and 22 lethal or paralethal effects (ranging from reduced growth/feeding/density to 80–100% mortality). 23 For adult and juvenile salmonids, Newcombe and Jensen calculated that for a very short-term 24 exposure (1 hour), sublethal effects began at around 20 mg/l (milligrams per liter) of suspended 25 solids and lethal/paralethal effects began at around 20,000 mg/l.

## 26 Green Sturgeon

NMFS (2008a) noted that short-term increases in suspended sediments or turbidity were unlikely to
affect green sturgeons' foraging success because the species uses olfactory cues as opposed to
vision. As noted above, the species is benthic and so is unlikely to be present in nearshore areas.
Spawning habitat for green sturgeon is mostly upstream of the program area and in waters of 3
meters or more (Moyle 2002), so spawning is unlikely to be affected by the shoreline rock
placement.

### 33 Delta Smelt

Delta smelt are found in relatively turbid water, possibly because predation by visual predators is
 reduced (Nobriga et al. 2008). Increased turbidity may decrease feeding opportunities and
 increased suspended solids could clog and abrade gill filaments (U.S. Fish and Wildlife Service
 2008).

### 38 Longfin Smelt

- 39 Effects of increased turbidity and suspended solids are likely to be similar to those described above
- 40 for delta smelt, because the species have sufficiently similar biology for similar responses to be
- 41 inferred.

#### 1 Sacramento Splittail

Effects of increased turbidity and suspended solids are likely to be similar to those described above
 for delta smelt, because the species have sufficiently similar biology for similar responses to be
 inferred.

#### 5 Conclusion

6 Effects related to increases in sedimentation, suspended solids, and turbidity would be significant for

- all species (with the possible exception of green sturgeon) but would be adequately mitigated to a
  level that is less than significant by adopting Mitigation Measure WQ-MM-1: Monitor Turbidity
- 9 during Construction, described in Chapter 5, and Mitigation Measure FISH-MM-1.

#### 10 Effect FISH-3: Spillage and Leakage of Contaminants during Construction

- 11 Accidental spillage or leakage of contaminants such as gasoline, lubricants, and other petroleum-
- 12 based products could kill or injure fish populations in the program area, as well as making them
- 13 more susceptible to disease and other forms of mortality (National Marine Fisheries Service 2008<del>a</del>).

#### 14 Salmonids

Salmonids would be negatively affected by <u>exposure to increased levels of petroleum-based</u>
 contaminants. <u>For example, Juveniles in particular would be affected by contamination of the</u>
 nearshore environment, whereas adults tend to be farther from shore and may not be as susceptible.
 Moles et al. (1981) found that growth of juvenile coho salmon fry (*Oncorhynchus kisutch*) was
 slowed by exposure to sublethal doses of two refined oil constituents, toluene and naphthalene. The
 response of juvenile salmonids in the program area is likely to be similar.

#### 21 Green Sturgeon

No information was found on the effects of petroleum-based contaminants on green sturgeon, but it
 can be assumed that exposure to petroleum-based products could adversely affect green sturgeon,
 as noted for salmonids. As with salmonids, exposure to contaminants would probably be detrimental
 to green sturgeon. Likelihood of exposure is reduced by the species' benthic habitat and relatively
 infrequent occurrence in nearshore habitat (National Marine Fisheries Service 2008a).

#### 27 Delta Smelt

No information was found on the effects of petroleum-based contaminants on delta smelt, There is
 relatively little information on the effects of contaminants on delta smelt (Bennett 2005), but it can
 be assumed that exposure to petroleum-based products could <u>adversely affectkill or injure</u> delta
 smelt, as noted for salmonids. Additionally, contaminants could reduce the extent of vegetated
 nearshore habitat believed to be important for delta smelt spawning and early life history.

### 33 Longfin Smelt

No information was found on the effects of petroleum-based contaminants on longfin smelt, but it
 can be assumed that exposure to petroleum-based products could adversely affect longfin smelt, as
 noted for salmonids. Effects of increased contaminant levels are likely to be similar to those

[]	F	all (Sente	ember_Nr	wember	<u> </u>	\\/i	nter (Dec	ember_l	February	)		Spring	(March-	-May)			Summer	(lune_A	uquet)	
Focus Fish Species and Water Year	Adult migration	Spawning and egg incubation	Fry and juvenile rearing	Juvenile migration	Adult residence	Adult migration	Spawning and egg incubation	juvenile rearing	Juvenile migration	Adult residence	Adult migration	Spawning and geg incubation	juvenile rearing	Juvenile migration	Adult residence	Adult migration	Spawning and egg incubation Frv and	juvenile rearing	Juvenile migration	Adult residence
Spring-tur           2013           2014           2015           2017           2018           2028           2038           2063           2070	0 -638 -639 -635 -633 -539 -489 -489 -491 -493	0 0 0 0 0 0 0 0 0	0 -12 -9 -8 -1 -17 -34 -33	0 0 3 12 16 41 48 60 62		0 -630 -629 -625 -623 -534 -474 -475 -455 -458	0 0 0 0 0 0 0 0 0	0 -31 -30 -27 -25 -32 -65 -104 -105	0 -333 -323 -317 -213 -322 -603 -619		0 -636 -632 -629 -544 -496 -489 -490	0 0 0 0 0 0 0 0 0	0 -36 -35 -29 -28 -52 -104 -161 -161	0 -354 -355 -348 -342 -236 -365 -689 -706		0 -645 -648 -651 -652 -563 -512 -508 -508	0 0 0 0 0 0 0 0 0	0 -13 -9 -8 -1 -17 -35 -33	0 -4 -5 -4 -3 15 23 41 46	
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Steelhead           2013           2014           2015           2017           2018           2028           2038           2063           2070	0 -557 -559 -550 -545 -355 -249 -255 -263	0 0 0 0 0 0 0 0	0 -36 -31 -29 -9 -32 -69 -68	0 -292 -296 -290 -286 -153 -142 -221 -222	0 -557 -559 -550 -545 -355 -249 -255 -263	0 -541 -540 -531 -526 -346 -225 -194 -201	0 0 0 0 0 0 0 0 0	0 -70 -68 -63 -59 -63 -113 -186 -188	0 -414 -406 -403 -315 -390 -611 -624	0 -541 -540 -531 -526 -346 -225 -194 -201	0 -553 -553 -545 -539 -365 -261 -254 -260	0 0 0 0 0 0 0 0 0	0 -78 -70 -67 -87 -162 -258 -260	0 -431 -433 -427 -423 -336 -431 -686 -701	0 -553 -553 -545 -539 -365 -261 -254 -254 -260	0 -570 -576 -581 -582 -401 -294 -290 -293		0 -38 -36 -31 -29 -9 -32 -69 -69	0 -299 -289 -285 -154 -150 -246 -250	0 -570 -576 -581 -582 -401 -294 -290 -293
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Figure 11-1 Alternative 1 SAM results showing bank-line weighted relative response (feet) within all regions combined



Focus Fish Species and Water Year	Adult migration	Spawning and egg (5) lle	Fry and juvenile rearing	Juvenile migration	Adult residence	Adult migration	Spawning and egg incubation	Fry and juvenile rearing	Juvenile migration	Adult residence	Adult migration	Spawning and egg incubation	Fry and juvenile rearing	Juvenile Majration	Adult residence	Adult migration	Spawning and egg incubation	juvenile rearing	Juvenile migration	Adult residence
2013 2014 2015 2017 2018 2028 2028 2038 2063 2070 Fall-run Chi	0 -1,045 -1,320 -1,831 -2,136 -4,145 -4,646 -5,021 -5,067 nook	0 0 0 0 0 0 0 0 0 0	0 -195 -372 -679 -817 -1,610 -1,797 -1,939 -1,955	0 -494 -981 -1,907 -2,376 -4,854 -5,425 -5,854 -5,906		0 -970 -1,185 -1,587 -1,833 -3,326 -3,690 -3,963 -3,998	0 0 0 0 0 0 0 0 0	0 -209 -359 -607 -752 -1,819 -2,083 -2,282 -2,282 -2,306	0 -1,321 -2,129 -3,501 -4,314 -10,029 -11,464 -12,539 -12,672		0 -1,027 -1,286 -1,771 -2,062 -3,969 -4,445 -4,802 -4,845	0 0 0 0 0 0 0 0 0	0 -299 -523 -897 -1,112 -2,668 -3,053 -3,344 -3,380	0 -1,450 -2,354 -3,901 -4,815 -11,202 -12,803 -14,003 -14,151		0 -2,071 -2,655 -3,504 -3,806 -4,854 -5,070 -5,234 -5,253	0 0 0 0 0 0 0 0 0 0	0 -815 -1,113 -1,455 -1,564 -1,904 -1,974 -2,026 -2,032	0 -2,293 -3,173 -4,265 -4,613 -5,718 -5,944 -6,112 -6,133	
2013 2014 2015 2017 2018 2028 2038 2063 2070 Late fall-ru	0 -1,045 -1,320 -1,831 -2,136 -4,098 -4,588 -4,954 -5,000 n Chinoc	0 0 0 0 0 0 0 0 0 0 0 0 k	0 -38 -52 -63 -79 -364 -440 -498 -505	0 -405 -858 -1,730 -2,119 -3,832 -4,213 -4,213 -4,499 -4,534		0 -119 -137 -236 -761 -893 -994 -1,007	0 0 0 0 0 0 0 0 0	0 -209 -359 -607 -752 -1,818 -2,084 -2,281 -2,305	0 -1,321 -2,129 -3,501 -4,314 -10,029 -11,464 -12,539 -12,672		0 -901 -1,139 -1,580 -1,809 -3,150 -3,480 -3,727 -3,757		0 -234 -434 -786 -992 -2,306 -2,613 -2,845 -2,874	0 -1,283 -2,119 -3,538 -4,264 -9,121 -10,351 -11,273 -11,387		0 -2,071 -2,655 -3,504 -3,806 -4,854 -5,070 -5,234 -5,253	Image: state	0 -776 -1,057 -1,366 -1,459 -1,733 -1,789 -1,831 -1,835	0 -1,975 -2,695 -3,492 -3,724 -4,427 -4,570 -4,677 -4,690	
2013 2014 2015 2017 2018 2028 2038 2063 2070 Winter-run (	0 -1,045 -1,320 -1,831 -2,136 -4,010 -4,471 -4,816 -4,859 Chinook		0 -23 -34 -63 -63 -227 -264 -292 -295	0 -736 -1,254 -2,188 -2,653 -5,242 -5,852 -6,310 -6,365		0 -970 -1,185 -1,587 -1,833 -3,326 -3,690 -3,963 -3,998		0 -31 -46 -69 -102 -371 -432 -479 -485	0 -1,321 -2,129 -3,501 -4,310 -9,644 -10,968 -11,960 -12,084		0 -1,027 -1,286 -1,771 -2,062 -3,841 -4,279 -4,608 -4,648		0 -299 -523 -897 -1,112 -2,544 -2,893 -3,156 -3,190	0 -644 -2,467 -3,104 -6,313 -7,064 -7,627 -7,696				0 -85 -123 -187 -211 -283 -298 -309 -310	0 -1,975 -2,695 -3,492 -3,724 -4,427 -4,570 -4,677 -4,690	
2013 2014 2015 2017 2018 2028 2038 2063 2070 Steelhead	0 -1,045 -1,320 -1,831 -2,136 -4,010 -4,471 -4,816 -4,859		0 -195 -372 -679 -817 -1,553 -1,723 -1,852 -1,868	0 -736 -1,254 -2,188 -2,653 -5,243 -5,853 -6,312 -6,367		0 -970 -1,185 -1,587 -1,833 -3,326 -3,690 -3,963 -3,998		0 -209 -359 -607 -752 -1,738 -1,979 -2,160 -2,183	0 -1,321 -2,129 -3,501 -4,314 -9,673 -11,002 -11,997 -12,121		0 -1,027 -1,286 -1,771 -2,062 -3,841 -4,279 -4,608 -4,648		0 -299 -523 -897 -1,112 -2,547 -2,897 -3,161 -3,195	0 -1,450 -2,354 -3,901 -4,815 -10,800 -12,280 -13,390 -13,526		0 -2,050 -2,614 -3,421 -3,703 -4,665 -4,864 -5,013 -5,031		0 -803 -1,091 -1,414 -1,513 -1,822 -1,886 -1,933 -1,938	0 -257 -266 -289 -303 -358 -358 -369 -377 -378	
2013 2014 2015 2017 2018 2028 2038 2063 2070 Delta Smelt	0 -1,254 -1,783 -2,772 -3,361 -7,210 -8,167 -8,884 -8,971	0 0 0 0 0 0 0 0 0	0 -304 -555 -1,013 -1,231 -2,515 -2,817 -3,045 -3,073	0 -821 -1,284 -2,107 -2,522 -5,061 -5,674 -6,134 -6,190	0 -1,254 -1,783 -2,772 -3,361 -7,210 -8,167 -8,884 -8,971	0 -1,127 -1,557 -2,367 -2,855 -6,020 -6,806 -7,394 -7,467	0 0 0 0 0 0 0 0 0	0 -353 -588 -992 -1,230 -2,953 -3,380 -3,700 -3,739	0 -1,236 -1,893 -2,981 -3,621 -8,182 -9,334 -10,197 -10,302	0 -1,127 -1,557 -2,367 -2,855 -6,020 -6,806 -7,394 -7,467	0 -1,227 -1,737 -2,687 -3,255 -6,962 -7,883 -8,573 -8,657	0 0 0 0 0 0 0 0	0 -468 -795 -1,362 -1,691 -4,044 -4,626 -5,063 -5,116	0 -1,347 -2,091 -3,335 -4,062 -9,216 -10,516 -11,490 -11,609	0 -1,227 -1,737 -2,687 -3,255 -6,962 -7,883 -8,573 -8,657	0 -3,247 -4,378 -6,012 -6,587 -8,572 -8,984 -9,292 -9,330		0 -1,230 -2,234 -2,234 -2,412 -2,981 -3,097 -3,185 -3,197	0 -2,231 -2,906 -3,708 -3,961 -4,796 -4,968 -5,096 -5,112	0 -3,247 -4,378 -6,587 -8,572 -8,984 -9,292 -9,330
2013 2014 2015 2017 2018 2028 2038 2063 2070 Green Sturc	0 0 0 0 0 0 0 0 0 0 0 0				0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0	0 -910 -1,686 -3,104 -3,980 -9,391 -10,717 -11,713 -11,834	0 -763 -1,385 -2,583 -3,326 -7,894 -8,988 -9,808 -9,808 -9,908		0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0	0 -911 -1,688 -3,109 -3,988 -9,413 -10,742 -11,740 -11,862	0 -763 -1,387 -2,587 -3,334 -7,914 -9,010 -9,831 -9,932		0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 -2,735 -3,664 -4,809 -5,172 -6,337 -6,577 -6,755 -6,777	0 -2,247 -3,876 -4,149 -4,966 -5,132 -5,255 -5,270		0 0 0 0 0 0 0 0 0 0
2013 2014 2015 2017 2018 2028 2038 2038 2063 2070			0 -942 -1,092 -1,432 -1,636 -2,189 -2,244 -2,282 -2,288	0 0 0 0 0 0 0 0 0	0 -835 -990 -1,311 -1,490 -2,536 -2,794 -2,987 -3,012	0 0 0 0 0 0 0 0 0 0		0 -942 -1,092 -1,432 -1,636 -2,189 -2,244 -2,282 -2,288	0 0 0 0 0 0 0 0 0	0 -958 -1,130 -1,494 -1,734 -3,240 -3,616 -3,897 -3,933	0 0 0 0 0 0 0 0 0 0 0	0 -69 -73 -78 -87 368 520 634 648	0 -942 -1,092 -1,432 -1,636 -2,189 -2,244 -2,282 -2,288	0 0 0 0 0 0 0 0 0 0	0 -958 -1,130 -1,494 -1,734 -3,240 -3,616 -3,897 -3,933	0 0 0 0 0 0 0 0 0	0 -13 50 179 246 571 642 695 702	0 -1,389 -1,605 -1,945 -2,044 -2,237 -2,273 -2,298 -2,301	0 0 0 0 0 0 0 0 0 0	0 -1,662 -2,094 -2,742 -2,970 -3,767 -3,932 -4,056 -4,072
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Figure 11-2 Alternative 2 SAM results showing bank-line weighted relative response (feet) within all regions combined described above for delta smelt, because the species have sufficiently similar biology for similar
 responses to be inferred.

#### 3 Sacramento Splittail

No information was found on the effects of petroleum-based contaminants on Sacramento splittail,
 but it can be assumed that exposure to petroleum-based products could adversely affect Sacramento
 splittail, as noted for salmonids. Effects of increased contaminant levels are likely to be similar to
 those described above for delta smelt, because the species have sufficiently similar biology for
 similar responses to be inferred.

#### 9 **Conclusion**

10Effects related to spillage and leakage of contaminants would be significant but would be adequately11mitigated to a level that is less than significant by adopting Mitigation Measures FISH-MM-1 and12WQ-MM-2: Implement Measures to Maintain Surface Water and Groundwater Quality, described in

13 Chapter 5.

# 14**11.5.1.3**Alternative 3A—Maximize Meander Zone (Environmentally15Superior Alternative)

16 Effect FISH-1 would not occur under Alternative 3A because this alternative does not involve theplacement of any rock.

## Effect FISH-2: Increases in Sedimentation, Suspended Sediments, and Turbidity during Construction

Effect FISH-2, as described above under Alternative 2A, has the potential to occur under Alternative
3A, though construction of setback and adjacent levees would have a significantly lower likelihood
of disturbing soils near the water because most of the work would be implemented on the landside
of the existing levee. Potential increases in suspended solids and turbidity would be considered a
significant effect, but implementation of Mitigation Measures WQ-MM-1 and FISH-MM-1 would
reduce the effect to a level that is less than significant.

#### 26 Effect FISH-3: Spillage and Leakage of Contaminants during Construction

- As described under Alternative 2A, accidental spillage or leakage of contaminants could kill or injure
  fish populations in the program area. However, the likelihood of contaminants entering waterways
  under Alternative 3A is much lower than under Alternative 2A because most of the work would be
- 30 implemented on the landside of the existing levee. Effects related to the spillage and leakage of
- 31 contaminants either directly or indirectly into adjacent waters would be considered significant, but
- 32 would be adequately mitigated to a level that is less than significant by implementing Mitigation
- 33 Measures WQ-MM-2 and FISH-MM-1.

### **1 11.5.1.4** Alternative 4A—Habitat Replacement (Preferred Alternative)

## 2 Effect FISH-1: Short-Term Effects of Rock Placement into Nearshore Aquatic Habitat during 3 Construction

- 4 Effect FISH-1, as described under Alternative 2A, has the potential to occur under Alternative 4A, but
- 5 to a lesser extent because Alternative 4A calls for less rock placement than Alternative 2A. The
- 6 short-term effect of rock placement would be significant for salmonids, steelhead, delta smelt,
- 7 longfin smelt, and Sacramento splittail, but would be adequately mitigated to a level that is less than
- 8 significant by implementation of Mitigation Measure FISH-MM-1.

## 9 Effect FISH-2: Increases in Sedimentation, Suspended Sediments, and Turbidity during 10 Construction

- 11 Effect FISH-2, as described under Alternative 2A, has the potential to occur under Alternative 4A, but
- 12 to a lesser extent because Alternative 4A calls for less work in and near the water than Alternative
- 13 2A. Effects related to increases in sedimentation, suspended solids, and turbidity are considered
- 14 significant but would be adequately mitigated to a level that is less than significant by implementing
- 15 Mitigation Measures WQ-MM-1 and FISH-MM-1.

#### 16 Effect FISH-3: Spillage and Leakage of Contaminants during Construction

- 17 Effect FISH-3, as described under Alternative 2A, has the potential to occur under Alternative 4A, but
- 18 to a lesser extent because Alternative 4A calls for less work in and near the water than Alternative
- 19 2A. Effects related to spillage and leakage of contaminants into adjacent waterways are considered
- 20 significant but would be adequately mitigated to a level that is less than significant by implementing
  21 Mitigation Measures WO, MM, 2 and FISH, MM, 1
- 21 Mitigation Measures WQ-MM-2 and FISH-MM-1.

# 11.5.1.5 Alternative 5A—Habitat Replacement Reaching Environmental Neutrality

## Effect FISH-1: Short-Term Effects of Rock Placement into Nearshore Aquatic Habitat during Construction

- 26 Effect FISH-1, as described under Alternative 2A, has the potential to occur under Alternative 5A, but
- 27 to a lesser extent because Alternative 5A calls for less rock placement than Alternative 2A. The
- 28 short-term effect of rock placement would be significant for salmonids, steelhead, delta smelt,
- 29 longfin smelt, and Sacramento splittail, but would be adequately mitigated to a level that is less than
- 30 significant by implementation of Mitigation Measure FISH-MM-1.

# Effect FISH-2: Increases in Sedimentation, Suspended Sediments, and Turbidity during Construction

- 33 Effect FISH-2, as described under Alternative 2A, has the potential to occur under Alternative 5A, but
- 34 to a lesser extent because Alternative 5A calls for less work in and near the water than Alternative
- 35 2A. Effects related to increases in sedimentation, suspended solids, and turbidity are considered
- 36 significant but would be adequately mitigated to a level that is less than significant by implementing
- 37 Mitigation Measures WQ-MM-1 and FISH-MM-1.

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Focus Fish Species and Water Year	Adult migration	Spawning and egg (6) incubation	Fry and juvenile rearing	Juvenile migration	Adult residence	Adult migration	Spawning and egg incubation	Fry and juvenile rearing	Juvenile migration	Adult residence	Adult migration	Spawning and egg incubation	Fry and juvenile rearing	Juvenile migration	Adult residence	Adult migration	Spawning and egg incubation	juvenile juvenile rearing	Juvenile migration	Adult residence
2013 2014 2015 2017 2018 2028 2038 2063 2070 Fall-run Chin	0 -638 -639 -635 -633 -539 -489 -491 -493 nook	0 0 0 0 0 0 0 0 0 0	0 -12 -12 -9 -8 -1 -17 -34 -33	0 0 3 12 16 41 48 60 62		0 -630 -629 -625 -623 -534 -474 -455 -458	0 0 0 0 0 0 0 0 0	0 52 155 277 328 561 578 573 576	0 -209 -84 60 125 533 490 255 246		0 -636 -632 -629 -544 -496 -489 -490	0 0 0 0 0 0 0 0 0 0	0 82 236 420 500 829 849 843 843	0 -222 -91 65 138 573 513 238 227		0 -645 -648 -651 -652 -563 -512 -508 -508	0 0 0 0 0 0 0 0	0 -13 -9 -9 -8 -1 -17 -35 -33	0 -4 -5 -3 15 23 41 46	
2013 2014 2015 2017 2018 2028 2038 2063 2063 2070 Late fall-rur	0 -638 -639 -635 -633 -539 -489 -491 -493 Chinoo	0 0 0 0 0 0 0 0 0 0 0 0 k	0 -12 -13 -13 -13 -8 -20 -32 -30	0 0 3 12 16 36 35 26 24		0 0 0 0 2 6 17 19	0 0 0 0 0 0 0 0 0	0 52 155 277 328 561 578 573 576	0 -209 -84 60 125 533 490 255 246		0 -636 -632 -629 -546 -502 -506 -510		0 107 257 438 518 847 912 969 978	0 -222 -91 65 138 560 487 181 163		0 -645 -648 -651 -652 -563 -512 -508 -508		0 0 1 4 5 9 9 9 16 18	0 0 3 12 16 36 35 26 24	
2013 2014 2015 2017 2018 2028 2038 2063 2070 Winter-run C	0 -638 -639 -635 -633 -539 -489 -491 -493 Chinook		0 0 0 2 6 18 21	0 -190 -191 -185 -183 -38 -38 -32 -125 -127		0 -630 -629 -625 -623 -534 -474 -455 -458		0 0 0 5 11 26 29	0 -209 -84 60 125 533 490 255 246		0 -636 -632 -629 -544 -496 -489 -490		0 82 236 420 500 829 849 843 843	0 102 225 378 450 739 792 819 821				0 0 0 2 6 18 21	0 0 3 12 16 36 35 26 24	
2013 2014 2015 2017 2018 2028 2038 2063 2070	0 -638 -639 -635 -633 -539 -489 -491 -493		0 -12 -9 -8 -1 -17 -34 -33	0 -190 -191 -185 -183 -38 -32 -125 -125 -127		0 -629 -625 -623 -534 -474 -455 -458		0 52 155 277 328 561 578 573 576	0 -209 -84 60 125 533 490 255 246		0 -636 -632 -629 -544 -496 -489 -490		0 82 236 420 500 829 849 843 849	0 -222 -91 65 138 573 513 238 227		0 -645 -648 -651 -652 -563 -512 -508 -508		0 -13 -9 -9 -8 -1 -17 -35 -33	0 -179 -178 -174 -172 1 39 -50 -57	
2013 2014 2015 2017 2018 2028 2028 2028 2038 2063 2070	0 -557 -559 -550 -545 -355 -249 -255 -263	0 0 0 0 0 0 0 0 0 0	0 -36 -31 -29 -9 -32 -69 -68	0 -292 -296 -290 -286 -153 -142 -221 -222	0 -557 -559 -545 -355 -249 -255 -263	0 -541 -540 -531 -526 -346 -225 -194 -201	0 0 0 0 0 0 0 0 0	0 44 176 330 398 715 733 708 710	0 -299 -185 -59 0 370 355 179 171	0 -541 -531 -526 -346 -225 -194 -201	0 -553 -545 -545 -539 -365 -261 -254 -260	0 0 0 0 0 0 0 0 0	0 68 244 454 548 951 965 930 935	0 -309 -192 -56 8 392 362 155 146	0 -553 -553 -545 -539 -365 -261 -254 -254 -260	0 -570 -576 -581 -582 -401 -294 -290 -293		0 -38 -36 -31 -29 -9 -32 -69 -69	0 -299 -289 -285 -154 -150 -246 -250	0 -570 -576 -581 -582 -401 -294 -290 -293
Delta Smelt 2013 2014 2015 2017 2018 2028 2038 2063 2070	0 0 0 0 0 0 0 0 0 0				0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0	0 148 310 501 587 939 1,016 1,077 1,084	0 131 281 464 546 880 951 1,023 1,037		0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0	0 148 310 501 587 938 1,014 1,075 1,083	0 131 281 464 546 878 949 1,021 1,036		0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 -9 -15 -22 -24 -18 -10 12 16	0 0 4 20 28 52 57 74 80		0 0 0 0 0 0 0 0 0
2013 2014 2015 2017 2018 2028 2028 2028 2038 2063 2070			0 -660 -691 -701 -597 -504 -396 -367	0 0 0 0 0 0 0 0 0	0 -665 -663 -657 -611 -553 -528 -530	0 0 0 0 0 0 0 0 0		0 -660 -691 -701 -604 -513 -407 -379	0 0 0 0 0 0 0 0 0	0 -665 -663 -657 -657 -557 -476 -431 -430	0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0	0 -660 -691 -701 -604 -513 -407 -379	0 0 0 0 0 0 0 0 0	0 -665 -663 -657 -657 -557 -476 -431 -430	0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0	0 -668 -681 -720 -738 -649 -555 -434 -401	0 0 0 0 0 0 0 0 0 0	0 -679 -715 -724 -677 -604 -556 -554
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Figure 11-3 Alternative 3 SAM results showing bank-line weighted relative response (feet) within all regions combined



					<u>,                                     </u>		/			<u>,                                     </u>			() 4							
Focus Fish Species and Water Year	Adult migration	Spawning and egg incubation	Fry and juvenile rearing	Juvenile migration	Adult residence	Adult migration	Spawning and egg incubation	Fry and juvenile rearing	Juvenile migration	Adult residence	Adult migration	Spawning and egg incubation 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600106 600100000000	Fry and juvenile rearing	Juvenile migration	Adult residence	Adult migration	Spawning and egg incubation	juvenile jevenile rearing	Juvenile migration	Adult residence
2013 2014 2015 2017 2018 2028 2038 2038 2063 2070	0 -663 -674 -706 -764 -1,074 -745 -319 -266	0 0 0 0 0 0 0 0 0	0 -18 -21 -24 -38 -71 131 345 373	0 -20 -28 -60 -131 -238 -23 181 204		0 -582 -556 -565 -586 -379 -154 115 147	0 0 0 0 0 0 0 0 0	0 102 232 363 415 978 1,413 1,941 2,008	0 -97 88 237 278 1,412 2,380 3,404 3,531		0 -594 -570 -577 -599 -367 38 490 546	0 0 0 0 0 0 0 0 0 0 0	0 122 503 585 1,386 2,116 2,839 2,928	0 -118 75 245 294 1,580 2,673 3,620 3,733		0 -795 -898 -1,089 -1,162 -1,241 -846 -369 -310	0 0 0 0 0 0 0 0 0 0 0	0 -66 -98 -160 -184 -132 94 327 357	0 -160 -275 -486 -563 -396 -117 133 163	
2013 2014 2015 2017 2018 2028 2038 2063 2070 Late fall-run	0 -663 -674 -706 -764 -1,036 -702 -274 -220 Chinool		0 -18 -22 -28 -43 -43 -86 96 289 314	0 0 3 12 16 117 204 275 283		0 -3 -36 -91 -280 -262 -213 -207	0 0 0 0 0 0 0 0 0	0 102 232 363 415 978 1,413 1,941 2,008	0 -97 88 237 278 1,412 2,380 3,404 3,531		0 -586 -559 -535 -500 -113 222 575 618		0 94 239 412 468 787 1,028 1,262 1,291	0 -101 97 315 475 1,871 2,784 3,565 3,658		0 -795 -898 -1,089 -1,162 -1,241 -846 -369 -310		0 -53 -80 -128 -144 -116 -21 77 90	0 -15 -27 -48 -59 88 187 267 275	
2013 2014 2015 2017 2018 2028 2038 2063 2070 Winter-run C	0 -663 -674 -706 -764 -961 -624 -204 -152 chinook		0 -12 -18 -27 -43 -81 -18 49 58	0 -200 -207 -230 -295 -124 463 1,000 1,064		0 -582 -556 -565 -589 -404 -187 74 106		0 -3 -4 -14 -37 -42 33 135 148	0 -97 88 237 272 1,408 2,333 3,300 3,420		0 -594 -570 -577 -602 -356 34 466 519		0 122 503 583 1,383 2,075 2,758 2,842	0 102 225 378 450 586 642 681 684				0 -49 -72 -113 -126 -107 -34 41 51	0 -15 -27 -48 -59 88 187 267 275	
2013 2014 2015 2017 2018 2028 2038 2038 2063 2070	0 -663 -674 -706 -764 -959 -616 -189 -136		0 -18 -21 -24 -38 -21 188 405 433	0 -200 -207 -230 -295 -124 469 1,012 1,078		0 -582 -556 -565 -586 -379 -154 115 147		0 102 232 363 415 989 1,410 1,913 1,977	0 -97 88 237 278 1,468 2,417 3,407 3,529		0 -594 -570 -577 -599 -329 71 513 568		0 122 503 585 1,403 2,112 2,810 2,897	0 -118 75 245 294 1,633 2,714 3,647 3,759		0 -776 -862 -1,017 -1,073 -1,079 -688 -226 -168		0 -56 -79 -125 -141 -60 164 393 423	0 -210 -189 -175 -174 -11 301 584 619	
2013 2014 2015 2017 2018 2028 2038 2063 2070 Delta Smelt	0 -604 -625 -687 -800 -1,418 -943 -375 -305	0 0 0 0 0 0 0 0 0	0 -40 -43 -49 -72 -101 257 633 680	0 -312 -322 -342 -395 -437 136 690 758	0 -604 -625 -687 -800 -1,418 -943 -375 -305	0 -448 -396 -412 -453 -90 351 868 933	0 0 0 0 0 0 0 0 0	0 118 292 460 528 1,328 1,929 2,636 2,727	0 -203 -36 105 156 1,067 1,808 2,614 2,715	0 -448 -396 -412 -453 -90 351 868 933	0 -469 -421 -434 -476 -25 657 1,352 1,439	0 0 0 0 0 0 0 0 0 0	0 132 348 580 674 1,737 2,690 3,627 3,744	0 -222 -53 105 160 1,205 2,122 2,946 3,047	0 -469 -421 -434 -476 -25 657 1,352 1,439	0 -855 -1,053 -1,410 -1,544 -1,724 -1,724 -1,125 -467 -386		0 -112 -260 -300 -193 200 605 656	0 -349 -352 -385 -407 -156 310 742 795	0 -855 -1,053 -1,410 -1,544 -1,724 -1,724 -1,125 -467 -386
2013 2014 2015 2017 2018 2028 2038 2063 2070 Green Sturgo	0 0 0 0 0 0 0 0 0 0 0				0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0	0 161 330 460 413 -105 -228 -326 -339	0 144 300 422 381 97 21 -44 -52		0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0	0 161 330 460 413 -107 -231 -330 -343	0 144 300 422 381 96 20 -46 -54		0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0	0 -171 -323 -612 -723 -661 -593 -544 -539	0 -137 -255 -471 -548 -421 -364 -327 -323		0 0 0 0 0 0 0 0
2013 2014 2015 2017 2018 2028 2038 2063 2070			0 -560 -504 -470 -473 883 1,337 1,633 1,667	0 0 0 0 0 0 0 0 0	0 -681 -687 -688 -686 -714 -720 -726 -728	0 0 0 0 0 0 0 0 0		0 -522 -446 -404 -368 1,206 1,694 2,013 2,051	0 0 0 0 0 0 0 0 0	0 -861 -957 -1,039 -1,131 -2,771 -3,256 -3,623 -3,667	0 0 0 0 0 0 0 0 0 0 0	0 0 -4 -12 514 686 816 832	0 -522 -446 -404 -368 1,206 1,694 2,013 2,051	0 0 0 0 0 0 0 0 0	0 -861 -957 -1,039 -1,131 -2,771 -3,256 -3,623 -3,667	0 0 0 0 0 0 0 0 0	0 74 149 298 376 745 825 884 891	0 -245 -42 336 524 1,513 1,716 1,823 1,835	0 0 0 0 0 0 0 0 0	0 -774 -852 -994 -1,043 -1,188 -1,217 -1,241 -1,244
																N > 5 5 > > >	lot Analy 50% Gr 25%-50 10%-25 %-10% 5% Diffe %-10% 10%-25 25%-50 50% Le	vzed eater % Grea % Greater erent Less % Less % Less % Ss	ter ter	

Figure 11-4 Alternative 4 SAM results showing bank-line weighted relative response (feet) within all regions combined



#### 1 Effect FISH-3: Spillage and Leakage of Contaminants during Construction

2 Effect FISH-3, as described under Alternative 2A, has the potential to occur under Alternative 5A, but

3 to a lesser extent because Alternative 5A calls for less work in and near the water than Alternative

4 2A. Effects related to spillage and leakage of contaminants into adjacent waterways are considered

5 significant but would be adequately mitigated to a level that is less than significant by implementing

6 Mitigation Measures WQ-MM-2 and FISH-MM-1.

## 7 **11.5.1.6** Alternative 6A—Habitat Replacement with Vegetation ETL Variance

# 8 FISH-1: Short-Term Effects of Rock Placement into Nearshore Aquatic Habitat during 9 Construction

10 Effect FISH-1, as described under Alternative 2A, has the potential to occur under Alternative 6A, but

11 to a lesser extent because Alternative 6A calls for less rock placement than Alternative 2A. The

12 short-term effect of rock placement would be significant for salmonids, steelhead, delta smelt,

13 longfin smelt, and Sacramento splittail, but would be adequately mitigated to a level that is less than

14 significant by implementation of Mitigation Measure FISH-MM-1.

# Effect FISH-2: Increases in Sedimentation, Suspended Sediments, and Turbidity during Construction

- 17 Effect FISH-2, as described under Alternative 2A, has the potential to occur under Alternative 6A, but
- 18 to a lesser extent because Alternative 6A calls for less work in and near the water than Alternative
- 19 2A. Effects related to increases in sedimentation, suspended solids, and turbidity are considered
- significant but would be adequately mitigated to a level that is less than significant by implementing
- 21 Mitigation Measures WQ-MM-1 and FISH-MM-1.

#### 22 Effect FISH-3: Spillage and Leakage of Contaminants during Construction

23 Effect FISH-3, as described under Alternative 2A, has the potential to occur under Alternative 6A, but

- 24 to a lesser extent because Alternative 6A calls for less work in and near the water than Alternative
- 25 2A. Effects related to spillage and leakage of contaminants into adjacent waterways are considered
- significant but would be adequately mitigated to a level that is less than significant by implementing
- 27 Mitigation Measures WQ-MM-2 and FISH-MM-1.

## **11.5.2 Long-Term Effects**

## 29 **11.5.2.1** Alternative 1—No Action

30 As described in Chapter 2, under the No Action Alternative regular operation and maintenance

31 (0&M) of the levee system would continue as presently executed by the local maintaining entities

- 32 (subject to revision of the governing O&M manual), but the Corps would not implement bank
- 33 protection along SRFCP levees. The result is likely to be the continued gradual or sporadic loss of
- remnant floodplain (berm) and the riparian vegetation it supports. The SAM results reflect these
- 35 changes over time as a result of gradual changes to bank slope, vegetation, and instream structure
- 36 (Figure 11-1, plus Figures F-1 through F-4 in Appendix F). However, in addition to gradual losses,
- 37 the erosion could ultimately encroach into the cross-section of the levee foundation, creating critical
- 38 erosion sites. It is possible that federal, state or local flood control agencies would eventually

1 implement bank protection at various sites along SRFCP levees through emergency action. The SAM

- 2 results do not take this potential emergency action into account. In any case, the risk of levee failure
- 3 and possibly catastrophic flooding would increase substantially as more erosion sites become
- 4 critical and repair is limited to emergency response. Continued erosion prior to the federal or state
- 5 action would result in short- and long-term losses of valuable habitat. Although some erosion is
- 6 natural, the channelization of program reaches increases erosive forces.

### 7 11.5.2.2 Alternative 2A—Low Maintenance

#### 8 Effect FISH-4: Long-Term Effects on Fish from Loss of Habitat

9 Alternative 2A would have long-term effects on the habitat of listed fish species, including alteration 10 of river hydraulics, instream and overhead cover, and substrate conditions along the seasonal low-11 and high-flow shorelines of the erosion sites. Long-term changes in nearshore habitat are expected 12 to have adverse effects on all special-status fish species. The SAM results indicate moderate to 13 substantial deficits for all species in all seasons with the exception of minor increases for green 14 sturgeon spawning and egg incubation in spring and summer (Figure 11-2, plus Figures F-5 through 15 F-8 in Appendix F). The deficits are generally consistent across all regions, and become more negative over time, with the largest deficits occurring in Year 50. 16

- These deficits reflect the reduction in nearshore habitat value due to permanent removal of
  instream structure and riparian vegetation throughout all regions during construction. Because of
  the absence of any vegetation, benches, or IWM in the applied Bank Protection Measure 2: Bank Fill
  Stone Protection with No On-Site Woody Vegetation, the SAM results indicate there would be no
  recovery during the analysis period.
- While the SAM analysis does not analyze effects on spawning habitat for salmon and steelhead,
   implementation of Alternative 2A could result in the loss of suitable spawning habitat.
- The increase in bank substrate size and reduced shallow water habitat, instream structure, and
  shade, as well as the potential loss of spawning habitat, would result in a significant effect.
  Implementation of Mitigation Measures FISH-MM-2, FISH-MM-3, and VEG-MM-1: Compensate for
  the Loss of Woody Riparian Habitat (see Chapter 10, Vegetation and Wetlands) would reduce the
  effect on fish species in the area over time. Depending on the extent of the loss, implementation of
  FISH-MM-2, and VEG\_MM-1 may reduce but not fully compensate for effects; therefore, the effect
  would remain significant and unavoidable.
- 31 Mitigation Measure FISH-MM-2: Compensate for Loss of Fish Habitat
- Both on-site and off-site compensation can be used to compensate for the loss of fish habitat (note that only off-site compensation would occur under Alternative 2 because on-site compensation is excluded by the Alternative 2 definition). On-site compensation may include various riparian bench designs, including shallow bench slope designs and/or undulating riparian benches. The riparian benches shall be seasonally inundated during winter and spring high flows. Where no riparian benches will be constructed, bank slope repairs shall be planted with riparian vegetation in accordance with the Vegetation ETL.
- IWM and fascines shall be installed at erosion sites with Bank Protection Measures 4a, 4b, and
   40 4c to retain and enhance the structural habitat and hydraulic complexity of the nearshore zones
   relative to existing conditions. The key objective is to provide essential shaded riverine aquatic

	F	all (Sept	ember-N	ovember	.)	W	/inter (De	ecember-	-February	/)		Spring	g (March-	-May)			Summe	r (June–/	∖ugust)	
Focus Fish	- د	g n		_	e	ſ	g Dn		_	ė	_	g n		۲	ė	_	g N			é
Species and	atio	vnin egg aatic	ile Jg	ation	enc	ation	vnin egg batic	ile Jg	ation	enc	ation	vnin egg batic	nie Jg	ation	enc	ation	vnin egg batic	nie Jg	nile	enc
vvater year	dult nigra	pav nd ∉ icub	ry a Iver earii	uve	dult ssid	dult	pav nd e icub	ry a iver earii	uve	dult ssid	dult	pav nd ∉	ry a iver earii	uve	dult	dult	pav nd e	ry a Iver earii	uve	dult ssid
Spring-run Chi	_	n'a S	ш. Э. Б.	-5 E	A R	ΥĽ	n n	ш. Э. В.	-5 E	A 3	ΥĽ	⊐. a N	T J R	-5 E	₹ ₹	ΥĽ	ິສັດ	н . , я	-5 E	A 3
2013	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0	
2014	-648	0	-24	-20		-615	0	60	-190		-626	0	81	-210	ĺ	-638	0	-35	-58	
2015	-653	0	-30	-28		-606	0	169	-55		-619	0	237	-70		-615	0	-32	-72	
2017	-613	0	-21	-24		-556	0	323	193		-567	0	457	196		-578	0	-27	-97	
2018	-504	0	-9 76	255		-491		424	422 2 110		-501	0	1 538	2 243		-564	0	-30	218	
2038	-241	0	268	504		159	0	1,543	2,951		273	0	2,183	3,174		-265	0	262	482	
2063	109	0	464	728		395	0	2,004	3,826		648	0	2,821	3,986		96	0	462	716	
2070	156	0	490	754		426	0	2,065	3,954		697	0	2,904	4,106		145	0	488	744	
Fall-run Chinoc	ок Г о	0		0		0		0	0		0		0	0		0		0	0	
2013	-648	0	-24	0		-3	0	60	-190	r	-618		94	-193	-	-638		-27	-4	
2015	-653	0	-31	3		-5	0	169	-55		-608		239	-48		-615		-29	-5	
2017	-613	0	-25	12		-5	0	323	193		-557		424	212		-578		-34	-5	
2018	-554	0	-14	16		-2	0	424	422		-494		513	441		-584		-37	-4	
2028	-478	0	51 221	187		5	0	1,146	2,110		-102		991	1,926		-554		26	180	
2038	-196	0	395	373		43	0	2.004	3.826		445		1,242	3.277		-205		207	371	
2070	201	0	418	382		109	0	2,065	3,954		483		1,508	3,374		145		219	380	
Late fall-run C	hinook			- 1				-										_		
2013	0		0	0		0		0	100		0		0	102				0	0	
2014	-648		-12	-209		-615		-3 -4	-190		-620		237	225				-24	-4	
2010	-613		-21	-171		-556		-3	193		-567		457	378				-25	-5	
2018	-554		-21	-102		-494		1	416		-504		588	450				-26	-4	
2028	-403		21	571		-82		103	2,106		-57		1,534	699				22	180	
2038	-120		88	1,116		126		187	2,904		269		2,143	782				89	286	
2063	223		157	1,600		300		288	3,722		669		2,739	848				157	371	
Winter-run Chi	nook			.,					0,012				_,	0.0						
2013	0		0	0		0		0	0		0		0	0		0		0	0	
2014	-648		-24	-209		-615		60	-190		-626		81	-210		-620		-26	-110	
2015	-653		-30	-220		-606		169	-55		-619		237	-70		-5/8		-13	-44	
2017	-554		-21	-102		-491		424	422		-507		590	436		-495		13	102	
2028	-401		126	571		-56		1,158	2,166		-30		1,555	2,296		-392		136	326	
2038	-112		326	1,122		159		1,538	2,988		306		2,180	3,215		-107		332	607	
2063	238		525 551	1,612	_	395		1,977	3,828		670 718		2,792	4,013		240		528 554	878	
Steelhead	204		001	1,070		420		2,000	0,002		110		2,071	,101		207		004	0/0	
2013	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0
2014	-574	0	-54	-311	-574	-512	0	57	-271	-512	-531	0	70	-288	-531	-545		-62	-250	-545
2015	-584	0	-62	-323	-584	-495	0	198	-141	-495	-517	0	252	-156	-517	-493		-50	-203	-493
2017	-385	0	-43	-278	-385	-394	0	548	271	-394	-415	0	690	277	-415	-405		-31	-122	-403
2028	-296	0	150	162	-296	547	0	1,609	1,654	547	584	0	1,989	1,753	584	-352		140	176	-352
2038	138	0	473	653	138	978	0	2,154	2,298	978	1,185	0	2,822	2,520	1,185	105		469	528	105
2063	638 703	0	806	1,124	638 703	1,448	0	2,763	2,976	1,448	1,787	0	3,627	3,211	1,787	620		803	858	620
Delta Smelt	703	0	0+0	1,100	703	1,505	0	2,072	5,074	1,503	1,007	0	0,700	3,311	1,007	003		0+0	300	003
2013	0				0	0	0	0		0	0	0	0		0	0	0	0		0
2014	0				0	0	161	144		0	0	161	144		0	0	-52	-18		0
2015	0				0	0	330	300		0	0	330	300		0	0	-85	-16		0
2018	0				0	0	619	587		0	0	619	400 587		0	0	-147 -178	-5 _2		0
2028	0				0	0	850	1,051		0	0	849	1,051		0	0	122	361		0
2038	0				0	0	885	1,135		0	0	885	1,135		0	0	238	465		0
2063	0				0	0	907	1,188		0	0	906	1,188		0	0	320	537		0
2070 Green Sturgeo	0 n				0	0	908	1,195		0	0	907	1,195		U	0	330	546		0
2013			0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
2014			-661	0	-665	0		-669	0	-747	0	0	-669	0	-747	0	82	-304	0	-621
2015			-653	0	-664	0		-665	0	-786	0	0	-665	0	-786	0	164	65	0	-576
2017			-509	0	-619	0		-571	0	-848 -062	0	0	-571	0	-848	0	327	/61 1 022	0	-499
2018			1,474	0	-449	0		1,287	0	-2,647	0	551	1,287	0	-2.647	0	789	2,183	0	-488
2038			2,006	0	-438	0		1,810	0	-3,124	0	728	1,810	0	-3,124	0	872	2,432	0	-497
2063			2,381	0	-434	0		2,179	0	-3,487	0	862	2,179	0	-3,487	0	933	2,593	0	-507
2070			2,426	0	-434	0		2,224	0	-3,532	0	878	2,224	0	-3,532	0	940	2,614	0	-509

 Not Analyzed

 >50% Greater

 >25%-50% Greater

 >10%-25% Greater

 5%-10% Greater

 5% Different

 5%-10% Less

 >25%-50% Less

 >50% Less

Figure 11-5 Alternative 5 SAM results showing bank-line weighted relative response (feet) within all regions combined



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1 (SRA) habitat and velocity refuge opportunities for rearing juveniles. Woody materials shall be 2 installed in accordance with the Vegetation ETL. All installed IWM shall consist of hardwood 3 tree species (e.g., English walnut, almond) that span approximately 15–20 feet in length and 4 retain an extensive branch and root structure. IWM shall be securely anchored under rock 5 revetment at the front edge of the riparian bench or bank toe for both high water winter and 6 spring habitat and for low water summer and fall aquatic habitat. The required specifications for 7 installation of IWM and planting of riparian trees shall be clearly identified in final construction 8 drawings and construction contracts.

9 Off-site compensation may include the purchase of appropriate third-party mitigation bank 10 credits or will utilize one of five potential measures listed below: setback levees, IWM 11 installation, shallow bank slope construction, riparian planting, and rock removal. The site 12 lengths and/or area per compensation measure necessary to offset long- term habitat losses in 13 each region will be determined during the site-specific analyses, including site-specific SAM 14 analyses, to be conducted during program implementation.

- 151. The setback levee measure entails breaching or degrading the existing river bank levee and16constructing a setback levee some distance landward from the shoreline to restore a17seasonally inundated floodplain between the existing levee and newly constructed setback18levee. Benefits stem from the expected decrease in bank substrate size, IWM installation and19revegetation on the restored floodplain, and from the increase in winter- and spring-time20instream and overhead cover.
  - 2. The IWM installation measure simply entails adding woody materials to the banks of the identified compensation sites to provide year-round instream structure. This measure potentially benefits adult, juvenile, and smolt habitat conditions during the modeled time period.
  - 3. Construction of a shallow bank slope (>3:1) at a compensation site would increase available shallow water habitat, potentially offering improved habitat conditions for juveniles and smolts.
  - 4. Planting riparian vegetation along the shoreline of a compensation site would provide shade and improve habitat conditions primarily for juveniles and smolts, but for other life stages as well.
- Removing rock improves substrate conditions by reducing substrate size and possibly by
   allowing natural processes, such as erosion and regeneration of vegetation, to occur. This
   would improve conditions for most life stages, but for juveniles and smolts in particular.

#### 34 Mitigation Measure FISH-MM-3: Compensate for Loss of Spawning Habitat

35 A compensatory replacement program shall be implemented for the loss of suitable Chinook 36 salmon and steelhead spawning habitat at erosion sites on affected rivers. The compensatory 37 replacement program shall result in addition of spawning-size gravel in an amount suitable to 38 account for replacement of the spawning habitat lost by the project. The augmentation of 39 spawning-size gravel shall account for both the actual area lost to each revetment structure 40 footprint and the loss of the steelhead spawning that would potentially occur during the 41 season(s) that the revetments are built. An appropriate replacement ratio shall be determined 42 under consultation with the appropriate natural resource agencies. The location, volume, and 43 design for mitigation gravel shall be selected in close coordination with qualified experts (e.g.,

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fish biologist, geomorphologist). Mitigation may be on-site or off-site, including participation in larger gravel augmentation projects (e.g., U.S. Bureau of Reclamation efforts). The appropriate gravel augmentation approach shall be agreed upon by the project proponents and regulating natural resource agencies prior to construction. Implementation shall include appropriate monitoring for success based on success criteria.

# 6 11.5.2.3 Alternative 3A—Maximize Meander Zone (Environmentally 7 Superior Alternative)

#### 8 Effect FISH-4: Long-Term Effects on Fish from Loss of Habitat

9 Alternative 3A would have long-term effects on the habitat of listed fish species, including alteration
 10 of river hydraulics, instream and overhead cover, and substrate conditions along the seasonal low 11 and high-flow shorelines of the erosion sites.

12 Alternative 3A applies either Bank Protection Measure 1: Setback Levee or Bank Protection Measure 13 3: Adjacent Levee to all sites. Both of these bank protection measures are generally considered 14 protective of fish habitat. Additionally, Bank Protection Measure 1 would create new floodplain 15 habitat that could provide additional benefits for fish. The SAM results for Alternative 3A reflect the 16 different assumptions of the potential bank protection measures (Figure 11-3, plus Figures F-9 17 through F-12 in Appendix F). In all regions, the Alternative 3A results during the fall and summer 18 solely reflect changes because of erosion, which was assumed to occur at a similar rate as has been 19 observed historically. Differences in winter and spring were driven mostly by the extent of setback 20 levees in a given reach.

In Region 1a, the SAM results show little difference in summer and fall because there were relatively
few sites that had exhibited erosion (Appendix F, Figure F-9). In winter and spring, there was
appreciably more habitat value for life stages benefitting from floodplain inundation (primarily
Chinook salmon fry/juvenile rearing) because a relatively high proportion of the total length of sites
(more than 9,000 feet of 28,300 total feet, or 32%) was assumed to have setback levees constructed.

In Region 1b, only 3% (less than 400 feet of a total of 11,000 feet) of the total bank protection
measures were assumed to be setback levees, with the result that there was little difference (less
than 5%) between baseline and Alternative 3A SAM results in any season for all species and life
stages (Appendix F, Figure F-10).

30 In Region 2, the SAM results reflect a complex interaction of assumed species sensitivities to bank 31 features combined with erosion rates at a number of sites that resulted in habitat change (Appendix 32 F, Figure F-11). Thus, for example, the fry/juvenile rearing habitat value for green sturgeon 33 decreased over time because SAM does not assume that this life stage derives any benefit from 34 floodplain availability. In addition, the general pattern of change at eroding sites involved less shade 35 and instream woody material, both of which SAM assumed to have value for this life stage. Chinook 36 salmon fry/juvenile rearing is assumed to benefit greatly from floodplain inundation. The SAM 37 results for Region 2 showed a 5–10% increase in habitat value in the spring and winter by 2028 38 because more than 20% of total site length was assumed to have setback levees applied. However, 39 the increase was neutralized by 2070 through the assumed erosional loss of other functional 40 riparian habitat, such as shade. Trends for juvenile Chinook salmon migration were similar to those 41 of fry/juvenile rearing, but with no increase because the apparent trade-off in floodplain gain to 42 erosional loss of shade is balanced more towards to the latter.
	F	all (Sept	ember-N	ovember	) ]	W	'inter (De	cember-	-Februar	v)		Spring	(March-	May)			Summe	r (June–4	August)	
Focus Fish Species and Water Year	Adult migration	Spawning and egg incubation	Fry and juvenile rearing	Juvenile migration	Adult residence	Adult migration	Spawning and egg incubation	Fry and juvenile rearing	Juvenile migration	Adult residence	Adult migration Spawning	and egg incubation	Fry and juvenile rearing	Juvenile migration	Adult residence	Adult migration	spawning and egg incubation	Fry and juvenile rearing	Juvenile migration	Adult residence
2013 2014 2015 2017 2018 2028 2028 2038 2063 2070 Fall-run Chino	0 -716 -781 -887 -983 -1,366 -757 -11 82 pok	0 0 0 0 0 0 0 0 0 0	0 -70 -139 -169 -172 4 588 1,161 1,232	0 123 193 424 576 1,922 2,877 3,712 3,814		0 -580 -552 -554 -560 -180 121 469 513	0 0 0 0 0 0 0 0 0	0 59 122 252 327 1,240 1,811 2,463 2,547	0 -107 69 352 501 2,765 4,135 5,516 5,688		0 -633 -643 -677 -705 -315 276 935 1,017	0 0 0 0 0 0 0 0 0	0 -21 -17 96 153 1,173 2,156 3,125 3,245	0 -212 -115 101 202 2,400 3,926 5,248 5,409		0 -995 -1,167 -1,458 -1,567 -1,606 -901 -83 20	0 0 0 0 0 0 0 0 0	0 -439 -551 -626 -629 -174 481 1,108 1,185	0 -552 -618 -465 -281 1,608 2,689 3,617 3,732	
2013 2014 2015 2017 2018 2028 2038 2063 2070 Late fall-run	0 -716 -887 -983 -1,328 -713 33 128 Chinook	0 0 0 0 0 0 0 0	0 -18 -22 -28 -37 -34 189 420 450	0 143 224 496 698 2,029 2,774 3,409 3,487		0 -3 -5 -36 -83 -210 -178 -177 -110	0 0 0 0 0 0 0 0	0 59 122 252 327 1,240 1,811 2,463 2,547	0 -107 69 351 501 2,765 4,135 5,515 5,688		0 -625 -632 -635 -614 -130 368 907 974		0 -49 -80 6 36 574 1,069 1,548 1,608	0 -195 -93 171 353 2,454 3,742 4,853 4,988		0 -995 -1,167 -1,458 -1,567 -1,606 -901 -83 20		0 -426 -533 -594 -589 -158 365 857 918	0 -418 -391 -65 168 1,837 2,659 3,352 3,437	
2013 2014 2015 2017 2018 2028 2038 2063 2070 Winter-run Ch	0 -716 -781 -887 -983 -1,253 -636 104 196 hinook		0 -12 -18 -27 -37 -29 75 181 194	0 -57 14 254 412 2,036 3,363 4,531 4,674		0 -580 -552 -554 -563 -205 88 428 472		0 -3 -4 -14 -28 44 141 262 278	0 -107 69 352 2,761 4,088 5,412 5,577		0 -633 -643 -677 -708 -304 272 911 990		0 -21 -17 96 151 1,170 2,115 3,044 3,159	0 8 35 234 328 1,169 1,600 1,969 2,014				0 -47 -70 -112 -124 -59 57 172 186	0 -418 -391 -65 168 1,837 2,659 3,352 3,437	
2013 2014 2015 2017 2018 2028 2038 2063 2070 Steelhead	0 -716 -781 -887 -983 -1,251 -628 119 212		0 -70 -139 -169 -172 54 645 1,221 1,292	0 -57 14 254 412 2,036 3,369 4,543 4,688		0 -580 -552 -554 -560 -180 121 469 513		0 59 122 252 327 1,251 1,808 2,435 2,516	0 -107 69 352 501 2,821 4,172 5,519 5,686		0 -633 -643 -677 -705 -277 309 958 1,039		0 -21 -17 96 153 1,190 2,152 3,096 3,214	0 -212 -115 101 202 2,453 3,967 5,275 5,435		0 -976 -1,131 -1,386 -1,478 -1,444 -743 60 162		0 -429 -532 -591 -586 -102 551 1,174 1,251	0 -210 -189 -175 -174 -11 301 584 619	
2013 2014 2015 2017 2018 2028 2038 2063 2070 Delta Smelt	0 -689 -799 -987 -1,162 -1,902 -1,000 23 151	0 0 0 0 0 0 0 0	0 -96 -171 -204 -211 57 929 1,797 1,904	0 -250 -235 -120 -40 839 2,011 3,098 3,231	0 -689 -799 -987 -1,162 -1,902 -1,000 23 151	0 -444 -389 -393 -406 286 868 1,533 1,618	0 0 0 0 0 0 0 0 0	0 68 168 348 450 1,747 2,540 3,427 3,540	0 -207 -49 213 360 2,202 3,260 4,351 4,489	0 -444 -389 -393 -406 286 868 1,533 1,618	0 -534 -546 -610 -662 49 1,011 2,000 2,123	0 0 0 0 0 0 0 0 0	0 -32 -6 141 212 1,626 2,923 4,195 4,354	0 -303 -216 -14 90 1,919 3,224 4,392 4,537	0 -534 -546 -610 -662 49 1,011 2,000 2,123	0 -1,175 -1,483 -2,000 -2,195 -2,320 -1,251 -102 40		0 -595 -746 -860 -865 -195 778 1,721 1,838	0 -795 -811 -654 -521 782 1,851 2,811 2,930	0 -1,175 -1,483 -2,000 -2,195 -2,320 -1,251 -102 40
2013 2014 2015 2017 2018 2028 2038 2063 2070 Green Sturge	0 0 0 0 0 0 0 0 0 0 0 0				0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 51 96 255 293 675 782 862 872	0 49 88 232 268 877 1,048 1,178 1,193		0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0	0 51 255 293 676 783 865 875	0 49 88 233 269 879 1,052 1,181 1,197		0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0	0 -812 -904 -716 -478 1,440 1,920 2,280 2,325	0 -752 -839 -635 -398 1,485 1,947 2,292 2,335		0 0 0 0 0 0 0 0 0 0 0
2013 2014 2015 2017 2018 2028 2038 2063 2070			0 -368 -66 419 646 2,923 3,582 4,077 4,139	0 0 0 0 0 0 0 0 0 0 0	0 -630 -595 -564 -557 -575 -579 -582 -583	0 0 0 0 0 0 0 0		0 -517 -380 -255 -166 1,574 2,099 2,492 2,540	0 0 0 0 0 0 0	0 -1,157 -1,556 -2,285 -2,740 -6,175 -7,055 -7,716 -7,797	0 0 0 0 0 0 0 0 0	0 0 -4 -11 520 693 824 840	0 -517 -380 -255 -166 1,574 2,099 2,492 2,540	0 0 0 0 0 0 0 0 0	0 -1,157 -1,556 -2,285 -2,740 -6,175 -7,055 -7,716 -7,797	0 0 0 0 0 0 0 0 0 0 0 0	0 75 151 302 381 753 833 893 900	0 696 1,308 2,163 2,492 3,847 4,139 4,355 4,383	0 0 0 0 0 0 0 0 0 0	0 -625 -676 -790 -830 -949 -973 -991 -992
																No >5 >2 >1 59 <5 59 >1 >2 >5	ot Analy 50% Gr 25%-50 10%-25 6~10% 5% Diffe 6% 10% 25%-50 50% Le	yzed eater % Grea % Greater erent Less % Less % Less ss	ater ater	

Figure 11-6 Alternative 6 SAM results showing bank-line weighted relative response (feet) within all regions combined



1 The SAM results for Region 3 reflect similar trade-offs to those seen in Region 2. Much of the 2 patterns can be explained by the assumed changes at the Sacramento River Mile 163.0L site, which 3 constitutes more than 33% (around 1,200 feet) of the total length analyzed in Region 3. At this site, 4 erosion is assumed to lead to substantial changes in shoreline habitat for fish. Most notable is the 5 assumed loss of inundated vegetation during the winter and spring (from more than 60% cover to 6 0% cover) between 2018 and 2028, with a resulting decrease in SAM index for this attribute from 7 approximately optimal (1) to around half (0.5) (Appendix F, Figure F-12). This decrease outweighs 8 the increase in habitat value that is assumed to be derived from the construction of setback levees at 9 two other sites on the Sacramento River that total around 1,000 feet. The increase in habitat value 10 from the setbacks at these sites is assumed to be an increase in the SAM index for the floodplain 11 inundation ratio attribute from 0.2 (i.e., an inundation ratio of 1) under baseline conditions to 12 approximately 0.3 (i.e., an inundation ratio of 2) under Alternative 3A.

- Implementation of Alternative 3A would allow continued bank erosion, resulting in decreased shade
   and instream structure over time. This decrease in shade and instream structure would result in a
   significant effect on listed fish species because these habitat features contribute important
- 16 ecological functions such as refuge from predators. Implementation of Mitigation Measures FISH-
- 17 MM-2 and VEG-MM-1 would reduce the effect on fish species in the area to a level that is less than
- 18 significant.

## 19 **11.5.2.4** Alternative 4A—Habitat Replacement (Preferred Alternative)

#### 20 Effect FISH-4: Long-Term Effects on Fish from Loss of Habitat

Alternative 4A would have long-term effects on the habitat of listed fish species, including alteration of river hydraulics, instream and overhead cover, and substrate conditions along the seasonal lowand high-flow shorelines of the erosion sites (Figure 11-4, plus Figures F-13 through F-16 in Appendix F). Program implementation would result in temporary losses of instream structure and riparian vegetation along the summer-fall and winter-spring shorelines and would also limit longterm fluvial functioning necessary for the development and renewal of SRA habitat in the future.

- Initial cover losses as a result of Alternative 4A would be partially offset by installing riparian
   plantings along the lower slopes and benches with anchored IWM at many erosion sites. These
- 29 features would increase the availability of high-value shallow water habitat for juvenile Chinook
- salmon and steelhead, spawning and incubating delta smelt, and possibly juvenile green sturgeon
   during the annual high-flow period (late fall, winter, and spring). Assuming an initial reduction in
- existing shade values, program actions would reduce existing shade by as much as 75%, but
   eventually (Years 25–50) future shade values would exceed current shade values by up to 75%
   along the total bank length affected by the program. Further discussion of potential changes in shade
   that were assumed in the analyses are provided in the *Characterization of With-Project Conditions*
- 36 section of Appendix F.
- At project sites in Region 1a and the lower portion of Region 1b (Sacramento River Miles 20–30),
- 38 installation of vegetated riparian and wetland benches would further increase shallow-water habitat
- 39 by adding shallow-water areas that are suitable for rearing by juvenile salmonids, and for spawning,
- 40 incubation, and rearing by delta smelt. The establishment and growth of planted riparian vegetation
- 41 is expected to increase habitat values over time by increasing the extent of overhead cover available
- 42 to listed fish species. At project sites upstream of RM 30, temporary losses of existing IWM would be
- 43 offset by the placement of additional IWM either above or below the mean summer/fall waterline,

- 1 resulting in a net increase in IWM at many of those sites. The erosion sites where Bank Protection
- Measures 2 and 5 are implemented would not have additional IWM installed, resulting in long-term
   IWM losses.

4 The program-wide SAM results by species indicate initial negative responses for all salmonid life 5 stages in all seasons over the modeled 50-year period. The initial habitat deficits are the result of 6 riparian vegetation and IWM removal from the program sites during construction. On-site IWM 7 mitigation, installed to replace or exceed pre-project conditions, coupled with riparian vegetation 8 growth would allow habitat for nearly all salmonid life stages to recover to current conditions by 9 Year 50. However, the SAM projects negative adult migration responses through Year 50 in summer 10 and fall for all salmonids and steelhead, as well as in winter for fall-run Chinook salmon. Adult residence for steelhead in summer and fall is also projected to remain negative through Year 50, 11 12 despite gradual improvements following the initial habitat deficits. Habitat responses are generally 13 improved in winter and spring compared with summer and fall, because of differences between 14 proportions of installed IWM and available aquatic vegetation. During winter and spring, recovery 15 from initial habitat deficits for all salmonid life stages would be complete by Year 25 at the latest, 16 and often much earlier.

- 17 Region 1b would experience the greatest negative impacts as a result of site conditions in18 combination with the bank protection measures applied to those sites.
- 19 For delta smelt, the SAM results for Region 1b indicate reductions in habitat values for spawning, 20 incubation, and juvenile rearing (Appendix F, Figure F-14). These deficits are due to temporary 21 increases of bank substrate size and reductions in instream and riparian habitat that are assumed to 22 reduce the availability and suitability of habitat for spawning, incubation, and rearing. As previously 23 described, these life stages are sensitive to changes in bank slope, availability of floodplain, instream 24 structure, and aquatic vegetation. The results in Region 1a are generally positive, with slight 25 decreases in SAM values in the summer (Appendix F, Figure F-13). However, results in Region 1b 26 indicate modest decreases in SAM values that escalate and persist through Year 50. This is primarily 27 the result of those sites within that region that are repaired with Bank Protection Measure 2 (which 28 utilizes an all rock slope and no vegetation) and Bank Protection Measure 5 (which utilizes a rock 29 slope and revegetation). In those cases, adverse changes to instream structure and bank slope drive 30 the decreased SAM values. While the revegetation in Bank Protection Measure 5 provides value to 31 several target fish species, SAM does not derive benefits from overhead cover for the delta smelt fry 32 and juvenile rearing life stages.
- Green sturgeon adult residence would experience deficits in almost all seasons. This is the result of SAM deriving negative results for the adult residence life stage resulting from the changes in slope, which are primarily associated with the bench designs of Bank Protection Measures 4a, 4b, and 4c. While these changes in slope would occur, the proposed bank protection measures typically would not affect (e.g., change the slope of) the deeper parts of the channel that are utilized by adult green sturgeon.
- Implementation of Alternative 4A is expected to increase habitat values over time by increasing the
   extent of overhead cover and high-quality shallow water habitat available to listed fish species.
   However, this alternative would limit long-term fluvial functioning necessary for the development
   and renewal of SRA habitat in the future. Alternative 4A is expected to negatively affect summer and
   fall adult salmonid migration, winter migration of fall-run Chinook salmon, and adult steelhead
- 44 residence. The SAM also predicts negative effects on delta smelt in Region 1b due to changes in bank

- 1 slope and instream structure. These long-term effects on listed fish species would be considered
- significant. Implementation of Mitigation Measures FISH-MM-2, FISH-MM-3, and VEG-MM-1 would
   reduce the effect on fish species in the area to a level that is less than significant.

# 4 11.5.2.5 Alternative 5A—Habitat Replacement Reaching Environmental 5 Neutrality

#### 6 Effect FISH-4: Long-Term Effects on Fish from Loss of Habitat

7 Effects under Alternative 5A would be very similar to those previously described for Alternative 4A. 8 Alternative 5A would have long-term effects on the habitat of listed fish species, including alteration 9 of river hydraulics, instream and overhead cover, and substrate conditions along the seasonal low-10 and high-flow shorelines of the erosion sites (Figure 11-5, plus Figures F-17 through F-20 in Appendix F). Implementation of the program would result in temporary losses of instream structure 11 12 and riparian vegetation along the summer-fall and winter-spring shorelines and would also limit 13 long-term fluvial functioning necessary for the development and renewal of SRA habitat in the 14 future. However, Alternative 5A would include several setback and adjacent levees and incorporate 15 riparian benches into numerous sites. These setback and adjacent levees would protect or create 16 valuable fish habitat.

17 Alternative 5A differs from Alternative 4A in that a number of the bank protection measures applied 18 to the <u>106</u> representative <del>106</del> sites were changed to specifically reduce the adverse effects on fish as 19 determined by the SAM analysis. For example, some sites that utilized Bank Protection Measure 2 20 under Alternative 4A were changed to utilize Bank Protection Measure 1 under Alternative 5A. 21 Similarly, some sites changed from Bank Protection Measure 4a to Bank Protection Measure 3, or 22 Bank Protection Measure 5 changed to Bank Protection Measure 4b. All of these changes were made 23 to reduce the adverse effects on fish as identified in the SAM analysis of Alternative 4A. As a result, 24 the same types of impacts occur under Alternative 5A as under Alternative 4A, but to a somewhat 25 lesser degree.

- 26 In general, the SAM results for Alternative 5A become positive sooner (e.g., Year 15 instead of Year 27 25) and positive values in Year 50 are somewhat greater than under Alternative 4A. Additionally, 28 while some SAM deficits persist through Year 50 under Alternative 4A for certain salmonid and 29 steelhead life stages, those results become positive under Alternative 5A when considering 30 program-wide SAM results. Region 3 alone has deficits that persist through Year 50 as a result of the 31 erosion that is assumed to lead to substantial changes in shoreline habitat for fish. As previously 32 described under Alternative 3A, the assumed loss of inundated vegetation in the winter and spring 33 drives the SAM deficits. While the deficits under 5A are less than those under 3A as a result of 34 additional setback levees, the deficits persist.
- The increase in bank substrate size and reduced shallow water habitat, instream structure, and
  shade, as well as the potential loss of spawning habitat, would result in a significant effect.
  Implementation of Mitigation Measures FISH-MM-2, FISH-MM-3, and VEG-MM-1 would reduce the
  effect on fish species in the area to a level that is less than significant.

#### **1 11.5.2.6** Alternative 6A—Habitat Replacement with Vegetation ETL Variance

#### 2 Effect FISH-4: Long-Term Effects on Fish from Loss of Habitat

Similar to Alternative 4A, Alternative 6A would have long-term effects on the habitat of listed fish
 species, including alteration of river hydraulics, instream and overhead cover, and substrate
 conditions along the seasonal low- and high-flow shorelines of the erosion sites (Figure 11-6, plus
 Figures F-21 through F-24 in Appendix F). Implementation of the program would result in
 temporary losses of instream structure and riparian vegetation along the summer-fall and winter spring shorelines and would also limit long-term fluvial functioning necessary for the development
 and renewal of SRA habitat in the future.

- 10 Initial cover losses as a result of Alternative 6A would be partially offset by installing riparian
- 11 plantings along the lower slopes and benches with anchored IWM at a majority of the erosion sites.
- 12 These features would increase the availability of high-value shallow water habitat for juvenile
- 13 Chinook salmon and steelhead, spawning and incubating delta smelt, and possibly juvenile green
- 14 sturgeon during the annual high-flow period (late fall, winter, and spring). Assuming an initial
- 15 reduction in existing shade values, program actions would reduce existing shade by as much as 75%,
- 16 but eventually (Years 25–50) future shade values would exceed current shade values by up to 75%
- 17 along the total bank length affected by the proposed program.
- 18 At project sites in Regions 1a and the lower portion of Region 1b (Sacramento River Miles 20–30), 19 installation of vegetated riparian and wetland benches would further increase shallow-water habitat 20 by adding shallow-water areas that are suitable for rearing by juvenile salmonids, and for spawning, 21 incubation, and rearing by delta smelt. The establishment and growth of planted riparian vegetation 22 is expected to increase habitat values over time by increasing the extent of overhead cover available 23 to listed fish species. At project sites upstream of RM 30, temporary losses of existing IWM would be 24 offset by the placement of additional IWM either above or below the mean summer/fall waterline, 25 resulting in a net increase in IWM at many of those sites. The erosion sites where Bank Protection 26 Measures 2 and 5 are implemented would not have additional IWM installed, resulting in long-term 27 IWM losses.
- 28 The program-wide SAM results by species indicate initial negative responses for all salmonid life 29 stages in all seasons over the modeled 50-year period. The initial habitat deficits are the result of 30 riparian vegetation and IWM removal from the program sites during construction. On-site 31 mitigation from IWM, installed to replace or exceed pre-project conditions, coupled with riparian 32 vegetation growth, drives habitat recovery for the salmonid life stages to current conditions by Year 33 50 at the latest, except for adult migration in winter for fall-run Chinook salmon, which has negative 34 values through Year 50 despite gradual improvements following the initial habitat deficits. Habitat 35 responses are generally improved in winter and spring compared with summer and fall due to 36 differences between proportions of installed IWM and available aquatic vegetation. During winter 37 and spring, recovery from initial habitat deficits for all salmonid life stages is complete by Year 25 at 38 the latest, and often much earlier.
- Region 1b would experience the greatest negative impacts as a result of site conditions in
   combination with the bank protection measures applied to those sites (Appendix F, Figure F-22).
- 41 For delta smelt, the SAM results indicate initial reductions in habitat values for spawning,
- 42 incubation, and juvenile rearing only in summer. These deficits are due to temporary increases of
- 43 bank substrate size and reductions in instream and riparian habitat that are assumed to reduce the

- 1 availability and suitability of habitat for spawning, incubation, and rearing. The reductions are
- 2 driven by the results in Region 1b that persist through Year 50. As previously described, these life
- 3 stages are sensitive to changes in bank slope, availability of floodplain, instream structure, and
- 4 aquatic vegetation. The results in Region 1a are generally positive, with slight decreases in the
- summer. However, results in Region 1b indicate modest decreases that escalate and persist through
   Year 50. This is primarily the result of those sites within that region that are repaired with Bank
- 7 Protection Measure 5, which utilizes a rock slope and revegetation. In those cases, adverse changes
- 8 to instream structure and bank slope drive the decreased SAM values. While the revegetation in
- 9 Bank Protection Measure 5 provides value to several target fish species, SAM does not derive
- 10 benefits from overhead cover for the delta smelt fry and juvenile rearing life stages.
- SAM results for green sturgeon adult residence indicate deficits in winter and spring. This is the result of SAM deriving negative results for the adult residence life stage resulting from the changes in slope, which are primarily associated with the bench designs of Bank Protection Measures 4a, 4b, and 4c,. While these changes in slope would occur, the proposed bank protection measures typically would not affect (e.g., change the slope of) the deeper parts of the channel that are utilized by adult green sturgeon.
- 17 The increase in bank substrate size and reduced shallow water habitat, instream structure, and
- 18 shade, as well as, the potential loss of spawning habitat would result in a significant effect.
- 19 Implementation of Mitigation Measures FISH-MM-2, FISH-MM-3, and VEG-MM-1 would reduce the
- 20 effect on fish species in the area to a level that is less than significant.

**12.1** Introduction and Summary 3 4 This chapter describes the environmental setting associated with wildlife resources (terrestrial and 5 aquatic), the determination of effects, the environmental effects on wildlife resources that would 6 result from implementation of the proposed program, and the mitigation measures that would 7 reduce these effects. 8 The key sources of data and information used in the preparation of this chapter are listed below. 9 A California Natural Diversity Database (CNDDB) records search of the counties in the program 10 area: Butte, Colusa, Glenn, Placer, Sacramento, Sutter, Solano, Yolo, Yuba, and Tehama Counties (California Department of Fish and Game-Wildlife 20092018a). 11 12 A U.S. Fish and Wildlife Service (USWFS) list of endangered, threatened, and proposed species 13 for the counties in the program area: Butte, Colusa, Glenn, Placer, Sacramento, Yolo, Sutter, 14 Solano, Yuba, and Tehama (U.S. Fish and Wildlife Service 20092018). 15 Program area county general plans: Butte County 2030 General Plan (Butte County 2010). 16 0 17 Colusa County Draft General Plan (Colusa County 2011). Ο 18 Glenn County General Plan (Glenn County 1993). 0 19 Placer County General Plan (Placer County 19942013). Ο 20 Sacramento County 2030 General Plan (Sacramento County 2011). 0 Solano County General Plan (Solano County 2008). 21 0 22 Sutter County 2030 General Plan (Sutter County 2011) and Sutter County General Plan 0 Update Technical Background Report (2008). 23 24 Tehama County General Plan (Tehama County 2009). 0 25 0 Yolo County General Plan (Yolo County 2009). 26 Yuba County General Plan (Yuba County 2011) and Yuba County General Plan Update 0 27 Background Report (Yuba County 2008). 28 Program area habitat conservation plans (HCPs) and Natural Community Conservation Plans 29 (NCCPs): 30 Butte Regional Conservation Plan (in prep). Ο 31 Natomas Basin HCP (City of Sacramento et al. 2003). 0 32 Yuba-Sutter HCP/NCCP (in prep). Ο 33 Yolo HCP/NCCP Yolo Natural Heritage Program (in prep). Ο 34 American River Parkway Plan (Sacramento County 2008).

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1	•	Exi	sting SRBPP program and project-level documents:
2 3		0	Draft Environmental Assessment/Initial Study for Levee Repair of 25 Erosion Sites: Sacramento River Bank Protection Project (U.S. Army Corps of Engineers 2009).
4 5 6		0	Final Environmental Assessment/Initial Study for the Erosion Repairs of 13 Bank Protection Sites, 2008 and 2009: Sacramento River Bank Protection Project, Sacramento River and Tributaries, California (U.S. Army Corps of Engineers 2008).
7 8		0	Programmatic Biological Assessment for the Sacramento River Bank Protection Project Phase II, Final (Stillwater Sciences 2007)
9 10 11		0	Environmental Assessment/Initial Study for Five Critical Erosion Sites, River Miles 26.9 Left, 34.5 Right, 72.2 Right, 99.3 Right, and 123.5 Left Sacramento River Bank Protection Project, Draft (U.S. Army Corps of Engineers 2006a)
12 13		0	Environmental Assessment for levee repair of 14 Winter 2006 critical sites, Sacramento River Bank Protection Project, Final Report (U.S. Army Corps of Engineers 2006b)
14 15 16		0	Sacramento River Bank Protection Project, Erosion Management Report on Potential Impacts and Considerations for Bank Swallow and Associated Habitat (ICF International 2012)
17	•	Otł	ner published and unpublished reports.
18	•	ICF	FInternational file information.
19 20	Tab pro	ole 1 gra	2-1 summarizes the effects on wildlife resulting from the implementation of the proposed m.

#### 21 Table 12-1. Summary of Wildlife Effects and Mitigation

Effect	Mitigation Measures	Implementation Period
Effect WILD-1: Permanent Loss of Riparian Habitat for Special- Status Wildlife Species Associated with Compliance with the Vegetation ETL	VEG-MM-1: Compensate for the Loss of Woody Riparian Habitat	Develop revegetation plan prior to removal of existing riparian vegetation. Plantings will be monitored over a minimum period of time, as determined by the appropriate state and federal agencies.
Effect WILD-2: Potential Disturbance or Loss of Special- Status Wildlife Species and Their Habitats as a Result of Program Construction and O&M Activities	VEG-MM-1	Same as above
	VEG-MM-4: Conduct Mandatory Contractor/Worker Awareness Training for Construction Personnel	Prior to any construction work

Effect	Mitigation Measures	Implementation Period
	VEG-MM-8: Compensate for the Loss of Wetlands and Other Waters	Develop revegetation plan prior to removal of existing emergent wetland vegetation. Plantings will be monitored over a minimum period of time, as determined by the appropriate state and federal agencies.
	WILD-MM-1: Document Special- Status Wildlife Species and Their Habitats	As part of project-level environmental review
	WILD-MM-2: Avoid and Minimize Effects on Special-Status Wildlife Species by Redesigning the Action, Protecting Special-Status Wildlife Habitat, and Developing a Mitigation Monitoring Plan (If Necessary)	As part of project-level environmental review and during construction
	WILD-MM-3: Coordinate with Resource Agencies <u>to Obtain</u> <u>Incidental Take Authorization, as</u> <u>Necessary,</u> and Develop Appropriate Wildlife Compensation Plans for Species Listed under ESA and/or CESA	As part of project-level environmental review
Effect WILD-3: Disturbance to or Loss of Common Wildlife Species as a Result of Construction	WILD-MM-4: Avoid or Minimize Construction-Related Effects on Nesting Birds	During construction
	WILD-MM-5: Conduct a Preconstruction Survey for Roosting Bats and Avoid or Mitigate Potential Impacts	Prior to any tree trimming and removal activities
	<u>VEG-MM-1: Compensate for the</u> Loss of Woody Riparian Habitat	Same as above
Effect WILD-4: Disruption to Wildlife Movement Corridors as a Result of Construction	None required	Not applicable

## 1 12.2 Environmental Setting

The environmental setting for the proposed program is discussed in terms of the general program area, the four program regions (1a, 1b, 2, and 3), and the program study area. The program area and program regions are shown in Figure 2-1. The general program area consists of the watercourse reaches and associated levees expected to contain erosion protection sites as described in the Chapter 2, Project Description. The program area is further divided up into four program regions

- 1 that serve to divide up the area into smaller assessment areas to more easily determine the types
- 2 and magnitude of impacts resulting from the proposed program. The geographical extent of each
- 3 program region is described in detail in Chapter 2. For the purposes of this chapter, the program
- 4 study area contains the general program area plus a 0.5-mile buffer within which direct or indirect
- 5 impacts on wildlife resources may occur. The study area is also discussed in terms of the four above-6
- mentioned program regions.

#### 12.2.1 Existing Conditions 7

#### 12.2.1.1 Wildlife Habitat—Land Cover Type Associations 8

9 This section summarizes the land cover types identified in the program area and describes the 10 relationship between land cover types and the wildlife habitats addressed in this analysis. Land cover types are described in detail in Chapter 10, Vegetation and Wetlands, and are discussed below 11 12 as they pertain to wildlife habitat. Eight major land cover types were identified in the program area. 13 These include natural and artificial land cover types.

#### 14 **Riparian Forest**

15 Riparian forests are generally associated with rivers, low gradient streams, floodplains, and

- 16 occasionally ponds and canals. Riparian forest communities are composed of a mature tree canopy 17 dominated by valley oak (Quercus lobata) and Fremont cottonwood (Populus fremontii), and an 18 understory consisting of a shrub layer of varying densities and an herbaceous ground layer.
- 19 Riparian forest communities provide wildlife with dispersal and migration corridors and foraging, 20 cover, nesting, and breeding habitat (including shade and cover for aquatic species). Many species of 21 birds, mammals, reptiles, and amphibians are known to use riparian communities and other woody 22 vegetation communities located in close proximity to watercourses. Riparian trees provide suitable 23 nesting and roosting habitat for a variety of raptors, egrets, herons, songbirds, and bats. Birds 24 known to nest in these communities include red-shouldered hawk (Buteo lineatus), red-tailed hawk 25 (Buteo jamaicensis), Swainson's hawk (Buteo swainsoni), white-tailed kite (Elanus leucurus), 26 Cooper's hawk (Accipiter cooperii), American kestrel (Falco sparverius), great blue heron (Ardea 27 *herodias*), great egret (*Ardea alba*), green heron (*Butorides virescens*), belted kingfisher (Cervle 28 alcyon), Nuttall's woodpecker (Picoides nuttallii), western scrub-jay (Aphelocoma californica), 29 California towhee (*Pipilo crissalis*), spotted towhee (*Pipilo maculates*), black phoebe (*Sayornis* 30 nigricans), warbling vireo (Vireo gilvus), yellow-rumped warbler (Dendroica coronata), wrentit 31 (Chamaea fasciata), and house wren (Troglodytes aedon). Bats species known to utilize riparian 32 habitats for roosting in the program area include California myotis (Myotis californicus), Yuma 33 myotis (Myotis yumanensis), hoary bat (Lasiurus cinereus), western red bat (Lasiurus blossevillii), and 34 pallid bat (Antrozous pallidus). Other mammals species known to utilize these communities include 35 beaver (Castor canadensis), Virginia opossum (Didelphis virginiana), striped skunk (Mephitis 36 mephitis), black-tailed deer (Odocoileus hemionus), raccoon (Procyon lotor), and muskrat (Ondatra 37 zibethicus). Reptiles, including common garter snake (Thamnophis sirtalis), western fence lizard 38 (Sceloporus occidentalis), and western pond turtle (Actinemys marmorata), and amphibians, 39 including Pacific tree frog (Hylla regilla), western toad (Bufo boreas), and bullfrog (Rana 40 *catesbeiana*), are also associated with these communities. Additionally, valley elderberry longhorn 41 beetle (*Desmocerus californicus dimorphus*) has potential to occur in areas where elderberry shrubs 42 sized 1 inch or greater in diameter at ground level occur.

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#### Riparian Scrub/Shrub

Riparian scrub/shrub plant communities primarily occur at the to<u>ew</u> of levees and along the banks
 of rivers and streams and other drainages within the program area. These communities contain a
 variety of shrub and riparian tree species.

5 Riparian scrub/shrub provides nesting, cover, and foraging habitat for numerous bird species.

- 6 Specifically California quail (*Callipepla californica*), yellow-rumped warbler, song sparrow
- 7 (*Melospiza melodia*), spotted towhee, California towhee, wrentit, and bushtit (*Psaltriparus minimus*)
- 8 are known to occur in these communities. Tricolored blackbird (*Agelaius tricolor*) may also nest in
- 9 riparian scrub/shrub areas where blackberry or willow thickets are present. As with riparian forest,
- 10 the functions and values of this habitat type for wildlife species are high.

#### 11 Oak Woodland

- 12 Within the program area oak woodlands generally occur on the upper portion or landside of levees
- 13 outside of riparian zones. These areas are dominated by mature trees, specifically valley oak, and
- 14 provide similar wildlife habitat uses as riparian forests. Additionally acorn woodpecker (*Melanerpes*
- 15 *formicivorus*) and northern flicker (*Colaptes auratus*) nest and forage in these habitats. Reptiles,
- including gopher snake (*Pituophis catenifer*) and California king snake (*Lampropeltis getulus californiae*), also frequent these habitats.

#### 18 **Ruderal Herbaceous Vegetation**

19 Within the program area ruderal communities commonly occur along the mid- to upper-slope of 20 levees and within levee crowns. These communities also occur on the waterside of the levee within 21 gaps in the riparian forest canopy and riparian scrub/shrub communities. Despite a lack of native 22 plant species richness and complexity, ruderal vegetation communities provide wildlife species with 23 food resources (e.g., seeds from annual grasses and forbs) as well as cover and breeding 24 opportunities. Birds known to forage in these communities include red-tailed hawk, American 25 kestrel, burrowing owl (Athene cunicularia), northern mockingbird (Mimus polyglottos), western 26 kingbird (Tyrannus verticalis), western meadowlark (Sturnella neglecta), Brewer's blackbird 27 (Euphagus cyanocephalus), mourning dove (Zenaida macroura), rock pigeon (Columba livia), and 28 American crow (Corvus brachyrhynchos). Western meadowlark and burrowing owl are also known 29 to utilize these areas for nesting. Areas with nettle, thistle, or other shrubby upland vegetation may 30 also support nesting of tricolored blackbirds. Mammals known to occupy these communities include 31 black-tailed hare (Lepus californicus), California ground squirrel (Spermophilus beechevi), pocket

- 32 gopher (*Thomomys bottae*), deer mouse (*Peromyscus maniculatus*), and California meadow vole
- 33 (*Microtus californicus*). Reptiles found in these communities include western fence lizard, gopher 34 service California kinggonalya and wastern rattlegenalya (*Crotalya viridia*)
- 34 snake, California kingsnake, and western rattlesnake (*Crotalus viridis*).

#### 35 Emergent Marsh

36 Emergent marsh is restricted to a relatively narrow saturation zone along toes of levee slopes and is

- characterized by the presence of hydrophytic (i.e., "water-loving") herbaceous plant species, such as
   cattails (*Typha* spp.), tules (*Schoenoplectus* spp.), rushes (*Juncus* spp.), and sedges (various genera),
- that are able to tolerate fluctuating water levels and persist in continuously saturated soils. Though
- 40 most of these areas are likely relatively small in size, these areas provide cover and breeding habitat
- 41 for bullfrog, tree frog, western toad, and common garter snake. Larger patches may also support

nesting of marsh wren (*Cistothorus palustris*), wading birds such as Virginia rail (*Rallus limicola*),
 and songbirds, including red-winged blackbird (*Agelaius phoeniceus*), tricolored blackbird, and
 vellow-headed blackbird (*Xanthocephalus xanthocephalus*).

#### 4 Agricultural Lands

5 Agricultural lands occur at the outer program area boundary on the landside of levees. These lands 6 include orchards, vineyards, row and field crops, and pasturelands. Orchards and vineyards provide 7 very little value for wildlife, though birds, such as red-shouldered hawk, American crow, yellow-8 billed magpie (*Pica nuttalli*), mourning dove, and rock pigeon, may nest and forage in these areas. 9 Row and field crops provide foraging opportunities to a variety of raptors, including red-tailed 10 hawk, Swainson's hawk, white-tailed kite, American kestrel, northern harrier, great-horned owl, 11 barn owl and other migratory birds including western kingbird, Brewer's blackbird, American crow, 12 yellow-billed magpie, European starling (Sturnus vulgaris), mourning dove, and rock pigeon, to 13 name a few. Flooded agricultural fields provide foraging habitat for a variety of wading birds, 14 including curlews and yellow-legs, and may support giant garter snake (Thamnophis gigas). Similar 15 species are known to utilize pasturelands for foraging, and birds, such as burrowing owl, northern 16 harrier, and western meadowlark, are also known to nest in these communities. Mammals known to 17 occur in all types of agricultural lands include coyote (*Canis latrans*), grey fox (*Urocyon* 18 cinereoargenteus), California ground squirrel, pocket gopher, deer mouse, and California meadow 19 vole. Reptiles, such as western fence lizard, gopher snake, and California kingsnake, may also be

20 found in association with these communities.

#### 21 Barren

Barren areas within the program area generally include paved and dirt roads, dirt lots, revetment
areas dominated by quarry stone or rock, and other areas that are devoid of vegetation, usually
through vegetation management practices such as burning or discing (i.e., turning and loosening
soil). Barren areas provide little value to wildlife; however, areas containing rock or wood piles or
other debris piles may provide nesting opportunities for burrowing owls.

### 27 Open Water

Open water within the program area consists of rivers, creeks, sloughs, canals, and other unnamed drainages and ponds. Major water features within the program area are listed in Table 2-1 in Chapter 2, Project Description. Riparian forest and scrub/shrub vegetation communities are generally located adjacent to open water areas at the outboard toes of land slopes. Vegetation is not

- typically found directly within open water areas though instream woody material (IWM) is an
   important sub-community within many program area rivers and streams.
- In addition to providing resources for fish, discussed in the Chapter 11, Fisheries and Aquatics, open water habitat provides foraging, cover, and reproductive sites for a variety of wildlife species. Open
- 36 water areas provide essential foraging habitat for wading birds, including great blue heron, great 37 egret, and snowy egret (*Egretta thula*); numerous waterfowl species, including mallard (*Anas*
- 38 platyrhynchos), ruddy duck (*Oxyura jamaicensis*), Canada goose (*Branta canadensis*), and bufflehead
- 39 (*Bucephala albeola*); other water birds, including eared grebe (*Podiceps nigricollis*), common
- 40 merganser (*Mergus merganser*), cinnamon teal (*Anas cyanoptera*), double-crested cormorants
- 41 (*Phalacrocorax auritus*), and American white pelican<del>s</del> (*Pelecanus erythrorhynchos*); and land birds,
- 42 including osprey (*Pandion haliaetus*), black phoebe and belted kingfisher (*Megaceryle alcyon*). These

1 areas also provide rearing habitat, escape cover, and foraging habitat for reptiles and amphibians,

- 2 including western pond turtle, common garter snake, western aquatic garter snakes (*Thamnophis*
- *couchii*), giant garter snake, bullfrog, Pacific tree frog, and western toad. Several species of bats that
- occur in association with riparian forests forage for insects over open water. Other mammals,
   including black-tailed deer, raccoon, and striped skunk, utilize rivers and streams as water sources,
- and aquatic and semi-aquatic mammals that occur within open water habitats include beaver, river
- 7 otter (*Lutra canadensis*), mink (*Mustela vison*), and muskrat.

## 8 **12.2.1.2** Other Habitat Types

### 9 Vertical and Eroding Banks

10 Although not mapped as a "land cover type" in Chapter 10, vertical and eroding river banks provide 11 nesting habitat for bank swallows (*Riparia riparia*). Within their breeding range, bank swallows will 12 nest only where suitable habitat is present, usually at lower elevations. Bank swallows are colonial 13 nesters that excavate burrows in a vertical bank, and construct a nest at the terminal end of the 14 burrow. These vertical banks may be artificial or occur naturally. The burrows are normally found <del>at</del> 15 <del>least 3 feet highon the upper third of on</del> steep-faced sand or gravel banks at river edges, quarries, or 16 cliffs (Baicich 1997 Garrison 1999). It is estimated that the Sacramento River supports about 75% of 17 the state's bank swallow population. These Sacramento River sites occur mainly between Redding 18 and the Yolo Bypass in Yolo County (Garrison 1998).

Bank swallow habitat on the Sacramento and Feather Rivers is maintained through the fluvial
 processes of river meander, lateral migration, and bank erosion (Moffatt et al. 2005). These
 processes prepare nesting sites by exposing fresh vertical surfaces of river bank which include
 friable soil horizons suitable for colonization.

### 23 12.2.1.3 Special-Status Wildlife Species

Special-status wildlife species are defined as animals that are legally protected under the federal
Endangered Species Act (ESA), the California Endangered Species Act (CESA), or other regulations,
as well as species that are considered sufficiently rare by the scientific community to qualify for such
listing. Special-status species are defined as those that meet any of the criteria listed below.

- Species that are listed or proposed for listing as threatened or endangered under the ESA (50
   Code of Federal Regulations [CFR] Part 17.12 for listed plants, 50 CFR Part 17.11 for listed
   animals, and various notices in the Federal Register [FR] for proposed species).
- Species that are candidates for possible future listing as threatened or endangered under ESA (73 FR 75178, December 10, 2008).
  - Species listed or proposed for listing by the State of California as threatened or endangered under the CESA (14 Code of California Regulations [CCR] Section 670.5).
    - Species that meet the definitions of rare or endangered under CEQA (State CEQA Guidelines Section 15380).
- Animals listed as California species of special concern on the California Department of Fish and
   Wildlife's (DFW's) Special Animals List (California Department of Fish and Game 2009Wildlife
   2018b).

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3 Based on the U.S. Fish and Wildlife (USFWS) (20092018) species list for the program area 4 counties—Butte, Colusa, Glenn, Placer, Sacramento, Yolo, Sutter, Solano, Yuba, and Tehama—and a 5 review of CNDDB (California Department of Fish and Wildlife20092018b) for these counties, 49-71 6 special-status wildlife species were identified as occurring within a 10-mile radius of the program 7 area (Table 12-1). Of these species, 30-50 have low to no potential to occur because the program 8 area is outside the species' known range or suitable habitat is limited or absent. Three species are 9 native vernal pool species—vernal pool fairy shrimp (*Branchinecta lynchi*), vernal pool tadpole 10 shrimp (Lepidurus packardi), and California tiger salamander (Ambystoma californiense)—that are 11 known to occur within the program study area (i.e., within 0.5 miles of the program area). These 12 native vernal pool species are considered to have low to no potential to occur in the actual program 13 area because, although habitats such as vernal pools may occur in areas adjacent to the levees, these 14 habitats are absent along the SRBPP levees themselves. Furthermore, vernal pools are not expected 15 to be subject to project impacts because construction, staging, and project access will be generally 16 limited to the levees, established roadways, and previously disturbed areas, with the possible 17 exception of sites where setback levees or adjacent levees are utilized.

18The remaining 19-21 species are known to occur in the program study area and have moderate to19high potential to occur in the program area based on the proximity of known occurrences and the20presence of suitable habitat. These species are described in more detail below. Details of their21potential to occur within a specified program area region are located in Table 12-2. Potential22impacts on these species are described later in the chapter in the Effects and Mitigation Measures23section.

### 24 Valley Elderberry Longhorn Beetle

25 Valley elderberry longhorn beetle is federally listed as threatened under ESA. The range of the 26 beetle extends throughout the Central Valley of California from approximately Shasta County in the 27 north to Fresno County in the south. and associated foothills, from the 3,000 foot high contour in 28 the east foothills, through the valley floor, to the watershed of the Central Valley in the west foothills 29 (U.S. Fish and Wildlife Service 1999a). The majority of valley elderberry longhorn beetle 30 occurrences have been documented below 500 feet in elevation (U.S. Fish and Wildlife Service 31 2017). Elderberry shrubs (Sambucus spp.) are found in the remaining riparian forests and 32 grasslands of the Central Valley and adjacent foothills. The beetle is often associated with various 33 plant species, such as Freemont's cottonwood, California sycamore, willow, and valley oak (U.S. Fish 34 and Wildlife Service 1999a2017).

35 Elderberry shrubs are the host plant for valley elderberry longhorn beetle and are a common 36 component of the remaining riparian forests of the Central Valley. Elderberry shrubs are also 37 common in upland habitats. Field surveys have found that adult valley elderberry longhorn beetle 38 feed on elderberry foliage and perhaps flowers and are present from March through early June. It is 39 during this time that the adults mate. The females lay their eggs, either singularly or in small 40 clusters, in bark crevices or at the junction of stem and trunk or leaf petiole and stem. After hatching, 41 a larva burrows into the stem of the elderberry where it creates a gallery, which it fills with grass 42 and shredded wood. After the larva transforms into an adult beetle, it chews an exit hole and 43 emerges from the elderberry. The life span of valley elderberry longhorn beetle ranges from 1 to 2

years. Studies of the spatial distribution of occupied shrubs suggest that the beetle is a poor
 disperser (U.S. Fish and Wildlife Service 1999a2017).

Wildlife

#### 1 Table 12-2. Special-Status Wildlife Species with Potential to Occur in Program Area

	Status <sup>a</sup> Federal/			Po	tential Occurrence	in Program Area R	egions
Common and Scientific Names	State/ Other	Geographic Distribution	Habitat Requirements	Region 1a	Region 1b	Region 2	Region 3
Valley elderberry longhorn beetle Desmocerus californicus dimorphus	T//	Stream side habitats below 3,000 feet throughout the Central Valley.	Riparian and oak savanna habitats with elderberry shrubs; elderberries are the host plant.	High. Suitable habitat present; 26-31 occurrences within 10-mile radius and 21-2 occurrences within 0.5-mile radius.	High. Suitable habitat present; 27-46 occurrences within 10-mile radius and 19-26 occurrences within 0.5-mile radius.	High. Suitable habitat present; <u>49-72</u> occurrences within 10-mile radius and <u>36-23</u> occurrences within 0.5-mile radius.	High. Suitable habitat present; 41 <u>57</u> occurrences within 10-mile radius and 26 occurrences within 0.5-mile radius.
Conservancy fairy shrimp Branchinecta conservatio	E//	Disjunct occurrences in Solano, Merced, Tehama, Ventura, Butte, and Glenn Counties.	Large, deep vernal pools in annual grasslands.	None. Suitable habitat absent; 13 occurrences within 10-mile radius and <del>no-1</del> occurrence <del>s</del> within 0.5-mile radius.	None. Suitable habitat absent; <del>1</del> <u>2</u> occurrence <u>s</u> within 10-mile radius and no occurrences within 0.5-mile radius.	None. Suitable habitat absent; <u>no-2</u> occurrences within 10-mile radius of region <u>and no</u> <u>occurrences</u> within 0.5-mile <u>radius</u> .	None. Suitable habitat absent; 7 <u>14</u> occurrences within 10-mile radius and no occurrences within 0.5-mile radius.
<u>Longhorn fairy shrimp</u> <u>Branchinecta</u> <u>longiantenna</u>	<u>E//</u>	<u>Known to occur in</u> <u>Alameda, Contra Costa,</u> <u>Merced, and San Luis</u> <u>Obispo Counties.</u>	Typically found in small pools of relatively short ponding duration and pools with alkali soils.	<u>None. Region</u> outside of species' known range.	<u>None. Region</u> outside of species' known range.	<u>None. Region</u> outside of species' known range.	<u>None. Region</u> outside of species' known range.
Vernal pool fairy shrimp Branchinecta lynchi	T//	Central Valley, central and south Coast Ranges from Tehama County to Santa Barbara County; isolated populations also in Riverside County.	Common in vernal pools; also found in sandstone rock outcrop pools.	Low. Limited suitable habitat present; <u>56-74</u> occurrences within 10-mile radius and <del>2-3</del> occurrences within 0.5-mile radius.	Low. Limited suitable habitat present; 65-112 occurrences within 10-mile radius and 1-10 occurrence within 0.5-mile radius.	Low. Limited suitable habitat present; <u>33-97</u> occurrences within 10-mile radius and <u>3-9</u> occurrences within 0.5-mile radius.	Low. Limited suitable habitat present; <del>23</del> <u>41</u> occurrences within 10-mile radius and <del>2-4</del> occurrences within 0.5-mile radius.

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Statusª Federal/				Pot	ential Occurrence	in Program Area R	egions	
Common and	State /							
Scientific Names	Other	Geographic Distribution	Habitat Requirements	Region 1a	Region 1b	Region 2	Region 3	
Vernal pool tadpole shrimp <i>Lepidurus packardi</i>	E//	Shasta County south to Merced County.	Vernal pools and ephemeral stock ponds.	Low. Limited suitable habitat; <u>64-62</u> occurrences within 10-mile radius and 2 occurrences within 0.5-mile radius.	Low. Suitable habitat absent; <del>69-95</del> occurrences within 10-mile radius and <del>no-1</del> occurrence <del>s</del> within 0.5-mile radius.	Low. Limited suitable habitat; <u>33-59</u> occurrences within 10-mile radius and <u>411</u> occurrence <u>s</u> within 0.5-mile radius.	Low. Limited suitable habitat; <del>30</del> <u>48</u> occurrences within 10-mile radius and <u>2-12</u> occurrences within 0.5-mile radius.	
<u>Shasta crayfish</u> <u>Pacifastacus fortis</u>	<u>E/E/</u>	<u>Endemic to Shasta</u> <u>County.</u>	<u>Cold, clear, rocky areas</u> of the Pitt River and Fall <u>River.</u>	<u>None. Region</u> <u>outside of</u> <u>species' known</u> <u>range.</u>	<u>None. Region</u> <u>outside of</u> <u>species' known</u> <u>range.</u>	<u>None. Region</u> <u>outside of</u> <u>species' known</u> <u>range.</u>	<u>None. Region</u> outside of species' known range.	
<u>California freshwater</u> <u>shrimp</u> <u>Syncaris pacifica</u>	<u>E/E/</u>	<u>Endemic to Marin,</u> <u>Sonoma, and Napa</u> <u>Counties.</u>	Low-gradient streams with moderate to heavy riparian cover and undercut banks with exposed roots, often in shallow pools or areas away from main flow.	<u>None. Region</u> <u>outside of</u> <u>species' known</u> <u>range.</u>	<u>None. Region</u> outside of species' known range.	<u>None. Region</u> <u>outside of</u> <u>species' known</u> range.	<u>None. Region</u> outside of species' known range.	
Delta green ground beetle Elaphrus viridus	T//	Restricted to Olcott Lake and other vernal pools at Jepson Prairie Preserve, Solano County.	Sparsely vegetated edges of vernal lakes and pools; occurs up to 250 feet from pools.	None. Region outside of species' known range.	None. Region outside of species' known range.	None. Region outside of species' known range.	None. Region outside of species' known range.	
Lange's metalmark butterfly <i>Apodemia mormo langei</i>	E//	Once found throughout the Antioch Dunes; range now reduced to less than 10 acres of Antioch Dunes in Contra Costa County.	Limited to dense to moderately dense patches of food plant, wild buckwheat, in stabilized sand dunes.	None. Suitable habitat absent; 1 occurrence within 10-mile radius and 1 occurrence within 0.5-mile radius	None. <u>Suitable</u> <u>habitat absent;</u> <del>Region outside</del> of species' <u>known range.1</u> <u>occurrence</u> within 10-mile radius	None. Region outside of species' known range.	None. Region outside of species' known range.	

	Status <sup>a</sup>			Pot	tential Occurrence	in Program Area R	egions
Common and Scientific Names	Federal/ State/ Other	Geographic Distribution	Habitat Requirements	Region 1a	Region 1b	Region 2	Region 3
<u>San Bruno Elfin</u> <u>butterfly</u> <u>Callophrys mossii bayensis</u>	<u>E//</u>	San Bruno Mountain, Montara Mountains, and northern end of Santa Cruz Mountains, San Mateo County; San Francisco Bay Area, Contra Costa County, and Marin County.	North-facing slopes and ridges facing Pacific Ocean from 600 to 1,100 feet; Rocky outcrops and cliffs in coastal shrub.	<u>None. Region</u> outside of species' known range.	<u>None. Region</u> outside of species' known range.	<u>None. Region</u> outside of species' known range.	<u>None. Region</u> outside of species' known range.
<u>Bay checkerspot butterfly</u> <u>Euphydryas editha</u> <u>bayensis</u>	<u>T//</u>	Vicinity of San Francisco Bay including San Francisco peninsula in San Mateo County. and mountains near San Jose. Santa Clara County.	<u>Native grasslands on</u> outcrops of serpentine soil: California plantain and owl's clover are host plants.	<u>None. Region</u> outside of species' known range.	<u>None. Region</u> <u>outside of</u> <u>species' known</u> <u>range.</u>	<u>None. Region</u> <u>outside of</u> <u>species' known</u> <u>range.</u>	<u>None. Region</u> <u>outside of species'</u> <u>known range.</u>
<u>Callippe silverspot</u> <u>butterfly</u> <u>Speyeria callippe callippe</u>	<u>E//</u>	<u>San Bruno Mountain, San</u> <u>Mateo County: a single</u> <u>location in Alameda</u> <u>County: Contra Costa</u> <u>County.</u>	Open hillsides where wild pansy (Viola pendunculata) grows: larvae feed on Johnny jump-up plants, whereas adults feed on native mints and nonnative thistles.	<u>None. Region</u> <u>outside of</u> <u>species' known</u> <u>range.</u>	<u>None. Region</u> outside of species' known range.	<u>None. Region</u> outside of species' known range.	<u>None. Region</u> <u>outside of species'</u> <u>known range.</u>
<u>Myrtle's silverspot</u> <u>butterfly</u> <u>Speyeria zerene myrtleae</u>	<u>E//</u>	Historically known from San Mateo County north to the mouth of the Russian River in Sonoma County. No butterflies have been observed recently at the known population sites near	Inhabits coastal terrace prairie, coastal bluff scrub, and associated nonnative grassland habitats where the larval foodplant, <i>Viola</i> sp. occurs; coastal dunes and bluffs.	<u>None. Region</u> outside of <u>species' known</u> range.	<u>None. Region</u> outside of species' known range.	<u>None. Region</u> outside of species' known range.	<u>None. Region</u> outside of species' <u>known range.</u>

Pacifica and San Mateo in San Mateo County; Marin County and southwestern

Sonoma County.

	Status <sup>a</sup>			Potential Occurrence in Program Area Regions				
Common and Scientific Names	Federal/ State/ Other	Geographic Distribution	Habitat Requirements	Region 1a	Region 1b	Region 2	Region 3	
Amphibians								
California tiger salamander <i>Ambystoma californiense</i>	T/ <del>SSC<u>T</u>/</del>	Central Valley, including Sierra Nevada foothills, up to approximately 1,000 feet, and coastal region from Butte County south to northeastern San Luis Obispo County.	Small ponds, lakes, or vernal pools in grasslands and oak woodlands for larvae; rodent burrows, rock crevices, or fallen logs for cover for adults and for summer dormancy.	Low. Limited suitable habitat; 50-59 occurrences within 10-mile radius and no-1 occurrences within 0.5-mile radius.	None- Limited suitable habitat; no occurrences within 10-mile radius.	Low. Limited suitable habitat; 7 occurrences within 10-mile radius <del> and 1</del> occurrence within 0.5-mile radius.	Low. Suitable habitat absent; 1 occurrence within 10-mile radius <del> and 1 occurrence</del> within 0.5-mile radius.	
<u>Western spadefoot</u> <u>Spea hammondii</u>	<u>/SSC/</u>	Sierra Nevada foothills, Central Valley, Coast Ranges, coastal counties in southern California; west of Sierran-desert range axis.	Shallow pools and seasonal wetlands, such as vernal pools in annual grasslands and oak woodlands, also temporary rainpools.	Low. Limited suitable habitat: no occurrences within 10-mile radius.	Low. Limited suitable habitat: 9 occurrences within 10-mile radius.	Low. Limited suitable habitat: 8 occurrences within 10-mile radius.	Low. Suitable habitat absent: 10 occurrences within 10-mile radius and 2 occurrences within 0.5-mile radius.	
<u>Foothill yellow-legged</u> frog <u>Rana boylii</u>	<u>/C. SSC/-</u> -	Occurs in the Klamath, Cascade, North Coast, South Coast, Transverse, and Sierra Nevada Ranges up to approximately 6,000 feet.	Creeks or rivers in woodland, forest, mixed chaparral, and wet meadow habitats with rock and gravel substrate and low overhanging vegetation along the edge. Usually found near riffles with rocks and sunny banks nearby.	Low. Suitable habitat present: 50 occurrences within 10-mile radius and no occurrences within 0.5-mile radius.	Low. Suitable habitat present: no occurrences within 10-mile radius.	Low. Suitable habitat present: 16 occurrences within 10-mile radius. and no occurrences within 0.5-mile radius.	Low. Suitable habitat present: 15 occurrences within 10-mile radius. and no occurrences within 0.5-mile radius.	
California red-legged frog Rana aurora draytonii	T/SSC/	Found along the coast and coastal mountain ranges of California from Marin County to San Diego County and in the Sierra Nevada from Tehama County to Fresno County.	Permanent and semipermanent aquatic habitats, such as creeks and cold-water ponds, with emergent and submergent vegetation. May estivate in rodent burrows or cracks during dry periods.	Low. Limited suitable habitat; 16 occurrences within 10-mile radius and no occurrences within 0.5-mile radius.	None. Region outside of species' known range.	None. Region outside of species' known range.	None. Region outside of species' known range.	

	Statuca			Potential Occurrence in Program Area Regions						
	Federal/			P0		III Program Area R	egions			
Common and	State/									
Scientific Names	Other	Geographic Distribution	Habitat Requirements	Region 1a	Region 1b	Region 2	Region 3			
<u>Sierra Nevada yellow-</u> legged frog <u>Rana sierrae</u>	<u>E/T/</u>	Western Sierra Nevada north of the Monarch Divide and the eastern slope of the Sierra Nevada from Inyo County: through Mono County to areas north of Lake Tahoe.	Lakes, ponds, marshes, meadows, and streams at high elevations— typically ranging from about 4,500 to 12,000 feet, but can occur as low as about 3,500 feet in the northern portions of its range.	<u>None. Region</u> outside of <u>species' known</u> <u>range.</u>	<u>None. Region</u> outside of <u>species' known</u> <u>range.</u>	<u>None. Region</u> <u>outside of</u> <u>species' known</u> <u>range.</u>	<u>None. Region</u> outside of species' <u>known range.</u>			
Reptiles										
<u>Silvery Northern</u> <u>California</u> legless lizard Anniella pulchra pulchra	/SSC/	Along the Coast, Transverse, and Peninsular Ranges from Contra Costa County to San Diego County with spotty occurrences in the San Joaquin Valley.	Habitats with loose soil for burrowing or thick duff or leaf litter; often forages in leaf litter at plant bases; may be found on beaches, sandy washes, and in woodland, chaparral, and riparian areas.	Low. Suitable habitat present; <u>9-6</u> occurrences within 10-mile radius and no occurrences within 0.5-mile radius.	None. Region outside of species' known range.	None. Region outside of species' known range.	None. Region outside of species' known range.			
<u>California glossy snake</u> <u>Arizona elegans</u> <u>occidentalis</u>	<u>/SSC/</u>	Occurs from the eastern part of the San Francisco Bay Area south to northwestern Baja California: absent along the central coast.	<u>Arid scrub, grassland, and</u> <u>chaparral habitats, and</u> <u>rocky washes.</u>	Low. Limited suitable habitat: <u>1 occurrence</u> within 10-mile radius and no occurrences within 0.5-mile radius.	<u>None. Region</u> <u>outside of</u> <u>species' known</u> <u>range.</u>	<u>None. Region</u> <u>outside of</u> <u>species' known</u> <u>range.</u>	<u>None. Region</u> <u>outside of species'</u> <u>known range.</u>			
Alameda whipsnake Masticophis lateralis euryxanthus	Т/Т/	Restricted to Alameda and Contra Costa Counties; fragmented into five disjunct populations throughout its range.	Valleys, foothills, and low mountains associated with northern coastal scrub or chaparral habitat; requires rock outcrops for cover and foraging.	Low. Limited suitable habitat; <u>15-25</u> occurrences within 10-mile radius and no occurrences within 0.5-mile radius.	None. Region outside of species' known range.	None. Region outside of species' known range.	None. Region outside of species' known range.			

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	Status <sup>a</sup>			Potential Occurrence in Program Area Regions						
Common and Scientific Names	Federal/ State/ Other	Geographic Distribution	Habitat Requirements	Region 1a	Region 1b	Region 2	Region 3			
Giant garter snake Thamnophis couchi gigas	T/T/	Central Valley from the vicinity of Burrel in Fresno County north to near Chico in Butte County; has been extirpated from areas south of Fresno.	Sloughs, canals, low gradient streams and freshwater marsh habitats where there is a prey base of small fish and amphibians; also found in irrigation ditches and rice fields; requires grassy banks and emergent vegetation for basking and areas of high ground protected from flooding during winter.	High. Suitable habitat present; <u>131-182</u> occurrences within 10-mile radius and <del>61-27</del> occurrences within 0.5-mile radius.	High. Suitable habitat present; <u>106-162</u> occurrences within 10-mile radius and <u>40-16</u> occurrences within 0.5-mile radius.	High. Suitable habitat present; <u>141-246</u> occurrences within 10-mile radius and <del>69-45</del> occurrences within 0.5-mile radius.	High. Suitable habitat present; <del>39</del> <u>78</u> occurrences within 10-mile radius and <u>21-2</u> occurrences within 0.5-mile radius.			
<u>Green sea turtle</u> <u>Chelonia mydas</u>	<u>T//</u>	Baja California to southern Alaska, but most commonly from San Diego south.	Tropical and subtropical waters along continental coasts; typically in open ocean convergence zones, nest on beaches, feeds in coastal benthic zones.	<u>None. Region</u> <u>outside of</u> <u>species' known</u> range.	<u>None. Region</u> <u>outside of</u> <u>species' known</u> <u>range.</u>	<u>None. Region</u> <u>outside of</u> <u>species' known</u> range.	<u>None. Region</u> outside of species' known range.			
Northwestern <u>Western</u> pond turtle <i>Emys marmorata</i> marmorata	/SSC/	Occurs from the Oregon border of Del Norte and Siskiyou Counties south along the coast to San Francisco Bay, inland through the Sacramento Valley, and on the western slope of Sierra Nevada.	Occupies ponds, marshes, rivers, streams, and irrigation canals with muddy or rocky bottoms and with watercress, cattails, water lilies, or other aquatic vegetation in woodlands, grasslands,	High. Suitable habitat present; <u>16-65</u> occurrences within 10-mile radius and 4- <u>2</u> occurrences within 0.5-mile radius.	High. Suitable habitat present; <u>17-49</u> occurrences within 10-mile radius and <u>3-2</u> occurrences within 0.5-mile radius.	High. Suitable habitat present; 14-30 occurrences within 10-mile radius and 4- <u>8</u> occurrences within 0.5-mile radius.	High. Suitable habitat present; <del>6</del> <u>14</u> occurrences within 10-mile radius and 2 occurrences within 0.5-mile radius.			

and open forests.

	Status <sup>a</sup>			Potential Occurrence in Program Area Regions				
Common and Scientific Names	Federal/ State/ Other	Geographic Distribution	Habitat Requirements	Region 1a	Region 1b	Region 2	Region 3	
<u>Coast horned lizard</u> <u>Phrynosoma blainvillii</u>	<u>/SSC/</u>	Although the current range is more fragmented. historically was found along the Pacific Coast from the Baja California border west of the deserts and the Sierra Nevada. north to the Bay Area, and inland as far north as Shasta Reservoir, and south into Baja California. Ranges up onto the Kern Plateau east of the crest of the Sierra Nevada. Occurs from sea level to 8,000 feet in elevation.	Requires sandy or loose soil and abundant ant colonies for foraging: habitat ranges from exposed gravelly-sandy substrate in riparian woodlands to dry uniform chamise chaparral to annual grassland or saltbrush.	Low. Suitable habitat present: no occurrences within 10-mile radius.	Low. Suitable habitat present: no occurrences within 10-mile radius.	Low. Suitable habitat present: 2 occurrences within 10-mile radius and no occurrences within 0.5-mile radius.	Low. Suitable habitat present: 1 occurrence within 10-mile radius and no occurrences within 0.5-mile radius.	
Birds								
Greater sandhill crane Grus canadensis tabida	/T <u>.FP</u> /	Breeds in Siskiyou, Modoc, Lassen, Plumas, and Sierra Counties. Winters in the Central Valley, southern Imperial County, Lake Havasu National Wildlife Refuge, and the Colorado River Indian Reserve.	Summers in open terrain near shallow lakes or freshwater marshes. Winters in plains and valleys near bodies of fresh water.	Low. Limited suitable habitat; <u>1-No</u> occurrence <u>s</u> within 10-mile radius <del>and 1</del> occurrence within 0.5-mile radius.	None. Region outside of species' known range.	Low. Limited suitable habitat; 5 occurrences within 10-mile radius and 2 occurrences within 0.5-mile radius.	Low. Limited suitable habitat; <del>2</del> <u>3</u> occurrences within 10-mile radius and <del>2</del> - <u>no</u> occurrences within 0.5-mile radius.	
<u>Mountain plover</u> <u>Charadrius montanus</u>	<u>/SSC/</u>	Does not breed in California; in winter, found in the Central Valley south of Yuba County, along the coast in parts of San Luis Obispo, Santa Barbara, Ventura, and San Diego Counties; parts of Imperial, Riverside, Kern, and Los Angeles Counties.	Occupies open plains or rolling hills with short grasses or very sparse vegetation; nearby bodies of water are not needed; may use newly plowed or sprouting grainfields.	Low. Suitable habitat present: 13 occurrences within 10-mile radius and 2 occurrences within 0.5-mile radius	Low. Suitable habitat present: Z occurrences within 10-mile radius and no occurrences within 0.5-mile radius	Low. Suitable habitat present: 11 occurrences within 10-mile radius and no occurrences within 0.5-mile radius.	<u>None. Region</u> <u>outside of species'</u> <u>known range.</u>	

	Status <sup>a</sup>			Ро	tential Occurrence	in Program Area R	egions
Common and Scientific Names	Federal/ State/ Other	Geographic Distribution	Habitat Requirements	Region 1a	Region 1b	Region 2	Region 3
White-faced ibis <i>Plegadis chihi</i> (rookery site)	 / <u>SSCWL</u> /	Both resident and winter populations on the Salton Sea and in isolated areas in Imperial, San Diego, Ventura, and Fresno Counties; breeds at Honey Lake, Lassen County, at Mendota Wildlife Management Area, Fresno County, and near Woodland, Yolo County.	Prefers freshwater marshes with tules, cattails, and rushes, but may nest in trees and forage in flooded agricultural fields, especially flooded rice fields.	Low. Limited suitable habitat; 1 occurrence within 10-mile radius and <del>no-1</del> occurrence <del>s</del> within 0.5-mile radius.	Low. Limited suitable habitat; 1 occurrence within 10-mile radius and no occurrences within 0.5-mile radius.	Low. Limited suitable habitat; <u>3-2</u> occurrences within 10-mile radius and no occurrences within 0.5-mile radius.	Low. Limited suitable habitat; 2 occurrences within 10-mile radius and no occurrences within 0.5-mile radius.
American peregrine falcon Falco peregrinus anatum	/ <u>&amp;FP</u> /	Permanent resident along the north and south Coast Ranges. May summer in the Cascade and Klamath Ranges and through the Sierra Nevada to Madera County. Winters in the Central Valley south through the Transverse and Peninsular Ranges and the plains east of the Cascade Range.	Nests and roosts on protected ledges of high cliffs, usually adjacent to lakes, rivers, or marshes that support large prey populations.	Low. Foraging habitat only; 1 occurrence within 10-mile radius and <del>no-1</del> occurrence <del>s</del> within 0.5-mile radius.	NoneLow. Foraging habitat only; <u>1</u> <u>occurrence</u> within <u>10-mile</u> <u>radius and no</u> occurrences within <u>100.5-</u> mile radius.	Low. Foraging habitat only; 2 occurrences within 10-mile radius and no occurrences within 0.5-mile radius.	Low. Foraging habitat only; 2 occurrences within 10-mile radius and no occurrences within 0.5-mile radius.

	Status <sup>a</sup>			Potential Occurrence in Program Area Regions			
Common and Scientific Names	Federal/ State/ Other	Geographic Distribution	Habitat Requirements	Region 1a	Region 1b	Region 2	Region 3
Prairie falcon Falco mexicanus	 / <u>SSCWL</u> /	Found as permanent resident on the south Coast, Transverse, Peninsular, and northern Cascade Ranges, the southeastern deserts, Inyo-White Mountains, Modoc, Lassen, and Plumas Counties, and the foothills surrounding the Central Valley; winters in the Central Valley; winters in the Central Valley, along the coast from Santa Barbara County to San Diego County, and in Marin, Sonoma, Humboldt, Del Norte, and Inyo Counties.	Cliffs or escarpments for nesting; adjacent dry, open terrain or uplands, marshes, and seasonal marshes for foraging.	None. Foraging habitat only; no occurrences within 10-mile radius.	None. Foraging habitat only; no occurrences within 10-mile radius.	None. Foraging habitat only; no occurrences within 10-mile radius.	Low. Foraging habitat only; 1 occurrence within 10-mile radius and no occurrences within 0.5-mile radius.
Osprey Pandion haliaetus	 / <u>SSCWL</u> /	Nests along the north coast from Marin County to Del Norte County, east through the Klamath and Cascade Ranges, and in the upper Sacramento Valley. Important inland breeding populations at Shasta Lake, Eagle Lake, and Lake Almanor and small numbers elsewhere south through the Sierra Nevada. Winters along the coast from San Mateo	Nests in snags, trees, or utility poles near the ocean, large lakes, or rivers with abundant fish populations.	Moderate. Suitable nesting habitat; no occurrences within 10-mile radius.	Moderate. Suitable nesting habitat; no occurrences within 10-mile radius.	High. Suitable nesting habitat; <del>7-8</del> occurrences within 10-mile radius and <del>6 no</del> occurrences within 0.5-mile radius.	High. Suitable nesting habitat; <del>16</del> <u>18</u> occurrences within 10-mile radius and 8 occurrences within 0.5-mile radius.

County to San Diego

County.

Wildlife

	Status <sup>a</sup>			Potential Occurrence in Program Area Regions			
Common and Scientific Names	Federal/ State/ Other	Geographic Distribution	Habitat Requirements	Region 1a	Region 1b	Region 2	Region 3
Bald eagle Haliaeetus leucocephalus	/E, FP/	Nests in Siskiyou, Modoc, Trinity, Shasta, Lassen, Plumas, Butte, Tehama, Lake, and Mendocino Counties and in the Lake Tahoe Basin. Reintroduced into central coast. Winter range includes the rest of California, except the southeastern deserts, very high altitudes in the Sierra Nevada, and east of the Sierra Nevada south of Mono County.	In western North America, nests and roosts in coniferous forests within 1 mile of a lake, reservoir, stream, or the ocean.	NoneModerate. No s <u>S</u> uitable nesting habitat <u>present</u> ; no occurrences within 10-mile radius.	NoneModerate. No suitable Suitable nesting habitat <u>present;</u> no occurrences within 10-mile radius.	LowModerate. Limited sSuitable nesting habitat <u>present</u> ; 5-4_occurrences within 10-mile radius and <del>no.1</del> occurrence (CNDDB #357; Sacramento <u>River Mile 55)</u> s within 0.5-mile radius.	LowModerate. Limited sSuitable nesting habitat; <u>2-4</u> occurrences within 10-mile radius and no-1 occurrence (CNDDB # 347: Feather River)s within 0.5-mile radius.
Golden eagle Aquila chrysaetos	<u></u> ₽R/SSC, ₽₽ <u></u> ₽₽/	Foothills and mountains throughout California. Uncommon nonbreeding visitor to lowlands such as the Central Valley.	Nest on cliffs and escarpments or in tall trees overlooking open country. Forages in annual grasslands, chaparral, and oak woodlands with plentiful medium and large-sized mammals.	None. Limited suitable nesting habitat; no occurrences within 10-mile radius.	Low. Limited suitable nesting habitat; 1 occurrence within 10-mile radius and no occurrences within 0.5-mile radius.	None. Limited suitable nesting habitat; no occurrences within 10-mile radius.	None. Limited suitable nesting habitat; no occurrences within 10-mile radius.
White-tailed kite Elanus leucurus	/ FP/	Lowland areas west of Sierra Nevada from the head of the Sacramento Valley south, including coastal valleys and foothills to western San Diego County at the	Low foothills or valley areas with valley or live oaks, riparian areas, and marshes near open grasslands for foraging.	Moderate. Suitable nesting habitat; <del>30-29</del> occurrences within 10-mile radius and 4- <u>no</u> occurrences	High. Suitable nesting habitat; <u>32-36</u> occurrences within 10-mile radius and 4- <u>12</u> occurrences	Moderate. Suitable nesting habitat; 1 occurrence within 10-mile radius and no occurrences	High. Suitable nesting habitat; 2 occurrences within 10-mile radius and <u>1-no</u> occurrence <u>s</u> within 0.5-mile radius.

Mexico border.

within 0.5-mile

radius.

within 0.5-mile

radius.

within 0.5-mile

radius.

	Status <sup>a</sup>			Potential Occurrence in Program Area Regions			
Common and Scientific Names	Federal/ State/ Other	Geographic Distribution	Habitat Requirements	Region 1a	Region 1b	Region 2	Region 3
Northern harrier <i>Circus cyaneus</i>	/SSC/	Occurs throughout lowland California. Has been recorded in fall at high elevations.	Nests and forages in grasslands, meadows, marshes, and seasonal and agricultural wetlands.	Low to Moderate. Limited suitable nesting habitat; <del>no-1</del> occurrence <del>s</del> within 10-mile radius.	Low to Moderate. Limited suitable nesting habitat; <del>no 1</del> occurrence <del>s</del> within 10-mile radius.	Moderate. Limited suitable nesting habitat; 7 occurrences within 10-mile radius and 1 occurrence within 0.5-mile radius.	Moderate. Limited suitable nesting habitat; 1 occurrence within 10-mile radius and 1 occurrence within 0.5-mile radius.
<del>Northern goshawk</del> <i>Accipiter gentilis</i>	<del>/SSC/</del>	Permanent resident in the Klamath and Cascade Ranges, in the north Coast Ranges from Del Norte County to Mendocino County, and in the Sierra Nevada south to Kern County. Winters in Modoc, Lassen, Mono, and northern Inyo Counties.	Nests and roosts in older stands of red fir, Jeffrey pine, Ponderosa pine, lodgepole pine, Douglas fir, and mixed conifer forests.	None. Region outside of species' known range.	None. Region outside of species' known range.	Low. Limited suitable habitat; 1 occurrence within 10-mile radius and no occurrences within 0.5-mile radius.	<del>None. Region outside of species'</del> <del>known range.</del>
Swainson's hawk Buteo swainsoni	/T/ <del>/</del>	Lower Sacramento and San Joaquin Valleys, the Klamath Basin, and Butte Valley. Highest nesting densities occur near Davis and Woodland, Yolo County.	Nests in oaks or cottonwoods in or near riparian habitats. Forages in grasslands, irrigated pastures, and grain fields.	High. Suitable nesting and foraging habitat; 946-984 occurrences within 10-mile radius and <del>279</del> <u>134</u> occurrences within 0.5-mile radius.	High. Suitable nesting and foraging habitat; 494-643 occurrences within 10-mile radius and 204 93 occurrences within 0.5-mile radius.	High. Suitable nesting and foraging habitat; <del>387-449</del> occurrences within 10-mile radius -and <del>181</del> <u>138</u> occurrences within 0.5-mile radius.	High. Suitable nesting and foraging habitat; <del>70-115</del> occurrences within 10-mile radius and <del>35-<u>16</u> occurrences</del> within 0.5-mile radius.

	Status <sup>a</sup>			Potential Occurrence in Program Area Regions			
Common and Scientific Names	Federal/ State/ Other	Geographic Distribution	Habitat Requirements	Region 1a	Region 1b	Region 2	Region 3
Merlin Falco columbarius	 / <u>SSCWL</u> /	Does not nest in California. Rare but widespread winter visitor to the Central Valley and coastal areas.	Forages along coastline in open grasslands, savannas, and woodlands. Often forages near lakes and other wetlands.	Low. Suitable foraging habitat only; 6 occurrences within 10-mile radius.	Low. Suitable foraging habitat only; 7 occurrences within 10-mile radius.	Low. Suitable foraging habitat only; 2 occurrences within 10-mile radius and 1 occurrence within 0.5-mile radius.	Low. Suitable foraging habitat only; 1 occurrence within 10-mile radius <del>and 1 occurrence within 0.5 mile radius</del> .
<u>Northern spotted owl</u> <u>Strix occidentalis caurina</u>	<u>T/T/</u>	A permanent resident throughout its range: found in the North Coast. Klamath, and western Cascade Ranges from Del Norte County to Marin County.	Dense old-growth or mature forests dominated by conifers with topped trees or oaks available for nesting crevices.	None. Suitable nesting and foraging habitat absent: no occurrences within 10-mile radius.	None. Suitable nesting and foraging habitat absent: no occurrences within 10-mile radius.	None. Suitable nesting and foraging habitat absent: no occurrences within 10-mile radius.	None. Suitable nesting and foraging habitat absent: no occurrences within 10-mile radius.
Western burrowing owl Athene cunicularia hypugea	/SSC/	Lowlands throughout California, including the Central Valley, northeastern plateau, southeastern deserts, and coastal areas. Rare along south coast.	Level, open, dry, heavily grazed or low stature grassland or desert vegetation with available burrows.	High. Suitable nesting and foraging habitat; <u>192-215</u> occurrences within 10-mile radius and <u>12-24</u> occurrences within 0.5-mile radius.	High. Suitable nesting and foraging habitat; <u>100-125</u> occurrences within 10-mile radius and <u>10-11</u> occurrences within 0.5-mile radius.	Moderate. Suitable nesting and foraging habitat; <del>25</del> <u>31</u> occurrences within 10-mile radius and <del>no 1</del> occurrence <del>s</del> within 0.5-mile radius.	High. Suitable nesting and foraging habitat; 14 occurrences within 10-mile radius and <u>1-3</u> occurrence <u>s</u> within 0.5-mile radius.

	Status <sup>a</sup>			Potential Occurrence in Program Area Regions			
Common and Scientific Names	Federal/ State/ Other	Geographic Distribution	Habitat Requirements	Region 1a	Region 1b	Region 2	Region 3
Long-eared owl Asio otus	/SSC/ (nesting)	Permanent resident east of the Cascade Range from Placer County north to the Oregon border, east of the Sierra Nevada from Alpine County to Inyo County. Scattered breeding populations along the coast and in southeastern California. Winters throughout the Central Valley and southeastern California.	Nests in abandoned crow, hawk, or magpie nests, usually in dense riparian stands of willows, cottonwoods, live oaks, or conifers.	Low. Wintering habitat only; no occurrences within 10-mile radius.	Low. Wintering habitat only; no occurrences within 10-mile radius.	Low. Wintering habitat only; 1 occurrence within 10-mile radius and no occurrences within 0.5-mile radius.	Low. Wintering habitat only; no occurrences within 10-mile radius.
Short-eared owl <i>Asio flammeus</i>	/SSC/	Permanent resident along the coast from Del Norte County to Monterey County although very rare in summer north of San Francisco Bay, in the Sierra Nevada north of Nevada County, in the plains east of the Cascades, and in Mono County; small, isolated populations.	Freshwater and salt marshes, lowland meadows, and irrigated alfalfa fields; needs dense tules or tall grass for nesting and daytime roosts.	Low. Limited suitable habitat; 1 occurrence within 10-mile radius and no occurrences within 0.5-mile radius.	Low. Limited suitable habitat; no occurrences within 10-mile radius.	Low. Limited suitable habitat; no occurrences within 10-mile radius.	Low. Limited suitable habitat; no occurrences within 10-mile radius.
California least tern (nesting colony) Sterna antillarum browni	E/E, FP/	Nests on beaches along the San Francisco Bay and along the southern California coast from southern San Luis Obispo County south to San Diego County.	Nests on sandy, upper ocean beaches, and occasionally uses mudflats; forages on adjacent surf line, estuaries, or the open ocean.	None. Region outside of species' known range.Low. Limited suitable habitat: 2 occurrences within 10-mile radius and no occurrences within 0.5-mile radius	None. Region outside of species' known range.	Low. Limited suitable habitat; 2 occurrences within 10 mile radius and no occurrences within 0.5-mile radius. None. Region outside of species' known range.	None. Region outside of species' known range.

	Status <sup>a</sup>			Potential Occurrence in Program Area Regions			
Common and Scientific Names	Federal/ State/ Other	Geographic Distribution	Habitat Requirements	Region 1a	Region 1b	Region 2	Region 3
Purple martin Progne subis	/SSC/	Coastal mountains south to San Luis Obispo County, west slope of the Sierra Nevada, and northern Sierra and Cascade ranges. Absent from the Central Valley except in Sacramento. Isolated, local populations in southern California.	Nests in abandoned woodpecker holes in oaks, cottonwoods, and other deciduous trees in a variety of wooded and riparian habitats. Also nests in vertical drainage holes under elevated freeways and highway bridges.	Moderate. Suitable nesting and foraging habitat; 10 occurrences within 10-mile radius and <u>1-no</u> occurrence <u>s</u> within 0.5-mile radius.	Moderate. Suitable nesting and foraging habitat; 10 occurrences within 10-mile radius and 1 occurrence within 0.5-mile radius.	None. Region outside of species' known range.	None. Region outside of species' known range.
Bank swallow Riparia riparia	/T/	Occurs along the Sacramento River from Tehama County to Sacramento County, along the Feather and lower American Rivers, in the Owens Valley; and in the plains east of the Cascade Range in Modoc, Lassen, and northern Siskiyou Counties. Small populations near the coast from San Francisco County to Monterey County.	Nests in bluffs or banks, usually adjacent to water, where the soil consists of sand or sandy loam.	High. Suitable nesting and foraging habitat; <u>49-20</u> occurrences within 10-mile radius and <u>46-4</u> occurrences within 0.5-mile radius.	High. Suitable nesting and foraging habitat; <u>22-26</u> occurrences within 10-mile radius and <u>19-1</u> occurrences within 0.5-mile radius.	High. Suitable nesting and foraging habitat; <del>82-109</del> occurrences within 10-mile radius and <del>82-64</del> occurrences within 0.5-mile radius.	High. Suitable nesting and foraging habitat; <del>59-92</del> occurrences within 10-mile radius and 4 <u>1-38</u> occurrences within 0.5-mile radius.
Loggerhead shrike Lanius ludovicianus	/SSC/	Resident and winter visitor in lowlands and foothills throughout California; rare on coastal slope north of Mendocino County, occurring only in winter.	Prefers open habitats with scattered shrubs, trees, posts, fences, utility lines, or other perches.	Moderate. Suitable nesting and foraging habitat; 1 occurrence within 10-mile radius and no occurrences within 0.5-mile radius.	Low to Moderate. Suitable nesting and foraging habitat; no occurrences within 10-mile radius.	Moderate. Suitable nesting and foraging habitat; 1 occurrence within 10-mile radius and no occurrences within 0.5-mile radius.	Low to Moderate. Suitable nesting and foraging habitat; no occurrences within 10-mile radius.

	Status <sup>a</sup>			Po	tential Occurrence	in Program Area R	egions
Common and Scientific Names	Federal/ State/ Other	Geographic Distribution	Habitat Requirements	Region 1a	Region 1b	Region 2	Region 3
<u>Least Bell's vireo</u> <u>Vireo bellii pusillus</u>	<u>E/E/</u>	Small populations remain in southern Inyo, southern San Bernardino, Riverside, San Diego, Orange, Los Angeles, Ventura, and Santa Barbara Counties. Found at the San Joaquin River National Wildlife Refuge (San Joaquin and Stanislaus Counties) in 2005.	Riparian thickets/dense willows with a well- developed understory either near water or in dry portions of river bottoms: nests along margins of bushes and forages low to the ground: may also be found using mesquite and arrow weed in desert canyons.	Low. Suitable nesting and foraging habitat: <u>2 occurrences</u> within 10-mile radius and no occurrences within 0.5-mile radius.	Low. Suitable nesting and foraging habitat: 2 occurrences within 10-mile radius and 1 occurrence within 0.5-mile radius.	Low. Suitable nesting and foraging habitat: <u>3 occurrences</u> within 10-mile radius and 1 occurrence within 0.5-mile radius.	Low. Suitable nesting and foraging habitat: 4 occurrences within 10-mile radius and 1 occurrence within 0.5-mile radius.
Tricolored blackbird <i>Agelaius tricolor</i>	/ <u>T.</u> <del>SSC</del> /	Permanent resident in the Central Valley from Butte County to Kern County; breeds at scattered coastal locations from Marin County south to San Diego County and at scattered locations in Lake, Sonoma, and Solano Counties; rare nester in Siskiyou, Modoc, and Lassen Counties.	Nests in dense colonies in emergent marsh vegetation, such as tules and cattails, or upland sites with blackberries, nettles, thistles, and grain fields; habitat must be large enough to support 50 pairs; probably requires water at or near the nesting colony.	High. Suitable nesting and foraging habitat; <u>41-52</u> occurrences within 10-mile radius and <u>10-7</u> occurrences within 0.5-mile radius.	High. Suitable nesting and foraging habitat; <u>49-82</u> occurrences within 10-mile radius and 6 occurrences within 0.5-mile radius.	High. Suitable nesting and foraging habitat; <del>63-133</del> occurrences within 10-mile radius and <del>15-27</del> occurrences within 0.5-mile radius.	High. Suitable nesting and foraging habitat; <u>48-80</u> occurrences within 10-mile radius and 8 occurrences within 0.5-mile radius.

Wildlife

	Status <sup>a</sup>			Potential Occurrence in Program Area Regions				
Common and Scientific Names	Federal/ State/ Other	Geographic Distribution	Habitat Requirements	Region 1a	Region 1b	Region 2	Region 3	
Yellow-headed blackbird Xanthocephalus xanthocephalus	/SSC/	Locally numerous in the Klamath Basin, Modoc Plateau, Great Basin desert, and large mountain valleys in northeastern California; and in the San Joaquin Valley. Common breeders in the Colorado River valley, the Salton Sink, and the western Mojave desert; scarce in the Sacramento Valley and along the southern coast in Los Angeles, Riverside, and San Bernardino counties.	Nest in marshes with tall emergent vegetation, such as tules or cattails, generally in open areas and edges over relatively deep water. Breeding marshes often on edges of deep water bodies such as lakes, reservoirs, and or larger ponds.	Moderate. Limited suitable nesting and foraging habitat; 1 occurrence within 10-mile radius and <u>1-no occurrence occurrences</u> within 0.5-mile radius.	High. Limited suitable nesting and foraging habitat; 1 occurrence within 10-mile radius and 1 occurrence within 0.5-mile radius.	Low to Moderate. Limited suitable nesting and foraging habitat; no occurrences within 10-mile radius.	Low to Moderate. Limited suitable nesting and foraging habitat; no occurrences within 10-mile radius.	
Western yellow-billed cuckoo <i>Coccyzus americanus</i>	<u>T</u> <del>C</del> /E/	Nests along the upper Sacramento, lower Feather, south fork of the Kern, Amargosa, Santa Ana, and Colorado Rivers.	Wide, dense riparian forests with a thick understory of willows for nesting; sites with a dominant cottonwood overstory are preferred for foraging; may avoid valley-oak riparian habitats where scrub jays are abundant.	High. Suitable nesting and foraging habitat; 8 occurrences within 10-mile radius and <del>8-2</del> occurrences within 0.5-mile radius.	Moderate. Suitable nesting and foraging habitat; <u>3-8</u> occurrences within 10-mile radius and <u>3-2</u> occurrences within 0.5-mile radius.	High. Suitable nesting and foraging habitat; <u>31-43</u> occurrences within 10-mile radius and <u>30-11</u> occurrences within 0.5-mile radius.	High. Suitable nesting and foraging habitat; <u>39-51</u> occurrences within 10-mile radius and <u>31-25</u> occurrences within 0.5-mile radius.	

	Status <sup>a</sup>			Potential Occurrence in Program Area Regions				
Common and	Federal/ State/							
Scientific Names	Other	Geographic Distribution	Habitat Requirements	Region 1a	Region 1b	Region 2	Region 3	
<u>Yellow rail</u> <u>Coturnicops</u> <u>noveboracensis</u>	<u>/SSC/</u>	Historical records of nests in Mono County east of the Sierra Nevada and formerly Marin County on the coast; winter records also on the coast from Humboldt County to Orange County, and where the Central Valley merges with the San Francisco Bay estuary.	Freshwater marshes, brackish marshes, coastal salt marshes with moist soil or low standing water, and grassy meadows; prefers densely vegetated marshes.	Low. Limited suitable nesting and foraging habitat; 1 occurrences within 10-mile radius and no occurrences within 0.5-mile radius.	Low. Limited suitable nesting and foraging habitat; no occurrences within 10-mile radius.	Low. Limited suitable nesting and foraging habitat; no occurrences within 10-mile radius.	Low. Limited suitable nesting and foraging habitat; no occurrences within 10-mile radius.	
California black rail Laterallus jamaicensis coturniculus	/T <u>.FP</u> /	Permanent resident in the San Francisco Bay and eastward through the Delta into Sacramento and San Joaquin Counties; small populations in Marin, Santa Cruz, San Luis Obispo, Orange, Riverside, and Imperial Counties.	Tidal salt marshes associated with heavy growth of pickleweed; also occurs in brackish marshes or freshwater marshes at low elevations.	Low. Limited suitable nesting and foraging habitat; <u>23-34</u> occurrences within 10-mile radius and <del>no-3</del> occurrences within 0.5-mile radius.	None. Limited suitable nesting and foraging habitat; <del>no.5</del> occurrences within 10-mile radius <u>and no</u> <u>occurrences</u> <u>within 0.5-mile</u> <u>radius</u> .	Low. Limited suitable nesting and foraging habitat; <u>35-67</u> occurrences within 10-mile radius and no occurrences within 0.5-mile radius.	Low. Limited suitable nesting and foraging habitat; <del>1</del> <u>5</u> occurrences within 10-mile radius and no occurrences within 0.5-mile radius.	
<u>California Ridgway's rail</u> <u>Rallus obsoletus obsoletus</u>	<u>E/E, FP/</u>	<u>Marshes around the San</u> <u>Francisco Bay and east</u> <u>through the Delta to</u> <u>Suisun Marsh.</u>	Restricted to salt marshes and tidal sloughs: usually associated with heavy growth of pickle-weed: feeds on mollusks removed from the mud in sloughs.	<u>None. Region</u> <u>outside of</u> species' known <u>range.</u>	<u>None. Region</u> outside of species' known range.	<u>None. Region</u> outside of species' known range.	<u>None. Region</u> outside of species' <u>known range.</u>	

	Status <sup>a</sup>			Potential Occurrence in Program Area Regions				
Common and	Federal/ State/							
Scientific Names	Other	Geographic Distribution	Habitat Requirements	Region 1a	Region 1b	Region 2	Region 3	
Saltmarsh common yellowthroat Geothlypis trichas sinuosa	/SSC/	Found only in the San Francisco Bay Area in Marin, Napa, Sonoma, Solano, San Francisco, San Mateo, Santa Clara, and Alameda Counties.	Freshwater marshes in summer and salt or brackish marshes in fall and winter; requires tall grasses, tules, and willow thickets for nesting and cover.	Low. Limited suitable nesting habitat; <u>20-7</u> occurrences within 10-mile radius and no occurrences within 0.5-mile radius.	None. Region outside of species' known range.	None. Region outside of species' known range.	None. Region outside of species' known range.	
Yellow warbler Dendroica petechia brewsteri	/SSC/	Nests over all of California except the Central Valley, the Mojave Desert region, and high altitudes along the eastern side of the Sierra Nevada. Winters along the Colorado River and in parts of Imperial and Riverside Counties. Two small permanent populations in San Diego and Santa Barbara Counties.	Nests in riparian areas dominated by willows, cottonwoods, sycamores, or alders or in mature chaparral; may also use oaks, conifers, and urban areas near stream courses.	None. Region outside of species' known range.	None. Region outside of species' known range.	Low. Suitable nesting and foraging habitat; 2 occurrences within 10-mile radius and no occurrences within 0.5-mile radius.	Low. Suitable nesting and foraging habitat; 1 occurrence within 10-mile radius and no occurrences within 0.5-mile radius.	
<u>Song Sparrow "Modesto"</u> <u>Population</u> <u>Melospiza melodia</u>	<u>/SSC/</u>	Resides in the north- central portion of the Central Valley, with the highest densities in the Butte Sink area of the Sacramento Valley and in the Sacramento–San Joaquin River Delta.	Associated with freshwater marshes dominated by tules and cattails and riparian willow thickets. Also nests in riparian forests with blackberry understory and along vegetated irrigation canals and levees.	High. Limited suitable nesting habitat: 20 occurrences within 10-mile radius and no occurrences within 0.5-mile radius.	<u>High. Region</u> <u>outside of</u> <u>species' known</u> <u>range.</u>	<u>High. Region</u> <u>outside of</u> <u>species' known</u> <u>range.</u>	<u>High. Region</u> outside of species' known range.	

	Status <sup>a</sup>			Potential Occurrence in Program Area Regions			
Common and Scientific Names	Federal/ State/ Other	Geographic Distribution	Habitat Requirements	Region 1a	Region 1b	Region 2	Region 3
Yellow-breasted chat Icteria virens	/SSC/	Nests locally in coastal mountains and Sierra Nevada foothills, east of the Cascades in northern California, along the Colorado river, and very locally inland in southern California.	Nests in dense riparian habitats dominated by willows, alders, Oregon ash, tall weeds, blackberry vines, and grapevines.	None. Region outside of species' known range.	None. Region outside of species' known range.	Low. Suitable nesting and foraging habitat: 1 occurrence within 10-mile radius and no occurrences within 0.5-mile radius.None. Region outside of species' known range.	Low. Suitable nesting and foraging habitat; 1 occurrence within 10-mile radius and no occurrences within 0.5-mile radius.
Grasshopper sparrow Ammodramus savannarum	/SSC/	Summer resident in the foothills of the Sierra Nevada and Coast Range from Mendocino and Trinity counties south to San Diego County.	Dry, dense grasslands with a variety of grasses and tall forbs and scattered shrubs.	Low. Suitable nesting and foraging habitat; <u>1-2</u> occurrence within 10-mile radius and <del>no-1</del> occurrence <del>s</del> within 0.5-mile radius.	Low. Suitable nesting and foraging habitat; <u>1-2</u> occurrences within 10-mile radius and no occurrences within 0.5-mile radius.	Low. Suitable nesting and foraging habitat; 1 occurrence within 10-mile radius and no occurrences within 0.5-mile radius.	None. Region outside of species' known range.
Suisun song sparrow Melospiza melodia maxillaris	/SSC/	Restricted to the extreme western edge of the Delta, between the cities of Vallejo and Pittsburg near Suisun Bay.	Brackish and tidal marshes supporting cattails, tules, various sedges, and pickleweed.	Low. Limited suitable nesting and foraging habitat; <u>14-11</u> occurrences within 10-mile radius and no occurrences within 0.5-mile radius.	None. Region outside of species' known range.	None. Region outside of species' known range.	None. Region outside of species' known range.

	Status <sup>a</sup>			Potential Occurrence in Program Area Regions			
Common and	Federal/ State/						
Scientific Names	Other	Geographic Distribution	Habitat Requirements	Region 1a	Region 1b	Region 2	Region 3
Western snowy plover (inland populations) <i>Charadrius alexandrinus</i> <i>nivosus</i> (nesting)	/SSC/	Nests at inland lakes throughout northeastern, central, and southern California, including Mono Lake and Salton Sea.	Barren to sparsely vegetated ground at alkaline or saline lakes, reservoirs, ponds and riverine sand bars; also along sewage, salt- evaporation, and agricultural waste- water ponds.	Moderate. Possible suitable nesting and foraging habitat present; 2 occurrences within 10-mile radius and 2 occurrences within 0.5-mile radius.	Moderate. Possible suitable nesting and foraging habitat present; 2 occurrences within 10-mile radius and <u>2-no</u> occurrences within 0.5-mile radius.	Moderate. Possible suitable nesting and foraging habitat present; 1 occurrence within 10-mile radius and <u>1-no</u> occurrence <u>s</u> within 0.5-mile radius.	Low. Possible suitable nesting and foraging habitat present; no occurrences within 10-mile radius.
Mammals							
Western mastiff bat Eumops perotis californicus	/SSC/ WBWG: high priority	Occurs along the western Sierra primarily at low to mid elevations and widely distributed throughout the southern coast ranges. Recent surveys have detected the species north to the Oregon border.	Found in a wide variety of habitats from desert scrub to montane conifer. Roosts and breeds in deep, narrow rock crevices, but may also use crevices in trees, buildings, and tunnels.	None. Region outside of species' known range.	None. Region outside of species' known range.	Moderate. Suitable roosting and foraging habitat; 6 occurrences within 10-mile radius and 4- <u>1</u> occurrences within 0.5-mile radius.	Moderate. Suitable roosting and foraging habitat; 6 occurrences within 10-mile radius and <u>3-2</u> occurrences within 0.5-mile radius.
Hoary bat <i>Lasurius cinerius</i>	/SSC/	Occurs throughout California from sea level to 13,200 feet.	Primarily found in forested habitats. Also found in riparian areas and in park and garden settings in urban areas. Day roosts within foliage of trees.	Moderate. Suitable roosting and foraging habitat; <del>10-6</del> occurrences within 10-mile radius and <del>7-2</del> occurrences within 0.5-mile radius.	Moderate. Suitable roosting and foraging habitat; <u>5-6</u> occurrences within 10-mile radius and <u>2-1</u> occurrences within 0.5-mile radius.	Moderate. Suitable roosting and foraging habitat; 11 occurrences within 10-mile radius and <u>9-5</u> occurrences within 0.5-mile radius.	Moderate. Suitable roosting and foraging habitat; 15 occurrences within 10-mile radius and <del>8-6</del> occurrences within 0.5-mile radius.

	Status <sup>a</sup>			Potential Occurrence in Program Area Regions			
Common and Scientific Names	Federal/ State/ Other	Geographic Distribution	Habitat Requirements	Region 1a	Region 1b	Region 2	Region 3
Pallid bat Antrozous pallidus	/SSC/ WBWG: High priority	Occurs throughout California except the high Sierra from Shasta to Kern County and the northwest coast, primarily at lower and mid elevations.	Occurs in a variety of habitats from desert to coniferous forest. Most closely associated with oak, yellow pine, redwood, and giant sequoia habitats in northern California and oak woodland, grassland, and desert scrub in southern California. Relies heavily on trees for roosts.	Moderate. Suitable roosting and foraging habitat; <u>3-2</u> occurrences within 10-mile radius and no occurrences within 0.5-mile radius.	Moderate. Suitable roosting and foraging habitat; <u>3-4</u> occurrences within 10-mile radius and no occurrences within 0.5-mile radius.	Moderate. Suitable roosting and foraging habitat; <u>5-4</u> occurrences within 10-mile radius and no occurrences within 0.5-mile radius.	Moderate. Suitable roosting and foraging habitat; 6 occurrences within 10-mile radius and no occurrences within 0.5-mile radius.
Pale-Townsend's <del>(=western)</del> -big-eared bat Corynorhinus townsendii pallescens	/SSC/	Klamath Mountains, Cascades, Sierra Nevada, Central Valley, Transverse and Peninsular Ranges, Great Basin, and the Mojave and Sonora Deserts.	Requires caves, tunnels, buildings or other human-made structures for roosting. Gleans insects from brush or trees and feeds along habitat edges.	None. Limited to no suitable roosting habitat, foraging habitat only; no occurrences within 10-mile radius.	None. Limited to no suitable roosting habitat, foraging habitat only; no occurrences within 10-mile radius.	NoneLow. Limited to no suitable roosting habitat, foraging habitat only; <del>no</del> <u>1</u> occurrences within 10-mile radius.	Low. Limited to no suitable roosting habitat, foraging habitat only; 3 occurrences within 10-mile radius and no occurrences within 0.5-mile radius.
Western red bat Lasiurus blossevillii	/SSC/ WBWG: High priority	Scattered throughout much of California at lower elevations.	Found primarily in riparian and wooded habitats. Occurs at least seasonally in urban areas. Day roosts in trees within the foliage. Found in fruit orchards and sycamore riparian habitats in the Central Valley.	High. Suitable roosting and foraging habitat; <del>13</del> - <u>7</u> occurrences within 10-mile radius and <del>7-<u>2</u> occurrences</del> within 0.5-mile radius.	High. Suitable roosting and foraging habitat; 4- <u>5</u> -occurrences within 10-mile radius and 2- <u>1</u> occurrence <del>s</del> within 0.5-mile radius.	High. Suitable roosting and foraging habitat; 8 occurrences within 10-mile radius and <del>8.5</del> occurrences within 0.5-mile radius.	High. Suitable roosting and foraging habitat; 13 occurrences within 10-mile radius and 7- <u>5</u> occurrences within 0.5-mile radius.
Common and

Scientific Names

<u>Riparian brush rabbit</u>

<u>Sylvilagus bachmani</u> <u>riparius</u> Status<sup>a</sup> Federal/

State/

Other

<u>E/E/ --</u>

Geographic Distribution

Dense thickets of brush

associated with riparian

<u>habitats.</u>

	Po	tential Occurrence	in Program Area R	egions
Habitat Requirements	Region 1a	Region 1b	Region 2	Region 3
Extirpated from most of historic range and now restricted to Caswell Memorial State Park on the Stanislaus River, at the confluence with the San Joaquin River, and an adjacent portion of an overflow channel and Paradise Cut, Tom Paine Slough, and channels of the San Joaquin River.	<u>None. Region</u> outside of species' known range.	<u>None. Region</u> <u>outside of</u> <u>species' known</u> <u>range.</u>	<u>None. Region</u> <u>outside of</u> <u>species' known</u> <u>range.</u>	<u>None. Region</u> outside of species' known range.
<u>Friable soil, grass-forb</u> stages of chaparral.	<u>None. Region</u> outside of	<u>None. Region</u> outside of	Low. No suitable habitat:	<u>Low. No suitable</u> <u>habitat: Potentially</u>

<u>Marysville California</u> <u>kangaroo rat</u> <u>Dipodomys californicus</u> eximius	<u>/SSC/</u>	Endemic to the Sutter Buttes.	an adjacent portion of an overflow channel and Paradise Cut, Tom Paine Slough, and channels of the San Joaquin River. Friable soil, grass-forb stages of chaparral.	None. Region outside of species' known range.	<u>None. Region</u> outside of species' known range.	Low. No suitable habitat: Potentially extirpated.	Low. No suitable habitat: Potentially extirpated.
Salt-marsh harvest mouse Reithrodontomys Raviventris	E/E, FP/	San Francisco, San Pablo, and Suisun Bays; the Delta.	Salt marshes with a dense plant cover of pickle-weed and fat hen; adjacent to an upland site.	Low. Suitable habitat absent; <u>20-25</u> occurrences within 10-mile radius and no occurrences within 0.5-mile radius.	None. Region outside of species' known range.	None. Region outside of species' known range.	None. Region outside of species' known range.
<u>Gray wolf</u> <u>Canis lupus</u>	<u>E/E/</u>	<u>Currently inhabits Idaho,</u> <u>Montana, Wyoming,</u> <u>Washington, and</u> <u>Oregon.</u>	Wide-ranging, habitat generalist that historically occupied diverse habitats and varied topographies in North America, including tundra, forests, grasslands, and deserts. Primary habitat requirements are the presence of adequate ungulate prey and water.	<u>None. Region</u> <u>outside of</u> <u>species' known</u> <u>range.</u>	<u>None. Region</u> <u>outside of</u> <u>species' known</u> range.	<u>None. Region</u> outside of species' known range.	<u>None. Region</u> outside of species' known range.

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	Statusª Federal/			Potential Occurrence in Program Area Regions				
Common and Scientific Names	State/ Other	Geographic Distribution	Habitat Requirements	Region 1a	Region 1b	Region 2	Region 3	
American badger <i>Taxidea taxus</i>	/SSC/	In California, badgers occur throughout the state except in humid coastal forests of northwestern California in Del Norte and Humboldt Counties.	Occurs in a wide variety of open, arid habitats but is most commonly associated with grasslands, savannas, mountain meadows, and open areas of desert scrub; principal habitat requirements appear to be sufficient food (burrowing rodents), friable soils, and relatively open, uncultivated ground.	Low. Suitable habitat; 8 occurrences within 10-mile radius and 1 occurrence within 0.5-mile radius.	Low. Suitable habitat; 6 occurrences within 10-mile radius and 1 occurrence within 0.5-mile radius.	Low. Suitable habitat; <u>2-3</u> occurrences within 10-mile radius and 1 occurrence within 0.5-mile radius.	Low. Suitable habitat; <u>1-2</u> occurrence within 10-mile radius and <u>1-no</u> occurrence <u>s</u> within 0.5-mile radius.	
San Joaquin kit fox <i>Vulpes macrotis mutica</i>	E/T/	Principally occurs in the San Joaquin Valley and adjacent open foothills to the west; recent records from 17 counties extending from Kern County north to Contra Costa County.	Saltbush scrub, grassland, oak, savanna, and freshwater scrub.	Low. Limited suitable habitat; 4 occurrences within 10-mile radius and no occurrences within 0.5-mile radius.	None. Region outside of species' known range.	None. Region outside of species' known range.	None. Region outside of species' known range.	
<u>North American</u> <del>Wwolverine</del> <i>Gulo gulo</i>	<u>C/T.FP/</u>	<u>A scarce resident of</u> <u>North Coast mountains</u> <u>and Sierra Nevada.</u>	Prefers areas with low human disturbance. Uses caves, hollows in cliffs, logs, rock outcrops, and burrows for cover, generally in dense forest.	<u>None. Region</u> <u>outside of</u> <u>species' known</u> <u>range.</u>	<u>None. Region</u> <u>outside of</u> <u>species' known</u> <u>range.</u>	<u>None. Region</u> outside of species' known range.	<u>None. Region</u> outside of species' <u>known range.</u>	

	Status <sup>a</sup>				Potential Occurren	ce in Program Are	ea Regions
C	Federal/						
Common and	State/					_	
Scientific Names	Other	Geographic Distribution	Habitat Requirements	Region 1a	Region 1b	Region 2	Region 3
<sup>a</sup> Status explanations:							
Federal							
E = listed as enda	ngered unde	r the federal Endangered S	pecies Act.				
T = listed as thre	atened under	the federal Endangered Sp	ecies Act.				
<del>C = candidate spe</del>	ecies for whic	h USFWS has on file suffici	ent information on biolog	ical vulnerability	<del>and threat(s) to su</del>	pport issuance of	<del>a proposed rule to list,</del>
but issuance	of the propos	ed rule is precluded.	0	-			
= no listing.		1					
State							
E = listed as enda	ingered unde	r the California Endangere	d Species Act.				
T = listed as thre	atened under	• the California Endangered	Species Act.				
<u>C = Candidate for</u>	· listing under	r the California Endangered	Species Act receiving the	e same legal prot	ection afforded to a	in endangered or t	hreatened species.
FP = fully protecte	d under the (	California Fish and Game Co	ode.				
SSC = species of species	ecial concern	in California.					
<u>WL = California De</u>	VL = California Department of Fish and Wildlife watch list.						
= no listing.	-						

#### Western Bat Working Group (WBWG)

High priority = species are imperiled or at high risk of imperilment.

- Based on CNDDB (California Department of Fish and Wildlife 2009 2018a) valley elderberry 1 2 longhorn beetle is reported to occur within all four program study area regions. Riparian forest and 3 scrub habitats, often containing elderberry shrubs, are prevalent throughout the four program 4 regions. Valley elderberry longhorn beetle may occur within any of the four program regions 5 wherever shrubs sized 1-inch diameter or more at ground level occur. Continuing maintenance of 6 levees and canals is likely to account for less available habitat along the lower Sacramento River 7 than along the upper Sacramento River (Talley et al. 2006). Levees along the lower Sacramento 8 River limit restoration potential within Regions 1a and 1b of the program area. Additionally, 9 creation of valley elderberry longhorn beetle habitat is constrained by concerns over allowing a 10 federally listed species to inhabit SRFCP levees within these and other regions of the program area. 11 Other factors negatively affecting valley elderberry longhorn beetle habitat are pesticide application 12 and invasive species.
- 13 Approximately 50,000 acres of existing riparian habitat in the Central Valley, primarily in the
- 14 Sacramento Valley, have been protected by federal, state, and local agencies, as well as private
- organizations. Within the program area, large parcels of suitable habitat for the valley elderberry
   longhorn beetle have been protected in the Sacramento River National Wildlife Refuge, along the
- American River Parkway, and in the lower Cosumnes River watershed, much of which is owned by
- 18 The Nature Conservancy. Additionally, restoration of more than 5,000 acres of habitat has been
- 19 initiated throughout the beetle's range (Talley et al. 2006).

#### 20 Giant Garter Snake

- The giant garter snake is listed as threatened under both ESA and CESA. The giant garter snake is
   the largest garter snake, reaching a maximum total length of at least 64 inches. Dorsal background
   coloration varies from brownish to olive with a checkered pattern of black spots, separated by a
   yellow dorsal stripe and two light colored lateral stripes (U.S. Fish and Wildlife Service 1999b2015).
- 25 Giant garter snakes typically breed in March and April, and live young are born from late July to 26 early September (U.S. Fish and Wildlife Service 2015). The giant garter snake inhabits marshes, 27 sloughs, ponds, small lakes, low gradient streams, agricultural wetlands (including irrigation canals 28 and rice fields), and adjacent uplands. Essential habitat components consist of 1) freshwater aquatic 29 habitat with protective emergent vegetation cover where snakes can forage, 2) upland habitat near 30 the aquatic habitat that can be used for thermoregulation and summer shelter (i.e., burrows), and 3) upland refugia outside flood waters that can serve as winter hibernacula (U.S. Fish and Wildlife 31 32 Service 2015).
- 33 Ideal giant garter snake aquatic habitat exhibits the following characteristics.
- 34 Water present from March through November.
- 35 Slow moving or static water flow with mud substrate.
  - Presence of emergent and bankside vegetation that provides cover from predators and may serve in thermoregulation.
- 38 Absence of a continuous canopy of riparian vegetation.
- 39 Available prey in the form of small amphibians and small fish.
- 40 Thermoregulation (basking) sites with supportive vegetation such as folded tule clumps
   41 immediately adjacent to escape cover.

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1 • Absence of large predatory fish. 2 • Absence of recurrent flooding, or, where flooding is probable, the presence of upland refugia. 3 Although the giant garter snake is predominately an aquatic species, incidental observations and 4 radio telemetry studies have shown that the snake can be found in upland areas near the aquatic 5 habitat component during the active spring and summer seasons. Upland habitat (land that is not 6 typically inundated during the active season and is adjacent to the aquatic habitat of the giant garter 7 snake) is used for basking to regulate body temperature, for cover, and as a retreat into mammal 8 burrows and crevices in the soil during ecdysis (shedding of skin) or to avoid predation. Giant garter 9 snakes have been observed using burrows for refuge in the summer as much as 164 feet away from 10 the marsh edge. Important qualities of upland habitat have been found by researchers (U.S. Fish and Wildlife Service 2015) to include the following characteristics. 11 12 • Availability of bankside vegetative cover, typically tule (Scirpus sp.) or cattail (Typha sp.), for screening from predators. 13 14 • Availability of more permanent shelter, such as bankside cracks or crevices, holes, or small mammal burrows. 15 16 • Free of poor grazing management practices (such as overgrazed areas). 17 During the colder winter months, giant garter snakes spend their time in a lethargic state. During 18 this period, giant garter snakes over-winter in locations such as mammal burrows along canal banks 19 and marsh locations, or riprap along a railroad grade near a marsh or roads. Giant garter snakes 20 typically do not over-winter where flooding occurs in channels with rapidly moving water, such as 21 the Sutter Bypass. Over-wintering snakes use burrows as far as 656 to 820 feet from the edge of 22 summer aquatic habitat (Wylie et al. 2000; U.S. Fish and Wildlife Service 2015). 23 Giant garter snakes are endemic to wetlands in the Sacramento and San Joaquin Valleys and inhabit 24 marshes, sloughs, ponds, small lakes, low-gradient streams and other waterways, and agricultural wetlands such as irrigation and drainage canals and rice fields, as well as the adjacent uplands. 25 26 There are four essential habitat components. 27 Adequate water during the species' active season (early spring through mid-fall) to provide food 28 and cover. 29 Emergent herbaceous wetland vegetation, such as cattails and bulrushes, for escape cover and 30 foraging habitat during the active season. 31 Upland habitat with grassy banks and openings in waterside vegetation for basking. 32 Higher elevation uplands for cover and refuge from floodwaters during the dormant season in 33 winter (U.S. Fish and Wildlife Service 1999b). 34 The giant garter snake is extremely aquatic and rarely found away from water. Giant garter snakes 35 actively forage in the water and retreat to water to escape from predators and when disturbed. The 36 predominant prey species include crayfish, carp (Cyprinus carpio), mosquitofish (Gambusia affinis), 37 bullfrogs, and Pacific tree frogs. Giant garter snakes are typically absent from larger rivers and other 38 water bodies that support introduced populations of large predatory fish and from wetlands with 39 sand, gravel, or rock substrates. Riparian woodlands do not typically provide suitable habitat 40 because of excessive shade, lack of basking sites, and absence of prey populations (U.S. Fish and 41 Wildlife Service 1999b).

- 1 Giant garter snakes hibernate in small mammal burrows and other soil crevices located near aquatic
- 2 habitat above prevailing flood levels throughout the winter months (November until early spring).
- 3 They typically select burrows with sunny exposure along south- and west-facing slopes. Giant garter
- 4 snakes also use burrows as refuge from extreme heat during their active period. The U.S. Geological
- Survey Biological Resources Division has documented giant garter snakes using burrows in summer
   as much as 165 feet away from the marsh edge. Overwintering giant garter snakes have been
- as much as 165 feet away from the marsh edge. Overwintering giant garter snakes have been
   documented using burrows as far as 820 feet from the edge of marsh habitat (U.S. Fish and Wildlife
- 8 <u>Service 1999b</u>).

Based on CNDDB (<u>California Department of Fish and Wildlife 2018a</u>2009) giant garter snakes are
 reported to occur within all four program study area regions. Within the program area, suitable

- aquatic habitat for this species consists of emergent marshes, flooded agricultural fields, and slow moving open water areas containing adjacent upland areas for winter hibernacula. Therefore, this
   species may occur in any of the four program regions where suitable habitat is present.
- 14 Activities in the program area that affect giant garter snakes are primarily related to flood control 15 and agriculture. Flood control projects may result in mortality during construction and degradation 16 of habitat. However, most flood control projects in the program area are conducted by federal, state, 17 or local agencies and are conducted in compliance with Sections 7 or 10 of ESA. Consequently, the 18 agencies are required to minimize potential take and restore affected habitat, resulting in mostly 19 temporary impacts. Many agricultural activities that affect conditions for giant garter snakes are not 20 subject to ESA consultation, but may be subject to CESA requirements. Application of pesticides, 21 rodent control, and discharge of nutrients can degrade both aquatic and upland habitat for the 22 species (U.S. Fish and Wildlife Service 2006a).

#### 23 Western Pond Turtle

- 24The western pond turtle is a California species of special concern. The western pond turtle is the25only abundant turtle native to California (California Department of Fish and Game 2005Morey262000). It was historically found in most Pacific slope drainages between the Oregon and Mexican27borders. It is still found in suitable habitats west of the Sierra-Cascade crest (Jennings and Hayes281994).
- 29 Western pond turtles require some slow-water aquatic habitat and are uncommon in high-gradient 30 streams (Jennings and Hayes 1994). The banks of inhabited waters usually have thick vegetation, 31 but basking sites such as logs, rocks, or open banks must also be present (Morey 2000California 32 Department of Fish and Game 2005). Depending on the latitude, elevation, and habitat type, the 33 western pond turtle may become inactive over winter or remain active year-round. Nest sites are 34 typically found on slopes that are unshaded and have high clay or silt composition (Jennings and 35 Hayes 1994). Eggs are laid from March to August, depending on local conditions, and incubation 36 lasts from 73 to 80 days. Western pond turtles are omnivorous and feed on aquatic plant material, 37 aquatic invertebrates, fishes, frogs, and even carrion (Morey 2000 California Department of Fish and 38 Game 2005).
- Based on CNDDB (<u>California Department of Fish and Wildlife 2018a</u>2009) western pond turtles are
   reported to occur within all four program study area regions. Throughout the program area, open
   water and emergent marsh habitats provide potentially suitable aquatic habitat, while annual
- 42 grassland, riparian forest, riparian scrub/shrub, and other upland areas adjacent to aquatic habitats

provide potential winter hibernacula and nesting habitat. Therefore this species may occur in any of
 the four program regions where suitable habitat is present.

#### 3 Swainson's Hawk

4 Swainson's hawks are protected under the Migratory Bird Treaty Act (MBTA) and are state-listed as 5 threatened. Based on a statistically valid statewide survey conducted during 2005 and 2006, the 6 statewide population of Swainson's hawks in California was estimated in 2007 to be 2,081 breeding 7 pairs (Anderson et al. 2007). Nearly 94% of nesting Swainson's hawks in California is found in the 8 Central Valley from Tehama County south to Kern County. More than 60% of the statewide 9 population occurs in Yolo, Sacramento, Solano, and San Joaquin Counties (Anderson et al. 2007). 10 Although intensively farmed for more than 100 years, much of this area retains a relative abundance 11 of nesting habitat—narrow riparian corridors along rivers and streams, remnant oak groves and 12 trees, roadside trees—and agricultural uses conducive to Swainson's hawk foraging (Estep 2007, 13 2008; Anderson et al. 2007). 14 In the Central Valley, Swainson's hawks usually nest in large native trees such as valley oak (Quercus 15 lobata), Fremont cottonwood (Populus fremontii), Hinds' walnut (Juglans hindsii), and willows (Salix 16 spp.), and in nonnative trees, such as eucalyptus (*Eucalyptus* spp.). Nests occur in riparian

- woodlands, roadside trees, trees along field borders, isolated trees, small groves, and on the edges of
   remnant oak woodlands. Stringers of remnant riparian forest contain the majority of known nests in
   the Central Valley (Estep 1984; Bechard et al. 2010). However, this appears to be a function of nest
   tree availability rather than dependence on riparian forest. Nests are usually constructed as high as
   possible in the tree, providing protection to the nest as well as better visibility from it.
- Nesting pairs are highly traditional in their use of nesting territories and nesting trees. Many nest
   sites in the Central Valley are known to have been occupied annually since 1979 and banding studies
   conducted since 1986 confirm a high degree of nest and mate fidelity (Yolo County Natural
   Community Conservation Plan Joint Powers Agency 2009).
- 26The 2006 and 2007 baseline surveys of nesting habitat in South Sacramento County and Yolo County27(Estep 2007, 2008) found that riparian habitat was the most frequently used nesting habitat type.28Isolated trees, roadside trees, tree rows, farmyard trees, and rural residential trees were also29frequently used. Valley oak and Fremont cottonwood were the most frequently used nest trees,30followed by walnut, willow, and eucalyptus trees.

31 Swainson's hawks inhabit grasslands, sage-steppe plains, and agricultural regions of western North 32 America during the breeding season, and winter in grassland and agricultural regions from central Mexico to southern South America (England et al. 1997). Swainson's hawks require large areas of 33 34 open landscape for foraging. Historically, the species foraged the grasslands of the Central Valley 35 and other inland valleys. With substantial conversion of these grasslands to farming operations, 36 Swainson's hawks have shifted their nesting and foraging into those agricultural lands that provide 37 large rodent prey populations amid low, open vegetation. Foraging habitat value is a function of the 38 following elements.

- 39 Patch size: sensitivity to fragmented landscapes; use will decline as suitable patch size
   40 decreases.
- 41 Prey accessibility: the ability of hawks to access prey depends on vegetation structure and
   42 management activities.

1

• Prey availability: the abundance of prey populations in a field.

2 Data on minimum foraging patch size are largely anecdotal, but are in the range of between 5 and 25 3 acres (ICF International 2013; California Department of Fish and Game 1994), Although Swainson's hawks have been observed foraging in habitat patches smaller than 40 acres, 40-acre fields are more 4 5 likely to be seen by Swainson's hawks and more likely to provide higher density prey (ICF 6 International 2013). In the Central Valley, land use or specific crop type and management practices 7 determine the foraging value of a field at any given time. Important land cover or agricultural crops 8 for foraging are alfalfa and other hay, grain and row crops, fallow fields, dryland pasture, and annual 9 grasslands (Estep 1989; Babcock 1995; Woodbridge 1998). The matrix of these cover types across a 10 large area creates a dynamic foraging landscape as temporal changes in vegetation results in 11 changing foraging patterns and foraging ranges. 12 Home ranges are highly variable depending on cover type, and fluctuate seasonally and annually 13 with changes in vegetation structure (e.g., growth and harvest) (Estep 1989; Woodbridge 1991; 14 Babcock 1995). Smaller home ranges consist of high percentages of alfalfa, fallow fields, and pastures (Estep 1989; Woodbridge 1991; Babcock 1995). Larger home ranges are associated with 15 16 higher proportions of cover types with reduced prey accessibility, such as orchards and vineyards, 17 or reduced prey abundance, such as flooded rice fields. Although Swainson's hawks can forage across a very large landscape compared with most other raptor species and still successfully 18 19 reproduce (Estep 1989; Bechard et al. 2010), travelling more than 5 miles from a nest site to high-20 value foraging sites statistically reduces reproductive success (Bechard et al. 2010). 21 In California, the nesting distribution includes the Sacramento and San Joaquin Valleys, the Great 22 Basin sage-steppe communities and associated agricultural valleys in extreme northeastern 23 California, isolated valleys in the Sierra Nevada in Mono and Invo Counties, and limited areas of the 24 Mojave Desert region (California Department of Fish and Game 1994). 25 Since 1980, based on nesting records alone, populations in California appear relatively stable. 26 However, continued agricultural conversion and practices, urban development, and water development have reduced available habitat for Swainson's hawks throughout their range in 27 California: this habitat reduction could potentially result in a long-term declining trend. The status 28 29 of populations, particularly with respect to juvenile survivorship, remains unclear. 30 In California, Swainson's hawk habitat generally consists of large, flat, open, undeveloped landscapes that include suitable grassland or agricultural foraging habitat and sparsely distributed trees for 31 nesting (England et al. 1997). Foraging habitat includes open fields and pastures. Preferred foraging 32 33 habitats for Swainson's hawk include alfalfa fields, fallow fields, low-growing row or field crops, rice 34 fields during the nonflooded period, and cereal grain crops (California Department of Fish and Game 35 2000). Prev species include ground squirrels. California voles, pocket gophers, deer mice, reptiles, 36 and insects (California Department of Fish and Game 2000; England et al. 1997). 37 Swainson's hawks usually nest in large native trees such as valley oak, cottonwood, and willows, 38 although nonnative trees such as eucalyptus (*Eucalyptus* spp.) are occasionally used. Nests occur in riparian woodlands, roadside trees, trees along field borders, isolated trees and small groves, trees 39 40 in windbreaks, and trees on the edges of remnant oak woodlands. In some locales, urban nest sites have been recorded. The breeding season is typically March to August (England et al. 1997). 41 CNDDB (California Department of Fish and Wildlife 2018a2009) records indicate that Swainson's 42 43 hawks are known to nest within all four program <del>study area</del> regions. Large trees located throughout

- 1 the program area contain suitable nesting habitat, and row and field agricultural lands and
- grasslands contain suitable foraging habitat. Therefore this species may occur in any of the four
   program area regions where suitable habitat is present.

### 4 White-Tailed Kite

5 The white-tailed kite is protected under the MBTA and is a fully protected species under the 6 California Fish and Game Code. White-tailed kites were threatened with extinction in North America 7 during the early twentieth century. Populations recovered throughout its range in the United States 8 from small populations that survived in California, Texas, and Florida. However, since the 1980s, 9 many white-tailed kite populations have been declining, apparently because of loss of habitat and 10 increased disturbance of nests (Dunk 1995).

- 11 The breeding season generally extends from early February through early August. White-tailed kites 12 usually nest in large native trees, although nonnative trees also are occasionally used. Nest trees are 13 generally at the edge of wooded habitat next to open fields. Large trees in areas that have been 14 developed may also be used, although the trees need to be close to open fields for foraging (Dunk 15 1995). White-tailed kites feed primarily on small mammals including voles (*Microtus* spp.), pocket 16 mice (*Perognathus* spp.), and harvest mice (*Reithrodontomys megalotis*).
- 17 CNDDB (<u>California Department of Fish and Wildlife 2018a2009</u>) records indicate that white-tailed
  18 kites are known to nest within program study area regions 1a, 1b, and 3. Though not reported to
  19 nest in regions 1a, 2, and 3, white-tailed kites are also likely to nest within this these regions due to
  20 the abundance of suitable nesting habitat and adjacent foraging habitat. Large trees located
  21 throughout the program study area provide suitable nesting habitat, and row and field agricultural
  22 lands and grasslands provide suitable foraging habitat. Therefore this species may occur in any of
  23 the four program area regions where suitable habitat is present.

### 24Osprey

Osprey is <u>on the California Department of Fish and Wildlife watch listdesignated as a California</u>
species of special concern. Osprey is considered to be widespread and increasing in the United
States and Canada (Poole et al. 2002Bierregaard et al. 2016). Species is reported to breed south to
north in California from Fresno to Siskiyou with single breeding occurrences in Orange and San
Diego Counties (California Department of Fish and Wildlife Fish and Game 20092018a). A majority
of the North American population winters south of the United States in Central and South America
(Bierregaard et al. 2016Poole et al. 2002).

Birds typically begin fall migrations in August and wander widely before beginning true migration
returning to breeding areas late February through April (<u>Bierregaard et al. 2016Poole et al. 2002</u>).
Breeding typically occurs from March to September (Zeiner et al. 1990a). Ospreys use large trees or
snags for nesting and cover and use open, clear water (rivers, lakes, reservoirs, and bays) to forage
for fish, though reptiles, amphibians and invertebrates may also serve as food sources (Zeiner et al.
1990a).

CNDDB (<u>California Department of Fish and Wildlife 2018a2009</u>) records indicate that ospreys are
 known to nest within program study area Rregions 2 and 3, mostly along the Sacramento River.
 Though osprey is not reported to nest within program Regions regions 1a, and 1b, and 2, these
 regions are within the expected range for this species and contain an abundance of river and stream
 systems capable of supporting this species. Throughout the program area, areas containing large

- 1 trees adjacent to large rivers and streams are capable of supporting breeding and foraging of this
- 2 species. Therefore, this species may occur in any of the four program area regions where suitable 3
- habitat is present.

#### 4 **Bald Eagle**

- 5 The bald eagle is listed as threatened under CESA, is a fully protected species under the fish and 6 game code and is protected under the MBTA. The bald eagle is the largest raptor in North America
- 7 next to California condor, and is broadly distributed throughout North America and into
- 8 northwestern Mexico (Buehler 2000). Breeding populations in California are predominantly 9
- concentrated in the northern counties of Shasta, Siskiyou, Lake, Trinity, Lassen, Butte, Modoc, and 10 Plumas (California Department of Fish and Game 1999). However, nests have been observed in
- lower numbers throughout counties farther south since the late 1980s (California Department of 11 12 Fish and Wildlife 2018a).
- 13 Bald eagle habitat use is largely correlated with proximity to substantial bodies of water because 14 fish constitute a large proportion of the species' diet. Breeding habitat is typically in forested areas 15 adjacent to rivers, lakes, or wetlands (Buehler 2000).
- 16 CNDDB (California Department of Fish and Wildlife 2018a) records indicate that bald eagles are 17 known to nest within program study area Rregions 2 and 3, mostly along the Sacramento River. 18 Although bald eagle is not reported to nest within Regions 1a and 1b, these regions are within the 19 expected range for this species and contain an abundance of river and stream systems capable of 20 supporting this species. Throughout the program area, areas containing large trees adjacent to large 21 rivers and streams are capable of supporting breeding and foraging of this species. Therefore, this 22 species may occur in any of the four program area regions where suitable habitat is present.

#### 23 Loggerhead Shrike

- 24 The loggerhead shrike (*Lanius ludovicianus*) is designated as a California species of special concern. 25 Loggerhead shrikes are a widespread species in North America, occurring from the southern 26 Canadian provinces across most of the United States into Mexico (Yosef 1996). In California, 27 loggerhead shrikes occur in open habitats with scattered shrubs, trees, posts, fences, utility lines, 28 and other perches. Habitats include valley foothill forests, pinyon-juniper, desert riparian, and 29 Joshua tree habitats (California Department of Fish and Game 2005Zeiner et al. 1990a). Loggerhead 30 shrikes are adaptable to urban environments as long as preferred habitat characteristics and 31 abundant prey supplies are present (Yosef 1996).
- 32 The loggerhead shrike is a predatory songbird. As opportunistic predators, loggerhead shrikes feed 33 on a wide variety of prey, including insects, small mammals and birds, reptiles, amphibians, and 34 occasionally carrion. Prey is often impaled on sharp objects such as thorns and barbed wire fences 35 (Yosef 1996). Nesting habitat includes densely foliaged shrubs and trees near open habitats 36 (California Department of Fish and Game 2005Zeiner et al. 1990a).
- 37 CNDDB (California Department of Fish and Wildlife 2018a2009) records do not indicate any
- 38 loggerhead shrike occurrences within any of the four program study area regions though this
- 39 species is known to occur within 10 miles of Regions 1a and 2. Due to the presence of grasslands 40
- within all program regions, loggerhead shrikes could occur in all regions where suitable habitat is
- 41 present.

1

#### **Tricolored Blackbird**

2 The tricolored blackbird is listed as a threatened species under CESA<del>a California species of special</del> 3 concern. Within California, active breeding colonies occur in 46 California counties with the largest 4 colonies in the Central Valley. In the Central Valley, breeding extends east into the foothills of the 5 Sierra Nevada. Historically, most California colonies have been located in the Sacramento and San 6 Joaquin Valleys, but habitat loss has reduced breeding considerably in this area in recent years 7 (Beedy and Hamilton 1999Beedy et al. 2018). Tricolored blackbirds have three basic requirements 8 for selecting their breeding colonies: open accessible water; a protected nesting substrate, including 9 either flooded vegetation or thorny/spiny vegetation; and a suitable foraging space providing 10 adequate insect prey within a few miles of the nesting colony. They often change their nest locations 11 from year to year. An increasing percentage of tricolored blackbirds are utilizing Himalayan 12 blackberry as well as dairies for nesting habitat (Beedy and Hamilton 1999et al. 2018).

13 Suitable breeding habitats within the Central Valley have been found to include emergent marsh 14 areas with tules or cattail and upland habitats consisting of thistle, nettle, blackberry, wheat, and 15 other shrubby upland substrates (Meese 2006). Foraging habitats in all seasons include annual 16 grasslands, wet and dry vernal pools and other seasonal wetlands, agricultural fields (e.g., large 17 tracts of alfalfa with continuous mowing schedules and recently tilled fields), cattle feedlots, and 18 dairies. Tricolored blackbirds also occasionally forage in riparian scrub habitats and along marsh 19 borders. Weed-free row crops and intensively managed vineyards and orchards do not serve as 20 regular forage sites (Beedy and Hamilton 1999et al. 2018).

CNDDB (<u>California Department of Fish and Wildlife 2018a</u>20092017) records indicate that
 tricolored blackbirds are known to nest within all four program study area regions. Throughout the
 program area, emergent marshes, riparian scrub, and grassland or ruderal areas containing dense
 forbs provide suitable nesting habitat and adjacent open grasslands and row and field crops contain
 suitable foraging habitat. Therefore, this species may occur in any of the four program regions
 where suitable habitat is present.

#### 27 Yellow-Headed Blackbird

28 Yellow-headed blackbird is a California species of special concern. This species breeds in central 29 California and is a year-round resident in southern California. Nests are built in emergent vegetation 30 of deep-water palustrine wetlands. The species also constructs nests over deeper water, primarily in 31 cattails, bulrushes, or reeds (*Phragmites* spp.), often in the same wetlands as nesting red-winged 32 blackbirds. Yellow-headed blackbird forages within wetlands and surrounding grasslands, as well as 33 open agricultural areas—harvested grain fields, plowed fields, meadows, and pastures—or savanna. 34 The species is not known to inhabit the forest interior, but it may use forest edges for roosting, 35 loafing, or foraging (Twedt and Richard 1995).

- During the breeding season, yellow-headed blackbirds feed primarily on aquatic prey, feeding
   aquatic insects to nestlings. During the post-breeding season, the species is known to consume
   primarily cultivated grains and weed seeds, often foraging in large flocks (Twedt and Richard 1995).
- 39 CNDDB (<u>California Department of Fish and Wildlife 2018a</u>20092017) indicates an historic (1899)
- 40 occurrence for this species that falls within program <del>study area</del> region<del>s 1a and</del> 1b. Though not
- 41 previously recorded known to occur within Regions 2 and 3 this species could occur in any of the
- 42 four program study area regions where suitable habitat is present.

1

#### Western Yellow-Billed Cuckoo

<u>The Western Distinct Population Segment of the yellow-billed cuckoo is a-federally threatened</u>
 <del>candidate species</del> and is state-listed as endangered. Breeding occurs in temperate North America
 south to Mexico, and Greater Antilles, with wintering occurring primarily in South America east of
 the Andes. Within California, breeding is now restricted to species occurs at isolated sites in the
 Sacramento Valley in northern California, and along the Kern and Colorado River systems in
 southern California (Hughes 19992015).

8 Western populations of vellow-billed cuckoos form pairs during mid-June or later and breed from 9 June to August, with a peak during mid-July to early August (Hughes 2015). Breeding is restricted to 10 the middle of summer, presumably because of a seasonal peak in large insect abundance (Rosenberg 11 et al. 1982). To accommodate this, development of young is very rapid with a breeding cycle of 17 12 days from egg-laying to fledging. Following a relatively short period of juvenile dependency after 13 fledging, cuckoos migrate out of California from approximately mid-August to early September. The 14 species migrates to South America during the nonbreeding season and is not present in California 15 from approximately October to May. Western yellow-billed cuckoos arrive on breeding grounds 16 starting mid-to late May with fall departures for wintering grounds beginning in late August, with most birds gone by mid September. 17

18 The vellow-billed cuckoo is a riparian obligate species. Its primary habitat association is willow-19 cottonwood riparian forest, but other tree species such as white alder (*Alnus rhombifolia*) and box 20 elder (Acer negundo) may be an important habitat element in some areas, including occupied sites 21 along the Sacramento River (Laymon 1998). Primary factors influencing nest site selection include 22 the presence of cottonwood/willow riparian forest, patch size, and density of understory vegetation. 23 Birds generally prefer open woodland with clearings and low, dense, scrubby vegetation; often 24 associated with watercourses. Most often found to occupy various woodlands, riparian forests and 25 thickets along streams and marshes, and successional shrubland. Cuckoos Pprimarily feed on large 26 insects including caterpillars, katydids, cicadas, grasshoppers, and crickets in open areas, 27 woodlands, orchards, and areas adjacent to streams (Hughes 19992015). USFWS identified three 28 primary constituent elements that are key to the species' life-history processes: 1) contiguous or 29 nearly contiguous riparian woodlands in patches that are greater than 325 feet in width and 200 30 acres with a dense canopy closure; 2) adequate prey base; and 3) dynamic riverine processes that 31 allow habitat to regenerate at regular intervals, sustaining structural heterogeneity and creating a 32 mosaic of early and late successional forest (Greco 2013, Larsen and Greco 2002, 79 FR 48547). 33 CNDDB (California Department of Fish and Wildlife 2018a2009) records indicate that western 34 yellow-billed cuckoos are knownhave been previously reported to nest within all four program 35 study area regions. Throughout the program area, riparian forest and oak woodland areas contain 36 suitable nesting and foraging habitat for this species. Therefore, this species may occur in any of the 37 four program study area regions where suitable habitat is present.

#### 38 Purple Martin

Purple martin is a California species of special concern. This species breeds locally along eastern
 slopes of Cascade Mountains of California south to extreme southwestern California. The species
 winters in South America in lowlands east of the Andes south to northern Argentina (rarely) and
 southern Brazil. Purple martin is the largest swallow in North America and among the largest in the

43 world. These martins inhabit montane forest or Pacific lowlands, restricted to areas with dead snags

U.S. Army Corps of Engineers

containing woodpecker holes, generally patchy and local in occurrence. This species is reported to
 typically avoid deserts and grasslands (Brown and Tarof 19972013).

Purple martin is a diurnal, aerial feeder that feeds on insects at higher elevations than other swallows, sometimes up to 490 feet. Because of the height of foraging, individuals are rarely observed foraging, with the exception being late afternoons and near dusk when birds feed low and close to nest sites. The species presumably ranges over areas immediately surrounding nest site, although there is no information on typical travel distance while foraging. Cold, rainy weather in spring forces purple martins, especially migrants, to feed low over ponds and lakes, apparently in pursuit of aquatic insects along water surface (Brown <u>and Tarof 2013</u><del>1997</del>).

CNDDB (California Department of Fish and Wildlife 2018a2009) indicates that purple martin is 10 11 known to nest within program study area Rregions 1a and 1b. Recorded occurrences within the 12 study area include nesting colonies utilizing weep holes and other holes and crevices under freeway 13 and other roadway overpasses. Within the program study area Rregions 1a and 1b suitable nesting 14 habitat for this species occurs in riparian forest and oak woodland areas. This species is presumed 15 to be absent from the Central Valley with the exception of occurrences in the City of Sacramento; 16 therefore, this species is expected to occur only in program area Regions 1a and 1b where suitable 17 habitat is present.

### 18 Bank Swallow

- 19 The bank swallow (*Riparia riparia*) is a state-listed threatened species. Within California, bank 20 swallow is a regular breeder from Monterey to San Francisco County and in northern California 21 including Siskiyou, Shasta, and Lassen Counties and along Sacramento River from Shasta County 22 south to Yolo County and the Feather River through Butte, Yuba, and Sutter Counties. Bank swallows 23 nest in erodible soils on vertical or near-vertical banks and bluffs in lowland areas dominated by 24 rivers, streams, lakes, and oceans. Based on the often ephemeral nature of nesting areas, bank 25 swallow has low nest site fidelity. Foraging habitats surrounding nesting colony sites include 26 wetlands, open water, grasslands, riparian forests, agricultural lands, shrublands, and occasionally 27 upland woodlands (Garrison 1999).
- Bank swallow is an aerial feeder from dawn to dusk that takes flying or jumping insects almost
  exclusively on the wing. The species is reported to occasionally eat terrestrial and aquatic insects or
  larvae and less often to consume vegetable matter. Bank swallow may feed on the ground where
  high concentrations of suitable insect prey are present (Garrison 1999).
- 32 CNDDB (California Department of Fish and Wildlife 2018a2009) indicates that bank swallow is 33 known to nest extensively within all four program study area regions along the banks of the 34 Sacramento River, Feather River, American River, and Cache Creek. Throughout the program area 35 suitable nesting habitat occurs along the above mentioned river systems. Table 12-3 highlights 36 provides results of bank swallow surveys conducted along the Sacramento and Feather Rivers 37 between 2008 and 2017 where bank swallow burrows have been were surveyed to be 38 ondocumented, directly adjacent to, or across the river from erosion sites currently being evaluated. 39 The table is not a complete or exhaustive list of nesting locations, but demonstrates likely presence 40 and annual variability near the 106 representative erosion sites over the past several years (Note: 41 Table 12-3 has been updated from what was presented in the Public Draft EIS/EIR, but the changes
- 42 <u>are not shown in underline/strikeout</u>].

#### 1 Song Sparrow "Modesto" Population

- 2 The Modesto song sparrow is a California species of special concern and is protected under the
- 3 MBTA and California Fish and Game Code Sections 3503 and 3503.5. The Modesto song sparrow is a
   4 small passerine. Modesto song sparrows are endemic to California and are permanent residents of
- 5 <u>the north-central portion of the Central Valley (Gardali 2008).</u>
- Modesto song sparrows require moderately dense vegetation to supply cover for nest sites, a source
   of standing or running water, semi-open canopies to allow light, and exposed ground or leaf litter for
   foraging (Gardali 2008). They frequent freshwater emergent marshes, riparian scrub and forest, and
- 9 vegetated irrigation canals or levees. Modesto song sparrows are primarily ground-feeders and feed
- 10 <u>on both vegetation and animal matter.</u>
- 11 <u>CNDDB (California Department of Fish and Wildlife 2018a) indicates that Modesto song sparrow is</u>
- 12 known to nest within all four program study area-regions. Throughout the program area, freshwater
- 13 <u>emergent marsh, riparian willow, riparian forest with sufficient understory, and vegetated irrigation</u>
- 14 canals and levees may provide suitable nesting and foraging habitat (Gardali 2008). Therefore, this
- 15 species may occur in any of the four program area regions where suitable habitat is present.

### 16 Western Snowy Plover (Inland Nesting Population)

- Inland populations of western snowy plover are California species of special concern. Inland
  populations breed locally in southern central Oregon, Salton Sea, and eastern California, western
  and central Nevada, northwest Utah, and southern. Arizona. They also breed in southern
  Saskatchewan, southwestern Wyoming, southwestern Montana, central and eastern Colorado, New
  Mexico, central and southwestern Kansas, western Oklahoma, north-central Texas, and central
  Mexico (Page et al. 1995) and are reported to <u>have nested</u> in central California in 1963 and 1970 in
  sewage ponds in Yolo County (California Department of Fish and <u>Game 2009Wildlife 2018a</u>).
- Inland populations breed on barren to sparsely vegetated ground at alkaline or saline lakes,
  reservoirs, ponds, on riverine sand bars, and at various types of ponds (sewage, salt-evaporation,
  and agricultural waste-water). Breeding varies depending on environmental conditions but
  generally occurs between March and mid-June. Inland birds feed on shores of lakes, reservoirs,
  ponds, braided river channels, and playas (mostly at seeps and along streams). Feeding typically
  occurs in shallow (1–2 cm deep) water or on wet mud or sand, on playas some foraging also occurs
  on dry flats where flies, beetles, moths, and caterpillars are available (Page et al. 1995).
- 31 CNDDB (California Department of Fish and Wildlife 2018a<del>2009</del>) indicates that western snowy 32 plover is known to nest within program study area regions 1a, 1b, and 2. Reported nesting 33 occurrences within the program area consist of two breeding sites reported in 1963 and 1970 at 34 sewage ponds in Yolo County. Suitable nesting habitat within the program area likely consists of 35 riverine sand bars associated with program program area rivers and streams, though the presence 36 of this habitat has not been documented. Though only known to occur within program study area 37 region<del>s</del> 1a, <del>1b, and 2</del>-this species may occur in all program area regions where suitable habitat 38 occurs.

Representative	Average Number of Bank Swallow Burrows										
Eroding Site	River Mile	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Sacramento River											
	172.6R				882						
	172.5R	250	841				346	192			812
	172.4R	430		898	54					700	
	172.2R			3							
	172.1L		13					123			
SAC 172.0 L	172.0L			32							
	171.8L				90						
	171.6L			170				150	160		
	171.5L						578				
	171.3R					234					229
	171.2R	290	172		54	240	152	334	48		
	168.3R	380	205						955		
SAC 168.3L	168.0R					232					
	167.0L			115	182		196	80		90	
	162.7L		106								
	162.6L	48		392							
SAC 162 0I	162.4L					407	73			235	
SAC 105.0L	162.3L							534			
	162.1L									17	126
	162.0L				26	70	54				
SAC 152.8L	153.9R				98		104	98			58
SAC 138.1L	137.8L			47							

#### 1 Table 12-3. Summary of Existing Bank Swallow Burrows in Close Proximity to Erosion Sites being Evaluated

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Representative	Average Number of Bank Swallow Burrows										
Eroding Site	River Mile	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
	130.9L		84								
	130.8L			73				52			
SAC 131.8L	130.7L				272					199	
	130.6L								13		
	130.5L					188					417
	128.8R			78							
	128.3L		84								
SAC 127.9R	128.1L								156	387	
	127.8R										15
	127.7R						139	216			
SAC 122.0R	121.8R				40						
	121.4R		62								
	121.2L									68	
	116.8L			426				108		24	
SAC 116.5L	116.7L	1	79		19						27
	116.5L		10			177	70				
	116.8L			426				108		24	
SAC 116.0L	116.7L	1	79		19						
	116.5L		10			177	70				
	100.5L									250	
CAC 101 3D	100.4L				73						
SAC 101.3R	100.3L							202	132		
	100.2R										240
	100.0L					298	26				
SAC 99.0L	99.3L						39				
	98.7R						104				

Wildlife

Representative

Eroding Site

Averag	e Number o	of Bank Swa	llow Burrov	WS			
2010	2011	2012	2013	2014	2015	2016	2017
			30				
		110				110	

	87.9R					30		
	87.8L				119			112
SAC 86.9R	87.7L		162			108	152	
	87.6L	126						
	86.9L	Inactive*						
SAC 86.3L	86.9L	Inactive*						
Feather River								
FHR 5.5L	4.9R		56	135	26			
	4.9R		56	135	26			
ГПК Э.UL	4.6R			6	22			

Notes:

Highlight = Bank swallow surveyed site that is on, directly adjacent to, or across the river from an erosion site.

2009

2010

Inactive\* = Site with old bank swallow burrows but no birds surveyed in 2008–2017.

2008

Source: Bank Swallow Technical Advisory annual survey data

River Mile

1

#### 1 Northern Harrier

The northern harrier is a California species of special concern and is protected under the MBTA and
California Fish and Game Code Sections 3503 and 3503.5. The northern harrier is a medium-sized
hawk raptor of upland grasslands and fresh- and saltwater marshes. In California, northern harriers
are a permanent resident of the northeastern plateau, coastal areas, and Central Valley (Macwhirter
and Bildstein 1996Smith et al. 2011). Northern harriers breed in California in the Central Valley and
Sierra Nevada (California Department of Fish and Game 2005Zeiner et al. 1990a).

Northern harriers frequent meadows, grasslands, desert sinks, open rangelands, and fresh- and
saltwater emergent wetlands; they are seldom found associated with wooded habitats. Harriers feed
mostly on voles and other small mammals, birds, frogs, small reptiles, crustaceans, insects, and
rarely on fish (Zeiner et al. 1990a California Department of Fish and Game 2005). Harriers mostly
nest in emergent wetland or along rivers or lakes, but may nest in grasslands, grain fields, or
sagebrush flats several miles from water (Macwhirter and Bildstein 1996Smith et al. 2011). The nest
is built of a large mound of sticks on wet areas and a smaller cup of grasses on dry sites.

15 CNDDB (<u>California Department of Fish and Wildlife 2018a</u>2009) indicates that northern harrier is
 16 known to nest within <u>all four program study area regions</u>. Regions 2 and 3. Though not reported to
 17 nest within program study area Regions 1a and 1b these regions are within the expected range for
 18 this species and are likely to support this species. Throughout the program area, annual grassland,
 19 irrigated pasture, and emergent marsh may provide suitable nesting habitat and areas containing
 20 field crops and annual grasslands likely provide suitable foraging habitat. Therefore, this species
 21 may occur in any of the four program area regions where suitable habitat is present.

#### 22 Western Burrowing Owl

Western burrowing owls are a California species of special concern and are protected under the
 MBTA. Western burrowing owls were formerly a common permanent resident throughout much of
 California, but population declines became noticeable by the 1940s and have continued to the
 present. Farming has taken a major toll on western burrowing owl populations and their habitat by
 destroying nesting burrows and exposing breeders and their young to the toxic effects of pesticides
 (Haug et al. 1993Poulin et al. 2011).

Western burrowing owls prefers open, dry, short grassland habitats with few trees and are often
associated with burrowing mammals such as California ground squirrels. They occupy burrows,
typically abandoned by ground squirrels or other burrowing mammals, but may also use artificial
burrows such as abandoned pipes, culverts, and debris piles (California Department of Fish and
Game 2012; <u>Poulin et al. 2011Haug et al. 1993</u>). Prey includes arthropods, amphibians, small
reptiles, small mammals, and birds, particularly horned larks (<u>Poulin et al. 2011Haug et al. 1993</u>).

The breeding season usually extends from late February through August. Western burrowing owls often nest in roadside embankments, on levees, and along irrigation canals. This species is more diurnal than most owls and can often be observed during the day standing outside the entrance to its burrow (Poulin et al. 2011Haug et al. 1993).

- 39 CNDDB (<u>California Department of Fish and Wildlife 2018a</u>2009) indicates nesting burrowing owl
- 40 records within <u>all four program study area Regions regions. 1a, 1b, and 3. Though not reported to</u>
- 41 nest within region 2, bBurrowing owl is likely to also nest within this region due to the abundance of

- 1 suitable nesting habitat. Throughout the program area, levees and grasslands provide suitable
- 2 nesting habitat where ground squirrel burrows are present and open landscapes near suitable
- 3 nesting habitat provide suitable foraging habitat. Therefore, this species may occur in any of the four
- 4 program area regions where suitable habitat is present.

### 5 Western Mastiff Bat

6 Western mastiff bat (Eumops perotis californicus) is a California species of special concern. In 7 California, it is an uncommon resident in southeastern San Joaquin Valley and coastal ranges from 8 Monterey County southward to southern California (Zeiner et al. 1990b). It is also found sparsely in 9 the Central Valley (<u>California Department of Fish and Wildlife 2018aCNDDB 2009</u>) and occurs in 10 open semi-arid to arid habitats such as conifer and deciduous woodlands, coastal scrub, grasslands, 11 palm oases, chaparral, desert scrub, and urban. The species uses rock and tree crevices for cover and 12 roosting. Mating occurs in March and young are born April through August or September. Western 13 mastiff bat catches and feeds on insects in flight, mainly night-flying hymenopterous insects (Zeiner 14 et al. 1990b).

15 CNDDB (<u>California Department of Fish and Wildlife 2018a20092017</u>) records indicate roosting of
 western mastiff bat in program study area Rregions 2 and 3. Riparian forests and oak woodlands
 within these regions have potential to provide suitable roosting habitat for this species while
 adjacent open water areas provide suitable foraging opportunities. Though only reported in
 program study area Rregions 2 and 3, this species may occur in any of the four program area regions
 where suitable habitat is present.

#### 21 Hoary Bat

22 The hoary bat is a California species of special concern. Species is widespread in North America and 23 can be found in any location within California though believed to have a patchy distribution in the 24 southeastern deserts. Hoary bats are found primarily in forested habitats, including riparian forests, 25 and may occur in park and garden settings in urban areas (Brown and Pierson 1996). Habitats that 26 are suitable for providing maternity roosts include all woodlands that have medium- to large-sized 27 trees with dense foliage. Females and young tend to roost at higher sites in trees (Zeiner 28 <u>1990bCalifornia Department of Fish and Game 2005</u>). Mating occurs in autumn and is followed by 29 delayed fertilization. Young are born in mid-May through early July. Species primarily feeds on 30 moths and other flying insects (Zeiner 1990b).

CNDDB (<u>California Department of Fish and Wildlife 2018a</u>20092017) records indicate roosting of
 hoary bat in all four program study area regions. Riparian forests and oak woodlands throughout
 the program study area have potential to provide suitable roosting habitat for this species while
 adjacent open water areas provide suitable foraging opportunities. Therefore, this species may
 occur in any of the four program area regions where suitable habitat is present.

#### 36 Western Red Bat

37 Western red bat is a California species of special concern that occurs throughout much of California

38 at lower elevations. It is found primarily in riparian and wooded habitats but also occurs seasonally

- in urban areas (Brown and Pierson 1996). Western red bats roost in the foliage of trees that are
- 40 often located on the edge of habitats adjacent to streams, fields, or urban areas. This species breeds

- in August and September, and young are born in May through July. Feed on a variety of insects
   including moths, crickets, beetles, and cicadas (Zeiner et al. 1990b).
- 3 CNDDB (<u>California Department of Fish and Wildlife 2018a</u>) records indicate roosting of western red
- 4 bat in all four program <del>study area</del> regions. Riparian forests and oak woodlands throughout the
- 5 program study area have potential to provide suitable roosting habitat for this species while
- 6 adjacent open water areas provide suitable foraging opportunities. Therefore, this species may
- 7 occur in any of the four program area regions where suitable habitat is present.

### 8 Pallid Bat

- 9 The pallid bat is a California species of special concern. Species occurs throughout California with
- 10 the exception of the high Sierra Nevada. Pallid bats are found in a variety of habitats but are
- 11 particularly associated with oak woodlands, ponderosa pine, redwood, and sequoia habitats in
- 12 central and northern California. Pallid bats have a high reliance on trees for day roosts (Brown and
- Pierson 1996) and feed on a wide variety of insects and arachnids including beetles, orthopterans, homosterans, mother spidere acceptions, colourida, and langelan ariskets (Zeiner et al. 1000b)
- 14 homopterans, moths, spiders, scorpions, solpugids, and Jerusalem crickets (Zeiner et al. 1990b).
- 15 CNDDB (<u>California Department of Fish and Wildlife 2018a20092017</u>) records do not indicate any 16 pallid bat observations within any of the four program <del>study area</del>-regions. However, bat species are 17 not readily incidentally observed and focused bat surveys are limited. Riparian forests and oak 18 woodlands throughout the program area have potential to provide suitable roosting habitat for this 19 species while adjacent open water areas provide suitable foraging opportunities. Therefore, all four 20 regions are considered to have potential to contain this species.

# 21 12.3 Regulatory Setting

- Appendix C, Regulatory Background, describes the federal, state, and local environmental laws,
   regulations, and policies that apply to wildlife resources in the program area. Pertinent laws,
   regulations, and policies are listed below.
- Federal:
- 26 O National Environmental Policy Act
- 27 Endangered Species Act
- 28 O Migratory Bird Treaty Act
- 29 Fish and Wildlife Coordination Act
- **30** State:
- 31 O California Environmental Quality Act
- 32 O California Endangered Species Act
- 33 O California Fish and Game Code
- Local:
- 35 O Butte County General Plan
- 36 O Butte Regional Conservation Plan

1	0	Colusa County General Plan
2	0	Placer County General Plan
3	0	Sacramento County General Plan
4	0	American River Parkway Plan
5	0	Natomas Basin Habitat Conservation Plan
6	0	Solano County General Plan
7	0	Sutter County General Plan
8	0	Yuba-Sutter Habitat Conservation Plan/Natural Communities Conservation Plan
9	0	Tehama County General Plan
10	0	Yolo County General Plan
11	0	Yolo Natural Heritage Program
12	0	Yuba County General Plan

# **13 12.4 Determination of Effects**

This section describes the methodology used to evaluate program-related effects on wildlife
 resources. The information used to determine the types of wildlife resources that could be impacted
 by program activities and the laws, regulations, and policies that apply to these resources is
 described above in the Introduction and Summary section of this chapter.

This section describes the type of analysis being conducted for the proposed program, the effects
 analysis assumptions, effect mechanisms, and significance thresholds used to conclude whether an
 effect would be significant.

## 21 **12.4.1 Assessment Methods**

Qualitative relationships between environmental conditions and life stage survival or wildlife
 resources are the basis of the effect assessment. Cause and effect relationships are identified for
 assessment species, including the relationship between environmental conditions and habitat, and
 the effects of changes in habitat on survival.

26 The effect analysis below is qualitative and programmatic and is not based on site-specific 27 information. However, as applicable, each effect identifies how a particular effect may differ by 28 program region based on available region-specific biological resource information. Measures to 29 mitigate (i.e., avoid, minimize, rectify, reduce, eliminate, or compensate for) significant effects 30 accompany each effect discussion. The mitigation measures described for potential effects on 31 sensitive resources are currently being developed through formal or informal consultation or 32 coordination with resource agencies (e.g., DFW and USFWS). A biological assessment has been 33 prepared by the Corps and submitted to USFWS and NMFS to initiate formal programmatic Section 7 34 consultation. As part of subsequent, project-level environmental analysis of future program 35 activities, project proponents will work with agencies as part of the environmental compliance 36 process to determine specific mitigation and compensation requirements for effects on state- and

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federally listed and proposed species, other special-status species, critical habitat, and other habitats
 important to the survival and continued existence of these species. Additional mitigation and
 compensation measures may also be identified in future issued programmatic permits or approvals
 (e.g., programmatic Biological Opinion/Section 7 Incidental Take Statement-or California Fish and

5 Game Code Section 1602 Streambed Alteration Agreement).

### 6 **12.4.1.1** Effect Assumptions

7 The following assumptions apply to program-related effects on wildlife.

- All program activities, including construction, associated equipment staging and access, and operations and maintenance activities, would be limited to the program area.
- Project-level analyses will be conducted for future SRBPP erosion repair projects to assess
   project-specific effects.
- All program activities will comply with the Engineering Technical Letter -2-583, Guidelines for Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and Appurtenant Structures (Vegetation ETL). In other words, no vegetation would be permitted within the levee's operation and maintenance zone, which includes the levee itself and an area extending 15 feet from the landside and waterside toes. These areas, known as vegetation-free zones (VFZs), would be maintained free of woody vegetation in perpetuity.
- Operation or maintenance activities proposed under the program could result in similar direct and indirect effects on wildlife resources as compared with construction activities, though the magnitude of these effects is expected to be much lower than that of construction-related effects based on past experience demonstrating that minimal action is typically taken and, when it is taken, it involves relatively minor amounts of vegetation removal and/or rock placement.

### 23 12.4.1.2 Types of Effects Mechanisms

The following pProgram-related activities have been identified as activities that could result in
 direct and indirect effects on wildlife resources within the study area. These types of effects were
 used to assess effects on wildlife resources The effects could directly result from program
 implementation, or indirectly result from the program.

### Direct Effects

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- <u>Clearing-Loss</u> of vegetation (including trees)<del>,</del> as a result of grading, excavating, trenching, placement of rock slope protection, and paving activities during construction.
- Loss of erosional processes that refresh and create bank swallow nesting habitat.
  - Temporary stockpiling and sidecasting of soil, construction materials, or other construction wastes.
  - Soil compaction, dust, and water runoff from the construction site.
    - Short-term construction-related noise (from equipment).
  - Degradation of water quality in drainages and wetlands, resulting from construction runoff containing petroleum products or sediment.

#### 1 Indirect Effects

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- Permanent alteration of light levels.
- <u>Altering Alteration of hydrology</u>.
- Causing damage through tToxicity associated with application of herbicides, insecticides, and rodenticides.
- <u>Disturbance of habitat as a result of lintroducing pets</u> and humans disturbance (includingand potential trash dumping).
- Increasing habitat for native competitors or predators.
- Introducing invasive nonnative species.

### 10 12.4.2 Significance Criteria

- For this analysis, an effect pertaining to wildlife resources was considered significant if it would
   result in any of the following environmental effects, which are based on the State CEQA Guidelines
   Appendix G (14 CCR 15000 et seq.).
- Have a substantial adverse effect, either directly or through habitat modification, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations or by DFW or the USFWS.
- Interfere substantially with the movement of any native resident or migratory fish or wildlife
   species or with established native resident or migratory wildlife corridors, or impede the use of
   native wildlife nursery sites.
- Conflict with any local policies or ordinances protecting biological resources, such as a tree
   preservation policy or ordinance.
- Conflict with the provisions of an adopted habitat conservation plan, natural communities
   conservation plan, or other approved local, regional, or state habitat conservation plan.
- Contribute to a substantial reduction or elimination of species diversity or abundance.

25 Local policies and ordinances that protect biological resources are addressed in Chapter 10, 26 "Vegetation and Wetlands," and are not discussed further in this chapter. Activities associated with 27 the proposed program may occur in the planning area of a number of HCPs or NCCPs, though at this 28 time there is only one completed HCP: the Natomas Basin HCP. The Butte Regional Conservation 29 Plan, Placer HCP, South Sacramento HCP, Yuba Sutter HCP/NCCP, and Yolo Natural Heritage 30 Program are still under development. DWR is also preparing an the Feather River HCP for some of 31 its flood program. The intent of the proposed program is to protect the species covered by such 32 plans through related compliance processes (e.g., Section 7 of the ESA, the Fish and Wildlife 33 Coordination Act, and NEPA and CEOA mitigation measures). Regardless, completed HCPs and 34 NCCPs will be consulted on a site-specific basis during project-level environmental review to ensure 35 consistency. HCPs and NCCPs are not addressed further in this chapter.

# **12.5 Effects and Mitigation Measures**

### 2 12.5.1 Alternative 1—No Action

The No Action Alternative is a continuation of the existing erosion deficiencies along proposed erosion repair areas within the program area. Current bank and levee maintenance activities, such as mowing and application of herbicides, would continue, and any effects from these activities would not be different from current (baseline) conditions. No direct or indirect construction-related effects on wildlife or its habitats would occur under this alternative.

8 Without erosion repairs, the risk of levee failure would continue. A catastrophic levee failure would 9 result in flooding and inundation that could adversely affect wildlife and its upland or wetland 10 habitats through physical displacement, mortality, or destruction of habitat. These adverse effects 11 could be further exacerbated by emergency clean-up and repair activities that would be required in 12 response to such an event, including the emergency placement of rock. Given the uncertainty of the 13 occurrence or magnitude of such an event, potential effects on wildlife and its habitats cannot be 14 quantified for this alternative but are expected to be potentially significant.

## 15 **12.5.2 Alternative 2A—Low Maintenance**

# Effect WILD-1: Permanent Loss of Riparian Habitat for Special-Status Wildlife Species Associated with Compliance with the Vegetation ETL

All activities proposed under this alternative would comply with the Vegetation ETL without use of a variance, which requires that there be no woody vegetation on the crown, slopes and within 15 feet of the waterside and landside levee toes. These zones are to be maintained free of woody vegetation in perpetuity. Thus, the removal of a substantial amount of mature trees and vegetation from the levees of the SRFCP may be required.

Permanent loss of the woody vegetation in compliance with the Vegetation ETL would result in
substantial adverse effects on special-status species dependent on riparian habitats. The full extent
of this effect is dependent on what portions of the existing levee would be deemed as the levee
prism by the Corps.

27 Riparian habitats, particularly in the Central Valley, provide essential nesting and cover habitat for 28 numerous special-status wildlife species with known or potential occurrence in the study area, 29 including valley elderberry longhorn beetle, western pond turtle, Swainson's hawk, white-tailed 30 kite, osprey, western yellow-billed cuckoo, western mastiff bat, hoary bat, western red bat, and 31 pallid bat. Valley elderberry longhorn beetles are dependent on riparian habitats containing 32 elderberry shrubs, which are the host plant for valley elderberry longhorn beetle and are needed to 33 complete the beetle's life cycle. Western pond turtle utilizes riparian vegetation for nesting and 34 cover during the breeding season and for overwintering. Swainson's hawk, white tailed kite, osprey, 35 and western yellow-billed cuckoo require mature trees for nesting. In the Central Valley, these trees 36 are most prevalent within riparian habitats, particularly those along the Sacramento River. Though 37 human-made structures are often used for day and night roosting by special-status bats, riparian 38 habitats provide essential, natural roosting and cover habitat adjacent to important open water

39 foraging areas.

- 1 Therefore, removal of woody riparian vegetation along levees in accordance with the Vegetation
- 2 ETL would result in the loss of substantial key habitats needed to support special-status wildlife
- 3 species in the study area. Because the riparian habitats within the study area are some of the most
- extensive in the Central Valley, the loss of these habitats would be a significant effect.
   Implementation of Mitigation Measure VEG-MM-1: Compensate for the Loss of Woody Riparian
- 6 Habitat would reduce the effect on species in the area over time. However, because mature riparian
- 7 habitat cannot be replaced in the short term, this effect on the special-status wildlife species that
- 8 depend on riparian habitats would remain significant and unavoidable.

# 9 Effect WILD-2: Potential Disturbance or Loss of Special-Status Wildlife Species and Their 10 Habitats as a Result of Program Construction and O&M Activities

11 The program area has potential to support numerous special-status wildlife species. As described 12 under the Special-Status Wildlife Species section, the study area contains documented occurrences 13 of valley elderberry longhorn beetle, giant garter snake, western pond turtle, bald eagle. Swainson's 14 hawk, white-tailed kite, osprey, northern harrier, western burrowing owl, Modesto song sparrow. 15 tricolored blackbird, yellow-headed blackbird, western snowy plover (inland population), western 16 yellow-billed cuckoo, purple martin, bank swallow, western mastiff bat, hoary bat, and western red 17 bat. In addition, loggerhead shrike and pallid bat, both of which are also special-status wildlife 18 species, have the potential to occur within the program area because of the presence of suitable 19 habitat.

- Construction within the program area could result in direct or indirect effects on special-status
   wildlife or their habitats, which are known to occur or could occur in the study area. Effects on
   special-status wildlife or its habitat could result in a substantial reduction in local population size,
   lowered reproductive success, or habitat fragmentation. Adverse effects on special-status wildlife
   associated with erosion repair projects would include the following effects.
- Direct mortality resulting from the movement of construction equipment and vehicles through
   the program area.
  - Direct mortality from the collapse of burrows, resulting from soil compaction.
- Loss of breeding and foraging habitat resulting from the filling or removal of emergent marsh
   and open water areas.
- Loss of breeding, foraging, or refuge habitat resulting from the permanent removal of riparian
   vegetation, oak woodland, grasslands, and non-orchard agricultural lands.
- Loss of geomorphic river process required for the regeneration of bank swallow nesting habitat
   and western yellow-billed cuckoo nesting and foraging habitat.
- Loss of potential nesting habitat for bank swallows in the currently eroding banks or banks that
   are likely to erode and have potentially suitable habitat.
- Abandoned eggs or young and subsequent nest failure for nesting special-status birds and other
   nonspecial-status migratory birds, including raptors, as a result of construction-related noise or
   close proximity to construction activity.
- **39** Loss or disruption of migration corridors.
- 40 Depending on which special-status wildlife species (listed versus unlisted) are affected and the
   41 extent of the effect, these species could experience potentially significant effects. Implementation of

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Mitigation Measures WILD-MM-1 through WILD-MM-3 and VEG-MM-1, VEG-MM-4, and VEG-MM-8 would reduce effects. However, effects are likely to still be significant because of the presence of habitats within the program area that are regionally important to special-status species, particularly listed species. The final determination would need to be made at a project-level for individual sites in consultation with the applicable resource regulatory agency (USFWS and/or DFW). In addition, as discussed above under Effect WILD-1, the specific extent of actual vegetation removal as a result of compliance with the Vegetation ETL for levees would determine the severity of the effect on riparian-dependent wildlife species. Therefore, this effect is considered significant and unavoidable.

# 9 Mitigation Measure WILD-MM-1: Document Special-Status Wildlife Species and Their 10 Habitats

11As part of project-level environmental review, the program proponent will retain a qualified12wildlife biologist to document the presence or absence of suitable habitat for special-status13wildlife species. The results of this effort will allow the program proponent to implement14Mitigation Measure WILD-MM-2: Avoid and Minimize Effects on Special-Status Wildlife Species15by Redesigning the Action, Protecting Special-Status Wildlife Habitat, and Developing a16Mitigation Monitoring Plan. The following steps will be implemented to document special-status17wildlife species and their habitats:

- **Review Existing Information**. The wildlife biologist will review existing information to develop a list of special-status wildlife species that could occur in the project area. The following information will be reviewed as part of this process: the USFWS special-status species list for the action region; DFW's CNDDB; previously prepared environmental documents; city and county general plans; HCPs and NCCPs (if there are anyboth adopted by the time the action is constructed and under development); and the USFWS-issued biological opinion for the program.
  - **Coordinate with State and Federal Agencies**. The wildlife biologist will coordinate with the appropriate agencies (DFW and USFWS) to discuss wildlife resource issues in the project area and determine the appropriate levels of survey necessary to document special-status wildlife species and their habitats.
- **Conduct Field Studies**. The wildlife biologist will evaluate existing habitat conditions and determine what levels of biological survey may be required. The type of survey required will depend on species richness, habitat type and quality, and the probability of special-status species occurring in a particular habitat type. Depending on the existing conditions in the project area and the proposed construction activity, one or a combination of the following levels of survey may be required.
- 35 Habitat Assessment. A habitat assessment determines whether suitable habitat is 36 present. This type of assessment can be conducted at any time of year and is used to 37 assess and characterize habitat conditions and to determine whether return surveys are necessary. If no suitable habitat is present, no additional surveys will be required. For 38 39 bank swallow, it is especially important to analyze suitable habitat adjacent to the construction areas in addition to identifying existing habitat. There is uncertainty with 40 41 regard to defining potential habitat, but identification should rely on physical 42 parameters (e.g., soil type, erosiveness) or proximity to existing habitat. Specific to bank 43 swallow habitat, it is believed to be dependent on several parameters with the most 44 pertinent being: 1) composition of bank material; 2) slope of bank; and 3) susceptibility

1	to regular erosion and resurfacing of the bank. Previous studies have shown sed	ment
2	grain size is one of the most significant factors affecting the suitability of bank sv	<u>vallow</u>
3	nesting habitat. The preferred composition of bank material consists of moderat	<u>ely</u>
4	sorted fine to medium sand with less than 10% fines. This class of grain sizes pro	<u>duces</u>
5	capillary conditions that maintain an appropriate amount of drainage, which kee	<u>ps</u>
6	nesting sites dry, while retaining a high enough moisture content to prevent the	burrow
7	from collapsing. In addition to grain size, suitable banks will have a high enough	<u>bulk</u>
8	density to maintain stable walls but be loose enough to allow bank swallows to e	xcavate
9	a nest. The bank slopes should be near vertical and undergo regular erosion that	
10	exposes fresh bank surfaces. USACE and CVFPB will coordinate with USFWS. DFV	<i>N</i> . and
11	the Bank Swallow Technical Advisor Committee to further define the process for	
12	assessing bank swallow habitat.	
13	• <b>Conduct Species-Focused Surveys</b> . Species-focused surveys (or target species	
14	surveys) will be conducted if suitable habitat is present for special-status wildlife	e and it
15	is necessary to determine the presence or absence of the species in the project a	rea. The
16	surveys will focus on special-status wildlife species that have the potential to occ	ur in
17	the region. The surveys will be conducted during a period when the target specie	es are
18	present and/or active. Surveys for bank swallow will follow the protocol current	lvused
19	by DFW and the Bank Swallow Technical Advisory Committee for their annual su	<u>irveys.</u>
20	• <b>Conduct Protocol-Level Wildlife Surveys</b> . The project proponent will comply w	vith
21	protocols and guidelines issued by responsible agencies for certain special-statu	S
22	species. USFWS and DFW have issued survey protocols and guidelines for severa	l
23	special-status wildlife species that could occur in the study area, including valley	
24	elderberry longhorn beetle, Swainson's hawk, western burrowing owl, western	zellow-
25	billed cuckoo, and giant garter snake. The protocols and guidelines may require	that
26	surveys be conducted during a particular time of year and/or time of day when t	he
27	species is present and active Many survey protocols require that only a USFWS-	or
28	DFW-approved biologist perform the surveys. The program proponent will coord	dinate
29 29	with the appropriate state or federal agency biologist before initiation of protoco	ol-level
30	surveys to ensure that the survey results will be valid. Because some species can	he
31	difficult to detect or observe multiple field techniques may be used during a sur	
37	noriod and additional surveys may be required in subsequent seasons or years	/Cy
32 33	outlined in the protocol or guidelines for each species.	15
24		1110
34	Mitigation Measure WILD-MM-2: Avoid and Minimize Effects on Special-Status Wild	llife
35	Species by Redesigning the Action, Protecting Special-Status Wildlife Habitat, and	
36	Developing a Mitigation Monitoring Plan (If Necessary)	
37	This mitigation measure focuses on avoiding and minimizing all direct and indirect effect	ts on
38	special-status wildlife species. The project proponent will implement the following meas	ures to
39	avoid and minimize effects on special-status wildlife species and their habitats.	
40	Redesign or modify the action to avoid direct and indirect effects on special-status w	ildlife
41	species or their habitats, if feasible. In the case of the bank swallow, design measures	το
42	avoid active nests or suitable nesting nabitat includinge the use of utilizing setback of	
43	adjacent levees. <u>The use of setback levees would also reduce effects on western yello</u>	<u>W-</u>

1 2	<u>billed cuckoo habitat.</u> Construction of setback or adjacent levees would not be feasible under Alternative 2A.
3 4 5 6 7 8 9 10 11 12 13 14	• Protect special-status wildlife species and their habitat near the project site by installing environmentally sensitive area fencing around habitat features, such as seasonal wetlands, elderberry shrubs, burrows, and nest trees. The environmentally sensitive area fencing or staking will be installed at a minimum distance from the edge of the resource as determined through coordination with state and federal agency biologists (DFW and USFWS). The location of the fencing will be marked in the field with stakes and flagging and shown on the construction drawings. The construction specifications will contain clear language that prohibits construction-related activities, vehicle operation, material and equipment storage, and other surface-disturbing activities within the fenced environmentally sensitive area. Construction-related activities will be restricted to the nonbreeding season for special-status wildlife species that could occur seasonally in the action area. Timing restrictions may vary depending on the species and could occur during any time of the year.
15 16 17 18	• Coordinate with the appropriate resource agencies to determine whether a construction monitoring plan for special-status wildlife species is necessary as part of the program. If a monitoring plan is required, it will be developed and implemented in coordination with appropriate agencies and will include all of the following information.
19 20	• A description of each of the wildlife species and the suitable habitat for species that could occur at the action site.
21 22	<ul> <li>Documentation of the locations of known occurrences of special-status wildlife species within 5 miles of the action site (e.g., CNDDB records search).</li> </ul>
23 24	• The location and size of no-disturbance zones in and adjacent to environmentally sensitive areas for wildlife.
25 26	• Directions on the handling and relocating of special-status wildlife species found on the action site that are in immediate danger of being destroyed.
27 28	<ul> <li>Notification and reporting requirements for special-status species that are identified on the action site.</li> </ul>
29 30 31	Mitigation Measure WILD-MM-3: Coordinate with Resource Agencies <u>to Obtain Incidental</u> <u>Take Authorization, as Necessary,</u> and Develop Appropriate Wildlife Compensation Plans for Species Listed under ESA and/or CESA
32 33 34 35 36	If Mitigation Measure WILD-MM-2 is not feasible and site-specific construction activities would result in significant effects on wildlife species listed under ESA and/or CESA, a compensation <u>the applicant will coordinate plan will be developed in coordination</u> with the appropriate resource agency to obtain incidental take authorization. or implement agency-approved compensation guidelines will be followed to reduce the effects on listed species and avoid take. As appropriate
37	incidental take authorizations will include project-specific c <del>C</del> ompensation plans developed in
38	coordination with the resource agencies. Agency-approved compensation guidelines have been
39	developed identified for several special-status wildlife species, including valley elderberry
40	longhorn beetle, Swainson's hawk, burrowing owl, and giant garter snake. The amount of
41	compensation will vary depending on the amount and quality of habitat loss or degree of habitat
42	disturbance anticipated. The compensation plan will be developed and implemented in
43	coordination with the appropriate state or federal agency and <del>will <u>may</u> involve <u>one or more of</u></del>

coordination with the appropriate state or federal agency and will may involve one or more of

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<u>the following:</u> identifying an agency-approved mitigation bank or mitigation site (on or off site); transplanting (elderberry shrubs), re-creating (burrows), creating habitat restoration areas (i.e., removing rock to create bank swallow habitat <u>and to expand areas subject to natural river</u> <u>process to create bank swallow and/or western yellow-billed cuckoo habitat</u>); and preserving additional habitat for special-status wildlife species; monitoring the mitigation site; and funding the management of the mitigation site.

#### 7 Effect WILD-3: Disturbance to or Loss of Common Wildlife Species as a Result of Construction

8 The program area contains both natural and nonnatural habitats that support numerous common 9 wildlife species. These species include a wide variety of terrestrial and aquatic invertebrates, birds 10 and raptors, amphibians, reptiles, and mammals, some of which are listed in the Environmental 11 Setting section.

12 Numerous common migratory bird species, including raptors, have potential to nest within the 13 study area, including red-tailed hawk, red-shouldered hawk, great horned owl, American kestrel, 14 and red-winged blackbird. Common bats, including California myotis, Yuma myotis, long-legged 15 myotis (Myotis volans), long-eared myotis (Myotis evotis), and small-footed myotis (Myotis 16 subulatus), also have potential to roost in <u>structures,</u> trees and snags within the program study area. 17 Tree and shrub removal, other vegetation clearing, grading, or other construction activities could 18 remove or cause abandonment of active bird nests or bat roosts. Within the program area, suitable 19 nesting habitat for migratory birds occurs in riparian forest, riparian scrub, oak woodland, 20 grassland, and pastureland. Similarly, riparian forests and oak woodland contain suitable bat 21 roosting habitat. Effects on bird species protected under the MBTA and the California Fish and Game 22 Code and effects on bat species protected by DFW are potentially significant. Implementation of 23 Mitigation Measures WILD-MM-4 and WILD-MM-5 would reduce these effects to a level that is less 24 than significant. In addition, implementation of Mitigation Measure VEG-MM-1 would compensate 25 for the removal of woody riparian vegetation that provides potential nesting bird and roosting bat 26 <u>habitat.</u>

Effects on nonspecial-status wildlife species are considered less than significant because these
species are widespread and abundant, the habitats they rely on exist well beyond the program area,
and the potential losses of suitable habitat as a result of the proposed program in relation to the
overall habitat available would be extremely small. As a result, the proposed program would not
contribute to a substantial reduction of these nonspecial-status species' diversity or abundance.

# 32Mitigation Measure WILD-MM-4: Avoid or Minimize Construction-Related Effects on33Nesting Birds

- 34To avoid removing or disturbing any active migratory bird and raptor nests, tree and shrub35removal, other vegetation clearing, grading, and other construction activities will be conducted36during the nonbreeding season (generally September 1 through February 14) or after a qualified37biologist determines that fledglings have left an active nest.
- If construction or tree-felling activities will be conducted during the breeding season (February
   15 through August 31), a qualified biologist will be retained to conduct a breeding season survey
   for nesting birds for all trees, shrubs and ground-nesting habitat (and vertical banks along the
   project area for bank swallow) located within 500 feet (0. 5 mile for Swainson's hawk and
   western yellow-billed cuckoo) of construction activities, including grading, vegetation removal,

1 2	and excavation in borrow sites. The following focused nesting surveys will take place prior to the start of construction and in the appropriate habitat to confirm the absence of nesting:
3 4 5 6 7	• Swainson's hawk surveys will be completed in accordance with the Recommended Timing and Methodology for Swainson's Hawk Nesting Surveys in California's Central Valley (Swainson's Hawk Technical Advisory Committee 2000) with at least one survey being conducted no more than 48 hours prior to the start of construction to confirm the absence of nesting.
8 9 10	• Surveys for western burrowing owls will be conducted in accordance with DFW's 2012 Staff Report on Burrowing Owl Mitigation (2012 Staff Report) (California Department of Fish and Game 2012).
11 12 13 14	• Within suitable habitat, western yellow-billed cuckoo surveys will be conducted to determine the presence or absence of the species within 0.5 mile of proposed activities. Surveys will be conducted in accordance with the protocol provided in Halterman et al. 2015 unless otherwise directed by USFWS or DFW.
15 16 17 18	• Within active and/or suitable habitat, bank swallow surveys will be conducted to determine the presence or absence of the species. Surveys will be conducted in accordance with the protocol currently utilized by USFWS, DFW and the Bank Swallow Technical Advisory Committee.
19 20 21	• Other bird nest surveys (within 500 feet of construction activities) can be conducted concurrent with Swainson's hawk surveys with at least one survey to be conducted no more than 48 hours from the initiation of project activities to confirm the absence of nesting.
22 23 24 25 26 27 28 29	If the biologist determines that the area surveyed does not contain any active occupied nests, construction activities, including tree removal, can commence without any further mitigation for species. Construction activities will avoid bank swallow nesting areas. If avoidance of bank swallow nests is not possible, design measures to minimize impacts, including reducing the construction footprint to protect the upper bank from encroachment, will be considered. If nesting habitat is directly impacted, mitigation will include removal of existing rock at a former bank protection site, acquisition of a permanent easement, or participation in a conservation easement on an appropriate landform.
30 31 32 33 34	In addition to occupied nests, USACE will also identify active Swainson's hawk nests (i.e., nests used during one or more of the previous 5 years). To the extent possible, removal of trees containing active but unoccupied Swainson's hawk nests will be avoided. Removal of potential Swainson's hawk nesting habitat would be mitigated under Mitigation Measure VEG-MM-1 that includes replacement of woody riparian vegetation.
35 36 37 38	If active occupied nests are found, the activities will not occur until nesting activities have ceased (i.e., after a qualified biologist determines that fledglings have left the nest) or DFW is contacted to determine an appropriate buffer area needed to protect nests from program activities.
39 40 41 42 43	If active bank swallow nests (nests containing eggs or young) are present within the construction easement, a no-disturbance buffer zone shall be established around the nest site. The width of the buffer zone shall be determined by a qualified biologist in coordination with DFW. No construction activities shall occur within the buffer zone. The buffer zone shall be maintained until <u>there is no longer potential to impact the individual birds, colony, or habitat (as</u>

1 determined by a qualified biologist in consultation with DFW)the young have fledged (as 2 determined by a qualified biologist). The buffer zone shall be delineated with exclusionary 3 fencing/flagging and/or signage as appropriate. A qualified biologist shall monitor any active 4 bank swallow nests that are located within the construction easement. The first monitoring 5 event shall coincide with the initial implementation of construction activities and monitoring 6 shall continue a minimum of once a week until the young have fledged. If the biologist 7 determines that construction activities are disturbing the birds and nest failure is possible, 8 construction activities shall immediately stop in the area of the nests and DFW shall be 9 immediately notified. Construction may not begin again until DFW and the biologist have 10 determined that the nesting birds are no longer being disturbed. Measures to avoid nest failure 11 shall be implemented in coordination with DFW and may include halting some or all 12 construction activities until the young have fledged. For any nest sites that require biological 13 monitoring, a monitoring report shall be submitted to DFW within 2 weeks of termination of 14 monitoring activities.

# 15Mitigation Measure WILD-MM-5: Conduct a Preconstruction Survey for Roosting Bats and16Avoid or Mitigate Potential Impacts

17 Bats are known to utilize tree cavities for breeding and wintering roosts and, therefore, 18 conducting tree and shrub removal, other vegetation clearing, grading, and other construction 19 activities outside of the breeding season may not avoid impacts on active roosts. Prior to any 20 tree trimming and removal activities, a qualified biologist should conduct a preconstruction 21 survey to determine whether bats are present. Trees within 100 feet of construction areas also 22 should be surveyed to ensure that adjacent bat roosts are not disturbed. Within 2 weeks prior to 23 tree pruning or removal, a qualified biologist should conduct The survey should consist of a 24 daytime survey of suitable habitat features (e.g., large tree cavities, basal hollows, loose or 25 peeling bark, and large snags) nighttime emergence survey of suitable trees for evidence 26 (presence of guano or urine stains) of use by bats, including vocalizations, guano droppings, and 27 urine staining or smell of urine, and it should be conducted no more than 14 days prior to 28 construction activities. The daytime survey should be followed by a nighttime emergence survey 29 of habitat features exhibiting evidence of bat use.

30 If the biologist determines that the area surveyed does not contain any active roosts, activities 31 may commence without any further mitigation. If active roosts are found, roosting structures 32 should be retained, and the need for a construction buffer should be determined through 33 consultation with DFW. If avoidance is not possible, DFW may require that bats be excluded 34 from the habitat prior to start of the breeding and/or hibernation season. Compensatory 35 mitigation of the loss of roosting habitat also should be determined through consultation with 36 DFW but may include the construction and installation of suitable replacement habitat on site, 37 such as bat houses.

#### 38 Effect WILD-4: Disruption to Wildlife Movement Corridors as a Result of Construction

Within the program area, all watercourses and associated banks and levees are considered to act as
movement corridors for wildlife. These areas provide important opportunities for food and cover
for migrating or dispersing animals. During construction of erosion repair sites, movement through
project sites would likely be temporarily impeded either by the placement of physical barriers
(fencing) used to protect resources outside of the construction footprint or because of the presence
of construction noise, which would be likely to discourage animals from entering the area. The

1 program area is considered to contain numerous important movement corridors, particularly along 2 the Sacramento, American, Feather, Yuba, and Bear Rivers, and disruption of these areas could 3 adversely affect the ability of animals to move through these areas. However, it is assumed that 4 construction at erosion repair sites within each region would be staggered based on varying 5 schedule constraints at each site, and, thus, all sites would not be impassible at one time. 6 Additionally, it is assumed that construction at each site would most often be completed within 1 7 year, thereby creating only a temporary barrier to movement within a specific localized area. The 8 function of program area regions to act as movement corridors would, therefore, be disrupted 9 temporarily during project construction within a localized area, but movement corridor function 10 would be restored following the completion of program construction. Further, while vegetation loss 11 will be substantial because of compliance with the Vegetation ETL as well as the varied vegetation 12 loss from the different erosion treatments that could affect exposure rates, the losses would be 13 intermittent as they are spread throughout the system and, therefore, would not substantially 14 reduce the value of the area for wildlife movement. Therefore, this potential effect would be less 15 than significant.

# 16 12.5.3 Alternative 3A—Maximize Meander Zone 17 (Environmentally Superior Alternative)

# Effect WILD-1: Permanent Loss of Riparian Habitat for Special-Status Wildlife Species Associated with Compliance with the Vegetation ETL

20 All activities proposed under this alternative would comply with the Vegetation ETL without use of a 21 variance. Under Alternative 3A, either a setback levee would be constructed some distance behind 22 the existing levee or an adjacent levee embankment would be constructed toward the landside of 23 the existing levee. In either case, the bank repair methods would shift the levee prism and VFZ 24 landward. Within the VFZ of the new levee, the loss of vegetation would likely result in fewer effects 25 on special-status wildlife species as compared with Alternative 2A, though the degree of the effect 26 would depend upon the type and extent of vegetation present within the levee construction area. 27 Construction of setback levees would create enlarged floodplains that would offer benefits to the 28 giant garter snake, western pond turtle, various special-status birds including western vellow-billed 29 cuckoo, and numerous other common wildlife species. However, there is substantial riparian habitat 30 on the landside of existing levees that could be adversely affected by the construction of new levees 31 or adjacent levees and result in significant effects. Implementation of Mitigation Measure VEG-MM-1 32 would ensure the eventual restoration of riparian habitats and reduce this effect to a less-than-33 significant level.

# Effect WILD-2: Potential Disturbance or Loss of Special-Status Wildlife Species and Their Habitats as a Result of Program Construction and O&M Activities

36 As described under the Special-Status Wildlife Species section, the program area has potential to 37 support numerous special-status wildlife species. Construction within the program area could result 38 in direct or indirect effects on special-status wildlife or its habitats. Where setback levees are 39 constructed, the loss of habitats (particularly woody habitats) would likely result in fewer effects on 40 wildlife resources as compared with Alternative 2A, though the degree of the effect would depend 41 upon the type and extent of habitats present within the setback levee construction area. The 42 breaching or degrading of the existing levee and creation of an enlarged floodplain could benefit 43 giant garter snake, western pond turtle, various special-status birds including western yellow-billed

- 1cuckoo, and numerous other common wildlife species (see beneficial effect, Effect-VEG-8) though2the degree of the benefit will depend on the type of restoration that occurs within these new
- 3 floodplain areas.

Where adjacent levees are constructed, woody vegetation along existing erosion repair site banks and levees would be retained along the waterside, though may be removed on the landside. Within the VFZ of the new levee, the loss of habitats (particularly woody habitats) would likely result in fewer effects on wildlife resources as compared with Alternative 2A, though the degree of the effect would depend upon the type and extent of habitats present within the adjacent levee construction area.

- 10Though Alternative 3A would retain woody vegetation within the existing levee and11potentially create an extended floodplain that could benefit special-status wildlife species, removal12of woody vegetation and special-status species habitats due to the creation of a setback or adjacent13levee could still result in significant effects because of the loss of habitat associated with the14vegetation removal that would still need to occur. Implementation of Mitigation Measures WILD-15MM-1 through WILD-MM-3 and VEG-MM-1, VEG-MM-4, and VEG-MM-8 would reduce effects to a16less-than-significant level.
- 17 Effect WILD-3: Disturbance to or Loss of Common Wildlife Species as a Result of Construction
- 18 This effect is similar to Effect WILD-3 as described under Alternative 2A, although the magnitude of
- 19 Effect WILD-3 under Alternative 3A is expected to be substantially less than under Alternative 2A.
- 20 Alternative 3A would retain woody vegetation on the existing levee and potentially create an
- 21 extended floodplain that could benefit common wildlife species. However, effects on bird species
- 22 protected under the MBTA and the California Fish and Game Code and effects on bat species
- protected by DFW are potentially significant because, as more fully described under Alternative 2A,
   tree and shrub removal, other vegetation clearing, grading, or other construction activities would
- 25 still occur to some extent under Alternative 3A. These activities could remove or cause
- abandonment of active bird nests or bat roosts. Implementation of Mitigation Measures WILD-MM-4
- and WILD-MM-5 would reduce these effects to a level that is less than significant. <u>In addition</u>,
   implementation of Mitigation Measure VEG-MM-1 would compensate for the removal of woody
- 29 riparian vegetation that provides potential nesting bird and roosting bat habitat.
- Effects on common wildlife species not protected under the MBTA or California Fish and Game Code
   are considered less than significant because these species are widespread and abundant, the
- 32 habitats they rely on exist well beyond the program area, and the potential losses of suitable habitat
- as a result of the proposed program in relation to the overall habitat available would be extremely
- 34 small. As a result, the proposed program would not contribute to a substantial reduction for these
  35 nonspecial status species' diversity or abundance
- 35 nonspecial-status species' diversity or abundance.

### 36 Effect WILD-4: Disruption to Wildlife Movement Corridors as a Result of Construction

- 37 This effect is similar to Effect WILD-4 as described under Alternative 2A, although the magnitude of
- 38 Effect WILD-4 under Alternative 3A is expected to be substantially less than under Alternative 2A
- 39 because much less habitat would be removed or permanently altered as a result of implementing
- 40 setback and adjacent levee designs under Alternative 3A. This effect is considered less than
- 41 significant.

### 12.5.4 Alternative 4A—Habitat Replacement (Preferred Alternative)

# Effect WILD-1: Permanent Loss of Riparian Habitat for Special-Status Wildlife Species Associated with Compliance with the Vegetation ETL

5 All activities proposed under this alternative will comply with the Vegetation ETL without use of a 6 variance. Under Alternative 4A, all of the available bank protection measures would be utilized to 7 varying extents (see Table 2-2). The amount of woody riparian vegetation removed under 8 Alternative 4A due to compliance with the Vegetation ETL would be less than under Alternative 2A 9 but more than under Alternative 3A. The amount of vegetation to be removed under this alternative 10 would be considered a significant effect on special-status wildlife species. Although implementation 11 of Mitigation Measure VEG-MM-1 would ensure the eventual restoration of riparian habitats, short-12 term riparian habitat losses would still be considered a significant and unavoidable effect on special-13 status wildlife species.

# Effect WILD-2: Potential Disturbance or Loss of Special-Status Wildlife Species and Their Habitats as a Result of Program Construction and O&M Activities

As described under the Special-Status Wildlife Species section, the program area has the potential to
 support numerous special-status wildlife species, and construction within the program area could
 result in direct or indirect effects on special-status wildlife species or their habitats.

19The creation of riparian benches, setbacks or adjacent levees at a majority of sites under Alternative204A would offset the loss of woody riparian habitat to a greater degree than under Alternative 2A21because some of the replacement riparian habitat, required as compensation, would occur on-site as22part of the project. Additionally, the creation of a wetland bench could offset effects on western pond23turtle and giant garter snake by replacing aquatic cover and breeding habitat. Also, the placement of24IWM along project site banks above the summer/fall waterline could offset effects on western pond25turtle by replacing on-site nesting and cover habitat.

- Where setback levees are constructed, the loss of habitats (particularly woody habitats) would likely result in fewer effects on wildlife resources as compared with Alternative 2A, though the degree of the effect would depend upon the type and extent of habitats present within the setback levee construction area. The breaching or degrading of the existing levee and creation of an enlarged floodplain could benefit giant garter snake, western pond turtle, and various special-status birds (see beneficial effect, Effect-VEG-8), though the degree of the benefit would depend on the type of restoration that occurs within these new floodplain areas.
- 33 Alternative 4A includes revegetation components that may offset effects to a greater degree than 34 Alternative 2A would. However, Alternative 4A's effect on special-status wildlife species could still 35 be potentially significant and unavoidable because mature riparian habitat, a key habitat for special-36 status species in the program area, cannot be replaced in the short term regardless of whether 37 replacement is occurring on site or off site. Implementation of Mitigation Measures WILD-MM-1 38 through WILD-MM-3 and VEG-MM-1, VEG-MM-4, and VEG-MM-8 would reduce this effect, but it 39 would remain significant and unavoidable. Additionally, though riparian vegetation would be 40 replaced within waterside bank or levees areas outside of the Corps' designated VFZ, compensation 41 of riparian vegetation removed from levees would likely still require off-site mitigation resulting in 42 substantial reductions in riparian habitat within the program area. Though the creation of a wetland

- bench would offset impacts on special-status and common wildlife species dependent on wetland
   habitats, the benefit of this component would not offset the loss of riparian habitat and effects on
- 3 riparian-dependent species associated with this alternative.

#### 4 Effect WILD-3: Disturbance to or Loss of Common Wildlife Species as a Result of Construction

5 This effect is similar to Effect WILD-3 as described under Alternative 2A. The magnitude of Effect 6 WILD-3 under Alternative 4A is expected to be less than under Alternative 2A, but greater than 7 under Alternative 3A. The creation of a wetland bench at many sites under Alternative 4A could 8 offset effects on numerous common wildlife species by replacing aquatic cover and breeding habitat, 9 and the creation of enlarged floodplains at certain sites would be beneficial as well. However, effects 10 on bird species protected under the MBTA and the California Fish and Game Code and effects on bats 11 protected by DFW are potentially significant. Implementation of Mitigation Measures WILD-MM-4 12 and WILD-MM-5 would reduce this effect to a level that is less than significant. In addition, 13 implementation of Mitigation Measure VEG-MM-1 would compensate for the removal of woody

- 14 <u>riparian vegetation that provides potential nesting bird and roosting bat habitat.</u>
- 15 Effects on common wildlife species not protected by the MBTA and California Fish and Game Code
- 16 are considered less than significant because these species are widespread and abundant, the
- habitats they rely on exist well beyond the program area, and the potential losses of suitable habitatas a result of the proposed program in relation to the overall habitat available would be extremely
- small. As a result, the proposed program would not contribute to a substantial reduction for these
- 20 nonspecial-status species' diversity or abundance.
- 21 Effect WILD-4: Disruption to Wildlife Movement Corridors as a Result of Construction
- This effect is similar to Effect WILD-4 as described under Alternative 2A. The magnitude of Effect
   WILD-<u>4</u>3 under Alternative 4A is expected to be less than under Alternative 2A, but greater than
   under Alternative 3A. This effect is considered less than significant.

# 12.5.5 Alternative 5A—Habitat Replacement Reaching Environmental Neutrality

# Effect WILD-1: Permanent Loss of Riparian Habitat for Special-Status Wildlife Species Associated with Compliance with the Vegetation ETL

29 All activities proposed under this alternative would comply with the Vegetation ETL without use of a 30 variance. Under Alternative 5A, all of the available bank protection measures will be utilized to 31 varying extents (see Table 2-2). The amount of woody riparian vegetation removed under 32 Alternative 5A due to compliance with the Vegetation ETL would be similar to, though slightly less, 33 than under Alternative 4A, and would be considered a significant effect on special-status wildlife 34 species. Although implementation of Mitigation Measure VEG-MM-1 would ensure the eventual 35 restoration of riparian habitats, short-term riparian habitat losses would still be considered a 36 significant and unavoidable effect on special-status wildlife species.

# Effect WILD-2: Potential Disturbance or Loss of Special-Status Wildlife Species and Their Habitats as a Result of Program Construction and O&M Activities

3 As described under the Special-Status Wildlife Species section, the program area has the potential to 4 support numerous special-status wildlife species, and construction within the program area could 5 result in direct or indirect effects on special-status wildlife or their habitats. Under Alternative 5A, 6 all of the available bank protection measures would be utilized to varying extents (see Table 2-2). 7 While Bank Protection Measure 1 would remove all vegetation within the project footprint, the 8 remaining bank protection measures would retain vegetation to the extent feasible and consistent 9 with the Vegetation ETL or create plantable space that would support riparian vegetation. As 10 previously discussed in Chapter 2, the goal of Alternative 5A is to reach "environmental neutrality" 11 with regard to existing habitat, with an emphasis on vegetation that is beneficial to target fish 12 species, while at the same time protecting the bank from erosion. In this case, "environmental neutrality" refers specifically to fish habitat as evaluated using the Standard Assessment 13 14 Methodology (SAM) (as described in Chapter 11, Fisheries and Aquatics) and riparian habitat. The 15 program would be considered to meet environmental neutrality if the SAM values for the alternative 16 are zero or greater (positive) and the amount of vegetation removed can be adequately replaced on-17 site or within other program sites within the same region (e.g., 1a, 1b, 2, or 3).

Where setback levees are constructed, the loss of habitats (particularly woody habitats) would likely result in fewer effects on wildlife resources as compared with Alternative 2A, though the degree of the effect would depend upon the type and extent of habitats present within the setback levee construction area. The breaching or degrading of the existing levee and creation of an enlarged floodplain could benefit giant garter snake, western pond turtle, and various special-status birds (see beneficial effect, Effect-VEG-8), though the degree of the benefit would depend on the type of restoration that occurs within these new floodplain areas.

Where adjacent levees are constructed, woody vegetation along existing erosion repair site banks
and levees would be retained along the waterside, though may be removed on the landside. Within
the VFZ of the new levee, the loss of habitats (particularly woody habitats) would likely result in
fewer affects effects on wildlife resources as compared with Alternative 2A though the degree of the
effect would depend upon the type and extent of habitats present within the adjacent levee
construction area.

31Setback levees were added into Regions 2 and 3 specifically under Alternative 5 to avoid bank32swallow habitat. Eroding sites SAC 172.0L, SAC 168.3L, SAC 163.0L, SAC 138.1L, SAC 131.8L, and33SAC 116.5L as listed in Table 2-2 were all redesigned with a setback levee to intentionally avoid34known and/or suitable bank swallow nesting sites. Setback levees would also benefit other special-35status species, such as the western yellow-billed cuckoo, that rely on natural river processes for the36generation of suitable habitat.

- Alternative 5A includes revegetation components that may offset effects to a greater degree than
  Alternatives 2A or 4A would. However, Alternative 5A's effect on special-status wildlife species
  could still be significant because mature riparian habitat, a key habitat for special-status species in
  the program area, cannot be replaced in the short term regardless of whether replacement is
  occurring on site or off site. Implementation of Mitigation Measures WILD-MM-1 through WILDMM-3 and VEG-MM-4, and VEG-MM-8 would reduce this effect, but it would remain
- 43 significant and unavoidable.
#### 1 Effect WILD-3: Disturbance to or Loss of Common Wildlife Species as a Result of Construction

2 This effect is similar to Effect WILD-3 as described under Alternative 4A. The magnitude of Effect

3 WILD-3 under Alternative 5A is expected to be similar to that of Alternative 4A. This effect is

4 considered significant, but implementation of Mitigation Measures WILD-MM-4 and WILD-MM-5

5 would reduce this effect to a level that is less than significant. In addition, implementation of

6 Mitigation Measure VEG-MM-1 would compensate for the removal of woody riparian vegetation that 7 provides potential nesting bird and roosting bat habitat.

8

### Effect WILD-4: Disruption to Wildlife Movement Corridors as a Result of Construction

9 This effect is similar to Effect WILD-4 as described under Alternative 2A. The magnitude of Effect 10 WILD-<u>43</u> under Alternative 5A is expected to be similar to that of Alternative 4A. This effect is 11 considered less than significant.

#### 12.5.6 Alternative 6A—Habitat Replacement with Vegetation ETL 12 Variance 13

14 Effect WILD-1 would not apply to Alternative 6A because this alternative would involve a variance 15 from the Vegetation ETL, and removal of vegetation in the VFZ would not be implemented.

#### 16 Effect WILD-2: Potential Disturbance or Loss of Special-Status Wildlife Species and Their 17 Habitats as a Result of Program Construction and O&M Activities

18 Under Alternative 6A, all of the available bank protection measures would be utilized to varying 19 extents, with the exception of adjacent levees (see Table 2-2). While Bank Protection Measure 1 20 would remove all vegetation within the project footprint, the remaining bank protection measures 21 would retain vegetation to the extent feasible or create plantable space that would support riparian 22 vegetation. As previously discussed in Chapter 2, the goal of Alternative 6 is to retain as much 23 vegetation as feasible, through use of a variance from the Vegetation ETL.

24 In the situations where riparian benches are constructed under Alterative 6A, the types of effects on 25 wildlife would be similar to that described above for Alterative 4A. The creation of riparian benches 26 would offset the loss of woody riparian habitat because some riparian habitat required as 27 compensation would be replaced on-site as part of the project. Additionally, the creation of a 28 wetland bench could offset effects on western pond turtle and giant garter snake by replacing 29 aquatic cover and breeding habitat. Also, the placement of IWM along project site banks above the 30 summer/fall waterline could offset effects on western pond turtle by replacing on-site nesting and 31 cover habitat.

32 In the limited situations where setback levees are constructed under Alternative 6A, the types of 33 effects on wildlife would be similar to that described above for Alternative 3A. The breaching or

- 34 degrading of the existing levee and creation of an enlarged floodplain could benefit giant garter 35 snake, western pond turtle, and various special-status birds (see beneficial effect, Effect-VEG-8) though the degree of the benefit would depend on the type of restoration within these new 36
- 37 floodplain areas.
- 38 Though Alternative 6A limits the removal of riparian vegetation, its effect on special-status wildlife 39 species could still be significant because mature riparian habitat, a key habitat for special-status 40 species in the program area, cannot be replaced in the short term regardless of whether

replacement is occurring on site or off site. Implementation of Mitigation Measures WILD-MM-1
 through WILD-MM-3 and VEG-MM-1, VEG-MM-4, and VEG-MM-8 would reduce this effect, but it
 would remain significant and unavoidable.

### 4 Effect WILD-3: Disturbance to or Loss of Common Wildlife Species as a Result of Construction

- 5 This effect is similar to Effect WILD-3 as described under Alternative 4A. This effect is considered 6 significant, but implementation of Mitigation Measures WILD-MM-4 and WILD-MM-5 would reduce 7 this effect to a level that is less than significant. In addition, implementation of Mitigation Measure 8 VEG-MM-1 would compensate for the removal of woody riparian vegetation that provides potential
- 9 <u>nesting bird and roosting bat habitat.</u>

### 10 Effect WILD-4: Disruption to Wildlife Movement Corridors as a Result of Construction

- 11 This effect is similar to Effect WILD-4 as described under Alternative 2A. The magnitude of Effect
- 12 WILD-<u>4</u>3 under Alternative 6A is expected to be similar to that of Alternative 4A. This effect is
- 13 considered less than significant.

## **3 13.1 Introduction and Summary**

This chapter describes the environmental setting associated with land use and agricultural
resources, the determination of effects, the environmental effects on land use and agriculture that
would result from implementation of the proposed program, and the mitigation measures that
would reduce these effects.

### 8 The key sources of data and information used in the preparation of this chapter are listed here.

- 9 Program area county general plans.
- Program area habitat conservation plans (HCPs) and natural community conservation plans
   (NCCPs):
- 12 O Butte Regional Conservation Program (in prep).
- 13 Yuba-Sutter HCP/NCCP (in prep).
- 14 O Yolo Natural Heritage Program (in prep).
- 15 O Natomas Basin HCP
- 16 American River Parkway Plan (Sacramento County 2008).
- California Department of Conservation, Farmland Mapping and Monitoring Program Important
   Farmland maps (California Department of Conservation 2006).
- Table 13-1 summarizes the effects on land use and agriculture resulting from the implementation ofthe proposed program.

#### 21 Table 13-1. Summary of Land Use and Agriculture Effects and Mitigation

Effect	Mitigation Measure	Implementation Period
Effect LA-1: Physical Division of an Established Community Located Adjacent to the Levee Corridor	None required	Not applicable
Effect LA-2: Conflicts with Local Land Use and Agriculture Policies	None required	Not applicable
Effect LA-3: Conversion of Important Farmland to Nonagricultural Uses	LA-MM-1: Evaluate the Potential for Direct Farmland Conversion at the Project Level and Avoid, Minimize, and Compensate for Loss of Farmland	During project-level environmental review

1

2

## **13.2 Environmental Setting**

2 The environmental setting for the proposed program is discussed in terms of the general program 3 area, the four program regions (1a, 1b, 2, and 3), and the program study area. The program area and 4 regions are shown in Figure 1-1. The general program area is located along the Sacramento River 5 and its tributaries and spans 10 counties, as described in the Existing Conditions section and in 6 more detail in Chapter 2, Project Description. The program area is further divided into four regions, 7 organized south to north by the location of the downstream terminus of each watercourse with the 8 mainstem Sacramento River (Figure 2-1). The geographical extent of each program region is 9 described in detail in Chapter 2, Project Description. For the purposes of this chapter, the program 10 study area contains the general program area, where potential bank protection sites are located, plus a 0.5-mile buffer within which direct or indirect impacts on land use and agriculture may occur. 11 12 The study area is also discussed in terms of the four program regions.

### 13 **13.2.1** Existing Conditions

14The land use context for the proposed program extends over 10 Sacramento Valley counties (Butte,15Colusa, Glenn, Placer, Sacramento, Solano, Sutter, Tehama, Yolo, and Yuba) and one San Joaquin-

16 Sacramento Delta region county (Solano). While the proportion of land uses varies by county, the

17 majority of the program area consists primarily of undeveloped agricultural fields and grassland,

18 with large-scale urban development concentrated in a few centralized locations. Table 13-2 shows

19 the percentage of land in different land use categories within each county in the program area.

#### 20 Table 13-2. Land Use in Program Area Counties (Percentage of Total County Acreage\*)

					Count	у				
Land Use	Butte	Colusa	Glenn	Placer	Sacramento	Solano	Sutter	Tehama	Yolo	Yuba
Agriculture	51	59	69	26	62	64	80	71	75	64
Open Space	41	33	30	61	12	10	13	27	17	25
Water	1	0	0	6	1	9	0	0	1	2
Residential	5	3	0	4	17	4	2	1	3	4
Commercial	1	1	0	1	3	2	0	0	1	2
Industrial	1	4	0	1	3	3	4	0	1	3
Mixed Use	0	0	0	0	0	0	0	0	0	0
Planned Development	1	1	0	1	3	7	0	0	1	1
Undetermined	0	0	0	0	0	1	0	0	1	0
Grand Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

\* The total sum of the percentages shown for each county may not add up to 100 percent due to decimal rounding.

Source: State of California 2009.

21

- 1 The program area also includes a substantial amount of open space, partially attributable to the
- 2 presence of large public land holdings within the vicinity of the Sacramento River and its tributaries.
- 3 Additionally, it is common for undeveloped grasslands that do not specifically carry an agricultural
- 4 land use designation to be classified as open space.
- 5 For the purposes of this discussion, existing land uses are divided into three categories: general land 6 uses, agricultural land uses, and general plan land use designations and zoning.

### 7 **13.2.1.1 General Land Uses**

### 8 Butte County

- 9 Butte County as a whole is generally rural with more than 92% of the county area designated for
- agricultural and open space uses. Butte County has five incorporated cities (Biggs, Chico, Gridley,
- 11 Oroville, and Paradise), which range from small farming communities to medium-size urban centers.
- Numerous unincorporated communities are also located within Butte County, including Berry Creek,
   Brush Creek, Cherokee, Dayton, Durham, Feather Falls, Forbestown, Honcut, Magalia, Nelson,
- Brush Creek, Cherokee, Dayton, Durham, FeatherPalermo, and Paradise Pines.
- 15 Public lands in Butte County include those of the U.S. Forest Service (USFS), U.S. Bureau of Land
- Management (BLM), California Department of Fish and Wildlife (DFW), California State University,
   Chico (CSU Chico), and other public agencies such as school districts. Major public land holdings
   include the Plumas National Forest, Lassen National Forest, Gray Lodge Wildlife Area, Upper Butte
   Basin Wildlife Area, and Lake Oroville State Recreation Area. CSU Chico facilities include the 119 acre main campus in Chico and an 800-acre agricultural research center and teaching facility located
- 21 south of the campus.

### 22 Colusa County

- Colusa County as a whole is generally rural with more than 92% of the county area designated for
   agricultural and open space uses. Colusa County's two incorporated cities—Colusa and Williams—
   encompass about 1,300 acres. There are also five unincorporated communities in Colusa County:
   Maxwell, Princeton, Grimes, Stonyford, and College City.
- About 45% of the county consists of forested rangeland, national wildlife refuges, and national
   forest lands. Much of the rangeland is owned by the BLM or the Bureau of Reclamation; national
- 29 wildlife refuges and national forest lands in the county are owned by the U.S. Fish and Wildlife
- 30 Service (USFWS) and the USFS, respectively. Major public land holdings include the Colusa, Delevan,
- 31 and Sacramento National Wildlife Refuges, and Mendocino National Forest. The California State
- 32 Parks also own the Colusa–Sacramento State Recreation Area near Colusa.

### 33 Glenn County

- 34 Glenn County as a whole is generally rural with more than 96% of the county area designated for
- 35 agricultural and open space uses. Incorporated cities are Orland and Willows, and unincorporated
- 36 communities include Bayliss, Glenn, Ord Bend, Capay, Codora, Four Corners, Artois, Hamilton City,
- 37 Butte City, North Willows, Northeast Willows, and West Orland.

- 1 Public lands in Glenn County include those of the USFS or the USFWS, and various county and city
- 2 parklands. Major public land holdings include Mendocino National Forest and Sacramento National
- 3 Wildlife Refuge, of which approximately 8,555 acres are located in Glenn County.

### 4 Placer County

5 Approximately 87% of the land area in Placer County is composed of agricultural and open space

6 uses. There are the six incorporated cities and towns in Placer County: Auburn, Colfax, Lincoln,

- Roseville, Rocklin, and Loomis. Unincorporated communities include Alpine Meadows, Alta,
   Applegate, Bowman, Carnelian Bay, Dutch Flat, Emigrant Gap, Foresthill, Gold Run, Granite Bay,
- Applegate, Bowman, Carnelian Bay, Dutch Flat, Emigrant Gap, Forestnill, Gold Run, Granite Bay,
   Homewood, Iowa Hill, Kings Beach, Meadow Vista, Newcastle, Olympic Valley, Penryn, Sheridan,
- 10 Tahoe City, Tahoe Vista, and Weimar.
- 11 Public lands in Placer County include those of the California State Parks and the USFS, and various
- county and city parklands and other public facilities. Major public land holdings include Auburn
   State Recreation Area, Folsom Lake State Recreation Area, and Tahoe National Forest.

### 14 Sacramento County

15 Urban development in Sacramento County is primarily clustered around the Sacramento 16 metropolitan area in the northern half of the county and accounts for approximately 26% of the 17 total land area, with the remaining areas composed of agricultural and open space uses. The county 18 has seven incorporated cities: Sacramento, Citrus Heights, Elk Grove, Folsom, Galt, Isleton, and 19 Rancho Cordova. Unincorporated communities include Antelope, Arden-Arcade, Carmichael, Del 20 Paso Heights, Elverta, Fair Oaks, Florin, Foothill Farms, Gold River, Hagginwood, Herald, La Riviera, 21 Laguna, Locke, Natomas, North Highlands, Orangevale, Parkway-South Sacramento, Rancho 22 Murrieta, Rio Linda, Rosemont, Vineyard, Walnut Grove, and Wilton.

23 Public lands in Sacramento County include those of the USFWS and the California State Parks, and 24 various county- and city-owned parklands and other public facilities. Major areas of public open 25 space include Stone Creek National Wildlife Refuge; the Sacramento National Wildlife Refuge 26 complex; Brannan Island State Recreation Area; Folsom Lake State Recreation Area; the 27 Sacramento-San Joaquin Delta's islands and waterways; and the Cosumnes River floodplain. Within 28 the urban area, the American River Parkway stands apart as the dominant open space feature. Other 29 notable planned open spaces in the urban area include Dry Creek Parkway in Rio Linda and the 30 buffer lands around the regional sewage treatment plant.

### 31 Solano County

- 32 Approximately 74% of the land area in Solano County is comprised of agricultural and open space
- uses. The county has seven incorporated cities: Benicia, Dixon, Fairfield, Rio Vista, Suisun City,
   Vacaville, and Vallejo. Additionally, the county has five incorporated communities: Birds Landing,
- 35 Collinsville, Cordelia, Elmira, Green Valley, and Bucktown.
- 36 Public lands in Solano County include those of the USFWS, California Department of Parks, DFW, and
- 37 various county and city parklands and other public facilities. Major areas of public open space
- 38 include the San Pablo Bay National Wildlife Refuge, Grizzly Island Wildlife Area, Benicia State
- 39 Recreation Area, Lake Solano Park, Sandy Beach Park, Rockville Hills Regional Park, Suisun Marsh,
- 40 Mare Island wetlands, and the open waters of San Pablo Bay.

### 1 Sutter County

Sutter County as a whole is generally rural with more than 93% of the County area designated for
agricultural and open space uses. The county contains two incorporated cities—Yuba City and Live
Oak—and several unincorporated rural communities, including Sutter, Robbins, Rio Oso, Nicolaus,
Meridian, and East Nicolaus/Trowbridge.

- 6 Public Lands in Sutter County include those of USFWS and DFW, as well as municipal parklands
- 7 within the jurisdiction of Yuba City and Live Oak. Three major water-related facilities are located on
- 8 the Sutter Bypass and Feather Rivers, including the Sutter National Wildlife Area, which extends
- along the Sutter Bypass from Gilsizer Slough to the Wadsworth Canal; Fremont Weir Wildlife Area,
   located near the confluence of Sutter Bypass and the Sacramento River; and the Nelson Slough Unit
- located near the confluence of Sutter Bypass and the Sacramento River; and the Nelson Slough Unit
   of the Feather River Wildlife Area, located near the confluence of the Feather River and the Sutter
- 12 Bypass. Several municipal parks or recreation areas are also located adjacent to the Feather River,
- 13 including Boyd's Pump, Live Oak Park and Recreation Area, Shanghai Bend, and Yuba City Boat
- 14Ramp and Mosquito Beach within Yuba City.

### 15 Tehama County

Tehama County is largely rural in nature with isolated pockets of population primarily concentrated
 near the incorporated cities, and/or along the major transportation corridors. Agricultural and open
 space uses comprise approximately 98% of the total land area in the county. The county has three
 incorporated cities—Corning, Red Bluff, and Tehama—and 11 unincorporated communities:
 Dairyville, Flournoy, Gerber, Los Molinos, Manton, Mill Creek, Mineral, Paskenta, Paynes Creek,
 Proberta, and Vina.

22 The largest nonjurisdictional land holdings within Tehama County are managed by the USFS, BLM, 23 NPS, U.S. Army Corps of Engineers (Corps), U.S. Bureau of Indian Affairs, and California State Parks. 24 With respect to national parks and forests, major land areas include Mendocino National Forest, 25 Lassen Volcanic National Park, Lassen National Forest, and Shasta-Trinity National Forest. BLM 26 lands lie along the Sacramento River within Tehama County, including Foster Island, Todd Island, 27 Iron Canyon, Bald Hill, Paynes Creek, Perry Rifle, Massacre Flat, Inks Creek, and Jelly's Ferry Area. 28 Other major areas of public open space include Black Butte Lake Recreation Area, Woodson Bridge 29 State Recreation Area, and tribal trust lands near the City of Corning that are associated with the 30 Paskenta Band of Nomlaki Indians.

### 31 Yolo County

Yolo County as a whole is generally rural with more than 92% of the County area designated for
agricultural and open space uses. Four incorporated cities are located in the County: Davis, West
Sacramento, Winters, and Woodland. The total incorporated area of the County accounts for 32,325
acres, which is approximately 5% of county. The unincorporated county consists of 11 towns: Capay,
Guinda, Rumsey, Clarksburg, Dunnigan, Esparto, Knights Landing, Madison, Monument Hills, Yolo,
and Zamora.

- 38 Public lands in Yolo County include those of BLM, U.S. Bureau of Indian Affairs, DFW, and University
- 39 of California-Davis, as well as Yolo County park. Major public land holdings include the Cache Creek
- 40 Natural Area/Camp Haswell Park; Yolo Bypass, Sacramento Bypass, and Fremont Weir Wildlife
- 41 Areas, and various tribal trust lands associated with the Wintun Indian Tribe. Among county parks,

- 1 Elkhorn Regional Park and Boat Launch, which is located adjacent to the Sacramento River and
- 2 north of West Sacramento, comprises the largest regional park in the vicinity of the program area.

### 3 Yuba County

- 4 Approximately 74% of the land area in Yuba County is composed of agricultural and open space
- 5 uses. The county has two incorporated cities: Marysville and Wheatland. Unincorporated
- 6 communities include Arboga, Browns Valley, Brownsville, Camptonville, Challenge, Dobbins, French
- 7 Corral, Hallwood, Hammonton, La Porte, Loma Rica, Olivehurst, Oregon House, Rackerby,
- 8 Renaissance, Smartville, Strawberry Valley, and Woodleaf.
- Public lands in Yuba County include those of the USFS, and Yuba County Water Agency, and various
   county and city parklands and other public facilities. Major areas of public open space include Tahoe
   National Forest, Colling Lake, and New Pullards Par Personalis
- 11 National Forest, Collins Lake, and New Bullards Bar Reservoir.

### 12 13.2.1.2 Agricultural Land Uses

- 13 Fertile soils, a long growing season, and the reliable availability of irrigation water in the
- 14 Sacramento Valley and Delta region provide a favorable combination of conditions that support a
- 15 wide variety of crops. According to county-level statistics obtained by the California Department of
- 16 Food and Agriculture in 2007, rice, nuts, tomato processing, and dairy were the leading commodities
- 17 in terms of the gross value of production in the Sacramento Valley counties (California Department
- 18 of Food and Agriculture 2009).

### 19 Important Farmland

- 20 Potential bank protection sites in the program area are flanked by irrigated and nonirrigated
- 21 farmland intermixed with scattered areas classified as *Other Land* and *Urban* and *Built up Land*
- 22 under the Department of Conservation's Farmland Mapping and Monitoring Program (FMMP).
- 23 Acreages of Important Farmland by county are presented in Table 13-3. Brief descriptions of
- 24 important farmland within each county and in the vicinity of the program area are included below.

25	Table 13-3	Important Farmla	nd Δcreage i	in Program	Area Counties	2006
25	Table 13-3.	πηρυτιαπι Γαππα	illu Acieage i	in Flogram.	Alea Counties,	2000

	Irrigated Farmland			Nonirrig	ated Farmland
County	Prime	Statewide	Unique	Local	Grazing Land
Butte	196,219	21,604	24,235	0	407,678
Colusa	200,182	2,170	123,318	232,921	9,030
Glenn	161,685	87,867	17,469	80,290	229,191
Placer	8,525	5,020	22,792	101,847	28,692
Sacramento	106,667	51,217	15,268	41,961	156,977
Solano	139,536	7,164	11,036	0	202,826
Sutter	165,817	107,194	19,245	0	51,516
Tehama	63,707	17,284	18,085	132,437	1,550,095
Yolo	257,893	16,989	50,197	65,173	150,339
Yuba	41,993	11,019	32,372	0	142,729
Source: California Department of Conservation 2006.					

#### 1 Butte County

- 2 Of the 242,058 acres of Important Farmland inventoried in Butte County in 2006, 196,219 were
- 3 designated Prime Farmland, 21,604 acres were designated Farmland of State Importance, and
- 4 24,235 were designated Unique Farmland (California Department of Conservation 2006). Irrigated
- 5 farmland is concentrated in the western half of the county, including in areas located immediately
- 6 adjacent to potential bank protection sites along the Cherokee Canal and Butte Creek.

### 7 Colusa County

- 8 A total of 558,591 acres of Important Farmland were inventoried in Colusa County in 2006, of which
- 9 200,182 were designated Prime Farmland, 2,170 acres were designated Farmland of State
- 10 Importance, and 123,318 acres were designated Unique Farmland (California Department of
- 11 Conservation 2006). Irrigated farmland is concentrated in the eastern portion of the county,
- including in areas located immediately adjacent to potential bank protection sites along the ColusaDrain and Sacramento River.

### 14 Glenn County

- 15 The total amount of Important Farmland inventoried in Glenn County in 2006 was 347,311 acres, of
- 16 which 161,685 were designated Prime Farmland, 87,867 acres were designated Farmland of State
- 17 Importance, and 17,469 acres were designated Unique Farmland (California Department of
- Conservation 2006). Irrigated farmland is primarily found in the eastern portion of the county,
   including in areas located immediately adjacent to the bank protection sites along the Sacramento
   River.

### 21 Placer County

In 2006, the Department of Conservation inventoried 138,184 acres of Important Farmland in Placer
 County, of which 8,525 acres were designated Prime Farmland, 5,020 acres were designated
 Farmland of State Importance, and 22,792 were designated Unique Farmland (California
 Department of Conservation 2006). Irrigated farmland is concentrated in the western area of the
 county, including in areas located immediately adjacent to potential bank protection sites along Bear
 River, Coon Creek Group Interceptor Unit 6 (East Side Canal), and the Natomas Cross Canal.

### 28 Sacramento County

- A total of 215,113 acres of Important Farmland were inventoried in Sacramento County in 2006, of which 106,667 acres were designated Prime Farmland, 51,217 acres were designated Farmland of State Importance, and 15,268 acres were designated Unique Farmland (California Department of Conservation 2006). Irrigated farmland is concentrated in the northwestern, central, and southwestern portion of the county, including in areas located immediately adjacent to the bank
- 34 protection sites along the Sacramento River and the Delta.

### 35 Solano County

- 36 Important Farmland inventoried in Solano County in 2006 totaled 157,736 acres. Of this, 139,536
- acres were designated Prime Farmland, 7,164 acres were designated Farmland of State Importance,
- and 11,036 acres were designated Unique Farmland (California Department of Conservation 2006).
- 39 Irrigated farmland is concentrated in the northern portion of the county, including in areas located

- 1 immediately adjacent to potential bank protection sites along Putah Creek, Ulatis Creek Bypass,
- 2 Cache Slough, Lindsey Slough, and the Sacramento River north of Rio Vista to the Yolo County line.

### 3 Sutter County

- 4 The total acreage of Important Farmland inventoried in Sutter County in 2006 was 292,256 acres, of
- 5 which 165,817 acres were designated Prime Farmland, 107,194 acres were designated Farmland of
- State Importance, and 19,245 acres were designated Unique Farmland (California Department of
   Conservation 2006). Irrigated farmland is found throughout the county, including in areas located
- 8 immediately adjacent to potential bank protection sites along the Sutter Bypass, Tisdale Bypass,
- 9 Sacramento River, the lower Feather River, and Yuba River.

### 10 Tehama County

- 11 Of the 231,513 acres of Important Farmland inventoried in Tehama County in 2006, 63,707 acres
- 12 were designated Prime Farmland, 17,284 acres were designated Farmland of State Importance, and
- 13 18,085 acres were designated Unique Farmland (California Department of Conservation 2006).
- 14 Important Farmland is concentrated in the central portion of the county, including in areas located
- 15 immediately adjacent to potential bank protection sites along Elder Creek and Deer Creek.

### 16 Yolo County

- 17 In 2006, 390,252 acres of land were designated Important Farmland in Yolo County, of which
- 18 257,893 acres were designated Prime Farmland, 16,989 acres were designated Farmland of State
- 19 Importance, and 50,197 acres were designated Unique Farmland (California Department of
- 20 Conservation 2006). Irrigated farmland is concentrated in the eastern and southeastern portions of
- 21 the county, including in areas located immediately adjacent to potential bank protection sites along
- 22 Yolo Bypass, Willow Slough Bypass, Putah Creek, and the Sacramento River.

### 23 Yuba County

Land in Yuba County designated as Important farmland totaled 85,384 acres in 2006. Of this, 41,993
were designated Prime Farmland, 11,019 acres were designated Farmland of State Importance, and
32,372 acres were designated Unique Farmland (California Department of Conservation 2006).
Irrigated farmland is concentrated in the western portion of the county, including in areas located
immediately adjacent to potential bank protection sites along the Feather River, Honcut Creek, Yuba
river, and Bear River.

### 30 Williamson Act Contracts

31 Potential bank protection sites in the program area are abutted by land enrolled in Williamson Act 32 contracts. Acreages of land enrolled in Williamson Act contracts are presented by county in Table 33 13-4. Under the California Land Conservation Act of 1965, commonly referred to as the Williamson 34 Act, agricultural and open space lands are preserved through contracts with private landowners. By 35 entering into a Williamson Act contract, the landowner foregoes the possibility of converting 36 agricultural land to nonagricultural use for a rolling period of 10 years in return for lower property 37 taxes. Brief descriptions of Williamson Act lands within each county and in the vicinity of the 38 program area are included below.

County	Area (acres)	
Butte	215,882	
Colusa	319,551	
Glenn	416,544	
Placer	42,601	
Sacramento	187,102	
Solano	268,845	
Sutter	63,022	
Tehama	800,003	
Yolo	416,340	
Yuba*	0	
Notes:		

#### Table 13-4. Acreages of Lands Enrolled in Williamson Act Contracts in 2007 by County

\* Yuba County was not enrolled in the Williamson Act Program in 2007. Source: California Department of Conservation 2007.

#### 2

1

### 3 Butte County

The majority of lands enrolled in Williamson Act contracts are found in the western half of the
 county, including a number of prime agricultural lands located immediately adjacent to potential
 bank protection sites along the Cherokee Canal and Butte Creek.

### 7 Colusa County

8 The majority of lands enrolled in Williamson Act contracts are found in the eastern portion of the 9 county, including a number of prime and non-prime agricultural lands and farmland security zone 10 lands located immediately adjacent to potential bank protection sites along the Colusa Drain and 11 Sacramento River.

### 12 Glenn County

13 Prime agricultural lands and farmland security zone lands enrolled in Williamson Act contracts are

- 14 found in the eastern portion of the county, where a number of parcels are located immediately
- 15 adjacent to the bank protection sites along the Sacramento River. Non-prime agricultural lands are
- 16 primarily located in the central portion of the county, well outside of the program area.

### 17 Placer County

- 18 The majority of lands enrolled in Williamson Act contracts are found in the western portion of
- 19 Placer County, including a number of prime and non-prime agricultural lands located immediately
- 20 adjacent to potential bank protection sites along Coon Creek <u>Group Interceptor Unit 6 (East Side</u>
- 21 <u>Canal</u>) and the Natomas Cross Canal. No Williamson contracts are currently in place in the vicinity of
- the Bear Creek setback levee and restoration sites.

#### 23 Sacramento County

Prime agricultural lands enrolled in Williamson Act contracts are found in the southwestern portion
 of the county, where a number of parcels are located immediately adjacent to potential bank

- 1 protection sites along the Sacramento River and the Delta. Non-prime agricultural lands are
- 2 primarily located in the eastern portion of the county, well outside of the program area.

### 3 Solano County

- 4 Prime agricultural lands enrolled in Williamson Act contracts are found in the northern portion of
- 5 the county, where a number of parcels are located immediately adjacent to potential bank
- 6 protection sites along the Sacramento River, Putah Creek, Ulatis Creek Bypass, Cache Slough,
- 7 Lindsey Slough, the Sacramento River, and the Delta. Non-prime agricultural lands are primarily
- 8 located in the southern portion of the county, well outside of the program area.

### 9 Sutter County

- 10 Prime agricultural lands enrolled in Williamson Act contracts are evenly scattered throughout the
- 11 county, including a number of parcels that abut proposed bank protection sites along the Sutter
- 12 Bypass, Tisdale Bypass, Sacramento River, the lower Feather River, and Yuba River. Non-prime
- agricultural lands are primarily located in the northern portion of the county, well outside of the
- 14 program area.

### 15 Tehama County

- 16 The majority of lands enrolled in Williamson Act contracts are found in the central portion of 17 county, including a number of prime agricultural lands located immediately adjacent to potential
- 18 bank protection sites along Elder Creek and Deer Creek.

### 19 Yolo County

- 20 Prime agricultural lands enrolled in Williamson Act contracts are found in the eastern and
- 21 southeastern portions of the county, where a number of parcels are located immediately adjacent to
- 22 potential bank protection sites along Yolo Bypass, Willow Slough Bypass, Putah Creek, and the
- 23 Sacramento River. Non-prime agricultural lands are primarily located in the western portion of the
- 24 county, well outside of the program area.

### 25 Yuba County

- As of 2007, Yuba County was not enrolled in the Williamson Act Program; consequently, there are
- 27 no Williamson Act parcels in the vicinity of program area.

## 28 13.3 Regulatory Setting

- 29 Appendix C, Regulatory Background, describes the federal, state, regional, and local laws,
- 30 regulations, and policies that pertain to land use and agricultural resources within the program area.
- 31 Pertinent laws, regulations, policies, and plans are listed below.
- Federal:
- 33 O National Environmental Policy Act
- 34 Farmland Protection Policy Act
- 35 State:

U.S. Army Corps of Engineers

1	0	California Environmental Quality Act
2	0	California Farmland Mapping and Monitoring Program
3	0	California Land Conservation Act of 1965 (Williamson Act)
4	0	Delta Protection Act of 1992
5	• L	ocal:
6	0	Butte Regional Conservation Plan
7	0	Natomas Basin Habitat Conservation Plan
8	0	Yuba-Sutter Habitat Conservation Plan/Natural Communities Conservation Plan
9	0	Yolo Natural Heritage Program
10	0	Butte County General Plan
11	0	Colusa County General Plan
12	0	Glenn County General Plan
13	0	Placer County General Plan
14	0	American River Parkway Plan
15	0	Sacramento County General Plan
16	0	Solano County General Plan
17	0	Sutter County General Plan
18	0	Tehama County General Plan
19	0	Yolo County General Plan
20	0	Yuba County General Plan

## 21 **13.4 Determination of Effects**

This section describes the methodology used to evaluate the proposed program's effects on land use
 and agriculture. The information used to determine effects on land use and agriculture and any
 applicable laws, regulations, and policies are described in this chapter's Environmental Setting
 section and in Appendix C, Regulatory Background.

This section describes how impacts on land use and agriculture in the program area were evaluated,
and the significance thresholds used to conclude whether an effect would be significant.

### **13.4.1 Assessment Methods**

Effects related to land use were assessed qualitatively based on professional judgment in light of the land uses that occur in the immediate vicinity of the program area. The effects analysis in this chapter focuses on evaluating potential impacts of the proposed program and alternatives on existing land uses and local land use plans. Information on related recreational impacts is presented in Chapter 14. Decreation language related to the concerning of a prior planet land are an indirect result.

33 in Chapter 14, Recreation. Issues related to the conversion of agricultural lands as an indirect result

- of changing patterns of land use in the program area are discussed in Chapter 22, Growth-Inducing
   Effects.
- The significance criteria used to evaluate the effects of the proposed program on land use and
   agricultural resources are generally based on the State CEQA Guidelines Appendix G criteria, with
   the following two notable exceptions.
- The threshold that relates to Williamson Act contracts is not relevant to this analysis because
   Williamson Act contracts are deemed null and void when Williamson Act land is acquired in lieu
   of eminent domain for a public improvement by a public agency (Government Code Section
   51295). Therefore, this effect will not be discussed further in this chapter.
- The proposed program's consistency with local and regional HCPs and NCCPs is not evaluated
   under the threshold that relates to conflicts with applicable land use plans; rather, this issue is
   addressed in Chapter 12, Wildlife, and will not be discussed further in this chapter.

### 13 **13.4.2** Significance Criteria

- For this analysis, an effect pertaining to land use or agricultural resources was considered
  significant if it would result in any of the following environmental effects, which are based on the
  State CEQA Guidelines Appendix G (14 CCR 15000 et seq.).
- 17 Physically divide an established community.
- Conflict with any applicable land use plan, policy, or regulation adopted for the purpose of
   avoiding or mitigating an environmental effect by an agency with jurisdiction over the project.
- Convert prime farmland, unique farmland, or farmland of statewide importance.
- Cause a conflict with existing zoning for agricultural use.
- Involve other changes in the existing environment, which because of their location or nature, could result in conversion of farmland to nonagricultural use.

24 Presently, bank protection measures and flood protection structures are not specifically identified 25 within some of the applicable local zoning ordinances, but they would constitute public facilities, 26 which many local jurisdictions recognize as consistent with all zoning districts. Further, sections 27 65302.9 and 65860.1 of the California Government Code declare that flood protection in the 28 Sacramento River and San Joaquin Rivers drainage areas is a matter of statewide concern, and 29 require each city and county within the Sacramento-San Joaquin Valley to amend its general plan 30 and zoning ordinances to be consistent with the Central Valley Flood Protection Plan and adopt 31 goals, policies, and objectives to reduce the risk of flood damage. General plan amendments must 32 occur within 24 months of July 2, 2013, and zoning ordinance amendments must occur within 12 33 months of general plan amendments. The fourth criterion above regarding whether or not the 34 proposed program would conflict with existing zoning for agricultural use is therefore not discussed 35 further in this analysis.

## **13.5 Effects and Mitigation Measures**

### 2 13.5.1 Alternative 1—No Action

3 Under Alternative 1, regular operation and maintenance (0&M) of the levee system would continue 4 as presently executed by the local maintaining entities (subject to revision of the governing O&M 5 manual), but construction activities associated with the proposed program would not occur. As a 6 result, erosion would continue and the risk of levee failure and possible catastrophic flooding would 7 increase as more erosion sites become critical and repair is limited to emergency response by 8 federal, state, or local flood control agencies that would eventually implement bank protection at 9 various sites along Sacramento River Flood Control Project levees through emergency action. 10 Emergency repairs would likely result in effects on adjacent agricultural lands and other land uses 11 similar to the proposed program.

### 12 **13.5.2** Alternative 2A—Low Maintenance

## Effect LA-1: Physical Division of an Established Community Located Adjacent to the Levee Corridor

A number of rural and urban communities are located in the vicinity of potential bank protection 15 16 sites and throughout the program area. Alternative 2A entails filling the eroded portion of the bank 17 and installing revetment along the levee slope and streambank from the levee's toe to crest. 18 Alternative 2A would be most applicable in areas where there is inadequate space or substantial 19 constraints to acquiring sufficient real estate to construct setback levees or other measures, either 20 landside or waterside. However, construction associated with the proposed program would not be 21 expected to divide an established community because all of the communities in the program area 22 are already subject to existing limitations on growth and community cohesion as a result of being 23 located in the vicinity of a natural watercourse. Consequently, any changes in land use associated 24 with implementation of Alternative 2A would not likely result in physically dividing an established 25 community. No significant effects would occur, and no mitigation is required.

### 26 Effect LA-2: Conflicts with Local Land Use and Agriculture Policies

Alternative 2A is not expected to permanently encroach upon or conflict with adjacent agricultural
 uses, although construction activities could require temporary lane closures or re-routing of traffic,

- which would result in potential short-term effects on farmers and agriculture-related operations.
- 30 However, these effects would be temporary and not considered significant. See Chapter 7,
- 31 Transportation and Navigation, for a detailed discussion of traffic-related effects of construction
- 32 activities, and of Mitigation Measure TN-MM-1: Implement a Traffic Control and Road Maintenance
- 33 Plan.
- 34 Construction of Alternative 2A would potentially result in encroachment on existing recreational
- 35 lands or facilities in the program area, reducing the allowable recreational uses at certain locations.
- 36 While this type of reduction of activities at individual sites may occur, the proposed program would
- 37 at the same time protect adjacent land uses from flooding. The proposed program would also
- maintain the existing planform of the river corridor and access along and to the river. Overall, the
- 39 proposed program is considered to be consistent with applicable local planning policies regarding
- 40 flood protection for local communities and the continued provision of open space corridors along

- 1 the Sacramento River and its tributaries. Therefore, the proposed program is considered consistent
- 2 with the applicable local policies for management and use of program area lands, despite the
- potential reduction in activities at individual sites noted regarding the use of these lands for
   recreation and natural resources. This effect is considered less than significant, and no mitigation is
- 5 required.

### 6 Effect LA-3: Conversion of Important Farmland to Nonagricultural Uses

- Alternative 2A entails installing revetment along the levee slope and streambank from the levee's
  toe to crest, and is not expected to permanently encroach upon or result in the conversion of
  Important Farmlands to nonagricultural uses.
- <sup>3</sup> Important Parimanus to nonagricultural uses.
- 10 Construction associated with the proposed program would require the establishment of
- 11 construction staging areas for equipment laydown, soil stockpiling, and vehicle parking, potentially
- 12 disrupting the use of some adjacent agricultural lands. As described in more detail in Chapter 2,
- 13 Project Description, materials would be brought to individual sites either by barge (waterside
- 14 construction) or via surface roads. Haul routes to those sites requiring landside access would be via
- 15 interstate and U.S. highways, state highways, county and city roads, and levee access roads.
- 16 Construction materials, including quarry stone, would be hauled from a commercial or previously
- 17 permitted quarry or borrow site located within 100 miles of the site. Temporary lane closures and,
- in some instances, full road closures may be required. See Chapter 7, Transportation and Navigation,
   for a detailed discussion of traffic-related effects of construction activities, and of Mitigation
- 20 Measure TN-MM-1: Implement a Traffic Control and Road Maintenance Plan.
- These construction activities would result in short-term effects on farmers and agriculture-related operations on Important Farmlands, such as temporary delays in the movement of agricultural equipment and/or temporary disruption of farming activities as a result of staging areas within sitespecific project areas. However, these effects would be temporary and are not considered significant because they are not expected to cause permanent encroachment upon or conversion of Important Farmlands to nonagricultural uses. The following avoidance and minimization measures will be used during project-level design:
- Design bank protection projects to avoid or minimize the direct conversion of Important
   Farmland to nonagricultural uses.
- Locate borrow sites and construction staging areas on sites that are fallow, that are already developed or disturbed, or that are to be discontinued for use as agricultural land.
- Use existing roads to access construction areas to the extent possible.
- 33 This effect is considered less than significant.

# 3413.5.3Alternative 3A—Maximize Meander Zone35(Environmentally Superior Alternative)

## Effect LA-1: Physical Division of an Established Community Located Adjacent to the Levee Corridor

Effects associated with Alternative 3A would be similar to those described for Alternative 2A, but
 would occur at a greater magnitude because this alternative would involve construction of adjacent
 and setback levees. Improvements under a setback levee would result in the construction of a new

- 1 levee some distance from the existing levee. A widened landside footprint would result, whereby a
- 2 new levee would be constructed on the landward side of the existing levee. Although it cannot be
- 3 known at this time precisely how far landward the footprint would extend for the flood control
- 4 facilities under this alternative, a comparatively greater extent of land would be displaced by these
- 5 improvements than under Alternative 2A. In addition to removing mature woody vegetation within
- the vegetation-free zone (VFZ), the proposed improvements would potentially remove the edges of
   adjacent agricultural parcels from agricultural use in some locations and could also potentially
- adjacent agricultural parcels from agricultural use in some locations and could also potentially
   displace some existing agricultural buildings, residences, roadways, and recreational parklands,
- 4 displace some existing agricultural buildings, residences, roadways, and recreational park
   4 trails, and other appurtenant facilities within the widened flood control facility footprint.
- <sup>3</sup> u ans, and other appurtenant facilities within the widened hood control facility footprint.
- As discussed in Chapter 2, Project Description, the environmental analysis in this EIS/EIR is
   programmatic in nature, analyzing the 80,000 LF in its entirety. Although it cannot be known at this
   time precisely how far landward the footprint would extend for the flood control facilities under this
   alternative, additional project-level environmental documentation, tiering from this programmatic
   analysis, will be conducted to address erosion sites that will be constructed.
- 15 Although of greater magnitude than the effects described under Alternative 2A, the effects
- associated with Alternative 3A would nevertheless be similar. Further, as discussed in Chapter 15,
- 17 Population and Housing, Alternative 3A would not displace a substantial number of people or
- 18 residences. Therefore, construction under Alternative 3A is not expected to result in the physical
- 19 division of a community. The effect would be less than significant.

### 20 Effect LA-2: Conflicts with Local Land Use and Agriculture Policies

- Effects associated with Alternative 3A would be greater in magnitude than those described for
   Alternative 2A, because of a wider landside footprint to accommodate setback levees. However, the
   proposed program is considered to be consistent with the intent of applicable local planning policies
   regarding the continued provision of open space corridors along the Sacramento River and its
   tributaries, and local planning policies aimed at ensuring flood protection for local communities.
- 26 Therefore, this effect is considered less than significant, and no mitigation is required.

### 27 Effect LA-3: Conversion of Important Farmland to Nonagricultural Uses

- 28 This effect under Alternative 3A would be more severe than that described under Alternative 2A 29 because Alternative 3A would affect a greater amount of land than Alternative 2A. Implementation 30 of a setback levee would potentially be greater in magnitude than construction of an adjacent levee 31 because a setback levee would likely affect a wider footprint than an adjacent levee. Implementation 32 of Alternative 3A would potentially result in the conversion of Important Farmland in order to 33 accommodate the setback levee or adjacent levee.
- As discussed in Chapter 2, Project Description, the environmental analysis in this EIS/EIR is programmatic in nature, analyzing the 80,000 LF in its entirety. Although it cannot be known at this time whether this alternative would result in the conversion of Important Farmland to accommodate setback levees, additional project-level environmental documentation, tiering from this programmatic analysis, will be conducted to address erosion sites that will be constructed. Project-level design will consider additional avoidance and minimization measures to be used, including:
- 41 Design bank protection projects to avoid or minimize the direct conversion of Important
   42 Farmland to nonagricultural uses.

- 1 Design bank protection projects to avoid or minimize siting of project features on the highest 2 valued agricultural land, to the greatest extent feasible. 3 • Design project features to avoid fragmenting or isolating important farmland, to the greatest 4 extent feasible. 5 • Locate borrow sites and construction staging areas on sites that are fallow, that are already 6 developed or disturbed, or that are to be discontinued for use as agricultural land. 7 Use existing roads to access construction areas to the extent possible. • 8 The Corps shall also evaluate the environmental significance of potential farmland conversion 9 impacts at the project-level using the California Agricultural Land Evaluation and Site Assessment 10 Model, which was developed by the Department of Conservation's Division of Land Resource 11 Protection to provide lead agencies with a systematic and objective method for evaluating the 12 potential impacts of proposed projects on agricultural resources. Implementation of Alternative 3A 13 could potentially result in the conversion of Important Farmland. This would constitute a significant 14 effect. Mitigation Measure LA-MM-1 would reduce the effect of converting these lands to 15 nonagricultural uses under Alternative 3A. However, even with the incorporation of Mitigation 16 Measure LA-MM-1, the effect would remain significant and unavoidable because conversion of 17 Important Farmland could still occur and may not be fully mitigated. Mitigation Measure LA-MM-1: Evaluate the Potential for Direct Farmland Conversion at 18 19 the Project Level and Avoid, Minimize, and Compensate for Loss of Farmland 20 Compensate for unavoidable Important Farmland conversion impacts by: 21 Protecting productive off-site agricultural land subject to conversion through the purchase • 22 or transfer of its development rights. Agricultural conservation easements shall be acquired 23 at a 1:1 ratio, and the lands on which the easements are acquired shall be maintained in 24 agricultural use. 25 Paying any applicable agricultural land mitigation fees, as required by a local government 26 agency with jurisdiction over the project. 13.5.4 Alternative 4A—Habitat Replacement (Preferred 27 Alternative) 28 29 Effects under Alternative 4A would be similar to those under Alternative 3A, but at a lesser 30 magnitude because the specific bank protection measures proposed under Alternative 4A are 31 primarily located on the water side of the levee, have a much smaller overall footprint, and, as a
- result, affect substantially less land (see Chapter 2, Project Description, Proposed Site-Specific Bank
   Protection Measures). Under Bank Protection Measure 4, constructed benches would be planted
- with riparian vegetation, and revegetation would occur in areas where setback levees and adjacent
   levees are constructed. Further, off-site mitigation has been an acceptable means of mitigation to the
- 36 regulatory resource agencies and mitigation would be provided within the region of impact (e.g.,
- 37 Regions 1a, 1b, 2, or 3).

## Effect LA-1: Physical Division of an Established Community Located Adjacent to the Levee Corridor

- 3 Effects associated with Alternative 4A would be comparable in type and magnitude to those
- 4 described for Alternative 3A. The improvements under Alternative 4A would not result in the
- 5 physical division of a community, and the effect would be less than significant.

### 6 Effect LA-2: Conflicts with Local Land Use and Agriculture Policies

- 7 Under Alternative 4A, this effect would be comparable in type and magnitude to that described for
  8 Alternative 3A, except for the program area that encompasses Colusa County. As described in
- 9 Appendix C, Regulatory Background, the 2011 Colusa County Draft General Plan Agricultural
- 10 Element contains policies specific to the creation and management of habitat on agricultural lands.
- 11 Habitat management cannot be considered a legitimate use of agricultural land in Colusa County and
- 12 requires a general plan amendment to change the land use designation to "Resource Conservation."
- Because off-site mitigation is acceptable under this alternative, there is a potential that
- 14 implementation of some bank protection measures will result in the need for off-site mitigation
- 15 within lands designated for agricultural use. It cannot be known at this time whether this alternative
- would conflict with the Colusa County General Plan or require a general plan amendment. However,
   additional project-level environmental documentation, tiering from this programmatic analysis, will
- be conducted to address any policy issues associated with site-specific erosion sites, including those
   required in Colusa County.
- Following appropriate compliance with relevant policies, which may include a general plan amendment in Colusa County, the improvements under Alternative 4A would not result in substantial conflicts with local land use planning policies, and the effect would be less than significant.

### 24 Effect LA-3: Conversion of Important Farmland to Nonagricultural Uses

- Effects associated with Alternative 4A would be comparable in type to Alternative 3A, because
  implementation of Alternative 4A would include the construction of setback levees. Because this
  alternative applies a combination of site-specific bank protection measures (Bank Protection
  Measures 1–5), setback levees would be applied to fewer sites than under Alternative 3A (which is
  limited to the application of setback and adjacent levees). Consequently, this effect under Alternative
  4A would be lesser in magnitude than Alternative 3A.
- However, implementation of Alternative 4A would still potentially result in the conversion of Important Farmland in order to accommodate the setback levee. As discussed in Chapter 2, Project Description, the environmental analysis in this EIS/EIR is programmatic in nature, analyzing the 80,000 LF in its entirety. Although it cannot be known at this time whether this alternative would result in the conversion of Important Farmland to accommodate setback levees, additional projectlevel environmental documentation, tiering from this programmatic analysis, will be conducted to address erosion sites that will be constructed.
- 38 Implementation of Alternative 4A could potentially result in the conversion of Important Farmland.
- 39 This would constitute a significant effect. Mitigation Measure LA-MM-1 would reduce the effect of
- 40 converting these lands to nonagricultural uses under Alternative 4A. However, even with the
- 41 incorporation of Mitigation Measure LA-MM-1, the effect would remain significant because
- 42 conversion of Important Farmland could still occur.

# **13.5.5** Alternative 5A—Habitat Replacement Reaching Environmental Neutrality

Effects under Alternative 5A would be similar to those under Alternative 3A, because Alternative 5A
 involves a similar set of site-specific bank protection measures, with the exception of adjacent
 levees. Also, fewer setback levees would be constructed under this alternative.

## 6 Effect LA-1: Physical Division of an Established Community Located Adjacent to the Levee 7 Corridor

8 Effects associated with Alternative 5A would be comparable in type and magnitude to those

- 9 described for Alternative 3A. The improvements under Alternative 5A would not result in the 10 physical division of a community, and the effect would be less than significant.
- 11 Effect LA-2: Conflicts with Local Land Use and Agriculture Policies

Effects associated with Alternative 5A would be comparable in type and magnitude to those described for Alternative 4A, which include the need for a general plan amendment if agricultural land is converted to a Resource Conservation designation in order to provide mitigation for natural resource effects. The improvements under Alternative 5A would not result in substantial adverse conflicts with local land use planning policies, and the effect would be less than significant.

### 17 Effect LA-3: Conversion of Important Farmland to Nonagricultural Uses

18 Effects associated with Alternative 5A would be comparable in type to Alternative 3A because

19 implementation of Alternative 5A also includes the application of setback levees (although at fewer

20 sites than under Alternative 3A). However, implementation of Alternative 5A would still potentially

- 21 result in the conversion of Important Farmland in order to accommodate the setback levee. As
- discussed in Chapter 2, Project Description, the environmental analysis in this EIS/EIR is
- programmatic in nature, analyzing the 80,000 LF in its entirety. Although it cannot be known at this
   time whether this alternative would result in the conversion of Important Farmland in to
- 25 accommodate setback levees, additional project-level environmental documentation, tiering from
- this programmatic analysis, will be conducted to address erosion sites that will be constructed.
- 27 Implementation of Alternative 5A could potentially result in the conversion of Important Farmland.
- This would constitute a significant effect. Mitigation Measure LA-MM-1 would reduce the effect of
- 29 converting these lands to nonagricultural uses under Alternative 5A. However, even with the
- incorporation of Mitigation Measure LA-MM-1, the effect would remain significant and unavoidable
   because conversion of Important Farmland could still occur.

# 13.5.6 Alternative 6A—Habitat Replacement with Vegetation ETL Variance

Effects under Alternative 6A would be comparable in type and magnitude as they would be under
 Alternative 4A; however, there would be no application of Bank Protection Measure 2 (bank fill

36 stone protection with no on-site vegetation), or Bank Protection Measure 3 (adjacent levee).

## Effect LA-1: Physical Division of an Established Community Located Adjacent to the Levee Corridor

3 This effect would be the same as under Alternative 4A.

### 4 Effect LA-2: Conflicts with Local Land Use and Agriculture Policies

- 5 This effect would be the same as under Alternative 4A.
- 6 Effect LA-3: Conversion of Important Farmland to Nonagricultural Uses
- 7 This effect would be the same as under Alternative 4A.

## **14.1 Introduction and Summary**

This chapter describes the environmental setting associated with recreation, the determination of
effects, the environmental effects on recreation that would result from implementation of the
proposed program, and the mitigation measures that would reduce these effects.

- 7 The key sources of data and information used in the preparation of this chapter are listed below.
  - American River Parkway Plan, 2008.
- 9 Butte County General Plan, 2010.

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- 10 Colusa County General Plan, 2011.
- 11 Glenn County General Plan, 1993.
- 12 Placer County General Plan, 19942013.
- Sacramento County General Plan, 2011.
- Solano County General Plan, 2008.
- 15 Sutter County General Plan Policy Document, 2011.
- 16 Tehama County General Plan, 2009.
  - Yolo County General Plan, 2009.
- 18 Yuba County General Plan, 2011.
- Table 14-1 summarizes the recreation effects resulting from the implementation of the proposedprogram.
- 21 Table 14-1. Summary of Recreation Effects and Mitigation

Effect	Mitigation Measures	Implementation Period
REC-1: Temporary Disruption of Recreational Opportunities during Construction	REC-MM-1: Notify Recreation Users of Potential Construction Hazards	During construction
REC-2: Long-Term Reduction in Quality of Existing Recreational Opportunities within the Levee Corridor	VEG-MM-1: Compensate for the Loss of Woody Riparian Habitat	Post-construction
REC-3: Temporary Obstruction of Access to Marina or Boat Launch Facilities	REC-MM-3: Preserve Marina and Boat Launch Access	During construction
REC-4: Permanent Loss of Recreational Opportunities	REC-MM-4: Rebuild Affected Formal Park Facilities and Trails	Post-construction
amento River Bank Protection Project	Volume I	March 2020

Effect	Mitigation Measures	Implementation Period
REC-5: Safety Hazards to Recreationists	REC-MM-5: Hazard-Reducing Placement of Instream Woody Material	During design

### **14.2 Environmental Setting**

The Sacramento River, its tributaries, and its adjacent levees are popular recreation venues for local
residents and visitors. While recreation opportunities vary among locations along the river,
recreationists are attracted to in-water recreation as well as off-water recreation on the levees and
facilities surrounding the river. In-water recreation activities include boating, fishing, kayaking,
canoeing, floating, tubing, water skiing, and swimming. Off-water activities include bicycling,
walking, hiking, bird-watching, wildlife viewing, enjoying nature trails, photography, and picnicking.

8 Recreation along the Sacramento River and its tributaries is varied and differs throughout the 9 numerous reaches of the river and its tributaries.

10 Boating is a very common activity along the Sacramento River and many of its tributaries. Motorized

11 boat use, water skiing, use of personal watercraft, and cruising along the river, is especially popular

- 12 in various locations. Kayaking and canoeing are occasionally favored in portions of the program
- 13
   area. The Sacramento River also provides opportunities for sailing and windsurfing at different
- locations along the river. For example, windsurfing on the river from Rio Vista to the tip of Sherman
   Island is a common activity under favorable conditions. Formal and informal facilities support
- Island is a common activity under favorable conditions. Formal and informal facilities support
   windsurfing, providing sales and rental of equipment, physical access to the water, and camping
- 17 sites for windsurfers. Marinas, boat launch facilities and parks are distributed along the Sacramento
- 18 River and its tributaries. The marinas and boat launching facilities range in size and amount of boat
- 19 launching traffic throughout the program area. Parks and other sites adjacent to the Sacramento
- 20 River and its tributaries offer a variety of outdoor recreation activities, both in-water and off-water,
- 21 such as swimming, bank-fishing, observing nature and wildlife, hunting, and picnicking.
- Fishing is another popular recreation activity throughout portions of the entire program area.
  Anglers fish from boats and the shore throughout the reaches of the river.
- There are access points to the Sacramento River and its tributaries through marinas and local and
   state parks throughout the program area; however, many parts of the shoreline are inaccessible or
   not easily accessible to recreationists.

## 27 14.3 Regulatory Setting

Appendix C, Regulatory Background, describes the federal, state, and local laws, regulations, and
 policies that pertain to recreation resources within the program area. Pertinent laws, regulations,
 policies, and plans are listed below.

- Federal:
- 32 O National Environmental Policy Act
- 33 O Wild and Scenic Rivers Protection Act

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1	•	514	
2		0	California Environmental Quality Act
3		0	California Wild and Scenic Rivers Act
4	٠	Lo	cal:
5		0	Butte County General Plan
6		0	Colusa County General Plan
7		0	Glenn County General Plan
8		0	Placer County General Plan
9		0	American River Parkway Plan
10		0	Sacramento County General Plan
11		0	Solano County General Plan
12		0	Sonoma County General Plan
13		0	Tehama County General Plan
14		0	Yolo County General Plan
15		0	Yuba County General Plan

## 16 14.4 Determination of Effects

This section describes the effects analysis relating to recreation for the proposed program. It
 describes the methods used to determine the impacts of the proposed program and lists the
 thresholds used to conclude whether an effect would be significant. Measures to mitigate significant
 effects accompany each discussion.

### 21 **14.4.1 Assessment Methods**

22 Effects on recreation were assessed using the significance criteria outlined below.

### 23 14.4.2 Significance Criteria

The thresholds for determining the significance of effects for this analysis are based on the
 environmental checklist in Appendix G of the State CEQA Guidelines and issues and concerns that
 have been previously encountered in implementing the bank protection program. The proposed
 program was determined to result in a significant effect related to recreation if it would:

- increase the use of existing neighborhood and regional parks or other recreation facilities such that substantial physical deterioration of the facility would occur or be accelerated;
- include recreation facilities or require the construction or expansion of recreation facilities that
   might have an adverse physical effect on the environment;
- restrict the availability or quality of existing recreation opportunities in the program vicinity;

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- implement operational or construction-related activities related to the placement of program 2 facilities that would cause a substantial long-term disruption of any institutionally recognized 3 recreation activities; or
- 4 result in increased risk to recreationists in or adjacent to the program vicinity.

5 The action alternatives do not include the construction of recreation facilities unless required as a 6 form of mitigation. The alternatives would not increase the use of existing recreational facilities, or 7 include the construction or expansion of recreational facilities unless required for mitigation. While 8 construction of recreation facilities has in the past been done under Sacramento River Bank 9 Protection Project authority, there is no nonfederal sponsor to cost-share with the federal 10 government, and current Corps budgetary guidance limits federal participation in the construction 11 of recreation improvements. Therefore, the first and second criteria are not discussed further in this 12 analysis.

14.5 Effects and Mitigation Measures 13

#### 14.5.1 Alternative 1—No Action 14

15 Under Alternative 1, construction activities associated with the proposed program would not occur. 16 While pre-scheduled levee maintenance activities and any required emergency repairs would 17 continue to be conducted, the riverbanks, and associated recreation uses would remain unchanged 18 from their current (baseline) conditions and banks would be subject to ongoing erosion and risk of 19 levee failure. Failure of the levee at an erosion site would result in potentially significant effects on 20 recreation resources and public safety. For example, levee failure could result in restricted 21 availability or quality of existing recreation opportunities if linear trails or recreation facilities are 22 damaged or flooded, Depending on the location of levee failure, a federal or state agency would 23 likely repair the levee, but it would be the responsibility of the appropriate local or state agency to 24 repair or rebuild the recreation facilities.

#### 14.5.2 Alternative 2A—Low Maintenance 25

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### Effect REC-1: Temporary Disruption of Recreational Opportunities during Construction

27 There is a substantial variety of type and intensity of recreation that occurs at sites along the 28 Sacramento River and its tributaries. Some sites are very popular for outdoor recreation, while 29 others have no public access or receive little or no recreation use. Recreation activities along the 30 river and its tributaries occur both in the river and along its banks and levees, including, but not 31 limited to, boating, fishing, swimming, walking, bicycling, and enjoying the waterfront.

- 32 Recreation activities would be disrupted while rock revetment is installed along the levee slope and 33 streambank from the levee to the levee crest. The levee crown and adjacent construction and 34 staging areas likely would be closed to public access at most of the project sites during construction.
- 35 In places where construction occurs close to recreation areas, the areas themselves may not be
- 36 closed but the proximity to construction equipment and activity may degrade recreation
- 37 experiences.

- During construction on the bank slope, shoreline fishing would be prohibited at specific
   construction sites to avoid hazards to the public.
- The levee crown may be closed during construction. At some project sites where there is a bike trail on the levee crown or adjacent to the levee, bicyclists and pedestrians who use the trail would be affected. However, areas just upstream and downstream of specific project sites likely would remain open for recreational uses.
- 7 The installation of rock along the bank may require that construction take place from the waterside
- 8 of the levee. This activity could temporarily disrupt boating and personal watercraft activities along 9 the Sacramento River and its tributaries. Temporary disruption to recreational boating would result
- the Sacramento River and its tributaries. Temporary disruption to recreational boating would result
   from the presence of construction barges and associated equipment, vehicles, and personnel in and
- 11 adjacent to the river.
- 12 Construction at each site generally would take one season to complete. In many cases, there are
- 13 alternative locations for recreational activity relatively close to the construction sites. However, this
- 14 effect is considered significant. Implementation of Mitigation Measures REC-MM-1 and REC-MM-2
- 15 would reduce this effect to a less-than-significant level.
- 16 Mitigation Measure REC-MM-1: Notify Recreation Users of Potential Construction Hazards
- 17To reduce potential construction hazards, signage and/or buoys will be provided at each of the18erosion sites to warn of the potential hazards during construction. Construction personnel will19warn the public (e.g., boaters, recreationists) to stay away if they approach within 100 feet of20construction equipment (e.g., barges, cranes).
- 21 Mitigation Measure REC-MM-2: Provide Alternate Recreation Routes
- Where construction zones encompass recognized recreational trails, alternate routes and
   detours will be provided. Signage will be placed around the construction areas to identify the
   closed areas and alternate routes.

## Effect REC-2: Long-Term Reduction in Quality of Existing Recreational Opportunities within the Levee Corridor

- The bank improvements proposed for Alternative 2A would follow the Engineering Technical Letter 1110-2-583, Guidelines for Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and Appurtenant Structures (Vegetation ETL). The Vegetation ETL does not allow woody vegetation on the slopes of the levee or within 15 feet of the waterside and landside levee toes. This would require the removal of a substantial amount of mature trees and vegetation from the banks of the Sacramento River and its tributaries within certain portions of the erosion site construction footprints.
- The placement of riprap along the bank of project sites would reduce the natural qualities of these sites. The reconstructed banks would be less appealing to some users for bank fishing, swimming, picnicking, and other riverbank recreation. However, the riprap sections might become more
- 37 appealing to others.
- 38 Many recreation activities are enhanced by or depend on the presence of mature woody vegetation.
- 39 Recreationists, such as anglers, pedestrians, cyclists, boaters, and swimmers, use woody vegetation
- 40 for shade, while wildlife and nature viewers enjoy the various wildlife and aesthetic values that this

- vegetation supports and for the visual characteristics it contributes to the landscape. Permanent loss
   of woody vegetation on and within 15 feet of levees along the Sacramento River and its tributaries
   would substantially reduce the quality of existing recreation activities and is therefore considered a
   significant effect. At construction sites where feasible, implementation of Mitigation Measure VEG MM-1: Compensate for the Loss of Woody Riparian Habitat (described in Chapter 10, Vegetation and
   Wetlands), would reduce but may not fully compensate for effects. At construction sites where this
- 7 mitigation measure is not feasible, the effect would remain significant and unavoidable.

# 8 14.5.3 Alternative 3A—Maximize Meander Zone 9 (Environmentally Superior Alternative)

Effects REC-1 and REC-2, described above under Alternative 2A, would apply to Alternative 3A.
 Mitigation measures for these effects are REC-MM-1, REC-MM-2, and VEG-MM-1, also described
 above. However, under Alternative 3A the creation of additional floodplain to support riparian
 habitat and the potential to restore woody vegetation on the landside of adjacent levees would offset
 the loss of woody riparian vegetation to a greater degree than in Alternative 2A because some level
 of mitigation would occur on site.

### 16 Effect REC-3: Temporary Obstruction of Access to Marina or Boat Launch Facilities

17During the construction of a setback levee or adjacent levee, access to boat ramps may be affected18because levee roads could be closed temporarily by construction activities. Closing of boat ramps if19safe access cannot be provided would reduce recreational boating opportunities and could reduce20revenue for marina operations. This effect is considered significant. Implementation of Mitigation21Measure Rec-MM-3 would reduce this effect to a less-than-significant level.

- 22 Mitigation Measure REC-MM-3: Preserve Marina and Boat Launch Access
- The Corps and CVFPB will work with the owners and operators of marinas and boat launches to
   ensure that access is maintained to marinas and boat launch facilities during project
   construction.

### 26 Effect REC-4: Permanent Loss of Recreational Opportunities

27 Setback and adjacent levee construction would involve the placement of a new levee some distance 28 landward of, or adjacent to, the existing levee. For setback levees, the land between the setback 29 levee and the old levee would act as a floodplain. While the construction of a setback levee may 30 create new recreation opportunities at some program locations, it could also cause some recreation 31 areas to be closed entirely. The location of the setback levee may lead to occasional inundation of the 32 area during a high flow event, thus reducing the opportunity for recreation activities. In addition, the 33 construction of an adjacent levee could occur in a recreation area and cause it to be closed.

- 34 Any parks or trails that sit adjacent to the existing levee or within the footprint of the setback levee
- could be affected, and portions of the park, park's facilities, or trails may have to be removed. This
- 36 effect is considered significant. Implementation of Mitigation Measure REC-MM-4 would reduce this
- 37 effect to a less-than-significant level.

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**Mitigation Measure REC-MM-4: Rebuild Affected Formal Park Facilities and Trails** The Corps and CVFPB will ensure that formal park facilities, such as fields or trails, that are affected by construction of a setback levee or adjacent levee are rebuilt upon completion of levee construction. With the implementation of this mitigation measure, there would be no permanent loss of recreation opportunities.

# 6 14.5.4 Alternative 4A—Habitat Replacement (Preferred 7 Alternative)

### 8 Effect REC-1: Temporary Disruption of Recreational Opportunities during Construction

9 This effect would be the same as under Alternative 2A. Implementation of Mitigation Measures REC 10 MM-1 and REC-MM-2 would reduce this effect to a less-than-significant level.

## Effect REC-2: Long-Term Reduction in Quality of Existing Recreational Opportunities within the Levee Corridor

13 This effect would be the same as under Alternative 2A. However, in areas where setback levees are

14 constructed, the creation of additional floodplain to support riparian habitat and the potential to

restore woody vegetation on the landside of adjacent levees would offset the loss of woody riparian vegetation to a greater degree than in Alternative 2A because some level of mitigation would occur

17 on site. At construction sites where feasible, implementation of Mitigation Measure VEG-MM-1:

18 Compensate for the Loss of Woody Riparian Habitat, would reduce the effect but may not fully

compensate for effects. At construction sites where this mitigation measure is not feasible, the effect
 would remain significant and unavoidable.

### 21 Effect REC-3: Temporary Obstruction of Access to Marina or Boat Launch Facilities

22 This effect would be the same as under Alternative 3A, but at a potentially lesser magnitude because

23 fewer setback levees and adjacent levees would be constructed under Alternative 4A.

Implementation of Mitigation Measure Rec-MM-3 would reduce this effect to a less-than-significantlevel.

### 26 Effect REC-4: Permanent Loss of Recreational Opportunities

- 27 This effect would be the same as under Alternative 3A, but at a potentially lesser magnitude because
- 28 fewer setback levees and adjacent levees would be constructed under Alternative 4A.
- 29Implementation of Mitigation Measure REC-MM-4 would reduce this effect to a less-than-significant
- 30 level.

### 31 Effect REC-5: Safety Hazards to Recreationists

- 32 There are typical river hazards along the Sacramento River and its tributaries that recreationists
- 33 face when they participate in in-water or off-water activities. The hazards include ledge and/or hole
- 34 hydraulics, sweepers and strainers (downed tree snags), vertical riverbanks, and foot entrapment in
- 35 riprap. The hazards vary by site along the river and its tributaries.
- Foot entrapment is a potential hazard for swimmers, waders, anglers, and other recreationists along
   the bank protection sites. Foot entrapment would be avoided by the use of relatively uniform

U.S. Army Corps of Engineers

- 1 gradation in rock sizes, including a full range of small, medium, and large rocks that would preclude 2 the presence of large voids.
- 3 Instream woody material (IWM) would be incorporated at project sites to ensure that fish habitat is 4 of the highest quality possible. IWM would be anchored to the levee bank so that it lies within the 5 flowing channel without floating downstream. IWM acts as fish habitat for sensitive species that use 6 the Sacramento River and its tributaries. There is evidence, however, that the placement of this type 7 of material and even the natural existence of it may pose a threat to recreationists, especially 8 swimmers, boaters, and canoeists (Jones & Stokes 1999). Hazards are most likely to result when the 9 IWM is beneath the water but fairly shallow (Jones & Stokes 1999). Hazards resulting from IWM 10 include minor to serious injury and possibly death, damage to boat motors and propellers, and 11 damage to rafts, canoes, and other small watercraft. This effect would be significant. Implementation
- of Mitigation Measure REC-MM-5 would reduce this effect to a less-than-significant level. 12
- 13

### Mitigation Measure REC-MM-5: Hazard-Reducing Placement of Instream Woody Material

- 14 The placement of IWM is directly related to its hazard potential. The incorporation of the 15 following design factors would avoid and/or minimize risks to recreationists.
- 16 Visibility of IWM will be ensured and IWM design will incorporate the use of natural indicators, 17 such as a partially emergent portion of IWM, or vegetation on the low berm, to act as a visual 18 warning of the presence of shallowly submerged hardscape. This would ensure visual warning 19 so that boaters, swimmers, and other recreationists would have adequate time to avoid the IWM 20 and possibly injury or damage to property. Alternatively, the materials would be placed at least 21 2 feet below the normal summer flow to reduce the hazard to power boaters and paddlers.
- 22 IWM will be placed facing downstream (or rootwads would be used), thus reducing the risk to 23 recreationists flowing with the river current, especially swimmers and canoeists.

#### 14.5.5 Alternative 5A—Habitat Replacement Reaching 24 **Environmental Neutrality** 25

#### 26 Effect REC-1: Temporary Disruption of Recreational Opportunities during Construction

27 This effect would be the same as under Alternative 2A. Implementation of Mitigation Measures REC-28 MM-1 and REC-MM-2 would reduce this effect to a less-than-significant level.

#### 29 Effect REC-2: Long-Term Reduction in Quality of Existing Recreational Opportunities within 30 the Levee Corridor

31 This effect would be the same as under Alternative 2A. However, in areas where setback levees are 32 constructed, the creation of additional floodplain to support riparian habitat and the potential to 33 restore woody vegetation on the landside of adjacent levees would offset the loss of woody riparian 34 vegetation to a greater degree than under Alternative 2A because some level of mitigation would 35 occur on site. At construction sites where feasible, implementation of Mitigation Measure VEG-MM-1: Compensate for the Loss of Woody Riparian Habitat, would reduce this effect but may not fully 36 37 compensate for effects. At construction sites where this mitigation measure is not feasible, the effect 38 would remain significant and unavoidable.

### 1 Effect REC-3: Temporary Obstruction of Access to Marina or Boat Launch Facilities

- This effect would be the same as under Alternative 3A, but at a potentially lesser magnitude because
   fewer setback levees and adjacent levees would be constructed under Alternative 5A.
- 4 Implementation of Mitigation Measure Rec-MM-3 would reduce this effect to a less-than-significant 5 level.

### 6 Effect REC-4: Permanent Loss of Recreational Opportunities

- 7 This effect would be the same as under Alternative 3A, but at a potentially lesser magnitude because
- 8 fewer setback levees and adjacent levees would be constructed under Alternative 5A.
- 9 Implementation of Mitigation Measure REC-MM-4 would reduce this effect to a less-than-significant
   10 level.

### 11 Effect REC-5: Safety Hazards to Recreationists

- 12 This effect would be the same as under Alternative 4A. Implementation of Mitigation Measure REC-
- 13 MM-5 would reduce this effect to a less-than-significant level.

# 14.5.6 Alternative 6A—Habitat Replacement with Vegetation ETL Variance

- 16 Effects associated with Alternative 6A would be comparable in type and magnitude to those
- 17 described above for Alternative 4A, except that effect REC-2 would be of a lesser magnitude because
- 18 a number of the bank protection measures involved in Alternative 6A include protection of existing
- 19 vegetation and placement of on-site mitigation vegetation within the vegetation-free zone. Effects
- 20 REC-1 through REC-5 would apply to this alternative, as would Mitigation Measures REC-MM-1
- 21 through REC-MM-5, and VEG-MM-1.

## **3 15.1 Introduction and Summary**

This chapter describes the environmental setting associated with population and housing, the
determination of effects, the environmental effects on population and housing that would result
from implementation of the proposed action, and the mitigation measures that would reduce these
effects.

### 8 The key sources of data and information used in the preparation of this chapter are listed below.

- 9 Program area county general plans and corresponding housing elements.
- 10 U.S. Census Bureau QuickFacts (2012).

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Table 15-1 summarizes the population and housing effects resulting from the implementation of theproposed program.

### 13 Table 15-1. Summary of Population and Housing Effects

Effect	Mitigation	Implementation Period
POP-1: Displace a Substantial Number of Existing Housing Units or a Substantial Number of People, Necessitating Construction of Replacement Housing Elsewhere	None required	Not applicable

## 14 **15.2 Environmental Setting**

### 15 **15.2.1 Existing Conditions**

### 16 **15.2.1.1 Regional**

17 The metropolitan area of Sacramento serves as the program area's urban core and is connected to 18 smaller cities, such as Chico, Yuba City, West Sacramento, Davis, and Elk Grove, by major roadways 19 in the region. While much of the program area is still in agricultural production, there has been and 20 continues to be a conversion of agricultural land to urban and suburban land uses. This trend is 21 evident around the outskirts of Chico, Yuba City, Davis, Sacramento, West Sacramento, and Elk 22 Grove. Many of the small, agrarian communities in this region, such as Live Oak, Colusa, Woodland, 23 and Rio Vista, are experiencing similar growth.

### 24 **15.2.1.2 Program Area**

As described in Chapter 2, Project Description, the program area spans the counties of Butte, Colusa,
 Glenn, Placer, Sacramento, Solano, Sutter, Tehama, Yolo, and Yuba. The counties vary in density, and

1generally range from rural in Regions 1a, 2, and 3 (i.e., Delta area, agricultural and open space area),2to suburban/urban in Region 1b (i.e., cities of Sacramento and West Sacramento). Suburban3communities are located throughout all of the regions. In addition to public and private docks,4businesses, and campgrounds, homes are interspersed among woodland on the waterside of5program levees. The population in 2010 by county within the program area is presented in Table615-2.

7

### Table 15-2. Populations by County for 2010

Butte Colusa Glenn Placer Sacramento Solano Sutter Tehama Yolo Yuba 220.000 21.419 28.122 348,432 1.418.788 413,344 94.737 63,463 200,849 72.155 Source: U.S. Census Bureau 2012

## 8 **15.3 Regulatory Setting**

9 Appendix C, Regulatory Background, describes the federal, state, and local laws, regulations, and 10 policies that pertain to population and housing issues within the program area. Pertinent laws, regulations, policies, and plans are listed below. 11 12 Federal: 13 National Environmental Policy Act 0 14 0 Uniform Relocation Assistance and Real Property Acquisition Policies Act 15 State: • 16 0 California Environmental Quality Act 17 California Relocation Act Ο 18 **Relocation Assistance and Real Property Acquisition Guidelines** Ο 19 Local: 20 0 **Butte County General Plan** 21 Colusa County General Plan 0 22 **Glenn County General Plan** 0 23 Placer County General Plan 0 24 0 Sacramento County General Plan 25 Solano County General Plan 0 26 Sutter County General Plan 0 27 Tehama County General Plan 0 28 0 Yolo County General Plan 29 • Yuba County General Plan

## **1 15.4 Determination of Effects**

### 2 15.4.1 Assessment Methods

- 3 Potential effects on population and housing are based on the potential for construction,
- 4 maintenance, and monitoring activities associated with the proposed program, which would take
- 5 place incrementally over several years, to affect the population and housing resources in the
- 6 program area.

### 7 15.4.2 Significance Criteria

- For this analysis, an effect pertaining to population and housing was considered significant under
   NEPA and significant under CEQA if it would result in either of the following environmental effects:
- Induce population growth in an area, either directly (e.g., by proposing new homes and businesses) or indirectly (e.g., through extension of roads or other infrastructure).
- Displace substantial numbers of people, necessitating the construction of replacement housing
   elsewhere.

The significance criteria were developed based on professional practice and State CEQA Guidelines
 Appendix G. Growth-inducing effects of the proposed program are addressed in Chapter 22, and,
 therefore, are not discussed further in this chapter.

## 17 **15.5 Effects and Mitigation Measures**

### 18 **15.5.1 Alternative 1—No Action**

19 Under Alternative 1, regular operation and maintenance (0&M) of the levee system would continue 20 as presently executed by the local maintaining entities (subject to revision of the governing O&M 21 manual), but construction activities associated with the proposed program would not occur. As a 22 result, erosion would continue and the risk of levee failure and possible catastrophic flooding would 23 increase as more erosion sites become critical and repair is limited to emergency response. Under 24 Alternative 1, increased risk of levee failure and flooding would threaten a large population and 25 substantial improvements in the program area and possibly displace people and residences. 26 Although no construction associated with the proposed program would occur, current policy is to 27 protect eroding sites during emergencies. This policy may result in construction associated with 28 emergency actions. However, this alternative would not result in any construction associated with 29 the proposed program. The effects of Alternative 1 on population and housing would be less than 30 significant.

### **1 15.5.2 Alternative 2A—Low Maintenance**

## Effect POP-1: Displace a Substantial Number of Existing Housing Units or a Substantial Number of People, Necessitating Construction of Replacement Housing Elsewhere

4 Under Alternative 2A, structures (i.e., residences, outbuildings, agriculture-related structures) may 5 need to be relocated to implement bank protection if such structures are located on or adjacent to 6 erosion repair sites. It would be infeasible however to predict the number of structures, homes, or 7 people affected under Alternative 2A because the footprints of most of these projects are not known 8 yet. However, based on analysis of the 106 representative sites, it is not anticipated that Alternative 9 2A would require construction of new housing to provide relocation of residences or to 10 accommodate workers, and would not involve the displacement of a substantial number of people 11 or residences. A site specific analysis will be undertaken during subsequent project level

- 11 or residences. A site-specific analysis will be undertaken during subsequent project-level
- environmental documentation. The environmental effects associated with relocation/demolition of
   structures are addressed in Chapter 18, Public Health and Environmental Hazards.
- Bank protection would provide a benefit to existing populations, homes, businesses, and other
   improvements by increasing the level of flood protection in the program area. Without the
   implementation of proposed bank protection measures at critical erosion sites, increased risk of
   levee failure and flooding would threaten a large population and substantial improvements in the
- 18 program area, and possibly displace people and residences.
- Any potential relocation of residents would be conducted in compliance with the federal Uniform Relocation Assistance and Real Property Acquisition Policies Act, the California Relocation Act, and the Relocation Assistance and Real Property Acquisition Guidelines. Pursuant to these federal and state relocation laws, appropriate compensation would be provided to displaced landowners and tenants, and residents would be relocated to comparable replacement housing. This effect would be less than significant under Alternative 2A.

# 15.5.3 Alternative 3A—Maximize Meander Zone (Environmentally Superior Alternative)

## Effect POP-1: Displace a Substantial Number of Existing Housing Units or a Substantial Number of People, Necessitating Construction of Replacement Housing Elsewhere

The effects of Alternative 3A on population and housing would be similar to those described under
 Alternative 2A, but possibly to a greater magnitude because the setback and adjacent levees would
 require an expanded footprint that could displace a greater number of residences.

- As discussed in more detail in Chapter 13, Land Use and Agriculture, the proportion of different land
   uses varies by counties within the program area. The majority of the program area consists of
   undeveloped agricultural fields and grassland. Large-scale urban development is concentrated in a
   few centralized locations (i.e., the City of Sacramento and the City of West Sacramento).
- 36 Although it is not known at this time precisely how far landward the footprint would extend for the
- 37 flood control facilities under this alternative, a comparatively greater extent of land would be
- displaced by these improvements than would be displaced under Alternative 2A. As a result, the
- 39 proposed improvements under Alternative 3A would potentially displace some existing homes and
- 40 people within the widened footprint. It would be infeasible however to predict the number of

structures, homes, or people affected under Alternative 3A because the footprints of most of these
 projects are not known yet. However, based on analysis of the 106 representative sites, it is not
 anticipated that Alternative 3A would require construction of new housing to provide relocation of
 residences or to accommodate workers, and would not involve the displacement of a substantial
 number of people or residences. A site-specific analysis will be undertaken during subsequent
 project-level environmental documentation.

Any potential relocation of residents would be conducted in compliance with the federal Uniform
Relocation Assistance and Real Property Acquisition Policies Act, the California Relocation Act, and
the Relocation Assistance and Real Property Acquisition Guidelines. Pursuant to these federal and
state relocation laws, appropriate compensation would be provided to displaced landowners and
tenants, and residents would be relocated to comparable replacement housing. This effect would be
less than significant under Alternative 3A.

# 13 15.5.4 Alternative 4A—Habitat Replacement (Preferred Alternative)

## 15Effect POP-1: Displace a Substantial Number of Existing Housing Units or a Substantial16Number of People, Necessitating Construction of Replacement Housing Elsewhere

17 The effects of Alternative 4A on population and housing would be similar to those described under 18 Alternative 2A. It would be infeasible to predict the number of structures, homes, or people affected 19 under this alternative because the footprints of most of these projects are not yet known. However, 20 based on analysis of the 106 representative sites, it is not anticipated that Alternative 4A would 21 require construction of new housing to provide relocation of residences or to accommodate 22 workers, and would not involve the displacement of a substantial number of people or residences. A 23 site-specific analysis will be undertaken during subsequent project-level environmental 24 documentation. Any potential relocation of residents would be conducted in compliance with the 25 federal Uniform Relocation Assistance and Real Property Acquisition Policies Act, the California 26 Relocation Act, and the Relocation Assistance and Real Property Acquisition Guidelines. Pursuant to 27 these federal and state relocation laws, appropriate compensation would be provided to displaced 28 landowners and tenants, and residents would be relocated to comparable replacement housing. This 29 effect would be less than significant under Alternative 4A.

# 30 15.5.5 Alternative 5A—Habitat Replacement Reaching 31 Environmental Neutrality

## Effect POP-1: Displace a Substantial Number of Existing Housing Units or a Substantial Number of People, Necessitating Construction of Replacement Housing Elsewhere

The effects of Alternative 5A on population and housing would be similar to those described under Alternative 2A. It would be infeasible to predict the number of structures, homes, or people affected under this alternative because the footprints of most of these projects are not yet known. However, based on analysis of the 106 representative sites, it is not anticipated that Alternative 5A would require construction of new housing to provide relocation of residences or to accommodate workers, and would not involve the displacement of a substantial number of people or residences. A

40 site-specific analysis will be undertaken during subsequent project-level environmental

- 1 documentation. Any potential relocation of residents would be conducted in compliance with the
- 2 federal Uniform Relocation Assistance and Real Property Acquisition Policies Act, the California
- 3 Relocation Act, and the Relocation Assistance and Real Property Acquisition Guidelines. Pursuant to
- 4 these federal and state relocation laws, appropriate compensation would be provided to displaced
- 5 landowners and tenants, and residents would be relocated to comparable replacement housing. This
- 6 effect would be less than significant under Alternative 5A.

# 15.5.6 Alternative 6A—Habitat Replacement with Vegetation ETL 8 Variance

## 9 Effect POP-1: Displace a Substantial Number of Existing Housing Units or a Substantial 10 Number of People, Necessitating Construction of Replacement Housing Elsewhere

11 The effects of Alternative 6A on population and housing would be similar to those described under 12 Alternative 2A. It would be infeasible to predict the number of structures, homes, or people affected 13 under this alternative because the footprints of most of these projects are not yet known. However, 14 based on analysis of the 106 representative sites, it is not anticipated that Alternative 6A would 15 require construction of new housing to provide relocation of residences or to accommodate 16 workers, and would not involve the displacement of a substantial number of people or residences. A 17 site-specific analysis will be undertaken during subsequent project-level environmental 18 documentation. Any potential relocation of residents would be conducted in compliance with the 19 federal Uniform Relocation Assistance and Real Property Acquisition Policies Act, the California 20 Relocation Act, and the Relocation Assistance and Real Property Acquisition Guidelines. Pursuant to 21 these federal and state relocation laws, appropriate compensation would be provided to displaced 22 landowners and tenants, and residents would be relocated to comparable replacement housing. This 23 effect would be less than significant under Alternative 6A.
## **3 16.1 Introduction and Summary**

This chapter describes the environmental setting associated with public services and utilities, the
determination of effects, the environmental effects on public services and utilities that would result
from implementation of the proposed program, and the mitigation measures that would reduce
these effects.

- 8 The key sources of data and information used in the preparation of this chapter are program area 9 county general plans and related documents.
- 10 Table 16-1 summarizes the utilities and public services effects resulting from the implementation of
- 11 the proposed program.

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Effect	Mitigation	Implementation Period
PUB-1: Potential Damage of Utility Infrastructure and Disruption of Service during Construction	PUB-MM-1: Verify Utility Locations, Coordinate with Utility Providers, Prepare and Implement a Response Plan, and Conduct Worker Training	Prior to construction
PUB-2: Potential Disruption to Irrigation Water Supply	PUB-MM-2: Coordinate with Irrigation Water Users Before and During Infrastructure Modifications and Minimize Disruptions to Supply	Prior to and during construction

### 12 Table 16-1. Summary of Utilities and Public Services Effects and Mitigation

## 13 16.2 Environmental Setting

### 14 **16.2.1 Existing Conditions**

Existing utility infrastructure, including underground natural gas pipelines, underground and overhead electrical distribution lines, aerial and underground telephone lines, and underground cable television lines, could be located near or at the individual bank repair sites. Water supply and drainage facilities and infrastructure at the individual sites could consist of storm drain outfalls, sanitary sewer lines, water pipelines, water intake structures, drainage laterals and ditches, wells, irrigation lines, and other facilities.

### 1 **16.2.1.1** Water Supply and Drainage

### 2 Butte County

3 The primary source of water in Butte County is surface water, which meets 69% of the county's

- 4 water needs. Groundwater accounts for approximately 31% of the county's needs. The majority of
- 5 the county's water supply is stored in Lake Oroville as part of the State Water Project, and local
- 6 irrigation districts' surface water rights are provided through the California water rights priority
- 7 system. The Butte County Department of Water and Resource Conservation monitors groundwater
- 8 quality, and the Butte Basin Water Users Association addresses planning and management of both
- 9 groundwater and surface water resources (Butte County 2010a).

### 10 Colusa County

11 All domestic water systems in Colusa County are supplied with groundwater, and most irrigation

- 12 systems are supplied with surface water from the Tehama-Colusa or Glenn-Colusa Canals, the Colusa
- 13 Drain, or the Sacramento River. Community water systems are located in Arbuckle, Maxwell,
- 14 Princeton, Grimes, Stonyford, and the Cities of Colusa and Williams. Numerous private groundwater
- 15 wells are located throughout unincorporated areas of the county (Colusa County 2010).

### 16 Glenn County

17 Three community services districts supply domestic water in Glenn County: Elk Creek Community

- 18 Services District, which serves 130 customers with water from Stony Gorge Reservoir; Butte City
- 19 Community Services District, which serves 39 customers; and Artois Community Services District,
- 20 which serves 52 customers (Glenn County 1993).

### 21 Placer County

The Placer County Water Agency (PCWA) operates eight individual treated water systems. These
water systems include Alta, Applegate, Bianchi, Auburn/Bowman, Colfax, Foothill-Sunset, Martis
Valley, and Monte Vista. Six of the water systems are supplied through water treatment plants that
treat surface water supplied via the PCWA canal system (Placer County Water Agency 2009).

### 26 Sacramento County

Sacramento County Water Agency (SCWA) Zone 41 serves as the retail water service provider to
eight separate service areas in unincorporated Sacramento County as well as the cities of Elk Grove
and Rancho Cordova. SCWA also provides wholesale water supply to much of the Elk Grove Water
Service retail service area (Sacramento County 2009).

### 31 Solano County

- 32 The Solano County Water Agency (provides untreated water to water service agencies in Solano
- 33 County from the federal Solano Project and the North Bay Aqueduct of the State Water Project. The
- 34 Solano County Water Agency provides water for municipal, industrial, and agricultural uses in
- Fairfield; Suisun City; Vacaville; Vallejo; Benicia; the Solano Irrigation District and Maine Prairie
- 36 Water District service areas; the University of California, Davis; and the California State Prison in
- 37 Solano County (Solano County 2008).

### 1 Sutter County

- 2 Sutter County's potable water is provided by groundwater and surface water. Yuba City is the only
- 3 user of surface water for potable waters supplies in the county, although Yuba City also uses
- 4 groundwater. Several other community water systems use groundwater, including: the Community
- 5 of Robbins, Community of Sutter, and the Rio Ramaza Subdivision. There are many other small
- 6 systems in the unincorporated areas of the county that serve only a few homes, and many homes in
- the county obtain water from their own wells. Yuba City diverts water from the Feather River
  throughout the year using four water rights permits, which currently meet the city's demands
- 8 throughout the year using four water rights permits, which currently meet the city s
- 9 (Sutter County 2008).

### 10 **Tehama County**

11 The cities of Corning and Red Bluff each operate domestic water distribution systems that serve the 12 residents of these communities. The remainder of the county is served by small community water 13 systems and individual wells (Tehama County 2009).

### 14 Yolo County

The cities of Davis, West Sacramento, Winters, and Woodland; the unincorporated communities of
Esparto, Knights Landing, Madison, and Yolo; and the North Davis Meadows and Wild Wings
developments are served by public water systems. The El Macero, Willowbank, and Royal Oaks
Mobile Home Park developments are connected to the City of Davis municipal water system (Yolo
County 2009).

### 20 Yuba County

- 21 The following districts provide domestic, commercial, and/or irrigation water in Yuba County.
- Brophy Water District.
- Browns Valley Irrigation District.
- Camp Far West Irrigation District.
- 25 Cordua Irrigation District.
- Linda County Water District.
- Ramirez Water District.
- South Yuba Water District.
- Nevada Irrigation District.
- 30 Wheatland Water District.
- Yuba County Water Agency.
- 32 Yuba County Water District.
- Hallwood Irrigation District.
- South Sutter Water District.
- Olivehurst Public Utility District.
- **6** Camptonville Community Service District

- 1 In addition, other entities that provide water to users in Yuba County include the city of Wheatland
- 2 and Beale Air Force Base, as well as several water companies, including California Water Service
- 3 Company, which provides water to the City of Marysville, Dry Creek Mutual Water Company, Plumas
- 4 Mutual Water Company, and Hallwood Irrigation Company. In many rural areas, water is also
- supplied from private wells. There are also some public utility corporations regulated by the
   California Public Utilities Commission that supply water to portions of the county (Yuba County)
- 7 2009).

### 8 **16.2.1.2** Wastewater

### 9 Butte

Wastewater services are provided by a combination of public sewer systems and individual on-site
 septic systems. Five municipal wastewater treatment systems exist within Butte County, located in
 Biggs, Chico, Gridley, Richvale Sanitary District and the Oroville region (Butte County 2010b).

### 13 Colusa County

- 14 There are five communities in Colusa County that are served by centralized wastewater disposal
- 15 systems: Arbuckle, Maxwell, Princeton, and the Cities of Colusa and Williams. On-site septic systems
- are used in areas for which connection to community facilities is not feasible. The communities of
- 17 Grimes, College City, Century Ranch, and Stonyford dispose of local wastewater through on-site
- 18 septic systems, as do most rural residences throughout the county (Colusa County 2010).

### 19Glenn County

- 20 Three municipal wastewater treatment facilities serve most of the urbanized portion of Glenn
- 21 County: Willows, Orland, and Hamilton City (Glenn County 1993).

### 22 Placer County

The Placer County Department of Facility Services operates and maintains ten separate sanitary sewer systems within the county. Nine of the ten are either sewer maintenance districts (SMDs) or county service areas (CSAs), which derive their operating revenue from sewer user fees. Funds do not co-mingle between districts. The Placer County Board of Supervisors is the governing board of each SMD or CSA. The tenth sewer system serves the Cabin Creek Facility, with the property being owned by the County (Placer County Water Agency 2009).

### 29 Sacramento County

- 30 Existing public liquid waste facilities of Sacramento County include the regional sewer system for
- 31 the Sacramento metropolitan area; sanitary sewer systems in Galt, Rancho Murrieta, Hood,
- 32 Courtland, Locke, Walnut Grove, and Isleton; and dedicated, single-facility systems at the
- 33 Sacramento County Boys Ranch, the Rio Cosumnes Correctional Center, and the Sacramento Metro
- Airport. The remainder of the county is served by private septic systems (Sacramento County 1993).

### 35 Solano County

The following water treatment plants are located in Solano County: City of Vacaville's Diatomaceous
 Earth (DE) Water Treatment Plant, Vacaville and Fairfield's North Bay Regional Water Treatment

- 1 Plant, Fairfield's Waterman Treatment Plant, Cement-Hill Water Treatment Plant, Fleming Hill
- Treatment Plant, and Vallejo's Green Valley Treatment Plant. These plants filter and treat water used
   by county businesses and residents.

### 4 Sutter County

- 5 Yuba City owns and operates a wastewater treatment and collection system that provides sewer
- 6 service for the community of Yuba City and serves a population of about 52,000. The facility also
- 7 accepts septage from unsewered portions of Sutter and Yuba Counties (State Water Resources
- 8 Control Board 2007).

### 9 Tehama County

- 10 Community wastewater disposal outside of these areas is handled primarily by septic tank and leach
- field systems or by seepage pits. On-site wastewater systems are limited by soil conditions
   throughout the county (Tehama County 2009).

### 13 Yolo County

14 Private on-site septic systems are the most common method of wastewater treatment in the 15 unincorporated county. Individual septic systems typically require lot sizes of 0.8 to 1 acre. In areas 16 where wells are used for domestic water supply, 1.5-acre lots may be necessary. All existing 17 community systems in unincorporated Yolo County are managed by a CSA or community service 18 district (CSD). Municipal wastewater systems currently serve Davis, West Sacramento, Winters, and 19 Woodland. Wastewater treatment plants commonly provide primary and secondary treatment, and 20 some provide tertiary treatment to meet increasingly stringent wastewater discharge standards of 21 the state SwrcbState Water Board (Yolo County 2009).

### 22 Yuba County

Aside from the cities of Marysville and Wheatland and the communities of Linda and Olivehurst,
 virtually all sewage disposal in Yuba County is accomplished by means of on-site septic tank and
 leach field systems. In particular, septic tanks are used throughout the rural foothill and mountain
 communities. Marysville is served by a county-owned wastewater treatment system that serves
 more than 3,700 residential and commercial customers (Yuba County 2009).

### 28 **16.2.1.3** Solid Waste

### 29 Butte

30 Solid waste management facilities in Butte County consist of the Neal Road Recycling and Waste

- 31 Facility and adjacent septic waste disposal area, two transfer stations, a large materials
- 32 recovery/transfer station facility, a private wood waste recycling facility, and two municipal wood
- 33 waste recyclers. The City of Chico operates a compost site for green waste byproducts, and is located
- 34 at the Chico Municipal Airport. Butte County is served by four licensed private haulers who provide
- 35 residential, commercial, and industrial collection services (Butte County 2010b)

### Colusa County

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Garbage pickup service is provided by Recology Butte Colusa <del>Counties</del> in the cities of Colusa and Williams, as well as the unincorporated communities of Arbuckle, Maxwell, and Princeton. Solid waste facilities in the county consist of the Maxwell Transfer Station and the Stonyford Disposal Site (Colusa County 2010).

### 6 Glenn County

Solid waste in Glenn County is collected by franchised haulers, with rates set by the county board of
supervisors for the unincorporated area and by the city councils in the cities of Willows and Orland.
There is one sanitary landfill in the county, located on Road 33, west of the community of Artois. The
landfill is on more than 195 acres leased by Glenn County for 50 years. It is a Class III facility (a
facility at which protection is provided to water quality from municipal, industrial and agricultural
wastes).

### 13 Placer County

The Placer County Environmental Health Services Solid Waste Program focuses on the handling and
 disposal of nonhazardous solid wastes, sometimes referred to as refuse, such as garbage and
 rubbish, including vard wastes, and construction and demolition debris.

### 17 Sacramento County

18 There are nine active permitted solid waste facilities in Sacramento County, including two

- 19 transfer/processing stations and one landfill that are publicly owned and operated. There are also
- 20 three transfer/processing stations, one construction and demolition transfer/processing station,
- 21 and one landfill that are privately owned within the county. Sacramento County owns and operates 22 Kiefer Landfill (Sacramento County 1002)
- 22 Kiefer Landfill (Sacramento County 1993).

### 23 Solano County

24The county contracts for solid waste management services. Various contractors serve the25unincorporated communities outside of Solano County's cities. Allied Waste Industries serves the26unincorporated area outside of Benicia; Vacaville Sanitary Service (Norcal Waste SystemsRecology)27serves the unincorporated areas outside of the cities of Dixon, Vacaville, and Vallejo; Solano Garbage28Company (Republic Services) serves the unincorporated areas outside of Fairfield and Suisun City;29and Rio Vista Sanitation Service (Garaventa Enterprises) serves the unincorporated area outside of30Rio Vista. The privately owned Recology Hay Road solid waste disposal site, located near Vacaville,

- 31 consists of 640 acres, 256 of which are permitted as a Class II landfill. This site serves as the
- 32 municipal and commercial landfill for Solano and San Francisco Counties.

### 33 Sutter and Yuba Counties

- 34 Yuba-Sutter Disposal, Inc. (YSDI) serves more than 43,000 residential customers and 3,500
- 35 commercial customers and collects more than 100,000 tons of materials annually. YSDI provides
- 36 service to the communities of Beale Air Force Base, Live Oak, Marysville, Wheatland, Yuba City, and
- 37 the counties of Yuba and Sutter (Yuba-Sutter Disposal, Inc. 2009).

### 1 Tehama County

- 2 The Tehama County Sanitary Landfill Association (TCSLA) owns the Tehama County-Red Bluff
- 3 Sanitary Landfill, an 83.63-acre site located approximately 2.5 miles northwest of the City of Red
- 4 Bluff. The TCSLA contracts with Green Waste of Tehama for operation of the landfill. The Tehama
- 5 County-Red Bluff Sanitary Landfill provides extensive services for waste diversion and offers
- 6 recycling services.

### 7 Yolo County

8 Solid waste is disposed of at the Yolo County Central Landfill, located on County Road 28H
9 approximately 4 miles northeast of Davis.

### 10 **16.2.1.4** Electrical and Natural Gas Service

### 11 Butte

- 12 The Pacific Gas and Electric Company (PG&E) provides Butte County with most of its electricity. The
- 13 cities of Gridley and Biggs run their own power companies, Gridley Municipal Utilities and Biggs
- 14 Electrical Department, each of which distributes electricity purchased from the federal government
- 15 to residents within their city limits. PG&E also supplies most of the natural gas used within Butte
- 16 County.

### 17 Colusa County

18 PG&E provides electrical and natural gas services to consumers in Colusa County.

### 19 Glenn County

Natural gas and electrical service in the county are provided by PG&E. PG&E owns, operates, and
 maintains electric service in Glenn County. PG&E is a provider of resources to the counties affected
 by the proposed program.

### 23 Placer County

24 PG&E provides gas and electrical services to Placer County consumers.

### 25 Sacramento County

- 26 The Sacramento Municipal Utility District (SMUD) is the electrical service provider for Sacramento
- 27 County and small areas of Placer County. SMUD delivers electricity to more than 553,000 customers
- within approximately 900 square miles of Sacramento County and a small portion of Placer County.
- 29 PG&E is the natural-gas service provider.

### 30 Solano County

- 31 Natural gas service for Solano County is provided by PG&E, as regulated by the California Public
- 32 Utilities Commission and the Federal Energy Regulatory Commission.

- 1 Electricity for Solano County is also provided by PG&E, as regulated by the California Public Utilities
- 2 Commission and the Federal Energy Regulatory Commission. All public electrical energy for Solano
- 3 County is generated outside the County and supplied via transmission lines.

### 4 Sutter County

PG&E provides electrical and natural gas service to Sutter County. Electrical service is provided to
all areas of the county. Natural gas service is provided only to the urbanized areas of Yuba City and
Live Oak, and to the community of Nicolaus. Most of the electrical service in the county is carried

- 8 through above-ground lines. However, new urban development is now typically served by
- 9 underground service. In addition, PG&E maintains a program to <u>convert existing overhead electric</u>
- 10 <u>facilities to</u> underground <del>existing service lines</del><u>facilities</u>.

### 11 Tehama County

Natural gas and electricity providers in Tehama County are franchisees regulated by the CaliforniaPublic Utilities Commission.

### 14 Yolo County

15 PG&E provides natural gas and electrical services to the residents of Yolo County.

### 16 Yuba County

- 17 PG&E is the primary service provider in Yuba County for natural gas and electricity. Natural gas is
- 18 provided to urbanized areas of the county. Rural residents who run gas appliances purchase bottled
- 19 propane from several providers.

### 20 **16.2.1.5** Telephone and Cable

A variety of telephone service providers are within the program area. However, based on a review of
 affected general plans, AT&T California is the main provider of telephone services to the consumers
 residing within program area.

### 24 **16.2.1.6** Fire and Police Protection

### 25 Butte

- 26 Various local, state, and federal agencies provide criminal justice services in Butte County. These
- 27 include, but are not limited to, the police agencies in the cities of Chico, Oroville, Gridley, Biggs, and
- 28 the town of Paradise; and the Butte County Sheriff, the California Highway Patrol, the State
- 29 Department of Fish and Wildlife (DFW), the State Department of Parks and Recreation, and the U.S.
- 30 Forest Service.
- The Butte County Fire Department (BCFD), with support from the California Department of Forestry
- and Fire Protection (CAL FIRE), provides fire protection to the entire unincorporated county, except
   for a small area south of Oroville served by the El Medio Fire Protection District.
- The incorporated jurisdictions of Biggs, Chico, Gridley, Oroville, Paradise, and the El Medio Fire
   District play an important role in providing fire protection services in the areas within their

jurisdictions, as well as coordination with the BCFD in the unincorporated areas surrounding their
 jurisdictions.

### 3 Colusa County

4 The unincorporated areas of Colusa County receive general public safety and law enforcement

- 5 services from the County Sheriff. Municipal police departments serve the cities of Colusa and
- Williams. The District Ranger has responsibility for the Mendocino National Forest. The DFW patrols
   the national wildlife refuges.
- / the national whenle religes.
- 8 Fire protection services in Colusa County are provided by eight rural districts, two city fire
- 9 departments, the California Department of Forestry, and the U.S. Forest Service. The majority of the
- 10 districts are staffed by volunteer fire fighters. There are mutual aid agreements between most of the
- 11 agencies to ensure that adequate manpower and equipment can be provided when a fire occurs.

### 12 Glenn County

- 13 The Glenn County Sheriff's Office provides law enforcement services within unincorporated areas of
- 14 the county. The two incorporated cities within the county, Willows and Orland, are served by the
- 15 Willows and Orland Police Departments, respectively. Fire and police protection are provided by the 16 local and county agencies.
- Fire protection in Glenn County is provided by twelve individual fire districts, which include the cities of Willows and Orland. On a seasonal basis, protection is also provided by CAL FIRE in the unincorporated foothill and rural areas. In the areas covered by the CDF that are also served by a fire district, both respond to fires during the fire season (approximately May 1 to November 1).

### 21 Placer County

The Placer County Sheriff's Department provides law enforcement services to the county, including
 the program area. <u>Placer County Fire Department provides year-round, all-hazard fire and</u>
 <u>emergency services to approximately 475 square miles of unincorporated county area. Both full-</u>
 <u>time and volunteer firefighter provided service. Placer County contracts with CAL FIRE for fire</u>
 <u>protection services in the unincorporated areas of the county.</u>

### 27 Sacramento County

Fire service is provided in the County of Sacramento by the cities of Folsom, Galt, Isleton and Sacramento, Elk Grove Community Services District, and fourteen other independent fire districts (Sacramento County 1993). All fire districts provide emergency medical rescue and fire protection services, while some districts also provide advanced life support via fire department ambulances, paramedic squads, or by the placement of firefighter/paramedics on engines (Sacramento County 1993).

- 34 The County Sheriff's Department provides local police protection services to the unincorporated
- area and provides specialized law enforcement services to both the incorporated and
   unincorporated areas (Sacramento County 1993).

### 1 Solano County

The following individual fire protection districts (FPDs) serve the unincorporated portion of Solano
County: CAL FIRE, Gordon Valley Fire Station, Cordelia FPD, Dixon FPD (under contract with City of
Dixon Fire Department), East Vallejo FPD (under contract with City of Vallejo Fire District),
Montezuma FPD, Ryer Island FPD (under contract with Montezuma FPD), Suisun FPD, and Vacaville

6 FPD.

### 7 Sutter County

8 Law enforcement in Sutter County is provided by two principal separate agencies, the Sutter County 9 Sheriff, and the California Highway Patrol. The Sutter County Sheriff's Department (SCSD) is 10 responsible for crime prevention, law enforcement, and criminal investigation in the unincorporated 11 areas of the county and the city of Live Oak. The SCSD has its main office at the Law Enforcement 12 Center in Yuba City, with resident deputies in Meridian, Robbins, and Pleasant Grove. The existing 13 county jail is also located at the Law Enforcement Center. The California Highway Patrol (CHP) is the 14 primary law enforcement agency for state highways and roads in the unincorporated areas of the 15 county. Services include law enforcement, traffic control, accident investigation, and management of 16 hazardous materials spill incidents. The CHP has a mutual aid agreement with the Sheriff's

- 17 Department and will respond when requested by the sheriff.
- 18 Sutter County Fire and Emergency Services coordinates fire protection for CSAs C, D, and F in the
- 19 unincorporated portion of Sutter County covering approximately 360 square miles. In addition,
- 20 Sutter County provides fire service to the city of Live Oak through a contractual agreement. The
- 21 Meridian FPD covers approximately 93 square miles. The Sutter Basin FPD covers approximately
- 22 127 square miles. The Walton FPD covers approximately 24 square miles. The Meridian FPD, Sutter
- 23 Basin FPD, and Walton FPD are all independent FPDs.

### 24 Tehama County

- Law enforcement in the unincorporated areas of Tehama County and the City of Tehama is provided by the Tehama County Sheriff's Department, whose headquarters are located in Red Bluff. The cities of Red Bluff and Corning operate police departments with jurisdiction in the incorporated cities. The California Highway Patrol enforces traffic laws throughout the county with an office located at 2550 Main Street in Red Bluff.
- 30 The Tehama County Fire Department (TCFD) and CAL FIRE are integrated departments that
- 31 mutually support each agency's fire suppression efforts without an agreement. The TCDF and CAL
- 32 FIRE provide fire protection and other emergency services for the unincorporated areas of Tehama
- 33 County, with the exceptions of the Gerber and Capay FPDs.

### 34 Yolo County

- 35 Fire protection services, including rescue, emergency medical services, hazardous material
- 36 response, are provided by a large number of fire districts and the Rumsey Tribe within the
- 37 unincorporated areas of Yolo County (Yolo County 2009). Law enforcement services in Yolo County
- 38 are provided by the County Sheriff–Coroner. This department patrols the County, administers the
- 39 County Jail and work program, provides animal control services, and serves as the County Coroner
- 40 (Yolo County 2009).

### 1 Yuba County

- 2 The Yuba County Sheriff's Office provides dispatching services to the City of Wheatland, Plumas-
- 3 Brophy Fire District, and Olivehurst Public Utilities District as well as to the City of Marysville Fire
- 4 Department for calls that this department responds to outside city limits. Unincorporated areas of
- 5 the county are provided with fire protection by nine fire districts, community services districts, or 6 public utilities districts.
- 7 Fire protection in Yuba County is provided by several agencies, reflecting the fact that there is city,
- county, state, and generally administered land and privately owned land in the county. The two
   incorporated cities, Marysville and Wheatland, provide their own fire protection through the
- 10 Marysville Fire Department and the Wheatland Fire Department.
- 11 The California Highway Patrol assists in moving vehicles and pedestrians from hazard areas; assists
- 12 local law enforcement agencies in establishing evacuation routes and traffic control procedures;
- 13 controls traffic on state freeways and highways within unincorporated areas of the state; and assists
- 14 in preventing traffic from re-entering hazard areas.

## 15 **16.3 Regulatory Setting**

- 16 Appendix C, Regulatory Background, describes the state and local laws, regulations, and policies that
- 17 pertain to utilities and public services within the program area. Specifically, the California
- 18 Environmental Quality Act, California Public Utilities Commission standards, the California
- 19 Integrated Waste Management Act, and local general plans are pertinent to the proposed program.

## 20 **16.4 Determination of Effects**

### 21 **16.4.1 Assessment Methods**

22 Effects on utilities and public services were evaluated based on the duration and extent to which 23 such services would be affected as well as the ability of a service provider to continue to provide a 24 level of service that could meet the needs of an affected community. This section analyzes proposed 25 program effects that are not expected to create additional demand for electricity or natural gas and 26 would not require the construction or expansion of electrical or natural gas transmission lines or 27 public utilities. Implementation of the proposed program would not require the construction or 28 expansion of wastewater treatment facilities, nor would it require the relocation of major 29 infrastructure.

## 30 16.4.2 Significance Criteria

An effect pertaining to utilities and public services as a result of the proposed program would be
 considered significant if it would result in any of the following environmental effects.

Require the construction or expansion of electrical or natural gas transmission or distribution
 facilities.

1 Require the construction or expansion of a water conveyance or wastewater treatment facility 2 or require new or expanded water supply entitlements. 3 Require the construction of new or expanded stormwater drainage facilities. • 4 Require the construction or expansion of wastewater treatment facilities. • 5 Cause the capacity of a solid waste landfill to be reached sooner than it would without the 6 proposed program. 7 • Require the construction or expansion of communications facilities (telephone, cell, cable, 8 satellite dish). 9 • Adversely affect public utility facilities that are located underground or aboveground along the 10 local roadways from program construction activities. 11 Create an increased need for new fire protection, police protection, or ambulance services or • 12 adversely affect existing emergency response times or facilities. 13 Intersect with major infrastructure components, such as bridges or overpasses, requiring 14 relocation of the components. 15 The proposed program would not require the construction or expansion of electrical or natural gas 16 transmission or distribution facilities, water conveyances, or wastewater treatment facilities; and 17 would not require new or expanded water supply entitlements, stormwater drainage facilities, or 18 wastewater treatment facilities. The proposed program would also not cause the capacity of a solid 19 waste landfill to be reached sooner than it would without the program; would not require the 20 construction or expansion of communications facilities; would not create an increased need for new 21 fire protection, police protection, or ambulance services; and would not intersect with major 22 infrastructure components. Therefore, the first six criteria and the last two criteria listed above are 23 not discussed further in this analysis.

## **16.5 Effects and Mitigation Measures**

### **16.5.1 Alternative 1—No Action**

26 Under Alternative 1, regular operation and maintenance (O&M) of the levee system would continue 27 as presently executed by the local maintaining entities (subject to revision of the governing O&M 28 manual), but construction activities associated with the proposed program would not occur. As a 29 result, erosion would continue and the risk of levee failure and possible catastrophic flooding would 30 increase as more erosion sites become critical and repair is limited to emergency response by 31 federal, state or local flood control agencies that would eventually implement bank protection along 32 various sites along Sacramento River Flood Control Project levees through emergency action. The 33 continued potential for levee failure could cause inundation from high flows and destruction or 34 damage to utility lines and water or wastewater piping or facilities, all of which could lead to 35 temporary power outages and interruptions of other utilities in the study program area. The level of 36 damage to public services and infrastructure is unpredictable, but could adversely affect fire 37 protection, police protection, or emergency medical assistance. There would be no immediate effect 38 on the utilities within the program area. Possible degradation of the existing levees could result in 39 utility failure in extreme circumstances.

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### **1 16.5.2 Alternative 2A—Low Maintenance**

## 2 Effect PUB-1: Potential for Damage of Utility Infrastructure and Disruption of Service during 3 Construction

4 Alternative 2A entails construction activities that could damage or require the relocation of existing 5 utility infrastructure at individual project sites, including underground and overhead electrical 6 distribution lines, aerial and underground telephone lines, underground natural gas pipelines, and 7 underground cable television lines, and could cause temporary service interruptions. Because the 8 potential exists for damage and service interruptions to existing utilities both identified and 9 unidentified, this construction effect is considered potentially significant. However, implementation 10 of Mitigation Measure PUB-MM-1 would reduce the severity of this effect to a level that is less than 11 significant.

## Mitigation Measure PUB-MM-1: Verify Utility Locations, Coordinate with Utility Providers, Prepare and Implement a Response Plan, and Conduct Worker Training

- The following measures will be implemented to avoid and minimize potential damage to utilitiesand service disruptions during construction.
  - Obtain utility excavation or encroachment permits as necessary before initiating any work with the potential to affect utility lines, and include all necessary permit terms in construction contract specifications.
    - Before starting construction, coordinate with utility providers in the area to locate existing lines. Avoid the relocation of utilities when possible. Provide notification of potential interruptions in services to the appropriate agencies.
- Before starting construction, verify utility locations through field surveys and Underground
   Service Alert services. Clearly mark any buried utility lines in the area of construction before
   any earthmoving activity.
  - Before starting construction, prepare a response plan to address potential accidental damage to a utility line. The plan will identify chain-of-command rules for notifying authorities and appropriate actions and responsibilities to ensure the safety of the public and the workers. Contractors will conduct worker training to respond to these situations.
    - •\_\_\_\_Stage utility relocations to minimize service interruptions.
    - <u>Utilities or infrastructure that are temporarily disconnected during construction shall be</u> reconnected as soon as is feasible to minimize utility and infrastructure interruptions.

### 32 Effect PUB-2: Potential Disruption to Irrigation Water Supply

- Under Alternative 2A, placement of bank fill stone protection would be confined to the levee slope.
   There would be no expansion of the levee footprint, no acquisition of additional land, and
   construction would avoid areas where existing irrigation water supply facilities are located. There
- 36 would be no effect on irrigation water supply.

# 116.5.3Alternative 3A—Maximize Meander Zone2(Environmentally Superior Alternative)

# Effect PUB-1: Potential for Damage of Utility Infrastructure and Disruption of Service during Construction

5 This effect would be similar to Alternative 2A in type and magnitude because construction activities 6 under Alternative 3A could also damage or require the relocation of existing utility infrastructure at 7 individual project sites, including underground and overhead electrical distribution lines, aerial and 8 underground telephone lines, underground natural gas pipelines, and underground cable television 9 lines, and could cause temporary service interruptions. Because the potential exists for damage and 10 service interruptions to existing utilities both identified and unidentified, effect PUB-1 is considered 11 potentially significant. However, implementation of Mitigation Measure PUB-MM-1 would reduce 12 the severity of this effect to a level that is less than significant.

### 13 Effect PUB-2: Potential Disruption to Irrigation Water Supply

Under Alternative 3A, improvements would result in the construction of a setback levee some
 distance from the existing levee, or construction of an adjacent levee, resulting in a widened
 landside footprint. Although it cannot be known at this time precisely how far landward the
 footprint would extend for the flood control facilities under this alternative, a comparatively greater
 extent of land would be displaced by these improvements than under Alternative 2A, increasing the
 potential for effects to irrigation and drainage pipelines, wells, and pumps.

- As discussed in Chapter 2, Project Description, the environmental analysis in this EIS/EIR is
   programmatic in nature, analyzing the 80,000 linear feet (LF) in its entirety. Additional project-level
   environmental documentation, tiering from this programmatic analysis, will be conducted to
   address erosion sites that will be constructed.
- Although temporary, the potential for substantial interruptions of irrigation supply could occur if irrigation infrastructure is damaged or otherwise rendered inoperable at a time when it is needed (e.g., by the time crop irrigation must begin). Because construction activities could cause a delay in the provision of irrigation supply, this temporary effect is considered significant. However, implementation of Mitigation Measure PUB-MM-2 would reduce the potential temporary effect of disruptions to irrigation supply to a level that is less than significant.
- 30Mitigation Measure PUB-MM-2: Coordinate with Irrigation Water Users Before and31During Infrastructure Modifications and Minimize Disruptions to Supply
- The Corps and its contractors for engineering design and construction will implement the
   following measures to minimize the potential for irrigation water supply interruptions during
   construction activities.
  - Determine if construction activities will modify or otherwise effect irrigation supply infrastructure.
- Coordinate the timing of all modifications to irrigation supply infrastructure with the
   affected infrastructure owners and water supply users.
- Include detailed scheduling of modifications or replacement of existing irrigation
   infrastructure components in project design and in construction plans and specifications.

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- Plan and complete modifications of irrigation infrastructure for-during the non-irrigation season to the extent feasible.
  - If necessary, provide for alternative water supply when modifications or replacement of irrigation infrastructure must be conducted during periods when it would be in normal use by an irrigation water user.

# 6 16.5.4 Alternative 4A—Habitat Replacement (Preferred 7 Alternative)

## 8 Effect PUB-1: Potential for Damage of Utility Infrastructure and Disruption of Service during 9 Construction

- 10 This effect would be similar to that described under Alternative 2A in type and magnitude.
- 11 Implementation of Mitigation Measure PUB-MM-1 would reduce the severity of this effect to a level
- 12 that is less than significant.

### 13 Effect PUB-2: Potential Disruption to Irrigation Water Supply

- 14 This effect would be similar to that described under Alternative 3A, but at a lesser magnitude
- 15 because fewer setback levees and adjacent levees would be constructed. Construction activities
- 16 could cause a delay in the provision of irrigation supply, and this temporary effect would be
- 17 considered significant. Implementation of Mitigation Measure PUB-MM-2 would reduce this effect to
- 18 a level that is less than significant.

# 19 16.5.5 Alternative 5A—Habitat Replacement Reaching 20 Environmental Neutrality

## Effect PUB-1: Potential for Damage of Utility Infrastructure and Disruption of Service during Construction

- 23 This effect would be similar to that described under Alternative 2A in type and magnitude.
- Implementation of Mitigation Measure PUB-MM-1 would reduce the severity of this effect to a levelthat is less than significant.

### 26 Effect PUB-2: Potential Disruption to Irrigation Water Supply

- 27 This effect would be similar to that described under Alternative 3A, but at a lesser magnitude
- 28 because fewer setback levees and adjacent levees would be constructed. Construction activities
- 29 could cause a delay in the provision of irrigation supply, and this temporary effect would be
- 30 considered significant. Implementation of Mitigation Measure PUB-MM-2 would reduce this effect to
- 31 a level that is less than significant.

# 16.5.6 Alternative 6A—Habitat Replacement with Vegetation ETL Variance

### 34 Effects associated with Alternative 6A would be comparable in type and magnitude to those

35 described for Alternative 3A because construction activities under Alternative 6A could also damage

- 1 or require the relocation of existing utility infrastructure at individual project sites, including
- 2 underground and overhead electrical distribution lines, aerial and underground telephone lines,
- 3 underground natural gas pipelines, and underground cable television lines, and could cause
- 4 temporary service interruptions. In addition, irrigation water supply could be disrupted in areas
- 5 where setback levees are constructed. Because the potential exists for damage and service
- 6 interruptions to existing utilities both identified and unidentified, both effects PUB-1 and PUB-2 are
   7 considered potentially significant. However, implementation of Mitigation Measures PUB-MM-1 and
- 8 PUB-MM-2 would reduce the severity of these effects to a level that is less than significant.

## **17.1 Introduction and Summary**

This chapter describes the environmental setting associated with aesthetics, the determination of
 the environmental effects on aesthetics that would result from implementation of the proposed
 program, and the mitigation measures that would reduce these effects.

### 7 The key sources of data and information used in the preparation of this chapter are listed below.

8 • Google Earth and Maps Street View (2009).

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- 9 American River Parkway Plan (Sacramento County 2008).
- 10 California Scenic Highway Program (California Department of Transportation 2009, 2007).
- Final Alternatives Report—80,000 LF (107 Sites), Sacramento River Bank Protection Project (Kleinfelder-Geomatrix 2009).
- Programmatic Biological Assessment for the Sacramento River Bank Protection Project Phase II,
   Final (Stillwater Sciences 2007).
- Table 17-1 summarizes the aesthetics effects resulting from the implementation of the proposedprogram.

### 17 Table 17-1. Summary of Aesthetics Effects and Mitigation

Effect	Mitigation Measure	Implementation Period
VIS-1: Temporary Visual Effects Caused by Construction Activities	VIS-MM-1: Install Temporary Visual Barriers between Construction Zones and Residences and Maintain Construction Sites and Staging Areas in an Orderly Fashion	During construction
VIS-2: Substantially Adversely Affect a Scenic Vista	None available	Not applicable
VIS-3: Substantially Damage Scenic Resources, including, but Not Limited to, Trees, Rock Outcroppings, and Historic Buildings along a Scenic Highway	None available	Not applicable
VIS-4: Substantially Degrade the Existing Visual Character or Quality of the Site and Its Surroundings	None available	Not applicable
VIS-5: Create a New Source of Light or Glare	None available	Not applicable

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## 1 17.2 Environmental Setting

This section discusses the existing conditions related to aesthetics in the program area.

### 3 17.2.1 Concepts and Terminology

- 4 Identifying a project area's aesthetics and conditions involves three steps.
- 5 1. Objective identification of the visual features (aesthetics) of the landscape.
  - 2. Assessment of the character and quality of those resources relative to overall regional visual character.
- 8 3. Determination of the importance to people, or sensitivity, of views of aesthetics in the landscape.

9 A combined methodology approach using Federal Highway Administration, U.S. Bureau of Land 10 Management, U.S. Forest Service, and professional standards of visual assessment methodology has 11 been used to determine potential effects on aesthetic values of the program area. The aesthetic value 12 of an area is a measure of its visual character and quality, combined with the viewer response to the 13 area (Federal Highway Administration 1988). Scenic quality can best be described as the overall impression that an individual viewer retains after driving through, walking through, or flying over 14 15 an area (U.S. Bureau of Land Management 1980). Viewer response is a combination of viewer exposure and viewer sensitivity. Viewer exposure is a function of the number of viewers, number of 16 17 views seen, distance of the viewers, and viewing duration. Viewer sensitivity relates to the extent of 18 the public's concern for a particular viewshed. These terms and criteria are described in detail 19 below.

### 20 17.2.1.1 Visual Character

21 Natural and artificial landscape features contribute to the visual character of an area or view. Visual 22 character is influenced by geologic, hydrologic, botanical, wildlife, recreational, and urban features. 23 Urban features include those associated with landscape settlements and development, including 24 roads, utilities, structures, earthworks, and the results of other human activities. The perception of 25 visual character can vary significantly seasonally, even hourly, as weather, light, shadow, and 26 elements that compose the viewshed change. The basic components used to describe visual 27 character for most visual assessments are the elements of form, line, color, and texture of the 28 landscape features (U.S. Forest Service 1995; Federal Highway Administration 1988). The 29 appearance of the landscape is described in terms of the dominance of each of these components.

### 30 **17.2.1.2** Visual Quality

Visual quality is evaluated using the well-established approach to visual analysis adopted by Federal
 Highway Administration, employing the concepts of vividness, intactness, and unity (Federal
 Highway Administration 1988; Jones et. al. 1975), which are described below.

- Vividness is the visual power or memorability of landscape components as they combine in striking and distinctive visual patterns.
- Intactness is the visual integrity of the natural and human-built landscape and its freedom from
   encroaching elements; this factor can be present in well-kept urban and rural landscapes, and in
   natural settings.

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• **Unity** is the visual coherence and compositional harmony of the landscape considered as a whole; it frequently attests to the careful design of individual components in the landscape.

Visual quality is evaluated based on the relative degree of vividness, intactness, and unity, as
modified by its visual sensitivity. High-quality views are highly vivid, relatively intact, and exhibit a
high degree of visual unity. Low-quality views lack vividness, are not visually intact, and possess a
low degree of visual unity.

### 7 **17.2.1.3** Viewer Exposure and Sensitivity

8 The measure of the quality of a view must be tempered by the overall sensitivity of the viewer. 9 Viewer sensitivity or concern is based on the visibility of resources in the landscape, proximity of 10 viewers to the visual resource, elevation of viewers relative to the visual resource, frequency and 11 duration of views, number of viewers, and type and expectations of individuals and viewer groups.

- 12 The importance of a view is related in part to the position of the viewer to the resource; therefore,
- 13 visibility and visual dominance of landscape elements depend on their placement within the
- 14 viewshed. A viewshed is defined as all of the surface area visible from a particular location (e.g., an
- 15 overlook) or sequence of locations (e.g., a roadway or trail) (Federal Highway Administration 1988).
- 16To identify the importance of views of a resource, a viewshed must be broken into distance zones of17foreground, middleground, and background. Generally, the closer a resource is to the viewer, the18more dominant it is and the greater its importance to the viewer. Although distance zones in a19viewshed may vary between different geographic regions or types of terrain, the standard20foreground zone is 0.25–0.5 mile from the viewer, the middleground zone is from the foreground21zone to 3–5 miles from the viewer, and the background zone is from the middleground to infinity22(U.S. Forest Service 1995).
- Visual sensitivity depends on the number and type of viewers and the frequency and duration of
   views. Visual sensitivity is also modified by viewer activity, awareness, and visual expectations in
   relation to the number of viewers and viewing duration. For example, visual sensitivity is generally
   higher for views seen by people who are driving for pleasure, people engaging in recreational
   activities such as hiking, biking, or camping, and homeowners.
- 28 Sensitivity tends to be lower for views seen by people driving to and from work or as part of their 29 work (U.S. Forest Service 1995; Federal Highway Administration 1988; U.S. Soil Conservation 30 Service 1978). Commuters and nonrecreational travelers typically have fleeting views and tend to 31 focus on commute traffic, not on surrounding scenery; therefore, they are generally considered to 32 have low visual sensitivity. Residential viewers typically have extended viewing periods and are 33 concerned about changes in the views from their homes; therefore, they are generally considered to 34 have high visual sensitivity. Viewers using recreation trails and areas, scenic highways, and scenic 35 overlooks are usually assessed as having high visual sensitivity.
- Judgments of visual quality and viewer response must be made with a regional frame of reference (U.S. Soil Conservation Service 1978). The same landform or visual resource appearing in different geographic areas could have a different degree of visual quality and sensitivity in each setting. For example, a small hill may be a significant visual element on a flat landscape but have very little significance in mountainous terrain.

## 1 17.2.2 Existing Conditions

### 2 **17.2.2.1** Visual Character of the Program Area

3 The program area is located in the region of California's Sacramento Valley (valley), with its 4 northern extent beginning at the town of Gerber (approximately 25 miles north of Chico) stretching 5 south to the shores opposite Sherman Island in the Sacramento-San Joaquin Delta, 3 miles east of 6 Collinsville. The metropolitan area of Sacramento serves as the region's urban core, connected to 7 smaller cities, such as Chico, Yuba City, West Sacramento, Davis, and Elk Grove, by major roadways 8 in the region. While much of the valley is still in agricultural production, there has been and 9 continues to be a conversion of agricultural land to urban and suburban land uses. This trend is 10 evident around the outskirts of Chico, Yuba City, Davis, Sacramento, West Sacramento, and Elk 11 Grove. Many of the small, agrarian communities in this region, such as Live Oak, Colusa, Woodland, 12 and Rio Vista, are experiencing similar growth.

13 Agricultural land, planted predominantly with row crops, stretches for miles in the region. A 14 patchwork of fields separates the urban center of Sacramento, and its suburban outskirts, from 15 smaller, outlying cities. These fields offer expansive views that, when haze is at a minimum, extend 16 over agricultural fields and recent development in the foreground to the middleground and 17 background. The high-rise buildings of downtown Sacramento can be seen in the middleground and 18 background, rising up from the flat valley floor. Background views to the Sierra Nevada foothills are 19 more rarely seen to the east while views of Mount Vaca and the Coast Range, to the west, and the 20 Sutter Buttes, west of Yuba City, are more commonly seen. These types of landscape views are 21 strongly characteristic of the valley and have contributed to the program area's identity.

Growth radiating out from city and town cores is reducing the amount of agricultural land in the region and closing the gap between the Sacramento metropolitan area and smaller, outlying cities and towns. Waterways, both natural and human made, and bypasses often aid in limiting development but are a desirable amenity that, combined with increased access provided via new roadway facilities, lead to development spreading outward where vast acreage of agricultural land remains. This growth is changing the visual character from rural to suburban.

- 28 Development of the smaller cities in the region is typified by a growing core of residential,
- 29 commercial, and some industrial land uses with agricultural fields surrounding the city outskirts.
- Older residential and commercial areas in the region are often distinct, having a wide vernacular of
   architectural styles, development layouts, and visual interest. Newer residential and commercial
   development, however, tends to be homogenous in nature, having similar architectural styles,
- building materials, plan layouts, and commercial entities; and development often lacks a distinctive
   character from one city to the next.
- 35 Overall, a mix of developed and natural landscapes characterizes the program area. The landscape 36 pattern is influenced by development sprawling from existing city cores and the major roadways in 37 the program area. The waterways and areas within each of the four regions of the program area 38 have different visual characteristics at a finer scale. In general, waterways within each region tend to 39 be visually analogous and are discussed as such for the purpose of this analysis. However, areas that 40 visually deviate from the general visual character are identified and discussed. Viewers in all regions 41 include residents, businesses, roadway users, and recreational users. Areas to be affected by the 42 proposed program are shown in Figure 2-1.
  - Sacramento River Bank Protection Project Phase II Supplemental Authorization Final EIS/EIR

### 1 Region 1a

This region's primary features are the Yolo, Willow Slough, and Ulatis Creek Bypasses; Cache and
Putah Creeks; and several sloughs in the Delta. The agricultural fields of the Yolo Bypass become
inundated with water during periods of high flows in the program area. Buildings associated with
farms and duck clubs are commonly raised structures that are scattered throughout the bypass.
Most of the Yolo Bypass is kept free of shrubs and trees, except along the toe drains adjacent to the
levees, where riparian vegetation lines the water corridor. The Willow Slough and Ulatis Creek

- 8 Bypasses are much smaller, similar to canals, are highly channelized, and have levees on either side
- 9 with grassy side slopes.
- Cache Creek in the program area has a wider floodplain with gravel bars and riparian vegetation to the west, with past and present mining activities located to the north and south. East of the mining areas, its floodplain narrows and is more channelized on approach to Interstate 5, with thin bands of riparian vegetation, and continues in a confined corridor until it reaches the Cache Creek Settling Basin where sediment from mining activities carried during the high flows of Cache Creek can settle out before entering the Sacramento River.
- 16 Putah Creek, in the program area, has a narrow and densely vegetated corridor until it passes under 17 Interstate 80, where the levees transition to a farther setback that more than doubles the width of 18 available floodplain as it enters the Yolo Bypass. However, much of this is an elevated floodplain that 19 is being used for agricultural production. This is possible because the Putah Creek does not 20 generally flood outside of the narrow, dense riparian corridor that has steep banks up to the 21 elevated floodplain. Sloughs are highly channelized by levees on both sides of the waterways. 22 Vegetation along the levees varies from a thick, to narrow band of riparian and upland vegetation to 23 grassy slopes. These waterways are often highly armored with riprap with minimal vegetation 24 growing above the rock line, as reported in the programmatic biological assessment (BA) (Stillwater 25 Sciences 2007) and further discussed in Chapter 10, Vegetation and Wetlands.
- 26 Delta sloughs meander through a patchwork of agricultural fields and orchards, passing by several 27 small water-oriented communities, on their flow toward the Suisun Marsh. The network of sloughs 28 form dendritic channel patterns that wind and branch through the low-lying landscape and create 29 agricultural islands. Many of these channels are contained by the low levees that have contributed to 30 maintaining historical channel patterns. Human-made irrigation channels have been created to 31 transport water from the sloughs to the fields. Development in this Delta area occurs alongside the 32 sloughs where roadways such as State Route (SR) 160 (River Road/Victory Highway) and other 33 paved local roadways on levees provide access.
- 34 Foreground views in the Yolo Bypass typically consist of agricultural fields, the toe drains, and 35 levees, dependent upon location within the landscape. Roadways, typically found on levees or 36 adjacent to levees in this region, provide most of the views toward the program area. Foreground 37 views near smaller bypasses, creeks, and sloughs often consist of the waterway and levees, 38 vegetation, surrounding agriculture and orchards, communities, docking areas, local roadways, and 39 related infrastructure. Middleground and background views throughout the region may be limited 40 by vegetation, levees, and infrastructure or may extend over the landscape to include views of the 41 Sacramento city skyline, the Sierra Nevada, the Coast Range, and a collage of agricultural fields and 42 orchards.

### 1 Region 1b

2 This region's primary features are the Sacramento and American Rivers and canals. The Sacramento 3 River in this region meanders along a path that is highly confined by levees. Vegetation within the 4 river corridor is limited to a thin band that varies in density from only grassy banks with a few 5 shrubs to densely vegetated, as reported in the programmatic BA (Stillwater Sciences 2007) and 6 further discussed in Chapter 10, Vegetation and Wetlands. The American River is allowed to 7 meander a little more freely within its levees, creating bars and banks that are often highly 8 vegetated with mature riparian vegetation. This floodplain is highly used as an open space corridor 9 supporting habitat, wildlife, and recreational uses. The American River in this region, often 10 identified as the Lower American River, is both a federally and state-designated Wild and Scenic 11 River classified as "recreation" (see Appendix C, Regulatory Background).

- 12 The waterways in this region of the program area meander through a patchwork of agricultural 13 fields and orchards, passing by the urban areas of West Sacramento and Sacramento, on their flow 14 toward the Delta. Roadways, typically found on levees or adjacent to levees in this region, provide 15 most of the views toward the program area. Foreground views along the rivers often consist of the 16 waterway and levees, vegetation, surrounding agriculture and orchards, development and 17 communities, docking areas, local roadways, and related infrastructure. Middleground and 18 background views, throughout the region, may be limited by vegetation, levees, and infrastructure
- background views, throughout the region, may be limited by vegetation, levees, and infrastructu
   or may extend over the landscape to include views of the Sacramento skyline, Sierra Nevada
- 20 Mountains, Coast Range, and a collage of agricultural fields and orchards.

### 21 Region 2

This region's primary features are the Sacramento, Feather, Yuba, and Bear Rivers; the Sutter
Bypass; the Colusa Main Drain; Butte and Honcut Creeks; and several smaller bypasses and canals.
The Sacramento River in this region is highly confined by levees on both sides of the river as it
meanders through a patchwork of agricultural fields and orchards. Vegetation along the levees
varies from a dense yet narrow band of riparian and upland vegetation to grassy slopes, as reported
in the programmatic BA (Stillwater Sciences 2007) and further discussed in Chapter 10, Vegetation
and Wetlands.

29 Between Grimes and Sycamore, a portion of the Sacramento River has a wider, vegetated floodplain 30 where the river is allowed to meander more freely. The Sutter Bypass hugs the base of the Sutter 31 Buttes, where the bypass begins in the north, and becomes a broad corridor paralleling the 32 Sacramento River with large straight segments and shallow bends as it travels south. The Tisdale 33 Bypass and its vegetated low-flow channels allow the Sacramento River to flow into the Sutter 34 Bypass in Region 2. The Sutter Bypass widens near Knights Landing as the bypass travels south and 35 serves as a water bypass structure that supports agricultural production outside of the winter and 36 early spring months when flows are high, inundating this area and forming a large water body. The 37 Colusa Bypass's grassy bottom, showing evidence of scarring caused by flows, provides a visual 38 contrast between the character of Region 2 and Region 3.

39 The Feather River in the program area has a wider floodplain with gravel bars and riparian 40 vegetation to the north, and past mining activities located to the east and west. South of the mining 41 areas, the river's floodplain expands and contracts. In narrower areas it supports a dense riparian 42 vegetation corridor. In wider areas there is an elevated floodplain that is being used for agricultural 43 production, which often extends to bends in the river. This character remains much the same until

- 1 the river enters the Sutter Bypass, where it hugs the Garden Highway on the east, has only a narrow
- band of riparian vegetation on either side, and has a wide swath of agricultural fields between it and
   the west levee.
- 4 The Yuba River has a wider floodplain with many gravel bars and narrow areas of riparian
- vegetation influenced by intense past mining activities located to the northeast. The Bear River has
   thin bands of riparian vegetation on either side. The river is allowed to meander within the narrow
- floodplain and within the confined corridor created by the levees. Creeks and canals in this region
- 8 are highly channelized by levees on both sides of the waterways. Vegetation along the levees varies
- 9 from a dense yet thin band of riparian vegetation to grassy slopes.
- 10 The waterways in this region of the program area meander through a patchwork of agricultural 11 fields and orchards, passing by several smaller and larger rural communities as the rivers flow
- 12 toward the south. Roadways, typically found on levees or adjacent to levees in this region, provide
- 13 most of the views toward the program area. Foreground views near the creeks and river often
- 14 consist of the waterway, levees, vegetation, surrounding agriculture, orchards, communities,
- 15 docking areas, local roadways, and related infrastructure. Middleground and background views
- 16 throughout the region may be limited by vegetation, levees, and infrastructure or may extend over
- the landscape to include views of the Sutter Buttes, the Sierra Nevada, the Coast Range, and a collageof agricultural fields and orchards.

### 19 Region 3

- This region's primary features are the Sacramento River and Elder, Deer, and Mud Creeks. Colusa marks a distinct visual change for the Sacramento River from lower regions. At Arnold Bend, west of Bridge Street/River Road, the Sacramento River transforms from a highly channelized system to a meandering river corridor with many bends, depositional bars, and dense riparian vegetation. The creeks are also not highly channelized in this region and have wider floodplains, gravel bars and sand bars, and densely vegetated corridors, as reported in the programmatic BA (Stillwater Sciences 2007) and further discussed in Chapter 10, Vegetation and Wetlands.
- The waterways in this region of the program area meander through a patchwork of agricultural
  fields and orchards, passing by several small rural communities, as the waterways flow south.
- 29 Roadways, typically found on levees or adjacent to levees in this region, provide most of the views
- 30 toward the program area. Foreground views near the creeks and river often consist of the waterway,
- 31 levees, vegetation, surrounding agriculture, orchards, communities, docking areas, local roadways,
- 32 and related infrastructure. Middleground and background views throughout the region may be
- limited by vegetation, levees, and infrastructure or may extend over the landscape to include views
   of the Sutter Buttes, the Sierra Nevada, the Coast Range, adjacent wildlife refuges, and a collage of
- 35 agricultural fields and orchards.

### 36 **17.2.2.2** Existing Viewer Groups and Viewer Responses

- 37 The primary viewer groups in the program area are persons living or conducting business near
- 38 levees; travelers using the interstates, highways, and smaller local roads (including those on levee
- 39 crowns); and recreational users (including boaters, beachgoers, and anglers using canals, creeks,
- 40 and rivers; trail users; equestrians; bicyclists; and joggers). All viewer groups have direct views of
- 41 the program regions described above.

### 1 Residents

2 Suburban and rural residents are located directly adjacent to levees or are separated from them by 3 local streets or a similar corridor. Suburban residences are mostly oriented inward toward the 4 developments, and only residences on the outer edge of the developments have middleground and 5 background views of levees, vegetation, and trees. The separation and orientation of rural 6 residences allow inhabitants to have direct views over agricultural fields toward levees. Both 7 suburban and rural residents are likely to have a high sense of ownership over their adjacent 8 waterways, the open space that surrounds them, the recreational opportunities they provide, and 9 their inherent scenic quality. Residents are considered to have high sensitivity to changes in the

- 10 viewshed because of their potential exposure to such views, short distance from the program areas,
- 11 and sense of ownership.

### 12 Businesses

Viewers from industrial, commercial, government, and educational facilities have semi-permanent views from their respective facilities. Situated in different locations throughout the program area, these facilities' views range from views limited by the levees to sweeping views that extend out to the background. Employees and users of these facilities are likely to be occupied with their work activities and tasks at hand. However, some of these facilities are dependent on the waterways in the program area as a destination spot and source of income (e.g., the Port of West Sacramento and restaurants situated along the river).

People using these facilities often travel to and from work and spend leisure time on the waterways
and levees. Because of their limited viewing times, their focus on tasks at hand, and the current use
of the levees, this viewer group is considered to have moderate sensitivity to changes in views.

### 23 Roadway Users

24 Roadway users' vantages differ based on the roadway they are traveling and the elevation of that 25 roadway. The majority of views are mostly limited to the foreground by suburban, commercial, and 26 industrial development; vegetation; and the levees themselves. Views to the middleground and 27 background are present but are limited to areas where structures that otherwise would conceal 28 background views from the roadway are set back. However, if the vantage is elevated, as on portions 29 of Capital City Freeway, bridges crossing over the Sacramento River, levee roads (e.g., SR 160), and 30 other local roadways, most views of the surrounding mountain ranges (Vaca Mountains, Coast 31 Range, and Sierra Nevada), waterways (American and Sacramento Rivers, Yolo Bypass when 32 flooded), and open space areas (agriculture, parkways) are only partially obstructed by the rooflines 33 and mature vegetation in the area.

34 Travelers use roadways at varying speeds; normal highway and roadway speeds differ based on 35 speed limits and the traveler's familiarity with the route and roadway conditions (e.g., 36 presence/absence of rain). Single views typically are of short duration, except on straighter 37 stretches where views last slightly longer. Viewers who frequently travel these routes generally 38 possess moderate visual sensitivity to their surroundings. The passing landscape becomes familiar 39 to these viewers, and their attention typically is not focused on the passing views but on the 40 roadway, roadway signs, and surrounding traffic. Viewers who travel local routes for their scenic 41 quality generally possess a higher visual sensitivity to their surroundings because they are likely to 42 respond to the natural environment with a high regard and as a holistic visual experience.

Furthermore, scenic stretches of roadway passing through the program area offer sweeping views of
 the surrounding area that are of interest to motorists, especially when traveling on the bridges or

### 3 levee tops. For these reasons, viewer sensitivity is moderate among most roadway travelers.

### 4 Recreational Users

5 Recreational users view the program areas from parks, waterways, roadways, trails, and the levees 6 themselves. Recreational uses consist of boating and fishing, hunting along the upper Sacramento 7 River and rural levees, birding, walking, running, jogging, and bicycling along trails, levee crowns, 8 and local roads. Users of the waterways are likely to seek out natural areas within the corridor, such 9 as sand and gravel bars and beaches, in addition to using the waterways as a resource. Waterway 10 users provide differing views based on their location in the landscape and are accustomed to 11 variations in the level of industrial, commercial, suburban, and recreational activities occurring 12 within the program area. The amount of vegetation present along the levees creates a softened, 13 natural edge that is enjoyed by all recreational users. Local recreational users also have a high sense 14 of ownership over the waterways and corridors they use, and these areas are highly valued 15 throughout the Sacramento Valley area.

- Viewer sensitivity is high among recreational users using the program areas because they are more
- likely to highly value the natural environment, appreciate the visual experience, have a high sense of
  ownership, and be more sensitive to changes in views. Refer to Chapter 14, Recreation, for a

19 discussion of impacts on Sacramento River recreation.

## 20 17.3 Regulatory Setting

Appendix C, Regulatory Background, describes the federal, state, and local laws, regulations, and
 policies that pertain to aesthetic resources within the program area. Pertinent laws, regulations,
 policies, and plans are listed below.

- Federal:
  - National Environmental Policy Act
  - Wild and Scenic Rivers Preservation Act
- State:

25

26

- 28 O California Environmental Quality Act
- 29 California Wild and Scenic Rivers
- 30 O California Scenic Highway Program
- 31 Local:
- 32 O American River Parkway Plan
- 33 Other local ordinances and policies

## **17.4 Determination of Effects**

This section describes the effect analysis relating to aesthetics for the proposed program. It
describes the methods used to determine the effects of the proposed program and lists the
thresholds used to conclude whether an effect would be significant. Measures to mitigate (i.e., avoid,
minimize, rectify, reduce, eliminate, or compensate for) significant effects accompany each effect
discussion.

### 7 **17.4.1 Assessment Methods**

8 Changes to the visual environment are assessed by factoring the degree of change to the visual
9 resource affected and viewer response to that change. Using the concepts and terminology
10 described at the beginning of this section, and criteria for determining effects, analysis of visual
11 effects of the proposed program are based on:

- Observation of existing visual resources from available roadways using Google Maps Street
   View.
- Observation of landscape patterns using Google Earth.
- Review of the proposed program in regard to compliance with state and local ordinances and regulations and professional standards pertaining to visual quality.
- The Corps has published a Visual Resources Assessment Procedure (VRAP) (Environmental
  Laboratory 88-1) for determining the visual resource effects of water resource projects, but the
  VRAP was not used in this analysis because the VRAP is heavily dependent on site-specific detail,
  which is not necessarily meaningful at a programmatic level. However, the assessment methodology
  and terminology used for this analysis is very similar to the VRAP. Both involve the following steps:
- Establishment of a baseline that describes the existing character and quality of visual resources;
- Assessment of visual resource effects that would occur as a result of the proposed program;
- Evaluation of the beneficial or adverse nature of the visual effects; and
- Recommendation of changes in design or mitigation measures to lessen adverse visual effects.
- The methodology utilized for this analysis is robust and provides a sound means of analyzing
   impacts under NEPA and CEQA.

### 28 17.4.2 Significance Criteria

- For this analysis, an effect pertaining to aesthetics was considered significant if it would result in
   any of the following environmental effects, which are based on professional practice and State CEQA
   Guidelines Appendix G (14 California Code of Regulations Sections 15000 et seq.):
- Cause a substantial, demonstrable negative aesthetic effect on a scenic vista or view open to the
   public.
- Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings,
   and historic buildings within a state scenic highway.
- Substantially degrade the existing visual character or quality of the site and its surroundings.

Create a new source of substantial light or glare that would adversely affect day or nighttime
 public views.

### 3 17.4.2.1 Professional Standards

Professional standards result from professional and direct expertise gained by staff working on
visual analyses and consulting with other experienced staff, subconsultants, and clients on visual
effects, including knowledge gained from public input on a broad range of projects. The effects
listed represent collective knowledge that is professionally agreed upon and represents common,
general public concerns. According to professional standards, a project may be considered to have a
significant effect if it would substantially:

- 10 Conflict with local guidelines or goals related to visual quality.
- Alter the existing natural viewsheds, including changes in natural terrain.
- Alter the existing visual quality of the region or eliminate visual resources.
- 13 Increase light and glare in the project vicinity.
- Result in backscatter light into the nighttime sky.
- Result in a reduction of sunlight or introduction of shadows in community areas.
- Obstruct or permanently reduce visually important features.
- Result in long-term (that is, persisting for 2 years or more) adverse visual changes or contrasts
   to the existing landscape as viewed from areas with high visual sensitivity.
- 19 The proposed program would not result in backscatter light into the nighttime sky, and would not 20 result in a reduction of sunlight or introduction of shadows in community areas. Therefore, the fifth 21 and sixth standards are not discussed further in this analysis.

## **17.5 Effects and Mitigation Measures**

### 23 **17.5.1** Alternative 1—No Action

Without the proposed program, aesthetics are expected to remain similar to existing conditions. The 24 25 visual character could change in the event of levee failure during flooding. Catastrophic flooding has 26 the potential to destroy vegetation, infrastructure, and development. However, current policy under 27 the Corps' Rehabilitation and Inspection Program is to protect eroding sites during emergencies and 28 to rehabilitate and repair Public Law 84-99 eligible (active status) levees that are damaged during 29 flood events. Erosion on banks often has the potential to create situations where there are small 30 earthslides that take vegetation with them. However, this is part of a natural functioning river 31 system and vegetation more often than not will re-colonize such sites over time. These areas often 32 create areas of visual interest, but at erosion sites that are roughly 500 feet or larger, the loss of 33 bank and vegetation due to erosion would be highly visible. Such a large site is likely to fall under 34 emergency repair and be rocked, and unlikely to be evaluated for vegetative and instream woody 35 material (IWM) environmental compensation.

### **17.5.2 Alternative 2A—Low Maintenance**

### 2 Effect VIS-1: Temporary Visual Effects Caused by Construction Activities

Construction under this alternative would create temporary and permanent changes in views of and
 from the program area. Construction activities would require staging and the use of considerable
 heavy equipment and associated vehicles, including dozers, graders, cranes, scrapers, and trucks,
 adversely affecting views of adjacent residents, recreational users, motorists, and businesses. The
 equipment would be visible throughout the construction season. Presence of the equipment would
 temporarily degrade the visual quality of the program area. However, because this effect is
 temporary, would last no longer than the construction duration, and is limited to small portions of

- 10 the larger river corridor, it would not substantially degrade the visual quality of the program area.
- 11 Residential viewer groups in the program area and vicinity are not accustomed to seeing
- 12 construction activities and equipment, and sensitivity to such effects would be high. Recreational
- 13 users would have scenic views disrupted during construction while visiting areas that are often
- 14 appreciated for their high scenic qualities. Effects on roadway users would be significant because
- 15 many local roadways are located on the levees in the program area.
- In addition to the presence of construction equipment, construction of the levee embankment would
   require the removal of all vegetation within the construction footprint. All vegetation within 15 feet
   of the waterside toe would be removed during construction, in addition to the vegetation that would
   be removed for construction access and staging. The removal of mature landscape and native trees
   will substantially change the aesthetic qualities of the area. This effect would be significant.
- 21 As discussed in Chapter 2, Project Description, the environmental analysis in this EIS/EIR is 22 programmatic in nature, analyzing the 80,000 LF in its entirety. Additional project-level 23 environmental documentation, tiering from this programmatic analysis, will be conducted to 24 address erosion sites that will be constructed. Where construction areas are located in proximity to 25 residences, Mitigation Measure VIS-MM-1 may be implemented to help mitigate the effect of the 26 presence of construction equipment and staging areas on residential viewers. However, even with 27 the potential implementation of Mitigation Measure VIS-MM-1, construction activities and the 28 removal of vegetation would be a significant and unavoidable effect on all viewer groups. Under 29 Alternative 2A, trees and other vegetation cannot be replanted to reduce the severity of this short-30 and long-term effect.

# 31Mitigation Measure VIS-MM-1: Install Temporary Visual Barriers between Construction32Zones and Residences and Maintain Construction Sites and Staging Areas in an Orderly33Fashion

34 To obstruct undesirable views of construction activities from residence backyards and front 35 yards that abut the project sites, the program proponent or the contractor may install fencing 36 (such as chain link with slats or fencing made of windscreen material) or other structures. The 37 fencing would be a minimum of 7 feet high to help maintain residents' privacy. In addition, 38 construction sites and staging areas will be maintained in a neat and orderly fashion. The 39 construction sites and staging areas will also be managed to be kept free of debris and trash to 40 the degree possible. The construction sites and staging areas will be left in a clean state upon 41 completion of construction.

### 1 Effect VIS-2: Substantially Adversely Affect a Scenic Vista

2 The program area is filled with scenic vistas. Major roads traversing the program area act as 3 gateways and offer unique vistas of the contrasting landscape features. Development and the high-4 rise buildings of West Sacramento and Sacramento that tower over agricultural fields are softened 5 by the lush riparian corridors that line the waterways. Vistas from the waterways are mostly not 6 present because the levees and, in places, development, preclude views beyond the water channel. 7 The majority of locations in Regions 1a, 1b, and 2 would require removal of all vegetation within 15 8 feet of the levee toe. Some locations within those regions and most locations in Region 3 have areas 9 where vegetation beyond a 15-foot vegetation-free zone (VFZ) would be allowed to remain and/or 10 have space to support vegetative and IWM environmental compensation. Removal of vegetation 11 within 15 feet of the levee toe would open up additional vistas from levee roadways and vantages 12 adjacent to erosion sites. Removal of vegetation at erosion sites, as perceived from vantages outside 13 the program area, would not be very noticeable because bank erosion sites would be scattered 14 within the program area and actions would take place over time, starting with erosion sites 15 determined to be most critical. According to the 2009 80,000 LF Final Alternatives Report prepared 16 by Kleinfelder-Geomatrix, the lengthiest site is 8,500 feet (1.6 miles) and the majority are less than 17 2,000 feet (0.4 mile) (Kleinfelder-Geomatrix 2009). Changes at the erosion sites from vantages 18 outside the program area would not be very noticeable due to distance from the program area, 19 length of erosion sites, and existing gaps that presently exist. Therefore, the proposed program 20 would have a less-than-significant effect on scenic vistas.

# Effect VIS-3: Substantially Damage Scenic Resources, including, but Not Limited to, Trees, Rock Outcroppings, and Historic Buildings along a Scenic Highway

SR 160 is a state-designated scenic highway and is located within Regions 1a and 1b. Table 17-2 lists
 erosion sites identified in the survey of erosion sites along the Sacramento River that would affect
 scenic views from SR 160. The erosion sites at river mile (RM) 35.3R and 35.4R would not be visible

26 from SR 160 where the roadway deviates from the river's edge and travels through orchards.

Region	Site	Length (feet)
Region 1a	RM 21.5L	159
Region 1b	RM 22.5L	852
	RM 22.7L	311
	RM 23.2L	589
	RM 23.3L	256
	RM 24.8L	781
	RM 25.2L	304
	RM 31.6R	442
	RM 38.5R	360
RM = river mile		
Source: U.S. Army Corp	s of Engineers 2009, Appendix D	

### 27 Table 17-2. Erosion Sites and Lengths along the Sacramento River and SR 160

29 Removal of all vegetation within the levee footprint and 15 feet of the levee toe constitutes a drastic

30 change to the vegetation and scenic resources, particularly large trees, along the roadway corridor.

31 While vegetation beyond a 15-foot VFZ would be allowed to remain, the majority, if not all, of the

<sup>28</sup> 

- 1 erosion sites where the proposed program would affect views from SR 160 do not have such areas
- 2 and would result in complete vegetation removal at erosion site. This complete removal would
- 3 create and/or help to expand contrast sharply from the existing visual landscape and degrade the
- 4 quality of views from SR 160. Similar effects are likely to result in counties in the program area that
- 5 have designated scenic routes. Therefore, the proposed program would have a significant and
- 6 unavoidable effect on scenic resources along designated scenic highways. There is no available
   7 mitigation. This effect occurs for a state-designated scenic highway in Regions 1a and 1b. This effect
- 8 may also occur along county-designated scenic routes, which would be identified during project-
- 9 level analysis, for all regions.

# Effect VIS-4: Substantially Degrade the Existing Visual Character or Quality of the Site and Its Surroundings

- Major roads through the program area are aligned on levee tops, cross over affected waterways, or are in sufficiently close proximity to have views of the program area. Residential and commercial developments also often have direct views of the program area. Lush riparian corridors that line the waterways soften the appearance of development and the high-rise buildings of West Sacramento and Sacramento that tower over agricultural fields.
- 17 The lower American River in Region 1b is a federal- and state-designated Wild and Scenic River 18 classified as "recreation". There is one erosion site at RM 7.3 that is 426 feet long (U.S. Army Corps of 19 Engineers 2009). The erosion site survey states that erosion at this site is minor and may not need 20 repair unless the levee crest is widened. Therefore, it is likely that there would be no effect or minor 21 visual alterations on the designated waterway. Removal of all vegetation within the levee footprint 22 and 15 feet of the levee toe constitutes a drastic visual change at these locations. While vegetation 23 beyond a 15-foot VFZ would be allowed to remain, the majority of waterways in the program area 24 do not have such areas and complete vegetation removal at these erosion sites would result. Even in 25 areas where there is adequate area to support vegetative and IWM environmental compensation, 26 complete vegetation removal would still occur on the levee slope and within 15 feet of the levee toe 27 at erosion sites. This complete removal would contrast sharply with the existing visual landscape, 28 alter the visual character from one that is vegetated with large trees and shrubs to one that is rocked 29 and grassed, and degrade the overall visual quality. These changes in views would be perceived by 30 all viewer groups. Therefore, the proposed program would have a long-term significant and 31 unavoidable effect on the existing visual character and quality of the site and its surroundings. There 32 is no available mitigation.

### 33 Effect VIS-5: Create a New Source of Light or Glare

34 The proposed program will not add any new sources of light. Removal of trees and shrubs and 35 replacement with rock and grass would be visible on the landside and waterside of the levees to all 36 adjacent viewer groups. This would increase glare by removing trees that are green in the spring 37 and summer, when grass is brown, and remove shade that helps decrease glare on levee, roadway, 38 and water surfaces. The change would also affect glare in the winter months to a slightly lesser 39 degree because, while surfaces are not shaded as much when trees have lost their leaves, the sun is 40 generally less intense and is at a lower angle during this time of year, and daylight hours are shorter. 41 This effect would be significant to all viewer groups in direct contact (i.e., travelers on levee 42 roadways, adjacent residents and business, and recreational users of waterways and levees) with 43 locations affected by the proposed program. This effect would be significant and unavoidable. There 44 is no available mitigation.

# 1**17.5.3**Alternative 3A—Maximize Meander Zone2(Environmentally Superior Alternative)

### 3 Effect VIS-1: Temporary Visual Effects Caused by Construction Activities

This effect would the same as under Alternative 2A. In addition, construction of a new setback levee
adjacent to the existing levee could require the displacement and demolition of residences and
businesses and alter roadway alignments. Displacement would heighten sensitivity among residence
and business viewer groups by physically removing select viewers from their existing vantage
points and relocating them. This displacement would cause highly negative perceptions for the
remaining neighboring viewers.

- Construction of an adjacent levee using the existing levee would likely displace agricultural fields,
   orchards, or development, and alter roadway alignments, similar to effects of a setback levee;
   however, an adjacent levee would have a smaller footprint than a setback levee and, because
   structures are often set back from the levee would require less displacement.
- 13 structures are often set back from the levee, would require less displacement.
- Physical demolition of residences and businesses would add to the already heightened negative perception of the proposed program because of the finality of the action that was initiated with displacement, in addition to creating a visual eyesore during such activities. This effect would be significant. While implementation of Mitigation Measure VIS-MM-1 would help mitigate some of the effect of construction equipment on residential viewers, construction activities and the removal of vegetation would be a significant and unavoidable effect on all viewer groups.

### 20 Effect VIS-2: Substantially Adversely Affect a Scenic Vista

- The program area is filled with scenic vistas. Major roads through the program area act as gateways and offer unique vistas of the contrasting landscape features. Development and the high-rise buildings of West Sacramento and Sacramento that tower over agricultural fields are softened by the lush riparian corridors that line the waterways. A new setback levee adjacent to the existing levee could alter roadway alignments and introduce a large mass that would block views of the vegetated waterways, affecting vistas from all vantages. There is no available mitigation.
- 27 In instances where an adjacent levee is constructed using the existing levee, it is likely that 28 agricultural fields, orchards, or development would be displaced, and that roadway alignments 29 would be altered. However, removal of vegetation within 15 feet of the levee toe would also open up 30 additional vistas from levee roadways and vantages adjacent to erosion sites. Changes at the erosion 31 sites from vantages outside the program area would not be very noticeable, and would be similar to 32 Alternative 2A due to the distance from the program area, length of erosion sites, and gaps that currently exist. However, because some setback levees would be constructed as part of this 33 34 alternative and would affect vistas from all vantages, this effect would be significant and 35 unavoidable. There is no available mitigation.

## Effect VIS-3: Substantially Damage Scenic Resources, including, but Not Limited, to Trees, Rock Outcroppings, and Historic Buildings along a Scenic Highway

- 38 SR 160 is a state-designated scenic highway and is located within Regions 1a and 1b. A new adjacent
- 39 levee or setback levee adjacent to the existing levee would alter the alignment of SR 160 and county-
- 40 designated scenic routes and take away highly valued views of adjacent waterways. This effect

1 would be significant and unavoidable. There is no available mitigation. A state-designated scenic

- 2 highway in Regions 1a and 1b would be affected. This effect may also occur along county-designated
- 3 scenic routes, which would be identified during project-level analysis, for all regions.

## 4 Effect VIS-4: Substantially Degrade the Existing Visual Character or Quality of the Site and Its 5 Surroundings

6 In areas where a setback levee is constructed, Alternative 3A would introduce a new levee in the 7 viewshed of all viewer groups. Major roads through the program area are aligned on levee tops, 8 cross over affected waterways, or are in sufficiently close proximity to have views of the program 9 area. Residential and commercial development also often has direct views of the program area. After 10 a project is constructed, these viewers would see a levee where residences, businesses, agricultural 11 fields, or vegetation once existed, resulting in a negative visual shift in character. Lush riparian 12 corridors that line the waterways softened the appearance of development and the high-rise 13 buildings of West Sacramento and Sacramento that tower over agricultural fields. For areas where 14 an adjacent levee is constructed, removal of all vegetation within the levee footprint and 15 feet of 15 the levee toe would constitute a drastic visual change at these locations. While vegetation beyond 16 the 15-foot VFZ would be allowed to remain, the majority of waterways in the program area do not 17 have such areas and the result would be complete vegetation removal at erosion sites. Even in sites 18 where there is area to support vegetative and IWM environmental compensation, complete 19 vegetation removal would still occur on the levee slope and within the levee footprint and 15 feet of 20 the levee toe at erosion sites. This complete removal would contrast sharply from the existing visual 21 landscape, alter the visual character from one that is vegetated with large trees and shrubs to one 22 that is rocked and grassed, and degrade the overall visual quality. These changes in views would be 23 perceived by all viewer groups. Therefore, the proposed program would have a long-term significant 24 and unavoidable effect on the existing visual character and quality of the site and its surroundings. 25 There is no available mitigation.

### 26 Effect VIS-5: Create a New Source of Light or Glare

A new setback levee adjacent to the existing levee, or an adjacent levee, would introduce a new
visual feature in the environment and could displace agricultural fields, orchards, or development. A
new setback levee would not introduce new sources of light, but it would introduce a large surface
of grass and rock, increasing glare for all viewer groups. This effect would be significant and
unavoidable. There is no available mitigation.

# 17.5.4 Alternative 4A—Habitat Replacement (Preferred Alternative)

- 34 Effect VIS-1: Temporary Visual Effects Caused by Construction Activities
- 35 This effect would be the same as under Alternative 3A.

### 36 Effect VIS-2: Substantially Adversely Affect a Scenic Vista

37 This effect would be similar to the effect under Alternative 3A, but at a lesser magnitude because

38 Bank Protection Measure 4 implements vegetative and IWM environmental compensation. Under

- 39 Bank Protection Measure 4, constructed benches would be planted with riparian vegetation, and
- 40 revegetation would occur in areas where setback levees and adjacent levees are constructed to

1 partially restore scenic resources, as seen from a scenic vista. However, there would still be

- substantial damage to views seen from scenic vistas, and restored areas would take time for new
   vegetation to mature. Therefore, this effect would be significant and unavoidable. There is no
- 4 available mitigation.

# 5 Effect VIS-3: Substantially Damage Scenic Resources, including, but Not Limited to, Trees, 6 Rock Outcroppings, and Historic Buildings along a Scenic Highway

- 7 This effect would be similar to the effect under Alternative 3A, but at a lesser magnitude because
- Bank Protection Measure 4 implements vegetative and IWM environmental compensation. Under
   Bank Protection Measure 4, constructed benches would be planted with riparian vegetation, and
- 10 revegetation would occur in areas where setback levees and adjacent levees are constructed to
- 11 partially restore scenic resources. However, there would still be substantial damage to scenic
- resources, and restored areas would take time for new vegetation to mature. Therefore, this effect
   would be significant and unavoidable. A state-designated scenic highway in Regions 1a and 1b
- 14 would be affected. This effect may also occur along county-designated scenic routes for all regions.

# Effect VIS-4: Substantially Degrade the Existing Visual Character or Quality of the Site and Its Surroundings

17 Removal of all vegetation within the levee footprint and 15 feet of the levee toe at sites where bank 18 protection measures 2 through 5 would be implemented constitutes a drastic visual change. While 19 vegetation beyond the 15-foot VFZ would be allowed to remain, the majority of waterways in the 20 program area do not have such areas and would result in complete vegetation removal at erosion 21 sites. Even in sites where there is area to support vegetative and IWM environmental compensation, 22 under bank protection measure 4, complete vegetation removal would still occur on the levee slope 23 and within 15 feet of the levee toe at erosion sites. This complete removal would contrast sharply 24 from the existing visual landscape, alter the visual character from one that is vegetated with large 25 trees and shrubs to one that is rocked and grassed, and degrade the overall visual quality. In 26 addition, new vegetation would take time to mature in restored areas. These changes in views would 27 be perceived by all viewer groups. Therefore, the proposed program would have a long-term 28 significant and unavoidable effect on the existing visual character and quality of the site and its 29 surroundings. There is no available mitigation.

### 30 Effect VIS-5: Create a New Source of Light or Glare

- This effect would be similar to the effect under Alternative 3A. Bank Protection Measure 4 would not introduce new sources of light and would help to reduce glare, over time, as newly planted vegetation matures to provide shade and cover. However, a new setback levee adjacent to the existing levee and adjacent levees would introduce new visual features in the environment and likely displace agricultural fields, orchards, or development. While this could reduce nighttime light to a small degree, it would introduce a large surface of grass and rock, increasing glare for all viewer
- 37 groups. This effect would be significant and unavoidable. There is no available mitigation.

# 17.5.5 Alternative 5A—Habitat Replacement Reaching Environmental Neutrality

### 3 Effect VIS-1: Temporary Visual Effects Caused by Construction Activities

4 This effect would be the same as under Alternative 4A.

#### 5 Effect VIS-2: Substantially Adversely Affect a Scenic Vista

6 This effect would be the same as under Alternative 4A. Although fewer setback levees would be

constructed under this alternative, scenic vistas would still be permanently altered, and there is no
available mitigation.

## 9 Effect VIS-3: Substantially Damage Scenic Resources, including, but Not Limited, to Trees, 10 Rock Outcroppings, and Historic Buildings along a Scenic Highway

11 This effect would be similar to the effect under Alternative 4A. Bank Protection Measure 4 would 12 implement vegetative and IWM environmental compensation in areas where setback levees and 13 adjacent levees are constructed to partially restore scenic resources. Even though fewer setback 14 levees would be constructed under this alternative, there would still be substantial damage to scenic 15 resources, and new vegetation would take time to mature in restored areas. Therefore, this effect would be significant and unavoidable. A state-designated scenic highway in Regions 1a and 1b 16 17 would be affected. This effect may also occur along county-designated scenic routes, which would be 18 identified during project-level analysis, for all regions.

## Effect VIS-4: Substantially Degrade the Existing Visual Character or Quality of the Site and Its Surroundings

- 21 This effect would be similar to the effect under Alternative 4A. While vegetation beyond the 15-foot 22 VFZ would be allowed to remain, vegetation removal within the VFZ would be implemented under 23 Bank Protection Measures 2 through 5. This would constitute a drastic visual change because the 24 majority of waterways in the program area do not have vegetated areas beyond the VFZ. The result 25 would be complete vegetation removal at erosion sites. Bank Protection Measure 4 would 26 implement vegetative and IWM environmental compensation in areas where setback levees and 27 adjacent levees are constructed to partially restore scenic resources. However, fewer setback levees 28 would be constructed under this alternative, and new vegetation would take time to mature in 29 restored areas. Therefore, this alternative would still result in substantial damage to the existing 30 visual character, and these changes in views would be perceived by all viewer groups. The proposed 31 program would have a long-term significant and unavoidable effect on the existing visual character
- 32 and quality of the site and its surroundings. There is no available mitigation.

### 33 Effect VIS-5: Create a New Source of Light or Glare

34 This effect would be similar to the effect under Alternative 4A. Bank Protection Measure 4 would

- 35 introduce no new sources of light and would help to reduce glare, over time, as newly planted
- 36 vegetation matures to provide shade and cover. However, fewer setback levees would be
- 37 constructed under this alternative. The new setback levee adjacent to the existing levee and adjacent
- 38 levees would introduce new visual features in the environment and likely displace agricultural
- 39 fields, orchards, or development. While this could reduce nighttime light to a small degree, it would

introduce a large surface of grass and rock, increasing glare for all viewer groups. Therefore, this
 effect would be significant and unavoidable. There is no available mitigation.

# 17.5.6 Alternative 6A—Habitat Replacement with Vegetation ETL Variance

### 5 Effect VIS-1: Temporary Visual Effects Caused by Construction Activities

6 This effect would be comparable in type to Alternative 4A, but at a lesser magnitude because there 7 would be no bank fill stone protection with no on-site vegetation or adjacent levees constructed. 8 Mitigation Measure VIS-MM-1 would lessen this affect, but it would still be considered significant 9 and unavoidable, because there would still be intensive vegetation removal, earthwork, and 10 construction related to the adjacent levees, riparian and wetland benches with revegetation, and 11 bank fill stone protection with on-site vegetation. There is no available mitigation.

### 12 Effect VIS-2: Substantially Adversely Affect a Scenic Vista

13 This effect would be comparable in type as it would be under Alternative 4A, but at a lesser 14 magnitude. Vegetation would not be removed within the VFZ, but would be allowed to remain on the 15 levee, and adjacent levees would not be constructed. Therefore, this effect would be less than 16 significant.

# Effect VIS-3: Substantially Damage Scenic Resources, including, but Not Limited to, Trees, Rock Outcroppings, and Historic Buildings along a Scenic Highway

19 This effect would be similar to the effect under Alternative 4A, but at a lesser magnitude because 20 vegetation would be allowed to remain on levees within the VFZ and many sites would have 21 vegetation restored through Bank Protection Measure 4. However, there would still be substantial 22 damage to scenic resources with the removal of vegetation. Construction of setback levees and 23 riparian and wetland benches would affect scenic resources because they would require vegetation 24 removal to construct and introduce a new or modified landform. New vegetation would take time to 25 mature and appear more natural and closer to existing conditions in restored areas. Placement of 26 bank fill stone protection where none previously existed would alter views of earthen or vegetated 27 banks, even with selected on-site vegetation remaining. Therefore, this effect would be significant 28 and unavoidable. A state-designated scenic highway in Regions 1a and 1b would be affected. This 29 effect may also occur along county-designated scenic routes, which would be identified during 30 project-level analysis, for all regions.

# Effect VIS-4: Substantially Degrade the Existing Visual Character or Quality of the Site and Its Surroundings

33 Under Alternative 6A, a number of bank protection measures would involve protection of existing 34 vegetation and placement of on-site mitigation vegetation within the VFZ. However, many of the 35 erosion sites would still have vegetation removed as part of construction, which would degrade the 36 existing visual character. Construction of setback levees and riparian and wetland benches would 37 affect scenic resources because they would require vegetation removal to construct and introduce a 38 new or modified landform. New vegetation would take time to mature and appear more natural and 39 closer to existing conditions in restored areas. Placement of bank fill stone protection where none 40 previously existed would alter views of earthen or vegetated banks, even with selected on-site

vegetation remaining. This effect is considered significant and unavoidable. There is no available
 mitigation.

### 3 Effect VIS-5: Create a New Source of Light or Glare

4 Erosion sites where low riparian benches with revegetation are constructed would create a new 5 source of light and glare in the same manner as under Alternative 4A, but would be of a lesser 6 magnitude in areas where existing vegetation is protected. Bank Protection Measure 4 would help to 7 reduce glare, over time, as newly planted vegetation matures to provide shade and cover. However, 8 the new setback levee adjacent to the existing levee and adjacent levees would introduce new visual 9 features in the environment and likely displace agricultural fields, orchards, or development. While 10 this could reduce nighttime light to a small degree, it would introduce a large surface of grass and 11 rock, increasing glare for all viewer groups. This effect would be significant and unavoidable. There 12 is no available mitigation. 13

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|                          | Chapter 18                   |
|--------------------------|------------------------------|
| <b>Public Health and</b> | <b>Environmental Hazards</b> |

## **18.1 Introduction and Summary**

This chapter describes the environmental setting associated with public health and environmental
hazards, the determination of effects, the environmental effects associated with public health and
environmental hazards that would result from implementation of the proposed program, and the
mitigation measures that would reduce these effects.

- 8 The key sources of data and information used in the preparation of this chapter are listed below.
- 9 Program area county general plans.
- 10 American River Parkway Plan (Sacramento County 2008).
- 11 Existing Sacramento River Bank Protection Project (SRBPP) documents:
  - Draft Environmental Assessment/Initial Study for Levee Repair of 25 Erosion Sites: Sacramento River Bank Protection Project (U.S. Army Corps of Engineers 2009).
    - Final Environmental Assessment/Initial Study for the Erosion Repairs of 13 Bank Protection Sites, 2008 and 2009: Sacramento River Bank Protection Project, Sacramento River and Tributaries, California (U.S. Army Corps of Engineers 2008).
- Environmental Assessment/Initial Study for Five Critical Erosion Sites, River Miles 26.9 Left,
   34.5 Right, 72.2 Right, 99.3 Right, and 123.5 Left Sacramento River Bank Protection Project,
   Draft (U.S. Army Corps of Engineers 2006a).
- 20•Environmental Assessment for levee repair of 14 Winter 2006 critical sites, Sacramento21River Bank Protection Project, Final Report (U.S. Army Corps of Engineers 2006b).
- California Department of Toxic Substances Control Envirostor database. (California Department of Toxic Substances Control 2007)
- Table 18-1 summarizes the public health and environmental hazards effects resulting from theimplementation of the proposed program.
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#### Table 18-1. Summary of Public Health and Environmental Hazards Effects and Mitigation

Effect	Mitigation Measures	Implementation Period
PH-1: Temporary Exposure to or Release of Hazardous Materials during Construction	None required	Not applicable
PH-2: Exposure of the Environment to Hazardous Materials during Ground- Disturbing Activities	WQ-MM-2: Implement Measures to Maintain Surface Water and Groundwater Quality; PH-MM-1: Employ a Toxic Release Contingency Plan	During construction

Effect	Mitigation Measures	Implementation Period	
PH-3: Temporary Exposure to Safety Hazards from the Construction Site	PH-MM-2: Implement Construction Site Safety Measures; PH-MM-3: Implement an Emergency Response Plan	During construction	
PH-4: Exposure of People or Structures to Increased Flood Risk	None required	Not applicable	
PH-5: Potential for Higher Frequency of Collision between Aircraft and Wildlife	Mitigation Measure PH-MM-4: Design and Manage Habitat Created by Setback Levees Such That It Does Not Attract Wildlife Known to Collide with Aircraft	During project-level design, construction, and O&M	

# **1 18.2 Environmental Setting**

## 2 **18.2.1** Existing Conditions

#### 3 18.2.1.1 Hazardous Materials

Hazardous materials are chemicals and other substances defined as hazardous by federal and state
laws and regulations. In general, these materials are substances that, because of their quantity,
concentration, or physical, chemical, or infectious characteristics, may have harmful effects on
public health or the environment during their use or when released to the environment. Hazardous
materials also include waste chemicals and spilled materials.

#### 9 **Potential Sources of Hazardous Materials**

The program area levee reaches are located in urban, suburban, and rural areas. Potential sources of
 hazardous materials and waste may exist in the urbanized as well as agricultural areas adjacent to
 the levees. Hazardous materials may be present in the program area in a variety of common
 contexts, including:

- Pesticides, herbicides, and fertilizers associated with agricultural lands.
- 15 Petroleum hydrocarbons.
- 16 Underground storage tanks.
- 17 Contaminated debris.
- 18 Lead associated with paints and structures.
- 19 Wastewater.
- Pits or ponds.
- Stormwater runoff structures.
- Transformers that may contain polychlorinated biphenyls (PCBs).

#### 1 Known Sources of Hazardous Materials

2 The Department of Toxic Substances Control's (DTSC's) Envirostor database provides access to 3 detailed information on hazardous waste permitted and corrective action facilities within California, 4 as well as existing site cleanup information. According to the Envirostor Database, the following 5 known sources of hazardous materials are located adjacent to or along program levees, and consist 6 of federal superfund, state response, military evaluation, evaluation sites, voluntary cleanup, and 7 permitted hazardous waste sites (California Department of Toxic Substances Control 2007). 8 Evaluation sites are typically 1) in the preliminary phase of a site investigation, 2) were found to 9 have no contamination, and/or 3) were referred to another agency or program. The sites located 10 within the program area have been organized by program region in Table 18-2.

#### 11 Table 18-2. Known Hazardous Materials Sources in Program Area

Region	Site Name	County	DTSC Category	
1a	Rio Vista Storage	Solano	Military, inactive	
1a	Rio Vista Army Reserve Center	Solano	State response, certified	
1a	Yolo County Central Landfill	Yolo	Evaluation site	
1a	Old Bryte Landfill	Yolo	Evaluation site	
1b	Clark Trucking	Yolo	Evaluation site	
1b	Ramos Environmental Service	Yolo	Evaluation site	
1b	PG&E Manufactured Gas Plant	Sacramento	Evaluation site, inactive	
1b	PG&E Sacramento Site	Sacramento	State response, active	
1b	Sacramento Housing and Redevelopment Agency	Sacramento	State response, certified	
1b	Caltrans, I-5 Q Street Off-ramp	Sacramento	State response, certified, land use restrictions	
1b	SMUD, Front and T Streets	Sacramento	State response, certified, land use restrictions	
1b	The Docks Area Sacramento EOA	Sacramento	Voluntary cleanup site, active	
1b	Van Waters and Rogers, Inc.	Yolo	Evaluation site	
1b	Westco Technologies	Yolo	Evaluation site	
1b	Capitol Plating Corporation	Yolo	State response, active	
1b	Jibboom Building	Sacramento	Voluntary cleanup site, certified	
1b	Jibboom Junkyard	Sacramento	Federal Superfund site, certified	
1b	Sacramento Signal Depot	Sacramento	Military evaluation	
1b	Sac ENGR Area-Weir Area	Yolo	Military evaluation	
2	Onstott Dusters Inc./Sutter Co Airport	Sutter	Evaluation site	
2	PG&E Manufactured Gas Plant	Yuba	Evaluation site, inactive	
2	PG&E Marysville	Yuba	Voluntary cleanup site, certified, land use restrictions	
2	Triangle Engineering	Yuba	Evaluation site	
2	Lomo Airstrip	Sutter	State response, de-listed	
2	PG&E MGP, Colusa	Colusa	State response site, active	
3	Delta Industries	Colusa	Evaluation site	
3	Colusa-Sacramento River State Recreation	Colusa	Evaluation site	
3	Davies Oil Company	Colusa	Evaluation site	
3	Allen Property Burn Piles	Butte	Voluntary cleanup site, certified	
Source: Department of Toxic Substances Control 2007.				

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#### 2 18.2.1.2 Agricultural Lands

The program area has large tracts of agricultural lands throughout the counties in the program area. Agricultural lands are known to have various pesticides, herbicides, and fertilizers in their soils, and can pose a risk to local and regional water quality because these areas are largely considered floodplain for the Sacramento River. The river elevation fluctuates seasonally and the groundwater elevation is assumed to fluctuate with river levels. During periods of low flow, it is likely that groundwater flows from agricultural lands toward the river and that any contaminated water could

9 be transported to the soils within and near the levees.

#### 10 **18.2.1.3** Wildland Fires

11 The large areas of undeveloped, agricultural, and forested land in the program area pose a serious 12 risk for wildland fires. These areas are largely agricultural lands that have been left fallow or lands 13 that are composed primarily of annual grasses that become dry during summer months, which 14 raises the risk of grassland fire. Areas of this type are found throughout the program area; however, 15 wildland fire risk is increased in rural locations.

- Various city and county agencies are responsible for controlling and responding to wildland fires.
   For areas that are incorporated into cities and towns within the program area, city fire departments
- 18 are responsible for responding to fires. Many unincorporated areas have formed fire districts that
- 19 are primarily protected by county fire departments. Other entities involved in wildland fire
- 20 protection are the California Department of Forestry and Fire Protection and the U.S. Forest Service.
- 21 Some areas within the program area also have volunteer fire departments for fighting wildland fires.
- 22 Refer to Chapter 16, Utilities and Public Services, for a detailed discussion.

#### 23 **18.2.1.4** Emergency Response

- 24 Emergency response and evacuation services for the program area are provided by various
- departments in the counties and cities nearest to the program area, including, but not limited to,
   sheriff, fire, and emergency services departments.

#### 27 **18.2.1.5** Airport Safety

The Sacramento International Airport (SIA) and the Chico Municipal Airport serve the Sacramento
 Valley region, and are the airports that provide commercial flights in the program area. Other
 airports that serve the program are municipal, providing local flights and serving personal aircraft.

31 The SIA has one of the highest numbers of reported wildlife strikes with aircraft of all California

- 32 airports (Sacramento County Airport System 2009). Collisions between aircraft and wildlife
- compromise the safety of aircraft passengers and flight crews. In an attempt to reduce wildlife
- 34 collisions with aircraft, the Sacramento County Airport System has maintained and implemented the
- 35 Wildlife Hazard Management Plan (WHMP) for more than 10 years at the SIA. The plan identifies
- routine maintenance, hazardous wildlife habitat manipulation, and other land management
   activities as the most effective long-term preemptive measures for reducing wildlife hazards.
- As described in the Federal Aviation Administration's (FAA's) AC 150/5200-33B, *Hazardous Wildlife Attractants on or Near Airports*, the FAA recommends a separation distance of 10,000 feet between

- 1 the airport operations area and hazardous wildlife attractants (Federal Aviation Administration
- 2 2007); this area is identified as the Airport Critical Zone. Additionally, the FAA recommends a
- 3 distance of 5 statute miles<sup>1</sup> between the farthest edge of the airport operations area and hazardous
- 4 wildlife attractants (Federal Aviation Administration 2007). Open water and agricultural crops are
- recognized as being the greatest wildlife attractants in the SIA vicinity, and rice cultivation is
   considered the most incompatible agricultural crop because it necessitates flooding. Wildlife
- attractants near the runways are of greatest concern because, nationally, 74% of bird-aircraft strikes
- 8 occurred at or below 500 feet above ground level (Cleary et al. 2004). The area within a 10,000-foot
- 9 radius of the airport operations area is where arriving and departing aircraft are typically operating
- 10 at or below 2,000 feet, an altitude that also corresponds with most bird activity (Sacramento County
- 11 Airport System 2009).

# 12 18.3 Regulatory Setting

Appendix C, Regulatory Background, describes the federal, state, and local laws, regulations, and
 policies that pertain to public health and environmental hazards within the program area.

# 15 **18.4 Determination of Effects**

16 This section describes the effects analysis for the program relating to environmental hazards and 17 public health. It describes the methods used to determine the effects of the program and lists the 18 thresholds used to conclude whether an effect would be significant. Measures to mitigate (i.e., avoid, 19 minimize, rectify, reduce, eliminate, or compensate for) significant effects accompany each effect 20 discussion.

## 21 **18.4.1 Assessment Methods**

The evaluation of potential effects on public health and environmental hazards addresses the potential for health and safety hazards during construction of the levee improvements. The analysis includes evaluation of (1) the potential effects related to construction activities on workers, and (2) general safety of and hazards to both workers and the public posed by construction, operations and maintenance associated with implementation of the proposed program.

## 27 18.4.2 Significance Criteria

- 28 Criteria used for determining the significance of an effect on public health and environmental
- 29 hazards are based on the environmental checklist included in Appendix G (14 CCR 15000 *et seq*.) of
- 30 the State CEQA Guidelines as well as professional standards and practices. The proposed program
- 31 was considered to cause a significant effect if it would result in any of the following conditions.
- Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials.

<sup>&</sup>lt;sup>1</sup> A statute mile is a unit of length used in the United States, the United Kingdom, and certain other countries that is equal to 5,280 feet or 1.61 kilometers. The statute mile is commonly referred to as a *mile* or *land mile* and is used to distinguish a mile of 5,280 feet from the nautical mile of approximately 6,076 feet.

- Create a significant hazard to the public or the environment through reasonably foreseeable
   upset and accident conditions involving the release of hazardous materials to the environment.
- Emit hazardous emissions or involve handling hazardous or acutely hazardous materials,
   substances, or waste within one-quarter mile of an existing or proposed school.
- Be located on a site that is on a list of hazardous materials sites compiled pursuant to California
   Government Code 65962.5, and as a result would create a significant hazard to the public or the
   environment.
- Impair implementation of or physically interfere with an adopted emergency response plan or
   emergency evacuation plan.
- Place within a 100-year flood hazard area structures that would impede or redirect floodflows.
- Expose people or structures to a significant risk of loss, injury, or death involving flooding,
   including flooding as a result of the failure of a levee or dam.
- 13 Adversely affect drinking water quality.
- Result in a safety hazard for people residing or working in a project area that is located within 2
   miles of a public airport or public-use airport.
- The proposed program would not involve hazardous emissions or the handling of hazardous or
   acutely hazardous materials, substances, or waste within one-quarter mile of an existing or
   proposed school. In addition, the proposed program would not place structures within the 100-year
   flood hazard area. Therefore, the third and sixth criteria do not apply and are not addressed further
   in this analysis.
- For this analysis, airport safety was analyzed within the Airport Critical Zone and the airport operations area for the SIA. The FAA recommends a separation distance of 10,000 feet between the airport operations area and hazardous wildlife attractants (Federal Aviation Administration 2007); this area is identified as the Airport Critical Zone. Additionally, the FAA recommends a distance of 5 statute miles between the farthest edge of the airport operations area and hazardous wildlife attractants (Federal Aviation Administration 2007).

# **18.5 Effects and Mitigation Measures**

### 18.5.1 Alternative 1—No Action

- Under Alternative 1, no construction activities associated with the program would occur. Thus the
   proposed program would not result in accidental spills of hazardous materials, nor would there be
   any affect to emergency response, as there would be no interference with emergency response
   routes. Any public health or hazards effects related to ongoing O&M activities would not be different
   from current (baseline) conditions.
- However, without erosion improvements to the program area, the risk of levee failure would remain
   high. A levee failure within the SRBPP area could result in flooding that would upset stored
   hazardous materials and spread agricultural pesticides, oil, gasoline, and other hazardous materials
   in flood waters, creating hazardous conditions for the public and the environment. However, the
- 38 timing, duration, magnitude, and location for such an occurrence cannot be predicted.

## **1 18.5.2 Alternative 2A—Low Maintenance**

#### 2 Effect PH-1: Temporary Exposure to or Release of Hazardous Materials during Construction

3 Construction associated with Alternative 2A would involve the use of hazardous materials, such as 4 fuels and lubricants, associated with the operation of construction equipment and vehicles (i.e., 5 excavators, compactors, haul trucks, and loaders). Fuels and lubricants have the potential to be 6 released into the environment at construction sites and along haul routes, causing potential 7 environmental and/or human exposure to these hazards. The implementation of a stormwater 8 pollution prevention plan (SWPPP), which would be required by the State Water Quality Control 9 Board for any construction activities that disturb 1 acre or more, would ensure that this effect would 10 be less than significant by requiring the implementation of best management practices (BMPs) to prevent and/or minimize exposure to or release of hazardous materials. Some BMPs that could be 11 12 implemented by the Corps and its contractors include, but are not limited to, the following:

- Restrict the volume of petroleum products allowed onsite to the volume that can be addressed
   by the spill control and response measures included in the SPCCP;
- Store hazardous materials in staging areas at least 100 feet from streams and other water
   bodies and store the materials so that they cannot come into contact with stormwater, including
   providing a cover from the rain and elevating the material from the ground on pallets;
- Perform refueling and vehicle maintenance at least 100 feet from streams and other water
   bodies;
- Minimize equipment operations in flowing water;
- Inspect equipment to ensure that seals prevent any fuel, engine oil, or other fluids from leaking,
   and
- Dispose of soils contaminated with fuels or chemicals at an approved facility appropriate to the type and degree of contamination to prevent discharge to surface waters and in accordance with the rules and regulations of the U.S. Department of Transportation, the EPA, and the California Environmental Protection Agency (CalEPA).
- The SWPPP would also require regular inspections of BMPs to ensure that they are being
  maintained, to confirm that they are performing adequately, and to determine if additional or
  different BMPs should be implemented. Refer to Chapter 5, Water Quality and Groundwater
  Resources, for further description of SWPPP measures.
- Because the above measures would prevent or reduce the likelihood of significant soil and ground
   water contamination from occurring and would minimize the extent and severity of contamination
   that could occur, this effect would be less than significant, No mitigation is required.

# Effect PH-2: Exposure of the Environment to Hazardous Materials during Ground-Disturbing Activities

- 36 Clearing and grading would likely be required in order to access the erosion site and install
- 37 revetment along the levee slope and stream bank. This ground disturbance may expose humans or
- 38 the environment to contaminants that would otherwise remain buried in or near the levee.
- 39 Implementation of a SWPPP and an SPCCP would ensure that the risk of accidental exposures and
- 40 releases into the environment would be minimal and that the effect would be less than significant.

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- 1 However, if a release were to occur, Mitigation Measures WO-MM-2 and PH-MM-1 would be 2
  - implemented to ensure that water quality is returned to baseline conditions and that any threat to public health is responded to effectively.
- 4 Mitigation Measure WQ-MM-2: Implement Measures to Maintain Surface Water Quality 5 and Groundwater Quality.
- 6 Refer to Chapter 5, Water Quality and Groundwater Resources, for a detailed description of this 7 mitigation measure.

#### 8 Mitigation Measure PH-MM-1: Employ a Toxic Release Contingency Plan

9 The construction contractor will coordinate with regional and local planning agencies to 10 incorporate a toxic release contingency plan, pursuant to California Government Code Section 11 8574.16, which requires that regional and local planning agencies incorporate such a measure 12 within their planning. Implementation of this plan will ensure the effective and efficient use of 13 resources in the areas of traffic and crowd control; firefighting; hazardous materials response 14 and cleanup; radio and communications control; and provision of medical emergency services. 15 Implementation of this mitigation measure will ensure that this effect would be less than 16 significant.

#### 17 Effect PH-3: Temporary Exposure to Safety Hazards from the Construction Site

18 Construction associated with Alternative 2A would involve operation of vehicles and other 19 mechanical equipment by construction workers that, if used improperly, could result in safety 20 hazards at the construction site to workers and the public (i.e., pedestrians, bicyclists). Also, the 21 staging of the equipment outside the hours of operation (i.e., weekends, holidays, and overnight) 22 may pose a threat to public safety if the equipment is not properly secured. Implementation of 23 Mitigation Measures PH-MM-2 and PH-MM-3 would ensure this effect would be less than significant.

#### 24 Mitigation Measure PH-MM-2: Implement Construction Site Safety Measures

- 25 The construction contractor will ensure that all workers are properly trained to operate 26 equipment. Safety precautions will be followed at all times during construction to avoid 27 accidents. The construction contractor will also require that all workers have valid drivers' 28 licenses and insurance. Proper signage and detours will be provided to ensure public safety.
- 29 Mitigation Measure PH-MM-3: Implement an Emergency Response Plan
- 30 Development of an emergency response plan will ensure that any accidents that occur at the 31 construction site will be responded to appropriately. The construction contractor will develop 32 the emergency response plan, taking into consideration the location of nearby emergency
- 33 response agencies as well as emergency response access routes and response times.
- 34 Effect PH-4: Exposure of People or Structure to Increased Flood Risk

35 All levees have the potential to fail, regardless of design. The Corps has set forth guidelines for levee 36 design (EM-1110-2-1913). Alternative 2A would result in improved levees in the program area 37 through implementation of bank protection and erosion prevention methods that meet engineering

38 requirements set forth by both the Corps and the Central Valley Flood Protection BoardCVFPB. This would be an improvement compared with the existing flood protection. Therefore, this effect would
 be beneficial. No mitigation is necessary.

#### 3 Effect PH-5: Potential for Higher Frequency of Collision between Aircraft and Wildlife

Generally, the Airport Critical Zone surrounding SIA is used for agricultural purposes, a land use
 practice that is considered to attract hazardous wildlife. Implementation of Alternative 2A would
 not increase the amount of hazardous wildlife habitat because the only on-site vegetation to be

not increase the amount of nazardous wildlife habitat because the only on-site vegetation to be
 included in Alternative 2A implementation is mown grass. Because Alternative 2A does not increase

7 included in Alternative 2A implementation is mown grass. Because Alternative 2A does not increase

8 the amount of hazardous wildlife habitat, there would be no effect.

# 9 18.5.3 Alternative 3A—Maximize Meander Zone 10 (Environmentally Superior Alternative)

#### 11 Effect PH-1: Temporary Exposure to or Release of Hazardous Materials during Construction

12 These effects would be similar in type to those described above for Alternative 2A, but at a greater

13 magnitude due to the extensive amount of earthmoving and construction vehicles required to

14 construct a setback levee or adjacent levee, which would increase the chance of a hazardous

15 material spill. However, the implementation of a SWPPP would ensure that this effect would be less

16 than significant. No mitigation is required.

# Effect PH-2: Exposure of the Environment to Hazardous Materials during Ground-Disturbing Activities

19These effects would be similar in type to those described above for Alternative 2A, but at a greater20magnitude due to the extensive amount of earthmoving required to construct a setback levee or

21 adjacent levee, which would increase the chance of an exposure to, or release of, underground

22 contamination sources. However, implementation of a SWPPP would ensure that the risk of

23 accidental exposures and releases into the environment would be minimal and that the effect would

be less than significant. If a release were to occur, Mitigation Measures WQ-MM-2 and PH-MM-1

would be implemented to ensure that water quality is returned to baseline conditions and that any

26 threat to public health is responded to effectively.

#### 27 Effect PH-3: Temporary Exposure to Safety Hazards from the Construction Site

This effect would be similar in type to that described above for Alternative 2A. Implementation of
 Mitigation Measures PH-MM-2 and PH-MM-3 would ensure this effect would be less than significant.

#### 30 Effect PH-4: Exposure of People or Structure to Increased Flood Risk

31 This effect would be similar in type to that described above for Alternative 2A.

#### 32 Effect PH-5: Potential for Higher Frequency of Collision between Aircraft and Wildlife

Alternative 3A would create the potential for an increase in wildlife habitat because the construction

of setback levees would increase areas that could be replanted as mitigation for vegetation removal

35 at other erosion sites. Construction of adjacent levees, however, is not expected to result in a net

36 increase in wildlife habitat because under this measure, vegetation would be removed from the

37 landward side of the existing levee.

1 An analysis using geographic information systems and Google Earth was conducted to determine the 2 proximity of public airports to potential sites where the setback levees would be constructed. Of the 3 106 selected representative erosion sites along the Sacramento River and its tributaries, which 4 constitute a representative sample of the sites eventually to be treated under the supplemental 5 80,000 linear feet (LF), three potential setback levee sites are proposed within 5 miles (i.e., 26,400 6 feet) of a public airport. Specifically, all three potential setback levee sites are within the 5-mile 7 buffer of the Colusa County Airport (located 3 miles south of Colusa). New vegetation planted in the 8 setback areas and inundation of the setback areas would have the potential to provide wildlife 9 habitat that could increase the risk of wildlife strikes at Colusa County Airport.

10 As discussed in Chapter 2, Project Description, the number and extent of documented sites can 11 change from year to year because of various factors, including identification of new sites, increased 12 or decreased rates of erosion, repair of sites, reclassification of erosion sites to maintenance sites, 13 and removal of sites. As discussed in Chapter 2, Project Description, the environmental analysis in 14 this EIS/EIR is programmatic in nature, analyzing the 80,000 LF in its entirety. Additional project-15 level environmental documentation, tiering from this programmatic analysis, will be conducted to 16 address erosion sites that will be constructed within the 5-mile buffer of any public airport. Because 17 Alternative 3A involves the construction of setback levees within the 5-mile buffer that could 18 potentially increase habitat that would attract wildlife known to collide with aircraft (e.g., waterfowl 19 [Federal Aviation Administration 2014]), this effect is potentially significant. Implementation of 20 Mitigation Measure PH-MM-4 would reduce this effect to a less-than-significant level.

# 21Mitigation Measure PH-MM-4: Design and Manage Habitat Created by Setback Levees22Such That It Does Not Attract Wildlife Known to Collide with Aircraft

At potential setback levee sites that are within the 5-mile buffer of public airports, the Corps will ensure that new habitat areas created by the setback levees will be designed and managed in such a way that it will not attract wildlife known to collide with aircraft (i.e., primarily waterfowl [FAA 2014]). Implementing routine maintenance, hazardous wildlife habitat manipulation, and other land management activities have been identified as the most effective long-term preemptive measures for reducing wildlife hazards (Sacramento International Airport 2013).

# 18.5.4 Alternative 4A—Habitat Replacement (Preferred Alternative)

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#### 31 Effect PH-1: Temporary Exposure to or Release of Hazardous Materials during Construction

These effects would be similar in type to those described above for Alternative 3A, but at a lesser magnitude because fewer setback levees or adjacent levees would be constructed, which would

- decrease the chance of a hazardous material spill compared with Alternative 3A. Implementation of
- 35 a SWPPP would ensure that this effect would be less than significant. No mitigation is required.

# Effect PH-2: Exposure of the Environment to Hazardous Materials during Ground-Disturbing Activities

- 38 These effects would be similar in type to those described above for Alternative 3A, but at a lesser
- 39 magnitude because fewer setback levees or adjacent levees would be constructed, which would
- 40 decrease the chance of an exposure to, or release of, underground contamination sources when

- 1 compared to Alternative 3A. Implementation of a SWPPP would ensure that this effect would be
- 2 considered less than significant. If a release were to occur, Mitigation Measures WQ-MM-2 and PH-
- 3 MM-1 would be implemented to ensure that water quality is returned to baseline conditions and
- 4 that any threat to public health is responded to effectively.

#### 5 Effect PH-3: Temporary Exposure to Safety Hazards from the Construction Site

This effect would be similar in type to that described above for Alternative 2A. Implementation of
 Mitigation Measures PH-MM-2 and PH-MM-3 would ensure this effect would be less than significant.

#### 8 Effect PH-4: Exposure of People or Structure to Increased Flood Risk

9 This effect would be similar in type to that described above for Alternative 2A.

#### 10 Effect PH-5: Potential for Higher Frequency of Collision between Aircraft and Wildlife

11 This effect would be similar in type to that described above for Alternative 3A; however, no setback 12 levees are proposed within the recommended 5-mile buffer around public airports under 13 Alternative 4A. In addition, there would be no net increase in wildlife habitat at sites within the 14 buffer that would implement other bank protection measures. As discussed in Chapter 2, Project 15 Description, the environmental analysis in this EIS/EIR is programmatic in nature, analyzing the 16 80,000 LF in its entirety. Additional project-level environmental documentation, tiering from this 17 programmatic analysis, will be conducted to address erosion sites that will be constructed within 18 the 5-mile buffer of any public airport. <u>Although there are no setback levees proposed within the</u> 19 recommended 5-mile buffer around public airports for the 106 representative erosion sites under 20 Alternative 4A, it is possible that erosion sites may develop within the buffer in the future, and that a 21 setback levee may be constructed. For this reason, this effect is considered potentially significant. 22 Implementation of Mitigation Measure PH-MM-4 would reduce this effect to a less-than-significant 23 level. However, because Alternative 4A would result in no net increase in the amount of habitat 24 considered to attract hazardous wildlife within the 5-mile buffer, this effect is considered less than 25 significant. No mitigation is necessary.

# 18.5.5 Alternative 5A—Habitat Replacement Reaching Environmental Neutrality

#### 28 Effect PH-1: Temporary Exposure to or Release of Hazardous Materials during Construction

- These effects would be similar in type to those described above for Alternative 3A, but at a lesser
   magnitude because fewer setback levees or adjacent levees would be constructed, which would
- decrease the chance of a hazardous material spill compared to Alternative 3A. Implementation of a

#### 32 SWPPP would ensure that this effect would be less than significant. No mitigation is required.

# Effect PH-2: Exposure of the Environment to Hazardous Materials during Ground-Disturbing Activities

These effects would be similar in type to those described above for Alternative 3A, but at a lesser magnitude because fewer setback levees or adjacent levees would be constructed, which would decrease the chance of an exposure to, or release of, underground contamination sources when compared to Alternative 3A. Implementation of a SWPPP would ensure that this effect would be considered less than significant. If a release were to occur, Mitigation Measures WQ-MM-2 and PH-

- 1 MM-1 below would be implemented to ensure that water quality is returned to baseline conditions 2 and that any threat to public health is responded to effectively.
- 3 Effect PH-3: Temporary Exposure to Safety Hazards from the Construction Site
- This effect would be similar in type to that described above for Alternative 2A. Implementation of
   Mitigation Measures PH-MM-2 and PH-MM-3 would ensure this effect would be less than significant.

#### 6 Effect PH-4: Exposure of People or Structure to Increased Flood Risk

7 This effect would be similar in type to that described above for Alternative 2A.

#### 8 Effect PH-5: Potential for Higher Frequency of Collision between Aircraft and Wildlife

- 9 This effect would be similar in type to that described above for Alternative 3A. Additionally, setback
- 10 levees are proposed within the recommended 5-mile buffer around public airports under
- 11 Alternative 5A would create the potential for an increase in wildlife habitat because the construction
- 12 of setback levees would increase areas that could be replanted as mitigation for vegetation removal
- 13 at other erosion sites. However, there would be no net increase in wildlife habitat at sites within the
- 14 buffer that would implement other bank protection measures. As discussed in Chapter 2, Project
- 15 Description, the environmental analysis in this EIS/EIR is programmatic in nature, analyzing the
- 80,000 LF in its entirety. Additional project-level environmental documentation, tiering from this
   programmatic analysis, will be conducted to address erosion sites that will be constructed within
- 18 the 5-mile buffer of any public airport. However, because Alternative 5A involves the construction of
- 19 setback levees that could potentially increase habitat that would attract wildlife known to collide
- 20 with aircraft, this effect is potentially significant. Implementation of Mitigation Measure PH-MM-4
- 21 would reduce this effect to a less-than-significant level.

# 18.5.6 Alternative 6A—Habitat Replacement with Vegetation ETL Variance

#### 24 Effect PH-1: Temporary Exposure to or Release of Hazardous Materials during Construction

This effect would be similar in type to that described above for Alternative 3A, but at a lesser

- 26 magnitude because fewer setback levees would be constructed, which would decrease the chance of
- a hazardous material spill compared to Alternative 3A. Implementation of a SWPPP would ensure
- 28 that this effect would be less than significant. No mitigation is required.

# 29 Effect PH-2: Exposure of the Environment to Hazardous Materials during Ground-Disturbing 30 Activities

- 31 This effect would be similar in type to that described above for Alternative 3A, but at a lesser
- 32 magnitude because fewer setback levees would be constructed, which would decrease the chance of
- 33 an exposure to, or release of, underground contamination sources when compared to Alternative
- 34 3A. Implementation of a SWPPP would ensure that this effect would be considered less than
- 35 significant. If a release were to occur, Mitigation Measures WQ-MM-2 and PH-MM-1 below would be
- 36 implemented to ensure that water quality is returned to baseline conditions and that any threat to
- 37 public health is responded to effectively.

#### 1 Effect PH-3: Temporary Exposure to Safety Hazards from the Construction Site

This effect would be similar in type to that described above for Alternative 2A. Implementation of
 Mitigation Measures PH-MM-2 and PH-MM-3 would ensure this effect would be less than significant.

#### 4 Effect PH-4: Exposure of People or Structure to Increased Flood Risk

5 This effect would be similar in type to that described above for Alternative 2A.

#### 6 Effect PH-5: Potential for Higher Frequency of Collision between Aircraft and Wildlife

7 This effect would be similar in type to that described above for Alternative 3A; however, no setback 8 levees are proposed within the recommended 5-mile buffer around public airports under 9 Alternative 6A. In addition, there would be no net increase in wildlife habitat at sites within the 10 buffer that would implement other bank protection measures. As discussed in Chapter 2, Project 11 Description, the environmental analysis in this EIS/EIR is programmatic in nature, analyzing the 12 80,000 LF in its entirety. Additional project-level environmental documentation, tiering from this 13 programmatic analysis, will be conducted to address erosion sites that will be constructed within 14 the 5-mile buffer of any public airport. <u>Although there are no setback levees proposed within the</u> 15 recommended 5-mile buffer around public airports for the 106 representative erosion sites under 16 Alternative 6A, it is possible that erosion sites may develop within the buffer in the future, and that a setback levee may be constructed. For this reason, this effect is considered potentially significant. 17 18 Implementation of Mitigation Measure PH-MM-4 would reduce this effect to a less-than-significant 19 level. However, because Alternative 6A would result in no net increase in the amount of habitat 20 considered to attract hazardous wildlife within the 5-mile buffer, this effect is considered less than 21 significant. No mitigation is necessary.

# **3 19.1 Introduction and Summary**

This chapter describes the environmental setting associated with cultural resources, assesses the
impacts on cultural resources that would result from implementation of the proposed program, and
presents mitigation measures that would reduce these impacts. The key sources of data and
information used in the preparation of this chapter are listed below.

- 8 A records search and review of existing information.
  - Consultation with interested parties.
- 10 Archival research.

1

2

9

11 • Limited field surveys of the program area.

12 Because the proposed program is subject to several laws governing the consideration of cultural 13 resources, including NEPA, Section 106 of the National Historic Preservation Act (NHPA), 16 U.S.C. § 14 470f, and CEQA, and because the proposed program would be implemented over a number of years 15 in several phases, the program lends itself to a phased approach to historic properties management 16 as permitted under 36 Code of Federal Regulations (CFR) Section 800.14(b). Consequently, it was 17 determined that developing a cultural resources Programmatic Agreement (PA) for the proposed 18 program and an attending historic properties treatment plan (HPTP) is the most effective way to 19 comply with the NHPA, and CEQA. The PA was agreed upon and signed by the Corps, the California 20 State Historic Preservation Officer (SHPO), and the Central Valley Flood Protection Board (CVFPB). 21 Concurring parties include the Shingle Springs Rancheria, the Mechoopda Tribe, and the Central 22 Valley Miwok. The HPTP was prepared and attached to the PA (Appendix B, Cultural Resources 23 Programmatic Agreement). The purpose of the HPTP is to direct cultural resource management 24 activities during the life of the proposed program. Documentation of consultation for the PA can be 25 found in Appendix H.

- 26 Pursuant to the Cultural Resources PA/HPTP, as the specific construction schedule is determined 27 and the boundaries of the erosion site project areas are identified, including access routes and 28 staging areas, the Corps will conduct archaeological survey(s) to identify if cultural resources are 29 present (or absent). The Corps will document previously recorded or newly discovered cultural 30 resources sites, and make a determination as to their potential eligibility for nomination to the 31 National Register of Historic Places. The Corps will then determine if the resources can be avoided, if 32 the project would adversely affect eligible historic properties, and, if so, how to mitigate for those 33 effects. If human remains are discovered or if mitigation is necessary, the Corps will consult with the
- 34 signatories and concurring parties to the PA (Attachment 1 of Appendix B).
- Table 19-1 summarizes the cultural resources effects resulting from the implementation of theproposed program.

1

Effect	Mitigation Measures	Implementation Period	
Effect CUL-1: Disturbance of Native American or Historic Period Human Remains	CUL-MM-1: Stop Work if Human Remains Are Discovered	During construction	
Effect CUL-2: Unavoidable Impacts to Historic Properties or Historical Resources as a Result of Bank Protection Measures	CUL-MM-2: Identify Historic Properties and Historical Resources and Implement Treatment Measures for Adverse Effects according to the Historic Properties Treatment Plan	Before and during construction	
Effect CUL-3: Loss of Integrity of Character-Defining Elements that Would Qualify the Sacramento River Levee System as a Historic Property (NHPA) or Historical Resource (CEQA)	CUL-MM-3: Evaluate the Sacramento River Levee System for NRHP Eligibility and Implement Treatment Measures for Adverse Effects According to the Historic Properties Treatment Plan	Before and during construction	

#### Table 19-1. Summary of Cultural Resources Effects and Mitigation

## 2 19.2 Environmental Setting

The cultural setting of the Northern Sacramento Valley comprises a vast area with numerous Native
 American groups and historical time periods. These are summarized below, and a detailed
 description is provided in Appendix G, Cultural Context.

### 6 19.2.1 Native Americans

7 Seven Native American groups live within the program area: the Bay Miwok, Konkow Maidu, 8 Northern Valley Yokuts, Patwin, Plains Miwok, River Nomlaki, and Valley Nisenan. Although various 9 peoples dwelled in the area now known as the Central Valley and spoke a variety of languages, 10 common linguistic roots indicate that these groups had a related history and regular interaction 11 (Rosenthal et al. 2007:149). A shared heritage is also indicated by common technological, economic, 12 ceremonial, and sociopolitical characteristics described by twentieth-century anthropologists who 13 identified the Central Valley as the core of the California Culture area (Goldschmidt 1951; Klimek 14 1935; Kroeber 1936, 1939).

- 15 Early inhabitants of the Central Valley used the various habitats found throughout the valley,
- 16 including riparian forest, marsh, alkali basins, oak savanna, and foothill woodland communities.
- 17 They created a sophisticated material culture and established a trade system involving a wide range
- 18 of manufactured goods from distant and neighboring regions, and their population and villages
- 19 prospered in the centuries prior to historic contact (Rosenthal et al. 2007:147, 149).
- 20 Over time, however, the majority of surface sites in the Central Valley, including many mounds, were
- 21 destroyed by agricultural development, levee construction, and river erosion. Also, many
- 22 excavations of Central Valley sites in the early twentieth century were performed by untrained
- 23 individuals who focused on artifact and burial recovery but paid little attention to other artifacts

- 1 such as dietary remains and technological features, thus hampering modern attempts at reanalysis
- 2 (Bouey 1995; Hartzell 1992). Additionally, the Central Valley's archaeological record has been
- 3 affected by the natural processes of landscape evolution: Surface sites are embedded in young
- 4 sediments set within a massive and dynamic alluvial basin, while most older archaeological deposits
- 5 have been obliterated or buried by ongoing alluvial processes. Consequently, archaeologists are
- challenged to identify and explain long-term culture change in portions of the Central Valley where
   the majority of the available evidence spans only the past 2,500 years (or, in rare cases, the past
- 8 5,500 years) (Rosenthal et al. 2007:150).
- 9 There is no single cultural-historical framework that accommodates the entire prehistoric record of
- 10 the Central Valley. Moratto's (1984) well-regarded synthesis of Central Valley archaeology was
- 11 based on works from Bennyhoff and Fredrickson (Elsasser 1978: 37–57; Fredrickson 1973, 1974).
- 12 The comparative frameworks established by Bennyhoff and Fredrickson (1994: 15–24)
- incorporated a wide range of local and regional traditions, but these have not been systematicallyapplied outside of the Sacramento Valley.

## 15 **19.2.2 History**

#### 16 **19.2.2.1** Early American Settlements

17The pace of physical change to the landscape and the construction of adobes and other structures18widened as Spanish missions were disbanded in the 1830s and Mexican settlers took title to the19land. Agriculture, grazing, and mining activities led to the establishment of permanent settlements20and urban centers. The natural environment began to change rapidly as cattle and other21domesticated animals grazed the land, as woodlands were cut for fuel and lumber, and as native22vegetation gave way to imported grasses and plants spread by the settlers and their livestock.

#### 23 **19.2.2.2** Gold Rush

24 In January 1848, gold was discovered by James Marshall on the South Fork of the American River 25 near present-day Coloma. Subsequent gold discoveries were made not long after that, such as the discovery by Jonas Spect on the Yuba River in the vicinity of Marysville in June 1848. The onset of 26 27 the Gold Rush brought large numbers of people into California; miners poured into the area in 28 search of placer deposits along the rivers and creeks of the Sacramento Valley and the adjacent 29 Sierra Nevada foothills. When the placer deposits were depleted, the miners turned to other 30 methods to reach gold-bearing strata. One of the most common methods of mining, hydraulic 31 mining, introduced huge quantities of rock, sand, and mud into and adjacent to the mountain 32 waterways. Later, mining companies deployed dredges to reach gold deposits along the rivers. Some 33 of the tailings associated with this type of gold mining—particularly in and around the cities of 34 Folsom and Oroville—have contributed to these cities' historic significance. The Gold Rush 35 dramatically altered the landscape of California, particularly the Sacramento Valley and the counties 36 and regions that are part of and surround the valley (Hoover et. al. 1990: 27, 290, 540).

#### 37 Agriculture and Flood Control

The decline of the Gold Rush resulted in disenchanted miners who realized they could make a
 greater fortune through farming and ranching rather than prospecting, and they helped transform
 much of the Sacramento Valley into a booming agricultural region. Frequent floods plagued the
 residents of the region, however, and posed a significant threat to the viability of agricultural

- 1 interests and further settlement. Advances in agricultural techniques, equipment, and water
- 2 management from the 1880s to the early twentieth century brought the Sacramento Valley into the
- "fruit epoch." Agriculture replaced mining and cattle ranching as the valley's most profitable
   industry. By 1894, 75% of fruit shipped from California to the east coast was from the Sacrament
- industry. By 1894, 75% of fruit shipped from California to the east coast was from the Sacramento
   Valley (Sacramento History Online 2004.)
- 10.2 Pagulatory Satting

# 6 19.3 Regulatory Setting

Appendix C, Regulatory Background, describes the federal and state laws, regulations, and policies
that pertain to cultural resources within the proposed program area. Pertinent laws, regulations,
policies, and plans are listed below.

- 10 Federal:
- 11 O National Environmental Policy Act
- 12 O National Historic Preservation Act
- 13 O Programmatic Agreement and Historic Property Treatment Plan
- 14 O American Indian Religious Freedom Act
- 15 O Archaeological Resources Protection Act
- 16 O Native American Graves Protection and Repatriation Act
- 17 State:
- 18 O California Environmental Quality Act
- 19 O Public Resources Code (PRC) Section 5097
- 20 California Health and Safety Code Section 8100
- 21 California Penal Code Sections 7050.5 and 7052.

# 22 **19.4 Determination of Effects**

## **19.4.1 Assessment Methods**

### 24 **19.4.1.1** Review of Existing Information

#### 25 Terrestrial

26 The identification of cultural resources in the program area began with a records search conducted 27 in 2000 at the North contact information Contact the North Contact in C

- 27 in 2009 at the Northeast Information Center, the North Central Information Center, and the Central 28 California Information Contor of the California Uistorical Resources Information Center (CUDIC)
- California Information Center of the California Historical Resources Information System (CHRIS).
   The records search focused on identifying known and recorded resources and digitally plotting their
- 30 locations on U.S. Geological Survey 7.5-minute topographic quadrangle maps. Although large
- 31 portions of the program area have not been subject to archaeological survey, approximately 650
- 32 resources have been previously identified and documented within the program area.

#### 1 Underwater

- 2 The California State Lands shipwreck database was consulted in August 2009. Literature from the
- 3 ICF library was also consulted for potential submerged resources within the program area. A total of
- 4 16 previously discovered submerged resources were found to be located within the program area.
- 5 Information from this research is documented in the Panamerican Consultants 2010 report.

#### 6 **19.4.1.2 Consultation with Interested Parties**

#### 7 Native American Groups

8 Native American groups with potential interest in the area were identified through the efforts of 9 ethnographer Dr. Helen McCarthy. An initial list of potentially concerned tribes for the program area 10 was obtained from the Native American Heritage Commission (NAHC). The initial list received from 11 the NAHC was edited based on her recommendations and is included in the HPTP (Attachment 1 of 12 Appendix B). The final list included 27 Native American groups and individuals. A series of scoping 13 letters, phone calls, emails, and two workshops open to Native American groups were held in the 14 spring of 2010 (one in Sacramento and one in Chico) to further identify interested parties. Based on 15 this work and Dr. McCarthy's extensive experience in consulting with northern California tribes, in 16 accordance with 36 CFR Part 800, the Corps has initiated consultation with the following tribes:

- 17 Berry Creek Rancheria of Tyme Maidu Indians
- 18 Buena Vista Rancheria of Me-Wuk Indians
- 19 Cachil DeHe Band of Wintun Indians of the Colusa Indian Community
- 20 California Valley Miwok Tribe
- Cortina Band of Indians, Enterprise Rancheria (Estom Yumeka)
- Enterprise Rancheria (Estom Yumeka)
- Grindstone Rancheria
- Ione Band of Miwok Indians
- Mechoopda Indian Tribe of Chico Rancheria
- Mooretown Rancheria of Maidu Indians
- 27 Paskenta Band of Nomlaki Indians, Redding Rancheria
- Shingle Springs Band of Miwok Indians
- 29 United Auburn Indian Community of Auburn Rancheria
- 30 Wilton Rancheria
- 31 Yocha Dehe Wintun Nation (Rumsey Rancheria)

32 Further consultation with the tribes involved requesting comments on the PA and HPTP, additional

33 outreach meetings with individual tribes, and finally requesting their participation as concurring

34 parties to the PA. All documentation regarding consultation with Native Americans is located in

35 Appendix C and G of the HPTP (Attachment 1 of Appendix B, Cultural Resources Programmatic

- 36 Agreement). To date, the California Valley Miwok Tribe, Mechoopda Indian Tribe of Chico Rancheria,
- 37 and the Shingle Springs Band of Miwok have signed as concurring parties. Those tribes that have not

signed the documented will still be given an opportunity to comment on specific construction
 projects as they are designed and planned.

#### 3 Historical Groups

A total of 120 historical societies, museums, state parks, agencies, parks, and other institutions were
solicited in 2009 for any knowledge they may have concerning local cultural resources. A full list of
the consulted parties is provided in Chapter 2 of the HPTP (Attachment 1 of Appendix B). Responses
were received from the Aerospace Museum of California, the Community Memorial Museum of
Sutter County, the Department of Parks and Recreation (DPR) North Buttes District in Chico, West
Sacramento Historical Society, and the California State Archives.

- Roxanne Yonn, executive director of Aerospace Museum of California, stated that the museum did not anticipate that the effort would affect the historic resources under its control.
- Julie Stark, director of the Community Memorial Museum of Sutter County, stated that the
   museum's only concern was the Hunter Burial Site. This site is located outside the program area
   and would not be impacted by the proposed program.
- Leslie Steidl, an archaeologist with the DPR North Buttes District in Chico, stated that she had several site records and other associated documents that could prove useful to the program.
   These were provided to the Corps. Ms. Steidl confirmed that all of the known sites have been recorded. Additionally, a detailed geomorphological description for the area is available.
- 19 Thom Lewis, of the West Sacramento Historical Society, called and said that he possessed data 20 regarding historical sites in the downtown Sacramento area and wanted to know the proposed 21 program timeframe to insure he would send the Corps the information in time. Mr. Lewis agreed 22 to follow up the phone call with an email attaching pictures of the historical sites. Mr. Lewis 23 provided historic pictures of features on the west side of the Sacramento River and suggested 24 contacting the Western Railway Museum in Suisun City. Currently there is no work planned for 25 those areas. However, the Corps shall take into consideration the features should any program 26 activity take place in those areas. A letter was sent to the Western Railway Museum to inquire 27 about additional information.
- Linda Johnson, an archivist and the reference coordinator for the California State Archives,
   stated that because of staff limitations, the State Archives could not conduct in-depth research
   for the program area, but encouraged utilization the State Archives website and facilities to
   conduct research.
- No other response has been received to date. However, should work affect a resource that would be
   of interest to historical groups, every effort will be made to involve them oin the process.

#### 34 **19.4.1.3** Field Surveys

#### 35 Terrestrial

From December 2009 to May 2010, ICF archaeologists conducted an intensive cultural resources survey of 16 repair areas within the program area. The 16 locations were chosen based on repair priority and access. A total of 53.25 acres were surveyed. Archaeologists walked transects no wider than 5 meters across all accessible areas within the area of potential effects (APE) for each repair location. This spacing ensured maximum ground coverage in a timely manner. The survey also included observation and inspection of cuts, fill, walls of drainage ditches and levees, and rodent
 burrow spoil piles. In areas with poor visibility, boot scrapes were conducted every 10 meters to
 more closely inspect the ground surface. No cultural resources were identified as a result of the

4 survey effort. Methods, results, and locations of the surveys can be found in Chapter 2 of the HPTP
5 (Attachment 1 of Appendix B).

#### 6 Underwater

7 Panamerican Consultants, of Memphis, Tennessee, was hired to conduct a remote sensing survey 8 within selected portions of the program area to identify submerged cultural resources (Panamerican 9 Consultants 2010). Submerged resource types in the program area include the remains of landings, 10 pilings, and modern and historic ships. Areas selected for survey were chosen based on three 11 criteria: potential for locating cultural resources, number of identified levee repair locations in the 12 area, and the goal of gathering data from a variety of location types. Areas with high potential for 13 locating cultural resources were selected as a result of historic shipwreck data obtained during pre-14 field research. This documentation included information from the CHRIS, the California State Lands 15 Commission Shipwreck Database, General Land Office maps, and newspaper articles. Eleven areas 16 totaling approximately 50 miles in length were chosen for survey: Knights Landing, the mouth of the 17 American River, northern Sacramento, the Old Sacramento waterfront, southern Sacramento, 18 Hood/Courtland, Walnut Grove/Locke, Isleton, Steamboat Slough/Grand Island, Rio Vista, and Cache 19 Slough. This study was conducted between September 22 and October 29, 2009. A total of 428 20 resources were identified as a result of the study. Of these, 73 resources were recommended for 21 further study. Five potential NRHP-eligible resources were selected for dive investigation. 22 Panamerican conducted 5 days of dive investigations to assess the five potential NRHP-eligible 23 resources. Of these, three were recommended as eligible for listing on the NRHP. Detailed methods 24 and results can be found in the HPTP (Attachment 1 of Appendix B).

## 25 **19.4.2 Findings**

#### 26 **19.4.2.1** Known Resources

#### 27 Terrestrial

A total of 642 known cultural resources were identified within the program area as a result of the records search. Of these, 418 are historic structures and 224 are archaeological sites. Of the 224 archaeological sites, 127 are prehistoric archaeological sites, 67 are historical archaeological sites, and 30 sites contain both historic and prehistoric components.

#### 32 Archaeological Resources

As part of on-going efforts to clarify and understand cultural resources risk prior to conducting fullcoverage surveys, the Corps is currently engaged in the creation of a formal model of archaeological site sensitivity for a different project in the Central Valley (the American River Common Features Project [ARCF]). The ARCF project area falls within the larger program area. Part of this effort has involved quantifying the specific likelihood that archaeological sites will occur at increasing distances from sources of permanent water. 1 2

3



#### Figure 19-1. Probability of an Archaeological Site Existing within 70 Meters of a Given Point at Increasing Distances from a Permanent Water Source in the ARCF Project

4 Figure 19-1 reflects the empirical probability of an archaeological site occurring within 70 meters of 5 a point located at a given distance from a water source in those portions of the ARCF project area 6 that have been subject to intensive archaeological inventories. These data indicate that 7 archaeological sensitivity drops quickly with increasing distance to water. Though the ARCF data 8 were compiled for a smaller part of the Sacramento River, it is reasonable to expect a generally 9 similar pattern of land use throughout the overall system. The spectrum of linguistic and cultural 10 variability throughout prehistoric California was broad and vibrant, but patterns of adaptation were 11 remarkably consistent between culturally distinct groups, especially in the Central Valley.

12 The Area of Potential Effect (APE) for the proposed levee repairs would likely extend no more than 13 400 meters from the river and in most cases would be located within 100 meters of the river. Using 14 this figure, we can divide the total length of proposed levee (approximately 20,800 meters) by 70 15 and multiply that by the probability of encountering a site at 100 meters (approximately 0.035). 16 This predicts that at least 11 prehistoric sites would be encountered within the course of the 17 proposed program within construction APEs. The noncontiguous nature of this proposed program 18 may increase or decrease the likelihood of sites within a repair area because this prediction is based 19 on the overall length of the program. Considering the average length of current sites within the 20 program area (approximately 335 meters), there is a 17% chance that a prehistoric site would be 21 found in any given repair area. This model does not include the likelihood of encountering historic 22 sites or structures; however 97 are known to be within the program area and others are likely to be 23 identified during the course of proposed program implementation.

#### 24 Sacramento River Levee System

Due to hydraulic mining in the Sierra Nevada foothills, severe flooding became commonplace in the
 Central Valley beginning in the 1850s. In response, private landowners began to construct small
 levees near their farms along the Sacramento River. These 3- to 4-foot-high levees proved to be

- 28 ineffective and regularly failed during catastrophic floods. The federal Swamp Land Act of 1850
- allowed for the state to reclaim wetlands through construction of levees. The reclamation program,

- 1 however, was ineffective due to corruption and other problems. In 1864, the state legislature
- 2 enhanced the power of local levee districts in order to spur more levee construction, though political
- 3 battles were still being waged over who would control these districts. Through the 1880s and 1890s,
- 4 local levee districts continued to build levees piecemeal. The Flood Control Act was passed by
- 5 Congress in 1917 (Public Law 64-367, Section 2). The act required the Corps to work with state
- governments and local levee districts to construct flood control facilities along the Sacramento River
   and also authorized the Sacramento River Flood Control Project (SRFCP), which provided for
- and also authorized the Sacramento River Flood Control Project (SRFCP), which provided for
   construction of more levees as well as the Yolo and Sutter Bypasses. The SRFCP resulted in
- construction of about 1,000 miles of levees, which are part of the Sacramento River Levee System.
- 10 The program area encompasses part of this system.
- 11 The Sacramento River Levee System as a whole has not been formally evaluated. The system is 12 widely recognized by the federal, state, and local professional cultural resources and historic
- 13 preservation community as being eligible for listing in the NRHP under Criterion A/1 for the
- 14 system's role in flood control of the Central Valley, which led to the expansion of early settlements.
- 15 For the purposes of this study it is assumed that the Sacramento River Levee System would meet
- both state and federal significance criteria under Criteria A of the NRHP, and, therefore, both the PA
- 17 and the HPTP outline procedures for the evaluation and treatment during the course of program
- 18 implementation.

#### 19 Underwater

Initial analysis of the data collected during dive investigations indicates that three sites examined
 appear eligible for NRHP and California Register of Historical Resources (CRHR) status. Additionally,
 several sites may meet eligibility criteria. If any of these potentially significant sites cannot be
 avoided and would be affected, further investigations would be needed to determine whether the
 sites meet NRHP and CRHR eligibility as outlined in the PA and HPTP.

### 25 **19.4.2.2 Predicted Property Types**

Because a considerable portion of the program area has not yet been examined for cultural
resources, this section describes the types of resources that are predicted to be present in the
program area. The term "property type" refers to a grouping of properties that share similar
important characteristics. For the HPTP, property types have been broadly categorized into groups
based on their cultural and temporal associations. These two groups are subdivided as discussed
below.

### 32 Prehistoric Archaeological Property Types

Previous studies in the vicinity of the program area provide reasonable expectations of the range of prehistoric archaeological property types relevant to the proposed program. They are classified here based on constituents and features. Five prehistoric archaeological property types, as defined in the HPTP, have potential to be present in the program area: midden sites, isolated burials and features, lithic scatters, bedrock milling features, and isolated artifacts. Each prehistoric property

38 type is described separately in the HPTP (Attachment 1 of Appendix B).

#### 1 Native American Property Types

Native American property types, or traditional cultural properties (TCPs), within the program area
would be associated with the waterways of the Central Valley. Such properties derive their
significance from the role the property plays in the cultural practices or beliefs of an extant
community or identifiable social group. Examples of TCPs range from expansive geographic areas
such as the Sutter Buttes to individual locations associated with beliefs or practices that are of
traditional cultural significance. Examples of TCP types include ceremonial and sacred sites, as well

8 as plant gathering and fishing locations, as described in the HPTP (Attachment 1 of Appendix B).

#### 9 Historical Archaeological Property Types

10 The records search identified previous cultural resource studies in the vicinity of the program area 11 that provide reasonable expectations of the range of historical archaeological property types 12 relevant to the proposed program. These property types are classified here in terms of function. 13 Intensive historic-era use of waterways within the program area coincides with the discovery of 14 gold in 1848. The sudden influx of fortune seekers resulted in heavy use of waterways for 15 transportation of individuals and supplies. To accommodate the surge, cities and towns were established along the rivers. Both small- and large-scale mining endeavors were carried out within 16 17 the program area along the Feather, Bear, Yuba, and American Rivers. Agricultural endeavors 18 followed quickly, and overland transportation routes were developed that often paralleled 19 waterways within the program area. Historical archaeological resources within the program area 20 are mostly related to these events. Five categories of historical archaeological property types, as 21 defined in the HPTP (Attachment 1 of Appendix B), have been identified within the program area: 22 mining sites, building foundations, refuse scatters/dumps, transportation related features, and 23 water conveyance systems.

#### 24 Historic Structure Property Types

25 Historic structures include several different property types best classified as buildings, structures, 26 and sites. Property types within these classifications can also be classified as a district. A district 27 would contain a high concentration of buildings, structures, and sites united historically or 28 aesthetically. Cultural landscapes include a combination of property types and are typically 29 classified as either a site or district. The records search identified previous cultural resource studies 30 within the program area that indicate a high concentration of historic structure property types, as 31 defined in the HPTP (Attachment 1 of Appendix B), including buildings, structures, sites, and cultural 32 landscapes.

#### 33 Submerged Property Types

34 Previous studies in the vicinity of the program area provide reasonable expectations of the range of 35 submerged property types relevant to the proposed program. These property types are classified 36 here based on function because of the wide variation in form. Submerged resources are typically 37 associated with historic-era activities, although there is a small possibility for submerged prehistoric 38 resources. Use of the waterways within the program area for commercial, military, and recreational 39 endeavors has been intensive since the 1840s, resulting, for various reasons, in numerous 40 submerged properties. The records search revealed previous cultural resources studies within the 41 program area that have identified several submerged property types. Submerged resource property

types, as described in the HPTP (Attachment 1 of Appendix B), include the remains of landings,
 pilings, and historic vessels.

### 3 19.4.3 Significance Criteria

#### 4 **19.4.3.1** Federal

- 5 Because there is no federal land in the program area, the Native American Graves Protection and
- 6 Repatriation Act (NAGPRA) and the Archaeological Resources Protection Act (ARPA) are not
- 7 applicable. Although NAGPRA and ARPA do not apply to the proposed program, NEPA and Section
- 8 106 of the NHPA are applicable.

#### 9 **NEPA**

According to the NEPA regulations, in considering whether an action may "significantly affect the
 quality of the human environment," an agency must consider the following:

- Unique characteristics of the geographic area such as proximity to historic or cultural resources
   (40 CFR Section 1508.27(b)(3)).
- The degree to which the action may adversely affect districts, sites, highways, structures, or
   objects listed in or eligible for listing in the National Register of Historic Places (40 CFR Section
   1508.27(b)(8)).

The NEPA regulations also require that, to the fullest extent possible, agencies must prepare draft
 environmental impact statements concurrently with and integrated with environmental impact
 analyses and related surveys and studies required by the NHPA (40 CFR Section 1502.25(a)).

#### 20 Section 106 of the NHPA

21 Under Section 106 criteria for the assessment of effects, a project or program may result in a finding 22 of no historic properties affected, no adverse effect on historic properties, or an adverse effect on 23 historic properties (36 CFR Part 800). If the finding indicates that a project or program would have 24 an adverse effect on a historic property, appropriate mitigation is required in consultation with 25 SHPO and other concerned entities. An adverse effect on a historic property is found when an 26 activity may alter, directly or indirectly, any of the characteristics of the historic property that 27 render it eligible for inclusion in the NRHP. The alteration of characteristics is considered an adverse 28 effect if it could diminish the integrity of the historic property's location, design, setting, materials, 29 workmanship, feeling, or association. The assessment of effects on historic properties in the 30 program area would be conducted in accordance with the guidelines set forth in 36 CFR Section 31 800.5. Under this regulation, adverse effects to historic properties that would be considered 32 significant include, but are not limited to, the following effects.

- Physical destruction of or damage to all or part of the property.
- Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation, and provision of handicapped access, that is not consistent with the Secretary of Interior's Standards and Guidelines for the Treatment of Historic
   Properties (36 CFR Part 68).
- Removal of the property from its historic location.

- Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance.
- Introduction of visual, atmospheric, or audible elements that diminish the integrity of the
   property's significant historic characteristics.
- Neglect of a property that causes its deterioration, except where such neglect and deterioration
   are recognized qualities of a property of religious and cultural significance to a Native American
   tribe.
- 8 Transfer, lease, or sale of the property out of federal ownership or control without adequate and
   9 legally enforceable restrictions or conditions to ensure long-term preservation of the property's
   10 historic significance.

#### 11 **19.4.3.2 State**

According to CEQA, a project that may cause a "substantial adverse change" in the significance of a
 "historical resource" or a "unique archaeological resource" may have a significant impact on the
 environment (State CEQA Guidelines Section 15064.5, PRC 21083.2). CEQA defines a "substantial
 adverse change" as follows:

- Physical demolition, destruction, relocation, or alteration of the resource or its immediate
   surroundings such that the significance of a historical resource would be materially impaired.
- Demolition or material alteration in an adverse manner of those physical characteristics of a historical resource which convey its historical significance and justify its inclusion in or eligibility for inclusion in the California Register of Historical Resources, inclusion in a local register pursuant to Section 5020.1(k) of the Public Resources Code, or its identification in a historical resources survey meeting the requirements of Section 5024.1(g) of the Public Resources Code.
- If a project results in significant effects on historical resources, alternative plans or mitigation
   measures must be considered.

## 26 **19.4.4 Eligibility Criteria**

#### 27 **19.4.4.1 Federal**

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The Federal government is required to consider effects to cultural resources if they qualify as
 historic properties under the NHPA. Cultural resource importance is evaluated based on eligibility
 for listing in the NRHP. The NRHP significance criteria applied to evaluate the cultural resources in
 this study are defined in 36 CFR Part 60.4 as follows:

- [T]he quality of significance in American history, architecture, archaeology, engineering, and
   culture as present in districts, sites, buildings, structures, and objects that possess integrity of
   location, design, setting, materials, workmanship, feeling, and association, and
  - that are associated with events that have made a significant contribution to the broad patterns of our history; or
    - that are associated with the lives of persons significant in our past; or

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- that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
  - that have yielded, or may be likely to yield, information important in prehistory or history.

As mentioned above, eligibility for listing in the NRHP requires that a resource not only meet one of the significance criteria but also possess "integrity." Integrity is the ability of a property to convey its significance. The evaluation of a resource's integrity must be grounded in an understanding of that resource's physical characteristics and how those characteristics relate to its significance. The evaluation of a resource's integrity in relation to its significance will be conducted as prescribed in National Register Bulletin No. 15: How to Apply the National Register Criteria for Evaluation (National Park Service 2002).

#### 12 **19.4.4.2** State

Under CEQA, a cultural resource is considered important if it meets the definition of "historical
 resource or unique archaeological resource." PRC Section 5020.1(j)) states:

"Historical resource" includes, but is not limited to, any object, building, structure, site, area,
place, record, or manuscript which is historically or archaeologically significant, or is significant
in the architectural, engineering, scientific, economic, agricultural, educational, social, political,
military, or cultural annals of California.

- 19 Historical resources may be designated as such through three different processes.
- Official designation or recognition by a local government pursuant to local ordinance or resolution (PRC Section 5020.1(k)).
- A local survey conducted pursuant to PRC Section 5024.1(g).
- Listed in or eligible for listing in the NRHP (PRC Section 5024.1(d)(1).

The process for identifying historical resources typically is accomplished by applying the criteria for
 listing in the CRHR (14 California Code of Regulations [CCR] Section 4852), which states that a
 historical resource must be significant at the local, state, or national level under one or more of the
 following four criteria.

- It is associated with events that have made a significant contribution to the broad patterns of
   California's history and cultural heritage (Criterion 1).
- It is associated with the lives of persons important in our past (Criterion 2).
- It embodies the distinctive characteristics of a type, period, region, or method of construction, or
   represents the work of a master or possesses high artistic values (Criterion 3).
- It has yielded, or may be likely to yield, information important in prehistory or history (Criterion
  4).
- To be considered an "historical resource" for the purpose of CEQA, the resource must also have integrity, which is the authenticity of a resource's physical identity evidenced by the survival of characteristics that existed during the resource's period of significance.

# Resources, therefore, must retain enough of their historic character or appearance to be recognizable as historical resources and to convey the reasons for their significance. Integrity is evaluated with regard to the retention of location, design, setting, materials, workmanship, feeling,

- and association. It also must be judged with reference to the particular criteria under which a
   resource is eligible for listing in the CRHR (14 CCR Section 4852[c]).
- The state also recognizes the importance of "unique archaeological resources" defined in PRC
  Section 21083.2 as an archaeological artifact, object, or site about which it can be clearly
  demonstrated that, without merely adding to the current body of knowledge, there is a high
  probability that it meets any of the following criteria.
- Contains information needed to answer important scientific research questions and for which
   there is a demonstrable public interest.
- Has a special and particular quality such as being the oldest of its type or the best available
   example of its type.
- Is directly associated with a scientifically recognized important prehistoric or historic event or
   person.
- 13 In most situations, resources that meet the definition of a unique archaeological resource also meet
- 14 the definition of historical resource. As a result, it is current professional practice to evaluate
- 15 cultural resources on their eligibility for listing in the CRHR. For the purposes of this cultural
- 16 resources study, a resource is considered important if it meets the CRHR eligibility (significance and
- 17 integrity) criteria.

# **18 19.5 Effects and Mitigation Measures**

## 19 **19.5.1 Alternative 1—No Action**

- Under Alternative 1, regular operation and maintenance (0&M) of the levee system would continue
  as presently executed by the local maintaining entities (subject to revision of the governing 0&M
  manual), but construction activities associated with the proposed program would not occur. As a
  result, erosion would continue and the risk of levee failure and possible catastrophic flooding would
  increase as more erosion sites become critical and repair is limited to emergency response.
  Continued erosion and the increased flood risk have the potential to adversely affect historical
  properties in the program area as a result of the following:
- Continued loss of berm and levee foundation.
- Catastrophic flooding.
- Implementation of bank protection measures similar to the program's alternatives through
   emergency actions.
- 31 Taking no action would result in incremental damage to the Sacramento River Levee System, a vast 32 network of levees that is assumed eligible for the NRHP under criterion A of 36 CFR Part 60.4 and 33 the CRHR under criterion 1 of 14 CCR Section 4852. Continued erosion, catastrophic flooding and 34 implementation of emergency bank protection measures could result in destruction of cultural 35 resources, including prehistoric and historic cultural resources and human remains that are 36 associated with Native Americans or date to the historic period in California. The cultural resources 37 that would suffer destruction as a result of catastrophic flooding would be much more widespread 38 than those confined to the general program area. Emergency bank protection measures could result 39 in destruction of cultural resources because there would be no lead time to properly identify and

- protect historic properties or historical resources before measures required for public health and
   safety would need to be implemented.
- However, this alternative would not result in any construction associated with the proposed
   program and, therefore, would not result in a significant effect on historic properties.

### 5 **19.5.2 Alternative 2A—Low Maintenance**

- The following activities associated with Alternative 2A have the potential to adversely affect
   historical properties in the program area:
- 8 Placement of bank fill.
- 9 Placement of revetment.
- 10 Removal of vegetation on the waterside of existing levees.

#### 11 Effect CUL-1: Disturbance of Native American or Historic Period Human Remains

12 The proposed program could result in disturbance of human remains that are associated with

13 Native Americans or date to the historic period in California (the historic period in the Sacramento

14 Valley region is generally considered to range from 1835 to the present). This effect would be

significant. Mitigation Measure CUL-MM-1 would reduce the severity of the effect, but it would
 remain significant and unavoidable.

- 10 Tellialli Significant and unavoid
- 17 Mitigation Measure CUL-MM-1: Stop Work if Human Remains Are Discovered
- 18 If human remains are discovered during any activities associated with bank protection 19 measures, the Corps and DWR-CVFPB will comply with state and federal laws relating to the 20 discovery and identification of human remains. The Corps and CVFPBDWR will consult with the 21 most likely descendant of the deceased regarding the disposition of human remains and 22 associated burial items pursuant to the PA as outlined in the HPTP (Attachment 1 of Appendix 23 B). This process includes contacting the coroner and developing a plan for the removal or 24 protection of the remains pursuant to the PA and as outlined in the HPTP (Attachment 1 of 25 Appendix B).

# 26 Effect CUL-2: Unavoidable Impacts on Historic Properties or Historical Resources as a Result 27 of Bank Protection Measures

- 28 The proposed program may result in adverse effects on historic properties as a result of
- implementing planned bank protection measures. This effect would be significant, but Mitigation
   Measure CUL-MM-2 would reduce the effect to a less-than-significant level.

# 31Mitigation Measure CUL-MM-2: Identify Historic Properties and Historical Resources and32Implement Treatment Measures for Adverse Effects according to the Historic Properties33Treatment Plan

- 34The proposed program will be implemented over a number of years in several phases. The35Corps and CVFPB DWR have determined that implementation of a PA and HPTP is the most36effective way to accommodate the program requirements and compliance with NEPA, CEQA, and37Implementation of a PA and HPTP is the most36or program to accommodate the program requirements and compliance with NEPA, CEQA, and
- 37 the NHPA (see Appendix B, Cultural Resources Programmatic Agreement). The PA will allow the

1	incremental documentation and mitigation of adverse effects on historic properties through an
2	identification strategy that is integrated with the planning, design, and ultimate construction of
3	bank protection measures at each repair location when and as that process takes place. This
4	approach allows flexibility in terms of approach and context, as well as specific appropriate
5	treatment measures, as the program and specific geographic locale dictate. General treatment
6	measures are described in the HPTP (Attachment 1 of Appendix B), and include, in order of
7	preference, avoidance (through the establishment of environmentally sensitive areas along the
8	perimeter of the property or through visual screening), preservation in place (through capping
9	or site stabilization), and data recovery. Additional treatment measures are presented that could
10	be used in conjunction with other treatments, such as documentation and public interpretation,
11	and for historic structures, preservation, rehabilitation, restoration, and reconstruction. The
12	HPTP also presents a process for resolving inadvertent discoveries of historic properties.

# 13 19.5.3 Alternative 3A—Maximize Meander Zone 14 (Environmentally Superior Alternative)

- Activities associated with Alternative 3A that have the potential to adversely affect historicalproperties in the program area are as follows:
- 17 Construction of setback levees.
- Construction of adjacent levees on the landward side of existing levees.
- Removal of vegetation on the landward side of the existing levee and within the footprint of the new adjacent levee.

#### 21 Effect CUL-1: Disturbance of Native American or Historic Period Human Remains

Effect CUL-1 is materially the same as described under Alternative 2A. This effect would be
 significant. Mitigation Measure CUL-MM-1 would reduce the severity of the effect, but it would
 remain significant and unavoidable.

# 25 Effect CUL-2: Unavoidable Impacts on Historic Properties or Historical Resources as a Result 26 of Bank Protection Measures

Implementation of Alternative 3A may result in adverse effects on historic properties as a result of
 implementing planned bank protection measures. Because the project footprint under Alternative
 3A would be larger than under Alternative 2A, the potential magnitude of this effect would be
 greaterEffect CUL-2 is materially the same as described under Alternative 2A. This effect would be
 significant, but Mitigation Measure CUL-MM-2 would reduce the effect to a less-than-significant
 level.

# Effect CUL-3: Loss of Integrity of Character-Defining Elements that Would Qualify the Sacramento River Levee System as a Historic Property or Historical Resource

- 35 The proposed program would result in incremental changes to the Sacramento River Levee System,
- 36 a vast network of levees that is assumed eligible for the NRHP under criterion A of 36 CFR Part 60.4
- and the CRHR under criterion 1 of 14 CCR Section 4852. This effect would be significant, but
- implementation of Mitigation Measure CUL-MM-3 would reduce this effect to a level that is less than
   significant.

# 1Mitigation Measure CUL-MM-3: Evaluate the Sacramento River Levee System for NRHP2Eligibility and Implement Treatment Measures for Adverse Effects According to the3Historic Properties Treatment Plan

4The proposed program will be implemented over a number of years in several phases. The5Corps and <u>CVFPB DWR</u> have determined that a PA and HPTP is the most effective way to6accommodate both the program requirements and compliance with CEQA, NEPA, and the NHPA.7The Corps and <u>CVFPBDWR</u> will implement the HPTP, which outlines a multi-property method8for recording, evaluating, and mitigating effects on the levee. The general process for mitigation9of adverse effects on the Sacramento River Levee System may include historical documentation10and recordation of current conditions.

# 19.5.4 Alternative 4A—Habitat Replacement (Preferred Alternative)

- 13 The following activities associated with Alternative 4A have the potential to adversely affect14 historical properties in the program area:
- 15 Construction of setback levees.
- Construction of adjacent levees on the landward side of existing levees.
- Removal of vegetation on the landward side of the existing levee and within the footprint of the new adjacent levee.
- 19 Placement of bank fill.
- Placement of revetment.
- 21 Effect CUL-1: Disturbance of Native American or Historic Period Human Remains
- Effect CUL-1 is materially the same as described under Alternative 2A. This effect would be
   significant. Mitigation Measure CUL-MM-1 would reduce the severity of the effect, but it would
   remain significant and unavoidable.

# 25 Effect CUL-2: Unavoidable Impacts on Historic Properties or Historical Resources as a Result 26 of Bank Protection Measures

Implementation of Alternative 4A may result in adverse effects on historic properties as a result of
 implementing planned bank protection measures. Because the project footprint under Alternative
 4A would be larger than under Alternative 2A, the potential magnitude of this effect would be
 greaterEffect CUL-2 is materially the same as described under Alternative 2A. This effect would be
 significant, but Mitigation Measure CUL-MM-2 would reduce the effect to a level that is less than
 significant.

# Effect CUL-3: Loss of Integrity of Character-Defining Elements that Would Qualify the Sacramento River Levee System as a Historic Property or Historical Resource

- 35 Effect CUL-3 is materially the same as described under Alternative 3A. This effect would be
- significant, but implementation of Mitigation Measure CUL-MM-3 would reduce this effect to a level
   that is less than significant.

# 19.5.5 Alternative 5A—Habitat Replacement Reaching Environmental Neutrality

Effects associated with Alternative 5A would be comparable in type to those described above for
 Alternatives 2A and 3A. Effects CUL-1 through CUL-3 would apply to this alternative, as would
 Mitigation Measures CUL-MM-1 through CUL-MM-3.

#### 6 Effect CUL-1: Disturbance of Native American or Historic Period Human Remains

7 Effect CUL-1 is materially the same as described under Alternative 2A. This effect would be

8 significant. Mitigation Measure CUL-MM-1 would reduce the severity of the effect, but it would
 9 remain significant and unavoidable.

# Effect CUL-2 Unavoidable Impacts on Historic Properties or Historical Resources as a Result of Bank Protection Measures

12Implementation of Alternative 5A may result in adverse effects on historic properties as a result of13implementing planned bank protection measures. Because the project footprint under Alternative145A would be larger than under Alternative 2A, the potential magnitude of this effect would be15greaterEffect CUL-2 is materially the same as described under Alternative 2A. This effect would be16significant, but Mitigation Measure CUL-MM-2 would reduce the effect to a less-than-significant17level.

# Effect CUL-3: Loss of Integrity of Character-Defining Elements that Would Qualify the Sacramento River Levee System as a Historic Property or Historical Resource

Effect CUL-3 is materially the same as described under Alternative 3A. This effect would be
 significant, but implementation of Mitigation Measure CUL-MM-3 would reduce this effect to a less than-significant level.

# 19.5.6 Alternative 6A—Habitat Replacement with Vegetation ETL Variance

Activities associated with Alternative 4A that have the potential to adversely affect historical
 properties in the program area are as follows:

- Construction of setback levees.
- Placement of bank fill.
- Placement of revetment.

#### 30 Effect CUL-1: Disturbance of Native American or Historic Period Human Remains

- 31 Effect CUL-1 is materially the same as described under Alternative 2A. This effect would be
- 32 significant. Mitigation Measure CUL-MM-1 would reduce the severity of the effect, but it would
- 33 remain significant and unavoidable.

# Effect CUL-2: Unavoidable Impacts on Historic Properties or Historical Resources as a Result of Bank Protection Measures

3 Implementation of Alternative 6A may result in adverse effects on historic properties as a result of

4 implementing planned bank protection measures. Because the project footprint under Alternative

5 <u>6A would be larger than under Alternative 2A, the potential magnitude of this effect would be</u>

6 <u>greaterEffect CUL-2 is materially the same as described under Alternative 2A</u>. This effect would be
 7 significant, but Mitigation Measure CUL-MM-2 would reduce the effect to a less-than-significant
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8 level.

# 9 Effect CUL-3: Loss of Integrity of Character-Defining Elements that Would Qualify the 10 Sacramento River Levee System as a Historic Property or Historical Resource

- 11 Effect CUL-3 is materially the same as described under Alternative 3A. This effect would be
- significant, but implementation of Mitigation Measure CUL-MM-3 would reduce this effect to a less than-significant level.

# **3 20.1 Introduction and Summary**

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This section describes the environmental setting pertaining to socioeconomics and environmental
justice, the determination of effects that would result from implementation of the proposed
program, and mitigation measures that would reduce significant effects.
The key sources of data and information used in the preparation of this chapter are listed below.

- 8 U.S. Census Bureau Quick Facts (U.S. Census Bureau 2012).
- 9 Council on Environmental Quality (CEQ), Environmental Justice under the National
  10 Environmental Policy Act (NEPA), Guidance for Agencies on Key Terms in Executive Order
  11 12898 (Council on Environmental Quality 1997).
- U.S. Environmental Protection Agency (EPA), Environmental Justice website (U.S.
   Environmental Protection Agency 2009).

Table 20-1 summarizes the socioeconomic and environmental justice effects resulting from theimplementation of the proposed program.

#### 16 Table 20-1. Summary of Socioeconomic and Environmental Justice Effects

Effect	Mitigation	Implementation Period
SOC-1: Disproportionate Effect on Minority or Low-Income Populations	None required	Not applicable
SOC-2: Temporary Increase in Employment during Construction	None required	Not applicable

## 17 20.2 Environmental Setting

## 18 **20.2.1 Existing Conditions**

#### 19 **20.2.1.1 Program Area**

This section discusses the affected environment related to socioeconomic and environmental justice
 in the program area. For the purposes of this chapter, the program area includes all of the counties
 within the program area as described in Chapter 2. Effects of construction of program alternatives
 would take place incrementally over several years.

#### 24 **20.2.1.2 Demographics**

In 2011, Caucasians and those of Hispanic or Latino origin comprised the two largest populations in
 the state, accounting for 74.0% and 38.1% of the population, respectively (U.S. Census Bureau

- 2012). California's remaining population consisted of American Indians (1.7%), Asians (13.9%),
   Blacks (6.6%), Pacific Islanders (0.5%), and people who responded "Two or more races" (3.6%)
- 3 (U.S. Census Bureau 2012).

4 The race characteristics in the program area are similar to the characteristics of California. In 2011, 5 Caucasians and Hispanics made up the two largest populations in the program area, accounting for

Caucasians and Hispanics made up the two largest populations in the program area, accounting for
 71.5% and 21.5%, respectively. The remaining race categories made up approximately 7% of the
 population in the program area.

In 2010, the percentage of households below the poverty level in California was 13.7%. This
percentage is higher in almost all counties within the program area than the state's overall, with the
exception of Placer and Solano counties. Counties within the program area with higher poverty
levels than in California overall were Butte (18.4%), Colusa (15.0%), Glenn (17.5%), Sacramento
(13.9%), Sutter (14.3%), Tehama (20.3%), Yolo (17.1%), and Yuba (19.2%) counties.

- 13 Table 20-2 presents data regarding race and origin by program area counties in 2011, while Table
- 14 20-3 presents percentages of households below the poverty level in 2010, also by program area
- 15 counties. Data presented in these tables are based on data derived from the U.S. Census Bureau's
- 16 population estimates and income and poverty estimates (U.S. Census Bureau 2012).

#### 17 Table 20-2. Percentage of Population by Race/Origin Characteristics by County in 2011

	Percentage						
County	White	Black	American Indian	Asian	Pacific Islander	Multiple Races <sup>a</sup>	Hispanic <sup>b</sup>
Butte	87.0	1.8	2.3	4.4	0.3	4.2	14.7
Colusa	92.0	1.1	2.7	1.6	0.5	2.0	56.1
Glenn	90.0	1.2	3.1	2.9	0.2	2.8	38.4
Placer	87.0	1.6	1.1	6.3	0.3	3.8	13.3
Sacramento	65.7	10.9	1.6	15.0	1.1	5.7	22.0
Solano	60.8	15.2	1.2	15.2	1.0	6.5	24.6
Sutter	75.3	2.4	2.3	15.5	0.4	4.1	29.4
Tehama	91.1	0.9	3.3	1.2	0.2	3.3	22.6
Yolo	75.6	3.0	1.9	14.1	0.6	4.8	30.5
Yuba	79.5	3.9	3.1	7.2	0.5	5.9	25.9
California	74.0	6.6	1.7	13.6	0.5	3.6	38.1

<sup>a</sup> People may have chosen to provide two or more races either by checking two or more race response check boxes, by providing multiple write-in responses, or by some combination of check boxes and write-in responses.

<sup>b</sup> People who identify their origin as Spanish, Hispanic, or Latino may be of any race and, therefore, are included in other applicable race categories.

Source: U.S. Census Bureau 2012.

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County	% Below Poverty Level <sup>a</sup>	
Butte	18.4	
Colusa	15.0	
Glenn	17.5	
Placer	6.6	
Sacramento	13.9	
Solano	10.4	
Sutter	14.3	
Tehama	20.3	
Yolo	17.1	
Yuba	20.0	
California	13.7	

#### Table 20-3. Percentage of Households below Poverty Level by County and State in 2010

Source: U.S. Census Bureau 2012

<sup>a</sup> Families and persons are classified as below poverty if their total family income or unrelated individual income was less than the poverty threshold specified for the applicable family size, age of householder, and number of related children under 18 present. The poverty thresholds are updated every year to reflect changes in the Consumer Price Index.

## 2 20.3 Regulatory Setting

Appendix C, Regulatory Background, describes the federal and state laws, regulations, and policies
 that pertain to socioeconomic and environmental justice issues within the proposed program area.
 Pertinent laws, regulations, and policies are listed below.

6 • Federal:

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- National Environmental Policy Act
  - Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations
- 10 Title VI of the Civil Rights Act
- 11 State:
- 12 O California Environmental Quality Act
- 13 O Government Code Section 65040.12

## **20.4 Determination of Effects**

Potential effects on socioeconomic conditions and environmental justice related to construction or
 operation of the proposed program alternatives are considered at a program level.

### 1 20.4.1 Assessment Methods

According to the Council on Environmental Quality's (CEQ's) Guidance for Agencies on Key Terms in
 Executive Order 12898 (Council on Environmental Quality 1997), the following definitions are used
 to assess environmental justice effects of the proposed program.

- Minority individuals are defined as members of the following population groups: American
   Indian or Alaskan Native, Asian or Pacific Islander, Black, or Hispanic.
- 7 Minority populations are identified either:
  - where the minority population percentage of the affected area is meaningfully greater than the minority population percentage of the general population, or
  - where the minority population percentage of the affected area exceeds 50% (Council on Environmental Quality 1997).
- For the purposes of this analysis, low-income populations are identified as populations in whicheither:
- the population percentage below the poverty level is meaningfully greater than that of the
   population percentage in the general population, or
- the population percentage below the poverty level in the affected area exceeds 50%.
- Based on the U.S. Census data presented in Table 20-3, the population percentage below the poverty
   level is not meaningfully greater than that of the population percentage of the general population in
- California, nor is the population percentage below the poverty level in the program area greater
   there 50%
- 20 than 50%.

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### 21 **20.4.2 Significance Criteria**

#### 22 **20.4.2.1** Socioeconomics

For this analysis, an effect pertaining to socioeconomics was considered significant if it would result
 in a substantial change in employment.

#### 25 **20.4.2.2** Environmental Justice

- 26 CEQ guidance (Council on Environmental Quality 1997:26–27) states that federal agencies are to
   27 consider the following three factors to the extent practicable when determining whether
   28 environmental effects are disproportionately high and adverse:
- Whether there is or would be an impact on the natural or physical environment that
   significantly and adversely affects a minority population, or low-income population. Such effects
   may include ecological, cultural, human health, economic, or social impacts on minority
   communities, low-income communities, or Indian tribes when those impacts are interrelated to
   impacts on the natural or physical environment.
- Whether the environmental effects are significant and are or may be having an adverse impact
   on minority populations, or low-income populations, which appreciably exceeds or is likely to
   appreciably exceed those on the general population or other appropriate comparison group.
- Whether the environmental effects occur or would occur in a minority population or low income population affected by cumulative or multiple adverse exposures from environmental
   hazards.
- 4 Unlike federal law, CEQA does not require an analysis of environmental justice. Therefore, this
- analysis (i.e., Effect SOC-1: Disproportionate Effect on Minority or Low-Income Populations) does
   not provide a CEQA finding or conclusion.

### 7 20.4.2.3 Related Analysis

Related issues include the potential displacement of housing and people and growth-inducing effects
of the proposed program, which are addressed in Chapters 15 and 22, respectively. In addition, the
effects pertaining to loss of agricultural lands and conversion of farmlands to nonagricultural uses is
addressed in Chapter 13, Land Use and Agriculture. Therefore, these issues are not discussed further
in this chapter.

## **20.5 Effects and Mitigation Measures**

## 14 **20.5.1** Alternative 1—No Action

15 Under Alternative 1, regular operation and maintenance (0&M) of the levee system would continue 16 as presently executed by the local maintaining entities (subject to revision of the governing O&M 17 manual), but construction activities associated with the proposed program would not occur. 18 Therefore, there would be no potential displacement of homes or residences as a result of levee 19 implementation, or changes in existing population or employment associated with construction of 20 the alternative. As described in Chapter 2, Project Description, erosion would continue under this 21 alternative, and the risk of levee failure and possible catastrophic flooding would increase as more 22 erosion sites become critical and repair is limited to emergency response by federal, state, or local 23 flood control agencies that would eventually implement bank protection along various sites along 24 Sacramento River Flood Control Project levees through emergency action. Emergency repairs would 25 likely result in effects on adjacent agricultural lands and other land uses similar to the proposed 26 program. However, this would likely affect populations of all incomes and races and would not 27 result in a disproportionately high or adverse effect on minority or low-income populations.

## 28 **20.5.2** Alternative 2A—Low Maintenance

#### 29 Effect SOC-1: Disproportionate Effect on Minority or Low-Income Populations

30 A number of rural and urban communities are located in the vicinity of potential bank protection 31 sites and throughout the program area. Alternative 2A entails filling the eroded portion of the bank 32 and installing revetment along the levee slope and streambank from the levee's toe to crest. As 33 described in Chapter 2, Project Description, the purpose and objective of the proposed program is to 34 arrest or avoid streambank erosion that threatens the integrity of the Sacramento River Flood 35 Control Project levee system. Implementing the bank repair and levee rehabilitation alternatives at 36 critical erosion sites would protect property, as well as the health and safety of residents. Therefore, 37 the proposed program would reduce the risk of flooding to existing residential, commercial, and 38 industrial development throughout the program area. While there are low-income and minority

- 1 populations present throughout the program area, the flood protection benefits of the proposed
- 2 program would affect all segments of the population in the program area. Without the
- 3 implementation of proposed bank protection measures at critical erosion sites, increased risk of
- levee failure and flooding would threaten a large population and substantial improvements in the
   program area, which spans 10 counties in California, and possibly displace people and residences.
- 6 There are known vagrant populations that camp along the program area. The proposed program
- 7 could displace this population during construction activities by deterring camping activity. Due to
- 8 the lack of established residences and the wandering nature of these individuals, there is not enough 9 data about this population to draw conclusions about the number of people that could potentially be
- 9 data about this population to draw conclusions about the number of people that could potentially be
   10 displaced. Furthermore, any loitering or camping along the river corridors outside of designated
- 11 campgrounds is typically unlawful [e.g., Sacramento City Code, Title 12 Streets, Sidewalks and Public
- 12 Places; Yolo County Code, Title 6 Sanitation and Health; Butte County Code, Chapter 24, Section 24-
- 13 260(a)]. As addressed in more detail in Chapter 13, Land Use and Agriculture, construction of this
- 14 alternative is not expected to divide an established community. Further, construction-related
- 15 environmental effects associated with Alternative 2A (e.g., temporary exposure to noise, dust, traffic,
- and hazardous materials) would occur throughout the program area and take place incrementally.
- Construction activities associated with Alternative 2A would not result in a disproportionate effect
   on minority or low-income populations. This effect is considered less than significant.

### 19 Effect SOC-2: Temporary Increase in Employment during Construction

Construction activities associated with implementation of this alternative would temporarily
 increase employment and personal income in the local area, and potentially in all 10 counties within
 the program area. Although construction would take place incrementally over several years,
 employment during the construction period would increase directly as a result of the labor needed
 for construction activities. Employment in the program area would also increase indirectly as
 personnel involved in construction of the program spend their wages and salaries in the program
 area.

Therefore, program construction would benefit the local economies within program area counties
by temporarily increasing employment and personal income. However, those changes would be
minor relative to the total economic activity in program area counties. Construction-related
employment would represent a small fraction of total employment and personal income levels. The
effect on employment is considered beneficial.

# 20.5.3 Alternative 3A—Maximize Meander Zone (Environmentally Superior Alternative)

#### 34 Effect SOC-1: Disproportionate Effect on Minority or Low-Income Populations

35 This effect would be similar to Alternative 2A in type, but at a potentially greater magnitude due to

36 the greater amount of land required. Alternative 3A involves constructing new setback levees some 37 distance landward of the existing levee, as well as adjacent levees, and would avoid or minimize

- construction in the stream channel or riparian areas. Therefore, while effects on residents and
- homes on the waterside may be minimized or avoided, construction of a setback levee or adjacent
- 40 levee could increase the potential to adversely affect residents and homes on the landside. A setback

- levee or adjacent levee may be applied anywhere within the program area, but cost, existing land
   use, and technical issues may limit opportunities.
- 3 In addition to public and private docks, businesses, and campgrounds, homes are interspersed 4 among woodlands on the waterside of SRBPP levees. Implementation of Alternative 3A has the 5 potential to displace people and homes, thus requiring the relocation of residences. As addressed in 6 more detail in Chapter 15, Population and Housing, construction of a setback levee or adjacent levee 7 would not require construction of new housing to achieve relocation of residences or to 8 accommodate workers, and would not involve the displacement of a substantial number of people 9 or residences. Any potential relocation of residents would be conducted in compliance with the 10 federal Uniform Relocation Assistance and Real Property Acquisition Policies Act (42 U.S.C. § 4601 11 et seq.), the California Relocation Act, and the California Relocation Assistance and Real Property Acquisition Guidelines. Pursuant to these federal and state relocation laws, appropriate 12 compensation would be provided to displaced landowners and tenants, and residents would be 13 14 relocated to comparable replacement housing. The Relocation Assistance and Real Property 15 Acquisition Guidelines were established by 25 CCR Section 1.6. The guidelines were developed to 16 assist public entities with developing regulations and procedures for implementing 42 USC Section 61, the Uniform Act for federal and federally assisted programs. The guidelines are designed to 17 18 ensure that uniform, fair, and equitable treatment is given to people displaced from their homes, 19 businesses, or farms as a result of the actions of a public entity.
- In addition, bank protection methods would be selected using selection criteria that consider the
   need to purchase real estate and land use compatibility, among others factors. Regardless of
   demographic characteristics, it is the intention of the proposed program to avoid displacement of
   homes whenever possible and such bank repair methods would be proposed only when they are
   absolutely necessary because of constraints, such as engineering, construction, and the ability of the
   treatment to provide adequate flood protection for the entire population in the area.
- As addressed in more detail in Chapter 13, Land Use and Agriculture, construction of this alternative
- 27 is not expected to divide an established community. Construction activities associated with
- Alternative 3A would not result in a disproportionate effect on minority or low-income populations.
   This effect would be less than significant.
- 30 Effect SOC-2: Temporary Increase in Employment during Construction
- 31 This effect would be similar to Alternative 2A and would be considered beneficial.

# 32 20.5.4 Alternative 4A—Habitat Replacement (Preferred 33 Alternative)

#### 34 Effect SOC-1: Disproportionate Effect on Minority or Low-Income Populations

- This effect would be similar to Alternative 3A in type, but at a lesser magnitude because fewer
   setback levees and adjacent levees would be constructed. This effect would be considered less than
   significant.
- 38 Effect SOC-2: Temporary Increase in Employment during Construction
- 39 This effect would be similar to Alternative 2A and would be considered beneficial.

# 20.5.5 Alternative 5A—Habitat Replacement Reaching Environmental Neutrality

#### 3 Effect SOC-1: Disproportionate Effect on Minority or Low-Income Populations

This effect would be similar to Alternative 3A in type, but at a lesser magnitude because fewer
setback levees and adjacent levees would be constructed. This effect would be considered less than
significant.

#### 7 Effect SOC-2: Temporary Increase in Employment during Construction

8 This effect would be similar to Alternative 2A and would be considered beneficial.

# 9 20.5.6 Alternative 6A—Habitat Replacement with Vegetation ETL 10 Variance

#### 11 Effect SOC-1: Disproportionate Effect on Minority or Low-Income Populations

12 This effect would be similar to Alternative 3A in type, but at a lesser magnitude because fewer 13 setback levees would be constructed. This effect would be considered less than significant.

#### 14 Effect SOC-2: Temporary Increase in Employment during Construction

15 This effect would be similar to Alternative 2A and would be considered beneficial.

Chapter 21
Effects of Implementation in
<b>Economically Justified Basins Only</b>

As previously discussed in Chapter 2, Project Description, implementation of the proposed program
may be influenced by a benefit-cost analysis. In accordance with Corps policy, all water resources
projects must have a federal interest and be justified by showing beneficial outputs greater than
costs (Engineer Regulation 1105-2-100, Planning Guidance Notebook). While the traditional
approach has been to look at the erosion sites in the aggregate (e.g., all 106 representative sites
together), and that approach will likely continue, it is possible that the analysis will look at
individual basins or reclamation districts, maintenance areas, or levee districts.

A preliminary analysis has indicated that flood damage reduction in certain less-developed regions
 (i.e., economic impact areas) in the study program area is not likely to meet the benefit-cost criteria.
 These regions are agricultural areas with few structures. During the implementation phase, it may
 be difficult to justify bank protection for levees that protect these regions. As a result, bank
 protection may only be considered justified in some portions of the program area. Accordingly, this
 EIS/EIR considers a set of alternatives within these "economically justified basins."

17 In order to account for this possibility, a subset of the 106 representative sites is analyzed under 18 each action alternative. The subset, or sub-alternative, represents the erosion sites within the 19 currently identified seven basins that are most likely to satisfy the more restrictive approach to the 20 benefit-cost analysis (also referred to as economically justified basins in this EIS/EIR), as indicated 21 in Table 2-2 in Chapter 2. The proposed action at the individual sites within the seven basins would 22 not change under the sub-alternatives; however, sites outside of the seven basins would not be 23 addressed. As a result, the total number of erosion sites to be addressed, and, therefore, the length of 24 bank protection to be implemented, would be less under the sub-alternative when compared with 25 the corresponding primary alternative (e.g., 2B is a sub-alternative to Alternative 2A, a primary 26 alternative).

Effects associated with each sub-alternative (e.g., 2B, 3B, 4B, 5B, and 6B) were evaluated under each
resource -and have been found to be comparable in type to those previously described for the
corresponding primary alternative (e.g., 2A, 3A, 4A, 5A, and 6A, respectively), but at a lesser
magnitude due to the reduced total footprint of the sub-alternative. In every case, the significance
determinations for the effects under the sub-alternatives were found to remain the same as for the
primary alternatives, and the relevant mitigation measures also apply (Table 21-1).

33 For those effects that result in a less than significant or beneficial effect, it is logical that the lesser 34 magnitude associated with the sub-alternative would result in the same effect conclusion as that 35 found for the primary alternative. For example, temporary increases in turbidity and suspended 36 solids during construction (Effect WQ-1) would occur under both the primary and sub-alternatives, 37 as would disturbance to or loss of common wildlife species as a result of construction (Effect WILD-38 3). No situations were identified where a less-than-significant effects determination under the 39 primary alternative changed to a no effect or beneficial conclusion under the sub-alternative. This is 40 due to the nature of the impacts having some level of adverse effect regardless of the scale (e.g., 41 constructing only one site would still have temporary increases in turbidity that would not be 42 considered no effect or a beneficial effect).

1

2

3

- 1 Similarly, those effects considered significant under a primary alternative are expected to remain
- 2 significant under a sub-alternative. While these effects may be less severe under a sub-alternative
- 3 than a primary alternative, they would still cross the threshold of significance when assessed under
- 4 the relevant criteria. For example, the loss of special-status plant populations or wildlife species as a
- 5 result of construction activities would be significant regardless of the number of sites where it
- happens. Effects on recreation, aesthetics, and cultural resources could also be significant based on
   actions at a single site if the relevant resource characteristics are present at that site. As a result, the
- 8 same significance determinations are found for both the primary alternatives and sub-alternatives.
- 9 In conclusion, effects associated with each sub-alternative would be comparable in type to those
- 10 described by each resource in Chapters 4 through 20 for the corresponding primary alternative.
- Additionally, the significance determinations under each sub-alternative would remain the same as
- 12 for the primary alternative, and the applicable mitigation measures would also apply (Table 21-1).

Alternative	Finding	Mitigation Measure	Finding with Mitigation
Effect FCGEOM-1: Decreas	e in Levee Erosion and	d Change in Sediment Recruitme	nt
Alternative 1—No Action	No effect	None required	—
Alternative 2A	Less than significant	FCGEOM-MM-1: Conduct Site- Specific Studies at Levee Repair Sites and Minimize Changes in Local Hydraulic Conditions through Project Design	Less than significant
Sub-Alternative 2B	Less than significant	FCGEOM-MM-1	Less than significant
Alternative 3A	Less than significant	FCGEOM-MM-1	Less than significant
Sub-Alternative 3B	Less than significant	FCGEOM-MM-1	Less than significant
Alternative 4A	Less than significant	FCGEOM-MM-1	Less than significant
Sub-Alternative 4B	Less than significant	FCGEOM-MM-1	Less than significant
Alternative 5A	Less than significant	FCGEOM-MM-1	Less than significant
Sub-Alternative 5B	Less than significant	FCGEOM-MM-1	Less than significant
Alternative 6A	Less than significant	FCGEOM-MM-1	Less than significant
Sub-Alternative 6B	Less than significant	FCGEOM-MM-1	Less than significant
Effect FCGEOM-2: Increase	e in Levee Slope Stabil	ity	
Alternative 1—No Action	No effect	None required	_
Alternative 2A	Beneficial	None required	—
Sub-Alternative 2B	Beneficial	None required	—
Alternative 3A	Beneficial	None required	_
Sub-Alternative 3B	Beneficial	None required	—
Alternative 4A	Beneficial	None required	_
Sub-Alternative 4B	Beneficial	None required	_
Alternative 5A	Beneficial	None required	—
Sub-Alternative 5B	Beneficial	None required	_
Alternative 6A	Beneficial	None required	—
Sub-Alternative 6B	Beneficial	None required	_

#### 13 Table 21-1. Summary of All Effects and Mitigation Measures, Including Sub-Alternatives

			Finding with
Alternative	Finding	Mitigation Measure	Mitigation
Effect FCGEOM-3: Decrease	e in Instream Woody N	laterial Recruitment	
Alternative 1—No Action	No effect	None required	—
Alternative 2A	Significant	FISH-MM-2: Compensate for Loss of Fish Habitat	Less than significant
		VEG-MM-1: Compensate for the Loss of Woody Riparian Habitat	
Sub-Alternative 2B	Significant	FISH-MM-2, VEG-MM-1	Less than significant
Alternative 3A	No effect	FISH-MM-2, VEG-MM-1	_
Sub-Alternative 3B	No effect	FISH-MM-2, VEG-MM-1	_
Alternative 4A	Significant	FISH-MM-2, VEG-MM-1	Less than significant
Sub-Alternative 4B	Significant	FISH-MM-2, VEG-MM-1	Less than significant
Alternative 5A	Significant	FISH-MM-2, VEG-MM-1	Less than significant
Sub-Alternative 5B	Significant	FISH-MM-2, VEG-MM-1	Less than significant
Alternative 6A	Significant	FISH-MM-2, VEG-MM-1	Less than significant
Sub-Alternative 6B	Significant	FISH-MM-2, VEG-MM-1	Less than significant
Effect FCGEOM-4: Changes	in Local Hydraulics ar	nd Shear Stress	
Alternative 1—No Action	No effect	None required	—
Alternative 2A	Significant	FCGEOM-MM-1	Less than significant
Sub-Alternative 2B	Significant	FCGEOM-MM-1	Less than significant
Alternative 3A	Significant	FCGEOM-MM-1	Less than significant
Sub-Alternative 3B	Significant	FCGEOM-MM-1	Less than significant
Alternative 4A	Significant	FCGEOM-MM-1	Less than significant
Sub-Alternative 4B	Significant	FCGEOM-MM-1	Less than significant
Alternative 5A	Significant	FCGEOM-MM-1	Less than significant
Sub-Alternative 5B	Significant	FCGEOM-MM-1	Less than significant
Alternative 6A	Significant	FCGEOM-MM-1	Less than significant
Sub-Alternative 6B	Significant	FCGEOM-MM-1	Less than significant
Effect FCGEOM-5: Minimiza	ation of Stream Energy	y and Associated Floodplain Scou	r and/or Deposition
Alternative 1—No Action	No effect	None required	_
Alternative 2A	No effect	None required	_
Sub-Alternative 2B	No effect	None required	—
Alternative 3A	Beneficial	None required	—
Sub-Alternative 3B	Beneficial	None required	—
Alternative 4A	Beneficial	None required	—
Sub-Alternative 4B	Beneficial	None required	—
Alternative 5A	Beneficial	None required	_
Sub-Alternative 5B	Beneficial	None required	_
Alternative 6A	Beneficial	None required	_
Sub-Alternative 6B	Beneficial	None required	_

Alternative	Finding	Mitigation Measure	Finding with Mitigation
FCGEOM-6: Substantially A	lter the Existing Drai	nage Pattern of the Site or Area	
Alternative 1—No Action	No effect	None required	_
Alternative 2A	No effect	None required	_
Sub-Alternative 2B	No effect	None required	_
Alternative 3A	Significant	FCGEOM-MM-2: Coordinate with Owners and Operators, Prepare Drainage Studies as Needed, and Remediate Effects through Project Design	Less than significant
Sub-Alternative 3B	Significant	FCGEOM-MM-2	Less than significant
Alternative 4A	Significant	FCGEOM-MM-2	Less than significant
Sub-Alternative 4B	Significant	FCGEOM-MM-2	Less than significant
Alternative 5A	Significant	FCGEOM-MM-2	Less than significant
Sub-Alternative 5B	Significant	FCGEOM-MM-2	Less than significant
Alternative 6A	Significant	FCGEOM-MM-2	Less than significant
Sub-Alternative 6B	Significant	FCGEOM-MM-2	Less than significant
Effect WQ-1: Temporary In	ncrease in Turbidity a	nd Suspended Solids during Cons	struction
Alternative 1—No Action	No effect	None required	_
Alternative 2A	Significant	WQ-MM-1: Monitor Turbidity during Construction	Less than significant
Sub-Alternative 2B	Significant	WQ-MM-1	Less than significant
Alternative 3A	Significant	WQ-MM-1	Less than significant
Sub-Alternative 3B	Significant	WQ-MM-1	Less than significant
Alternative 4A	Significant	WQ-MM-1	Less than significant
Sub-Alternative 4B	Significant	WQ-MM-1	Less than significant
Alternative 5A	Significant	WQ-MM-1	Less than significant
Sub-Alternative 5B	Significant	WQ-MM-1	Less than significant
Alternative 6A	Significant	WQ-MM-1	Less than significant
Sub-Alternative 6B	Significant	WQ-MM-1	Less than significant
Effect WQ-2: Release of Ha Construction	zardous Materials to A	Adjacent Water Body or Groundv	vater during
Alternative 1—No Action	No effect	None required	_
Alternative 2A	Less than Significant	WQ-MM-2: Implement Measures to Maintain Surface Water and Groundwater Quality	Less than significant
Sub-Alternative 2B	Less than Significant	WQ-MM-2	Less than significant
Alternative 3A	Less than Significant	WQ-MM-2	Less than significant
Sub-Alternative 3B	Less than Significant	WQ-MM-2	Less than significant
Alternative 4A	Less than Significant	WQ-MM-2	Less than significant
Sub-Alternative 4B	Less than Significant	WQ-MM-2	Less than significant
Alternative 5A	Less than Significant	WQ-MM-2	Less than significant
Sub-Alternative 5B	Less than Significant	WQ-MM-2	Less than significant
Alternative 6A	Less than Significant	WQ-MM-2	Less than significant

			Finding with
Alternative	Finding	Mitigation Measure	Mitigation
Sub-Alternative 6B	Less than Significant	WQ-MM-2	Less than significant
Effect GEO-1: Potential Ad	verse Effects Resulting	g from Surface Fault Rupture	
Alternative 1—No Action	No effect	None required	_
Alternative 2A	No effect	None required	_
Sub-Alternative 2B	No effect	None required	_
Alternative 3A	No effect	None required	_
Sub-Alternative 3B	No effect	None required	_
Alternative 4A	No effect	None required	_
Sub-Alternative 4B	No effect	None required	_
Alternative 5A	No effect	None required	_
Sub-Alternative 5B	No effect	None required	_
Alternative 6A	No effect	None required	_
Sub-Alternative 6B	No effect	None required	—
Effect GEO-2: Increase Exp	osure of People or Str	uctures to Hazards Related to St	rong Seismic Ground
Shaking			
Alternative 1—No Action	No effect	None required	_
Alternative 2A	Less than significant	None required	_
Sub-Alternative 2B	Less than significant	None required	_
Alternative 3A	Less than significant	None required	_
Sub-Alternative 3B	Less than significant	None required	_
Alternative 4A	Less than significant	None required	_
Sub-Alternative 4B	Less than Significant	None required	_
Alternative 5A	Less than significant	None required	_
Sub-Alternative 5B	Less than significant	None required	_
Alternative 6A	Less than significant	None required	_
Sub-Alternative 6B	Less than significant	None required	_

Effect GEO-3: Potential Accelerated Erosion and Sedimentation Resulting from Construction-Related Ground Disturbance

Alternative 1—No Action	No effect	None required	—
Alternative 2A	Less than significant	None required	—
Sub-Alternative 2B	Less than significant	None required	—
Alternative 3A	Less than significant	None required	—
Sub-Alternative 3B	Less than significant	None required	—
Alternative 4A	Less than significant	None required	—
Sub-Alternative 4B	Less than significant	None required	—
Alternative 5A	Less than significant	None required	—
Sub-Alternative 5B	Less than significant	None required	—
Alternative 6A	Less than significant	None required	—
Sub-Alternative 6B	Less than significant	None required	_

			Finding with
Alternative	Finding	Mitigation Measure	Mitigation
Effect GEO-4: Loss of Signi	ficant Mineral Resour	ces as a Result of Program Imple	ementation
Alternative 1—No Action	No effect	None required	_
Alternative 2A	Less than significant	None required	_
Sub-Alternative 2B	Less than significant	None required	_
Alternative 3A	Less than significant	None required	_
Sub-Alternative 3B	Less than significant	None required	_
Alternative 4A	Less than significant	None required	_
Sub-Alternative 4B	Less than significant	None required	_
Alternative 5A	Less than significant	None required	_
Sub-Alternative 5B	Less than significant	None required	—
Alternative 6A	Less than significant	None required	—
Sub-Alternative 6B	Less than significant	None required	—
Effect TN-1: Temporary In	crease in Traffic Volu	mes from Construction-Generate	ed Traffic and
Potential Degradation of I	.OS for Roadways in tl	ne Vicinity of the Program	
Alternative 1—No Action	No effect	None required	_
Alternative 2A	Significant	TN-MM-1: Implement a Traffic Control and Road Maintenance Plan	Less than significant
Sub-Alternative 2B	Significant	TN-MM-1	Less than significant
Alternative 3A	Significant	TN-MM-1	Less than significant
Sub-Alternative 3B	Significant	TN-MM-1	Less than significant
Alternative 4A	Significant	TN-MM-1	Less than significant
Sub-Alternative 4B	Significant	TN-MM-1	Less than significant
Alternative 5A	Significant	TN-MM-1	Less than significant
Sub-Alternative 5B	Significant	TN-MM-1	Less than significant
Alternative 6A	Significant	TN-MM-1	Less than significant
Sub-Alternative 6B	Significant	TN-MM-1	Less than significant
Effect TN-2: Potential Incr	ease in Safety Hazard	s Attributable to Construction-G	enerated Traffic
Alternative 1—No Action	No effect	None required	—
Alternative 2A	Significant	TN-MM-1	Less than significant
Sub-Alternative 2B	Significant	TN-MM-1	Less than significant
Alternative 3A	Significant	TN-MM-1	Less than significant
Sub-Alternative 3B	Significant	TN-MM-1	Less than significant
Alternative 4A	Significant	TN-MM-1	Less than significant
Sub-Alternative 4B	Significant	TN-MM-1	Less than significant
Alternative 5A	Significant	TN-MM-1	Less than significant
Sub-Alternative 5B	Significant	TN-MM-1	Less than significant
Alternative 6A	Significant	TN-MM-1	Less than significant
Sub-Alternative 6B	Significant	TN-MM-1	Less than significant

			Finding with
Alternative	Finding	Mitigation Measure	Mitigation
Effect TN-3: Increase Emer	gency Response Time	2S	
Alternative 1—No Action	No effect	None required	—
Alternative 2A	Significant	TN-MM-1	Less than significant
Sub-Alternative 2B	Significant	TN-MM-1	Less than significant
Alternative 3A	Significant	TN-MM-1	Less than significant
Sub-Alternative 3B	Significant	TN-MM-1	Less than significant
Alternative 4A	Significant	TN-MM-1	Less than significant
Sub-Alternative 4B	Significant	TN-MM-1	Less than significant
Alternative 5A	Significant	TN-MM-1	Less than significant
Sub-Alternative 5B	Significant	TN-MM-1	Less than significant
Alternative 6A	Significant	TN-MM-1	Less than significant
Sub-Alternative 6B	Significant	TN-MM-1	Less than significant
Effect TN-4: Potential Inad	equate Parking Suppl	y to Meet Parking Demand for Co	onstruction
Equipment and Constructi	on Workers		
Alternative 1—No Action	No effect	None required	_
Alternative 2A	No effect	None required	—
Sub-Alternative 2B	No effect	None required	—
Alternative 3A	No effect	None required	—
Sub-Alternative 3B	No effect	None required	—
Alternative 4A	No effect	None required	—
Sub-Alternative 4B	No effect	None required	—
Alternative 5A	No effect	None required	—
Sub-Alternative 5B	No effect	None required	_
Alternative 6A	No effect	None required	_
Sub-Alternative 6B	No effect	None required	_
Effect TN-5: Potential Conf	lict with Alternative T	ransportation Modes because of	Temporary Road
Closures			
Alternative 1—No Action	No effect	None required	_
Alternative 2A	Significant	TN-MM-1	Less than significant
Sub-Alternative 2B	Significant	TN-MM-1	Less than significant
Alternative 3A	Significant	TN-MM-1	Less than significant
Sub-Alternative 3B	Significant	TN-MM-1	Less than significant
Alternative 4A	Significant	TN-MM-1	Less than significant
Sub-Alternative 4B	Significant	TN-MM-1	Less than significant
Alternative 5A	Significant	TN-MM-1	Less than significant
Sub-Alternative 5B	Significant	TN-MM-1	Less than significant
Alternative 6A	Significant	TN-MM-1	Less than significant
Sub-Alternative 6B	Significant	TN-MM-1	Less than significant

			Finding with
Alternative	Finding	Mitigation Measure	Mitigation
Effect TN-6: Temporary Ch	nanges to Navigation		
Alternative 1—No Action	No effect	None required	—
Alternative 2A	Less than significant	None required	_
Sub-Alternative 2B	Less than significant	None required	_
Alternative 3A	Less than significant	None required	_
Sub-Alternative 3B	Less than significant	None required	_
Alternative 4A	Less than significant	None required	_
Sub-Alternative 4B	Less than significant	None required	—
Alternative 5A	Less than significant	None required	
Sub-Alternative 5B	Less than significant	None required	
Alternative 6A	Less than significant	None required	—
Sub-Alternative 6B	Less than significant	None required	_
Effect TN-7: Potential Rero	outing of Roads		
Alternative 1—No Action	No effect	None required	—
Alternative 2A	No effect	None required	—
Sub-Alternative 2B	No effect	None required	—
Alternative 3A	Significant	TN-MM-1	Less than significant
Sub-Alternative 3B	Significant	TN-MM-1	Less than significant
Alternative 4A	Significant	TN-MM-1	Less than significant
Sub-Alternative 4B	Significant	TN-MM-1	Less than significant
Alternative 5A	Significant	TN-MM-1	Less than significant
Sub-Alternative 5B	Significant	TN-MM-1	Less than significant
Alternative 6A	Significant	TN-MM-1	Less than significant
Sub-Alternative 6B	Significant	TN-MM-1	Less than significant
Effect AQ-1: Generation of	Direct and Indirect Co	onstruction Emissions in Excess o	of Federal <i>de minimis</i>
Threshold Levels			
Alternative 1—No Action	No effect	None required	—
Alternative 2A	Significant	AQ-MM-1a: Apply Applicable Air District's Mitigation Measures to Reduce Construction Emissions below <i>de minimis</i> Threshold Levels	Significant and unavoidable
		AQ-MM-1b: Offset Construction-	
		Generated NUx Emissions to Net $Z_{\text{ero}}(0)$ for ROG NOv PM10 and	
		<u>PM2.5</u> Emissions in Excess of <i>de</i>	

Sub-Alternative 2B

Sub-Alternative 3B

Alternative 3A

Significant

Significant

Significant

minimis Thresholds

AQ-MM-1a, AQ-MM-1b

AQ-MM-1a, AQ-MM-1b

AQ-MM-1a, AQ-MM-1b

Significant and

unavoidable Significant and

unavoidable

unavoidable

Significant and

Alternative	Finding	Mitigation Measure	Finding with Mitigation
Alternative 4A	Significant	AQ-MM-1a, AQ-MM-1b	Significant and unavoidable
Sub-Alternative 4B	Significant	AQ-MM-1a, AQ-MM-1b	Significant and unavoidable
Alternative 5A	Significant	AQ-MM-1a, AQ-MM-1b	Significant and unavoidable
Sub-Alternative 5B	Significant	AQ-MM-1a, AQ-MM-1b	Significant and unavoidable
Alternative 6A	Significant	AQ-MM-1a, AQ-MM-1b	Significant and unavoidable
Sub-Alternative 6B	Significant	AQ-MM-1a, AQ-MM-1b	Significant and unavoidable

## Effect AQ-2: Generation of Direct and Indirect Operational Emissions in Excess of Federal *de minimis* Threshold Levels

Alternative 1—No Action	No effect	None required	_
Alternative 2A	Significant	AQ-MM-2: Apply Applicable Air District's Mitigation Measures to Reduce Operational Emissions below Federal <i>de minimis</i> Thresholds	Less than significant
Sub-Alternative 2B	Significant	AQ-MM-2	Less than significant
Alternative 3A	Significant	AQ-MM-2	Less than significant
Sub-Alternative 3B	Significant	AQ-MM-2	Less than significant
Alternative 4A	Significant	AQ-MM-2	Less than significant
Sub-Alternative 4B	Significant	AQ-MM-2	Less than significant
Alternative 5A	Significant	AQ-MM-2	Less than significant
Sub-Alternative 5B	Significant	AQ-MM-2	Less than significant
Alternative 6A	Significant	AQ-MM-2	Less than significant
Sub-Alternative 6B	Significant	AQ-MM-2	Less than significant

## Effect AQ-3: Temporary Increase in Construction-Related Emissions in Excess of Applicable Standards

Alternative 1—No Action	No effect	None required	—
Alternative 2A	Significant	AQ-MM-3: Apply Applicable Air District's Mitigation Measures to Reduce Construction Emissions below Applicable Air District's Thresholds	Significant and unavoidable
Sub-Alternative 2B	Significant	AQ-MM-3	Significant and unavoidable
Alternative 3A	Significant	AQ-MM-3	Significant and unavoidable
Sub-Alternative 3B	Significant	AQ-MM-3	Significant and unavoidable
Alternative 4A	Significant	AQ-MM-3	Significant and unavoidable

Alternative	Finding	Mitigation Measure	Finding with Mitigation
Sub-Alternative 4B	Significant	AQ-MM-3	Significant and unavoidable
Alternative 5A	Significant	AQ-MM-3	Significant and unavoidable
Sub-Alternative 5B	Significant	AQ-MM-3	Significant and unavoidable
Alternative 6A	Significant	AQ-MM-3	Significant and unavoidable
Sub-Alternative 6B	Significant	AQ-MM-3	Significant and unavoidable

#### Effect AQ-4: Elevated Health Risks from the Exposure of Nearby Sensitive Receptors to Construction-Related HAPs/TACs

Alternative 1—No Action	No effect	None required	—
Alternative 2A	Significant	AQ-MM-4: Apply Applicable Air District's Mitigation Measures to Reduce HAP/TAC Emissions below the Applicable Air District's HAP/TAC Thresholds	Less than significant
Sub-Alternative 2B	Significant	AQ-MM-4	Less than significant
Alternative 3A	Significant	AQ-MM-4	Less than significant
Sub-Alternative 3B	Significant	AQ-MM-4	Less than significant
Alternative 4A	Significant	AQ-MM-4	Less than significant
Sub-Alternative 4B	Significant	AQ-MM-4	Less than significant
Alternative 5A	Significant	AQ-MM-4	Less than significant
Sub-Alternative 5B	Significant	AQ-MM-4	Less than significant
Alternative 6A	Significant	AQ-MM-4	Less than significant
Sub-Alternative 6B	Significant	AQ-MM-4	Less than significant

#### Effect AQ-5: Generation of Operational Emissions in Excess of Applicable Standards

Alternative 1—No Action	No effect	None required	_
Alternative 2A	Significant	AQ-MM-5: Apply Applicable Air District's Mitigation Measures to Reduce Operational Emissions below Applicable Air District's Thresholds	Less than significant
Sub-Alternative 2B	Significant	AQ-MM-5	Less than significant
Alternative 3A	Significant	AQ-MM-5	Less than significant
Sub-Alternative 3B	Significant	AQ-MM-5	Less than significant
Alternative 4A	Significant	AQ-MM-5	Less than significant
Sub-Alternative 4B	Significant	AQ-MM-5	Less than significant
Alternative 5A	Significant	AQ-MM-5	Less than significant
Sub-Alternative 5B	Significant	AQ-MM-5	Less than significant
Alternative 6A	Significant	AQ-MM-5	Less than significant
Sub-Alternative 6B	Significant	AQ-MM-5	Less than significant

			Finding with			
Alternative	Finding	Mitigation Measure	Mitigation			
Effect AQ-6: Generation of Construction GHG Emissions that May Have a Significant Impact on the Environment						
Alternative 1—No Action	No effect	None required	_			
Alternative 2A	Significant	AQ-MM-6: Implement Measures to Minimize GHG Emissions from Construction Activities	Significant and unavoidable			
Sub-Alternative 2B	Significant	AQ-MM-6	Significant and unavoidable			
Alternative 3A	Significant	AQ-MM-6	Significant and unavoidable			
Sub-Alternative 3B	Significant	AQ-MM-6	Significant and unavoidable			
Alternative 4A	Significant	AQ-MM-6	Significant and unavoidable			
Sub-Alternative 4B	Significant	AQ-MM-6	Significant and unavoidable			
Alternative 5A	Significant	AQ-MM-6	Significant and unavoidable			
Sub-Alternative 5B	Significant	AQ-MM-6	Significant and unavoidable			
Alternative 6A	Significant	AQ-MM-6	Significant and unavoidable			
Sub-Alternative 6B	Significant	AQ-MM-6	Significant and unavoidable			
Effect AQ-7: Generation of Environment	Operational GHG Emi	ssions that May Have a Significan	it Impact on the			
Alternative 1—No Action	No effect	None required	_			
Alternative 2A	C' 'C' '		Significant and			

memative i mometion	No effect	None required	
Alternative 2A	Significant	AQ-MM-6	Significant and unavoidable
Sub-Alternative 2B	Significant	AQ-MM-6	Significant and unavoidable
Alternative 3A	Significant	AQ-MM-6	Significant and unavoidable
Sub-Alternative 3B	Significant	AQ-MM-6	Significant and unavoidable
Alternative 4A	Significant	AQ-MM-6	Significant and unavoidable
Sub-Alternative 4B	Significant	AQ-MM-6	Significant and unavoidable
Alternative 5A	Significant	AQ-MM-6	Significant and unavoidable
Sub-Alternative 5B	Significant	AQ-MM-6	Significant and unavoidable
Alternative 6A	Significant	AQ-MM-6	Significant and unavoidable
Sub-Alternative 6B	Significant	AQ-MM-6	Significant and unavoidable

A1	<b>D</b> . 1.	N	Finding with		
Alternative	Finding	Mitigation Measure	Mitigation		
Effect NOI-1: Exposure of S	Sensitive Receptors Ac	ljacent to the Levee Construction	Sites to Temporary		
Alternative 1—No Action	No effect	None required	_		
Alternative 2A	Significant	NOI-MM-1: Employ Noise- Reducing Construction Practices to Comply with Applicable Noise Impact Criteria	Significant and unavoidable		
Sub-Alternative 2B	Significant	NOI-MM-1	Significant and unavoidable		
Alternative 3A	Significant	NOI-MM-1	Significant and unavoidable		
Sub-Alternative 3B	Significant	NOI-MM-1	Significant and unavoidable		
Alternative 4A	Significant	NOI-MM-1	Significant and unavoidable		
Sub-Alternative 4B	Significant	NOI-MM-1	Significant and unavoidable		
Alternative 5A	Significant	NOI-MM-1	Significant and unavoidable		
Sub-Alternative 5B	Significant	NOI-MM-1	Significant and unavoidable		
Alternative 6A	Significant	NOI-MM-1	Significant and unavoidable		
Sub-Alternative 6B	Significant	NOI-MM-1	Significant and unavoidable		
Effect NOI-2: Exposure of Sensitive Receptors along Truck Haul Routes to Substantial Temporary					
Traffic Noise Increases					
Alternative 1—No Action	No effect	None required	—		
Alternative 2A	Less than significant	None required	_		
Sub-Alternative 2B	Less than significant	None required	_		
	T (1 · · · · · ·	N · 1			

Alternative 2A	Less than significant	None required	—
Sub-Alternative 2B	Less than significant	None required	—
Alternative 3A	Less than significant	None required	—
Sub-Alternative 3B	Less than significant	None required	—
Alternative 4A	Less than significant	None required	—
Sub-Alternative 4B	Less than significant	None required	—
Alternative 5A	Less than significant	None required	—
Sub-Alternative 5B	Less than significant	None required	—
Alternative 6A	Less than significant	None required	—
Sub-Alternative 6B	Less than significant	None required	_

Alternative	Finding	Mitigation Measure	Finding with
Effect NOI-3: Exposure of S	Sensitive Recentors t	o Temporary Construction-Relate	ad Vibration
Alternative 1—No Action	No effect	None required	
Alternative 2A	Significant	NOI-MM-2: Conduct Vibration Monitoring at Buildings within 40 feet of Construction Equipment	Significant and unavoidable
Sub-Alternative 2B	Significant	NOI-MM-2	Significant and unavoidable
Alternative 3A	Significant	NOI-MM-2	Significant and unavoidable
Sub-Alternative 3B	Significant	NOI-MM-2	Significant and unavoidable
Alternative 4A	Significant	NOI-MM-2	Significant and unavoidable
Sub-Alternative 4B	Significant	NOI-MM-2	Significant and unavoidable
Alternative 5A	Significant	NOI-MM-2	Significant and unavoidable
Sub-Alternative 5B	Significant	NOI-MM-2	Significant and unavoidable
Alternative 6A	Significant	NOI-MM-2	Significant and unavoidable
Sub-Alternative 6B	Significant	NOI-MM-2	Significant and unavoidable

#### Effect NOI-4: Exposure of Sensitive Receptors to Intermittent Noise Due to Long-Term Maintenance Activity including Emergency Repair Activities

Alternative 1—No Action	No effect	None required	—
Alternative 2A	Significant	NOI-MM-1 and NOI-MM-3: Employ Emergency Repair Practices to Reduce Noise Where Feasible	Significant and unavoidable
Sub-Alternative 2B	Significant	NOI-MM-1 and NOI-MM-3	Significant and unavoidable
Alternative 3A	Significant	NOI-MM-1 and NOI-MM-3	Significant and unavoidable
Sub-Alternative 3B	Significant	NOI-MM-1 and NOI-MM-3	Significant and unavoidable
Alternative 4A	Significant	NOI-MM-1 and NOI-MM-3	Significant and unavoidable
Sub-Alternative 4B	Significant	NOI-MM-1 and NOI-MM-3	Significant and unavoidable
Alternative 5A	Significant	NOI-MM-1 and NOI-MM-3	Significant and unavoidable
Sub-Alternative 5B	Significant	NOI-MM-1 and NOI-MM-3	Significant and unavoidable

Alternative	Finding	Mitigation Measure	Finding with Mitigation
Alternative 6A	Significant	NOI-MM-1 and NOI-MM-3	Significant and unavoidable
Sub-Alternative 6B	Significant	NOI-MM-1 and NOI-MM-3	Significant and unavoidable
Effect VEG-1: Permanent L	oss of Woody R	iparian Vegetation Resulting from Com	pliance with the
Alternative 1 No Action	No offort	None required	
Alternative 24	NO effect	VEC MM 1: Components for the	— Significant and
Alternative ZA	Significant	Loss of Woody Riparian Habitat. VEG-MM-2: Retain Qualified Botanists to Conduct Floristic Surveys for Special-Status Plants during Appropriate Identification Periods, VEG-MM- 3: Redesign Proposed Projects to Avoid Substantial Effects on and/or Transplant Special-Status Plants, and VEG-MM-4: Conduct Mandatory Contractor/Worker Awareness Training for Construction Personnel	unavoidable
Sub-Alternative 2B	Significant	VEG-MM-1, VEG-MM-2, VEG-MM- 3, and VEG-MM-4	Significant and unavoidable
Alternative 3A	Significant	VEG-MM-1, VEG-MM-2, VEG-MM- 3, and VEG-MM-4	Less than significant
Sub-Alternative 3B	Significant	VEG-MM-1, VEG-MM-2, VEG-MM- 3, and VEG-MM-4	Less than significant
Alternative 4A	Significant	VEG-MM-1, VEG-MM-2, VEG-MM- 3, and VEG-MM-4	Less than significant
Sub-Alternative 4B	Significant	VEG-MM-1, VEG-MM-2, VEG-MM- 3, and VEG-MM-4	Less than significant
Alternative 5A	Significant	VEG-MM-1, VEG-MM-2, VEG-MM- 3, and VEG-MM-4	Less than significant
Sub-Alternative 5B	Significant	VEG-MM-1, VEG-MM-2, VEG-MM- 3, and VEG-MM-4	Less than significant
Alternative 6A	No effect	None required	_
Sub-Alternative 6B	No effect	None required	—
Effect VEG-2: Potential Los	ss of Special-Sta	tus Plant Populations as a Result of Pro	gram Construction
Alternative 1—No Action	No effect	None required	_
Alternative 2A	Significant	VEG-MM-2, VEG-MM-3, VEG-MM- 4, VEG-MM-5: Install Construction Barrier Fencing to Protect Sensitive Biological Resources Adjacent to the Construction Zone, and VEG-MM- 6: Retain a Biological Monitor	Significant and unavoidable
Sub-Alternative 2B	Significant	VEG-MM-2, VEG-MM-3, VEG-MM- 4, VEG-MM-5, and VEG-MM-6	Significant and unavoidable
Sacramento River Bank Protection Pr	roject	Volume I	March 2020

	Alternative	Finding	Mitigation Measure	Finding with Mitigation
_	Alternative 3A	Significant	VEG-MM-2, VEG-MM-3, VEG-MM- 4, VEG-MM-5, and VEG-MM-6	Significant and unavoidable
	Sub-Alternative 3B	Significant	VEG-MM-2, VEG-MM-3, VEG-MM- 4, VEG-MM-5, and VEG-MM-6	Significant and unavoidable
	Alternative 4A	Significant	VEG-MM-2, VEG-MM-3, VEG-MM- 4, VEG-MM-5, and VEG-MM-6	Significant and unavoidable
	Sub-Alternative 4B	Significant	VEG-MM-2, VEG-MM-3, VEG-MM- 4, VEG-MM-5, and VEG-MM-6	Significant and unavoidable
	Alternative 5A	Significant	VEG-MM-2, VEG-MM-3, VEG-MM- 4, and VEG-MM-5	Significant and unavoidable
	Sub-Alternative 5B	Significant	VEG-MM-2, VEG-MM-3, VEG-MM- 4, and VEG-MM-5	Significant and unavoidable
	Alternative 6A	Significant	VEG-MM-2, VEG-MM-3, VEG-MM- 4, VEG-MM-5, and VEG-MM-6	Significant and unavoidable
	Sub-Alternative 6B	Significant	VEG-MM-2, VEG-MM-3, VEG-MM- 4, VEG-MM-5, and VEG-MM-6	Significant and unavoidable

# Effect VEG-3: Potential Disturbance or Removal of Riparian Habitat as a Result of Program Construction

Alternative 1—No Action	No effect	None required	_
Alternative 2A	Significant	VEG-MM-1, VEG-MM-2, VEG-MM- 3, and VEG-MM-4	Significant and unavoidable
Sub-Alternative 2B	Significant	VEG-MM-1, VEG-MM-2, VEG-MM- 3, and VEG-MM-4	Significant and unavoidable
Alternative 3A	Significant	VEG-MM-1, VEG-MM-2, VEG-MM- 3, and VEG-MM-4	Less than significant
Sub-Alternative 3B	Significant	VEG-MM-1, VEG-MM-2, VEG-MM- 3, and VEG-MM-4	Less than significant
Alternative 4A	Significant	VEG-MM-1, VEG-MM-2, VEG-MM- 3, and VEG-MM-4	Less than significant
Sub-Alternative 4B	Significant	VEG-MM-1, VEG-MM-2, VEG-MM- 3, and VEG-MM-4	Less than significant
Alternative 5A	Significant	VEG-MM-1, VEG-MM-2, VEG-MM- 3, and VEG-MM-4	Less than significant
Sub-Alternative 5B	Significant	VEG-MM-1, VEG-MM-2, VEG-MM- 3, and VEG-MM-4	Less than significant
Alternative 6A	Significant	VEG-MM-1, VEG-MM-2, VEG-MM- 3, and VEG-MM-4	Less than significant
Sub-Alternative 6B	Significant	VEG-MM-1, VEG-MM-2, VEG-MM- 3, and VEG-MM-4	Less than significant

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Alternative	Finding	Mitigation Measure	Finding with Mitigation
Effect VEG-4: Loss of Wate Construction	rs of the United States	, Including Wetlands, as a Result	of Program
Alternative 1—No Action	No effect	None required	_
Alternative 2A	Significant	VEG-MM-4, VEG-MM-5, VEG-MM- 6, VEG-MM-7: Redesign Proposed Projects to Avoid and Minimize Effects on Sensitive Biological Resources, and VEG- MM-8: Compensate for the Loss of Wetlands and Other Waters	Less than significant
Sub-Alternative 2B	Significant	VEG-MM-4, VEG-MM-5, VEG-MM- 6, VEG-MM-7, and VEG-MM-8	Less than significant
Alternative 3A	Significant	VEG-MM-4, VEG-MM-5, VEG-MM- 6, VEG-MM-7, and VEG-MM-8	Less than significant
Sub-Alternative 3B	Significant	VEG-MM-4, VEG-MM-5, VEG-MM- 6, VEG-MM-7, and VEG-MM-8	Less than significant
Alternative 4A	Significant	VEG-MM-4, VEG-MM-5, VEG-MM- 6, VEG-MM-7, and VEG-MM-8	Less than significant
Sub-Alternative 4B	Significant	VEG-MM-4, VEG-MM-5, VEG-MM- 6, VEG-MM-7, and VEG-MM-8	Less than significant
Alternative 5A	Significant	VEG-MM-4, VEG-MM-5, VEG-MM- 6, VEG-MM-7, and VEG-MM-8	Less than significant
Sub-Alternative 5B	Significant	VEG-MM-4, VEG-MM-5, VEG-MM- 6, VEG-MM-7, and VEG-MM-8	Less than significant
Alternative 6A	Significant	VEG-MM-4, VEG-MM-5, VEG-MM- 6, VEG-MM-7, and VEG-MM-8	Less than significant
Sub-Alternative 6B	Significant	VEG-MM-4, VEG-MM-5, VEG-MM- 6, VEG-MM-7, and VEG-MM-8	Less than significant
Effect VEC E. Detential Die	turbanco or Domoval	of Drotostad Traca as a Docult of	Drogram

## Effect VEG-5: Potential Disturbance or Removal of Protected Trees as a Result of Program Construction

Alternative 1—No Action	No effect	None required	_
Alternative 2A	Significant	VEG-MM-4, VEG-MM-5, VEG-MM- 6, VEG-MM-7, VEG-MM-8, VEG- MM-9: Conduct a Tree Survey, and VEG-MM-10: Compensate for the Loss of Protected Trees	Less than significant
Sub-Alternative 2B	Significant	VEG-MM-4, VEG-MM-5, VEG-MM- 6, VEG-MM-7, VEG-MM-8, VEG- MM-9, and VEG-MM-10	Less than significant
Alternative 3A	Significant	VEG-MM-4, VEG-MM-5, VEG-MM- 6, VEG-MM-7, VEG-MM-8, VEG- MM-9, and VEG-MM-10	Less than significant
Sub-Alternative 3B	Significant	VEG-MM-4, VEG-MM-5, VEG-MM- 6, VEG-MM-7, VEG-MM-8, VEG- MM-9, and VEG-MM-10	Less than significant

Alternative	Finding	Mitigation Measure	Finding with Mitigation
Alternative 4A	Significant	VEG-MM-4, VEG-MM-5, VEG-MM- 6, VEG-MM-7, VEG-MM-9, and VEG-MM-10	Less than significant
Sub-Alternative 4B	Significant	VEG-MM-4, VEG-MM-5, VEG-MM- 6, VEG-MM-7, VEG-MM-9, and VEG-MM-10	Less than significant
Alternative 5A	Significant	VEG-MM-4, VEG-MM-5, VEG-MM- 6, VEG-MM-7, VEG-MM-8, and VEG-MM-10	Less than significant
Sub-Alternative 5B	Significant	VEG-MM-4, VEG-MM-5, VEG-MM- 6, VEG-MM-7, VEG-MM-8, and VEG-MM-10	Less than significant
Alternative 6A	Significant	VEG-MM-4, VEG-MM-5, VEG-MM- 6, VEG-MM-7, VEG-MM-8, and VEG-MM-10	Less than significant
Sub-Alternative 6B	Significant	VEG-MM-4, VEG-MM-5, VEG-MM- 6, VEG-MM-7, VEG-MM-8, and VEG-MM-10	Less than significant
Effect VEG-6: Potential Intr	roduction or Spread of	f Invasive Plants as a Result of Pr	ogram Construction
Alternative 1—No Action	No effect	None required	_
Alternative 2A	Significant	VEG-MM-11: Conduct a Survey to Document Invasive Plant Infestations, VEG-MM-12: Avoid and Minimize the Spread or Introduction of Invasive Plant Species, and VEG-MM-13: Conduct a Follow-Up Weed Survey and Implement Eradication Methods if New Infestations Are Present	Less than significant
Sub-Alternative 2B	Significant	VEG-MM-11, VEG-MM-12, and VEG-MM-13	Less than significant
Alternative 3A	Significant	VEG-MM-11, VEG-MM-12, and VEG-MM-13	Less than significant
Sub-Alternative 3B	Significant	VEG-MM-11, VEG-MM-12, and VEG-MM-13	Less than significant
Alternative 4A	Significant	VEG-MM-11, VEG-MM-12, and VEG-MM-13	Less than significant
Sub-Alternative 4B	Significant	VEG-MM-11, VEG-MM-12, and VEG-MM-13	Less than significant
Alternative 5A	Significant	VEG-MM-11, VEG-MM-12, and VEG-MM-13	Less than significant
Sub-Alternative 5B	Significant	VEG-MM-11, VEG-MM-12, and VEG-MM-13	Less than significant
Alternative 6A	Significant	VEG-MM-11, VEG-MM-12, and VEG-MM-13	Less than significant
Sub-Alternative 6B	Significant	VEG-MM-11, VEG-MM-12, and VEG-MM-13	Less than significant

		N4111 11 N4	Finding with
Alternative	Finding	Mitigation Measure	Mitigation
Effect VEG-7: Potential Op	portunity for Habitat	Restoration in Enlarged Floodpla	ain following
Program Construction			
Alternative 1—No Action	No effect	None required	—
Alternative 2A	No effect	None required	_
Sub-Alternative 2B	No effect	None required	—
Alternative 3A	Beneficial	None required	—
Sub-Alternative 3B	Beneficial	None required	—
Alternative 4A	Beneficial	None required	_
Sub-Alternative 4B	Beneficial	None required	_
Alternative 5A	Beneficial	None required	_
Sub-Alternative 5B	Beneficial	None required	—
Alternative 6A	Beneficial	None required	—
Sub-Alternative 6B	Beneficial	None required	_
Effect FISH-1: Short-Term	Effects of Rock Placen	nent into Nearshore Aquatic Hab	itat during
Construction			
Alternative 1—No Action	No effect	None required	—
Alternative 2A	Significant	FISH-MM-1: Limit Construction Activity to Periods of the Year That Minimize Effects on Fish	Less than significant
Sub-Alternative 2B	Significant	FISH-MM-1	Less than significant
Alternative 3A	No effect	None required	_
Sub-Alternative 3B	No effect	None required	_
Alternative 4A	Significant	FISH-MM-1	Less than significant
Sub-Alternative 4B	Significant	FISH-MM-1	Less than significant
Alternative 5A	Significant	WQ-MM-1, WQ-MM-2, and FISH-	Less than significant

	0		0
Alternative 5A	Significant	WQ-MM-1, WQ-MM-2, and FISH- MM-1	Less than significant
Sub-Alternative 5B	Significant	WQ-MM-1, WQ-MM-2, and FISH- MM-1	Less than significant
Alternative 6A	Significant	FISH-MM-1	Less than significant
Sub-Alternative 6B	Significant	WQ-MM-1, WQ-MM-2, and FISH- MM-1	Less than significant

Effect FISH-2: Increases in Sedimentation, Suspended Sediments, and Turbidity during Construction

Alternative 1—No Action	No effect	None required	_
Alternative 2A	Significant	WQ-MM-1 and FISH-MM-1	Less than significant
Sub-Alternative 2B	Significant	WQ-MM-1 and FISH-MM-1	Less than significant
Alternative 3A	Significant	WQ-MM-1 and FISH-MM-1	Less than significant
Sub-Alternative 3B	Significant	WQ-MM-1 and FISH-MM-1	Less than significant
Alternative 4A	Significant	WQ-MM-1 and FISH-MM-1	Less than significant
Sub-Alternative 4B	Significant	WQ-MM-1 and FISH-MM-1	Less than significant
Alternative 5A	Significant	WQ-MM-1 and FISH-MM-1	Less than significant
Sub-Alternative 5B	Significant	WQ-MM-1 and FISH-MM-1	Less than significant
Alternative 6A	Significant	WQ-MM-1 and FISH-MM-1	Less than significant
Sub-Alternative 6B	Significant	WQ-MM-1 and FISH-MM-1	Less than significant

			Finding with
Alternative	Finding	Mitigation Measure	Mitigation
Effect FISH-3: Spillage and	Leakage of Contamina	ants during Construction	
Alternative 1—No Action	No effect	None required	—
Alternative 2A	Significant	FISH-MM-1 and WQ-MM-2	Less than significant
Sub-Alternative 2B	Significant	FISH-MM-1 and WQ-MM-2	Less than significant
Alternative 3A	Significant	FISH-MM-1 and WQ-MM-2	Less than significant
Sub-Alternative 3B	Significant	FISH-MM-1 and WQ-MM-2	Less than significant
Alternative 4A	Significant	FISH-MM-1 and WQ-MM-2	Less than significant
Sub-Alternative 4B	Significant	FISH-MM-1 and WQ-MM-2	Less than significant
Alternative 5A	Significant	FISH-MM-1 and WQ-MM-2	Less than significant
Sub-Alternative 5B	Significant	FISH-MM-1 and WQ-MM-2	Less than significant
Alternative 6A	Significant	FISH-MM-1 and WQ-MM-2	Less than significant
Sub-Alternative 6B	Significant	FISH-MM-1 and WQ-MM-2	Less than significant
Effect FISH-4: Long-Term H	Effects on Fish from Lo	oss of Habitat	
Alternative 1—No Action	No effect	None required	—
Alternative 2A	Significant	FISH-MM-2 and FISH-MM-3: Compensate for the Loss of Spawning Habitat	Significant and unavoidable
Sub-Alternative 2B	Significant	FISH-MM-2 and FISH-MM-3	Significant and unavoidable
Alternative 3A	Significant	FISH-MM-2 and VEG-MM-1	Less than significant
Sub-Alternative 3B	Significant	FISH-MM-2 and VEG-MM-1	Less than significant
Alternative 4A	Significant	FISH-MM-2, FISH-MM-3, and VEG-MM-1	Less than significant
Sub-Alternative 4B	Significant	FISH-MM-2, FISH-MM-3, and VEG-MM-1	Less than significant
Alternative 5A	Significant	FISH-MM-2, FISH-MM-3, and VEG-MM-1	Less than significant
Sub-Alternative 5B	Significant	FISH-MM-2, FISH-MM-3, and VEG-MM-1	Less than significant
Alternative 6A	Significant	FISH-MM-2, FISH-MM-3, and VEG-MM-1	Less than significant
Sub-Alternative 6B	Significant	FISH-MM-2, FISH-MM-3, and VEG-MM-1	Less than significant
Effect WILD-1: Permanent	Loss of Riparian Habi	tat for Special-Status Wildlife Sp	ecies Associated with

### Compliance with the Vegetation ETL

Alternative 1—No Action	No effect	None required	—
Alternative 2A	Significant	VEG-MM-1	Significant and unavoidable
Sub-Alternative 2B	Significant	VEG-MM-1	Significant and unavoidable
Alternative 3A	Significant	VEG-MM-1	Less than significant
Sub-Alternative 3B	Significant	VEG-MM-1	Less than significant
Alternative 4A	Significant	VEG-MM-1	Significant and unavoidable

Alternative	Finding	Mitigation Measure	Finding with Mitigation
Sub-Alternative 4B	Significant	VEG-MM-1	Significant and unavoidable
Alternative 5A	Significant	VEG-MM-1	Significant and unavoidable
Sub-Alternative 5B	Significant	VEG-MM-1	Significant and unavoidable
Alternative 6A	No effect	None required	—
Sub-Alternative 6B	No effect	None required	_

Effect WILD-2: Potential Disturbance or Loss of Special-Status Wildlife Species and Their Habitats as a
Result of Program Construction and O&M Activities

Alternative 1—No Action	No effect	None required	_
Alternative 2A	Significant	WILD-MM-1: Document Special- Status Wildlife Species and Their Habitats, WILD-MM-2: Avoid and Minimize Effects on Special- Status Wildlife Species by Redesigning the Action, Protecting Special-Status Wildlife Habitat, and Developing a Mitigation Monitoring Plan (If Necessary),WILD-MM-3: Coordinate with Resource Agencies to Obtain Incidental Take Authorization, as <u>Necessary</u> , and Develop Appropriate Wildlife Compensation Plans for Species Listed under ESA and/or CESA, VEG-MM-1, VEG-MM-4, and VEG- MM-8	Significant and unavoidable
Sub-Alternative 2B	Significant	WILD-MM-1, WILD-MM-2, WILD- MM-3, VEG-MM-1, VEG-MM-4, and VEG-MM-8	Significant and unavoidable
Alternative 3A	Significant	WILD-MM-1, WILD-MM-3, VEG- MM-1, VEG-MM-4, and VEG-MM- 8	Less than significant
Sub-Alternative 3B	Significant	WILD-MM-1, WILD-MM-3, VEG- MM-1, VEG-MM-4, and VEG-MM- 8	Less than significant
Alternative 4A	Significant	WILD-MM-1, WILD-MM-3, VEG- MM-1, VEG-MM-4, and VEG-MM- 8	Significant and unavoidable
Sub-Alternative 4B	Significant	WILD-MM-1, WILD-MM-3, VEG- MM-1, VEG-MM-4, and VEG-MM- 8	Significant and unavoidable
Alternative 5A	Significant	WILD-MM-1, WILD-MM-3, VEG- MM-1, VEG-MM-4, and VEG-MM- 8	Significant and unavoidable

			Finding with
Alternative	Finding	Mitigation Measure	Mitigation
Sub-Alternative 5B	Significant	WILD-MM-1, WILD-MM-3, VEG- MM-1, VEG-MM-4, and VEG-MM- 8	Significant and unavoidable
Alternative 6A	Significant	WILD-MM-1, WILD-MM-3, VEG- MM-1, VEG-MM-4, and VEG-MM- 8	Significant and unavoidable
Sub-Alternative 6B	Significant	WILD-MM-1, WILD-MM-3, VEG- MM-1, VEG-MM-4, and VEG-MM- 8	Significant and unavoidable
Effect WILD-3: Disturbanc	e to or Loss of Commo	on Wildlife Species as a Result of	Construction
Alternative 1—No Action	No effect	None required	_
Alternative 2A	Significant	WILD-MM-4 <u>: Avoid or Minimize</u> <u>Construction-Related Effects on</u> <u>Nesting Birds</u> , <del>and</del> -WILD-MM-5: Conduct a Preconstruction Survey for Roosting Bats and Avoid or Mitigate Potential	Less than significant
		Impacts, and VEG-MM-1	
Sub-Alternative 2B	Significant	WILD-MM-4 <u>, and</u> -WILD-MM-5 <u>,</u> and VEG-MM-1	Less than significant
Alternative 3A	Significant	WILD-MM-4, <del>and </del> WILD-MM-5, <u>and VEG-MM-1</u>	Less than significant
Sub-Alternative 3B	Significant	WILD-MM-4, <del>and </del> WILD-MM-5 <u>,</u> and VEG-MM-1	Less than significant
Alternative 4A	Significant	WILD-MM-4, <del>and </del> WILD-MM-5 <u>,</u> <u>and VEG-MM-1</u>	Less than significant
Sub-Alternative 4B	Significant	WILD-MM-4, <del>and </del> WILD-MM-5 <u>,</u> <u>and VEG-MM-1</u>	Less than significant
Alternative 5A	Significant	WILD-MM-4 <u>, and</u> -WILD-MM-5 <u>.</u> and VEG-MM-1	Less than significant
Sub-Alternative 5B	Significant	WILD-MM-4, <del>and </del> WILD-MM-5 <u>.</u> and VEG-MM-1	Less than significant
Alternative 6A	Significant	WILD-MM-4, <del>and </del> WILD-MM-5 <u>,</u> and VEG-MM-1	Less than significant
Sub-Alternative 6B	Significant	WILD-MM-4, <del>and </del> WILD-MM-5 <u>,</u> and VEG-MM-1	Less than significant
Effect WILD-4: Disruption	to Wildlife Movement	t Corridors as a Result of Constru	ction
Alternative 1—No Action	No effect	None required	—
Alternative 2A	Less than significant	None required	—
Sub-Alternative 2B	Less than significant	None required	—
Alternative 3A	Less than significant	None required	—
Sub-Alternative 3B	Less than significant	None required	—
Alternative 4A	Less than significant	None required	_
Sub-Alternative 4B	Less than significant	None required	_
Alternative 5A	Less than significant	None required	_
Sub-Alternative 5B	Less than significant	None required	—
Sacramento River Bank Protection Pr	oject	Values	March 2020

Alternative	Finding	Mitigation Measure	Finding with
Alternative 64	Less than significant	None required	
Sub-Alternative 6B	Less than significant	None required	
Effect I A-1: Physical Divisi	ion of an Established (	Community Located Adjacent to t	he Levee Corridor
Alternative 1—No Action	No effect	None required	
Alternative 24	Less than significant	None required	
Sub-Alternative 2R	Less than significant	None required	
Alternative 3A	Less than significant	None required	
Sub-Alternative 3R	Less than significant	None required	
Alternative 4A	Less than significant	None required	
Sub-Alternative AB	Less than significant	None required	
Alternative 5A	Less than significant	None required	_
Sub Altornativo 5R	Less than significant	None required	—
Alternative 6A	Less than significant	None required	—
Sub Alternative 6P	Less than significant	None required	—
Effect I A 2: Conflicts with	Less than significant	none required	
Alternative 1 No Action	No offect	None required	
Alternative 24	No effect	None required	—
Sub Alternative 2P	Less than significant	None required	—
Alternative 2A	Less than significant	None required	—
Sub Alternative 2P	Less than significant	None required	—
Alternative 44	Less than significant	None required	—
Alternative 4A	Less than significant	None required	_
Sub-Alternative 4B	Less than significant	None required	_
Alternative SA	Less than significant	None required	_
Sub-Alternative 5B	Less than significant	None required	_
Alternative 6A	Less than significant	None required	_
Sub-Alternative 6B	Less than significant	None required	
Effect LA-3: Conversion of	Important Farmland	to Nonagricultural Uses	
Alternative 1—No Action	No effect	None required	—
Alternative 2A	Less than significant	None required	_
Sub-Alternative 2B	Less than significant	None required	—
Alternative 3A	Significant	LA-MM-1: Evaluate the Potential for Direct Farmland Conversion at the Project Level and Avoid, Minimize, and Compensate for Loss of Farmland	Significant and unavoidable
Sub-Alternative 3B	Significant	LA-MM-1	Significant and unavoidable
Alternative 4A	Significant	LA-MM-1	Significant and unavoidable
Sub-Alternative 4B	Significant	LA-MM-1	Significant and unavoidable
Alternative 5A	Significant	LA-MM-1	Significant and unavoidable

Alternative	Finding	Mitigation Measure	Finding with Mitigation
Sub-Alternative 5B	Significant	LA-MM-1	Significant and unavoidable
Alternative 6A	Significant	LA-MM-1	Significant and unavoidable
Sub-Alternative 6B	Significant	LA-MM-1	Significant and unavoidable

#### Effect REC-1: Temporary Disruption of Recreational Opportunities during Construction

Alternative 1—No Action	No effect	None required	_
Alternative 2A	Significant	REC-MM-1: Notify Recreation Users of Potential Construction Hazards and REC-MM-2: Provide Alternate Recreation Routes	Less than significant
Sub-Alternative 2B	Significant	REC-MM-1 and REC-MM-2	Less than significant
Alternative 3A	Significant	REC-MM-1 and REC-MM-2	Less than significant
Sub-Alternative 3B	Significant	REC-MM-1 and REC-MM-2	Less than significant
Alternative 4A	Significant	REC-MM-1 and REC-MM-2	Less than significant
Sub-Alternative 4B	Significant	REC-MM-1 and REC-MM-2	Less than significant
Alternative 5A	Significant	REC-MM-1 and REC-MM-2	Less than significant
Sub-Alternative 5B	Significant	REC-MM-1 and REC-MM-2	Less than significant
Alternative 6A	Significant	REC-MM-1 and REC-MM-2	Less than significant
Sub-Alternative 6B	Significant	REC-MM-1 and REC-MM-2	Less than significant

## Effect REC-2: Long-Term Reduction in Quality of Existing Recreational Opportunities within the Levee Corridor

Alternative 1—No Action	No effect	None required	—
Alternative 2A	Significant	VEG-MM-1	Significant and unavoidable
Sub-Alternative 2B	Significant	VEG-MM-1	Significant and unavoidable
Alternative 3A	Significant	VEG-MM-1	Significant and unavoidable
Sub-Alternative 3B	Significant	VEG-MM-1	Significant and unavoidable
Alternative 4A	Significant	VEG-MM-1	Significant and unavoidable
Sub-Alternative 4B	Significant	VEG-MM-1	Significant and unavoidable
Alternative 5A	Significant	VEG-MM-1	Significant and unavoidable
Sub-Alternative 5B	Significant	VEG-MM-1	Significant and unavoidable
Alternative 6A	Significant	VEG-MM-1	Significant and unavoidable
Sub-Alternative 6B	Significant	VEG-MM-1	Significant and unavoidable

Alternative	Finding	Mitigation Measure	Finding with Mitigation
Effect REC-3: Temporary (	) bstruction of Access 1	to Marina or Boat Launch Facility	es
Alternative 1—No Action	No effect	None required	_
Alternative 2A	No effect	None required	_
Sub-Alternative 2B	No effect	None required	_
Alternative 3A	Significant	REC-MM-3: Preserve Marina and	Less than significant
	0	Boat Launch Access	0
Sub-Alternative 3B	Significant	REC-MM-3	Less than significant
Alternative 4A	Significant	REC-MM-3	Less than significant
Sub-Alternative 4B	Significant	REC-MM-3	Less than significant
Alternative 5A	Significant	REC-MM-3	Less than significant
Sub-Alternative 5B	Significant	REC-MM-3	Less than significant
Alternative 6A	Significant	REC-MM-3	Less than significant
Sub-Alternative 6B	Significant	REC-MM-3	Less than significant
Effect REC-4: Permanent L	oss of Recreational O	pportunities	
Alternative 1—No Action	No effect	None required	—
Alternative 2A	No effect	None required	—
Sub-Alternative 2B	No effect	None required	—
Alternative 3A	Significant	REC-MM-4: Rebuild Affected Formal Park Facilities and Trails	Less than significant
Sub-Alternative 3B	Significant	REC-MM-4	Less than significant
Alternative 4A	Significant	REC-MM-4	Less than significant
Sub-Alternative 4B	Significant	REC-MM-4	Less than significant
Alternative 5A	Significant	REC-MM-4	Less than significant
Sub-Alternative 5B	Significant	REC-MM-4	Less than significant
Alternative 6A	Significant	REC-MM-4	Less than significant
Sub-Alternative 6B	Significant	REC-MM-4	Less than significant
Effect REC-5: Safety Hazar	ds to Recreationists		
Alternative 1—No Action	No effect	None required	_
Alternative 2A	No effect	None required	_
Sub-Alternative 2B	No effect	None required	_
Alternative 3A	No effect	None required	_
Sub-Alternative 3B	No effect	None required	_
Alternative 4A	Significant	REC-MM-5: Hazard-Reducing Placement of Instream Woody Mat	Less than significant
Sub-Alternative 4B	Significant	REC-MM-5	Less than significant
Alternative 5A	Significant	REC-MM-5	Less than significant
Sub-Alternative 5B	Significant	REC-MM-5	Less than significant
Alternative 6A	Significant	REC-MM-5	Less than significant
Sub-Alternative 6B	Significant	REC-MM-5	Less than significant

Altomotive	Finding	Mitigation Magguna	Finding with
Alternative	Finding	Mitigation Measure	Mitigation
Effect POP-1: Displace a Su	ıbstantial Number of I	Existing Housing Units or a Subst	antial Number of
People, Necessitating Cons	struction of Replacem	ent Housing Elsewhere	
Alternative 1—No Action	No effect	None required	—
Alternative 2A	Less than significant	None required	—
Sub-Alternative 2B	Less than significant	None required	—
Alternative 3A	Less than significant	None required	—
Sub-Alternative 3B	Less than significant	None required	—
Alternative 4A	Less than significant	None required	—
Sub-Alternative 4B	Less than significant	None required	—
Alternative 5A	Less than significant	None required	—
Sub-Alternative 5B	Less than significant	None required	—
Alternative 6A	Less than significant	None required	—
Sub-Alternative 6B	Less than significant	None required	—
Effect PUB-1: Potential for	Damage of Utility Inf	rastructure and Disruption of Se	rvice during
Construction		-	c
Alternative 1—No Action	No effect	None required	_

	Alternative 1—No Action	NO effect	None required	—
	Alternative 2A	Significant	PUB-MM-1: Verify Utility Locations, Coordinate with Utility Providers, Prepare and Implement a Response Plan, and Conduct Worker Training	Less than significant
	Sub-Alternative 2B	Significant	PUB-MM-1	Less than significant
	Alternative 3A	Significant	PUB-MM-1	Less than significant
	Sub-Alternative 3B	Significant	PUB-MM-1	Less than significant
	Alternative 4A	Significant	PUB-MM-1	Less than significant
	Sub-Alternative 4B	Significant	PUB-MM-1	Less than significant
	Alternative 5A	Significant	PUB-MM-1	Less than significant
	Sub-Alternative 5B	Significant	PUB-MM-1	Less than significant
	Alternative 6A	Significant	PUB-MM-1	Less than significant
	Sub-Alternative 6B	Significant	PUB-MM-1	Less than significant
F	Effect PUB-2: Potential Dis	ruption to Irrigation V	Water Supply	
	Alternative 1—No Action	No effect	None required	—
	Alternative 2A	No effect	None required	_
	Sub-Alternative 2B	No effect	None required	—
	Alternative 3A	Significant	PUB-MM-2: Coordinate with Irrigation Water Users Before and During Infrastructure Modifications and Minimize Disruptions to Supply	Less than significant
	Sub-Alternative 3B	Significant	PUB-MM-2	Less than significant
	Alternative 4A	Significant	PUB-MM-2	Less than significant
	Sub-Alternative 4B	Significant	PUB-MM-2	Less than significant
	Alternative 5A	Significant	PUB-MM-2	Less than significant

Alternative	Finding	Mitigation Measure	Finding with Mitigation
Sub-Alternative 5B	Significant	PUB-MM-2	Less than significant
Alternative 6A	Significant	PUB-MM-2	Less than significant
Sub-Alternative 6B	Significant	PUB-MM-2	Less than significant
Effect VIS-1: Temporary V	isual Effects Caused by	y Construction Activities	
Alternative 1—No Action	No effect	None required	_
Alternative 2A	Significant	VIS-MM-1: Install Temporary Visual Barriers between Construction Zones and Residences and Maintain Construction Sites and Staging Areas in an Orderly Fashion	Significant and unavoidable
Sub-Alternative 2B	Significant	VIS-MM-1	Significant and unavoidable
Alternative 3A	Significant	VIS-MM-1	Significant and unavoidable
Sub-Alternative 3B	Significant	VIS-MM-1	Significant and unavoidable
Alternative 4A	Significant	VIS-MM-1	Significant and unavoidable
Sub-Alternative 4B	Significant	VIS-MM-1	Significant and unavoidable
Alternative 5A	Significant	VIS-MM-1	Significant and unavoidable
Sub-Alternative 5B	Significant	VIS-MM-1	Significant and unavoidable
Alternative 6A	Significant	VIS-MM-1	Significant and unavoidable
Sub-Alternative 6B	Significant	VIS-MM-1	Significant and unavoidable
Effect VIS-2: Substantially	Adversely Affect a Sce	enic Vista	
Alternative 1—No Action	No effect	None required	_
Alternative 2A	Less than significant	None required	_
Sub-Alternative 2B	Less than significant	None required	_
Alternative 3A	Significant	Mitigation not available	Significant and unavoidable
Sub-Alternative 3B	Significant	Mitigation not available	Significant and unavoidable
Alternative 4A	Significant	Mitigation not available	Significant and unavoidable
Sub-Alternative 4B	Significant	Mitigation not available	Significant and unavoidable
Alternative 5A	Significant	Mitigation not available	Significant and unavoidable
Sub-Alternative 5B	Significant	Mitigation not available	Significant and unavoidable
Alternative 6A	Less than significant	None required	—

			Finding with
Alternative	Finding	Mitigation Measure	Mitigation
Sub-Alternative 6B	Less than significant	None required	_
Effect VIS-3: Substantially	Damage Scenic Resou	rces, including, but Not Limited	to, Trees, Rock
Outcroppings, and Histori	c Buildings along a Sc	enic Highway	
Alternative 1—No Action	No effect	None required	_
Alternative 2A	Significant	Mitigation not available	Significant and unavoidable
Sub-Alternative 2B	Significant	Mitigation not available	Significant and unavoidable
Alternative 3A	Significant	Mitigation not available	Significant and unavoidable
Sub-Alternative 3B	Significant	Mitigation not available	Significant and unavoidable
Alternative 4A	Significant	Mitigation not available	Significant and unavoidable
Sub-Alternative 4B	Significant	Mitigation not available	Significant and unavoidable
Alternative 5A	Significant	Mitigation not available	Significant and unavoidable
Sub-Alternative 5B	Significant	Mitigation not available	Significant and unavoidable
Alternative 6A	Significant	Mitigation not available	Significant and unavoidable
Sub-Alternative 6B	Significant	Mitigation not available	Significant and unavoidable
Effect VIS-4: Substantially Degrade the Existing Visual Character or Quality of the Site and Its Surroundings			

Alternative 1—No Action	No effect	None required	_
Alternative 2A	Significant	Mitigation not available	Significant and unavoidable
Sub-Alternative 2B	Significant	Mitigation not available	Significant and unavoidable
Alternative 3A	Significant	Mitigation not available	Significant and unavoidable
Sub-Alternative 3B	Significant	Mitigation not available	Significant and unavoidable
Alternative 4A	Significant	Mitigation not available	Significant and unavoidable
Sub-Alternative 4B	Significant	Mitigation not available	Significant and unavoidable
Alternative 5A	Significant	Mitigation not available	Significant and unavoidable
Sub-Alternative 5B	Significant	Mitigation not available	Significant and unavoidable
Alternative 6A	Significant	Mitigation not available	Significant and unavoidable

Alternative	Finding	Mitigation Measure	Finding with Mitigation
Sub-Alternative 6B	Significant	Mitigation not available	Significant and unavoidable
Effect VIS-5: Create a New	Source of Light or Gla	re	
Alternative 1—No Action	No effect	None required	_
Alternative 2A	Significant	Mitigation not available	Significant and unavoidable
Sub-Alternative 2B	Significant	Mitigation not available	Significant and unavoidable
Alternative 3A	Significant	Mitigation not available	Significant and unavoidable
Sub-Alternative 3B	Significant	Mitigation not available	Significant and unavoidable
Alternative 4A	Significant	Mitigation not available	Significant and unavoidable
Sub-Alternative 4B	Significant	Mitigation not available	Significant and unavoidable
Alternative 5A	Significant	Mitigation not available	Significant and unavoidable
Sub-Alternative 5B	Significant	Mitigation not available	Significant and unavoidable
Alternative 6A	Significant	Mitigation not available	Significant and unavoidable
Sub-Alternative 6B	Significant	Mitigation not available	Significant and unavoidable
Effect PH-1: Temporary Ex	posure to or Release	of Hazardous Materials during C	onstruction
Alternative 1—No Action	No effect	None required	_
Alternative 2A	Less than significant	None required	—
Sub-Alternative 2B	Less than significant	None required	_
Alternative 3A	Less than significant	None required	_
Sub-Alternative 3B	Less than significant	None required	_
Alternative 4A	Less than significant	None required	_
Sub-Alternative 4B	Less than significant	None required	_
Alternative 5A	Less than significant	None required	_
Sub-Alternative 5B	Less than significant	None required	_
Alternative 6A	Less than significant	None required	_
Sub-Alternative 6B	Less than significant	None required	_
Effect PH-2: Exposure of th	ne Environment to Ha	zardous Materials during Groun	d-Disturbing
Activities			
Alternative 1—No Action	No effect	None required	—
Alternative 2A	Less than significant	WQ-MM-2 and PH-MM-1: Employ a Toxic Release Contingency Plan	Less than significant
Sub-Alternative 2B	Less than significant	WQ-MM-2 and PH-MM-1	Less than significant
Alternative 3A	Less than significant	WQ-MM-2 and PH-MM-1	Less than significant

Alternative	Finding	Mitigation Measure	Finding with Mitigation
Sub-Alternative 3B	Less than significant	WO-MM-2 and PH-MM-1	Less than significant
Alternative 4A	Less than significant	WO-MM-2 and PH-MM-1	Less than significant
Sub-Alternative 4B	Less than significant	WO-MM-2 and PH-MM-1	Less than significant
Alternative 5A	Less than significant	WO-MM-2 and PH-MM-1	Less than significant
Sub-Alternative 5B	Less than significant	WO-MM-2 and PH-MM-1	Less than significant
Alternative 6A	Less than significant	WO-MM-2 and PH-MM-1	Less than significant
Sub-Alternative 6B	Less than significant	WO-MM-2 and PH-MM-1	Less than significant
Effect PH-3: Temporary Ex	posure to Safety Haza	ards from the Construction Site	
Alternative 1—No Action	No effect	None required	_
Alternative 2A	Significant	PH-MM-2: Implement	Less than significant
	0	Construction Site Safety	0
		Measures and PH-MM-3:	
		Implement an Emergency Response Plan	
Sub-Alternative 2B	Significant	PH-MM-2 and PH-MM-3	Less than significant
Alternative 3A	Significant	PH-MM-2 and PH-MM-3	Less than significant
Sub-Alternative 3B	Significant	PH-MM-2 and PH-MM-3	Less than significant
Alternative 4A	Significant	PH-MM-2 and PH-MM-3	Less than significant
Sub-Alternative 4B	Significant	PH-MM-2 and PH-MM-3	Less than significant
Alternative 5A	Significant	PH-MM-2 and PH-MM-3	Less than significant
Sub-Alternative 5B	Significant	PH-MM-2 and PH-MM-3	Less than significant
Alternative 6A	Significant	PH-MM-2 and PH-MM-3	Less than significant
Sub-Alternative 6B	Significant	PH-MM-2 and PH-MM-3	Less than significant
Effect PH-4: Exposure of P	eople or Structure to I	Increased Flood Risk	
Alternative 1—No Action	No effect	None required	_
Alternative 2A	Beneficial	None required	_
Sub-Alternative 2B	Beneficial	None required	_
Alternative 3A	Beneficial	None required	_
Sub-Alternative 3B	Beneficial	None required	_
Alternative 4A	Beneficial	None required	_
Sub-Alternative 4B	Beneficial	None required	_
Alternative 5A	Beneficial	None required	_
Sub-Alternative 5B	Beneficial	None required	_
Alternative 6A	Beneficial	None required	—
Sub-Alternative 6B	Beneficial	None required	_
Effect PH-5: Potential for H	ligher Frequency of C	ollision between Aircraft and Wi	ldlife
Alternative 1—No Action	No effect	None required	_
Alternative 2A	No effect	None required	_
Sub-Alternative 2B	No effect	None required	_

Alternative	Finding	Mitigation Measure	Finding with Mitigation			
Alternative 3A	Significant	PH-MM-4: Design and Manage Habitat Created by Setback Levees Such That It Does Not Attract Wildlife Known to Collide with Aircraft	Less than significant			
Sub-Alternative 3B	Significant	PH-MM-4	Less than significant			
Alternative 4A	<u>Significant</u> Less than significant	<u>PH-MM-4None required</u>	<u>Less than</u> <u>significant</u> —			
Sub-Alternative 4B	<u>Significant</u> Less than significant	<u>PH-MM-4None required</u>	<u>Less than</u> <u>significant</u> —			
Alternative 5A	Significant	PH-MM-4	Less than significant			
Sub-Alternative 5B	Significant	PH-MM-4	Less than significant			
Alternative 6A	<u>Significant</u> Less than significant	<u>PH-MM-4None required</u>	<u>Less than</u> <u>significant</u> —			
Sub-Alternative 6B	<u>Significant</u> Less than significant	<u>PH-MM-4</u> None required	<u>Less than</u> <u>significant</u> —			
Effect CUL-1: Disturbance of Native American or Historic Period Human Remains						
Alternative 1—No Action	No effect	None required	_			
Alternative 2A	Significant	CUL-MM-1: Stop Work if Human Remains Are Discovered	Significant and unavoidable			
Sub-Alternative 2B	Significant	CUL-MM-1	Significant and unavoidable			
Alternative 3A	Significant	CUL-MM-1	Significant and unavoidable			
Sub-Alternative 3B	Significant	CUL-MM-1	Significant and unavoidable			
Alternative 4A	Significant	CUL-MM-1	Significant and unavoidable			
Sub-Alternative 4B	Significant	CUL-MM-1	Significant and unavoidable			
Alternative 5A	Significant	CUL-MM-1	Significant and unavoidable			
Sub-Alternative 5B	Significant	CUL-MM-1	Significant and unavoidable			
Alternative 6A	Significant	CUL-MM-1	Significant and unavoidable			
Sub-Alternative 6B	Significant	CUL-MM-1	Significant and unavoidable			

			Finding with			
Alternative	Finding	Mitigation Measure	Mitigation			
Effect CUL-2: Unavoidable Impacts on Historic Properties or Historical Resources as a Result of Bank Protection Measures						
Alternative 1—No Action	No effect	None required	_			
Alternative 2A	Significant	CUL-MM-2: Identify Historic Properties and Historical Resources and Implement Treatment Measures for Adverse Effects according to the Historic Properties Treatment Plan	Less than significant			
Sub-Alternative 2B	Significant	CUL-MM-2	Less than significant			
Alternative 3A	Significant	CUL-MM-2	Less than significant			
Sub-Alternative 3B	Significant	CUL-MM-2	Less than significant			
Alternative 4A	Significant	CUL-MM-2	Less than significant			
Sub-Alternative 4B	Significant	CUL-MM-2	Less than significant			
Alternative 5A	Significant	CUL-MM-2	Less than significant			
Sub-Alternative 5B	Significant	CUL-MM-2	Less than significant			
Alternative 6A	Significant	CUL-MM-2	Less than significant			
Sub-Alternative 6B	Significant	CUL-MM-2	Less than significant			
Effect CUL-3: Loss of Integrity of Character-Defining Elements that Would Qualify the Sacramento River Levee System as a Historic Property or Historical Resource						
Alternative 1—No Action	No effect	None required	_			
Alternative 2A	No effect	None required	_			
Sub-Alternative 2B	No effect	None required	_			
Alternative 3A	Significant	CUL-MM-3: Evaluate the Sacramento River Levee System for NRHP Eligibility and Implement Treatment Measures for Adverse Effects According to the Historic Properties Treatment Plan	Less than significant			
Sub-Alternative 3B	Significant	CUL-MM-3	Less than significant			
Alternative 4A	Significant	CUL-MM-3	Less than significant			
Sub-Alternative 4B	Significant	CUL-MM-3	Less than significant			
Alternative 5A	Significant	CUL-MM-3	Less than significant			
Sub-Alternative 5B	Significant	CUL-MM-3	Less than significant			
Alternative 6A	Significant	CUL-MM-3	Less than significant			
Sub-Alternative 6B	Significant	CUL-MM-3	Less than significant			
Effect SOC-1: Disproportionate Effect on Minority or Low-Income Populations						
Alternative 1—No Action	No effect	None required	_			
Alternative 2A	Less than significant	None required	_			
Sub-Alternative 2B	Less than significant	None required	—			
Alternative 3A	Less than significant	None required	_			
Sub-Alternative 3B	Less than significant	None required	—			
Alternative 4A	Less than significant	None required	_			

			Finding with		
Alternative	Finding	Mitigation Measure	Mitigation		
Sub-Alternative 4B	Less than significant	None required	_		
Alternative 5A	Less than significant	None required	—		
Sub-Alternative 5B	Less than significant	None required	—		
Alternative 6A	Less than significant	None required	—		
Sub-Alternative 6B	Less than significant	None required	_		
Effect SOC-2: Temporary Increase in Employment during Construction					
Alternative 1—No Action	No effect	None required	—		
Alternative 2A	Beneficial	None required	_		
Sub-Alternative 2B	Beneficial	None required	_		
Alternative 3A	Beneficial	None required	_		
Sub-Alternative 3B	Beneficial	None required	_		
Alternative 4A	Beneficial	None required	_		
Sub-Alternative 4B	Beneficial	None required	_		
Alternative 5A	Beneficial	None required	_		
Sub-Alternative 5B	Beneficial	None required	_		
Alternative 6A	Beneficial	None required	—		
Sub-Alternative 6B	Beneficial	None required			

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- 1
   Chapter 22

   2
   Growth-Inducing and Cumulative Effects
- This chapter provides an analysis of both the growth-inducing and cumulative effects that may
   result from the proposed program.

## 5 22.1 Growth-Inducing Effects

NEPA and CEQA require that an EIS and EIR discuss how a project, if implemented, could induce
 growth. This chapter presents an analysis of the potential growth-inducing effects of the proposed
 program. This chapter contains background information related to growth inducement, the methods
 used to analyze growth-inducing effects, and the effect conclusions.

### 10 22.1.1 Environmental Setting

The information in this section provides context for the analysis to help the reader understand thestructure of the analysis.

#### 13 **22.1.1.1** Growth Projections

14 Using population projections from the California Department of Finance, the California Department 15 of Housing and Community Development estimated that California's population would grow from 34 16 million people in 1999 to 45.4 million in 2020 (California Department of Housing and Community 17 Development 2000). On a yearly basis, California's population is expected to grow at a rate of 1.3% 18 per year between 2010 and 2020. Births will provide most of California's projected population 19 growth. Net migration, which accounted for more than half of the state's population growth during 20 the 1980s, is expected to account for a significantly smaller share of 1997–2020 statewide 21 population growth. All but 5% of California's projected population growth is expected to occur in 22 metropolitan areas (California Department of Housing and Community Development 2000). Based 23 on these projections, the population in the program area would continue to increase, and it can be 24 assumed that employment, income, and the demand for housing would also increase.

#### 25 **22.1.1.2** Current and Planned Development

To accommodate current populations and growth, development has been planned in program area
 counties in accordance with California law. The key development planning documents are the local
 general plans for Butte, Colusa, Glenn, Placer, Sacramento, Solano, Sutter, Tehama, Yolo, and Yuba
 Counties and the cities within these program area counties.

### 30 22.1.2 Regulatory Setting

#### 31 **22.1.2.1** NEPA and CEQA Requirements

Pursuant to 40 Code of Federal Regulations (CFR) Section 1502.16(b), an EIS must include a
 discussion of the potential indirect effects of a proposed action and their significance. The indirect
 effects of an action include those that would occur "later in time or farther away in distance, but are

- 1 still reasonably foreseeable" and "may include growth-inducing effects and other effects related to
- 2 induced changes in the pattern of land use, population density or growth rate" (40 CFR Section
  3 1508.8(b)).
- 4 In addition, Section 21100(b)(5) of CEQA requires an EIR to discuss how a proposed project, if
- 5 implemented, may induce growth and the impacts of that induced growth (see also State CEQA
- 6 Guidelines Section 15126). CEQA requires an EIR to discuss specifically "the ways in which the
- 7 proposed project could foster economic or population growth, or the construction of additional
- 8 housing, either directly or indirectly, in the surrounding environment" (State CEQA Guidelines
- 9 Section 15126.2[d]).

### 10 **22.1.3 Determination of Effects**

- 11 An action that removes an obstacle to growth is considered to be growth-inducing. Consequently,
- 12 where flood risk may be seen as an obstacle to growth in an area, levee improvements that would
- reduce that risk may be considered to remove an obstacle to growth and, thereby, be indirectlygrowth-inducing.
- 15 Growth inducement may lead to environmental effects, such as increased demand for utilities and
- 16 public services, increased traffic and noise, degradation of air or water quality, degradation or loss
- 17 of plant or animal habitats, and conversion of agricultural and open space land to urban uses.
- 18 Growth within a floodplain area increases the risk to people or property from flooding.
- 19 However, if the induced growth is consistent with or provided for by the adopted land use plans and 20 growth management plans and policies for the area affected (e.g., city and county general plans, 21 specific plans, transportation management plans), those plans may ensure that these effects are 22 either less than significant or mitigated to a level that is less than significant. In some instances, 23 significant and unavoidable effects would result from implementation of land use plans. All effects 24 associated with this planned growth are the responsibility of the city or county in which the growth 25 takes place. Local land use plans provide for land use development patterns and growth policies that 26 encourage orderly urban development supported by adequate urban public services, such as water 27 supply, roadway infrastructure, sewer services, and solid waste services.

## 28 **22.1.4 Effects and Mitigation Measures**

### 29 **22.1.4.1** No Action Alternative

30 Under Alternative 1—No Action, the Corps would not implement bank protection along Sacramento 31 River Flood Control Project (SRFCP) levees. The result is likely to be the continued gradual or 32 sporadic loss of remnant floodplain (berm) and the riparian vegetation it supports. Ultimately the 33 erosion could encroach into the cross-section of the levee foundation, creating critical erosion sites. 34 It is possible that federal or state flood control agencies or local maintaining agencies eventually 35 would implement bank protection at various sites along SRFCP levees through emergency action. In 36 any case, the risk of levee failure and possibly catastrophic flooding would increase substantially as 37 more erosion sites become critical and repair is limited to emergency response. In addition, the 38 associated risk to human health and safety, property, and the adverse economic effect that serious 39 flooding could cause would continue, and the risk of a catastrophic flood would remain high. The 40 economic analysis performed for the SRBPP Limited ReevaluationPost Authorization Change Report 41 (LRPACR) estimated that there are more than 193,000 structures protected by the SRBPP levees.

- 1 The value of these structures and their contents (in 2012 dollars) is estimated at almost \$100
- 2 billion. The SRBPP levees also protect more than 590,000 acres of agricultural land from flooding,
- 3 with a damage potential of up to \$630 billion depending on the severity of the flood event.
- Despite the likelihood of implementation of repairs led by federal or state agencies, for the purposes
   of evaluating effects under Alternative 1—No Action, the EIS/EIR assumes that the improvements
- 6 would not occur. This assumption provides the most conservative approach for disclosure and
- 7 comparison of potential effects. Therefore, under Alternative 1—No Action, no bank protection
- 8 would be implemented, flood risk would continue along existing SRFCP levees, and there would no
- 9 potential for growth inducement in the program area.

#### 10 **22.1.4.2** Action Alternatives

- The action alternatives (Alternatives 2A through 6B) were developed using those bank protection
   measures considered to reasonably meet the program's purpose, need, and objectives (see Chapter
   1, Introduction). Alternatives development also took into consideration an alternative's ability to
   eliminate significant environmental effects, to reduce effects to less-than-significant levels, and to
- 15 minimize any contribution to cumulative effects.
  - Levees within the program area provide flood damage risk reduction for the Sacramento Valley and
     help convey water flowing from the surrounding mountain ranges to the Delta. The proposed
     program seeks to identify and remedy through application of proposed bank protection measures,
     locations with high failure potential. The proposed program would maintain the integrity of the
     existing SRFCP levee system and, therefore, would not remove any present obstacles for growth.
- 21 Growth is part of the planned development of all program area counties. The counties and cities 22 within the program area have general plans under which growth and increases in population could 23 lead to effects on air and water quality, water supply, traffic, and noise conditions, and increases the 24 demand for such public services as schools, fire, police, sewer, solid waste disposal, and electrical 25 and gas utilities. The expansion of such services could result in significant effects. The effects of this 26 growth have been analyzed in the CEQA documents associated with these plans. Mitigation 27 measures that would reduce or eliminate these effects are included. Ultimately, the effects 28 associated with growth in Sutter and Butte counties are the responsibility of cities and counties in 29 which they occur, in combination with specific project proponents.
- While growth in program area counties may occur in the future under their respective approved general plans, the proposed program would not influence such growth because it would not remove any current obstacle to growth, does not increase flood protection (it maintains existing flood protection), and would not directly facilitate growth (like developing new water supply, utilities, or other infrastructure). Therefore, implementation of the action alternatives (i.e., the proposed program) would have no significant effect on growth.

### 36 **22.2 Cumulative Effects**

- 37 The cumulative effects analysis determines the combined effect of the proposed program and other
- 38 closely related, reasonably foreseeable, projects. This section introduces the methods used to
- 39 evaluate cumulative effects, lists related projects and describes their relationship to the project, and
- 40 identifies cumulative effects by resource area.

### **22.2.1 Approach to Cumulative Effects Analysis**

#### 2 22.2.1.1 Legal Requirements

- Both the CEQ NEPA implementing regulations and the State CEQA Guidelines require lead agencies
   to evaluate a proposed project's potential to contribute to a cumulative effect in the project area.
   Analysis of cumulative effects is needed to ensure that the project's effects are considered
- 6 thoroughly in the context of effects resulting from other similar, related, and neighboring projects.
- 7 The State CEQA Guidelines define *cumulative effects* as two or more individual effects which, when 8 considered together, are considerable or which compound or increase other environmental impacts
- 9 (State CEOA Guidelines Section 15355). Cumulative impacts can result from individually minor but
- 10 collectively significant projects taking place over a period of time (State CEQA Guidelines Section
- 11 15355[b]). The cumulative effects of a project are to be addressed if the project's incremental effect
- 12 is cumulatively considerable, meaning that the incremental effects of an individual project are
- 13 significant when viewed in connection with the effects of past projects, the effects of other current
- 14 projects, and the effects of probable future projects (State CEQA Guidelines Sections 15130[a][2]
- 15 and 15065[a][3]).
- Under NEPA, a cumulative effect is to be addressed if it is expected to be significant. The CEQ NEPA
   guidelines (40 Code of Federal Regulations [CFR] Section 1508.7) define a *cumulative effect* as:
- 18the impact on the environment which results from the incremental impact of the action when19added to other past, present, and reasonably foreseeable future actions regardless of what20agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts21can result from individually minor but collectively significant actions taking place over a period22of time.
- For the purpose of this joint CEQA/NEPA analysis, the NEPA terminology is primarily used, and
   cumulative impacts are identified as significant or less than significant. For CEQA purposes, a
   significant impact is also one to which the project's contribution is considerable.
- 26 The discussion of cumulative effects need not provide as much detail as the discussion of effects 27 attributable to the project alone. According to the State CEQA Guidelines Section 15130, the level of 28 detail should be guided by what is practical and reasonable, and CEQ suggests that analysis should 29 focus on truly meaningful effects. For those effects for which cumulative effects are identified, the 30 contribution of the proposed project is evaluated to consider whether mitigation measures are 31 available to reduce the potential effect. In cases where no cumulative effects are identified or when 32 the proposed project would have no or only limited contribution to the cumulative effect, the 33 potential effect is addressed briefly to the extent needed to support the effects conclusion.

#### 34 **22.2.1.2** Methods

- According to State CEQA Guidelines Section 15130, an adequate discussion of significant cumulative
   effects should contain:
- An analysis of related future projects or planned development that would affect resources in the
   project area similar to those affected by the proposed project.
- A summary of the expected environmental effects to be produced by those projects with specific reference to additional information stating where that information is available.

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A reasonable analysis of the cumulative effects of the relevant projects. An EIR must examine reasonable, feasible options for mitigating or avoiding the project's contribution to any 3 significant cumulative effects.

4 To identify the related projects, State CEQA Guidelines Section 15130[b] recommends either the list 5 or projection approach. This analysis uses the list approach, which entails listing past, present, and 6 probable future projects producing related or cumulative effects, including projects outside the 7 control of USACE or CVFPB.

8 According to CEO regulations, when determining the scope of the action assessment, similar actions 9 must be considered. Similar actions are defined as actions that, when viewed with other reasonably 10 foreseeable or proposed agency actions, have similarities that provide a basis for evaluating their 11 environmental consequences together, such as common timing or geography. An agency might want 12 to analyze these actions in the same environmental assessment. It should do so when the best way 13 to adequately assess the combined effects of similar actions or reasonable alternatives to such 14 actions is to address them in a single environmental assessment (40 CFR Section1508.25[a][3]) 15 (Council on Environmental Quality 1997). NEPA does not provide specific guidance regarding how 16 to conduct a cumulative effect assessment; however, the list approach has been effective for

17 disclosing cumulative effects under NEPA.

18 This analysis considers projects that have common timing and geography and have the potential to 19 affect the same environmental resources as would the proposed program.

#### 22.2.2 Projects Considered for the Cumulative Assessment 20

21 A list of past, current, and probable future projects was compiled for the cumulative setting. Some of 22 these projects are more applicable to the cumulative assessment than others. A list of generally 23 applicable projects is shown in Table 22-1. Following Table 22-1Below is a narrative description of 24 the most applicable projects (some of which reference back to descriptions in Chapter 1). These 25 projects (cumulative projects) include other flood management projects affecting the Sacramento 26 River and its tributaries, recreation projects in the region, restoration and other water-related 27 projects in and near the program area that could affect fish or vegetation on or adjacent to SRBPP 28 levees, or other activities that could result in effects and benefits similar to those of the proposed 29 project. Following the narrative descriptions of the most applicable projects is a table (Table 22-1) 30 listing other projects that could affect biological and other resources in the SRBPP region. (Note: 31 Table 22-1 has been relocated from its position in the Draft EIS/EIR.)

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#### 22.2.2.1 **Flood Risk–Reduction Projects**

34 The following descriptions of related or similar flood risk-reduction projects include those that have 35 been completed, are currently under construction, are under active consideration, have been 36 proposed, or have some form of environmental documentation complete. In addition, these projects 37 have the potential to affect the same resources and fall within the same geographic scope and are 38 therefore to be cumulatively considered. In particular, those resources are biological resources (riparian habitat and wildlife disturbance), hydrology, and geomorphology. The geographic scope of 39 40 consideration for effects on those resources is the Sacramento Valley region/Sacramento River 41 system.

1 2 3	Several of the flood-risk reduction projects that were considered in the cumulative assessment overlap with, or are closely linked to, the SRFCP. These projects, listed below, are described Section 1.2.2.4.		
4	State of California Central Valley Flood Protection Plan		
5	Previous Phases of the SRBPP		
6	Public Law 84-99 Rehabilitation Assistance of Flood Control Works		
7	Bay Delta Conservation Plan		
8	<ul> <li>Interagency Flood Maintenance Collaborative Program</li> </ul>		
9	<u>California Levee Stability Program</u>		
10	Natomas Levee Improvement Project		
11	American River Common Features Project		
12	Delta Levees Flood Protection Program		
13	Lower Feather River Corridor Management Program		
14	Levee Repairs Program		
15	Mid-Valley Levee Reconstruction Project		
16	Sacramento River Flood Control System Evaluation		
17	Sutter Basin Feasibility Study		
18	Feather River West Levee Improvement Project		
19 20	<ul> <li>Sacramento–San Joaquin River Basins Comprehensive Study and Central Valley Integrated Flood Management Study</li> </ul>		
21	Yuba Basin Project		
22	Three Rivers Levee Improvement Agency Levee Improvement Program		
23	West Sacramento General Reevaluation Report		
24	<u>West Sacramento Levee Improvements Program</u>		
25	Public Law 84-99 Rehabilitation Assistance of Flood Control Works		
26	Public law 84-99 is described in Chapter 1.		
27	Bay Delta Conservation Plan		
28	The Bay Delta Conservation Plan is described in Chapter 1.		
29	Interagency Flood Maintenance Collaborative Program		
30	The Interagency Flood Maintenance Collaborative is described in Chapter 1.		
31	California Levee Stability Program		
32	The California Levee Stability Program is described in Chapter 1.		

1	Natomas Levee Improvement Project
2	The Natomas Levee Improvement Project is described in Chapter 1.
3	American River Common Features Project
4	The American River Common Features project is described in Chapter 1.
5	Delta Levees Flood Protection Program
6	The Delta Levees Flood Protection Program is described in Chapter 1.
7	Lower Feather River Corridor Management Program
8	The Lower Feather River Corridor Management Program is described in Chapter 1.
9	Levee Repairs Program
10	The Levee Repairs Program is described in Chapter 1.
11	Mid-Valley Levee Reconstruction Project
12	The Mid-Valley Levee Reconstruction Project is described in Chapter 1.
13	Sacramento River Flood Control System Evaluation
14	The Sacramento River Flood Control System Evaluation is described in Chapter 1.
15	Sutter Basin Feasibility Study
16	The Sutter Basin Feasibility Study is described in Chapter 1.
17	Feather River West Levee Improvement Project
18	The Feather River West Levee Improvement Project is described in Chapter 1.
19 20	Sacramento–San Joaquin River Basins Comprehensive Study and Central Valley Integrated Flood Management Study
21 22	The Sacramento-San Joaquin River Basins Comprehensive Study and Central Valley Integrated Flood Management Study is described in Chapter 1.
23	State of California Central Valley Flood Protection Plan
24	The Central Valley Flood Protection Plan is described in Chapter 1.
25	Yuba Basin Project
26	The Yuba Basin Project is described in Chapter 1.

#### 1 Three Rivers Levee Improvement Agency Levee Improvement Program

The Three Rivers Levee Improvement Agency Levee Improvement Program is described in
 Chapter 1.

#### 4 West Sacramento General Reevaluation Report

5 The West Sacramento General Reevaluation Report is described in Chapter 1.

#### 6 West Sacramento Levee Improvements Program

- 7 The West Sacramento Levee Improvements Program is described in Chapter 1.
- 8 Additional related or similar flood risk-reduction projects that were considered in the cumulative
   9 assessment are described below.

#### 10 Upper Yuba River Levee Improvement Project

11 The Upper Yuba River Levee Improvement Project (UYLIP) constructed additional levee

12 improvements to a segment of the upper Yuba River in Yuba County. The improvements included

13 the installation of slurry walls and seepage berms (from Simpson Lane to the Yuba Goldfields).

14 Previous repairs had occurred on this levee segment, and further studies determined additional

15 work was necessary to provide the level of performance required relative to a 200-year flood event

16 for 40,000 residents in south Yuba County. Environmental review and Section 408 permission for

17 the UYLIP was finalized in 2010, and construction completed at the end of 2011.

#### 18 **Feather River Levee Repair Project**

19 The Feather River Levee Repair Project is a multi-phased flood risk-reduction measure construction 20 program on the east bank of the Feather River. It includes approximately 13 miles of levees within 21 the Three Rivers Levee Improvement Authority area in south Yuba County. Construction of the 22 Feather River Levee Repair Project was completed in 2011. Project features included seepage 23 berms, cutoff walls, and 6-mile setback levee. It reduces flood stages in the river by approximately 24 1.5 feet and more than 40,000 residents benefit from the provision of a level of performance relative 25 to a 200-year flood event

to a 200-year flood event.

#### 26 Feather River Setback Levee at Star Bend

Levee District No. 1 of Sutter County has constructed the Feather River Setback Levee at Star Bend
 on the west bank of the Feather River near the eastern boundary of Sutter County. The project

29 replaced a segment of the river's existing levee that constricted floodflows in the river and

- 30 presented an unacceptably high risk for levee failure because of seepage. Construction of the setback
- 31 levee removed the constriction and reduced water surface elevations in the region.

#### 32 Yuba River Basin Project General Reevaluation Report

All of the advanced work described under the Yuba Basin Project is being evaluated by USACE in the
 Yuba River Basin Project GRR. The scheduled work for the 7.5-mile-long Marysville Ring Levee is the

35 Final piece to the entire project. In 2008, USACE approved a "separable element" for Marysville, so

that work could begin while the GRR was underway. Construction in Marysville began in 2010 and

several additional phases of the project are designed and ready for construction. Both the Marysville
 element and GRR are in need of additional appropriation for completion.

#### 3 Sacramento Urban Levee Program

4 DWR is evaluating sites similar to the USACE's Sacramento River Bank Protection Project. The state 5 will repair 19 critical erosion sites, one of which is in West Sacramento at RM 55.8.

#### 6 North Delta Flood Control and Ecosystem Restoration Project

7 The purpose of DWR's proposed North Delta Flood Control and Ecosystem Restoration (North 8 Delta) Project is to implement flood risk-reduction measures in the northeast Delta in a manner that 9 benefits aquatic and terrestrial habitats, species, and ecological processes. The North Delta project 10 area includes the North and South Fork Mokelumne Rivers and adjacent channels downstream of I-5 11 and upstream of the San Joaquin River. Solution components being considered for flood 12 management include bridge replacement, setback levees, dredging, island bypass systems, and 13 island detention systems. The project will include ecosystem restoration and science actions in this 14 area, and improving and enhancing recreation opportunities. In support of the environmental 15 review process, an NOI was prepared and public scoping was held in 2003. An EIR was prepared in 16 2008, but the project is not currently funded for implementation.

#### 17 CALFED Levee System Integrity Program

18The goal of the CALFED Levee System Integrity Program is to reduce risk to land use and associated19economic activities, water supply, agriculture and residential use, infrastructure and the ecosystem20from the effects of catastrophic breaching of Delta levees. Estimates predict that 520 miles of levees21need modification and maintenance to meet the PL 84-99 standard for Delta levees. The program22continues to increase levee stability throughout the Delta.

#### 23 Delta Islands and Levee Feasibility Study

USACE's Delta Islands and Levee Feasibility Study (Delta Study) addresses ecosystem restoration
 needs, flood risk management problems, and related water resources in the Delta and Suisun Marsh
 area. The Delta Study will result in a feasibility report that will make recommendations on
 construction projects and/or additional studies for authorization by Congress. Periodic agency
 coordination meetings have been held with associated federal, state, and local agencies.

#### 29 CALFED Levee Stability Program

30 The purpose of the CALFED Levee Stability Program is to identify and prioritize potential levee

- stability projects in the Delta. USACE has prioritized potential projects according to how well they
   met USACE environmental, economic, and other implementation criteria. The short-term strategy is
   to move to construction quickly on high priority levee projects in order to address Delta-wide levee
   system needs. The long-term strategy will be developed through the Delta Study process described
- 35 above.

#### 36 South River Pump Station Flood Protection Project

The Sacramento Regional County Sanitation District (SRCSD) owns and operates the South River
 Pump Station (SRPS) located south of the city of West Sacramento. SRCSD is proposing the South

- 1 River Pump Station Flood Protection Project, which consists of constructing a new ring levee with
- 2 relief wells around the SRPS. The new ring levee is intended to provide 200-year protection for the
- 3 SRPS site. Three of the proposed borrow sites for the SRPS project are common to the Southport
- 4 project. The public draft EIR was prepared in April 2012. Construction is expected to begin in 2014.

#### 5 The Delta Plan

- 6 The Delta Plan has been developed by the Delta Stewardship Council (DSC), and is a long-term plan 7 which will be a legally enforceable, comprehensive management plan designed to meet the two co-8 equal goals of providing a more reliable water supply for California and protecting, restoring, and 9 enhancing the Delta ecosystem. The Delta Plan generally covers five topic areas and goals: increased 10 water supply reliability, restoration of the Delta ecosystem, improved water guality, reduced risks of 11 flooding in the Delta, and protection and enhancement of the Delta. The DSC does not propose 12 constructing, owning, or operating any facilities related to these five topic areas. Rather, the Delta 13 Plan sets forth regulatory policies and recommendations that seek to influence the actions,
- activities, and projects of cities and counties and state, federal, regional, and local agencies toward
   meeting the goals in the five topic areas.
- 16 The Delta Plan became final in September, 2013. The Delta Plan could contribute to beneficial
- cumulative effects by setting forth regulatory policies and recommendations that influence projects
  in a manner which would improve water quality, water supply reliability, flood risk-reduction, and
  increase habitat for fish and wildlife species.

# 2022.2.2.2Additional Projects Affecting Fish and Wildlife That Use the<br/>Program Area

22 As described in Chapter 11, Fisheries and Aquatic Resources, and Chapter 12, Wildlife, substantial 23 long-term effects on vegetation, fish, and wildlife are related to the removal of vegetation and 24 placement of riprap. Regarding wildlife, this could contribute to a cumulative effect when combined 25 with other projects that adversely affect habitat for wildlife that use the program area vegetation. 26 Regarding fish, this could contribute to a cumulative effect when combined with other projects within the geographic range of the fish that would be affected. Thus, the following projects are 27 28 considered in the cumulative analysis, even though they are not flood risk-reduction projects, 29 because they could also adversely affect the same species of fish or wildlife that would be affected by 30 vegetation removal and placement of riprap under the proposed program. The two programs most 31 likely to affect the same biological resources are summarized below. Additional projects are listed in 32 Table 22-1.

#### 33 CALFED Ecosystem Restoration Program

- 34 The goals of the CALFED Ecosystem Restoration Program are to:
- Recover 19 at-risk native species and contribute to the recovery of 25 additional species.
- Rehabilitate natural processes related to hydrology, stream channels, sediment, floodplains and ecosystem water quality.
- Maintain and enhance fish populations critical to commercial, sport, and recreational fisheries.
- Protect and restore functional habitats, including aquatic, upland, and riparian, to allow species to thrive.

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- Reduce the negative effects of invasive species and prevent additional introductions that 2 compete with and destroy native species.
  - Improve and maintain water and sediment quality to better support ecosystem health and allow species to flourish.

5 The Ecosystem Restoration Program, which is divided into the Sacramento, San Joaquin, and Delta 6 and Eastside Tributary regions, includes the following kinds of actions:

- 7 Develop and implement habitat management and restoration actions, including restoration of 8 river corridors and floodplains, reconstruction of channel-floodplain interactions, and 9 restoration of Delta aquatic habitats.
- 10 Restore habitat that would specifically benefit one or more at-risk species.
- 11 Implement fish passage programs and conduct passage studies. •
- 12 Continue major fish screen projects and conduct studies to improve knowledge of their effects. •
- 13 Restore geomorphic processes in stream and riparian corridors. •
- 14 Implement actions to improve understanding of at-risk species. •
- 15 • Develop understanding and technologies to reduce the effects of irrigation drainage on the San 16 Joaquin River and reduce transport of contaminant (selenium) loads carried by the San Joaquin 17 to the Delta and the Bay.
- 18 Implement actions to prevent, control, and reduce effects from non-native invasive species.
- 19 Ecosystem Restoration Program actions contribute to cumulative benefits on fish and wildlife 20 species, habitats, and ecological processes.

#### Long-Term Central Valley Project Biological Opinions 21

22 BOs issued by USFWS and NMFS for the Central Valley Project (CVP) and State Water Project (SWP) 23 determined that the existing fish passage structure at Fremont Weir was inadequate to allow normal 24 fish passage at most operational levels of the Sacramento River. As a result, the BOs required the 25 U.S. Bureau of Reclamation and/or DWR to increase inundation of suitable acreage for fish habitat 26 within the Yolo Bypass and to modify operations of the Sacramento Weir or Fremont weir to 27 increase juvenile rearing habitat. The BOs also require restoration of 8,000 acres of tidal marsh 28 habitat in the Delta to benefit Delta smelt and up to 20,000 acres of salmonid habitat restoration. 29 The operations of the SWP and CVP are currently subject to the terms and conditions of these BOs 30 until the new water conveyance infrastructure identified in the BDCP becomes operational. At that 31 time, an integrated Biological Opinion on coordinated long-term operation of the CVP and SWP will 32 be completed by USFWS and NMFS.

#### 33 Table 22-1. Additional Plans, Projects, and Programs Affecting Fish and Wildlife in the SRBPP Area

Agency	Programs, Projects, and Policies	Comments
Department of Fish and Game	California Aquatic Invasive Species Draft Rapid Response Plan	Program under development. Draft Plan issued in 2007.

Agency	Programs, Projects, and Policies	Comments
Department of Fish and Game	Fremont Landing Conservation Bank	Project completed.
Department of Fish and Game	Fish Screen Project at Sherman and Twitchell Islands	Program included in Delta Initiatives List.
Department of Parks and Recreation	Central Valley Vision	Implementation Plan completed in 2009.
Department of Water Resources	Dutch Slough Tidal Marsh Restoration Project	Project implementation began in 2012. Estimated completion in 2016.
Davis, Woodland, and University of California, Davis	Davis-Woodland Water Supply Project	Project under development. Final EIR in 2009. Specific design and operations criteria not identified.
Water Forum and U.S. Bureau of Reclamation	Lower American River Flow Management Standard	Program under development. Draft EIR in 2010. Recommendations included in NMFS Biological Opinion.
California Department of Fish and Game	Calhoun Cut/ Lindsey Slough Restoration	Increase intertidal marsh habitat and adjacent riparian habitat on 927 acres in Cache Slough ROA.
California Department of Fish and Game	Ecosystem Restoration Program Conservation Strategy	Created in 2000. Ongoing program to preserve, restore, and enhance terrestrial natural communities and ecosystems in the San Francisco Bay and Sacramento-San Joaquin Delta. Protected and restored more than 150,000 acres of habitat, including 3,900 acres and 59 miles of riparian and riverine aquatic habitat (as of 2010) after 7 of the planned 30 years of the project.
California Department of Fish and Game	Lower Sherman Island Wildlife Area Land Management Plan	Ongoing program. Directs habitat and species management on 3,100 acres of marsh and open water.
California Department of Fish and Game	Yolo Bypass Wildlife Area Land Management Plan	Ongoing program. Provides for multiple use management of 16,000 acres of mixed agricultural, grassland and managed wetland habitats.
California Department of Water Resources	FloodSAFE California	Promotes public safety through integrated flood management while protecting environmental resources; emphasizes action in the Delta.
California Department of Water Resources	Levee Repair-Levee Evaluation Program	Ongoing program. Upgrading levees along the Sacramento and San Joaquin Rivers and Delta; 1,600 miles of levees included in Central Valley.
<u>California Department of Water</u> <u>Resources</u>	<u>Small Erosion Repair</u> Program	Ongoing program. Facilitates implementation of annual repairs of small erosion sites on levees within the SRFCP area.
California Department of Water Resources	Small Erosion Repair Program	Ongoing program. Facilitates implementation of annual repairs of small erosion sites on levees within the SRFCP area.
California Department of Water Resources and MOA Partners	Lower Yolo Restoration Project	In Cache Slough ROA, reintroduce tidal action to half of 3,408-acre Yolo Ranch.

Agency	Programs, Projects, and Policies	Comments
Contra Costa Water District	Contra Costa Canal Fish Screen Project	Completed in 2011. Designed to restore Delta ecosystems. Minor terrestrial impact at fish screen sites.
Contra Costa Water District, U.S. Bureau of Reclamation, and California Department of Water Resources	Contra Costa Water District Middle River Intake and Pump Station (Alternative Intake Project)	Completed in 2010. Resulted in permanent conversion of 6–8 acres of rural agricultural land. Features about 12,000 feet of pipe across Victoria Island and under Old River.
National Marine Fisheries Service, U.S. Bureau of Reclamation, and Department of Water Resources	Biological Opinion (BiOp) on the Long-Term Operations of the Central Valley Project and State Water Project	Ongoing program. Action area consists of the Oroville Reservoir, Feather River downstream of Oroville, Sacramento River downstream of Feather River, Sacramento-San Joaquin Delta, and adjacent habitats that are dependent on or influenced by waterways. Designed to conserve freshwater, estuarine, nearshore, and offshore sites. Includes 8,000-acre tidal wetland restoration requirement.
Reclamation District 2093	Liberty Island Conservation Bank	Under implementation. Permits and approvals acquired in 2009. Project site is on northern tip of Liberty Island. Over 160 acres in the project site with about 50 proposed to be converted to open water channels, emergent marsh wetland, and riparian habitat. Focuses on Delta fish habitat but will restore 2.7 acres of riparian habitat.
Semi Tropic Water District	Delta Wetlands	Flood storage and habitat conservation project on three Delta islands.
U.S. Bureau of Reclamation, U.S. Fish and Wildlife Service, National Marine Fisheries Service, Department of Water Resources and Department of Fish and Game	San Joaquin River Restoration Program	Initiated in 2006. Ongoing program; 150 miles of the river is planned for restoration, including within the BDCP Plan Area.
U.S. Fish and Wildlife Service	Recovery Plan for Sacramento-San Joaquin Delta Native Fishes	Includes developing additional shallow water habitat, riparian vegetation zones and tidal marsh to restore wetland habitats throughout the Bay-Delta ecosystem.

1

### 2 22.2.3 Cumulative Effects by Resource

3 The following section describes the potential contribution to cumulative effects on each resource.

#### 4 22.2.3.1 Flood Risk Management and Geomorphic Conditions

The cumulative effects of bank revetment in the program area are primarily related to limiting bank
retreat. The effects on limiting bank retreat vary by alternative. Alternative 2A would have the
greatest limiting effect on bank retreat while Alternative 3A would provide for maximum potential
retreat. Alternatives 4A, 5A, and 6A are generally intermediate in value.

1 The arrest of continued bank retreat would result in secondary impacts on sediment recruitment, 2 meander migration, point bar formation, and the development of off-channel water bodies, such as 3 oxbow lakes and sloughs (Larsen et al. 1997, 2004; Larsen and Greco 2002). Restricting these 4 processes would also limit IWM recruitment and future riparian forest succession by limiting point 5 bar formation for future riparian vegetation colonization. Numerous reviews and studies over the 6 last three decades have illustrated the key physical and biological roles IWM plays in rivers of all 7 sizes for habitat formation, sediment and organic-matter storage, and bank stability, as well as in 8 maintaining a high degree of spatial heterogeneity (i.e., habitat complexity) in stream channels 9 (Harmon et al. 1986; Bisson et al. 1987; Hicks et al. 1991; Reeves et al. 1991; Lassettre and Harris 10 2001).

Armoring banks (e.g., by the use of riprap) can alter local hydraulics, which can affect channel 11 12 morphology and aquatic habitat by increasing nearshore velocities and depths, promoting channel 13 incision and channel narrowing, and increasing sediment transport (Binns and Eiserman 1979; 14 California Department of Fish and Game 1983; California Department of Water Resources 1994; 15 Nunally and Sotir 1994; Shields and Hoover 1991). However, as described in Chapter 4, Flood 16 Control and Geomorphology, individual site designs for erosion sites in the program area that would 17 receive waterside levee repair would be modeled if necessary, and developed in an iterative manner 18 intended to minimize changes in local hydraulic conditions. As a result, armoring banks would not 19 result in any significant hydraulic effects on other subbasins protected as part of the SRFCP. These 20 measures would be consistent with the principles that have guided the management of the SRFCP 21 over the past century.

22 Construction of setback levees would allow for continued bank retreat of the existing streambanks 23 and levees within the immediate vicinity of the repair (i.e., 50–200 feet landward from the current 24 channel position), thereby promoting potential future sediment recruitment, meander migration, 25 point bar formation, IWM recruitment, and riparian vegetation colonization on the existing banks 26 and the reconnected floodplain areas. However, any existing rock revetment at the outer channel 27 bend situated immediately upstream would potentially continue to inhibit lateral migration into the 28 floodplain. The amount and locations of existing rock revetment installed under the SRBPP is 29 documented in the recent baseline accomplishments report (U.S. Army Corps of Engineers, 2013).

- 30 Implementation of the proposed program is not anticipated to contribute to increased development 31 or growth on adjacent lands beyond what could be expected under existing conditions. The
- proposed program's contribution to cumulative geomorphic effects would be further reduced by the
   use of proposed program elements, such as increasing IWM and riparian habitat area.
- Many of the proposed erosion repair sites within the program area are located adjacent to high, historical SRFCP levees and do not have any adjacent significant floodplain habitat. For this reason, the cumulative effect of the proposed program on geomorphic conditions on the adjacent floodplain in those locations that have already had their positions defined would be less than significant. However, installing revetment in those locations that could still be subject to meaningful stream meander could contribute a significant incremental effect of the proposed program on flood control and geomorphology and be cumulatively considerable.
- 41 Table 22-1 and the previous descriptions of projects in the region that may have impacts similar to 42 those of the proposed program provide the context for this cumulative effects analysis. Specific
- 42 examples of projects in the Sacramento River basin that may contribute to cumulative effects on
- 44 bank retreat are the Central Valley Flood Protection Plan (California Department of Water Resources

2012) and the Bay Delta Conservation Plan (California Department of Water Resources, U.S. Bureau
 of Reclamation, U.S. Fish and Wildlife Service, and National Marine Fisheries Service, 2013). General
 reevaluation studies currently being conducted by the Corps on the American River Common
 Features project and the West Sacramento projects may also lead to actions that contribute to
 cumulative effects on bank retreat.

6 The primary goal of the Central Valley Flood Protection Plan is to reduce the chance of flooding and 7 flood damage by identifying and implementing structural and non-structural projects and actions 8 and to formulate standards and guidelines to facilitate that implementation. Promoting ecosystem 9 functions is one of the plan's supporting goals. Plan development included the review of levees 10 within the Central Valley and the identification of performance problems. The broad plan is now 11 undergoing two basin-wide feasibility studies (one for the Sacramento Valley and one for the San 12 Joaquin Valley) to identify more site-specific actions. Although specific actions are not yet identified, 13 plan implementation could result in increased or decreased bank retreat.

14 The Bay Delta Conservation Plan includes several potential water intake structures on the lower 15 Sacramento River that would prevent bank retreat at these sites. However, these sites are already 16 stable so the proposed intakes would not contribute to cumulative bank retreat effects. Additionally, 17 that plan would implement a variety of habitat restoration activities that would include 5,000 acres 18 of riparian habitat restoration within the lower Sacramento River and associated Delta and creation 19 of 30,000 acres of aquatic habitat over the next 15 years. Considering all the projects' impacts and 20 mitigation measures together, the impacts on bank retreat, with respect to all alternatives, would be 21 considered cumulatively significant and may not be fully mitigated to a level that is less than 22 significant.

23 In addition, global climate change could result in more rainfall runoff and flood flows in the 24 Sacramento River. Evaluation in the Interim Draft Post Authorization Change Report PACR for the 25 Sacramento River Bank Protection Project (HDR 2013) determined that because of the uncertainty 26 in the science of calculating appropriate future flows they would not be quantified. Rather, the 27 future condition hydrology is considered equal to existing condition hydrology. Thus there are no 28 changes in design in response to a new future condition hydrology. With respect to future sea level 29 changes and their effects on the proposed program, the Interim Draft Post Authorization Change 30 ReportPACR (HDR 2013) applied EC-1165-2-212 (U.S. Army Corps of Engineers 2011). That 31 evaluation found that sea level rise would not affect the design or cost of the proposed program. 32 However, sea level rise could potentially affect the design or cost of specific sites. Consequently, 33 evaluation and design of individual sites will consider sea level rise. Overall, the climate change 34 effects on the proposed program would be considered less than significant.

#### 35 **22.2.3.2** Water Quality

36 The proposed program could affect water quality during construction by increasing turbidity and 37 increasing the potential for accidental release of hazardous materials to surface and groundwater. 38 The effects on water quality vary by alternative. Alternative 3 would have the least potential effect 39 on water quality while Alternatives 2, 4, 5, and 6 would be similar to one another and have the 40 greatest potential effect. Cumulative effects could result from the implementation of projects shown 41 in Table 22-1. The previous descriptions of projects in the region that may have impacts similar to 42 those of the proposed program provide the context for this cumulative effects analysis. If 43 constructed at the same time, these projects could contribute to localized and temporary effects on 44 water quality as a result of ground disturbing activities resulting in increased turbidity or the

- 1 accidental release of hazardous materials. As described in Chapter 5, Water Quality, several
- 2 minimization measures, including a SWPPP, would be implemented; turbidity would be monitored
- 3 during construction to ensure acceptable levels identified by the Central Valley RWQCB are met; and
- 4 an NPDES permit and/or WDRs would be obtained to limit discharge to surface waters and into the
- 5 water table. These minimization measures are standard construction practices, and this analysis
- assumes that other projects also would implement the same or similar measures. Upon completion
   of construction, no additional effects on water quality would occur as part of the proposed program
- and the natural function of the program areas would be restored with regard to water quality.
- 9 Consequently, there would be no significant cumulative effect.

### 10 22.2.3.3 Geology, Seismicity, Soils, and Mineral Resources

11 The proposed program could result in both beneficial and negative effects on geology, seismicity, 12 soils, and mineral resources. The amount and locations of existing rock revetment installed under 13 the SRBPP is documented in the recent baseline accomplishments report (U.S. Army Corps of 14 Engineers, 2013). While the types of effects would be similar across alternatives, the degree of 15 effects on geology, seismicity, and soils would likely vary by alternative. Because of the 16 programmatic nature of this EIR/EIS/EIR, the degree of difference between alternatives cannot be 17 quantified at present; however, the level of effects would be determined during site-specific 18 analysis. There would be no effect on mineral resources and, therefore, no cumulative effects 19 associated with the proposed program. Other earth-moving activities in the program area (as 20 presented in Table 22-1 and the previous descriptions of projects in the region that may have 21 impacts similar to those of the proposed program) could alter the stability of soils, and increase 22 erosion, runoff, and sedimentation as a result of earth moving activities typically associated with 23 flood risk-reduction and habitat restoration projects. Soil stability would be addressed through 24 engineering design of program components, and ground-disturbing activities would be required to 25 stabilize soils upon completion of construction or even between stages of construction. 26 Consequently, no significant cumulative effects are anticipated related to soil stability. A cumulative 27 increase in erosion, runoff, and sedimentation could occur if other improvement projects on the 28 Sacramento River or its tributaries are implemented at the same time. The potential for erosion, 29 runoff, and sedimentation resulting from the proposed program and other projects would be limited 30 by minimization measures and implementation of a SWPPP. Any cumulative effect would be 31 temporary and minimal, and, therefore, less than significant. The proposed program would replace 32 or upgrade existing streambanks and there would be no change in risks attributable to seismicity. 33 The program area is not located within an active seismic area; therefore, any cumulative increase in 34 risk related to groundshaking and/or liquefaction would be less than significant.

### 35 22.2.3.4 Transportation and Navigation

36 The proposed program could affect traffic and navigation during construction by decreasing level of 37 service (LOS) on local transportation networks, including roads and waterways. However, these 38 effects would be temporary and LOS would be restored following the completion of construction. 39 Effects on transportation and navigation would likely vary by alternative. Because of the 40 programmatic nature of this EIR/EIS/EIR, differences in the level of these effects between 41 alternatives cannot be quantified at present; however, the level of effects would be determined 42 during site-specific analysis. Cumulative effects could occur if other projects were constructed at the 43 same time. Table 22-1 and the previous descriptions of projects in the region that may have impacts 44 similar to those of the proposed program provide the context for this cumulative effects analysis. As

1 described in Chapter 7, Transportation and Navigation, a traffic control and road maintenance plan 2 would help reduce effects; however, other projects could exacerbate the reduction of LOS in the 3 program area. If these projects occurred sequentially, the construction-related effects could be 4 drawn out for an extended period. If one local area experiences several large construction projects 5 simultaneously, there could be substantial localized effects. Specifically, cumulative effects would 6 occur if projects would use the same haul routes identified for the proposed program and cause 7 them to operate at an unacceptable LOS. Although the traffic control and road maintenance plan will 8 be implemented to reduce the effects of construction traffic on all haul routes, coordinating with the 9 construction schedules of other large projects in the region is heavily dependent on the ability to 10 make corresponding adjustments. In order to minimize these reductions in LOS, coordination with 11 agencies responsible for any other concurrent projects should occur. It is not known at this time 12 specifically where levee improvements would take place. Consequently, there remains potential for 13 a significant, if only temporary, cumulative effect on LOS in the program area.

#### 14 22.2.3.5 Air Quality and Climate Change

15 Under all alternatives, construction emissions would result from materials delivery, construction 16 equipment activity, and hauling debris away from the program area. The excavation amounts, 17 materials required, acreage disturbed, type and number of construction equipment pieces, haul 18 routes, and duration of construction activities associated with the alternatives are not known at this 19 time. Therefore, it is not possible to make a definite quantitative conformity determination. 20 Consequently, the environmental analysis is programmatic in nature, analyzing the 80,000 LF in its 21 entirety. Because of the programmatic level of analysis, variations in the level of effect by alternative 22 are not distinguished.

23 As explained above, because the jurisdiction, scale, and construction activities of an individual 24 project are unknown, it is possible that criteria pollutant emissions during construction may not be reduced below the federal de minimis and air district thresholds after implementing mitigation 25 26 measures required by air districts. Therefore, the construction criteria pollutant emissions 27 associated with the proposed program could result in a significant and unavoidable effect on local 28 and regional air quality and could result in cumulatively considerable air quality effects considering 29 other on-going and expected activities in the region. Because maintenance activities would have a 30 smaller scale and shorter duration than the construction activities, operational criteria pollutant 31 emissions associated with the proposed program are expected to be much fewer than the 32 construction emissions and are not expected to exceed federal *de minimis* and air district thresholds. 33 Therefore, emissions from program operation are not expected to result in cumulatively 34 considerable air quality effects.

The proposed program, in combination with other projects and activities in the region, would contribute to a cumulative increase in GHG contaminant emissions due to the nature of GHGs. GHGs accumulate in the atmosphere because of their relatively long lifespan. Even with GHG emissions reduction mitigation that would be incorporated into the proposed program and other projects, this cumulative GHG effect would be significant and unavoidable.

Global climate change could result in more rainfall runoff and flood flows in the Sacramento River
Evaluation in the Interim Draft Post Authorization Change Report PACR (HDR 2013) determined that
because of the uncertainty in the science of calculating appropriate future flows they would not be
quantified. Rather, the future condition hydrology is considered equal to existing condition
hydrology. Thus there are no changes in design in response to a new future condition hydrology (see

Chapter 4, Flood Control and Geomorphology). With respect to future sea-level changes and their
effects on the proposed program, the Interim Draft Post Authorization Change ReportPACR (HDR
2013) applied EC-1165-2-212 (U.S. Army Corps of Engineers 2011). That evaluation found that sea
level rise would not affect the design or cost of the proposed program. However, sea level rise could
potentially affect the design or cost of specific sites. Consequently, evaluation and design of
individual sites will consider sea level rise. Overall, the climate change effects on the proposed
program could be considered less than significant.

#### 8 22.2.3.6 Noise and Vibration

9 Some individual construction projects associated with the proposed program could result in 10 substantial increases in noise levels at sensitive receptors during construction, specifically those 11 limited cases where the construction activity takes place in close proximity to dwellings and 12 businesses. Changes in noise levels are expected to be similar among all of the action alternatives. To 13 assess the contribution of the alternatives to cumulative noise and vibration conditions, noise and 14 vibration from construction of the program is evaluated in conjunction with noise and vibration 15 potentially generated by past, present, and reasonably foreseeable future projects within the region 16 and previously described in this chapter (Table 22-1). Those projects in the vicinity of sensitive 17 receptors and occurring at the same time as the proposed program, could result in cumulative 18 effects. Because construction noise would be temporary and highly localized, and would take place 19 incrementally over several years, the effects may be minimized but they could still result in a 20 cumulative effect.

#### 21 22.2.3.7 Vegetation and Wetlands

22 The proposed program would result in direct loss of vegetation, primarily riparian vegetation, from 23 construction and implementation of Engineering Technical Letter 1110-2-583, Guidelines for Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and 24 25 Appurtenant Structures (Vegetation ETL). The amount and locations of existing rock revetment 26 installed under the SRBPP is documented in the recent baseline accomplishments report (U.S. Army 27 Corps of Engineers 2013). The effects on riparian vegetation vary by alternative. With respect to 28 direct riparian vegetation removal (see Tables 10-7 to 10-11) the effects range from a high of 30.67 29 acres for Alternative 2A to a low of 7.6 acres for Alternative 3A. The other alternatives would have 30 intermediate amounts of vegetation removal; specifically, 24.43 acres for Alternative 6A, 25.22 acres 31 for Alternative 4A, and 18.27 acres for Alternative 5A. The effects are different when the plantable 32 acres created are subtracted from the acres removed. Taking Considering created plantable acres 33 into consideration, Alternative 2A would still impact 30.67 acres because no plantable acres would 34 be created under this alternative. Alternative 6A effects would be reduced to a net of 4.78 acres. The 35 remaining alternatives would all have more plantable acres created than acres of directly removed 36 vegetation. The additional acres created would be 0.33 for Alternative 4A, 19.39 for Alternative 3A 37 and 21.49 for Alternative 5A.

38 Table 22-1 and the previous descriptions of projects in the region that may have impacts similar to 39 those of the proposed program provide the context for this cumulative effects analysis. Specific 40 examples of projects in the Sacramento River basin that may contribute to cumulative effects on 41 riparian vegetation are the Central Valley Flood Protection Plan (California Department of Water

42 Resources 2012), the Feather River Bank Protection Project (ICF International 2013), and the Bay

U.S. Army Corps of Engineers

Delta Conservation Plan (California Department of Water Resources, U.S. Bureau of Reclamation, U.S.
 Fish and Wildlife Service, and National Marine Fisheries Service, 2013).

3 The primary goal of the Central Valley Flood Protection Plan is to reduce the chance of flooding and 4 flood damage by identifying and implementing structural and nonstructural projects and actions 5 and to formulate standards and guidelines to facilitate that implementation. Promoting ecosystem 6 functions is one of the plan's supporting goals. Plan development included the review of levees 7 within the Central Valley and the identification of performance problems. The broad plan is now 8 undergoing two basin-wide feasibility studies to identify more site-specific actions (one for the 9 Sacramento Valley and one for the San Joaquin Valley). Although specific actions are not yet 10 identified, the plan does incorporate the Vegetation ETL and implementation could result in 11 increased effects on riparian vegetation.

12 The Feather River West Levee Project will implement bank protection measures on the west side 13 levee of the Feather River and will have effects very similar to those of the proposed program, 14 including riparian vegetation impacts. The Feather River West Levee Project also incorporates the 15 Vegetation ETL. Identified mitigation measures would reduce these effects with a goal of no net loss. 16 The Bay Delta Conservation Plan would have some direct riparian vegetation impacts but includes 17 5,000 acres of riparian habitat restoration within the lower Sacramento River and associated Delta. 18 Implementation of the Vegetation ETL could result in some increased effects on riparian vegetation. 19 Considering all the projects' impacts and mitigation measures together, the cumulative impacts on 20 riparian vegetation, with respect to all SRBPP alternatives, would be considered cumulatively 21 significant and may not be fully mitigated to a level that is less than significant, at least in the mid- to 22 upper Sacramento River system.

#### 23 **22.2.3.8** Fisheries and Aquatics

24 The proposed program would result in direct loss of channel margin and associated riparian shade 25 habitat because of construction of the bank protection measures and implementation of the 26 Vegetation ETL. The amount and locations of existing rock revetment installed under the SRBPP is 27 documented in the recent baseline accomplishments report (U.S. Army Corps of Engineers, 2013). 28 The effects on fish and aquatic species vary by alternative. Impacts by alternative on listed species as 29 determined by SAM analysis are provided in Figures 11-1 through 11-5 in Chapter 11, and are 30 detailed by region in Appendix F, Figures F-1 through F-24. To summarize impacts here, listed 31 salmonids are chosen because changes in nearshore habitat associated with proposed measures are 32 very relevant to salmonids and their various life stages when present in the system. Alternative 2A 33 would have the largest effect on salmonids, resulting in the loss of 14,151 linear feet of channel 34 margin. Alternative 6A would have the second largest effect, with a loss of 2,320 linear feet of 35 channel margin. Alternative 4A would result in the loss of 1,241 linear feet of channel margin, while 36 Alternatives 3A and 5A would result in the loss of 653 and 652 linear feet, respectively.

37 A number of other activities, including hatchery operations, timber harvest, recreation, and urban 38 and rural development, could potentially affect listed fish species in the Sacramento River Basin. 39 Levee maintenance activities by federal and state agencies and local maintaining agencies are likely 40 to continue. Ongoing activities such as levee maintenance that affect fish species, such as salmonids, 41 green sturgeon, and delta smelt, and their habitat will likely continue in the short-term at intensities 42 similar to those of recent years. However, some activities associated with the state's Central Valley 43 Flood Protection Plan and state or local efforts to implement the Vegetation ETL could result in 44 increased effects on fish species. The extent and pace of those activities are not yet known.

- Cumulative effects may also include non-federal rock revetment projects carried out by state or local
   agencies. These types of actions are possible at many locations throughout the program area, but are
   not included as part of the proposed program.
- 4 Potential cumulative effects on fish may also result from any continuing or future diversions of 5 water that remove adult or larval fish from water bodies by entrainment or that may incrementally 6 decrease river flows, thus affecting overall habitat conditions for these species. Reductions in 7 shoreline habitat from the proposed program and other flood control projects and reduced flows 8 and increased entrainment from water diversions could all combine into cumulative effects on fish 9 that migrate throughout the system during their various life stages. Water diversions through 10 intakes serving numerous small, private agricultural lands and duck clubs in the Delta, upstream of 11 the Delta, and in Suisun Bay also contribute to these cumulative effects. These diversions also 12 include municipal and industrial uses and power production. Several new diversions are in various 13 stages of action. The introduction of exotic species may also occur under numerous circumstances. 14 Exotic species can displace native species that provide food for larval fish.
- Additional potential cumulative effects could result from wave action in the water channel caused by
   boats that may degrade riparian and wetland habitat and erode banks; dumping of domestic and
   industrial garbage; land uses that result in increased discharges of pesticides, herbicides, oil, and
   other contaminants; and conversion of riparian areas for urban development.
- 19 The proposed program would result in direct loss of fish habitat from construction and use of rock 20 revetment as well as implementation of the Vegetation ETL. Implementation of the proposed 21 program and other programs and projects in the region previously described in Table 22-1 could 22 result in cumulatively considerable significant effects. Though Alternatives 3A through 6B include 23 on-site habitat restoration and improvement components (e.g., creation of riparian or wetland 24 benches and placement of IWM), direct loss of habitats would still result because of the construction 25 of bank protection measures. Restoration activities within the general program region could replace 26 some or all of the habitats lost as a result of the proposed program, but there could still be 27 substantial net losses within the program area itself. At a minimum, temporal losses could be 28 substantial because of the time it takes to reestablish riparian vegetation. This would result in 29 cumulatively considerable significant effects on fish habitat that may not be fully mitigated to a level 30 that is less than significant.

#### 31 **22.2.3.9** Wildlife

32 The amount and locations of existing rock revetment installed under the SRBPP is documented in 33 the recent baseline accomplishments report (U.S. Army Corps of Engineers, 2013). As described 34 under the Assessment Methods section of Chapter 12, the wildlife effects analysis is qualitative and 35 programmatic and is not based on site-specific information. The discussion regarding the loss of 36 riparian vegetation in Chapter 10, Vegetation and Wetlands, and summarized in that Cumulative 37 Effects section is relevant here because it reflects loss of wildlife habitat. With respect to direct 38 riparian vegetation removal, the effects would range from a high of 30.67 acres for Alternative 2A to 39 a low of 7.6 acres for Alternative 3A (the environmentally superior alternative). The other 40 alternatives would have intermediate amounts of vegetation removal; specifically, 24.43 acres for 41 Alternative 6A, 25.22 acres for Alternative 4A (the preferred alternative), and 18.27 acres for 42 Alternative 5A. The effects are reduced when the plantable acres created are subtracted from the 43 acres removed and that is described in Chapter 10.

1 The proposed program would result in direct loss of habitats and, thus, associated special-status 2 species as a result of construction and as a result of implementation of the Vegetation ETL. Indirect 3 impacts on special-status species could also occur due to the alter<del>n</del>ation of habitats, which could 4 result in altered hydrology and reductions in habitat quality due to reductions in natural processes 5 (e.g., river meander) and increases in invasive plants and animals and human and pet disturbances. 6 Implementation of the proposed program along all program area levees could result in cumulatively 7 considerable significant effects. Though Alternatives 3A through 5B include habitat restoration and 8 improvement components (i.e., creation of riparian or wetland benches and placement of IWM), 9 based on the Vegetation ETL, there is expected to be significant losses to riparian habitats and 10 limited opportunities to restore or preserve these habitats within the program area. Because they 11 involve a variance from the Vegetation ETL, Alternatives 6A or 6B would lessen the loss of riparian 12 habitat; however, direct loss of habitats would still occur due to the construction of bank protection 13 measures. Restoration activities within the general program region could replace some of the 14 habitats lost as a result of the proposed program, but there would still be substantial net losses 15 within the program area itself.

16 Table 22-1 and the previous descriptions of projects in the region that may have impacts similar to 17 those of the proposed program provide the context for this cumulative effects analysis. Specific 18 examples of projects in the region include the Central Valley Flood Protection Plan, the Feather 19 River West Levee Project, the Bay Delta Conservation Plan and state or local efforts to implement 20 the Vegetation ETL could result in increased effects on wildlife species. The Bay Delta Conservation 21 Plan would implement substantial mitigation measures including natural community protection and 22 restoration, seasonally inundated floodplain restoration, grassland natural community restoration 23 and nontidal marsh restoration. These restoration activities within the general program region 24 could replace some or all of the habitats lost as a result of the proposed program, but there could 25 still be net losses because of the time it takes to replace vegetated habitat. This would result in 26 cumulatively considerable significant effects on special-status species dependent on these habitats 27 that may not be fully mitigated to a level that is less than significant.

#### 28 **22.2.3.10** Land Use and Agriculture

29 Implementation of any of the alternatives except for 2A and 2B would potentially involve the 30 conversion of Important Farmland in locations throughout the Sacramento Valley and the Delta 31 region to managed grassland through establishment of a vegetation-free zone (VFZ) consistent with 32 the Corps' levee inspections standards on the landward side of the improved levee facilities. Many of 33 the county and local jurisdictions within the program area that support large urban centers have 34 already experienced the conversion of a substantial area of agricultural land to residential and 35 commercial development. These losses would continue an overall trend of net loss of Important 36 Farmland that has been documented in many counties in the program area by the Department of 37 Conservation, which tracks farmland conversions at 2-year intervals under its Farmland Mapping 38 and Monitoring Program. In combination with the conversions of Important Farmland in program 39 area counties associated with past, current, and future projects, the contribution of Alternatives 3A 40 through 6B would be cumulatively significant.

- 41 Implementation of Mitigation Measure LA-MM-1 would reduce the contributions of Alternatives 3A
- 42 through 6B to this cumulative impact; however the effect would remain significant. The contribution
- 43 of Alternatives 3A through 6B to cumulative conversion of Important Farmland to nonagricultural
- 44 uses would, therefore, be cumulatively significant and unavoidable.

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#### 22.2.3.11 Recreation

2 The proposed program would result in mostly short-term effects that would be confined to the 3 construction period. The amount and locations of existing rock revetment installed under the SRBPP 4 is documented in the recent baseline accomplishments report (U.S. Army Corps of Engineers, 2013). 5 Effects on recreation would likely vary by alternative. Because of the programmatic nature of this 6 EIRS/EIRS. differences in the level of these effects between alternatives cannot be quantified at 7 present; however, the level of effects would be determined during site-specific analysis. Negative 8 effects would result from vegetation removal and other construction activities that could disrupt or 9 temporarily close recreation along levees, bike paths, or other trails. Table 22-1 and the previous 10 descriptions of projects in the region that may have impacts similar to those of the proposed 11 program provide the context for this cumulative effects analysis. These other projects that may 12 affect the same recreation features could result in a cumulative effect on recreation by limiting the 13 availability of the recreation features during construction or altering their use following 14 construction. However, this cumulative effect would be less than significant because effects would 15 be temporary and localized, and other facilities would be available for use during construction. For 16 example, if a shoreline is closed to the public during construction, other shorelines upstream and 17 downstream of the construction sites would remain available. Similarly, if a boat ramp were closed 18 during construction, nearby boat ramps would still be available for use. Recreation features would 19 be restored or rebuilt once construction is completed.

#### 20 22.2.3.12 Population and Housing

21 The effects on population and housing vary by alternative. Alternative 3 would have the greatest 22 potential effect on population and housing while Alternatives 2, 4, 5, and 6 would be similar to one 23 another and have the least potential effect. Other bank protection and flood control projects 24 (including emergency actions), such as those in Table 22-1 and the previous descriptions of projects 25 in the region that may have impacts similar to those of the proposed program, might be constructed 26 in the program area and might have similar potential to displace homes. However, it would be 27 infeasible to predict the number of homes or people affected because the footprints of most of these 28 projects are not yet known, particularly projects that are the result of emergency levee repairs. For 29 the purposes of this analysis, it is assumed that other levee repair projects would also take place 30 incrementally in the future. While there are some flood risk-reduction projects in the region that 31 have removed houses, the number is extremely low. Most of the projects are intended to protect 32 housing and would not remove housing unless there is no practicable alternative to its removal. In 33 those situations, it is typically a single house as opposed to a substantial portion of a community. 34 However, based on analysis of the 106 representative sites and their proximity to existing housing, 35 it is not anticipated that the program would have any cumulatively considerable significant effect by 36 requiring construction of new housing to achieve relocation of residences or to accommodate 37 workers, and would not involve the displacement of a substantial number of people or residences.

Further, any potential relocation of residents would be conducted in compliance with the federal
 Uniform Relocation Assistance and Real Property Acquisition Policies Act, the California Relocation
 Act, and the Relocation Assistance and Real Property Acquisition Guidelines.

#### 41 **22.2.3.13** Utilities and Public Services

Implementation of the proposed program is not expected to have long-term effects on public
 utilities. The amount and locations of existing rock revetment installed under the SRBPP is

- 1 documented in the recent baseline accomplishments report (U.S. Army Corps of Engineers, 2013).
- 2 Construction of the proposed program may damage drainage and irrigation systems and public
- 3 utility infrastructure, resulting in temporary disruptions to service. Coordination with drainage and
- 4 irrigation system users, consultation with service providers, and implementation of appropriate
- 5 protection measures would minimize the possibility of any significant effects. Effects on irrigation
- 6 infrastructure and temporary disruptions to local water irrigation water supply would likely vary by
   7 alternative. Because of the programmatic nature of this EI<u>SR/EIRS</u>, these effects cannot be
- 8 quantified at present; however, the effects would be determined during site-specific analysis.
- 9 Because utility and public service system effects would be isolated, temporary, and fully mitigated,
- 10 the proposed program would not result in a cumulative impact to utilities and public services.

#### 11 **22.2.3.14** Aesthetics

The amount and locations of existing rock revetment installed under the SRBPP is documented in 12 13 the recent baseline accomplishments report (U.S. Army Corps of Engineers, 2013). The proposed 14 program would have significant cumulative effects in conjunction with existing and proposed levee 15 projects in the region and previously described in Table 22-1. The projects may require that levee 16 slopes be maintained free of woody vegetation in perpetuity, resulting in the loss of a highly valued 17 regional aesthetic landscape component. Effects on aesthetics would likely vary by alternative. 18 Because of the programmatic nature of this EI<u>SR</u>/EI<u>RS</u>, differences in the level of these effects 19 between alternatives cannot be quantified at present; however, the level of effects would be 20 determined during site-specific analysis. The mature vegetation along the levees is characteristic of 21 the region and is a striking, distinctive element in the landscape. The existing vegetation that is 22 removed would be replaced with herbaceous vegetation. Maintaining the levees void of the 23 characteristic riparian vegetation and mature landscaping, and replacing it with grass and more 24 rock, would highly degrade the visual character and quality of the area and increase glare. Projects 25 in the area would combine to slowly transform the vegetated waterways to channel-like water 26 conveyance ways because erosion is perpetual, and the Vegetation ETL requires future erosion sites 27 to comply with the VFZ. This would lead to the eventual denuding of the waterway and be a severe 28 affecteffect on the visual environment. This effect, when combined with the effects of other past, 29 present, and reasonably foreseeable future actions, would be cumulatively significant.

#### 30 22.2.3.15 Public Health

The proposed program has the potential to slightly increase risks to the public during construction through use of equipment and fuels, but the increased risk would be temporary. These risks do not vary substantively between alternatives and would be minimized through implementation of the SWPPP and other best management practices described for Mitigation Measures PH-MM-1 through PH-MM-3 and WQ-MM-2. Because these are standard practice for construction projects, it is expected that other projects would implement the practices, and the overall cumulative effect would be less than significant.

38 The proposed program would improve flood protection for the program area. Other projects, such 39 as those described in Table 22-1, that reduce stress on levees in the program area could contribute 40 to the beneficial cumulative effect by reducing the overall public risk resulting from levee failure.

#### 1 22.2.3.16 Cultural Resources

2 The amount and locations of existing rock revetment installed under the SRBPP is documented in 3 the recent baseline accomplishments report (U.S. Army Corps of Engineers 2013). The proposed 4 program would cause significant effects on the Sacramento River Levee System, which is assumed 5 eligible for the NRHP under Criterion A of 36 CFR Section 60.4. This would be a significant effect 6 that, when combined with other projects in the region (Table 22-1) that have altered and may alter 7 elements of this system, is considered a significant cumulative effect. The proposed program's 8 effects on cultural resources would likely vary by alternative. Because of the programmatic nature of 9 this EISR/EIRS, differences in the level of these effects between alternatives cannot be quantified at 10 present; however, the level of effects would be determined during site-specific analysis. The 11 procedure for mitigation of adverse effects on historic properties has been resolved in a Cultural 12 Resources Programmatic Agreement signed by the Corps, CVFPB and the State Historic Preservation 13 Officers and described in the associated historical properties treatment plan (HPTP) (Attachment 1 14 of Appendix B).

It is likely that known or unknown cultural resources and human remains could be adversely
affected during construction activities for the proposed program. The types of resources in this
extensive Sacramento River region are extremely broad and encompass the entire chronology of
California history and prehistory. The number of resources in this Sacramento River region is
unknown but likely exceeds 750, based on previously recorded sites.

20 The proposed program's adverse effects on each historic property of the program area would be 21 mitigated pursuant to the Cultural Resources Programmatic Agreement and HPTP (Appendix G). 22 Individual mitigation of effects on specific resources would substantially mitigate the accumulation 23 of effects on historic properties by creating a repository of information about the history and 24 prehistory of the program area, but the effects of the proposed program in combination with the 25 effects of other projects could still result in substantial net losses within the program area. This 26 would result in cumulatively considerable significant effects on cultural resources that may not be 27 fully mitigated to a level that is less than significant.

#### 28 **22.2.3.17** Socioeconomics and Environmental Justice

29 Implementation of the proposed program could result in temporary disruptions to local business 30 activities during construction along SRBPP levees. Effects on socioeconomics and environmental 31 justice would likely vary by site and alternative. Because of the programmatic nature of this 32 EI<u>SR</u>/EI<u>RS</u>, differences in the level of these effects between sites and alternatives cannot be 33 quantified at present; however, the level of effects would be determined during site-specific 34 analysis. Similar projects implemented within the same timeframe as the proposed program and 35 described in Table 22-1 may increase disruptions to businesses, but any temporary disruption is not 36 expected to contribute considerably to a cumulative effect because the disruptions would be short in 37 duration, and very localized and spread out over a very large program area. The proposed program 38 would, however, provide improved regional flood protection as well as provide a temporary 39 increase in employment during construction. Any similar projects implemented within the same 40 timeframe as the proposed program would increase local employment even more, which would be a

41 beneficial cumulative effect.

### 3 23.1 Introduction

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4 Indian Trust Assets (ITAs) are a legal interest in lands, natural resources, money, or other assets 5 held in trust by the United States government or that are restricted against alienation for Indian 6 tribes or individuals. The United States has an Indian trust responsibility to protect and maintain 7 rights reserved by or granted to Indian tribes or individuals by treaties, statues, executive orders, 8 and rights further interpreted by the courts. The Secretary of the Department of the Interior (DOI), 9 acting as the trustee, holds many assets in trust. Some examples of ITAs are lands, minerals, water 10 rights, hunting and fishing rights, titles and money. ITAs cannot be sold, leased, or alienated without 11 the express approval of the United States government.

12 The Indian trust responsibility requires that all federal agencies take all actions reasonably

13 necessary to protect such trust assets. Executive Order 13175, Consultation with Indian Tribal

14 Governments, and the Department of Defense's American Indian and Alaska Native Policy, signed on

15 October 20, 1998, require that the Corps, as the proposed program's lead federal agency, consult 16 with tribes and assess the impacts of the program on ITAs. If any ITAs are identified and would be

17 impacted, further consultation on measures to avoid or minimize potential adverse effects will take

18 place. If the proposed program results in adverse impacts, consultation regarding mitigation or

19 compensation will take place. Compliance with Executive Order 13007 (Indian Sacred Sites) and the

20 April 29, 1994 Executive Memorandum, Government-to-Government Relations with Native

21 American Tribal Governments, are discussed in Chapter 24, Regulatory Compliance.

## 22 23.2 Consultation and Determination of Effects

23 Government-to-Government scoping letters describing the proposed program and inviting 24 consultation were sent to 27 Native American tribes and individuals that have indicated they have 25 interests within the program area by asking to be included on the NAHC's list of contacts for the 26 region. These scoping letters were consistent with the Department of Defense's American Indian and 27 Alaska Native Policy, and based on the California Native American Heritage Commission's list of 28 Native American contacts. A series of phone calls, emails, and two workshops open to Native 29 American groups held in the spring of 2010 were also used to identify any concerns. To date, the 30 Corps has received no tribal concerns regarding the proposed program. No concerns regarding ITAs 31 have been brought to the attention of the Corps.

32 Additionally, analysis of Native American–owned land in the U.S. Geological Survey's Protected 33 Areas Database (U.S. Geological Survey 2012) shows that there are no Native American-owned or 34 reservation lands within 0.5 miles of the 106 project representative sites. While Native American-35 owned and reservation land is not common along the waterways of the program area, it is possible 36 that future unknown project sites could overlap with Native American-owned land. Given the 37 programmatic nature of the current analysis, Native American-owned lands, reservation lands, and 38 ITAs in general will be further evaluated at the project level when site-specific project locations are 39 determined.

1 The proposed program would not affect water rights or hunting and fishing rights. Effects of the 2 proposed program on water quality are addressed in Chapter 5, Water Quality, and were found to be 3 less than significant with mitigation. Effects on fish are addressed in Chapter 11, Fisheries and 4 Aquatics, and were found to be less than significant with mitigation with the exception of loss of fish 5 habitat and spawning habitat, which remained significant and unavoidable under Alternative 2. 6 Effects on common wildlife are addressed in Chapter 12, Wildlife, and were found to be less than 7 significant with mitigation. While effects on special-status wildlife were found to be significant and 8 unavoidable under Alternatives 2, 4, 5, and 6, these species are not legally hunted. Overall, proposed 9 program effects to ITAs are expected to be less than significant. The nearest known Tribal fishing 10 rights are those of the Hoopa Valley Tribe on the Trinity River, which is not within the program area 11 and would not be affected by the proposed program.

1	Chapter 24
2	Compliance with Applicable Laws, Policies, Plans,
3	and Regulatory Framework

### 4 24.1 Introduction

5 This chapter provides preliminary information on the major requirements for permitting and 6 environmental review and consultation for implementation of the Sacramento River Bank 7 Protection Project (SRBPP) Phase II Supplemental Authority (proposed program). Certain local, 8 state, and federal regulations require issuance of permits before proposed program implementation; 9 other regulations require agency consultation but may not require issuance of any authorization or 10 entitlements before proposed program implementation. Appendix C, Regulatory Background, 11 contains the discussion of the regulatory setting for applicable federal, state, regional and local laws 12 and regulations.

## 13 24.2 Regulatory Framework

### 14 **24.2.1** Federal Requirements

### 15 24.2.1.1 National Environmental Policy Act

16The National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 et seq., applies to all federal17agencies and most of the activities they manage, regulate, or fund that have the potential to affect18the environment. It requires federal agencies to disclose and consider the environmental19implications of their proposed actions. NEPA establishes environmental policies for the nation,20provides an interdisciplinary framework for federal agencies to prevent environmental damage, and21contains action-forcing procedures to ensure that federal agency decision makers take22environmental factors into account.

NEPA requires the preparation of an appropriate document to ensure that federal agencies
 accomplish the law's purposes. The President's Council on Environmental Quality (CEQ) has
 adopted regulations and other guidance that provide detailed procedures that federal agencies must
 follow to implement NEPA.

- 27 \_\_\_\_\_\_This document is the instrument for NEPA compliance for the proposed program under the Corps'
   28 authority, as described in Chapter 1, Introduction. <u>Full compliance with NEPA for the proposed</u>
   29 program will be complete when a Record of Decision is signed by the Commanding General of the
   30 <u>South Pacific Division.</u>
- Subsequent site-specific NEPA compliance actions would be tiered from this EIS/EIR, as
   appropriate.

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#### 1 24.2.1.2 Federal Endangered Species Act

Section 7 of the Endangered Species Act (ESA), 16 U.S.C. § 1536, requires federal agencies, in
consultation with the U.S. Fish and Wildlife Service (USFWS) and/or the National Marine Fisheries
Service (NMFS), to ensure that their actions do not jeopardize the continued existence of
endangered or threatened species, or result in the destruction or adverse modification of the critical
habitat of these species. The required steps in the Section 7 consultation process are as follows.

- Agencies must request information from USFWS and/or NMFS on the existence in a project area
   of special-status species or species proposed for listing.
  - Agencies must initiate formal consultation with USFWS and/or NMFS if the proposed action may adversely affect special-status species.

11 The proposed program may affect special-status species. The Corps will submitted a Programmatic 12 Biological Assessment (BA) and requested issuance of a Programmatic Biological Opinion (BO) from 13 USFWS and NMFS on May 5, 2014. Ensuing consultation resulted in the Corps submitting an updated Programmatic BA on December 14, 2014, a supplemental analysis of potential impacts to green 14 15 sturgeon habitat on January 22, 2016, and a revised Programmatic BA on January 20, 2017. USFWS 16 issued a Programmatic BO on December 19, 2017 (see Appendix K). On May 3, 2019, NMFS transmitted a draft Programmatic BO to the Corps for review. Further consultation with NMFS led 17 the Corps to submit an updated Programmatic BA to NMFS on June 24, 2019, and NMFS issued a 18 19 Programmatic BO on August 30, 2019 (see Appendix L). This EIS/EIR has been reviewed to ensure 20 that it is compatible with the requirements of the USFWS and NMFS Programmatic BOs.

21The Programmatic BOs issued by USFWS and NMFS meet the definition of framework programmatic22actions which will have subsequent Section 7 consultations tiered off of them. This programmatic23approach has been used for SRBPP since 2008. As part of subsequent, project-level environmental24analysis of future program activities, project proponents will work with the agencies as part of the25environmental compliance process to determine specific mitigation and compensation requirements26for effects on endangered or threatened species, as well as critical habitat, under the terms of the27anticipated Programmatic Biological OpinionBOs.

- Due to the dynamic erosional forces within the Sacramento River watershed, there is a high degree
   of uncertainty regarding the number of erosion sites, the sites that may be determined to be critical,
   and the linear footage of sites. This uncertainty and the potential for impact to the numerous
- 31 protected species within the SRBPP have led to an incremental approach in Section 7 and
- 32 <u>Magnuson-Stevens Act consultation with resource agencies. The initial Section 7 and Magnuson-</u>
- 33 Stevens Act programmatic consultation for the proposed program was limited to 30,000 LF within
- 34 <u>the seven current economically justified basins. Initial erosion repairs will likely occur in those</u>
- 35 <u>basins. As described in the Site Selection and Implementation Process (see Chapter 2), site-specific</u>
- 36 <u>consultations will be conducted for each cohort of proposed erosion repairs. Subsequent</u>
- 37 programmatic consultation(s) will occur when the length of repairs approaches 30,000 LF and/or
- 38 when updated economic analyses identify additional economically justified basins with eligible
- 39 erosion repair sites. The Magnuson-Stevens Act is discussed in Section 24.2.1.7 below.

### 40 **24.2.1.3** Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA), 16 U.S.C. §§ 703-712, implements a series of international
 treaties that provide for migratory bird protection. The MBTA authorizes the Secretary of the

- 1 Interior to regulate the taking of migratory birds; the act provides that it is unlawful, except as
- 2 permitted by regulations, "to pursue, take, or kill any migratory bird, or any part, nest or egg of any
- 3 such bird..." (16 U.S.C. § 703). This prohibition includes both direct and indirect acts, although
- 4 harassment and habitat modification are not included unless they result in direct loss of birds, nests,
- 5 or eggs. The current list of species protected by the MBTA includes several hundred species and
- essentially includes all native birds. Permits for take of non-game migratory birds can be issued only
   for specific activities, such as scientific collecting, rehabilitation, propagation, education, taxidermy,
- 8 and protection of human health and safety and personal property.
- 9 Compliance with the MBTA would be addressed through <u>implementation of compliance with the</u>
- 10 ESA and CESA. The proposed program incorporates mitigation measures that would help-ensure
- 11 that construction activities do not result in the take of migratory birds, as discussed in Chapter 12,
- 12 Wildlife.

#### 13 24.2.1.4 Bald and Golden Eagle Protection Act

- The Bald and Golden Eagle Protection Act, 16 U.S.C. §§ 668-668c, provides for the protection of the
  bald eagle and the golden eagle by prohibiting, except under certain specified conditions, the take,
  possession, and commerce of such birds.
- 17The re is a low probability that there is suitable golden eagle nesting habitat within the program18study-area. However, bald eagle nesting habitat may be present throughout the program area, in19areas containing large trees adjacent to large rivers and streams. does not contain bald eagle or20golden eagle nesting habitat, and the proposed program would not result in the take of bald or21golden eagles. The proposed program incorporates mitigation measures that would ensure that22construction activities do not result in the take of any raptors including nesting eagles, as discussed23in Chapter 12, Wildlife.

### 24 24.2.1.5 Clean Water Act Section 404, 404(b)(1) Guidelines, and Section 401

#### 25 Section 404

- Section 404 of the Clean Water Act (CWA), 33 U.S.C. § 1344, requires that a permit be obtained from
  the Corps for the discharge of dredged or fill material into "waters of the United States, including
  wetlands."
- Waters of the United States include wetlands and lakes, rivers, streams, and their tributaries; they
   are defined for regulatory purposes, at 33 C.F.R. § 328.3(a) as:
- 31 (1) All waters which are currently used, or were used in the past, or may be susceptible to use in 32 interstate or foreign commerce, including all waters which are subject to the ebb and flow of 33 tide; (2) All interstate waters, including interstate wetlands; (3) All other waters such as 34 intrastate lakes, rivers, streams, mudflats, sandflats, wetlands, sloughs, prairie potholes, wet 35 meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect 36 interstate or foreign commerce; (4) All impoundments of waters otherwise defined as waters of 37 the United States under the definition; (5) Tributaries of waters identified in paragraphs 1–4 in 38 this section; (6) The territorial seas; and (7) Wetlands adjacent to waters identified in 39 paragraphs 1–6 in this section.
- Wetlands are defined as "those areas that are inundated or saturated by surface or ground water at
  a frequency and duration sufficient to support, and that under normal circumstances do support, a

- 1 prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally
- 2 include swamps, marshes, bogs, and similar areas" (33 CFR §328[e]). For an area to be considered a
- 3 wetland, it must exhibit positive indicators of all three Federal wetland criteria (hydrophytic
- 4 vegetation, hydric soils, and wetland hydrology).
- 5 CWA Section 404(b) requires that the Corps process permits in compliance with guidelines 6 developed by EPA. These guidelines (404[b][1] Guidelines) in 40 CFR Part 230 require that there be 7 an analysis of alternatives available to meet the project purpose and need, including those that avoid 8 and minimize discharges of dredged or fill materials in waters. Once this first test has been satisfied, 9 the project that is permitted must be the least environmentally damaging practicable alternative.
- 10 Water resources projects developed by the Corps do not obtain Department of the Army permits
- 11 through a self-permitting process. Instead, the project documentation (i.e., report) and
- 12 environmental compliance work performed by the Corps serves as the functional equivalent of self-
- 13 permitting, ensuring that the same level of review is performed. A 404(b)(1) analysis will be
- 14 completed as part of each site-specific environmental compliance effort and included in the site-
- 15 <u>specific NEPA analysis report as applicable.</u> To the extent that the Corps undertakes erosion site
- 16 repairs under the proposed program, no permit would be issued, but the substantive requirements
- 17 of Section 404 will be met as necessary through NEPA compliance.

#### 18 Section 401

- 19 Under the CWA Section 401, 33 U.S.C. § 1341, applicants for a federal license or permit to conduct 20 activities that may result in the discharge of a pollutant into waters of the United States must obtain 21 certification from the state in which the discharge would originate or, if appropriate, from the 22 interstate water pollution control agency with jurisdiction over affected waters at the point where 23 the discharge would originate. Therefore, all projects that may affect state water quality and that 24 require federal agency approval (such as issuance of a Section 404 permit) must also comply with 25 CWA Section 401. In California, the authority to grant water quality certification has been delegated 26 to the State Water Board, and applications for water quality certification under CWA Section 401 are 27 typically processed by the RWQCB with local jurisdiction. Water quality certification requires 28 evaluation of potential impacts in light of water quality standards and CWA Section 404 criteria 29 governing discharge of dredged and fill materials into waters of the United States.
- As the <u>erosion site repairs proposed program would constitutes a federal actions</u> that may affect
   state water quality, a request for certification under CWA Section 401 will be submitted <u>as part of</u>
   <u>the site-specific environmental compliance processes</u>.

### 33 24.2.1.6 River and Harbors Appropriation Act of 1899

- The River and Harbors Appropriation Act of 1899 addresses activities that involve the construction
  of dams, bridges, dikes, and other structures across any navigable water, or that place obstructions
  to navigation outside established federal lines and excavate from or deposit material in such waters.
  Such activities require permits from the Corps. "Navigable waters" are defined in 33 C.F.R. § 329.4
  as:
- [T]hose waters that are subject to the ebb and flow of the tide and/or are presently used, or have
  been used in the past, or may be susceptible for use to transport interstate or foreign commerce.
  A determination of navigability, once made, applies laterally over the entire surface of the water

body, and is not extinguished by later actions or events which impede or destroy navigable
 capacity.

#### 3 Section 9

Section 9 (33 U.S.C. § 401) prohibits the construction of any bridge, dam, dike, or causeway across
any navigable water of the United States in the absence of congressional consent and approval of the
plans by the Chief of Engineers and the Secretary of the Army. Where the navigable portions of the
water body lie wholly within the limits of a single state, the structure may be built under authority of

- 8 the legislature of that state, if the location and plans or any modification thereof are approved by the
- 9 Chief of Engineers and by the Secretary of the Army.

#### 10 Section 10

11 Section 10 (33 U.S.C. § 403) prohibits the unauthorized obstruction or alteration of any navigable

- 12 water of the United States. This section provides that the construction of any structure in or over
- 13 any navigable water of the United States, or the accomplishment of any other work affecting the
- 14 course, location, condition, or physical capacity of such waters, is unlawful unless the work has been
- 15 authorized by the Chief of Engineers.

#### 16 Section 13

Section 13 (33 U.S.C. § 407) provides that the Secretary of the Army, whenever the Chief of
Engineers determines that anchorage and navigation would not be injured thereby, may permit the
discharge of refuse into navigable waters. In the absence of a permit, such discharge of refuse is
prohibited. While the prohibition of this section, known as the Refuse Act, is still in effect, the permit
authority of the Secretary of the Army has been superseded by the permit authority provided the
Administrator, EPA, and the states under Sections 402 and 405 of the CWA, respectively.

23 As described above in the Clean Water Act Section 404 discussion, water resources projects 24 developed by the Corps do not obtain Department of the Army permits through a self-permitting 25 process. Instead, the project documentation (i.e., report) and environmental compliance work 26 performed by the Corps serves as the functional equivalent of self-permitting, ensuring that the 27 same level of review is performed. The substantive requirements of the proposed program would 28 not affect waters of the United States under Section 404 or navigable waters under the Rivers and 29 Harbors Appropriation Act of 1899 will be incorporated into the site-specific NEPA analysis report 30 as applicable.

31

#### 32 24.2.1.7 Magnuson-Stevens Fishery Conservation and Management Act

33 The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), 16 34 U.S.C. §§ 1801-1883, establishes a management system for national marine and estuarine fishery 35 resources. In 1996, Congress passed the Sustainable Fisheries Act to amend the Magnuson-Stevens 36 Act and require that all federal agencies consult with NMFS regarding all actions or proposed actions 37 permitted, funded, or undertaken that may adversely affect essential fish habitat (EFH). EFH is 38 defined as "waters and substrate necessary to fish for spawning, breeding, feeding, or growth to 39 maturity." The legislation states that migratory routes to and from anadromous fish spawning 40 grounds are considered EFH. The phrase adversely affect refers to the creation of any effect that

- reduces the quality or quantity of essential fish habitat. Federal activities that occur outside of an
   essential fish habitat but that may, nonetheless, have an impact on essential fish habitat waters and
- 3 substrate must also be considered in the consultation process.
- Under the Magnuson-Stevens Act, effects on habitat managed under the Pacific Salmon Fishery
   Management Plan must also be considered. The Magnuson-Stevens Act states that consultation
   regarding essential fish habitat should be consolidated, where appropriate, with the interagency
   consultation, coordination, and environmental review procedures required by other federal
- 8 statutes, such as NEPA, Fish and Wildlife Coordination Act, CWA, and ESA. EFH consultation
- 9 requirements can be satisfied through concurrent environmental compliance if the lead agency
- 10 provides NMFS with timely notification of actions that may adversely affect EFH and if the
- 11 notification meets requirements for essential fish habitat assessments.
- The entire program area is designated as EFH by the Pacific Fishery Management Council. The Corps
   has prepared a Biological Assessment to be submitted to USFWS and NMFS pursuant to obtaining a
   Biological Opinion. The consultation process with NMFS will-included consideration of and
- 15 compliance with the Magnuson-Stevens Act to determine effects on EFH. <u>The Programmatic BO</u>
- 16 issued by NMFS on August 30, 2019 (see Appendix L) includes EFH conservation recommendations.
- 17As described above in the Federal Endangered Species Act discussion, the Programmatic BO issued18by NMFS meets the definition of a framework programmatic action which will have subsequent site-19specific Section 7 consultations tiered off of it. The Federal Endangered Species Act discussion above20also explains that an incremental approach was taken in ESA Section 7 and Magnuson-Stevens Act21consultation. Because of this incremental approach, subsequent programmatic consultation(s) will22occur when the length of repairs approaches 30,000 LF and/or when updated economic analyses23identify additional economically justified basins with eligible erosion repair sites.

#### 24 **24.2.1.8** Fish and Wildlife Coordination Act

25 The Fish and Wildlife Coordination Act, 16 U.S.C. §§ 661-666c, in general requires federal agencies to 26 coordinate with USFWS and state fish and game agencies whenever streams or bodies of water are 27 controlled or modified. This coordination is intended both to promote the conservation of wildlife 28 resources by providing equal consideration for fish and wildlife in water project planning and to 29 provide for the development and improvement of wildlife resources in connection with water 30 projects. Federal agencies undertaking water projects are required to include recommendations 31 made by USFWS and state fish and game agencies in project reports, and give full consideration to 32 these recommendations.

- 33 The Corps has initiated coordination coordinated with USFWS under the Fish and Wildlife
- 34 Coordination Act and the draft <u>final</u> Coordination Act Report for the proposed program was issued
- 35 in October 2012June 2018 (Appendix I). Corps responses to all recommendations contained in the
- 36 <u>final Coordination Act Report are included in Appendix I. Many of the recommendations are system-</u>
- 37 <u>oriented and will be adopted during implementation. During site-specific implementation, the Corps</u>
- 38 will review all the recommendations for adoption feasibility. Some of the recommendations may not
- 39 <u>be appropriate for certain sites.</u>

# 124.2.1.9Farmland Protection Policy Act and Memoranda on Farmland2Preservation

3 The Farmland Protection Policy Act (FPPA) (7 USC Section 4201, et seq.) and the CEQ policy 4 Memoranda on Farmland Preservation dated August 11, 1980 require federal agencies to include 5 assessments of the potential effects of a proposed project on prime and unique farmland. Federal 6 agencies must determine these effects before taking any action that could result in converting 7 designated prime or unique farmland for nonagricultural purposes. If implementing a project would 8 adversely affect farmland preservation, the agencies must consider alternative actions to lessen 9 those effects. Federal agencies also must ensure that their programs, to the extent feasible, are 10 compatible with state, local, and private programs to protect farmland. NRCS is the federal agency

11 responsible for ensuring that these laws and policies are followed.

- 12 Although it cannot be known at this time whether the proposed program would result in the
- 13 conversion of prime or unique farmland to accommodate certain bank protection measures,
- 14 additional project-level environmental documentation, tiering from this programmatic analysis,
- 15 would be conducted to address erosion sites that will be constructed.

#### 16 **24.2.1.10** National Historic Preservation Act

17 Section 106 of the National Historic Preservation Act (NHPA), 16 U.S.C. § 470f, requires federal 18 agencies to evaluate the effects of their undertakings on historic properties, which are those 19 properties listed or eligible for listing on the National Register of Historic Places. Implementing 20 regulations at 36 C.F.R. Part 800 require that federal agencies, in consultation with State Historic 21 Preservation Officer (SHPO), identify historic properties within the Area of Potential Effect (APE) of 22 the proposed project and make an assessment of adverse effects if any are identified. If the project is 23 determined to have an adverse effect on historic properties, the federal agency is required to consult 24 further with SHPO and the Advisory Council on Historic Preservation (ACHP) to develop methods to 25 resolve the adverse effects. The Section 106 process has five basic steps.

- Initiate the Section 106 process, including the identification of consulting parties, such as Native
   American tribes.
- 28 2. Identify and evaluate cultural resources to determine whether they are historic properties.
- 29 3. Assess the effects of the undertaking on historic properties within the APE.
- 30 4. If historic properties may be subject to an adverse effect, the federal agency, the SHPO, and any 31 other consulting parties (including Native American tribes and the ACHP) continue consultation 32 to seek ways to avoid, minimize, or mitigate the adverse effect. An Memorandum of Agreement 33 (MOA) is usually developed to document the measures agreed upon to resolve adverse effects. 34 Alternatively, the federal agency may prepare and execute a Programmatic Agreement (PA) with 35 the aforementioned parties to comply with 36 C.F.R. Part 800, particularly in the context of 36 complex undertakings that entail years of implementation actions or where the undertaking's 37 effects on historic properties cannot be well characterized during the planning phase.
- 38 5. Proceed in accordance with the terms of the MOA or PA.

#### 39 The efforts taken to identify cultural resources within the APE and any potential effects are

- 40 discussed in Chapter 19, Cultural Resources. The Corps and DWR the CVFPB have determined that
- 41 developing a PA for the proposed program and an attending Historic Properties Treatment Plan

1 (HPTP) is the most effective way to accommodate program requirements with compliance with 2 NEPA, Section 106 of the NHPA, and CEQA. The Corps has-initiated consultation with tribes with 3 potential interest in the program area. Consultation included requesting comments on the PA and 4 HPTP, additional outreach meetings with individual tribes, and finally requesting their participation 5 as concurring parties to the PA. The PA between the California SHPO, the CVFPB, and the Corps was 6 finalized in March 2012. To date, the California Valley Miwok Tribe, Mechoopda Indian Tribe of 7 Chico Rancheria, and the Shingle Springs Band of Miwok have signed as concurring parties. Those 8 tribes that have not signed as concurring parties to the PA will still be given an opportunity to 9 comment on specific construction projects as they are designed and planned. The Cultural Resource 10 PA is provided in Appendix B.

#### 11 24.2.1.11 American Indian Religious Freedom Act

12The American Indian Religious Freedom Act of 1978, Pub. L. No. 95-431, 92 Stat. 469 (1978),13codified at 42 U.S.C. § 1996, is also applicable to federal undertakings. This act established "the14policy of the United States to protect and preserve for American Indians their inherent right of15freedom to believe, express, and exercise the traditional religions, including but not limited to access16to sites, use and possession of sacred objects, and the freedom to worship through ceremonial and

17 traditional rites."

18 It is not anticipated that actions related to the proposed program will conflict with the American 19 Indian Religious Freedom Act. As discussed previously, and in Chapter 19, Cultural Resources, the 20 Corps and <del>DWR-<u>CVFPB</u> have consulted with the Native American Heritage Commission and the 21 Sacred Lands database was negative for findings in the <del>project program</del> area<del>s</del>.</del>

#### 22 24.2.1.12 Wild and Scenic Rivers Act

23 The Wild and Scenic Rivers Act (16 U.S.C. § 1271 et seq.) establishes a National Wild and Scenic 24 Rivers System for the protection of rivers with important scenic, recreational, fish and wildlife, and 25 other values. Rivers are classified as wild, scenic, or recreational. The act designates specific rivers 26 for inclusion in the System and prescribes the methods and standards by which additional rivers 27 may be added. The lower American River, from the Nimbus dam to its confluence with the 28 Sacramento River, is included in the system and is designated as Recreational. Any erosion sites 29 located along the lower American River would be subject to the conditions of this act and erosion 30 repairs will be assessed for compliance with the act during site-specific environmental analysis. The 31 National Parks Service, working under the United States Department of the Interior, has the 32 jurisdiction for determination of whether any violations occur.

#### 33 24.2.1.13 Executive Order 11988 (Floodplain Management)

Executive Order 11988 (May 24, 1977) requires federal agencies to prepare floodplain assessments for proposed actions located in or affecting floodplains. If an agency proposes to conduct an action in a floodplain, it must to the degree possible avoid short<u>-</u> and <u>long long-</u>term adverse effects associated with the occupancy and the modification of a floodplain and to avoid direct and indirect support of floodplain development whenever there is a reasonable and feasible alternative. If the only reasonable and feasible alternative involves siting in a floodplain, the agency must minimize potential harm to or in the floodplain and explain why the action is proposed in the floodplain.

- 1 The program proposes to improve existing flood protection facilities and would not directly or
- indirectly propose floodplain development. Please see further discussion in Chapter 22, Growth Inducing Effects.

#### 4 24.2.1.14 Executive Order 11990 (Protection of Wetlands)

5 Executive Order 11990 (May 24, 1977) requires federal agencies to prepare wetland assessments

6 for proposed actions located in or affecting wetlands. Agencies must avoid undertaking new

7 construction in wetlands unless no practicable alternative is available and the proposed action

8 includes all practicable measures to minimize harm to wetlands. Chapter 10, Vegetation and

- 9 Wetlands, describes effects on wetlands and mitigation measures for reducing significant effects of
- 10 the proposed program.

#### 11 24.2.1.15 Executive Order 12898 (Environmental Justice)

12 Executive Order 12898 (February 11, 1994) requires federal agencies to identify and address 13 adverse human health or environmental effects of federal programs, policies, and activities that 14 could be disproportionately high on minority and low-income populations. Federal agencies must 15 ensure that federal programs or activities do not directly or indirectly result in discrimination on the 16 basis of race, color, or national origin. Federal agencies must provide opportunities for input into the 17 NEPA process by affected communities and must evaluate the potentially significant and adverse 18 environmental effects of proposed actions on minority and low-income communities during 19 environmental document preparation. Even if a proposed federal project would not result in 20 significant adverse impacts on minority and low-income populations, the environmental document 21 must describe how Executive Order 12898 was addressed during the NEPA process.

Environmental justice issues are discussed in Chapter 20, Socioeconomics and Environmental
 Justice. In summary, the proposed program would not result in any significant effects on minority or
 low-income populations. In reality, the proposed program would increase flood protection to nearby
 established diverse communities of mixed income and ethnicity.

# 26 24.2.1.16 Executive Order 13007 (Indian Sacred Sites) and April 29, 1994, 27 Executive Memorandum

- Executive Order 13007 (May 24, 1996) requires federal agencies with land management
   responsibilities to accommodate access to and ceremonial use of Indian sacred sites by Indian
   religious practitioners and avoid adversely affecting the physical integrity of such sacred sites.
   Where appropriate, agencies are to maintain the confidentiality of sacred sites. Among other things,
   federal agencies must provide reasonable notice of proposed actions or land management policies
   that may restrict future access to or ceremonial use of, or adversely affect the physical integrity of,
   sacred sites. The agencies must comply with the April 29, 1994, Executive Memorandum,
- 35 Government-to-Government Relations with Native American Tribal Governments.
- Based on consultation with NAHC and the Sacred Lands Database, four sacred properties were
   identified in the vicinity of the program area. Information about the development of the PA and
   HPTP are described above under the National Historic Preservation Act section.

#### 1 24.2.1.17 Federal Clean Air Act

The federal Clean Air Act (CAA), 42 U.S.C. § 7401 et seq., was enacted to protect and enhance the nation's air quality in order to promote public health and welfare and the productive capacity of the nation's population. The CAA requires an evaluation of any federal action to determine its potential impact on air quality in the project region. California has a corresponding law, which also must be considered during the EIR process.

For specific projects, federal agencies must coordinate with the appropriate air quality management
district as well as with EPA. This coordination would determine whether the project conforms to the
CAA and the State Implementation Plan (SIP).

9 CAA and the State Implementation Plan (SIP).

Section 176 of the CAA, 42 U.S.C. § 7506, prohibits federal agencies from engaging in or supporting
 in any way an action or activity that does not conform to an applicable SIP. Actions and activities

- must conform to a SIP's purpose of eliminating or reducing the severity and number of violations of the national ambient air quality standards and in attaining those standards expeditiously. EPA promulgated conformity regulations (codified in 40 C F R § 93 150 *at sea*)
- 14 promulgated conformity regulations (codified in 40 C.F.R. § 93.150 *et seq.*).
- The potential air quality impacts of the proposed program resulting from construction (such as
  equipment emissions and fugitive dust) are discussed in Chapter 8, Air Quality and Climate Change,
  which analyzes and documents compliance with the CAA.

#### 18 **24.2.1.18** Federal Water Project Recreation Act

19 The federal Water Project Recreation Act, 16 U.S.C. §§ 460(L)(12) – 460(L)(21), requires federal

20 agencies with authority to approve water projects to include recreation development as a condition

21 of approving permits. Recreation development must be considered along with any navigation, flood

22 control, reclamation, hydroelectric, or multi-purpose water resource project. The act states that,

- 23 "[c]onsideration should be given to opportunities for outdoor recreation and fish and wildlife
- 24 enhancement whenever any such project can reasonably serve either or both purposes
- 25 consistently."
- 26 Recreation effects, such as temporary loss to river access, are described in Chapter 14, Recreation.

#### 27 **24.2.1.19** Resource Conservation and Recovery Act

- The federal Resource Conservation and Recovery Act enables EPA to administer a regulatory
   program that extends from the manufacture of hazardous materials to their disposal, thus regulating
- 30 the generation, transportation, treatment, storage, and disposal of hazardous waste at all facilities
- 31 and sites in the nation.
- 32 No materials classified as hazardous are proposed to be used for the proposed program.

# 24.2.1.20 Comprehensive Environmental Response, Compensation, and Liability Act

- The Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. § 9601 et
  seq., (also known as Superfund) was passed to facilitate the cleanup of the nation's toxic waste sites.
  In 1986, the act was amended by the Superfund Amendment and Reauthorization Act Title III, Pub.
  L. No. 99-499, 100 Stat. 1613 (1986) (community right-to-know laws). Title III states that past and
- 39 present owners of land contaminated with hazardous substances can be held liable for the entire
- 1 cost of the cleanup, even if the material was dumped illegally when the property was under different 2 ownership.
- 3 Effects related to hazardous waste sites are discussed in Chapter 18, Public Health and
- 4 Environmental Hazards.

#### 5 24.2.1.21 Wildlife Hazards on or Near Airports

6 The Federal Aviation Administration addresses control of hazardous wildlife in Advisory Circular 7 150/5200-33B, Hazardous Wildlife Attractants on or near Airports. The Federal Aviation 8 Administration provides direction on where public-use airports should restrict land uses that have 9 the potential to attract hazardous wildlife. The Federal Aviation Administration recommends a 10 distance of 10,000 feet separating wildlife attractants and aircraft movement areas. The area within 11 a 10,000-foot radius of the Airport Operations Area is designated as the Critical Zone. The definition 12 of wildlife attractants in Advisory Circular 150/5200-33A includes human-made or natural areas, 13 such as poorly drained areas, retention ponds, agricultural activities, and wetlands. Advisory 14 Circular 150/5200-33A recommends against the use of airport property for agricultural production 15 within a 5-mile radius of the Airport Operations Area unless the income from the agricultural crops is necessary for the economic viability of the airport. 16

17 Effects related to wildlife hazards are described in Chapter 18, Public Health and Environmental 18 Hazards.

#### 19 24.2.1.22 Uniform Relocation Assistance and Real Property Acquisition **Policies Act** 20

21 Federal, state, local government agencies, and others receiving federal financial assistance for public 22 programs and projects that require the acquisition of real property must comply with the policies 23 and provisions set forth in the Uniform Relocation Assistance and Real Property Acquisition Policies 24 Act (42 U.S.C. § 4601 et seq.) (Uniform Act), and implementing regulations, 49 C.F.R. Part 24. 25 Relocation advisory services, moving costs reimbursement, replacement housing, and

reimbursement for related expenses and rights of appeal are provided for in the Uniform Act. 26

27 While all or portions of parcels within the SRBPP footprints may need to be acquired to construct 28 certain bank protection measures, it is not anticipated that the proposed program will require 29 construction of new housing. However, if necessary, property acquisition and relocation services, 30 compensation for living expenses for temporarily relocated residents, and negotiations regarding 31 any compensation for temporary loss of business would be accomplished in accordance with the 32 Uniform Act and California Government Code Section 7267 et seq.

#### 24.2.2 State Requirements 33

#### 24.2.2.1 **California Environmental Quality Act** 34

35 CEQA requires state and local agencies to identify the significant environmental impacts of their 36 actions and to avoid or mitigate those impacts, if feasible. The environmental review required 37 imposes both procedural and substantive requirements. At a minimum, an initial review of the 38

- disclose to decision makers and the public the significant environmental effects of proposed
   activities,
- identify ways to avoid or reduce environmental damage,
- prevent environmental damage by requiring implementation of feasible alternatives or
   mitigation measures,
- disclose to the public reasons for agency approval of projects with significant environmental
   effects,
- 8 foster interagency coordination in the review of projects, and
- 9 enhance public participation in the planning process.

10 CEQA applies to all discretionary activities proposed to be carried out or approved by California 11 public agencies, including state, regional, county, and local agencies, unless an exemption applies. 12 The act requires that public agencies comply with both procedural and substantive requirements. 13 Procedural requirements include the preparation of the appropriate public notices (including 14 notices of preparation), scoping documents, alternatives, environmental documents (including 15 mitigation measures, mitigation monitoring plans, responses to comments, findings, and statements 16 of overriding considerations), completion of agency consultation and State Clearinghouse review, 17 and provisions for legal enforcement and citizen access to the courts.

- 18 CEQA's substantive provisions require agencies to address environmental impacts disclosed in an 19 appropriate document. When avoiding or minimizing environmental damage is not feasible, CEQA 20 requires agencies to prepare a written statement of overriding considerations when they decide to 21 approve a project that will cause one or more significant effects on the environment that cannot be 22 mitigated. CEQA establishes a series of action-forcing procedures to ensure that agencies accomplish 23 the purposes of the law. In addition, under the direction of CEQA, the California Resources Agency 24 has adopted regulations, known as the State CEQA Guidelines, which provide detailed procedures 25 that agencies must follow to implement the law.
- This document is the instrument for CEQA compliance for the proposed program under the Corps'
   authority, as described in Chapter 1.

#### 28 24.2.2.2 California Endangered Species Act

29 CESA is similar to ESA but pertains only to state-listed endangered and threatened species. CESA 30 requires state agencies to consult with the California Department of Fish and Wildlife (DFW) when 31 preparing documents under CEQA to ensure that the actions of the state lead agency do not 32 jeopardize the continued existence of listed species. CESA directs agencies to consult with DFW on 33 projects or actions that could affect listed species, directs DFW to determine whether there would be 34 jeopardy to listed species, and allows DFW to identify "reasonable and prudent alternatives" to the 35 project consistent with conserving the species. Agencies can approve a project that affects a listed 36 species if the agency determines that there are "overriding considerations;" however, the agencies 37 are prohibited from approving projects that would cause the extinction of a listed species.

- 38 Mitigating impacts on state-listed species involves avoidance, minimization, and compensation
- 39 (listed in order of preference). Unavoidable impacts on state-listed species are typically addressed
- 40 in a detailed mitigation plan prepared in accordance with DFW guidelines. DFW exercises authority

- over mitigation projects involving state-listed species, including those resulting from CEQA
   mitigation requirements.
- 3 CESA prohibits the <u>unauthorized</u> "take" of plant and wildlife species state-listed as endangered or
- 4 threatened. <u>Pursuant to Fish and Game Code 2081 et seq.</u> DFW may authorize<u>, by permit, the take of</u>
- 5 <u>endangered, threatened, and candidate species if the take is incidental to otherwise lawful activities.</u>
- 6 The impacts of the authorized take of the species must be minimized and fully mitigated, and
- 7 adequate funding must be ensured to implement all minimization and mitigation measures. In
- 8 addition, DFW may issue a permit for take only if it determines that issuance of the permit would
- 9 <u>not jeopardize the continued existence of the species.</u> if there is an approved habitat management
- 10 plan or management agreement that avoids or compensates for impacts on listed species.
- 11 Effects on wildlife resources are discussed in Chapter 12, Wildlife.

#### 12 24.2.2.3 Porter-Cologne Water Quality Control Act of 1969

In 1967, the Porter-Cologne Act established the State Water Board and nine RWQCBs as the primary
state agencies with regulatory authority over California water quality and appropriative surface
water rights allocations. Under this act (and the CWA), the state is required to adopt a water quality
control policy and WDRs to be implemented by the State Water Board and nine RWQCBs. The State
Water Board also establishes Basin Plans and statewide plans. The RWQCBs carry out State Water
Board policies and procedures throughout the state.

- Basin Plans designate beneficial uses for specific surface water and groundwater resources and
   establish water quality objectives to protect those uses. The project-proposed program has the
   potential to affect water quality in surface water or groundwater within the project-program area
   which is governed by the Central Valley RWQCB.
- Chapter 5, Water Quality and Groundwater Resources, describes water quality effects and mitigation
   measures for the proposed program.

#### 25 24.2.2.4 Central Valley Flood Protection Board Encroachment Permit

The CVFPB (formerly The Reclamation Board) requires an encroachment permit for any non-federal activity along or near federal flood damage reduction project levees and floodways or in CVFPBdesignated floodways to ensure that proposed local actions or projects do not impair the integrity of existing flood damage reduction systems to withstand flood conditions. The proposed program does not require an encroachment permit, as it is a federal activity and the CVFPB is the CEQA lead

31 agency. The proposed program will go before the CVFPB for consideration under CEQA.

#### 32 24.2.2.5 California Surface Mining and Reclamation Act

33 The California Surface Mining and Reclamation Act of 1975 (PRC Section 2710 et seq.) (SMARA) 34 addresses surface mining. Activities subject to SMARA include, but are not limited to, mining of 35 minerals, gravel, and borrow material. The SMARA statute requires mitigation to reduce adverse 36 impacts on public health, property, and the environment. Because SAFCA would require borrow 37 material for project construction, SAFCA must comply with SMARA. SMARA applies to an individual 38 or entity that would disturb more than 1 acre or remove more than 1,000 cubic yards of material 39 through surface mining activities, including the excavation of borrow pits for soil material. SMARA is 40 implemented through ordinances for permitting developed by local government lead agencies that

- 1 provide the regulatory framework under which local mining and reclamation activities are
- conducted. The State Mining and Geology Board reviews the local ordinances to ensure that they
   meet the procedures established by SMARA.
- 4 The Corps is not subject to SMARA requirements and therefore this regulation is not applicable to 5 activities carried out as part of the proposed program.

## 6 24.2.2.6 California Important Farmland Inventory System and Farmland 7 Mapping and Monitoring Program

- 8 The California Department of Conservation, Office of Land Conservation, maintains a statewide 9 inventory of farmlands. These lands are mapped by the Division of Land Resource Protection as part 10 of the Farmland Mapping and Monitoring Program. The maps are updated every 2 years with the 11 use of aerial photographs, a computer mapping system, public review, and field reconnaissance. 12 Farmlands are divided into the following five categories based on their suitability for agriculture.
- Prime Farmland: land that has the best combination of physical and chemical characteristics for
   crop production. It has the soil quality, growing season, and moisture supply needed to produce
   sustained high yields of crops when treated and managed.
- Farmland of Statewide Importance: land other than Prime Farmland that has a good combination of physical and chemical characteristics for crop production.
- Unique Farmland: land that does not meet the criteria for Prime Farmland or Farmland of
   Statewide Importance, but that has been used for the production of specific crops with high
   economic value.
- Farmland of Local Importance: land that is either currently producing crops or has the capability
   of production, but that does not meet the criteria of the categories above.
- Grazing Land: land on which the vegetation is suited to the grazing of livestock.
- These categories are sometimes referred to as Important Farmland. Other categories used in the
   mapping system are urban and built-up lands, lands committed to nonagricultural use, and other
   lands (land that does not meet the criteria of any of the other categories).
- 27 Effects on Prime Farmland and Farmland of Statewide Importance within the program area are
  28 addressed in Chapter 13, Land Use and Agriculture.

#### 29 24.2.2.7 California Land Conservation Act (Williamson Act)

- The California Land Conservation Act of 1965, commonly known as the Williamson Act (California Government Code Section 51200 *et seq*.), enables local governments to enter into contracts with private landowners for the purpose of promoting the continued use of the relevant land in agricultural or related open space use. In return, landowners receive property tax assessments that are based on farming and open space uses instead of full market value. Local governments receive an annual subvention (subsidy) of forgone property tax revenues from the state via the Open Space Subvention Act of 1971.
- 37 The Williamson Act empowers local governments to establish agricultural preserves consisting of
- 38 lands devoted to agricultural uses and other compatible uses. Upon establishment of such preserves,
- 39 the locality may offer to owners of included agricultural land the opportunity to enter into annually

- 1 renewable contracts that restrict the land to agricultural use for at least 10 years (i.e., the contract
- 2 continues to run for 10 years following the first date upon which the contract is not renewed). In
- 3 return, the landowner is guaranteed a relatively stable tax rate, based on the value of the land for
- 4 agricultural/open space use only and unaffected by its development potential.

As a public agency that may acquire lands within agricultural preserves, including lands under
contract, SAFCA is exempt from the normal cancellation process for Williamson Act contracts,
because the contract is nullified for the portion of the land actually acquired (California Government
Code Section 51295). SAFCA must provide notice to the California Department of Conservation prior
to acquiring such lands (California Government Code Section 51291[b]). A second notice is required
within 10 working days after the land is actually acquired (California Government Code Section

- 51291 (c J). As the land would be acquired for flood damage reduction measures, SAFCA is exempt
   from the findings required in California Government Code Section 51292 (California Government
- 13 Code Section 51293[e][1]) because the proposed project consists of flood control works. The
- 14 preliminary notice to the California Department of Conservation, provided before lands are actually
- 15 acquired, would demonstrate the purpose of the project and the exemption from the findings.
- 16 Williamson Act contracts are not relevant to the proposed program because Williamson Act
- contracts are deemed null and void when Williamson Act land is acquired in lieu of eminent domain
   for a public improvement by a public agency.
- 10 24 2 2 8 California Eich and Game Code Section 2502

## 1924.2.2.8California Fish and Game Code Section 3503 and 3503.5—20Protection of Bird Nests and Raptors

21 Section 3503 of the California Fish and Game Code states that it is unlawful to take, possess, or 22 needlessly destroy the nest or eggs of any bird. Section 3503.5 specifically states that it is unlawful 23 to take, possess, or destroy any raptors (i.e., species in the orders *Falconiformes* and *Strigiformes*), 24 including their nests or eggs. Typical violations of these codes include destruction of active nests 25 resulting from removal of vegetation in which the nests are located. Violation of Section 3503.5 26 could also include failure of active raptor nests resulting from disturbance of nesting pairs by nearby 27 project construction. This statute does not provide for the issuance of any type of incidental take 28 permit.

#### 29 24.2.2.9 California Fish and Game Code—Fully Protected Species

Protection of fully protected species is described in Sections 3511, 4700, 5050, and 5515 of the
 California Fish and Game Code. These statutes prohibit take or possession of fully protected species
 and do not provide for authorization of incidental take of fully protected species. DFW has informed
 non-federal agencies and private parties that their actions must avoid take of any fully protected
 species.

#### 35 **24.2.2.10** Basin Plan

Pursuant to the Porter-Cologne Act, the Central Valley RWQCB prepares and updates the Basin Plan
 for the Sacramento and San Joaquin River Basins every 3 years; the most recent update was

38 completed in February 2007 April 2016 (Central Valley Regional Water Quality Control Board 2007).

- 39 The Basin Plan describes the officially designated beneficial uses for specific surface water and
- 40 groundwater resources and the enforceable water quality objectives necessary to protect those

- beneficial uses. The Natomas Basin is located within the Central Valley RWQCB jurisdiction and is
   subject to the Basin Plan.
- 3 The Basin Plan includes numerical and narrative water quality objectives for physical and chemical 4 water quality constituents. Numerical objectives are set for temperature, DO, turbidity, and pH; TDS, 5 electrical conductivity, bacterial content, and various specific ions; trace metals; and synthetic 6 organic compounds. Narrative objectives are set for parameters such as suspended solids, 7 biostimulatory substances (e.g., nitrogen and phosphorus), oil and grease, color, taste, odor, and 8 aquatic toxicity. Narrative objectives are often precursors to numeric objectives. The primary 9 method used by the Central Valley RWOCB to ensure conformance with the Basin Plan's water 10 quality objectives and implementation policies and procedures is to issue WDRs for projects that 11 may discharge wastes to land or water. WDRs specify terms and conditions that must be followed 12 during the implementation and operation of a project.

#### 13 24.2.2.11 California Toxics Rule and State Implementation Policy

14 The CTR was promulgated in 2000 in response to requirements of the EPA NTR. The NTR and CTR 15 criteria are regulatory criteria adopted for inland surface waters, enclosed bays, and estuaries in 16 California that are subject to regulation pursuant to Section 303(c) of the CWA. The NTR and CTR 17 include criteria for the protection of aquatic life and human health. Human health criteria (water 18 and organisms) apply to all waters with a Municipal and Domestic Supply beneficial use designation 19 as indicated in the RWQCBs' basin plans. The Policy for Implementation of Toxics Standards for 20 Inland Surface Waters, Enclosed Bays, and Estuaries of California, also known as the State 21 Implementation Plan, was adopted by the State Water Board in 2000 to establish provisions for 22 translating CTR criteria, NTR criteria, and basin plan water quality objectives for toxic pollutants 23 into the following:

- NPDES permit effluent limits,
- compliance determinations,
- monitoring for dioxin (2,3,7,8-TCDD) equivalents,
- chronic toxicity control provisions,
- initiating site-specific objective development, and
- granting exceptions.
- See Chapter 5, Water Quality and Groundwater Resources, for information related to the proposed
   program and the CTR.

#### 32 24.2.2.12 California Register of Historic Resources

33 The CRHR includes resources that are listed in or formally determined eligible for listing in the 34 NRHP (see Chapter 19, Cultural Resources) as well as some California State Landmarks and Points of 35 Historical Interest (PRC Section 5024.1, 14, CCR Section 4850). Properties of local significance that 36 have been designated under a local preservation ordinance (local landmarks or landmark districts) 37 or that have been identified in a local historical resources inventory may be eligible for listing in the 38 CRHR and are presumed to be significant resources for purposes of CEQA unless a preponderance of 39 evidence indicates otherwise (State CEQA Guidelines Section 15064.5[a][2]). The eligibility criteria 40 for listing in the CRHR are similar to those for NRHP listing but focus on the importance of the

- resources to California history and heritage. A cultural resource may be eligible for listing in the
   CRHR if it:
- is associated with events that have made a significant contribution to the broad patterns of
   California's history and cultural heritage;
- 5 6. is associated with the lives of person important in our past;
- 6 7. embodies the distinctive characteristics of a type, period, region, or method of construction, or
   7 represents the work of an important individual, or possesses high artistic values; or
- 8 8. has yielded, or may be likely to yield, information important in prehistory or history.

#### 9 24.2.2.13 Native American Heritage Commission

10 NAHC identifies and catalogs places of special religious or social significance to Native Americans

11 and known graves and cemeteries of Native Americans on private lands, and performs other duties

12 regarding the preservation and accessibility of sacred sites and burials and the disposition of Native

- 13 American human remains and burial items. Consultation with NAHC, the Sacred Lands database, and
- 14 Native American groups are discussed above under the National Historic Preservation Act section
- 15 and also in Chapter 19 of this document, Cultural Resources.

#### 16 24.2.2.14 California Climate Solutions Act

17 In September 2006, Governor Arnold Schwarzenegger signed AB 32, the California Climate Solutions 18 Act of 2006. AB 32 requires that statewide greenhouse gas (GHG) emissions be reduced to 1990 19 levels by 2020. This reduction will be accomplished through an enforceable statewide cap on GHG 20 emissions that will be phased in starting in 2012. To effectively implement the cap, AB 32 directs CARB to develop and implement regulations to reduce statewide GHG emissions from stationary 21 22 sources. AB 32 specifies that regulations adopted in response to AB 1493 should be used to address 23 GHG emissions from vehicles. However, AB 32 also includes language stating that if the AB 1493 24 regulations cannot be implemented, then CARB should develop new regulations to control vehicle 25 GHG emissions under the authorization of AB 32.

- AB 32 requires that CARB adopt a quantified cap on GHG emissions representing 1990 emissions levels and disclose how it arrives at the cap; institute a schedule to meet the emissions cap; and develop tracking, reporting, and enforcement mechanisms to ensure that the state achieves the reductions in GHG emissions necessary to meet the cap. AB 32 also includes guidance to institute emissions reductions in an economically efficient manner and conditions to ensure that businesses and consumers are not unfairly affected by the reductions.
- Contributions of GHG emissions related to the proposed program are discussed in Chapter 8, Air
   Quality and Climate Change.

#### 34 **24.2.2.15** State of California General Plan Guidelines

The OPR published the *State of California General Plan Guidelines* (Governor's Office of Planning and
 Research 2003), which provides guidance for the acceptability of projects within specific <u>day-night</u>
 <u>sound level (Ldn)</u> contours. Generally, residential uses (e.g., mobile homes) are considered to be
 acceptable in areas where exterior noise levels do not exceed 60 dBA Ldn. Residential uses are

Sacramento River Bank Protection Project Phase II Supplemental Authorization Final EIS/EIR

- 1 normally unacceptable in areas exceeding 70 dBA  $L_{dn}$  and conditionally acceptable within 55–70 2 dBA Ldn.
- 3 Schools are normally acceptable in areas up to 70 dBA L<sub>dn</sub> and normally unacceptable in areas
- 4 exceeding 70 dBA L<sub>dn</sub>. Commercial uses are normally acceptable in areas with a CNEL of up to
- 5 70 dBA. Commercial uses are conditionally acceptable where the L<sub>dn</sub> is between 67.5 and 77.5 dBA,
- 6 depending on the noise insulation features and the noise reduction requirements. The guidelines
- 7 also provide adjustment factors for determining noise acceptability standards that reflect the noise
- 8 control goals of the community, the particular community's sensitivity to noise, and the
- 9 community's assessment of the relative importance of noise pollution.
- 10 Noise studies and project-related impacts and mitigation are discussed in Chapter 9, Noise.

#### 24.2.2.16 California Code of Regulations, Title 24 11

12 Title 24 of CCR establishes standards governing interior noise levels that apply to all new multi-

- 13 family residential units in California. These standards require that acoustical studies be performed
- 14 before construction begins at locations where the existing L<sub>dn</sub> exceeds 60 dBA. Such acoustical
- 15 studies are required to establish mitigation measures that limit maximum L<sub>dn</sub> levels to 45 dBA in any
- 16 habitable room. Although no generally applicable interior noise standards are pertinent to all uses,
- 17 many communities in California have adopted an L<sub>dn</sub> of 45 dBA as an upper limit on interior noise in
- 18 all residential units.
- 19 Noise studies are discussed in Chapter 9, Noise.

#### 20 24.2.2.17 **Central Valley Flood Control Act of 2008**

The Central Valley Flood Control Act of 2008, passed in 2007, recognizes that the Central Valley of 21 22 California is experiencing unprecedented development, resulting in the conversion of historically 23 agricultural lands and communities to densely populated residential and urban centers. Because of 24 the potentially catastrophic consequences of flooding, the Act recognizes that the federal 25 government's current 100-year flood protection standard is not sufficient to protect urban and 26 urbanizing areas within flood-prone areas throughout the Central Valley and declares that the 27 minimum standard for these areas is a 200-year level of flood protection. To continue with urban 28 development, cities and counties must develop and implement plans for achieving this new standard 29 by 2025. The CVFPB adopted the CVFPP, a comprehensive new framework for systemwide flood 30 management and flood risk reduction in the Sacramento and Joaquin River Basins, in June 2012. 31 DWR is leading the planning and coordination of major implementation actions of the 2012 CVFPP, 32 including State-led basin-wide feasibility studies, locally-led regional flood management planning, 33 and the Central Valley Flood System Conservation Strategy. Each of these planning efforts will be 34 incorporated into the next update of the CVFPP, which is scheduled for release in 2017. 35 Implementation of CVFPP actions have already begun and will be expanded after the 2017 Plan is 36 updated.

#### **California Regulations for Environmental Justice** 24.2.2.18 37

38 Most state governments have plans and policies intended to protect and expand the local and 39 regional economies affecting the communities within their jurisdictions. State plans and policies also 40 frequently address other social and economic impact topics, including fiscal conditions and related 41 public services that affect local residents' quality of life.

1 Within California, SB 115 (Chapter 690, Statutes of 1999) was signed into law in 1999. The

- 2 legislation established OPR as the coordinating agency for state environmental justice programs
- 3 (California Government Code, Section 65040.12[a]) and defined environmental justice in statute as
- 4 "the fair treatment of people of all races, cultures, and incomes with respect to the development,
- 5 adoption, implementation, and enforcement of environmental laws, regulations, and policies"
- 6 (Government Code Section 65040.12(e). SB 115 further required the CalEPA to develop a model
   7 environmental justice mission statement for boards, departments, and offices within the agency by
- 8 January 1, 2001 (Public Resources Code, Sections 72000–72001).
- 9 In 2000, SB 89 (Chapter 728, Statutes of 2000) was signed, which complemented SB 115 by
- 10 requiring the creation of an environmental justice working group and an advisory group to assist
- 11 CalEPA in developing an intra-agency environmental justice strategy (PRC Sections 72002–72003).
- 12 SB 828 (Chapter 765, Statutes of 2001) added and modified due dates for the development of
- CalEPA's intra-agency environmental justice strategy and required each board, department, and office within CalEPA to identify and address, no later than January 1,2004, any gaps in its existing
- programs, policies, and activities that may impede environmental justice (PRC, Sections 71114–
- 16 71115).

17 Cal/EPA adopted its environmental justice policy in 2004 (California PRC, Sections 71110–71113).
 18 This policy (or strategy) provides guidance to its resource boards, departments, and offices. It is
 19 intended to help achieve the state's goal of "achieving fair treatment of people of all races, cultures
 20 and incomes with respect to the development, adoption, implementation and enforcement of
 21 environmental laws and policies."

- AB 1553 (Chapter 762, Statutes of 2001) required OPR to incorporate environmental justice
   considerations in the General Plan Guidelines. AB 1553 specified that the guidelines should propose
   methods for local governments to address the following:
- planning for the equitable distribution of new public facilities and services that increase and
   enhance community quality of life,
- providing for the location of industrial facilities and uses that pose a significant hazard to human
   health and safety in a manner that seeks to avoid over-concentrating these uses in proximity to
   schools or residential dwellings,
- providing for the location of new schools and residential dwellings in a manner that avoids
   proximity to industrial facilities and uses that pose a significant hazard to human health and
   safety, and
- promoting more livable communities by expanding opportunities for transit-oriented
   development.
- Although environmental justice is not a mandatory topic in the general plan, OPR is required to
  provide guidance to cities and counties for integrating environmental justice into their general
  plans. The 2003 edition of the *General Plan Guidelines* included the contents required by AB 1553
  (see pages 8, 12, 20–27, 40, 114, 142, 144, and 260 of the revised *General Plan Guidelines*).
- 39 Environmental justice issues pertaining to the proposed program are discussed in Chapter 20,
- 40 Socioeconomics and Environmental Justice.

#### 1 24.2.2.19 Water Use Efficiency

The California Constitution prohibits the waste or unreasonable use of water. Further, Water Code
Section 275 directs DWR and the State Water Board to "take all appropriate proceedings or actions
before executive, legislative, or judicial agencies to prevent waste or unreasonable use of water."
Several legislative acts have been adopted to develop efficient use of water in the state:

- 6 Urban Water Management Planning Act of 1985,
- 7 Water Conservation in Landscaping Act of 1992,
- 8 Agricultural Water Management Planning Act,
- 9 Agricultural Water Suppliers Efficient Management Practices Act of 1990,
- 10 Water Recycling Act of 1991, and
- Agricultural Water Conservation and Management Act of 1992.
- 12 The purpose of the proposed program is to address flood issues. The proposed program would not 13 result in the waste or unreasonable use of water.

#### 14 **24.2.2.20 Public Trust Doctrine**

When planning and allocating water resources, the State of California is required to consider the
public trust and preserve for the public interest the uses protected by the trust. The public trust
doctrine embodies the principle that certain resources, including water, belong to all and, thus, are
held in trust by the state for future generations.

19 In common law, the public trust doctrine protects navigation, commerce, and fisheries uses in 20 navigable waterways. However, the courts have expanded the doctrine's application to include 21 protecting tideland, wildlife, recreation, and other public trust resources in their natural state for 22 recreational, ecological, and habitat purposes as they affect birds and marine life in navigable 23 waters. The National Audubon Society v. Superior Court of Alpine County (1983) 33 Cal 3d 419 24 decision extended the public trust doctrine's limitations on private rights to appropriative water 25 rights, and also ruled that longstanding water rights could be subject to reconsideration and could 26 possibly be curtailed. The doctrine, however, generally requires the court and the State Water Board 27 to perform a balancing test to weigh the potential value to society of a proposed or existing 28 diversion against its impact on trust resources.

- The 1986 Rancanelli decision applied the public trust doctrine to decisions by the State Water Board
  and held that this doctrine must be applied by the State Water Board in balancing all the competing
  interests in the uses of Bay-Delta waters (*United States v. State Water Resources Control Board*[1986] 182 Cal. App. 3d 82).
- The proposed program is consistent with the public trust doctrine, as the primary goal includes
   improved flood control.

#### 35 24.2.2.21 Relocation Assistance and Property Acquisition

36 The State of California's Government Code Section 7260, *et seq.* brings the California Relocation Act

- into conformity with the federal Uniform Act. In the acquisition of real property by a public agency,
- both the federal and state acts seek to (1) ensure consistent and fair treatment of owners of real

property, (2) encourage and expedite acquisition by agreement to avoid litigation and relieve
 congestion in the courts, and (3) promote confidence in public land acquisition.

3 The Relocation Assistance and Real Property Acquisition Guidelines were established by 25 CCR 1.6. 4 The guidelines were developed to assist public entities with developing regulations and procedures 5 implementing Title 42, Chapter 61 of the USC, the Uniform Act, for federal and federally assisted 6 programs. The guidelines are designed to ensure that uniform, fair, and equitable treatment is given 7 to people displaced from their homes, businesses, or farms as a result of the actions of a public 8 entity. Under the act, persons required to relocate temporarily are not considered displaced, but 9 must be treated fairly. Such persons have a right to temporary housing that is decent, safe, and 10 sanitary, and must be reimbursed for all reasonable out-of-pocket expenses. In accordance with 11 these guidelines, people may not suffer disproportionate injury as a result of action taken for the 12 benefit of the public as a whole. Additionally, public entities must ensure consistent and fair 13 treatment of owners of such property, and encourage and expedite acquisitions by agreement with 14 owners of displaced property to avoid litigation.

If necessary, property acquisition and relocation services, compensation for living expenses for
 temporarily relocated residents, and negotiations regarding any compensation for temporary loss of
 business would be accomplished in accordance with the Uniform Act (see above) and California
 Government Code Section 7267 *et seq*.

#### 19 24.2.3 State and Regional Plan Consistency

#### 20 24.2.3.1 Clean Water Act, Section 303(d)

21 Under CWA Section 303(d), the RWQCB and the State Water Board list water bodies as impaired 22 when not in compliance with designated water quality objectives and standards. A TMDL program 23 must be prepared for waters identified by the state as impaired. A TMDL is a quantitative 24 assessment of a problem that affects water quality. The problem can include the presence of a 25 pollutant, such as a heavy metal or a pesticide, or a change in the physical property of the water, 26 such as DO or temperature. A TMDL specifies the allowable load of pollutants from individual 27 sources to ensure compliance with water quality standards. Once the allowable load and existing source loads have been determined, reductions in allowable loads are allocated to individual 28 29 pollutant sources.

30 The proposed program would have no effect on TMDL issues for the Sacramento River.

#### 31 24.2.3.2 Water Rights

32 The State of California recognizes riparian and appropriative surface water rights. Riparian rights 33 are correlative entitlements to water that are held by owners of land bordering natural 34 watercourses. California requires a statement of diversion and use of natural flows on adjacent 35 riparian land under a riparian right. Appropriative water rights allow the diversion of a specified 36 amount of water from a source for reasonable and beneficial use during all or a portion of the year. 37 In California, previously issued appropriative water rights are superior to and take precedence over 38 newly granted rights. The State Water Board has authority to issue permits to grant appropriative 39 water rights. The proposed program is consistent with current water rights.

#### **24.2.4 Local Plan Consistency and Regulatory Requirements**

2 In addition to the federal and state regulatory and local plan requirements, the project may be

- 3 subject to certain zoning or other ordinances and general plans of counties and cities within the
- 4 program area. For more discussion on local plans and requirements applicable to the project, refer
- 5 to Appendix C, Regulatory Background.

This EIS/EIR was prepared by ICF International at the direction of the U.S. Army Corps of Engineers. The following individuals participated in the preparation of this document.

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

Name	Education/Experience	Contribution/Role
Dan Artho	BS, Biology	NEPA Document Review
	<u>24 years' experience</u>	
Lisa Clay	JD, 26 years' experience	Legal review/Attorney
Matthew Davis	MS, Biological Sciences	NEPA document review/NEPA
	29 years' experience	Regional Technical Specialist
Mike Dietl	BS, Fisheries	Plan Formulation and
	16 years' experience	Environmental Compliance
<u>Chelsea Fuentes</u>	JD, 3 years' experience	Legal review/Attorney
Miki Fujitsubo	Licensed Landscape Architect	Water Resource Regional Technical
	24 years' experience	Specialist
<u>Patricia K. Goodman</u>	<u>BS, Earth Sciences, MPA</u>	Environmental Lead
	<u>28 years' experience</u>	
Robert Gudiño	<u>MA, Anthropology</u>	<u>NHPA/Cultural Resources Specialist</u>
	<u>18 years' experience</u>	
Brian Luke	BS, Biology	Environmental Manager
	8 years' experience	
Brian Mulvey	MS, Fisheries Science	Environmental Lead/Fisheries
	24 years' experience	Specialist
Nikki Polson	MA, Archaeology	NHPA/Cultural Resources Specialist
	15 years' experience	
Darin L. Rummel	BS, Biology; BA, English	Environmental Manager
	<u>3 years' experience</u>	

#### 25.2 California Department of Water Resources

Name	Education/Experience	Contribution/Role
Kip Young	BS, Animal Science 18 years' experience	CEQA lead and document review
Dave Wheeldon	BS, Environmental Engineering 19 years' experience	Project Manager

## 25.3 HDR Inc. Consulting

Name	Education/Experience	Contribution/Role
Thomas Adams	Masters in Landscape Architecture 32 years' experience	
Sergio Jimenez	Masters in Civil Engineering	
	13 years' experience	
Daniel Teak	BS in Civil Engineering	
	4 years' experience	

## 25.4 ICF International

#### 25.4.1 Project Management

Name	Education/Experience	Contribution/Role
Gregg Ellis	BA, Geography	Project Director
	16 years' experience	
Sara Martin	BA, Anthropology	Project Manager
	13 years' experience	
Andrew Humphrey	BA, History	Project Coordinator
	5 years' experience	

#### 25.4.2 Technical Staff

Name	Education/Experience	Contribution/Role
Jeff Peters	MS, Geography BA, Geology 15 years' experience	Geomorphology and Flood Control; Geology, Seismicity, Soils and Mineral Resources
Ken Casaday	MA, Geophysics BA, Geology and Geophysics 30+ years' experience	Geology, Seismicity, Soils and Mineral Resources, Senior Review
Lesa Erecius	MS, Pharmacology & Toxicology (Aquatic Toxicology focus) BS, Physiology 7 years' experience	Water Quality and Groundwater Resources
Russ Grimes	MS, Environmental Management BA, Environmental Studies 13 years' experience	Water Quality and Groundwater Resources, Senior Review
Nate Martin	MA, Public Administration BA, Environmental Studies (Biology minor) 13 years' experience	Water Quality and Groundwater Resources, Senior Review
Bonnie Chiu	BA, Political Science/Public Service 10 years' experience	Land Use and Agriculture

Name	Education/Experience	Contribution/Role
Andrew Humphrey	BA, History 5 years' experience	Transportation and Navigation; Public Health and Environmental Hazards; Socioeconomics and Environmental Justice
Kai-Ling Kuo	MS, Civil & Environmental Engineering BS, Civil Engineering 7 years' experience	Air Quality and Climate Change
<u>Laura Yoon</u>	<u>MS, Environmental Management</u> <u>BA, Environmental Studies</u> <u>11 years' experience</u>	<u>Air Quality and Climate Change</u>
Shannon Hatcher	BS, Environmental Science BS, Environmental Health and Safety 10+ years' experience	Air Quality and Climate Change, Senior Review
Jim Wilder	MS, Environmental Engineering BS, Civil Engineering 20+ years' experience	Noise
Jessica Hughes	MS, Botany and Plant Pathology BS, Biology 9 years' experience	Vegetation and Wetlands
<u>Lisa Webber</u>	<u>MS, Botany</u> <u>BA, Biology</u> 28 years' experience	Vegetation and Wetlands
Brad Schafer	BA, Biology 16 years' experience	Vegetation and Wetlands, Senior Review
Marin Greenwood	PhD, Fish Ecology MS, Applied Fish Biology BS, Aquatic Bioscience 10 years' experience	Fisheries and Aquatics
Donna Maniscalco	BS, Wildlife, Fish, and Conservation Biology 10 years' experience	Fisheries and Aquatics
Bill Mitchell	MS Fisheries Biology BA, Biology 25+ years' experience	Fisheries and Aquatics, Senior Review
Erin Hitchcock	BS, Wildlife, Fisheries, and Conservation Biology 9 years' experience	Wildlife
Rachel Gardiner	<u>MS, Wildlife Ecology</u> <u>BS, Biology</u> <u>17 years' experience</u>	<u>Wildlife</u>
Angela Alcala	<u>BS, Wildlife, Fisheries, and Conservation</u> <u>Biology</u> 19 years' experience	<u>Wildlife</u>
Stephanie Myers	MS Avian Sciences BA, Biology 20+ years' experience	Wildlife, Senior Review

Name	Education/Experience	Contribution/Role
Stefanie Lyster	MPA	Recreation
	BA, Journalism	
	15 years' experience	
Julia Hooten	BA, Geography (Biology/Physical	Population and Housing; Utilities
	Environment concentration)	and Public Services
	4 years' experience	
Jennifer Stock	BA, Landscape Architecture	Visual Resources
	12 years' experience	
Christiaan Havelaar	BA, Anthropology	Cultural Resources
	11 years' experience	
Dana McGowan	RPA	Cultural Resources, Senior Review
	MA, Anthropology	
	BA, Anthropology	
	22 years' experience	
Paul Shigley	BA, Government Journalism	Lead Production Editor
	26 years' experience	
Ken Cherry	BA, English	Support Editor
	24 years' experience	
Stephanie Monzon	MA, English	Support Editor
	BA, English	
	Professional Certificate in Editing	
	9 years' experience	
Deborah Jew	CA, Graphic Communication	Publication Specialist
	AA, General Education	
	26 years' experience	
<u>Corrine Ortega</u>	AA, Communications	Publication Specialist
	<u>30 years' experience</u>	
Senh Saelee	BS, Visual Communications Design	Graphic Artist
	13 years' experience	
<u>Alan Barnard</u>	23 years' experience	Graphic Artist
Alex Angier	AA, Computer-Aided Drafting and Design	GIS Analyst
	<u>12 years' experience</u>	
Dan Moreno	MA, Geography	Senior GIS Analyst
	BA, Geography	
	30+ years' experience	

#### **3 26.1 Executive Summary**

1

2

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6 None.

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3

AB 32, 24-17

ACHP, 24-7

- Advisory Council on Historic Preservation (ACHP, 24-7
- Aerometric Data Analysis and Management System (ADAM, 8-1
- Alquist-Priolo Act, 6-4
- American Indian Religious Freedom Act, 19-4, 24-7, 24-8
- American River Common Features Project (Common Features, 1-7
- APE, 19-6, 19-8, 24-7
- ARB, 8-1, 8-7, 8-9, 8-11, 8-17
- bank protection measure, ES-4, ES-5, ES-11, ES-12, ES-20, ES-21, ES-22, ES-23, ES-48, 1-18, 2-4, 2-5, 2-13, 2-15, 2-16, 2-17, 2-18, 2-27, 4-22, 4-26, 7-9, 8-35, 8-37, 8-39, 9-15, 9-17, 9-18, 10-25, 10-26, 10-40, 10-42, 10-45, 11-43, 11-45, 11-46, 11-48, 12-60, 12-62, 12-64, 13-12, 13-16, 13-17, 13-18, 14-9, 15-4, 17-17, 17-19, 18-11, 18-12, 18-13, 19-14, 19-15, 19-16, 19-17, 19-18, 19-19, 20-6, 22-3, 22-17, 22-18, 22-19, 24-6, 24-11

Bay Delta Conservation Plan (BDCP, 1-6

BCAQMD, 8-25, 8-27, 8-28, 8-29, 8-30

BCFD, 16-8

BDCP, 1-6, 22-10, 22-12, 26-26

best management practices (BMP, 18-7

biological opinion, ES-50, 10-31, 12-53

BLM, 13-3, 13-5

BMP, 8-24, 8-25

- Butte County Air Quality Management District (BCAQMD, 8-2, 8-24
- Butte County Fire Department (BCFD, 16-8
- Butte County General Plan Technical Update, 6-6, 26-8
- Butte County Multi-Jurisdictional All-Hazard Pre-Disaster Mitigation Plan, 4-24

CAA, 8-11, 8-16, 24-9

CAAQS, 8-4, 8-7, 8-12, 8-13, 8-24, 8-25

CAL FIRE, 16-9, 16-10

CalEPA, 24-18

California Air Resources Board (ARB, 8-16

California Clean Air Act (CCAA, 8-11

California Department of Conservation, 13-1, 13-6, 13-7, 13-8, 13-9, 24-13, 24-14, 26-29

- California Department of Fish and Game, 10-1, 10-7, 10-10, 10-22, 10-30, 11-13, 11-17, 11-19, 11-24, 11-25, 11-26, 11-31, 12-1, 12-7, 12-35, 12-36, 12-41, 12-45, 12-56, 22-10, 22-11, 22-12, 26-3, 26-14, 26-17, 26-18, 26-19, 26-20, 26-21, 26-22, 26-23, 26-24, 26-25, 26-26, 26-29, 26-35
- California Department of Fish and Wildlife (DFW, 1-13, 10-26, 11-24, 13-3, 24-12
- California Department of Forestry and Fire Protection (CAL FIRE, 16-8
- California Department of Water Resources (DWR, 1-6, 4-21, 5-11

California Endangered Species Act, 10-10, 10-21, 10-23, 11-3, 11-10, 11-31, 12-7, 12-31, 12-47, 24-12

California Energy Commission (CEC, 8-10

California Environmental Protection Agency (CalEPA, 18-7

California Environmental Quality Act (CEQA, ES-1, 1-2, 10-10

California Fish and Game Code, 5-12, 10-10, 10-23, 12-31, 12-35, 12-40, 12-45, 12-47, 12-56, 12-60, 12-61, 12-62, 24-15

California Historical Resources Information System (CHRIS, 19-4

California Integrated Waste Management Act, 16-11

California Native Plant Protection Act, 10-10, 10-21, 10-23

California Native Plant Society (CNPS, 10-10, 10-21

California Natural Diversity Database (CNDDB, 10-1, 12-1, 26-14, 26-24

California Public Utilities Commission, 16-4, 16-7, 16-8, 16-11

California State University, Chico (CSU Chico, 13-3

California Surface Mining and Reclamation Act of 1975, 24-13

Cal-IPC, 10-1, 10-23, 10-37, 26-14

Caltrans, 7-6, 9-12, 18-3

carbon dioxide (CO2, 8-8

CCAPCD, 8-27, 8-28, 8-29, 8-30

CDFA, 10-1, 10-23, 10-37

CEC, 8-10, 26-11

Central Valley Flood Protection Act (CVFPA, 1-5

Central Valley Flood Protection Board (CVFPB, ES-1, 1-1, 2-1, 19-1

Central Valley Flood Protection Plan (CVFPP, 1-11

Central Valley Integrated Flood Management Study (CVIFMS, 1-11

Central Valley Project (CVP, 11-31, 22-10, 26-22

Central Valley spring-run Chinook, 11-3, 11-9, 11-17, 11-33

Central Valley steelhead, 11-3, 11-4, 11-9, 11-21, 11-33

CEQ, 1-1, 1-18, 2-12, 20-4, 22-4, 22-5, 24-6

CEQA, ES-v, ES-1, ES-2, ES-11, ES-23, ES-46, ES-47, ES-48, ES-51, 1-1, 1-2, 1-3, 1-5, 1-14, 1-15, 1-16, 1-17, 2-12, 2-13, 2-32, 2-33, 2-36, 3-1, 3-2, 3-3, 3-4, 3-5, 4-24, 5-13, 6-7, 7-5, 8-1, 8-17, 8-20, 8-22, 8-23, 8-25, 8-26, 8-28, 8-29, 8-30, 8-31, 8-32, 8-33, 8-34, 8-35, 8-36, 8-37, 8-38, 8-39, 8-40, 9-8, 10-10, 10-26, 10-27, 10-37, 11-33, 12-7, 12-50, 13-12, 14-3, 15-3, 17-10, 18-5, 19-1, 19-2, 19-12, 19-13, 19-15, 19-17, 20-5, 22-1, 22-2, 22-3, 22-4, 22-5, 24-7, 24-11, 24-12, 24-13, 24-16, 25-1, 26-11, 26-12

channel morphology, 4-7, 4-8, 22-12

CHRIS, 19-7

Clean Air Act (CAA, 8-11, 24-9

Clean Water Act (CWA, 5-3, 10-26, 24-3

Climate Change Scoping Plan, 8-17

CNDDB, 10-22, 12-8, 12-18, 12-32, 12-33, 12-34, 12-35, 12-36, 12-37, 12-38, 12-39, 12-40, 12-41, 12-45, 12-46, 12-47, 12-53, 12-55 CNEL, 24-17

CNPS, 10-1, 10-10, 10-11

CO, 8-4, 8-5, 8-6, 8-11, 8-12, 8-13, 8-14, 8-15, 8-16, 8-21, 8-22, 8-24, 8-26, 8-32, 8-35, 8-37, 8-39, 26-1, 26-2, 26-6, 26-10

CO2, 8-8, 8-9

Coded wire tag (CWT, 11-18

- Colusa County Air Pollution Control District (CCAPCD, 8-2, 8-24
- Common Features, 1-7, 1-8, 19-7, 22-6, 22-13

community service district (CSD, 16-5

Comp Study, 1-10, 1-11

Comprehensive Environmental Response, Compensation, and Liability Act, 24-10

- construction contract, 2-34, 7-7, 11-42, 16-13, 18-8
- Corps, ES-1, ES-2, ES-v, ES-2, ES-3, ES-4, ES-6, ES-11, ES-12, ES-20, ES-21, ES-22, ES-46, ES-50, ES-51, 1-1, 1-2, 1-3, 1-4, 1-5, 1-6, 1-7, 1-8, 1-9, 1-10, 1-11, 1-12, 1-13, 1-14, 1-15, 2-1, 2-3, 2-4, 2-5, 2-6, 2-14, 2-17, 2-27, 2-28, 2-29, 2-30, 2-31, 2-32, 2-33, 2-34, 2-35, 2-36, 3-5, 4-1, 4-3, 4-6, 4-7, 4-10, 4-12, 4-13, 4-16, 4-18, 4-19, 4-21, 4-22, 4-23, 4-27, 5-1, 5-2, 5-7, 5-13, 5-14, 5-15, 5-16, 6-9, 7-8, 8-27, 8-33, 8-35, 8-37, 8-39, 9-11, 9-12, 9-13, 10-2, 10-25, 10-27, 10-28, 10-29, 11-1, 11-3, 11-4, 11-6, 11-8, 11-17, 11-32, 11-33, 11-41, 12-2, 12-48, 12-51, 12-61, 13-16, 14-4, 14-6, 14-7, 16-14, 17-10, 17-11, 17-13, 17-14, 18-1, 18-7, 18-8, 18-10, 19-1, 19-5, 19-6, 19-7, 19-9, 19-15, 19-17, 21-1, 22-2, 22-13, 22-14, 22-16, 22-17, 22-18, 22-19, 22-20, 22-21, 22-22, 23-1, 24-1, 24-2, 24-3, 24-4, 24-5, 24-6, 24-7, 24-8, 24-12, 24-13, 25-1, 26-1, 26-2, 26-3, 26-4, 26-5, 26-6, 26-7, 26-8, 26-10, 26-12, 26-14, 26-15, 26-16, 26-22, 26-26, 26-27, 26-28, 26-32, 26-33, 26-34, 26-36

Corresponding Cohort Replacement Rates, 11-17, 11-19

Council on Environmental Quality (CEQ, 1-1, 20-1, 24-1

county service areas (CSAs, 16-4

CRHR, 19-9, 19-13, 19-14, 19-16, 24-16

CSAs, 16-10

CSU Chico, 13-3

CTR, 24-15, 24-16

CVFPA, 1-5

CVFPB, ES-v, ES-2, ES-22, ES-50, ES-51, 1-1, 1-3, 1-4, 1-5, 1-6, 1-7, 1-9, 1-13, 1-14, 1-15, 2-1, 2-3, 2-28, 2-32, 2-34, 2-35, 2-37, 3-5, 4-4, 4-23, 6-8, 12-53, 14-6, 14-7, 18-8, 19-15, 19-17, 22-5, 22-22, 24-7, 24-8, 24-13, 24-18

CVFPP, 1-5, 1-6, 1-11, 24-18

CVIFMS, 1-11

CVP, 11-31, 22-10

- CWA, 10-27, 24-3, 24-4, 24-5, 24-12, 24-15, 24-21, 26-7
- Delta, ES-v, ES-1, ES-2, ES-11, 1-1, 1-3, 1-4, 1-6, 1-7, 1-8, 2-1, 2-12, 4-1, 4-4, 4-7, 4-8, 4-9, 4-10, 4-11, 4-18, 4-19, 4-21, 4-22, 4-23, 5-2, 5-3, 5-4, 5-6, 5-8, 5-9, 5-11, 5-14, 8-10, 10-16, 10-17, 11-2, 11-3, 11-5, 11-6, 11-7, 11-9, 11-10, 11-11, 11-12, 11-13, 11-14, 11-15, 11-16, 11-18, 11-20, 11-22, 11-23, 11-24, 11-25, 11-27, 11-28, 11-29, 11-30, 11-31, 11-35, 11-36, 11-37, 11-38, 12-10, 12-24, 12-25, 12-26, 12-29, 13-2, 13-4, 13-6, 13-7, 13-10, 13-11, 15-2, 17-4, 17-5, 17-6, 18-3, 22-3, 22-6, 22-7, 22-8, 22-9, 22-10, 22-11, 22-12, 22-13, 22-14, 22-17, 22-18, 22-20, 24-20, 26-2, 26-4, 26-5, 26-16, 26-17, 26-18, 26-19, 26-20, 26-21, 26-22, 26-23, 26-26, 26-35, 26-36

DFW, ES-50, 1-13, 1-14, 10-26, 10-30, 10-31, 10-32, 11-24, 11-25, 11-26, 11-27, 11-33, 12-7, 12-48, 12-50, 12-52, 12-53, 12-54, 12-56, 12-57, 12-58, 12-60, 12-61, 13-4, 13-5, 16-8, 16-9, 24-12, 24-15

Diatomaceous Earth (DE, 16-4

dissolved oxygen (DO, 5-2

DO, 5-4, 5-9, 5-10, 24-15, 24-21

DTSC, 18-3

DWR, ES-50, ES-51, 1-5, 1-6, 1-7, 1-8, 1-9, 1-11, 1-12, 1-13, 1-14, 2-32, 2-33, 4-22, 11-25, 12-50, 22-7, 22-10, 24-18, 24-19

EFH, 11-11, 24-5, 24-6

employment, 20-4, 20-5, 20-6, 22-1, 22-23

- EPA, 8-4, 8-7, 8-9, 8-16, 18-7, 24-3, 24-5, 24-9, 24-10, 24-15, 24-18, 26-12, 26-19
- ESA, ES-v, ES-33, ES-33, ES-50, 10-10, 10-27, 11-3, 11-4, 11-9, 11-10, 11-11, 11-17, 11-21, 11-22, 11-23, 11-25, 11-26, 11-32, 12-3, 12-7, 12-8, 12-32, 12-33, 12-50, 12-55, 21-20, 24-1, 24-5, 24-6, 24-12

essential fish habitat (EFH, 11-11, 24-5

ETL, ES-i, ES-ii, ES-4, ES-11, ES-21, ES-22, 2-5, 2-6, 2-7, 2-8, 2-9, 2-13, 2-16, 2-17, 8-39, 10-25, 10-28, 11-33, 12-60, 12-62, 14-5, 22-18, 22-19, 26-1, 26-2, 26-22

Executive Order 11988, 4-23, 24-8

- Executive Order 12898, 20-1, 20-3, 20-4, 24-8, 26-35
- FAA, 18-4, 18-6, 18-10, 26-33
- Farmland Mapping and Monitoring Program (FMMP, 13-6
- Farmland Protection Policy Act (FPPA, 24-6

Feather River Air Quality Management District (FRAQMD, 8-2, 8-24 Feather River Fish Hatchery (FRFH, 11-19

federal Endangered Species Act (ESA, ES-3, 10-10, 11-3, 11-10, 12-7

FHWA, 26-13, 26-32

floodplain, ES-1, ES-4, ES-20, ES-23, 1-3, 1-10, 1-11, 2-5, 2-14, 2-15, 2-16, 2-30, 2-36, 4-3, 4-8, 4-9, 4-10, 4-11, 4-12, 4-17, 4-29, 7-9, 10-28, 10-38, 11-2, 11-3, 11-5, 11-6, 11-11, 11-13, 11-28, 11-29, 11-30, 11-32, 11-41, 11-42, 11-43, 11-44, 11-45, 11-48, 12-59, 12-60, 12-61, 12-63, 12-64, 13-4, 14-6, 14-7, 14-8, 17-5, 17-6, 17-7, 18-4, 22-2, 22-9, 22-13, 22-20, 24-8

FMWT, 11-22, 11-25

FRAQMD, 8-25, 8-27, 8-28, 8-29, 8-30

FRFH, 11-18, 11-19

FTA, 26-13

fugitive dust, 8-18, 8-19, 8-26, 8-32, 24-9

GCAPCD, 8-25, 8-27, 8-28, 8-29, 8-30

GCID, 11-23, 11-24

- GHG, ES-27, ES-40, 8-2, 8-8, 8-9, 8-18, 8-19, 8-20, 8-22, 8-25, 8-30, 8-31, 8-34, 8-35, 8-36, 8-37, 8-38, 8-40, 21-11, 22-16, 24-17, 26-12
- Glenn County Air Pollution Control District (GCAPCD, 8-2, 8-24

Glenn-Colusa Irrigation District (GCID, 11-23

greenhouse gas (GHG, 24-17

HEC-RAS, 4-27

human remains, 19-1, 19-14, 19-15, 22-22, 24-16

Hydrologic Engineering Center's River Analysis System (HEC-RAS, 4-12

instream woody material (IWM, ES-6, 2-6, 5-17, 11-3, 12-6, 17-11 IWM, ES-v, ES-6, ES-7, ES-8, ES-9, 2-6, 2-7, 2-8, 2-9, 2-10, 2-36, 2-37, 4-10, 4-11, 4-12, 4-13, 4-25, 4-27, 4-28, 4-29, 4-30, 4-31, 5-18, 10-6, 11-6, 11-41, 11-42, 11-45, 11-47, 11-48, 12-61, 12-64, 14-8, 17-13, 17-14, 17-16, 17-17, 17-18, 22-12, 22-13, 22-19

level of service (LOS, 22-15

LFRCMP, 1-8

LOS, ES-25, ES-39, 7-1, 7-6, 7-9, 21-6, 22-15

- Lower Feather River Corridor Management Plan (LFRCMP, 1-8
- low-income population, 20-4, 20-5, 20-6, 20-7, 24-8, 24-9

maintenance areas, ES-12, 2-14, 8-22, 21-1

- MBTA, 12-35, 12-36, 12-40, 12-45, 12-56, 12-60, 12-61, 12-62, 24-2, 24-3
- Migratory Bird Treaty Act (MBTA, 12-34, 24-2
- MSA, 11-11
- NAAQS, 8-4, 8-7, 8-12, 8-13, 8-27, 8-33, 8-36, 8-37, 8-39
- NAGPRA, 19-11
- NAHC, ES-v, ES-50, 1-14, 19-5, 23-1, 24-9, 24-16
- National Historic Preservation Act (NHPA, 1-14, 19-1, 24-7
- National Marine Fisheries Service (NMFS, ES-50, 1-6, 24-2
- Native American Graves Protection and Repatriation Act (NAGPRA, 19-11
- Native American Heritage Commission (NAHC, ES-50, 1-14, 19-5
- Natomas Basin HCP, 10-2, 12-1, 12-50, 13-1

- NEPA, ES-v, ES-1, ES-2, ES-3, ES-11, ES-23, ES-47, ES-48, ES-49, ES-51, 1-1, 1-2, 1-3, 1-5, 1-14, 1-16, 1-17, 1-18, 2-12, 2-13, 2-32, 2-33, 2-36, 3-1, 3-2, 3-3, 3-4, 3-5, 4-24, 6-7, 8-17, 8-20, 8-26, 8-27, 8-28, 8-31, 8-32, 8-33, 8-34, 8-35, 8-36, 8-37, 8-38, 8-39, 8-40, 9-8, 10-27, 10-37, 11-33, 12-50, 15-3, 17-10, 19-1, 19-11, 19-15, 19-17, 20-1, 22-1, 22-4, 22-5, 24-1, 24-4, 24-5, 24-7, 24-9, 25-1
- NHPA, 1-14, 19-1, 19-2, 19-11, 19-12, 19-15, 19-17, 24-7, 25-1

NLIP, 1-7

NMFS, ES-50, 1-6, 1-13, 1-14, 11-11, 11-24, 11-35, 11-37, 12-48, 22-10, 24-2, 24-5, 24-6, 26-17, 26-18, 26-20

NOAA, 26-18

NOX, ES-26, 8-1, 8-4, 8-6, 8-7, 8-18, 8-19, 8-21, 8-22, 8-24, 8-25, 8-26, 8-27, 8-32, 8-35, 8-37, 8-39, 21-8

NPDES, 5-14, 22-14, 24-16

NRCS, 24-6

NRHP, ES-37, 19-2, 19-7, 19-9, 19-11, 19-12, 19-13, 19-14, 19-16, 19-17, 21-31, 22-22, 24-16

NTR, 24-15

03, 8-5

open water, 10-6, 12-6, 12-33, 12-34, 12-40, 12-46, 12-47, 12-51, 12-52, 13-4, 22-11, 22-12

OPR, 24-17, 24-18, 24-19

Pacific Gas and Electric Company (PG&E, 11-5, 16-7

PCAPCD, 8-20, 8-25, 8-27, 8-28, 8-29, 8-30, 8-35

PCBs, 5-4

PCWA, 16-2

PG&E, 16-7, 16-8, 18-3

pH, 5-4, 5-9, 5-10, 10-15, 24-15

- Phase II Supplemental Authority, ES-i, ES-v, ES-1, ES-3, 1-1, 1-2, 1-5, 24-1
- Placer County Air Pollution Control District (PCAPCD, 8-2, 8-24

Placer County Water Agency (PCWA, 16-2

polychlorinated biphenyls (PCBs, 18-2

- Porter-Cologne, 5-4, 5-12, 5-15, 10-22, 10-23, 24-12, 24-15
- proposed program, ES-v, ES-1, ES-2, ES-3, ES-4, ES-23, ES-45, ES-46, ES-47, ES-48, ES-49, ES-50, ES-51, 1-1, 1-3, 1-5, 1-13, 1-14, 1-15, 1-18, 2-1, 2-3, 2-4, 2-16, 2-36, 4-1, 4-20, 4-23, 4-24, 5-1, 5-7, 5-8, 5-10, 5-12, 5-13, 5-15, 6-1, 6-4, 6-8, 6-9, 6-10, 6-11, 7-1, 7-2, 7-3, 7-5, 7-6, 7-8, 7-9, 8-1, 8-8, 8-14, 8-17, 8-18, 8-19, 8-20, 8-21, 8-22, 8-26, 8-29, 8-33, 9-1, 9-4, 9-5, 9-6, 9-8, 9-9, 9-12, 10-1, 10-2, 10-4, 10-22, 10-24, 10-25, 10-27, 10-28, 10-29, 10-32, 10-34, 10-36, 10-38, 10-40, 10-42, 10-43, 10-45, 11-1, 11-32, 11-34, 11-47, 12-1, 12-2, 12-3, 12-48, 12-50, 12-56, 12-60, 12-62, 13-1, 13-2, 13-11, 13-12, 13-13, 13-14, 13-15, 14-1, 14-3, 14-4, 15-1, 15-3, 16-1, 16-11, 16-12, 17-1, 17-4, 17-10, 17-11, 17-13, 17-14, 17-15, 17-16, 17-17, 17-18, 18-1, 18-5, 18-6, 19-1, 19-4, 19-6, 19-8, 19-9, 19-10, 19-11, 19-14, 19-15, 19-16, 19-17, 20-1, 20-3, 20-4, 20-5, 20-6, 20-7, 21-1, 22-1, 22-3, 22-5, 22-9, 22-13, 22-14, 22-15, 22-16, 22-17, 22-18, 22-19, 22-20, 22-21, 22-22, 22-23, 23-1, 23-2, 24-1, 24-2, 24-3, 24-6, 24-7, 24-8, 24-9, 24-10, 24-11, 24-12, 24-13, 24-14, 24-16, 24-17, 24-19, 24-20, 24-21

Proposed Program, ES-i, ES-3, ES-47, 1-5, 8-24, 11-12, 11-14

railroad, 7-4, 9-6, 11-4, 12-33

RBDD, 11-13, 11-18, 11-20, 11-21, 11-23, 11-24

#### RD, 1-11

Reclamation District (RD, 1-11

Red Bluff Diversion Dam (RBDD, 11-13

Relocation Assistance and Real Property Acquisition Guidelines, 15-2, 15-4, 15-5, 15-6, 20-7, 22-21, 24-20

Resource Conservation and Recovery Act, 24-10

Rivers and Harbors Act, 7-3

- ROG, ES-26, 8-1, 8-4, 8-18, 8-19, 8-21, 8-22, 8-24, 8-25, 8-26, 8-27, 8-32, 8-35, 8-37, 8-39, 21-8
- RWQCB, 5-4, 5-7, 5-8, 5-16, 22-14, 24-4, 24-13, 24-15, 24-21
- Sacramento Area Flood Control Agency (SAFCA, 1-7
- Sacramento County Water Agency (SCWA, 16-2
- Sacramento International Airport (SIA, 18-4
- Sacramento Metropolitan Air Quality Management District (SMAQMD, 8-2, 8-24
- Sacramento Municipal Utility District (SMUD, 16-7
- Sacramento River Bank Protection Project (SRBPP, ES-1, 1-1, 2-1, 5-1, 18-1, 24-1, 26-6, 26-14
- Sacramento River Flood Control Project (SRFCP, ES-1, 1-1, 2-1, 4-3, 19-9, 22-2
- Sacramento River Riparian Vegetation (SRRV, 10-7, 26-15

Sacramento Valley Air Basin (SVAB, 8-3

Sacramento–San Joaquin River Basins Comprehensive Study (Comp Study, 1-10 Sacramento-San Joaquin River Delta (Delta, 1-1 SAFCA, 1-7, 1-8, 24-13, 24-14 salmon FMP, 11-11 SAM, ES-v, ES-19, ES-23, 2-16, 2-17, 2-26, 2-36, 10-42, 11-32, 11-33, 11-34, 11-41, 11-42, 11-43, 11-44, 11-45, 11-46, 11-47, 11-48, 12-62, 22-18, 26-22 San Francisco Bay Area Air Basin (SFBAAB, 8-3 SCSD, 16-10 SCWA. 16-2 Section 10, ES-51, 1-7, 1-14, 3-2, 7-3, 19-1, 19-11, 24-5, 24-7 SFBAAB, 8-3, 8-11, 8-14, 8-27 shaded riverine aquatic (SRA, ES-7, 2-10, 11-42 SHPO, 19-11, 24-7 SIA, 18-4, 18-5, 18-6, 18-9 SIP, 24-9 slope flattening, 1-10 slope stability, 1-8, 4-16, 4-27, 4-28 SMAQMD, 8-20, 8-27, 8-28, 8-29, 8-30, 8-31, 8-34, 8-35, 8-36, 8-37, 8-38, 8-40 SMARA, 24-13 SMD, 16-4 SMUD, 16-7, 18-3 S02, 8-4, 8-5, 8-7, 8-14, 8-15, 8-16, 8-21, 8-22 SPCCP, 5-15, 5-16, 18-7 special-status plant, 10-10, 10-22, 10-27, 10-30, 10-31, 10-32, 10-38, 21-2

- special-status wildlife, 10-31, 10-32, 12-8, 12-51, 12-52, 12-53, 12-54, 12-55, 12-59, 12-60, 12-61, 12-62, 12-63, 12-64, 23-2
- Spill Prevention, Control, and Countermeasure Plan (SPCCP, 5-15
- SRA, ES-v, ES-9, 2-10, 2-36, 11-42, 11-44, 11-46, 11-47
- SRBPP, ES-i, ES-v, ES-1, ES-2, ES-3, ES-4, ES-7, ES-9, ES-21, ES-48, ES-50, 1-1, 1-2, 1-3, 1-4, 1-5, 1-12, 1-13, 1-14, 1-18, 2-1, 2-4, 2-8, 2-11, 2-15, 2-16, 2-17, 2-30, 4-10, 4-12, 4-13, 4-23, 6-8, 7-3, 7-4, 7-6, 7-8, 10-2, 10-4, 10-24, 10-37, 11-32, 11-33, 12-2, 12-8, 12-49, 18-6, 20-7, 22-2, 22-5, 22-6, 22-10, 22-13, 22-14, 22-17, 22-18, 22-19, 22-20, 22-21, 22-22, 22-23, 24-2, 24-11
- SRFCP, ES-v, ES-1, ES-2, ES-3, ES-20, ES-46, ES-49, 1-1, 1-3, 1-4, 1-5, 1-6, 1-9, 1-18, 2-1, 2-14, 2-27, 4-3, 4-4, 4-8, 4-12, 4-21, 6-11, 10-28, 11-41, 12-32, 12-51, 19-9, 22-2, 22-3, 22-6, 22-11, 22-13

SRRV, 10-7, 10-8, 10-9

- Standard Assessment Methodology (SAM, ES-21, 2-16, 2-17, 10-42, 11-32, 11-33, 12-62
- State Historic Preservation Officer (SHPO, 19-1, 24-7

State Implementation Plan (SIP, 24-9

State Systemwide Investment Approach, 1-6

State Water Project (SWP, 11-31, 22-10, 26-22

stormwater pollution prevention plan (SWPPP, 18-7

suspended sediment, ES-10, 2-11, 4-6, 4-9, 11-36, 11-37

suspended solids, 5-7, 5-9, 5-13, 5-14, 11-36, 11-37, 11-38, 11-39, 11-40, 21-1, 24-15

SVAB, 8-3, 8-11, 8-16, 8-27

SWP, 11-31, 22-10

- SWPPP, 5-14, 5-15, 5-17, 5-18, 6-10, 18-7, 18-9, 18-10, 18-11, 18-12, 22-14, 22-15, 22-22
- TCAPCD, 8-25, 8-27, 8-28, 8-29, 8-30
- TCP, 19-10
- TCSLA, 16-7
- TDS, 5-10, 5-11, 24-15
- Tehama County Air Pollution Control District (TCAPCD, 8-3, 8-25
- Tehama County Fire Department (TCFD, 16-10
- Tehama County Sanitary Landfill Association (TCSLA, 16-7
- temperature control device (TCD, 11-13
- through-seepage, 1-10, 1-12
- TMDL, 5-3, 24-21
- total dissolved solids (TDS, 5-10
- TRLIA, 1-11
- TSS, 5-7, 5-8, 5-13, 5-17
- turbidity, 4-9, 5-8, 5-13, 5-14, 5-15, 5-17, 5-18, 6-10, 11-22, 11-28, 11-34, 11-36, 11-37, 11-38, 11-39, 11-40, 21-1, 22-14, 24-15
- U.S. Army Corps of Engineers (Corps, ES-1, 1-1, 10-22, 13-5
- U.S. Bureau of Land Management (BLM, 13-3
- U.S. Environmental Protection Agency (EPA, 10-22, 20-1
- U.S. Fish and Wildlife Service (USFWS, ES-9, 1-6, 10-22, 11-25, 13-3, 24-1
- U.S. Forest Service (USFS, 13-3
- U.S. Geological Survey, 5-3, 5-7, 5-11, 6-4, 19-4, 23-1, 26-2, 26-3, 26-8, 26-9, 26-16, 26-36

under-seepage, 1-10, 1-12

USFS, 13-3, 13-4, 13-5, 13-6

- USFWS, ES-50, 1-6, 1-13, 1-14, 10-26, 10-30, 10-31, 10-32, 11-27, 11-28, 11-33, 12-8, 12-39, 12-48, 12-50, 12-52, 12-53, 12-54, 12-56, 13-4, 13-5, 22-10, 24-2, 24-6
- valley elderberry longhorn beetle, 10-5, 12-4, 12-8, 12-32, 12-51, 12-54, 12-55
- Vegetation ETL, ES-v, ES-4, ES-6, ES-7, ES-8, ES-11, ES-21, ES-22, ES-28, ES-32, ES-38, ES-41, ES-42, 2-5, 2-6, 2-7, 2-8, 2-9, 2-13, 2-16, 2-17, 4-32, 5-18, 6-12, 7-10, 8-39, 9-18, 10-2, 10-25, 10-26, 10-28, 10-29, 10-38, 10-40, 10-41, 10-42, 10-43, 10-44, 10-45, 11-33, 11-40, 11-42, 11-47, 12-2, 12-49, 12-51, 12-52, 12-58, 12-59, 12-60, 12-62, 12-63, 12-64, 13-18, 14-5, 14-9, 15-6, 16-15, 17-19, 18-12, 19-18, 20-8, 21-14, 21-19, 22-17, 22-18, 22-19, 22-20, 22-22
- vegetation removal, 6-9, 10-26, 12-49, 12-52, 12-56, 12-59, 17-14, 17-16, 17-17, 17-18, 17-19, 18-9, 18-12, 22-9, 22-17, 22-19, 22-20
- vibration, 9-1, 9-4, 9-5, 9-6, 9-7, 9-8, 9-9, 9-12, 9-13, 9-15, 9-16, 9-17, 9-18, 22-16
- visual character, 14-6, 17-2, 17-4, 17-10, 17-11, 17-14, 17-16, 17-17, 17-18, 17-19, 22-22
- visual quality, 17-3, 17-10, 17-11, 17-12, 17-14, 17-16, 17-17
- Water Resources Development Act (WRDA, ES-1, 1-1
- water surface elevation, ES-5, ES-8, 2-6, 2-10, 4-18, 4-19, 4-22, 4-25, 4-26, 4-27, 22-7
- Waters of the United States, ES-30, ES-41, 10-3, 10-34, 10-39, 10-41, 10-44, 10-46, 21-16, 24-3

West Sacramento Area Flood Control Agency (WSAFCA, 1-12

- West Sacramento General Reevaluation Report, 1-12, 22-6
- West Sacramento Levee Improvements Program, 1-12, 22-6

wetland, ES-6, ES-8, 2-7, 2-9, 2-15, 5-17, 5-18, 9-18, 10-2, 10-3, 10-22, 10-23, 10-28, 10-35, 11-2, 11-45, 11-47, 12-3, 12-45, 12-50, 12-61, 12-64, 17-19, 22-11, 22-12, 22-19, 24-3, 24-8

Williamson Act, 13-8, 13-9, 13-10, 13-11, 13-12, 24-14, 26-29 woodland, 10-11, 10-12, 10-13, 10-14, 10-15, 10-16, 10-17, 10-18, 10-19, 10-22, 10-24, 10-25, 12-12, 12-13, 12-28, 12-39, 12-52, 12-56, 15-2, 19-2

WRDA, ES-v, ES-3, 1-1, 1-5, 1-7

WSAFCA, 1-12

Yolo-Solano Air Quality Management District (YSAQMD, 8-3, 8-25

YSAQMD, 8-27, 8-28, 8-29, 8-30

YSDI, 16-6