

Draft Environmental Impact Statement/Draft Environmental Impact Report on the
American River Watershed Common Features Project/
Natomas Post-authorization Change Report/Natomas Levee
Improvement Program, Phase 4b Landside Improvements Project



State Clearinghouse No. 2009112025

Prepared for:



**US Army Corps
of Engineers**®
Sacramento District



**Sacramento
Area Flood
Control
Agency**



July 2, 2010

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July 2, 2010

**DRAFT ENVIRONMENTAL IMPACT STATEMENT/
DRAFT ENVIRONMENTAL IMPACT REPORT
ON THE
AMERICAN RIVER WATERSHED COMMON FEATURES PROJECT/
NATOMAS POST-AUTHORIZATION CHANGE REPORT/
NATOMAS LEVEE IMPROVEMENT PROGRAM,
PHASE 4b LANDSIDE IMPROVEMENTS PROJECT**

ABSTRACT

Federal Lead Agency: U.S. Army Corps of Engineers (USACE), Sacramento District

State Lead Agency: Sacramento Area Flood Control Agency (SAFCA)

Cooperating Agency: Federal Aviation Administration (FAA)

Non-Federal Sponsor: Central Valley Flood Protection Board (CVFPB)

This draft environmental impact statement/draft environmental impact report (DEIS/DEIR) has been prepared by USACE and SAFCA in accordance with the requirements of the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA), respectively. The DEIS/DEIR evaluates the potential environmental impacts of SAFCA's Natomas Levee Improvement Program (NLIP), Phase 4b Landside Improvements Project (Phase 4b Project), and will be submitted to Congress in late 2010 to support approval of USACE's American River Watershed Common Features Project/Natomas Post-authorization Change Report (Common Features/Natomas PACR), which is an element of the American River Watershed Common Features Project General Re-evaluation Report (Common Features GRR).

The Common Features/Natomas PACR includes all four project phases (1, 2, 3, and 4a and 4b) of the Landside Improvements Project, which is a component of the NLIP. The overall purpose of the NLIP is to bring the entire 42-mile Natomas Basin perimeter levee system into compliance with applicable Federal and state standards for levees protecting urban areas. The Phase 4b Project is the final phase of the Landside Improvements Project, and consists of improvements to the remaining portions of the Natomas Basin's perimeter levee system in the City of Sacramento and in Sutter and Sacramento Counties, California, associated landscape and irrigation/drainage infrastructure modifications, and habitat creation and management.

If the Common Features/Natomas PACR is authorized by Congress, USACE would implement the Phase 4b Project. In the event that USACE does not receive authorization to construct the Phase 4b Project, SAFCA could choose to implement the Phase 4b Project. In readiness for the latter scenario, SAFCA is requesting permission from USACE pursuant to Section 14 of the Rivers and Harbors Act of 1899 (33 United States Code [USC] Section 408, referred to as "Section 408") for alteration of Federal project levees; Section 404 of the Clean Water Act (33 USC Section 1344, hereinafter referred to as "Section 404") for placement of fill in jurisdictional waters of the United States; and Section 10 of the Rivers and Harbors Act of 1899 (33 USC Section 403, hereinafter referred to as "Section 10") for work performed in, over, or under navigable waters of the United States. This DEIS/DEIR covers the requested permissions from USACE, if needed.

The FAA is serving as a cooperating agency under NEPA because if USACE and SAFCA select an alternative that requires the Sacramento International Airport to seek a release from Federal Airport Improvement Grant assurances, the FAA would use this DEIS/DEIR in exercising its decision-making authority under 49 USC Section 47107 regarding whether to approve those actions. The CVFPB is serving as a non-Federal sponsor of USACE's Common Features/Natomas PACR, and is concerned about integrating overall flood damage reduction in Sacramento.

This DEIS/DEIR summarizes prior environmental analyses for all previously approved project phases of the Landside Improvements Project, including alternatives previously considered, analyzed, and rejected from further consideration, and evaluates in detail the environmental effects of the proposed Phase 4b Project (Proposed

Action), including alternatives to the Phase 4b Project. The Proposed Action would result in significant and unavoidable adverse impacts on agricultural resources; land use, socioeconomics, and population and housing; biological resources; cultural resources; transportation and circulation; noise; recreation; visual resources; and hazards and hazardous materials.

Public Review and Comment:

The public comment period for the DEIS/DEIR begins on July 2, 2010, and closes on August 16, 2010. A public meeting will be held before the SAFCA Board of Directors on July 15, 2010 at 3:00 p.m. in the Sacramento City Council Chambers located at 915 I Street, Sacramento, California.

For further information regarding the DEIS/DEIR, please contact Elizabeth Holland, USACE Sacramento District, Planning Division, 1325 J Street, Sacramento, CA, 95814, or email Elizabeth.G.Holland@usace.army.mil; or John Bassett, SAFCA Director of Engineering, 1007 7th Street, 7th Floor, Sacramento, CA 95814, or email BassettJ@saccounty.net.

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ACRONYMS AND ABBREVIATIONS

µg/m ³	micrograms per cubic meter
24/7	24 hours per day, 7 days per week
AB	Assembly Bill
AC	Advisory Circular
AC	Airport Circular
ACHP	Advisory Council on Historic Preservation
ADT	average daily traffic
AEP	annual exceedance probability
AFY	acre-feet per year
afy	acre feet per year
AG District	General Agriculture District
Airport	Sacramento International Airport
Airport Master Plan	<i>Sacramento International Airport Master Plan</i>
ALUC	Airport Land Use Commission
ALUCP	<i>Sacramento International Airport Land Use Compatibility Plan</i>
APE	Area of Potential Effect
APLIC	Avian Power Line Interaction Committee
APN	Assessor's Parcel Number
APP	Avian Protection Plan
APPA	Airport Policy Planning Area
AQAP	air quality attainment plan
AQMD	air quality management districts
AQMP	Air Quality Management Plan
ARB	California Air Resources Board
ARWI	American River Watershed Investigation
ASA	Assistant Secretary of the Army
AST	above ground storage tank
ATCM	Airborne Toxics Control Measure
AWRI	<i>American River Watershed Investigation</i>
B.P.	Before Present
BA	Biological Assessment
BACT	Best Available Control Technology
Basin Plan	<i>Water Quality Control Plan for the Sacramento and San Joaquin River Basins</i>
Bay-Delta	San Francisco Bay/Sacramento–San Joaquin Delta
Bikeway Plan	<i>2010 Sacramento City/County Bikeway Master Plan</i>

BMP	best management practice
BO	biological opinion
Bypass	Sacramento River and the Yolo Basin
CAA	Clean Air Act
CAA	Federal Clean Air Act
CAAA	Federal Clean Air Act Amendments of 1990
CAAQS	California ambient air quality standards
Cal/EPA	California Environmental Protection Agency
Cal/OSHA	California Occupational Health and Safety Administration
Caltrans	California Department of Transportation
CAPCOA	California Air Pollution Control Officers Association
CB	cement bentonite
CBC	California Building Standards Code
CCAA	California Clean Air Act
CCAR	California Climate Action Registry
CCR	California Code of Regulations
CDF	California Department of Forestry and Fire Protection
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
CHP	California Highway Patrol
CLUP	comprehensive airport land use plan
cmbs	centimeters below surface
CNDDB	California Natural Diversity Database
CNEL	community noise equivalent level
CNPS	California Native Plant Society
CO	carbon monoxide
CO ₂	carbon dioxide
Common Features GRR	American River Watershed Common Features Project General Re-evaluation Report
Common Features/Natomas PACR	American River Watershed Common Features Project/Natomas Post-authorization Change Report
CRHR	California Register of Historical Resources
CVFPB	California Central Valley Flood Protection Board, formerly The Reclamation Board
CVFPB	Central Valley Flood Protection Board

CWA	Clean Water Act of 1972
cy	cubic yards
dB	decibels
dBA	A-weighted decibels
dbh	diameter at breast height
DEIS/DEIR	draft environmental impact report/draft environmental impact statement
Delta	Sacramento–San Joaquin Delta
DFG	California Department of Fish and Game
DMM	Deep-Mix Method
DOC	California Department of Conservation
DPF	diesel particulate filters
DPM	diesel PM
DPS	distinct population segment; formerly Evolutionarily Significant Unit
DTSC	California Department of Toxic Substances Control
DWR	California Department of Water Resources
EFH	essential fish habitat
EIR	environmental impact report
EIS	environmental impact statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Federal Endangered Species Act
ESA	Environmental Site Assessment
ESU	Evolutionarily Significant Unit
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulations
FEIR	Final Environmental Impact Report
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
FMMP	Farmland Mapping and Monitoring Program
FPP	Farmland Protection Program
FPPA	Federal Farmland Protection Policy Act
FR	<i>Feasibility Report</i>
FR	<i>Federal Register</i>
FRA	USDOT Federal Railroad Administration
FRAQMD	Feather River Air Quality Management District

FSEIS	<i>Final Supplemental Environmental Impact Statement</i>
FTA	Federal Transit Administration
FWCA	Fish and Wildlife Coordination Act
GGs	Giant Garter Snake
GHCA	Garden Highway Community Association
GHG	greenhouse gas
Giant Garter Snake/Drainage Canal	new canal designed to provide drainage and associated giant garter snake habitat
gpm	gallons per minute
GRR	General Re-evaluation Report
H:V	horizontal to vertical
HAER	Historic American Engineering Record
HPTP	Historic Property Treatment Plan
HRA	health risk assessments
HUD	U.S. Department of Housing and Urban Development
I-5	Interstate 5
I-80	Interstate 80
in/sec	inch per second
ITE	Institute of Transportation Engineers
kW	kilowatt
L ₅₀	noise level exceeded 50% of the time
LAFCo	City of Sacramento and Sacramento Local Agency Formation Commission
lb/day	pounds per day
LCM	Life Cycle Management
L _{dn}	day-night average noise level
L _{eq}	energy-equivalent noise level
LESA	Land Evaluation and Site Assessment
LID	Low Impact Development
LLP	Locally Preferred Plan
L _{max}	maximum noise level
Local Funding EIR	<i>Environmental Impact Report on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area, State Clearinghouse No. 2006072098</i>
LOS	level of service
LSCE	Luhdorff & Scalmanini Consulting Engineers
LTMP	Long-Term Management Plan
MBTA	Migratory Bird Treaty Act
MLD	Most Likely Descendant

mm	millimeter
MMP	Mitigation and Monitoring Plan
MMRP	Mitigation Monitoring and Reporting Program
MRZ	mineral resource zone
MSA	Metropolitan Statistical Area
MTBE	methyl tertiary butyl ether
MTP	Metropolitan Transportation Plan
MUTCD	Manual on Uniform Traffic Control Devices
NAAQS	national ambient air quality standards
NAHC	Native American Heritage Commission
NALP	North Area Local Project
Natomas GRR	USACE's Natomas Basin General Re-evaluation Report
Natomas PACR	Natomas Post-authorization Change Report
NAVD88	North American Vertical Datum of 1988
NBHCP	<i>Natomas Basin Habitat Conservation Plan</i>
NCASI	National Council for Air and Stream Improvements, Inc.
NCC	Natomas Cross Canal
NCIC	North Central Information Center
NCMWC	Natomas Central Mutual Water Company
NCSHPO	National Conference of State Historic Preservation Officers
NEHRP	National Earthquake Hazards Reduction Program
NEHRPA	National Earthquake Hazards Reduction Program Act
NEIC	Northeast Information Center
NEMDC	Natomas East Main Drainage Canal
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NGVD29	National Geodetic Vertical Datum of 1929
NHC	Northwest Hydraulics Consultants, Inc.
NHPA	National Historic Preservation Act
NLAP	North Area Local Project
NLIP	Natomas Levee Improvement Program
NMFS	National Marine Fisheries Service
NNCP	North Natomas Community Plan
NO ₂	nitrogen dioxide
NOA	Naturally occurring asbestos
NOD	Notice of Determination
NOI	notice of intent

NOP	notice of preparation
NOS	Not Otherwise Specified
NO _x	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resources Conservation Service
NRHP	National Register of Historic Places
O&M	operations and maintenance
°C	Celsius
OES	Governor's Office of Emergency Services
OHWM	ordinary high water mark
OPR	Governor's Office of Planning and Research
OSHA	Occupational Safety and Health Administration
PA	Programmatic Agreement
PACR	Post-authorization Change Report
PCB	polychlorinated biphenyl
PG&E	Pacific Gas & Electric Company
PGCC	Pleasant Grove Creek Canal
Phase 2 EIR	<i>Environmental Impact Report on the Natomas Levee Improvement Program, Landside Improvements Project, State Clearinghouse No. 2007062016</i>
Phase 2 EIR 1 st Addendum	<i>Addendum to the Environmental Impact Report on the Natomas Levee Improvement Program, Landside Improvements Project – Phase 2 Project, State Clearinghouse No. 2007062016</i>
Phase 2 EIR 2 nd Addendum	<i>2nd Addendum to the Environmental Impact Report on the Natomas Levee Improvement Program, Landside Improvements Project – Phase 2 Project, State Clearinghouse No. 2007062016</i>
Phase 2 EIS	Environmental Impact Statement for 408 Permission and 404 Permit to Sacramento Area Flood Control Agency for the Natomas Levee Improvement Project
Phase 2 SEIR	<i>Supplement to the Environmental Impact Report on the Natomas Levee Improvement Program, Landside Improvements Project—Phase 2 Project, State Clearinghouse No. 2007062016</i>
Phase 3 EIR Addendum	<i>Addendum to the Environmental Impact Report on the Natomas Levee Improvement Program, Phase 3 Landside Improvements Project, State Clearinghouse No. 2008072060</i>
Phase 3 EIS and EIR	<i>Environmental Impact Statement and Environmental Impact Report on the Natomas Levee Improvement Program, Phase 3 Landside Improvements Project, State Clearinghouse No. 2008072060</i>
Phase 4a EIS and EIR	<i>Environmental Impact Statement and Environmental Impact Report on the Natomas Levee Improvement Program, Phase 4a Landside Improvements Project, State Clearinghouse No. 2009032097</i>
Phase 4b Project	Phase 4b Landside Improvements Project

PL	Public Law
PM	particulate matter
PM ₁₀	particulate matter with an aerodynamic diameter of 10 micrometers or less
PM _{2.5}	fine particulate matter with an aerodynamic diameter of 2.5 micrometers or less
Porter-Cologne Act	Porter-Cologne Water Quality Control Act
ppm	parts per million
PPV	peak particle velocity
PRC	California Public Resources Code
Proposed Action	Phase 4b Project
Proposed Project	Phase 4b Project
PSMFC	Pacific States Marine Fisheries Commission
RBDD	Red Bluff Diversion Dam
RCRA	Resource Conservation and Recovery Act
RD	Reclamation District
REC	recognized environmental condition
Reclamation	U.S. Bureau of Reclamation
RM	River Mile
ROD	record of decision
ROG	reactive organic gases
RSLIP	Raise and Strengthen Levee-in-Place
RV	recreational vehicle
RWQCB	Regional Water Quality Control Board
SacDOT	Sacramento County Department of Transportation
SACOG	Sacramento Area Council of Governments
SAFCA	Sacramento Area Flood Control Agency
SB	Senate Bill
SB	soil-bentonite
SCAS	Sacramento County Airport System
SCB	soil-cement-bentonite
SEIR	Supplemental EIR
SGA	Sacramento Groundwater Authority
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SIR	Supplemental Information Report
SMAQMD	Sacramento Metropolitan Air Quality Management District
SMARA	Surface Mining and Reclamation Act
SMF	Sacramento International Airport; formerly the Sacramento Metropolitan Airport

SMUD	Sacramento Municipal Utility District
SO ₂	sulfur dioxide
SR	State Route
SRA	shaded riverine aquatic
SRBPP	Sacramento River Bank Protection Project
SRFCP	Sacramento River Flood Control Project
STP	shovel test pit
SVAB	Sacramento Valley Air Basin
SVP	Society of Vertebrate Paleontology
SWPPP	Stormwater Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TAC	toxic air contaminant
T-BACT	toxic best available control technology
TCP	Traditional Cultural Property
TDS	total dissolved solids
the project	Phase 4b Project
TNBC	The Natomas Basin Conservancy
TPD	tons per day
TPY	tons per year
UBC	Uniform Building Code
UCMP	University of California Museum of Paleontology
USACE	U.S. Army Corps of Engineers
USC	United States Code
USDA	United States Department of Agriculture
USDOT	U.S. Department of Transportation
USFWS	U.S. Fish and Wildlife Service
UST	underground storage tanks
VdB	vibration decibels
VOC	volatile organic compounds
WDR	waste discharge requirement
WHMP	<i>Wildlife Hazard Management Plan</i>
Williamson Act	Important Farmland maps and California Land Conservation Act
WP/SP	Western Pacific/Southern Pacific

EXECUTIVE SUMMARY

ES.1 INTRODUCTION

This environmental impact statement/environmental impact report (EIS/EIR) has been prepared by the U.S. Army Corps of Engineers (USACE), Sacramento District and the Sacramento Area Flood Control Agency (SAFCA) in accordance with the requirements of the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA), respectively. This EIS/EIR evaluates the potential significant environmental impacts of the Natomas Levee Improvement Program (NLIP), Phase 4b Landside Improvements Project (Phase 4b Project), and will be submitted to Congress in late 2010 to support approval of USACE's American River Watershed Common Features Project/Natomas Post-authorization Change Report (Common Features/Natomas PACR), which is an element of the American River Watershed Common Features Project General Re-evaluation Report (Common Features GRR).

The Common Features/Natomas PACR includes all four project phases (1, 2, 3, and 4a and 4b) of the Landside Improvements Project, which is a component of the NLIP. The overall purpose of the NLIP is to bring the entire 42-mile Natomas Basin perimeter levee system into compliance with applicable Federal and state standards for levees protecting urban areas. The Phase 4b Project is the final subphase of the Landside Improvements Project, and consists of improvements to the remaining portions of the Natomas Basin's perimeter levee system in the City of Sacramento and in Sutter and Sacramento Counties, California, associated landscape and irrigation/drainage infrastructure modifications, and habitat creation and management.

If the Common Features/Natomas PACR is authorized by Congress, USACE would implement the Phase 4b Project. In the event that USACE does not receive authorization to construct the Phase 4b Project, SAFCA could choose to implement the Phase 4b Project. In readiness for the latter scenario, SAFCA is requesting permission from USACE pursuant to Section 14 of the Rivers and Harbors Act of 1899 (33 United States Code [USC] Section 408, hereinafter referred to as "Section 408") for alteration of Federal project levees; Section 404 of the Clean Water Act (33 USC Section 1344, hereinafter referred to as "Section 404") for the placement of fill in jurisdictional waters of the United States; and Section 10 of the Rivers and Harbors Act of 1899 (33 USC Section 403, hereinafter referred to as "Section 10") for work performed in, over, or under navigable waters of the United States (such as excavation of material from or deposition of material into navigable waters). This EIS/EIR covers the requested permissions from USACE, if needed.

The project proponent(s) may also need to obtain several state approvals or permits to implement the Phase 4b Project: Central Valley Flood Protection Board encroachment permit, California Surface Mining and Reclamation Act permit or exemption, Clean Water Act Section 401 water quality certification, Clean Water Act Section 402 National Pollutant Discharge Elimination System permit, California Fish and Game Code Section 2081 incidental-take authorization, California Fish and Game Code Section 1602 streambed alteration agreement, California Department of Transportation (Caltrans) encroachment permit, and permits from two local air districts, the Sacramento Metropolitan Air Quality Management District and the Feather River Air Quality Management District.

ES.2 LEAD AGENCIES AND COOPERATING AGENCY

USACE is the Federal lead agency for NEPA, and SAFCA is the California lead agency for CEQA.

The Federal Aviation Administration (FAA) is serving as a cooperating agency for NEPA. In the event that SAFCA and USACE select an alternative that requires the Sacramento International Airport (Airport) to change its Airport Layout Plan or seek a release from Federal Airport Improvement Grant assurances, the FAA would use this EIS/EIR in exercising its decision-making authority under 49 USC Section 47107 regarding whether to approve those actions. The CVFPB is serving as a non-Federal sponsor of USACE's Common Features GRR and

Common Features/Natomas PACR, and is concerned about integrating overall flood damage reduction in Sacramento.

ES.3 PURPOSE AND INTENDED USES OF THIS EIS/EIR

The purpose of this EIS/EIR is to evaluate the potential significant environmental impacts of the Phase 4b Project.

This EIS/EIR will be used to support Congressional approval of USACE's Common Features/Natomas PACR. In the event Congress does not authorize USACE to construct the Phase 4b Project, and SAFCA chooses to proceed with the Phase 4b Project without additional Federal participation, this EIS/EIR will be used to support USACE's decisions regarding whether to grant or deny permission to SAFCA for the Phase 4b Project pursuant to Sections 408, 404, and 10; and SAFCA's decision regarding whether to approve the Phase 4b Project.

SAFCA will consider whether or not to certify the EIR and approve the Phase 4b Project in fall 2010. This decision will be based on numerous factors, including the potential environmental impacts and mitigation measures addressed in this EIS/EIR, permitting requirements, Federal and state authorizations, funding and financing mechanisms, and implementation schedule.

This EIS/EIR will also be used by CEQA responsible agencies, such as the Central Valley Flood Protection Board (CVFPB) and Central Valley Regional Water Quality Control Board, and trustee agencies, such as the California Department of Fish and Game, to ensure that they have met the requirements of CEQA before deciding whether to issue discretionary permits over which they have authority. It may also be used by other state, regional, and local agencies, which may have an interest in resources that could be affected by the project.

This EIS/EIR is not intended to be used as the environmental clearance document for future development projects proposed in the Natomas Basin.

ES.4 DOCUMENTS INCORPORATED BY REFERENCE

Incorporation by reference is encouraged by both NEPA (40 Code of Federal Regulations [CFR] Section 1500.4, 1502.21) and CEQA (California Code of Regulations [CCR] Section 15150). Both NEPA and CEQA require citation to and a brief summary of the referenced material, as well as information about the public availability of the incorporated material. CEQA also requires citation of the state identification number of the EIRs cited. This EIS/EIR is tiered from, or incorporates by reference, information contained in the following documents:

- ▶ *Environmental Impact Report on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area*, State Clearinghouse No. 2006072098 (Local Funding EIR) (SAFCA 2007a), which evaluates impacts expected to result from the Phase 1 Project at a project level and the NLIP at a program level;
- ▶ *Environmental Impact Report on the Natomas Levee Improvement Program, Landside Improvements Project*, State Clearinghouse No. 2007062016 (Phase 2 EIR) (SAFCA 2007c), which evaluates impacts expected to result from the Phase 2 Project at a project level and the remainder of the NLIP at a program level;
- ▶ *Environmental Impact Statement for 408 Permission and 404 Permit to Sacramento Area Flood Control Agency for the Natomas Levee Improvement Project* (Phase 2 EIS) (USACE 2008), which evaluates impacts expected to result from the Phase 2 Project at a project level and the remainder of the NLIP at a program level;
- ▶ *Supplement to the Environmental Impact Report on the Natomas Levee Improvement Program, Landside Improvements Project—Phase 2 Project*, State Clearinghouse No. 2007062016 (Phase 2 SEIR) (SAFCA 2009a), which evaluates impacts expected to result from modifications to the Phase 2 Project at a project level;

- ▶ *Addendum to the Environmental Impact Report on the Natomas Levee Improvement Program, Landside Improvements Project—Phase 2 Project*, State Clearinghouse No. 2007062016 (Phase 2 EIR 1st Addendum) (SAFCA 2009c), which evaluates minor changes to the Phase 2 Project;
- ▶ *2nd Addendum to the Environmental Impact Report on the Natomas Levee Improvement Program, Landside Improvements Project—Phase 2 Project*, State Clearinghouse No. 2007062016 (Phase 2 EIR 2nd Addendum) (SAFCA 2009d), which evaluates minor changes to the Phase 2 Project;
- ▶ *Environmental Impact Statement and Environmental Impact Report on the Natomas Levee Improvement Program, Phase 3 Landside Improvements Project*, State Clearinghouse No. 2008072060 (Phase 3 EIS and EIR) (USACE 2009 and SAFCA 2009b), which evaluates impacts expected to result from the Phase 3 Project at a project level;
- ▶ *Addendum to the Environmental Impact Report on the Natomas Levee Improvement Program, Phase 3 Landside Improvements Project*, State Clearinghouse No. 2008072060 (Phase 3 EIR Addendum) (SAFCA 2009e), which evaluates minor changes to the Phase 3 Project; and
- ▶ *Environmental Impact Statement and Environmental Impact Report on the Natomas Levee Improvement Program, Phase 4a Landside Improvements Project*, State Clearinghouse No. 2009032097 (Phase 4a EIS and EIR) (USACE 2010 and SAFCA 2009f), which evaluates impacts expected to result from the Phase 4a Project at a project level.

Portions of these documents, where specifically noted, are summarized throughout this EIS/EIR. Printed copies of these documents are available to the public at USACE's office at 1325 J Street, Sacramento, California and are also available on USACE's Web site at <http://www.spk.usace.army.mil>. These documents are also available at SAFCA's office at 1007 7th Street, 7th Floor, Sacramento, California, during normal business hours, and on SAFCA's Web site, at http://www.safca.org/Programs_Natomas.html.

ES.5 PROJECT LOCATION

The Natomas Basin is located at the confluence of the American and Sacramento Rivers. Encompassing approximately 53,000 acres, the Basin extends northward from the American River and includes portions of the city of Sacramento, Sacramento County, and Sutter County. In addition to the American and Sacramento Rivers to the south and west, respectively, the Natomas Basin is bordered to the north by the Natomas Cross Canal (NCC) and to the east by the Pleasant Grove Creek Canal (PGCC) and the Natomas East Main Drainage Canal (NEMDC) (**Plate 1-1**). The NCC diverts the runoff from a large watershed in western Placer and southern Sutter Counties around the Natomas area and is a major contributor to the flows in the upper reach of the Sacramento River channel in SAFCA's jurisdiction. The NEMDC is an engineered channel along the southeastern flank of Natomas. Tributaries to the NEMDC include Dry Creek, Arcade Creek, Rio Linda Creek, Robla Creek, and Magpie Creek Diversion Channel. The Natomas Basin is protected from high flows in these tributaries and in the American and Sacramento Rivers by a Federal perimeter levee system.

USACE has divided the flood damage reduction improvements within the Natomas Basin into nine reaches (Reaches A–I), as shown on **Plate 1-3**. USACE's reach designations differ from SAFCA's reach designations, which are more finely subdivided than the USACE system for the Sacramento River east levee, American River north levee, and the NCC. In **Plate 1-3**, lettered reaches follow the USACE designation, while numbered reaches follow the SAFCA designations:

- ▶ Sacramento River east levee: Reach A:16–20
- ▶ Sacramento River east levee: Reach B:5A–15
- ▶ Sacramento River east levee: Reach C:1–4B
- ▶ NCC: Reach D:1–7
- ▶ PGCC: Reach E: there are no SAFCA reaches, just station numbers

- ▶ NEMDC North: Reaches F–G
- ▶ NEMDC South: Reach H
- ▶ American River north levee: Reach I:1–4

The Natomas Basin floodplain is occupied by more than 83,000 residents and over \$8.2 billion in damageable property, including the Airport and extensive urban development, primarily in the southern one-third of the Basin. The remaining agricultural lands in the Natomas Basin provide habitat for several important wildlife species. This habitat is protected under Federal and state laws, and expansion of the urban footprint into much of the remaining agricultural areas is governed by the *Natomas Basin Habitat Conservation Plan* (NBHCP), which is aimed at setting aside and conserving tracts of agricultural land that are needed to sustain the affected species.

The Phase 4b Project location primarily includes the Sacramento River east levee Reach A:16–20, American River north levee Reach I:1–4, NEMDC west levee, PGCC west levee, West Drainage Canal, Riego Road Canal, NCC south levee, and various borrow sites within the Natomas Basin (primarily the Fisherman’s Lake Borrow Area, West Lakeside School Site, and Triangle Properties Borrow Area). These areas are shown in the Plates in Chapter 2, “Alternatives,” of this EIS/EIR.

ES.6 PROJECT BACKGROUND AND PHASING

As stated above, the overall purpose of the multi-phase NLIP is to bring the entire 42-mile Natomas Basin perimeter levee system into compliance with applicable Federal and state standards for levees protecting urban areas. The Phase 4b Project is the final phase of the NLIP Landside Improvements Project, and consists of improvements to the remaining portions of the Natomas Basin’s perimeter levee system in the City of Sacramento and in Sutter and Sacramento Counties, California, associated landscape and irrigation/drainage infrastructure modifications, and habitat creation and management.

The NLIP addresses identified deficiencies in the Natomas Basin perimeter levee system based on (1) design criteria used to certify levees as providing 100-year flood risk reduction (0.01 AEP) under regulations adopted by the Federal Emergency Management Agency (FEMA), (2) design criteria used by USACE and the State for the levees comprising the Common Features Project, and (3) design 200-year¹ (0.005 AEP) water surface elevations developed by SAFCA in cooperation with the State using hydrologic modeling data developed by USACE and the State as part of the Sacramento–San Joaquin River Basins Comprehensive Study.

Although SAFCA anticipates that all segments of the Natomas perimeter levee system will eventually be improved to meet all of the above design criteria, SAFCA is partnering with the California Department of Water Resources (DWR) using SAFCA’s local assessments and grant funding available through DWR’s FloodSAFE California Program to initiate improvements to segments of the Natomas perimeter levee system in advance of full Federal authorization for the constructed improvements. SAFCA anticipates completion of this “early implementation project”—which includes the Phase 2, 3, and 4a Projects—by 2012. Phase 2 Project construction is underway and is anticipated to be completed by 2010; it is anticipated that construction of the Phase 3 and 4a Projects will be completed by 2012. USACE plans to complete improvements to the remaining segments of the perimeter levee system (i.e., the Phase 4b Project). This will require Congressional authorization to expand the scope of the already authorized Common Features Project based on the information and recommendations provided in the Common Features/Natomas PACR. SAFCA is coordinating with USACE to ensure that the planning and design of the early implementation project are consistent with applicable USACE planning,

¹ Design event analysis results, as a measure of system performance, are given as the expected (mean) frequency of the maximum event that can be safely passed through the reservoir, spillway, and downstream leveed system with a set (e.g., 3 feet) “freeboard” above the computed (expected) water surface profile. Design event analysis is not the same as the analysis procedure used by USACE as a basis for determining Federal interest in a project or for USACE certification for FEMA’s National Flood Insurance Program. USACE defines system performance as containing a specified frequency event (e.g., 0.01 event) with a high level of assurance (i.e., Conditional Non-exceedance Probability = 0.9) and includes consideration of system uncertainties.

engineering, and design guidelines. This EIS/EIR is the environmental compliance document for and will support the Common Features/Natomas PACR. USACE will subsequently prepare the Common Features GRR, which will cover all elements of the American River Common Features Project, and will be a separate report with its own environmental documentation. USACE and SAFCA recognize that Federal actions taken in connection with the early implementation project will need to be appropriately reflected in both Federal reports.

To move forward as quickly as possible to reduce the risk of flooding in the Natomas Basin, SAFCA identified the broad outlines of the early implementation project at a program level of detail and developed an incremental implementation strategy based on carrying out the project in four phases, with each phase contributing independently and cumulatively to reducing flood risk. Each individual project phase would contribute to reduced flood risk for the Natomas Basin, and thus has independent utility. However, no single project phase would achieve the overall flood risk reduction objectives of the NLIP. The NLIP, as a program, has independent utility from the other areas under consideration in the Common Features GRR because the NLIP will provide added flood risk reduction to an entire area (similar to a ring levee), and this increased flood risk reduction is not dependent on the outcome of the Common Features GRR. The four phases of the NLIP are described below.

The **Phase 1 Project** involved improvements to address underseepage deficiencies affecting a 1.9-mile segment of the NCC south levee (Reach D). The environmental impacts of these improvements were evaluated in the Local Funding EIR (SAFCA 2007a), which the SAFCA Board of Directors certified on February 16, 2007. These improvements were constructed in 2007 and 2008.

The **Phase 2 Project** focuses on improvements to address underseepage and levee height deficiencies along the entire 5.3-mile length of the NCC south levee as well as underseepage, erosion, encroachment, and levee height deficiencies along the upper 4.5 miles of the Sacramento River east levee (Reach C:1–4B). The environmental impacts of these improvements were evaluated in detail in the Phase 2 EIR (SAFCA 2007c), which the SAFCA Board of Directors certified on November 29, 2007; and the Phase 2 EIS, for which a record of decision (ROD) was issued by USACE on January 21, 2009 (USACE also issued the 408 permission and 404 permit for the Phase 2 Project in January 2009). Since certification of the Phase 2 EIR, SAFCA made minor modifications to the design of the Phase 2 Project. A supplemental EIR (Phase 2 SEIR) (SAFCA 2009a) was prepared by SAFCA to evaluate these modifications; the SAFCA Board of Directors certified the SEIR on January 29, 2009, at which time the Board also approved the modifications to the Phase 2 Project. Subsequently, two addenda to the Phase 2 EIR were prepared by SAFCA to evaluate additional minor modifications to the Phase 2 Project; the first Addendum to the Phase 2 EIR (SAFCA 2009c) was certified by the SAFCA Board of Directors on June 8, 2009 and the 2nd Addendum to the Phase 2 EIR (SAFCA 2009d) was certified on August 20, 2009.

The Phase 2 Project could be constructed on a stand-alone basis, assuming no further action on the balance of the NLIP is taken. Construction of the Phase 2 Project began in May 2009 and is anticipated to be completed in 2010, assuming receipt of all required environmental clearances and permits. It is clear that a portion of Phase 2 Project construction will likely be complete prior to construction of the Phase 3 Project. However, it is still likely that there will be some overlap in construction schedules between these two phases (see below).

The **Phase 3 Project** focuses on addressing underseepage, riverbank erosion, encroachment, and levee height deficiencies along the Sacramento River east levee Reach B:5A–9B, the PGCC west levee (Reach E), and a portion of the NEMDC west levee (between Elkhorn and Northgate Boulevards) (Reach H). On February 13, 2009, USACE and SAFCA issued the Phase 3 DEIS/DEIR for public review and comment. Following public review, SAFCA prepared a final EIR (FEIR) (SAFCA 2009b) to provide responses to comments on the Phase 3 DEIS/DEIR. The SAFCA Board of Directors certified the FEIR and approved the Phase 3 Project on May 21, 2009. Separately, USACE prepared a final EIS (FEIS) (USACE 2009) that was issued for public review on August 21, 2009. A ROD was issued on April 2, 2010, at which time USACE also issued the 408 permission and 404 permit for the Phase 3 Project.

After the May 21, 2009 certification of the Phase 3 EIR, SAFCA made minor modifications to the design of the Phase 3 Project. An addendum to the Phase 3 EIR (SAFCA 2009e) was prepared by SAFCA to evaluate these modifications; the SAFCA Board of Directors certified the Addendum and approved the modifications to the Phase 3 Project on September 17, 2009.

To construct the Phase 3 Project with minimal interruption of and conflict with drainage/irrigation services and wildlife habitat (specifically, giant garter snake habitat), some Phase 3 Project components were constructed in 2009 in advance of major levee construction that is scheduled to occur in 2010. To facilitate this staged construction, a staged permitting approach was developed for the Phase 3 Project. Specifically, irrigation and drainage infrastructure (termed the Phase 3a Project) was permitted by USACE and the Central Valley RWQCB under Sections 404 and 401, respectively, of the Clean Water Act, on October 7, 2009. Some vegetation encroachments would also occur during the non-nesting season for raptors and other bird species. A separate, but related, set of permits for the Phase 3 Project's levee construction and pumping plant improvements (termed the Phase 3b Project) was issued in spring 2010.

Preliminary construction (canal work, utility relocation, vegetation removal, and demolition of structures) of the Phase 3a Project began in fall 2009, with major levee construction (Phase 3b) planned to begin in 2010, assuming receipt of all required environmental clearances and permits. The potential exists for up to 30% of the Phase 2 Project to also be constructed in 2010, concurrent with major Phase 3 Project levee construction, or even potentially concurrently with the Phase 4a Project, depending on the timing and availability of funding, and environmental clearances and permits.

The **Phase 4a Project** includes levee raising and seepage remediation along the Sacramento River east levee (Reach B:10–15) and in two locations of the NCC south levee (Reach D), relocation and extension of the Riverside Canal, and modifications to the Riverside Pumping Plant and Reclamation District 1000's Pumping Plant Nos. 3 and 5. On August 28, 2009, USACE and SAFCA issued the Phase 4a DEIS/DEIR for public review and comment. Following public review, SAFCA prepared an FEIR (SAFCA 2009f). The SAFCA Board of Directors certified the FEIR and approved the Phase 4a Project on November 13, 2009. Separately, USACE prepared an FEIS (USACE 2010) that was issued for public review in February 2010. USACE will consider whether to grant Section 408 permission and issue permits under Sections 404 and 10, and document its decision in a ROD, expected in summer 2010. The Phase 4a Project could be constructed at the same time as portions of the Phase 3 Project. Construction of the Phase 4a Project is planned to begin in 2011 and to be completed in 2012, assuming receipt of all required environmental clearances and permits.

The **Phase 4b Project** would address underseepage, stability, erosion, penetrations, and levee encroachments along approximately 3.4 miles of the Sacramento River east levee in Reach A:16–20, approximately 1.8 miles of the American River north levee (Reach I:1–4), approximately 6.8 miles of the NEMDC west levee (Reach F–G), approximately 3.3 miles of the PGCC west levee (Reach E), and the gaps left in the improvements of previous phases at levee penetrations and road crossings on the NCC south levee. This EIS/EIR evaluates at a project-level the direct, indirect, and cumulative effects of the Phase 4b Project, which was evaluated at a program level in the Local Funding EIR, Phase 2 EIR, and Phase 2 EIS. Construction of the Phase 4b Project is planned to begin as early as 2012 and anticipated to be completed in 2016, assuming receipt of Congressional authorization, funding (if SAFCA pursues without Federal participation), and all required environmental clearances and permits.

Each of the project phases discussed above also includes associated habitat, drainage, irrigation, related infrastructure improvements, and borrow sites.

ES.7 NEED FOR ACTION

The need for the action is to reduce the flood risk to the Natomas Basin.

The Natomas Basin floodplain is occupied by over 83,000 residents and \$8.2 billion in damageable property. Although improvements to the Natomas Basin perimeter levee system, completed as part of the Sacramento Urban Levee Reconstruction Project and the NALP, have significantly reduced flood risk for the area, the Natomas Basin remains vulnerable to flooding in a less than 100-year (0.01 AEP) flood event. Uncontrolled flooding in the Natomas Basin floodplain in a flood exceeding a 100-year (0.01 AEP) event could result in \$7.4 billion in damage (this excludes the Airport facilities) (SAFCA 2007b). Flooding could also release toxic and hazardous materials, contaminate groundwater, and damage the metropolitan power and transportation grids. The disruption in transportation that could result from a major flood could affect the Airport and interstate and state highways. In addition, displacement of residents, businesses, agriculture, and recreational areas could occur. Resulting damage could hinder community growth, stability, and cohesion.

The NLIP was initially outlined in the *Natomas Levee Evaluation Study Final Report Prepared for SAFCA in Support of the Natomas Basin Components of the American River Common Features* (SAFCA 2006). This evaluation was based on the engineering studies and reports that were included as appendices to the above-referenced report, which are available for review at SAFCA's office at 1007 7th Street, 7th Floor, Sacramento, California. These studies and reports indicate that segments of the Natomas perimeter levee system reflect the following problems for both the FEMA 100-year (0.01 AEP) and the 200-year (0.005 AEP) design water surface elevations:

- ▶ inadequate levee height,
- ▶ through-levee seepage and foundation underseepage with excessive hydraulic gradients,
- ▶ embankment instability, and
- ▶ susceptibility to riverbank erosion and scour.

Although not highlighted in the levee evaluation report, portions of the perimeter levee system, particularly along the east levee of the Sacramento River, are also subject to vegetative and structural encroachments into the levee prism.

In January 2008, FEMA remapped the Natomas Basin as an AE zone, and the flood zone designation took effect in December 2008. FEMA defines AE zones as areas with a 0.01 AEP of flooding. The designation requires mandatory flood insurance purchases by homeowners and requires that the bottom floor of all new buildings be constructed at or above base flood elevation—as little as 3 feet above ground level in some of the Natomas Basin but up to 20 feet above ground level in much of the Basin. This designation and the associated constraints effectively stopped all projects that were not issued building permits before the new maps took effect.

ES.8 PROJECT PURPOSE/PROJECT OBJECTIVES

USACE and SAFCA each view the project purpose from the purview of their respective responsibilities, as defined below.

ES.8.1 U.S. ARMY CORPS OF ENGINEERS

The overall purpose of the project is to develop and select an alternative that would reduce the risk of flood damage in the Natomas Basin. Some residual risk will always remain, however, in any flood damage reduction system. Ultimately, Congress must authorize the Common Features/Natomas PACR, which includes the Phase 4b Project. If not authorized by Congress, USACE must make decisions on whether or not to grant permission to SAFCA to alter the Natomas Basin levee system (Federal project levees) under Section 408, and issue permits under Sections 404 and 10, for SAFCA to implement the Phase 4b Project without Federal participation.

ES.8.2 SACRAMENTO AREA FLOOD CONTROL AGENCY

SAFCA's project objectives adopted in connection with the NLIP are: (1) provide at least a 100-year level of flood risk reduction (0.01 AEP) to the Natomas Basin as quickly as possible, (2) provide 200-year flood risk reduction (0.005 AEP) to the Basin over time, and (3) avoid any substantial increase in expected annual damages as new development occurs in the Basin. The first two project objectives would reduce the residual risk of flooding sufficiently to meet the minimum requirements of Federal and state law for urban areas like the Natomas Basin. The third project objective is a long-term objective of SAFCA's.

Additional project objectives that have informed SAFCA's project design are to:

- (1) use flood damage reduction projects in the vicinity of the Airport to facilitate management of Airport lands in accordance with the Airport's *Wildlife Hazard Management Plan* (WHMP); and
- (2) use flood damage reduction projects to increase the extent and connectivity of the lands in the Natomas Basin being managed to provide habitat for giant garter snake, Swainson's hawk, and other special-status species.

SAFCA's approach to defining flood risk reduction accomplishments (system performance) differs from that of USACE; however, the method for determining hydraulic impacts is the same. The hydraulic impact analysis contained in this EIS/EIR evaluates hydraulics impacts based on upstream levees failing when overtopped along with the condition of allowing upstream levees to overtop without failing (see Section 4.5, "Hydrology and Hydraulics"). References in this EIS/EIR to levels of flood risk reduction are based on SAFCA's "best estimate" approach (FEMA's and the State's current method), and should not be taken as USACE concurrence that such levels would be achieved based on USACE's approach of incorporating risk and uncertainty in the estimate of system performance. In any case, flood risk to the Natomas Basin would be considerably reduced by the project.

ES.9 ALTERNATIVES SCREENING

USACE and SAFCA formulated the project and a reasonable range of alternatives that would achieve the specific project objectives through the following steps:

- ▶ identification of the deficiencies in the Natomas levee system that must be addressed to provide at least 100-year (0.01 AEP) flood risk reduction as quickly as possible;
- ▶ identification of the deficiencies in the Natomas levee system that must be addressed to provide 200-year (0.005 AEP) flood risk reduction,
- ▶ identification of feasible remedial measures to address the deficiencies,
- ▶ determination of the likely environmental impacts of the remedial measures,
- ▶ development of a reasonable range of flood damage reduction alternatives for implementing the remedial measures; and
- ▶ identification of measures to ensure that each alternative would improve aviation safety, minimize impacts on significant cultural resource sites, and enhance habitat values.

Alternatives screening for the overall NLIP has been undertaken in a systematic manner through several environmental documents as summarized in Chapter 2, "Alternatives," and detailed in **Appendix B1**.

ES.10 ALTERNATIVES

ES.10.1 ALTERNATIVES ELIMINATED FROM FURTHER CONSIDERATION

Numerous alternatives have been considered by USACE and SAFCA to reduce flood risk in the Natomas Basin. Many alternatives have been evaluated and eliminated from further consideration during completion of the previous NLIP environmental documents (see ES.2, “Purpose and Intended Uses of This Document”). A summary of the alternatives considered but eliminated from further consideration is provided in Chapter 2, “Alternatives,” and **Appendix B1**.

ES.10.2 ALTERNATIVES CARRIED FORWARD FOR EVALUATION IN THIS EIS/EIR

Three alternatives, one no-action and two action alternatives, were carried forward for detailed analysis in this EIS/EIR: No-Action Alternative (which includes two scenarios: No Phase 4b Project Construction and Potential Levee Failure), Adjacent Levee Alternative (Proposed Action), and Fix-in-Place Alternative. These alternatives are summarized below and described in detail in Chapter 2, “Alternatives.” The major project elements of the action alternatives are summarized in **Table ES-1**.

The No-Action Alternative, under NEPA, is the expected future without-project conditions. Under CEQA, the No-Action Alternative is the existing condition at the time the notice of preparation was published (November 5, 2009) as modified by what would be reasonably expected to occur in the foreseeable future if the project were not approved. The Phase 4b Project **No-Action Alternative** assumes the Phase 1, 2, 3, and 4a Projects are implemented. This alternative consists of the conditions that would be reasonably expected to occur in the foreseeable future if no additional permissions to alter the existing levees or discharge dredged or fill material into waters of the United States would be granted. Different scenarios are possible under this circumstance. Under one scenario, no project construction would occur and, thus, no construction-related impacts would occur under this alternative (this scenario is referred to in this EIS/EIR as “No-Action Alternative: No Phase 4b Project Construction”). Without improvements to the Natomas perimeter levee system (e.g., implementation of one of the action alternatives, described below), the Natomas area would continue to be designated as a special flood hazard area; new development would be effectively precluded in most areas of the Natomas Basin; and existing residential, commercial, and industrial developments in the Natomas Basin would remain subject to a significant risk of flooding. Under the second scenario, a levee failure and subsequent flooding would be considered reasonably foreseeable, if the project were not approved. Therefore, this EIS/EIR includes an analysis of the resulting potential impacts (this scenario is referred to in this EIS/EIR as “No-Action Alternative: Potential Levee Failure”); however, because impacts associated with a potential levee failure are largely unknown and would depend on the location and extent of flooding, many of these potential impacts are considered too speculative for meaningful consideration. A general, qualitative discussion of the likely impacts is nonetheless provided in this EIS/EIR.

Under the **Adjacent Levee Alternative (Proposed Action)**, an adjacent levee would be constructed along the Sacramento River east levee Reach A:16–20; and, where required for this levee, cutoff walls, seepage berms, and relief wells would be installed for seepage remediation. A cutoff wall would be installed in the American River north levee east of Gateway Oaks Drive to Northgate Boulevard, and the landside slope would be flattened. The NEMDC west levee would be raised in place or widened from just south of Elkhorn Boulevard to Sankey Road, and the landside slope would be flattened and seepage remediation would be constructed as necessary. Waterside erosion protection would be constructed in locations along the PGCC and NEMDC (south of Elkhorn Boulevard). Culverts located beneath the PGCC would be upgraded or removed, and replacement flood storage would be provided as needed. At the SR 99 crossing of the NCC, seepage remediation would be installed and a moveable barrier system would be constructed to prevent overflow from reaching the landside of the NCC south levee. The western portion of the West Drainage Canal would be realigned to the south, and the remaining portion of the existing canal would be improved to reduce bank erosion and sloughing, decrease aquatic weed infiltration, improve RD 1000 maintenance access, and enhance giant garter snake habitat connectivity. Irrigation canals and

Table ES-1 Summary of the Major Project Elements of the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative		
Major Project Elements	Adjacent Levee Alternative (Proposed Action)	Fix-in-Place Alternative
Sacramento River east levee (Reach A:16–20): Levee widening/rehabilitation and seepage remediation	Construct an adjacent levee with flattened landside slope and cutoff walls, seepage berms, and relief wells, where required, to reduce potential underseepage and seepage through the levee (Plates 2-7a and 2-7b). Cutoff wall construction may be conducted 24 hours per day, 7 days per week (24/7), except in the urbanized area east of the Interstate 80 (I-80) overcrossing, where it would be restricted to daytime hours.	Same as the Adjacent Levee Alternative (Proposed Action), <i>except that the levee crown would not be widened by 15 feet, necessitating waterside vegetation removal to comply with USACE guidance criteria.</i>
Sacramento River east levee (Reach B:10–15): Levee raise extension	Extend levee raise within Phase 4a Project footprint from Station 635+00 to 680+00 to address levee height requirements.	Same as the Adjacent Levee Alternative (Proposed Action)
American River north levee (Reach I:1–4): Slope flattening and seepage remediation	Flatten the slope and install cutoff walls in the American River north levee from just east of Gateway Oaks Drive to Northgate Boulevard (Plate 2-9). Cutoff wall construction would be restricted to daytime hours.	Same as the Adjacent Levee Alternative (Proposed Action)
NEMDC North (Reaches F–G): Levee raising, slope flattening, and seepage remediation	Raise the levee in place or construct an adjacent levee, flatten slopes, and install cutoff walls from Sankey Road to Elkhorn Boulevard. Cutoff wall construction may be conducted 24/7.	Same as the Adjacent Levee Alternative (Proposed Action)
PGCC (Reach E) and NEMDC South (Reach H): Levee raising and slope flattening	Raise the levee in place or construct a raised adjacent levee and flatten slopes from Howsley Road to Sankey Road on the PGCC west levee (Plate 2-13). On the NEMDC South, install a cutoff wall, flatten the slope, and raise the levee in place or construct an adjacent levee for approximately 500 feet south of Elkhorn Boulevard (Plate 2-14). Cutoff wall construction may be conducted 24/7.	Same as the Adjacent Levee Alternative (Proposed Action)
PGCC (Reach E) and NEMDC South (Reach H): Waterside improvements	Erosion repair and rock slope protection at locations where erosion around the outfall structures penetrating the levee has been observed. Construct additional remediation to protect against damage caused by beavers and burrowing animals (Plates 2-13 and 2-14).	Same as the Adjacent Levee Alternative (Proposed Action)
PGCC (Reach E) culvert remediation	Upgrade or remove five culverts that currently drain the area east of the PGCC by passing water under the canal to drainage ditches along the landside of the PGCC west levee (Plate 2-13). Under the culvert removal option, construct detention basins east of the PGCC levee to provide replacement storage for drainage. Depending on the design of the detention basins, pumping stations may be needed to discharge water out of the basins and into the PGCC. Installation of culverts under Pierce-Roberts drain, Pleasant Grove Creek, and Curry Creek may also be needed to interconnect drainage subbasins.	Same as the Adjacent Levee Alternative (Proposed Action)
SR 99 NCC Bridge remediation (Reach D:6)	Construct a moveable barrier system or a stop log gap at the south end of the SR 99 bridges to be used at high river stages to prevent overflow from reaching the landside of the NCC south levee. Modify the bridge deck connections to the supporting piers and abutments as needed to resist uplift pressure during high water stages. Install additional seepage remediation consisting of seepage cutoff walls where the bridges cross the NCC south levee (Reach D:6). Cutoff wall construction may be conducted 24/7.	Same as the Adjacent Levee Alternative (Proposed Action)

Table ES-1 Summary of the Major Project Elements of the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative		
Major Project Elements	Adjacent Levee Alternative (Proposed Action)	Fix-in-Place Alternative
West Drainage Canal	Realign the West Drainage Canal to shift an approximately 1-mile portion, starting at I-5, to an alignment farther south of the Airport Operations Area. Modify the existing canal east of the alignment to reduce bank erosion and sloughing, decrease aquatic weed infiltration, improve RD 1000 maintenance access, and enhance giant garter snake habitat connectivity.	Same as the Adjacent Levee Alternative (Proposed Action)
Riego Road Canal (highline irrigation canal) relocation	Relocate approximately 4,000 feet of irrigation canal, approximately 250 feet of buried irrigation piping and culverts, and several irrigation turn-out structures away from the proposed levee footprint for the northern segment of the NEMDC west levee (Reaches F–G).	Same as the Adjacent Levee Alternative (Proposed Action)
NCC south levee ditch relocations	Relocate the Vestal Drain ditch and Morrison Irrigation Canal landward to reduce underseepage potential at the NCC south levee (Reach D:2, 5, and 6).	Same as the Adjacent Levee Alternative (Proposed Action)
Modifications to RD 1000 Pumping Plants	Raise and/or replace the discharge pipes for Pumping Plant Nos. 1A and 1B along the Sacramento River east levee and Pumping Plant Nos. 6 and 8 along the NEMDC west levee (Reaches G–H). Construct new outfall structures for Pumping Plant Nos. 6 and 8, requiring dewatering of portions of the NEMDC. Construction for Pumping Plant Nos. 6 and 8 may be conducted 24/7.	Same as the Adjacent Levee Alternative (Proposed Action)
Modifications to City of Sacramento Sump Pumps	Raise and/or replace the discharge pipes for City Sump 160 (Sacramento River east levee Reach A:19B), City Sump 58 (American River north levee [Reach I:3]), and City Sump 102 (NEMDC west levee at Gardenland Park [Reach H]). Construct new outfall structures, requiring dewatering of portions of the Sacramento River, the low-flow channel of the NEMDC along the waterside of the American River north levee, and the NEMDC. Relocate pump stations as needed to accommodate the proposed levee improvements. Construction City Sump 102 may be conducted 24/7.	Same as the Adjacent Levee Alternative (Proposed Action)
Borrow site excavation and reclamation	Excavate earthen material at the borrow sites and then return the sites to preconstruction uses or suitable replacement habitat. For levee improvements along the Sacramento River east levee (Reach A:16–20) and the American River north levee (Reach I:1–4), the proposed South Fisherman’s Lake Borrow Area (Plate 2-7a) and the West Lakeside School Site (Plate 2-17) are anticipated to be the primary source of soil borrow material. A portion of the Fisherman’s Lake Borrow Area (identified on Plate 2-6), which was fully analyzed in the Phase 4a EIS/EIR, could provide additional borrow material for these improvements. The proposed Triangle Properties Borrow Area (Plate 2-13) would be the primary source of borrow material for levee improvements along the PGCC (Reach E) and NEMDC North (Reach F–G). The Krumenacher borrow site and Twin Rivers Unified School District stockpile site (Plate 2-14), which were fully analyzed in previous environmental documents, would be the source of borrow material for improvements to NEMDC South and back-up sources for NEMDC North (Reach F–G). The South Fisherman’s Lake Borrow Area, the West Lakeside School Site, and the Triangle Properties Borrow Area are fully analyzed in this EIS/EIR.	Same as the Adjacent Levee Alternative (Proposed Action)

Table ES-1 Summary of the Major Project Elements of the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative		
Major Project Elements	Adjacent Levee Alternative (Proposed Action)	Fix-in-Place Alternative
Habitat creation and management	Enhance connectivity between northern and southern populations of giant garter snake in the Natomas Basin by improving habitat conditions along the West Drainage Canal; establish woodlands consisting of native riparian and woodland species in the vicinity of the American River Parkway as compensation for woodland impacts along the Sacramento River east levee (Reach A:16–20), American River north levee (Reach I:1–4), PGCC (Reach E), and NEMDC (Reaches F–H); and create up to 200 acres of managed marsh from Brookfield Borrow Site to compensate for impacts to giant garter snake habitat as a result of loss of rice from levee and canal improvements, widen and extend the Chappell Ditch south of the borrow site to enhance delivery of surface water, and improve the adjacent Chappell Drain.	Same as the Adjacent Levee Alternative (Proposed Action), <i>except landside woodland compensation would be up to 70 acres.</i>
Infrastructure relocation and realignment	Relocate and realign private irrigation and drainage infrastructure (wells, pumps, canals, and pipes) and water and sanitary sewer lines, and relocate utility infrastructure (power poles) as needed to accommodate the levee improvements and canal relocations. Well construction may be conducted 24/7.	Same as the Adjacent Levee Alternative (Proposed Action)
Landside vegetation removal	In Sacramento River east levee Reach A:16–20, American River north levee Reach I:1–4, and NEMDC South (Reach H), vegetation would be cleared to prepare for Phase 4b Project levee and canal improvement work. To comply with USACE vegetation guidance, all vegetation would be cleared at least 15 feet from the landside toes of the improved levees (Sacramento River east levee Reach A:16–20 and American River north levee Reach I:1–4).	Same as the Adjacent Levee Alternative (Proposed Action), <i>except maximum extent of removal would be reduced by approximately 1 acre.</i>
Waterside Vegetation Removal	Waterside vegetation would be removed due to erosion control measures and modifications to pumping plants along the Sacramento River east levee (Reach A:16–20), NEMDC west levee (Reaches F–H), and PGCC west levee (Reach E). However, it is assumed that construction of an adjacent levee (the Adjacent Levee Alternative [Proposed Action]) in Sacramento River east levee Reach A:16–20 would allow the levee to qualify for a variance from USACE vegetation guidance criteria such that removal of waterside vegetation would not be necessary. Along the American River north levee Reach I:1–4, the levee is already considered overbuilt, and therefore it is assumed that it would also qualify for a variance from USACE vegetation guidance, allowing waterside vegetation to remain. Like the American River north levee, a section of NEMDC South from Northgate Boulevard to the Arden-Garden Connector is also assumed to be overbuilt enough that clearance of waterside vegetation would also not be necessary under a variance request to USACE. Along the west levee of NEMDC South north of the Arden-Garden Connector (Reach G), at a minimum, if a variance request is granted by USACE, vegetation removal would be required for all non-native trees from within the vegetation-free zone, all native trees that have a dbh of four inches or less, and all larger native trees that are located in the upper third of the waterside slope, the crown, or within 15 feet of the landside toe (or within the right-of-way, if less than 15 feet). Under a worst-case scenario, vegetation with stem widths that have a dbh greater than two inches would be cleared to the water's edge of the NEMDC.	Same as the Adjacent Levee Alternative (Proposed Action) for modifications to RD 1000 pump stations and for the NEMDC west levee south of the NEMDC Stormwater Pumping Station. <i>In Reach A:16–20 of the Sacramento River east levee, it is assumed that because of the uncertainty of how USACE levee vegetation guidance criteria would be applied where the levee is not widened by an additional 15 feet (as under the Adjacent Levee Alternative [Proposed Action]), approximately 19 acres of waterside vegetation would need to be removed from the waterside hinge point of the levee crown to the water's edge as a worst-case scenario.</i>

Table ES-1 Summary of the Major Project Elements of the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative		
Major Project Elements	Adjacent Levee Alternative (Proposed Action)	Fix-in-Place Alternative
Bank protection	Bank protection would be constructed along the NEMDC South (Reach H) and PGCC (Reach E) to address the waterside erosion sites because, as noted above, the adjacent levee would be constructed in Sacramento River east levee Reaches A–C:1–20 under the NLIP; no erosion protection is needed along the left bank of the Sacramento River. The distance from the projected levee slope of the new adjacent levee to the current bank location is sufficient to guarantee that bank erosion would not intrude into the projected levee slope in the near future.	Same as the Adjacent Levee Alternative (Proposed Action)
Right-of-way acquisition	Acquire lands within the Phase 4b Project footprint along the Sacramento River east levee (Reach A:16–20), American River north levee (Reach I:1–4), NEMDC west levee (Reaches F–G), PGCC west levee (Reach E), and at associated borrow sites.	Same as the Adjacent Levee Alternative (Proposed Action)
Encroachment management	Remove encroachments as required to meet the criteria of USACE, CVFPB, and FEMA. SAFCA would be required to submit a variance request to CVFPB, and then ultimately to USACE, requesting confirmation that SAFCA’s adjacent levee design for the Sacramento River east levee (Reach A–C:1–20), American River north levee (Reach I:1–4), and NEMDC west levee (Reach F–G) sufficiently addresses USACE’s guidance regarding vegetation on levees, if SAFCA chooses to implement the project without Federal participation.	Same as the Adjacent Levee Alternative (Proposed Action), <i>except in Reach A:16–20 of the Sacramento River east levee, it is assumed, as stated above, that the levee would not be in compliance with levee vegetation requirements on the waterside.</i>
Natomas Levee Class 1 Bike Trail Project	Construct a bicycle and pedestrian trail along the 42-mile loop of the Natomas Basin levee perimeter in the northwestern portion of the County of Sacramento, southern portion of Sutter County, and a portion of the City of Sacramento (program-level analysis only, because site-specific details are not available).	Same as the Adjacent Levee Alternative (Proposed Action)
Notes: 24/7 = 24 hours per day/7 days per week; CVFPB = Central Valley Flood Protection Board; dbh = diameter in breast height; FEMA= Federal Emergency Management Agency; I-80 = Interstate 80; NCC = Natomas Cross Canal; NEMDC = Natomas East Main Drainage Canal; PGCC = Pleasant Grove Creek Canal; RD = Reclamation District; SR = State Route; USACE = U.S. Army Corps of Engineers; SAFCA = Sacramento Area Flood Control Agency Source: Compiled by AECOM in 2010		

ditches would be relocated either to make room for expanded levee sections or to reduce underseepage potential. Discharge pipes for RD 1000 pumping plants and City of Sacramento sump pumps would be raised to cross the levee above design flood water surface elevation. Parcels in the South Fisherman's Lake and Triangle Properties Borrow Areas and at the West Lakeside School Site would be excavated and reclaimed as agricultural land. Woodland groves would be established to compensate for impacts along the Sacramento River east levee Reach A:16–20, American River north levee Reach I:1-4, and NEMDC.

Under the **Fix-in-Place Alternative**, the Sacramento River east levee would be improved in place in Sacramento River east levee Reach A:16–20 and seepage remediation would be implemented. The Fix-in-Place Alternative would be the same as described for the Adjacent Levee Alternative (Proposed Action) except that the crown of the Sacramento River east levee would not be widened. This type of levee improvement would narrow the overall landside footprint by 15 feet but would require a greater extent of levee degrade to construct cutoff walls and a greater extent of encroachment removal along the Sacramento River east levee compared to the Adjacent Levee Alternative (Proposed Action). Differences from the Adjacent Levee Alternative (Proposed Action), including encroachment removal and reduced footprint impacts, are shown in italicized text in **Table ES-1**.

ES.11 MAJOR CONCLUSIONS OF THE ENVIRONMENTAL ANALYSIS

The potential environmental impacts of the Adjacent Levee Alternative (Proposed Action) and alternatives under consideration, and mitigation measures to avoid, eliminate, minimize, or reduce the significant and potentially significant impacts to less-than-significant levels, are summarized in **Table ES-2** (presented at the end of this executive summary). This table also presents additional information on the impacts, including duration and quantification, where available, to provide a comparison among the alternatives.

ES.11.1 SUMMARY OF PROJECT MITIGATION AND CONSULTATION

Project mitigation needs have been coordinated with the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), and the California Department of Fish and Game (DFG) over the past four years as the NLIP Landside Improvement Project has gone through the Section 408/404 permit process. During the previous three project phases, project-induced impacts have been sufficiently compensated for through Section 7 consultation at the Federal level and the 2081 permit process at the State level. No additional compensation was recommended under the Fish and Wildlife Coordination Act. Although Federal agencies are not required to mitigate for State-listed species, mitigation for these species is required for species that are also Federally listed (e.g., fish, giant garter snake) or as recommended under the Fish and Wildlife Coordination Act. The non-Federal sponsor is required to comply with the California Endangered Species Act (CESA) and these compliance measures are included as part of the project. During project planning, steps were taken to avoid, minimize, reduce, and compensate for impacts to endangered species. Compensatory mitigation was first evaluated within the project area, and if these steps were not sufficient, mitigation banks were then considered.

In 1997, the NBHCP was approved under Section 10 of the Federal Endangered Species Act (ESA) by USFWS and Section 2081 of the California Fish and Game Code by DFG. The NBHCP established a multiple-species conservation program for the Natomas Basin that is managed by The Natomas Basin Conservancy (TNBC), a private, non-profit organization that serves as “plan operator” of the NBHCP. To avoid conflict with NBHCP lands, the resource agencies requested that the NLIP be coordinated with TNBC. In the programmatic biological opinion for the NLIP (**Appendix D1**), USFWS analyzed the cumulative effects of the project on the NBHCP, specifically stating that:

“...while SAFCA is not a signatory to the NBHCP, the plan sets forth a regional conservation strategy that covers the entire basin. The NBHCP's efficacy in maintaining a viable population of giant garter snakes in the Basin depends, in a significant part, on the retention of a sufficient amount of undeveloped acreage throughout the Basin, to ... provide habitat for all 22 of the

NBHCP covered species, including the giant garter snake [and Swainson's hawk]" (**Appendix D1:53**).

Another purpose of this coordination was to enhance the existing lands under jurisdiction of the NBHCP and increase connectivity between core habitat reserves that are distributed throughout the Basin.

Overall, the NLIP is an opportunity to employ a landscape-scale vision, helping to advance the goals and objectives of the NBHCP. Rather than a piecemeal approach to habitat protection, the NLIP secures and expands the amount of habitat protection in the Basin, establishes the components that tie the NBHCP preserves and disparate mitigation sites together in perpetuity under public ownership, and increases the quality and viability of this area. The following goals were considered when developing the mitigation plan:

- ▶ increase the amount of protected habitat;
- ▶ expand and consolidate the protected habitat in the Natomas Basin;
- ▶ strengthen connectivity between the NBHCP reserves;
- ▶ avoid significant habitat impacts, particularly to Swainson's hawks and special-status fish, through careful project design and construction phasing;
- ▶ develop a mitigation and monitoring plan and a long-term management plan; and
- ▶ utilize disturbed area to mitigate impacts.

The Natomas Basin is a unique ecological system separated from other systems by a circular levee system. Regional watershed boundaries, such as found in the Natomas Basin, may act as partial gene flow barriers (Paquin et al. 2006), resulting in defined population sets with unique adaptive characteristics. Biologists are conducting population dynamics studies of the giant garter snake in the middle-American Basin, which lies north of the NCC (Hansen 2003, 2004, 2006). However, no snakes have been found to move across the NCC itself, suggesting that snakes are not moving between the middle-American Basin and the Natomas Basin. If the NCC represents a barrier to movement within the greater American Basin, then giant garter snakes may be present in two separate and genetically isolated sub-populations, requiring separate conservation and management.

HABITAT CREATION AND MANAGEMENT

New GGS/Drainage Canal

All of the habitat being created for giant garter snakes is required as part of ESA Section 7 consultation. The new GGS/Drainage Canal would provide connectivity of aquatic habitat in the northern and southern Natomas Basin and to managed marsh lands and rice fields. The GGS/Drainage Canal will also function as a movement corridor for the snake to areas that have been isolated from larger habitat areas. This connectivity will increase habitat values for the snake, and make the entire system more functional as water will flow through areas instead of standing areas.

The material excavated to create the new GGS/Drainage Canal will be used to construct the adjacent levee and will be completed prior to filling of the existing canal habitat. This construction sequencing prevents any temporal loss of habitat for the snake. The new canal will also be maintained for the sole purpose of habitat for the giant garter snake, which will increase the value from the current canal, which is operated as an irrigation canal.

Managed Marsh Creation and Rice Preservation

Several soil borrow sites would be finished, graded, and planted with native riparian and marsh vegetation after the completion of borrow activities to create managed seasonal and perennial marsh habitat that would benefit the giant garter snake. Marsh design would follow the templates established by the NBHCP. These design templates feature a combination of uplands and shallow water bodies, sinuosity of swales, and good water control structures to manage precise water levels at different times of the year. Marsh design and management would optimize the value of giant garter snake habitat, but minimize the attraction to wildlife species considered to be potentially hazardous to aircraft at low elevations approaching or departing from runways. An essential component of the managed marshes would be procurement of a firm, reliable water supply and good water quality throughout the giant garter snake active season of April–October. Many marsh areas would be created adjacent to existing NBHCP marsh preserves, thereby providing for greater contiguous management areas and enhancing the overall habitat value of the adjacent preserves.

Large areas of property obtained for the NLIP will also be retained in rice cultivation through an arrangement with a grower or TNBC. Rice fields have become important habitat for giant garter snake, particularly associated canals and their banks for both spring and summer active behavior and winter hibernation. While within the rice fields, snakes forage in the shallow water for prey, utilizing rice plants and vegetated berms dividing rice checks for shelter and basking sites.

Managed Grasslands

Managed grasslands provide foraging habitat for Swainson’s hawk (a State listed species). The proposed levee improvements would result in landside slopes that are less steep than the existing slopes, and several reaches of the Sacramento River east levee would have adjoining 100- to 300-foot-wide earthen seepage berms with nearly flat slopes. Grasslands not on levee slopes include those borrow sites on the airport north bufferlands. The primary management objective on managed grasslands would be to reduce hazardous wildlife populations to the extent necessary to comply with Title 14, CFR Part 139 and FAA advisory circulars that address hazardous wildlife. While the grasslands provide habitat for Swainson’s hawk, they are an incidental benefit of the slopes, berms, and compliance with the CFR and FAA advisory.

Woodlands

As part of the Fish and Wildlife Coordination Act Report (CAR), woodlands consisting of native species would be established at several sites as a component of the proposed project. These woodlands will provide habitat for Swainson’s hawk as well as several birds protected under the Migratory Bird Treaty Act.

Woodland groves would be established throughout the project area, and would generally be at least 50 feet wide and several 100 feet long, depending on location constraints. Portions of the created woodlands would be at least 100 feet wide or wider to promote successful nesting birds deeper within the grove canopy, where nest parasitism by crows, cowbirds, and starlings is less of a factor in breeding success.

Valley Elderberry Longhorn Beetle

The valley elderberry longhorn beetle is a Federally listed threatened species, protected under ESA. The species is nearly always found on or close to its host plant, elderberry shrub. Many of the shrubs are found throughout the project area. The preferred conservation measure for these shrubs is to transplant them and plant additional seedlings along with associated native plants. All elderberry shrubs located within the project area will be transplanted to the woodland groves or corridor. Additional seedlings will be planted along with the transplants and the woodlands will provide the associated native requirement. This method of planting will meet two requirements: compliance with the biological opinion and compensation recommended in the CAR for woodlands.

ENVIRONMENTAL CONSIDERATIONS OF ALTERNATIVES

The Adjacent Levee Alternative (Proposed Action) was designed to minimize impacts to shaded riverine aquatic (SRA) habitat along the Sacramento River. The SRA is habitat for many State- and Federally-listed fish species and State-listed Swainson's hawk. Although mitigation for State listed species is not necessarily required for a Federal project, these impacts also affect Federally listed species and would be required under Section 7 consultation with NMFS. Construction of the Adjacent Levee alternative (Proposed Action) would allow waterside vegetation to remain due to the shift landward of the levee prism.

Mitigation for the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative is very similar, with the exception of loss of riparian habitat due to the removal of waterside trees required under the Fix-in-Place Alternative. This is because the Fix-in-Place Alternative would require the replacement of Garden Highway on top of the levee being brought up to current road standards. The new standards require widening the existing highway to about the same width as the adjacent levee.

During evaluation of borrow sites, consideration was given to using the sites for mitigation once the material was extracted. This allowed the project to be limited to one land purchase, eliminating the need to haul material from a commercial source into the Basin. The sites were evaluated for quality of borrow material, proximity to TNBC lands, connectivity to other habitat, and proximity to placement location. The end result is that material is only handled once, borrow sites are used to mitigate for fish and wildlife impacts, air quality impacts are minimized, and the overall project cost is reduced.

SECTION 7 CONSULTATION AND FISH AND WILDLIFE COORDINATION ACT

A biological assessment has been prepared and coordinated with the resource agencies. ESA Section 7 consultation has been on-going as part of the NLIP. A biological opinion will be obtained from both NMFS and USFWS for this project.

This project will be coordinated with USFWS under the Fish and Wildlife Coordination Act. It is anticipated that all mitigation covered under ESA and CESA consultation will also mitigate any impacts to fish and wildlife resources, and no additional compliance with the biological opinion and 2081 permit would be required.

Table ES-3 displays the potential impacts and mitigation proposed for the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. This mitigation reflects what is currently in the biological assessment and has been coordinated with USFWS, NMFS, and DFG.

ES.11.2 SIGNIFICANT AND UNAVOIDABLE IMPACTS OF THE ACTION ALTERNATIVES

A significant and unavoidable impact is one that would result in a substantial or potentially substantial adverse effect on the environment and that could not be reduced to a less-than-significant level even with implementation of applicable feasible mitigation.

The following impacts of the Adjacent Levee Alternative (Proposed Action) were found to be significant and unavoidable. Most of these impacts would be temporary and related to construction activities. Where feasible mitigation exists, it has been included to reduce these impacts; however, the mitigation would not be sufficient to reduce the impacts to a less-than-significant level. The following impacts are presented in the order they appear in Chapter 4, "Environmental Consequences and Mitigation Measures."

**Table ES-3
Environmental Impacts of and Proposed Mitigation for the
NLIP Landside Improvements Project Phase 2–4b Projects**

Habitat Type	Potential Impacts (Acres)	Mitigation Ratio	Mitigation Needed (Acres)
Adjacent Levee Alternative (Proposed Action)			
Permanently affected aquatic and rice habitats/managed marsh	201	1:1	201
Woodland (Swainson's hawk)	104	2.6:1	270.4
Upland agriculture (Swainson's hawk) ¹	224.7	1:1	224.7
Shaded riverine aquatic habitat (ESA fish species)	6.21 ²	3:1	18.63
Lower GGS/Drainage Canal ³	32.8	1:1	32.8
Fix-in-Place Alternative			
Permanently affected aquatic and rice habitats/managed marsh	201	1:1	201
Woodland (Swainson's hawk)	103	2.6:1	267.8
Upland agriculture (Swainson's hawk) ¹	277	1:1	277
Shaded riverine aquatic habitat (ESA fish species)	42.84 ²	3:1	128.52
Lower GGS/Drainage Canal ³	32.8	1:1	32.8
Notes: ¹ Represents approximate acres of affected alfalfa, which is considered high quality foraging habitat and has to be mitigated for on a 1:1 ratio. ² Assumes variance from USACE's vegetation guidance is not granted. ³ Mitigates for impacts to aquatic and upland habitat and Section 404 impacts. Source: Compiled by AECOM in 2010			

- ▶ conversion of Important Farmland to nonagricultural uses;
- ▶ conflicts with lands under Williamson Act² contracts;
- ▶ inconsistency with Airport Master Plan, Airport Comprehensive Land Use Plan, and Airport Wildlife Hazard Management Plans;
- ▶ inconsistency with the American River Parkway Plan and Wild and Scenic Rivers Act;
- ▶ potential to physically divide or disrupt an established community;
- ▶ loss of landside and waterside woodland and shaded riverine aquatic habitats;
- ▶ disruption to and loss of existing wildlife corridors;
- ▶ impacts on Swainson's hawk and other special-status birds;

² The California Land Conservation Act of 1965 is commonly known as the Williamson Act (California Government Code Section 51200 et seq.).

- ▶ potential damage or disturbance to known archaeological or architectural resources from ground-disturbance or other construction-related activities;
- ▶ potential damage to or destruction of previously unidentified or undiscovered cultural resources from ground-disturbance or other construction-related activities;
- ▶ potential discovery of human remains during construction;
- ▶ temporary and short-term increases in traffic on local roadways;
- ▶ temporary and short-term increases in traffic hazards on local roadways;
- ▶ generation of temporary and short-term construction noise;
- ▶ temporary and short-term exposure of residents to increased traffic noise levels from truck hauling associated with borrow activity;
- ▶ effects related to the proposed Natomas Levee Class 1 Bike Trail Project (short-term: significant and unavoidable; long-term: less than significant [beneficial]);
- ▶ permanent disruption of recreational activities and facilities;
- ▶ alteration of scenic vistas, scenic resources, and existing visual character of the project area;
- ▶ new sources of light and glare that adversely affect views; and
- ▶ aircraft safety hazards resulting from project implementation.

Significant and unavoidable impacts associated with the Fix-in-Place Alternative would be the same as those for the Adjacent Levee Alternative (Proposed Action) with the following additional significant and unavoidable impacts:

- ▶ inconsistency with the Natomas Basin Habitat Conservation Plan;
- ▶ impacts on Successful Implementation of Habitat Conservation Plans; and
- ▶ temporary and short-term exposure of sensitive receptors to, or temporary and short-term generation of, excessive groundborne vibration.

ES.11.3 CUMULATIVE IMPACTS OF THE ACTION ALTERNATIVES

Significant cumulative impacts in which no feasible mitigation measures are available to fully reduce significant impacts associated with the Adjacent Levee Alternative (Proposed Action) would be as follows:

- ▶ **Agricultural Resources:** Implementation of the Phase 4b Project would involve the permanent conversion of large acreages of Important Farmland (Prime Farmland and Farmland of Statewide Importance), which cannot feasibly be replaced. Historically, agricultural land in the Natomas Basin, much of it Prime Farmland and other categories of Important Farmland, has been converted to residential and commercial development. The Phase 4b Project would contribute to this loss.
- ▶ **Fisheries:** The Adjacent Levee Alternative (Proposed Action) would involve removal of a less than of an acre of SRA habitat for pumping plant modifications and as part of raising the west levee of NEMDC North. A variance would be requested for removal of waterside vegetation (including SRA habitat) along NEMDC

South, which would avoid loss of SRA habitat in this area. However, if full compliance with USACE vegetation guidance is required, approximately 11 acres of waterside vegetation (including SRA habitat) would have to be removed from the NEMDC South in a worst-case scenario. Mitigation Measure 4.7-a would require replacement of SRA habitat; however, it may not be possible to create enough suitable SRA habitat to fully compensate for this loss. Historic channel alterations have resulted in marginal habitat conditions that provide only limited habitat functions for most native fish species and other aquatic organisms.

- ▶ **Cultural Resources:** Known or unknown archaeological resources could be disturbed, and cultural resources could be potentially damaged or destroyed during construction activities. Although mitigation would be implemented to reduce impacts on potentially significant cultural resources, adverse impacts, particularly on prehistoric archaeological resources, may still occur. This would contribute to a historical trend in the loss of these resources as artifacts of cultural significance and as objects of research importance.
- ▶ **Transportation and Circulation:** The Phase 4b Project's construction-related traffic impacts would be temporary, short-term, and intermittent; however, cumulative traffic impacts could be significant if portions of the Phase 4a and 4b Projects are constructed in the same locations during the same time periods.
- ▶ **Air Quality:** With implementation of mitigation measures, construction of the Phase 4b Project would result in less-than-significant temporary and short-term construction-related air quality impacts associated with generation of oxides of nitrogen (NO_x), respirable particulate matter less than 10 microns in diameter (PM₁₀) (including fine particulate matter less than 2.5 microns in diameter [PM_{2.5}]), and volatile organic compounds (VOC), even. However, other medium-sized and large reasonably foreseeable projects, such as the anticipated developments in the Natomas area, would contribute substantially to air quality impacts. Taken together, the Phase 4b Project would contribute to air pollutant emissions in Sutter and Sacramento Counties, and to the nonattainment status of the Feather River Air Quality Management District (FRAQMD) and the Sacramento Metropolitan Air Quality Management District (SMAQMD) for ozone and PM₁₀.
- ▶ **Noise:** The Phase 4b Project would have a significant and unavoidable project-level impact on noise levels experienced by the occupants of residences that are near sites of construction activity or haul routes for construction traffic. This impact would be further exacerbated by the potential overlap in construction of the Phase 4a and 4b Projects.
- ▶ **Visual Resources:** The Phase 4b Project would include the removal of trees, including Heritage oaks, other vegetation, and structures from the landside of the Sacramento River east levee within the footprint of the adjacent levee and berms, and may include the removal of some vegetation from the waterside of the Sacramento River east levee. These changes would contribute to the substantial degradation of scenic resources in the Natomas Basin that are expected to result with various development projects and expansion of Airport facilities, as the area's visual character changes from rural agricultural landscape to urban/suburban setting. Although the Phase 4b Project includes the establishment of a substantial acreage of woodland plantings around the Basin to offset the significant effect of the project on scenic resources (oak and other native trees), the plantings would require decades to become well established and up to 100 years to replace Heritage oaks. Construction of an adjacent levee, in combination with removal of woodlands along the landside of the Sacramento River east levee, would substantially alter the existing visual character of the Natomas Basin and surrounding areas. Not only would the setback levee result in a physical barrier to the existing viewshed, tree removal would degrade the visual coherence of the project area.

In addition to the above significant cumulative impacts, implementation of the Fix-in-Place Alternative would also result in the following significant cumulative impacts:

- ▶ **Fisheries:** As noted above for the Adjacent Levee Alternative (Proposed Action) a variance would be requested for removal of waterside vegetation (including SRA habitat) along NEMDC South, which would avoid loss of SRA habitat in this area. However, if full compliance with USACE vegetation guidance is

required, approximately 11 acres of waterside vegetation (including SRA habitat) would have to be removed from the NEMDC South in a worst-case scenario. The Fix-in-Place Alternative would involve removal of 19 additional acres of vegetation (including SRA habitat) along the waterside of Sacramento River east levee Reach A:16–20 to comply with USACE vegetation guidance (for a total of 30 acres removed). Mitigation Measure 4.7-a would require replacement of SRA habitat; however, it may not be possible to create enough suitable SRA habitat to compensate for this loss. Historic channel alterations have resulted in marginal habitat conditions that provide only limited habitat functions for most native fish species and other aquatic organisms.

- ▶ **Terrestrial Biological Resources:** The narrower landside levee footprint of the Fix-in-Place Alternative would avoid some losses of woodland and grassland habitat that would be unavoidable under the Adjacent Levee Alternative (Proposed Action); however, under the Fix-in-Place Alternative, as much as 21 acres of riparian woodland on the waterside of the levee in Reaches B:10–15 of the Sacramento River east levee could be removed to conform with USACE guidance regarding levee encroachments. In addition to its overall value as habitat for various species, this woodland supports active Swainson’s hawk nests, elderberry shrubs, and other important biological resources. Adverse impacts on these resources on the waterside of the levee would be more difficult to mitigate than the adverse impacts from the adjacent levee footprint on the landside of the levee under the Adjacent Levee Alternative (Proposed Action), both in terms of the acreage of habitat lost and the quality of that habitat. Implementation of this alternative would include minimization, avoidance, and compensation measures in accordance with ESA and CESA requirements, and other relevant regulatory requirements; however, it is uncertain whether adequate compensation could be developed for the extensive loss of mature waterside vegetation under this alternative.
- ▶ **Visual Resources:** The Fix-in-Place Alternative would result in similar impacts to visual resources as the Adjacent Levee Alternative (Proposed Action) except that the Sacramento River east levee would be widened in place, requiring greater removal of riparian woodlands on the waterside of these levee reaches to conform with USACE guidance regarding levee encroachments. Therefore, the Fix-in-Place Alternative would result in the loss of high-aesthetic-value woodlands along the waterside of the levee. Because the replacement plantings that are part of the Phase 4b Project would be planted along the landside of the levee, and mitigation is not available to fully compensate for the loss of waterside vegetation (including SRA habitat).

ES.12 AREAS OF CONTROVERSY AND ISSUES TO BE RESOLVED

ES.12.1 AREAS OF CONTROVERSY

Based on the comments received during the scoping period and the history of the NEPA and CEQA processes undertaken by USACE and SAFCA, respectively, the major areas of public controversy associated with the project are:

- ▶ temporary, construction-related effects (especially noise and access issues) on residents and businesses adjacent to the project levees (including the potential for construction to continue 24 hours per day, 7 days per week [24/7 construction]);
- ▶ the hydraulic modeling used to analyze the project’s hydraulic impacts;
- ▶ construction-related impacts on cultural and biological resources;
- ▶ vegetation and tree removal and relocation of utilities, including power poles;
- ▶ removal of agricultural lands and loss of opportunity for future development; and
- ▶ SAFCA’s ability to fund mitigation measures.

The first two issues were the subject of a lawsuit, filed in December 2007, by the Garden Highway Community Association challenging the Phase 2 EIR prepared by SAFCA, which was settled. A copy of the settlement agreement is included as **Appendix A3**, and applies to all affected Garden Highway residents. Many of the agreements made by SAFCA in this settlement agreement regarding construction practices also have been incorporated into the Phase 3–4a Projects or, as appropriate, in the mitigation measures for those project phases. SAFCA intends to voluntarily apply the design and construction provisions in the agreement to all Sacramento River east levee components of the Phase 4b Project in the event that SAFCA chooses to implement the Phase 4b Project without Federal participation. While USACE is not bound by the settlement agreement, USACE nevertheless plans to implement some of the measures contained therein; these measures are incorporated into the project or reflected, as appropriate, in the mitigation measures in this EIS/EIR.

Other issues, including potential 24/7 construction, vegetation and tree removal, relocation of utilities (including power poles), and impacts to agricultural lands have been raised in comment letters by affected property owners. USACE and SAFCA have and will continue to respond to these issues, most recently in responses to comments on the Phase 4a FEIS and FEIR. Additionally, USACE and SAFCA continue to work individually with these property owners to respond to concerns.

Allegations regarding construction-related impacts on cultural and biological resources and SAFCA's ability to fund mitigation measures were the subject of a Petition for Writ of Mandate and Complaint for Injunctive Relief (Petition) filed in March 2009 by the Garden Highway Community Association challenging the adequacy of the Phase 2 Supplemental EIR under CEQA. This suit was voluntarily dismissed on October 22, 2009. In June 2009, both the Garden Highway Community Association and the Association for the Environmental Preservation of the Garden Highway filed Petitions challenging certification of the Phase 3 EIR. Both petitions made allegations similar to those contained in the 2007 and March 2009 lawsuits, including the issues described above. In July 2009, the Association for the Environmental Preservation of the Garden Highway dismissed its lawsuit challenging the Phase 3 EIR.

In December 2009, both the Garden Highway Community Association and the Association for the Environmental Preservation of the Garden Highway filed Petitions challenging certification of the Phase 4a EIR.

If USACE receives Congressional authorization and implements the Phase 4b Project, the issue of SAFCA's ability to fund proposed mitigation measures would no longer be an issue.

ES.12.2 ISSUES TO BE RESOLVED

Congress will consider approval of USACE's Common Features/Natomas PACR, which includes authorization for USACE to construct the Phase 4b Project.

In the event Congress does not authorize USACE to construct the Phase 4b Project, and SAFCA chooses to proceed with the Phase 4b Project without additional Federal participation, USACE will consider the Adjacent Levee Alternative (Proposed Action) and either grant or deny permission for the Phase 4b Project pursuant to Sections 408, 404, and 10.

SAFCA will consider whether or not to certify the EIR and approve the Phase 4b Project. This decision will be based on numerous factors, including the potential environmental impacts and mitigation measures addressed in this EIS/EIR, permitting requirements, Federal and state authorizations, funding and financing mechanisms, and implementation schedule.

ES.13 STEPS IN THE NEPA/CEQA PROCESS

USACE published a notice of intent (NOI) to prepare the American River Common Features GRR in the *Federal Register* (Vol. 73, No. 41) on February 29, 2008. Because the Common Features/Natomas PACR/Phase 4b Project

is a component of the Common Features GRR, a separate NOI for the Common Features/Natomas PACR/Phase 4b Project does not need to be published.

On November 5, 2009, SAFCA filed a notice of preparation (NOP) for this EIS/EIR with the State Clearinghouse, and distributed copies of the NOP to approximately 900 recipients. A joint NEPA/CEQA public scoping meeting was held on November 18, 2009 from 4:30 to 6:30 p.m. at the South Natomas Community Center in Sacramento, California, to brief interested parties on the Common Features/Natomas PACR/Phase 4b Project and obtain the views of agency representatives and the public on the scope and content of this EIS/EIR.

This DEIS/DEIR is being distributed for a public and agency review and comment period that begins on July 2, 2010 and closes on August 16, 2010. This document is available for public review during normal business hours at the following locations:

- ▶ USACE, Sacramento District office, 1325 J Street, Sacramento, California;
- ▶ SAFCA, 1007 7th Street, 7th Floor, Sacramento, California;
- ▶ Sacramento Central Library, 828 I Street, Sacramento, California; and
- ▶ Sutter County Library, 750 Forbes Avenue, Yuba City, California.

A public meeting will be held before the SAFCA Board of Directors on July 15, 2010 at 3:00 p.m. in the Sacramento City Council Chambers located at 915 I Street, Sacramento, California. In addition, written comments from the public, reviewing agencies, and stakeholders will be accepted throughout the public comment period. Comments must be received by 5:00 p.m. on August 16, 2010 by USACE or SAFCA at the following addresses, fax numbers, or e-mail addresses:

Elizabeth Holland, Planning Division
U.S. Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, CA 95814
Telephone: (916) 557-6763
Fax: (916) 557-7856
E-mail: Elizabeth.G.Holland@usace.army.mil

or John Bassett, Director of Engineering
Sacramento Area Flood Control Agency
1007 7th Street, 7th Floor
Sacramento, CA 95814
Telephone: (916) 874-7606
Fax: (916) 874-8289
E-mail: BassettJ@sacounty.net

Following public review of the DEIS/DEIR, a FEIS/FEIR will be prepared, in which USACE and SAFCA will provide responses to comments on the DEIS/DEIR. The FEIS/FEIR will constitute a reprint of the entire DEIS/DEIR, and will include comment letters, responses to comments, and any text changes/clarifications.

Table ES-2 Summary of Impacts and Mitigation Measures						
Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Agricultural Resources						
Impact 4.2-a: Conversion of Important Farmland to Non-agricultural Uses	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action)	Permanent and Temporary	Permanent: 851.70 acres Temporary: 355.65 acres	Significant	Mitigation Measure 4.2-a: Minimize Important Farmland Conversion to the Extent Practicable and Feasible	Significant and Unavoidable
	Fix-in-Place Alternative	Permanent and Temporary	Permanent: 849.92 acres Temporary: 355.65 acres	Significant	Implement Mitigation Measure 4.2-a	Significant and Unavoidable
Impact 4.2-b: Conflict with Lands under Williamson Act Contracts	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Permanent	42.14 active acres and 22.57 non-renewal acres	Significant	Mitigation Measure 4.2-b: Minimize Impacts on Agricultural Preserve Land and Williamson Act-Contracted Land; Comply with California Government Code Sections 51290–51293; and Coordinate with Landowners and Agricultural Operators	Significant and Unavoidable

**Table ES-2
Summary of Impacts and Mitigation Measures**

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Land Use, Socioeconomics, and Population and Housing						
Impact 4.3-a: Inconsistency with Airport Master Plan, Airport Comprehensive Land Use Plan, and Airport Wildlife Hazard Management Plans	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	Consistent	No mitigation is required	Consistent
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Not Applicable	Not Applicable	Potentially Inconsistent	Mitigation Measure 4.3-a: Implement Mitigation Measure 4.16-g, "Consult with SCAS and the FAA during Design of the Proposed Natomas Levee Class I Bike Trail to Implement Appropriate Airport Safety Precautions"	Significant and Unavoidable
Impact 4.3-b: Inconsistency with the Natomas Basin Habitat Conservation Plan	No-Action Alternative: No Phase 4b Project Construction and Potential Levee Failure	Not Applicable	Not Applicable	Consistent	No mitigation is required	Consistent
	Adjacent Levee Alternative (Proposed Action)	Permanent	See quantified impacts under "Biological Resources"	Potentially Inconsistent	Mitigation Measure 4.3-b: Implement Mitigation Measure 4.7-l, "Ensure that Project Encroachment Does Not Jeopardize Successful Implementation of the NBHCP and Implement Mitigation Measures 4.7-a and 4.7-c through 4.7-h"	Consistent
	Fix-in-Place Alternative	Permanent	See quantified impacts under "Biological Resources"	Inconsistent	Implement Mitigation Measure 4.3-b	Significant and Unavoidable

Table ES-2 Summary of Impacts and Mitigation Measures						
Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Impact 4.3-c: Inconsistency with the American River Parkway Plan and Wild and Scenic Rivers Act	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	Potentially Inconsistent	No mitigation is required	Significant and Unavoidable
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Not Applicable	Not Applicable	Potentially Inconsistent (if USACE requires removal of waterside vegetation from the American River north levee)	No mitigation is available	Significant and Unavoidable
Impact 4.3-d: Potential to Physically Divide or Disrupt an Established Community	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative

Table ES-2 Summary of Impacts and Mitigation Measures						
Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Temporary and Permanent	Temporary construction-related access issues and traffic impacts; and permanent acquisition of 30 residences (23 residences under the Fix-in-Place Alternative), 3 mobile homes, 2 farm residences, and 1 business (partial acquisition)	Significant	Mitigation Measure 4.3-d: Notify Residents and Businesses of Project Construction and Road Closure Schedules; and Implement Mitigation Measures 4.10-a, “Prepare and Implement a Traffic Safety and Control Plan for Construction-Related Truck Trips,” and 4.10-c, “Notify Emergency Service Providers about Project Construction and Maintain Emergency Access or Coordinate Detours with Providers”	Significant and Unavoidable
Impact 4.3-e: Displacement of Residences and Businesses	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Not Applicable	Not Applicable	Less than Significant	No mitigation is required	Less than Significant
Geology, Soils, and Mineral Resources						
Impact 4.4-a: Potential Temporary Localized Soil Erosion during Construction	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative

**Table ES-2
Summary of Impacts and Mitigation Measures**

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
	Adjacent Levee Alternative (Propose Action) and Fix-in-Place Alternative	Temporary	Unquantifiable	Potentially Significant	Mitigation Measure 4.4-a(1): Implement Mitigation Measure 4.6-a, “Implement Standard Best Management Practices, Prepare and Implement a Stormwater Pollution Prevention Plan, and Comply with National Pollutant Discharge Elimination System Permit Conditions” Mitigation Measure 4.4-a(2): Secure and Implement the Conditions of the California Surface Mining and Reclamation Act Permit or Exemption	Less than Significant
Impact 4.4-b: Potential Soil Erosion During Project Operations	No-Action Alternative: No Phase 4b Project Construction and Potential Levee Failure	Not Applicable	Not Applicable	Potentially Significant	No mitigation is required	Significant and Unavoidable
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Permanent	Unquantifiable	Less than Significant (Beneficial)	No mitigation is required	Less than Significant (Beneficial)
Impact 4.4-c: Potential Loss of Mineral Resources	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Temporary	Unquantifiable	Less than Significant	No mitigation is required	Less than Significant

Table ES-2 Summary of Impacts and Mitigation Measures						
Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Hydrology and Hydraulics						
Impact 4.5-a: Hydraulic Impacts on Other Areas and Exposure to Flood Risk	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Temporary or Permanent	Continued high risk of flooding	Significant	No feasible mitigation is available	Significant and Unavoidable
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Permanent	Substantially reduced risk of flooding; no hydraulic impacts	Less than Significant (Beneficial)	No mitigation is required	Less than Significant (Beneficial)
Impact 4.5-b: Alteration of Local Drainage	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Temporary or Permanent	Unknown	Potentially Significant	Mitigation Measure 4.5-b(1): Coordinate with Landowners and Drainage Infrastructure Operators, Prepare Final Drainage Studies as Needed, and Implement Proper Project Design Mitigation Measure 4.5-b(2): Prepare Hydraulic Study, and Design and Implement Lower Dry Creek Woodland Planting Areas to Avoid Adverse Hydraulic Effects	Less than Significant

Table ES-2 Summary of Impacts and Mitigation Measures						
Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Impact 4.5-c: Effects on Groundwater	No-Action Alternative: No Phase 4b Project Construction and Potential Levee Failure	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Permanent	No substantial decrease in groundwater levels or well yields or increase in pumping costs is expected	Less than Significant	No mitigation is required	Less than Significant
Water Quality						
Impact 4.6-a: Temporary Impacts on Water Quality from Stormwater Runoff, Erosion, or Spills	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Temporary	Unquantifiable	Potentially Significant	Mitigation Measure 4.6-a: Implement Standard Best Management Practices, Prepare and Implement a Stormwater Pollution Prevention Plan, and Comply with National Pollutant Discharge Elimination System Permit Conditions	Less than Significant
Impact 4.6-b: Impacts to Sacramento River Water Quality from Pleasant Grove Creek Canal Detention Basin Discharges	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative

Table ES-2 Summary of Impacts and Mitigation Measures						
Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Temporary	Unquantifiable	Potentially Significant	Mitigation Measure 4.6-b: Implement Best Management Practices and Comply with NPDES Permit Conditions for a Point-Source Discharge	Less than Significant
Impact 4.6-c: Effects on Water Quality from Groundwater Discharged by Relief Wells	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Temporary	Unquantifiable	Too Speculative	No feasible mitigation is available	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Temporary	Unquantifiable	Potentially Significant	Mitigation Measure 4.6-c: Conduct Groundwater Quality Tests, Notify the Central Valley RWQCB, and Comply with the Central Valley RWQCB's Waste Discharge Requirements and NPDES Permit	Less than Significant
Biological Resources						
Impact 4.7-a: Loss of Landside and Waterside Woodland and Shaded Riverine Aquatic Habitats	No-Action Alternative: No Phase 4b Project Construction	Permanent	Loss of approximately 35 acres (9.05 landside acres and 25.89 waterside acres) to conform with USACE guidance regarding levee encroachments	Potentially Significant	No feasible mitigation is available	Significant and Unavoidable
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative

**Table ES-2
Summary of Impacts and Mitigation Measures**

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
	Adjacent Levee Alternative (Proposed Action)	Temporary and Permanent	Loss of approximately 43 acres (35.99 landside acres and 7.32 waterside acres)	Significant	Mitigation Measure 4.7-a: Minimize Effects on Woodland Habitat; Implement Woodland Habitat Improvements and Management Agreements; Compensate for Loss of Habitat; and Comply with Section 7 of the Federal Endangered Species Act, Section 2081 of the California Endangered Species Act, and Section 1602 of the California Fish and Game Code	Significant and Unavoidable (short-term) Less than Significant (long-term)
	Fix-in-Place Alternative	Temporary and Permanent	Loss of approximately 61 acres (34.79 landside acres and 26.52 waterside acres)	Significant	Implement Mitigation Measure 4.7-a	Significant and Unavoidable
Impact 4.7-b: Disruption to and Loss of Existing Wildlife Corridors	No-Action Alternative: No Phase 4b Project Construction	Permanent	Loss of approximately 35 acres (9.05 landside acres and 25.89 waterside acres) to conform with USACE guidance regarding levee encroachments	Potentially Significant	No feasible mitigation is available	Significant and Unavoidable
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Permanent	Temporary disturbance and permanent loss of canals, ditches, and their associated habitat values	Significant	Mitigation Measure 4.7-b: Implement Mitigation Measures 4.7-a, “Minimize Effects on Woodland Habitat; Implement Woodland Habitat Improvements and Management Agreements; Compensate for Loss of Habitat; and Comply with Section 7 of the Federal Endangered Species Act, Section 2081 of the California Endangered Species Act, and Section 1602 of the California Fish and Game Code,” and 4.7-e, “Minimize the Potential for Direct Loss of Giant Garter Snake Individuals, Implement All Upland and Aquatic Habitat Improvements and Management Agreements to Ensure Adequate Compensation for Loss of Habitat, and Obtain Incidental Take Authorization”	Significant and Unavoidable
4.7-c: Direct and Indirect Impacts to Jurisdictional Waters of the United States	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action)	Temporary and Permanent	Temporary: 324 acres Permanent: 199 acres	Potentially Significant	Mitigation Measure 4.7-c: Minimize Effects on Jurisdictional Waters of the United States; Complete Detailed Design of Habitat Creation Components and Secure Management Agreements to Ensure Compensation of Waters Filled or Dewatered; and Comply with Section 404, Section 401, Section 10, and Section 1602 Permit Processes	Less than Significant (Beneficial)
	Fix-in-Place Alternative	Temporary and Permanent	Temporary: 324 acres Permanent: 199 acres	Potentially Significant	Implement Mitigation Measure 4.7-c	Less than Significant (Beneficial)

**Table ES-2
Summary of Impacts and Mitigation Measures**

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
4.7-d: Potential Loss of or Disturbance to Special-Status Plant Species and Their Habitats	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Permanent	No special-status plant species found; however additional surveys are needed	Potentially Significant	Mitigation Measure 4.7-d: Minimize Impacts on Special-Status Plant Species	Less than Significant
4.7-e: Giant Garter Snake Mortality, Injury, and/or Disturbance to Habitat	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Permanent	Approximately 23 acres of canal/ditch and 259 acres of rice	Potentially Significant	Mitigation Measure 4.7-e: Minimize the Potential for Direct Loss of Giant Garter Snake Individuals, Implement All Upland and Aquatic Habitat Improvements and Management Agreements to Ensure Adequate Compensation for Loss of Habitat, and Obtain Incidental Take Authorization	Less than Significant
4.7-f: Impacts on Swainson's Hawk and Other Special Status Birds	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Foraging impacts: unknown, but potentially substantial Nesting impacts: 110.77 acres	Potentially Significant	No feasible mitigation is available	Significant and Unavoidable
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
4.7-g: Potential Loss and/or Direct Impact of Elderberry Shrubs and/or Potential Loss of Valley Elderberry Longhorn Beetle	Adjacent Levee Alternative (Proposed Action)	Permanent	Foraging impacts: 253 acres Nesting impacts: 91.21 acres	Potentially Significant	Mitigation Measure 4.7-f: Minimize Potential Impacts on Swainson's Hawk and Other Special-Status Birds Foraging and Nesting Habitat, Monitor Active Nests during Construction, Implement All Upland and Agricultural Habitat Improvements and Management Agreements to Compensate for Loss of Quantity and Quality of Foraging Habitat, Obtain Incidental Take Authorization; and Implement Mitigation Measure 4.7-a, "Minimize Effects on Woodland Habitat, Implement all Woodland Habitat Improvements and Management Agreements, Compensate for Loss of Habitat, and Comply with Section 7 of the Federal Endangered Species Act, Section 2081 of the California Endangered Species Act, and Section 1602 of the California Fish and Game Code"	Significant and Unavoidable
	Fix-in-Place Alternative	Permanent	Foraging impacts: 251 acres Nesting impacts: 145.52 acres	Potentially Significant	Implement Mitigation Measure 4.7-f	Significant and Unavoidable
	No-Action Alternative: No Phase 4b Project Construction	Permanent	Unknown	Potentially Significant	No feasible mitigation is available	Significant and Unavoidable
	No-Action Alternative: Potential Levee Failure	Not applicable	Unquantifiable	Too Speculative	No mitigation is required	Significant and Unavoidable

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
	Adjacent Levee Alternative (Proposed Action)	Permanent	Unknown	Potentially Significant	Mitigation Measure 4.7-g: Conduct Focused Surveys for Elderberry Shrubs as Needed, Implement All Woodland Habitat Improvements and All Management Agreements, Ensure Adequate Compensation for Loss of Shrubs, and Obtain Incidental Take Authorization	Less than Significant
4.7-h: Impacts on Northwestern Pond Turtle and Burrowing Owl	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Permanent	Approximately 23 acres of canal/ditch	Potentially Significant	Mitigation Measure 4.7-h: Conduct Focused Surveys for Northwestern Pond Turtles, Relocate Turtles, Minimize Potential Impacts on Burrowing Owls, and Relocate Owls as Needed	Less than Significant
4.7-i: Disturbance to Special-Status Vernal Pool Crustaceans	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Temporary and Permanent	Unquantifiable	Potentially Significant	Mitigation Measure 4.7-i: Survey for Presence or Absence of Vernal Pool Invertebrates, Avoid Disrupting Vernal Pool Habitat, and Implement Measures to Mitigate Loss of Habitat	Less than Significant

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
4.7-j: Temporary Construction-related Impacts to Fish and Aquatic Habitats	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Temporary and Permanent	Unquantifiable	Potentially Significant	Mitigation Measure 4.7-j: Implement Mitigation Measure 4.6-a, "Implement Standard Best Management Practices, Prepare and Implement a Stormwater Pollution Prevention Plan, Prepare and Implement a Spill Containment Plan, and Comply with National Pollutant Discharge Elimination System Permit Conditions;" Implement a Feasible Construction Work Window that Minimizes Impacts to Special-Status Fish Species for Any In-Water Activities; and Implement Operational Controls and a Fish Rescue Plan that Minimizes Impacts to Fish Associated with Cofferdam Construction and Dewatering	Less than Significant
4.7-k: Impacts to Fish Species Associated with Operation of Pumping Plants and Surface Drains	No-Action Alternative: No Phase 4b Project Construction	Temporary or Permanent	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Temporary or Permanent	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Permanent	Unquantifiable	Less than Significant	No mitigation is required	Less than Significant

**Table ES-2
Summary of Impacts and Mitigation Measures**

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
4.7-l: Impacts on Successful Implementation of Habitat Conservation Plans	No-Action Alternative: No Phase 4b Project Construction	Permanent	See Impacts 4.7-a and 4.7-c through 4.7-h	Significant	No feasible mitigation is available	Significant and Unavoidable
	No-Action Alternative: Potential Levee Failure	Not Applicable	Not Applicable	Less than Significant	No mitigation is required	Less than Significant
	Adjacent Levee Alternative (Proposed Action)	Permanent	See Impacts 4.7-a and 4.7-c through 4.7-h	Significant	Mitigation Measure 4.7-l: Ensure that Project Encroachment Does Not Jeopardize Successful Implementation of the NBHCP and Implement Mitigation Measures 4.7-a and 4.7-c through 4.7-h	Less than Significant
	Fix-in-Place Alternative	Permanent	See Impacts 4.7-a and 4.7-c through 4.7-h	Significant	Implement Mitigation Measure 4.7-l	Significant and Unavoidable
Cultural Resources						
Impact 4.8-a: Potential Changes to Elements of Reclamation District 1000 and the Rural Landscape District	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Permanent	Unquantifiable	Less than Significant	No mitigation is required	Less than Significant
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Permanent	Unquantifiable	Potentially Significant	Mitigation Measure 4.8-a: Incorporate Mitigation Measures to Documents Regarding Any Elements Contributing to RD 1000 and Rural Landscape District and Distribute the Information to the Appropriate Repositories	Less than Significant

Table ES-2 Summary of Impacts and Mitigation Measures						
Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Impact 4.8-b: Potential Damage or Disturbance to Known Archaeological or Architectural Resources from Ground-Disturbance or Other Construction-Related Activities	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Permanent	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Permanent	Two prehistoric archaeological deposits, an historic farmstead, and an historic archaeological deposit	Potentially Significant	Mitigation Measure 4.8-b: Avoid Ground Disturbance Near Eligible and Listed Resources to the Extent Feasible, Prepare a Finding of Effect, and Resolve Any Adverse Effects through Preparation of an HPTP	Significant and Unavoidable
Impact 4.8-c: Potential Damage to or Destruction of Previously Unidentified or Undiscovered Cultural Resources from Ground-Disturbance or Other Construction-Related Activities	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Permanent	Unquantifiable	Potentially Significant	Mitigation Measure 4.8-c: Train Construction Workers before Construction, Monitor Construction Activities, Stop Potentially Damaging Activities, Evaluate Any Discoveries, and Resolve Adverse Effects on Eligible Resources, if Encountered	Significant and Unavoidable

**Table ES-2
Summary of Impacts and Mitigation Measures**

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Impact 4.8-d: Potential Discovery of Human Remains during Construction	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Temporary	Unquantifiable	Potentially Significant	Mitigation Measure 4.8-d: Stop Work Within An Appropriate Radius Around the Find, Notify the Applicable County Coroner and Most Likely Descendant, and Treat Remains in Accordance with State Law and Measures Stipulated in an HPTP Developed in Consultation between the Project Proponent(s) and the SHPO	Significant and Unavoidable
Paleontological Resources						
Impact 4.9-a: Disturbance of Unknown Unique Paleontological Resources during Earthmoving Activities	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Permanent	Not Applicable	Less than Significant	No mitigation is required	Less than Significant
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Permanent	Unquantifiable	Potentially Significant	Mitigation Measure 4.9-a: Conduct Construction Personnel Training and, if Paleontological Resources are Found, Stop Work Near the Find and Implement Mitigation in Coordination with a Professional Paleontologist	Less than Significant

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Transportation and Circulation						
Impact 4.10-a: Temporary and Short-Term Increases in Traffic on Local Roadways	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action)	Temporary	Haul trips per day: 540 for Sacramento River east levee Reach A:16–19A, 360 for Sacramento River east levee Reach A:19B–20, 120 for American River north levee Reach I:1–4, 810 for west levee of NEMDC North (Reaches F–G), and 566 for west levee of PGCC (Reach E); temporary and short-term road closures, lane closures, and traffic controls, specifically closure of Garden Highway and the Arden-Garden Connector	Significant	Mitigation Measure 4.10-a: Prepare and Implement a Traffic Safety and Control Plan for Construction-Related Truck Trips	Significant and Unavoidable

**Table ES-2
Summary of Impacts and Mitigation Measures**

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
	Fix-in-Place Alternative	Temporary	Same as the Proposed Action except 960 haul trips for Sacramento River east levee (7% greater than the Proposed Action)	Significant	Implement Mitigation Measure 4.10-a	Significant and Unavoidable
Impact 4.10-b: Temporary and Short-Term Increases in Traffic Hazards on Local Roadways	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Temporary	Reconstruction of multiple Garden Highway intersections and private parcel ramps; slowed traffic due to haul truck traffic; and road and lane closures (see Impact 4.10-a)	Significant	Mitigation Measure 4.10-b: Implement Mitigation Measure 4.10-a, "Prepare and Implement a Traffic Safety and Control Plan for Construction-Related Truck Trips"	Potentially Significant and Unavoidable
Impact 4.10-c: Temporary and Short-Term Disruption of Emergency Service Response Times and Access	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Temporary	Numerous temporary road closures and detours; and road and lane closures (see Impact 4.10-a)	Potentially Significant	Mitigation Measure 4.10-c: Implement Mitigation Measure 4.10-a, "Prepare and Implement a Traffic Safety and Control Plan for Construction-Related Truck Trips"	Less than Significant
Impact 4.10-d: Conflict with Adopted Policies, Plans, or Programs Supporting Alternative Transportation	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Temporary	Multiple road and lane closures (see Impact 4.10-a) affecting existing and planned bicycle routes	Significant	Mitigation Measure 4.10-d: Prepare and Implement a Bicycle Detour Plan for Project Area Roadways and Bike Trails, Including Garden Highway and the NEMDC Levees	Less than Significant
Air Quality						
Impact 4.11-a: Temporary and Short-Term Emissions of ROG, NO _x , and PM ₁₀ during Construction	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action)	Temporary	Total maximum mitigated emissions (combined Phase 4a and 4b Projects) in Sacramento County: ROG 78 lb/day NO _x 530 lb/day	Significant	Mitigation Measure 4.11-a: Implement Applicable District-Recommended Control Measures to Minimize Temporary Emissions of ROG, NO _x , and PM ₁₀ during Construction	Less than Significant

**Table ES-2
Summary of Impacts and Mitigation Measures**

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
	Fix-in-Place Alternative	Temporary	PM₁₀ 99 lb/day Sutter County: ROG 317 lb/day NO_x 114 lb/day PM₁₀ 26 lb/day Total maximum mitigated emissions (combined Phase 4a and 4b Projects) in Sacramento County: ROG 78 lb/day NO_x 530 lb/day PM₁₀ 81 lb/day Sutter County: ROG 17 lb/day NO_x 114 lb/day PM₁₀ 26 lb/day	Significant	Implement Mitigation Measure 4.11-a	Less than Significant
Impact 4.11-b: General Conformity with the Applicable Air Quality Plan	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Temporary	Mitigation would reduce impacts to the Federal <i>de minimis</i> thresholds	Less than Significant	No mitigation is required	Less than Significant

Table ES-2 Summary of Impacts and Mitigation Measures						
Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Impact 4.11-c: Long-Term Changes in Emissions of ROG, NO _x , and PM ₁₀ Associated with Project Implementation	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Temporary	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Permanent	Unquantifiable	Less than Significant	No mitigation is required	Less than Significant
Impact 4.11-d: Exposure of Sensitive Receptors to Toxic Air Emissions	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Temporary	Unquantifiable	Less than Significant	No mitigation is required	Less than Significant
Noise						
Impact 4.12-a: Generation of Temporary and Short-Term Construction Noise	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Temporary	Unquantifiable	Less than Significant	No feasible mitigation is available	Less than Significant

**Table ES-2
Summary of Impacts and Mitigation Measures**

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Temporary	79–90 dBA without feasible noise control (50 feet from nearest noise source); highest noise level would be 77.9 dBA L _{eq} (100 feet from construction activities)	Significant	Mitigation Measure 4.12-a: Implement Noise-Reducing Construction Practices, Prepare and Implement a Noise Control Plan, and Monitor and Record Construction Noise Near Sensitive Receptors	Significant and Unavoidable
Impact 4.12-b: Temporary and Short-term Exposure of Sensitive Receptors to, or Temporary and Short-term Generation of, Excessive Groundborne Vibration	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Temporary	Unquantifiable	Less than Significant	No feasible mitigation is available	Less than Significant
	Adjacent Levee Alternative (Proposed Action)	Temporary	0.089 in/sec PPV or 87 VdB (for bulldozers)	Significant	Mitigation Measure 4.12-b: Implement Vibration-Reducing Construction Practices, Prepare and Implement a Groundborne Vibration Control Plan, and Monitor and Record Construction Groundborne Vibration Near Sensitive Receptors	Less than Significant
	Fix-in-Place Alternative	Temporary	0.089 in/sec PPV or 87 VdB (for bulldozers)	Significant	Implement Mitigation Measure 4.12-b	Significant and Unavoidable
Impact 4.12-c: Temporary and Short-term Exposure of Residents to Increased Traffic Noise Levels from Truck Hauling Associated With Borrow Activity	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative

Table ES-2 Summary of Impacts and Mitigation Measures						
Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Temporary	66.4 dBA L _{eq} (50 feet from roadway centerline), resulting in interior noise levels of 41.4 dBA L _{eq}	Potentially Significant	Mitigation Measure 4.12-c: Implement Noise-Reduction Measures to Reduce the Impacts of Haul Truck Traffic Noise	Significant and Unavoidable
Impact 4.12-d: Long-Term Increases in Project-Generated Noise	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Permanent	78–88 dBA 3–5 feet away; meets compliance standards	Less than Significant	No mitigation is required	Less than Significant
Impact 4.12-e: Temporary and Short-Term Exposure of People Working in the Project Area to Excessive Airport Noise Levels	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Temporary	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Temporary	Would not exceed Airport noise threshold levels	Less than Significant	No mitigation is required	Less than Significant

**Table ES-2
Summary of Impacts and Mitigation Measures**

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Recreation						
Impact 4.13-a: Effects Related to the Proposed Natomas Levee Class 1 Bike Trail Project	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Temporary and Permanent	Unquantifiable	Significant	No feasible mitigation is available	Short-Term: Significant and Unavoidable Long-Term: Less than Significant (Beneficial)
Impact 4.13-b: Permanent Disruption of Recreational Activities and Facilities	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	Significant	No mitigation is required	Significant and Unavoidable
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Permanent	Permanent encroachment on City parks, nature preserves, a private golf course, and an off-street bikeway	Significant	Mitigation Measure 4.13-b: Compensate City of Sacramento Department of Parks and Recreation for Loss of Parkland and Park Amenities	Significant and Unavoidable

Table ES-2
Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Impact 4.13-c: Temporary Changes in Recreational Opportunities during Project Construction Activities	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Temporary	Temporary encroachment on City parks, nature preserves, a private golf course, and an off-street bikeway	Significant	Mitigation Measure 4.13-c(1): Prepare and Implement a Bicycle Detour Plan for All Bicycle Trails and On-Street Bicycle Routes, Provide Detours for Bicycle Facilities, and Coordinate with City and/or County Departments of Parks and Recreation to Repair of Damage to Recreational Facilities Mitigation Measure 4.13-c(2): Provide Construction Period Information on Recreational Facility Closures and Detours and Provide Detours for Alternate Routes to Marinas	Less than Significant
Visual Resources						
Impact 4.14-a: Alteration of Scenic Vistas, Scenic Resources, and Existing Visual Character of the Project Area	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	Potentially Significant	No mitigation is required	Significant and Unavoidable
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Permanent	Tree removal is quantified under “Biological Resources”; other visual impacts are unquantifiable	Significant	Mitigation Measure 4.14-a: Implement Mitigation Measures 4.7-a, “Minimize Effects on Woodland Habitat; Implement all Woodland Habitat Improvements and Management Agreements; Compensate for Loss of Habitat; and Comply with Section 7 of the Federal Endangered Species Act,	Significant and Unavoidable

**Table ES-2
Summary of Impacts and Mitigation Measures**

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Section 1602 of the California Fish and Game Code, and Section 2081 of the California Endangered Species Act Permit Conditions,” and 4.13-b, “Compensate City of Sacramento Department of Parks and Recreation for Loss of Parkland and Park Amenities”						
Impact 4.14-b: New Sources of Light and Glare that Adversely Affect Views	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Temporary	Unquantifiable	Significant	Mitigation Measure 4.14-b: Direct Lighting Away from Adjacent Properties	Significant and Unavoidable
Utilities and Service Systems						
Impact 4.15-a: Potential Temporary Disruption of Irrigation Water Supply	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Temporary	Unquantifiable	Potentially Significant	Mitigation Measure 4.15-a: Coordinate with Irrigation Water Supply Users Before and During All Irrigation Infrastructure Modifications and Implement Measures to Minimize Interruptions of Supply	Less than Significant

Table ES-2 Summary of Impacts and Mitigation Measures						
Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Impact 4.15-b: Potential Disruption of Utility Service	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Temporary	Unquantifiable	Potentially Significant	Mitigation Measure 4.15-b: Verify Utility Locations, Coordinate with Utility Providers, Prepare and Implement a Response Plan, and Conduct Worker Training with Respect to Accidental Utility Damage	Less than Significant
Impact 4.15-c: Increases in Solid Waste Generation	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Temporary	Up to 100,000 cy solid waste; would not exceed remaining capacity	Less than Significant	No mitigation is required	Less than Significant
Hazards and Hazardous Materials						
Impact 4.16-a: Accidental Spills of Hazardous Materials	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact

Table ES-2 Summary of Impacts and Mitigation Measures						
Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Temporary or Permanent	Unquantifiable	Less than Significant	No mitigation is required	Less than Significant
Impact 4.16-b: Potential Land Use Constraints Due to Contamination within the Pumping Plant No. 8 Footprint and Potential Exposure of Construction Workers and the General Public to Contaminated Groundwater	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Temporary	Unquantifiable	Potentially Significant	Mitigation Measure 4.16-b: Cooperate with Olympian Oil and Regulatory Agencies to Preserve, Modify, or Close Existing Groundwater Monitoring Wells at the Olympian Oil Site	Less than Significant
Impact 4.16-c: Potential Exposure of Construction Workers and the General Public to Hazardous Materials Encountered at Project Sites	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	Potentially Significant	No mitigation is required	Significant and Unavoidable
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative

Table ES-2 Summary of Impacts and Mitigation Measures						
Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Temporary	Unquantifiable	Potentially Significant	Mitigation Measure 4.16-c(1): Complete Recommendations Included in Phase I and/or II ESAs and Implement Required Measures Mitigation Measure 4.16-c(2): Complete Phase I and/or II ESAs, Soil, and/or Groundwater Investigations in Phase 4b Project Footprint Areas Not Covered by the Existing Phase I and/or II ESAs, and Implement Required Measures (e.g., Site Management and/or Other Contingency Plans)	Less than Significant
Impact 4.16-d: Interference with an Adopted Emergency Evacuation Plan	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Temporary	Unquantifiable	Significant	Mitigation Measure 4.16-d: Implement Mitigation Measure 4.10-a, “Prepare and Implement a Traffic Safety and Control Plan for Construction-Related Truck Trips,” and Mitigation Measure 4.10-c, “Notify Emergency Service Providers about Project Construction and Maintain Emergency Access or Coordinate Detours with Providers”	Less than Significant
Impact 4.16-e: Possible Hazardous Emissions or Handling of Hazardous or Acutely Hazardous Materials, Substances, or Waste within One-Quarter Mile of an Existing or Proposed School	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Less than Significant	No mitigation is required	Less than Significant

**Table ES-2
Summary of Impacts and Mitigation Measures**

Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Temporary	Seven schools are located within one-quarter mile of the Phase 4b Project footprint	Significant	Mitigation Measure 4.16-e: Notify the Natomas Unified School District and Affected Schools within One-Quarter Mile of Project Construction Activities	Less than Significant
Impact 4.16-f: Potential for Higher Frequency of Collisions between Aircraft and Wildlife at Sacramento International Airport	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Temporary	Unquantifiable	Less than Significant	No mitigation is required	Less than Significant
Impact 4.16-g: Aircraft Safety Hazards Resulting from Project Implementation	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Temporary	Unquantifiable	Potentially Significant	Mitigation Measure 4.16-g: Consult with SCAS and the FAA during Design of the Proposed Natomas Levee Class I Bike Trail to Implement Appropriate Airport Safety Precautions	Significant and Unavoidable

Table ES-2 Summary of Impacts and Mitigation Measures						
Resource Topic/Impact	Alternative	Duration of Impact	Quantification of Impact (Where Applicable)	Level of Significance before Mitigation	Mitigation Measure	Level of Significance after Mitigation
Impact 4.16-h: Potential Exposure to Wildland Fires	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Temporary	Unquantifiable	Potentially Significant	Mitigation Measure 4.16-h: Prepare and Implement a Fire Management Plan to Minimize Potential for Wildland Fires	Less than Significant
Environmental Justice						
Impact 4.17-a: Potential to Have a Disproportionate High and Adverse Environmental Impact on any Minority or Low-Income Populations	No-Action Alternative: No Phase 4b Project Construction	Not Applicable	Not Applicable	No Impact	No mitigation is required	No Impact
	No-Action Alternative: Potential Levee Failure	Not Applicable	Unquantifiable	Too Speculative	No mitigation is required	Too Speculative
	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Temporary and Permanent	Unquantifiable	Significant	Mitigation Measure 4.17-a: Increase the Direct Benefits of the Project for the Ancestors of the Native American Tribes	Less than Significant

1 INTRODUCTION AND STATEMENT OF PURPOSE AND NEED

1.1 INTRODUCTION

This document is a joint environmental impact statement/environmental impact report (EIS/EIR) that has been prepared by both the U.S. Army Corps of Engineers (USACE), Sacramento District as Federal lead agency under the National Environmental Policy Act (NEPA) and the Sacramento Area Flood Control Agency (SAFCA) as state lead agency under the California Environmental Quality Act (CEQA). See Code of Federal Regulations (CFR), Title 40, Sections 1502.25, 1506.2, and 1506.4 (authority for combining Federal and state environmental documents) and California Code of Regulations (CCR), Title 14, Division 6, Chapter 3 (State CEQA Guidelines), CCR Section 15222 (“Preparation of Joint Documents”). See also 33 CFR Part 230 (USACE NEPA regulations) and 33 CFR Part 325, Appendix B (“NEPA Implementation Procedures for the [USACE] Regulatory Program”).

This EIS/EIR has been prepared to evaluate the potential environmental impacts of SAFCA’s Natomas Levee Improvement Program (NLIP), Phase 4b Landside Improvements Project (Phase 4b Project), and will be submitted to Congress in late 2010 to support approval of USACE’s American River Watershed Common Features Project/Natomas Post-authorization Change Report (Common Features/Natomas PACR), which is an element of the American River Watershed Common Features Project General Re-evaluation Report (Common Features GRR). The Common Features/Natomas PACR includes all four project phases (1, 2, 3, and 4a and 4b) of the Landside Improvements Project, which is a component of the NLIP. These project phases are summarized in Section 1.5, “Environmental Regulatory Framework and Relationship of this EIS/EIR to Other Documents.” This EIS/EIR summarizes environmental analyses for all previously approved project phases, as well as previously released public draft documents of the Landside Improvements Project, including alternatives previously considered, analyzed, and rejected from further consideration, and evaluates at a project-level the environmental effects of the proposed Phase 4b Project (Proposed Action/Proposed Project), hereinafter referred to as “the project.” This EIS/EIR evaluates project alternatives, and includes mitigation to reduce, minimize, or avoid, where feasible, any significant and potentially significant adverse impacts. This information will become part of the overall request for congressional review and approval of the Common Features/Natomas PACR.

1.1.1 SCOPE OF ENVIRONMENTAL ANALYSIS

The overall purpose of the multi-phase NLIP is to bring the entire 42-mile Natomas Basin perimeter levee system into compliance with applicable Federal and state standards for levees protecting urban areas through a program of proposed levee improvements to address levee height deficiencies, levee seepage potential, and streambank erosion conditions along the Natomas Basin perimeter levee system. The Landside Improvements Project, which is a component of the NLIP, consists of four phases (1, 2, 3, and 4a and 4b). The Phase 1 Project was completed by SAFCA in 2008. The Phase 2 Project was analyzed in previous environmental documents (see Section 1.5.4.2, below) and is currently under construction. The Phase 3 Project was analyzed in previous environmental documents (see Section 1.5.4.3, below) and preliminary construction began in fall 2009, with major levee construction planned to begin in 2010, assuming receipt of all required environmental clearances and permits. The Phase 4a Project was analyzed in previous environmental documents (see Section 1.5.4.4, below) and preliminary construction is planned to begin in 2011, assuming receipt of all required environmental clearances and permits. See Section 4.18, “Summary of Environmental Impacts and Mitigation Measures from Previous Natomas Levee Improvement Program Landside Improvements Project Phases 1–4a,” for a summary of impacts and mitigation measures associated with the Phase 1–4a Projects.

The Phase 4b Project, builds upon a program of improvements analyzed in previous environmental documents, listed in Section 1.5 below, for achieving flood risk damage reduction for the 53,000-acre Natomas Basin, which is encircled by 42 miles of levees (**Plate 1-1**). The Phase 4b Project is the final subphase of the Landside

Improvements Project and is the subject of this EIS/EIR, consists of improvements to the remaining portion of the Natomas Basin's perimeter levee system in the City of Sacramento and in Sacramento and Sutter Counties, California. The improvements consist of levee improvements, associated landscape and irrigation/drainage infrastructure modifications, and habitat creation and management.

The Common Features/Natomas PACR is being prepared by USACE to consider the level of Federal participation in flood risk management for the Natomas Basin. The schedule for completing the Common Features/Natomas PACR has been accelerated due to the high risk of levee failure in the Natomas Basin. The accelerated schedule will allow USACE to begin construction as early as 2012 (assuming Congressional authorization and receipt of all environmental clearances and permits) and reduce the risk of flooding and billions of dollars of property damage in the Natomas Basin.

USACE plans to implement the Phase 4b Project; however, in the event the Common Features/Natomas PACR is not approved by Congress, this EIS/EIR will support SAFCA's implementation of the Phase 4b Project, should SAFCA choose to proceed without additional Federal participation.

For SAFCA to implement the Phase 4b Project, SAFCA is requesting permission from USACE pursuant to Section 14 of the Rivers and Harbors Act of 1899 (33 United States Code [USC] Section 408, hereinafter referred to as "Section 408") for alteration of Federal project levees; Section 404 of the Clean Water Act (33 USC Section 1344, hereinafter referred to as "Section 404") for the placement of fill in jurisdictional waters of the United States; and Section 10 of the Rivers and Harbors Act of 1899 (33 USC Section 403, hereinafter referred to as "Section 10") for work in, over, or under navigable waters of the United States (such as excavation of material from or deposition of material into navigable waters). This EIS/EIR covers the requested permissions from USACE, if needed.

NEPA evaluation is required when a major Federal action, including a permit, authorization, or approval, is under consideration and may have significant impacts on the quality of the natural and human environment. The Phase 4b Project has the potential to significantly affect the natural and human environment; therefore, USACE has prepared this EIS. Compliance with CEQA is required when a state or local public agency proposes to carry out or approve a project that may have a significant adverse effect on the physical environment (i.e., significant impact). As the lead agency for CEQA compliance, SAFCA has determined that the proposed project may have significant impacts on the physical environment and, therefore, has prepared this EIR.

The project proponent(s) may also need to obtain several state approvals or permits, to implement the Phase 4b Project: California Central Valley Flood Protection Board (CVFPB) encroachment permit, California Surface Mining and Reclamation Act permit, Clean Water Act Section 401 water quality certification, Clean Water Act Section 402 National Pollutant Discharge Elimination System permit, California Fish and Game Code Section 2081 incidental take authorization, California Fish and Game Code Section 1602 Streambed Alteration Agreement, California Department of Transportation (Caltrans) encroachment permit, and permits from two local air districts, Sacramento Metropolitan Air Quality Management District and Feather River Air Quality Management District.

1.1.1.1 RELATIONSHIP BETWEEN THE FEDERAL INTEREST AND THE LOCALLY PREFERRED PLAN

Federal Interest

This section will describe the process used by USACE to determine what the Federal interest in the project is.

In the civil works project planning context, National Economic Development (NED) can be generally defined as economic benefit-cost analysis for plan formulation, evaluation, and selection that is used to evaluate the Federal interest in pursuing a prospective project plan. The P&G analytical framework for the use of NED analysis relates specifically to civil works.

Civil works project planning is as follows:

The Federal Objective:

- (a) The Federal objective of water and related land resource project planning is to contribute to national economic development consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements.*
- (b) Contributions to NED are increases in the net value of the national output of goods and services, expressed in monetary units. Contributions to NED are the direct net benefits that accrue in the planning area and the rest of the Nation. Contributions to NED include increases in the net value of those goods and services that are marketed, and also of those that may not be marketed.*
- (c) The Federal Objective for the relevant planning setting should be stated in terms of an expressed desire to alleviate problems and realize opportunities related to the output of goods and services or to increased economic efficiency. (P&G, Chapter I, Section II)*

Plan Selection:

- (a) The alternative plan with the greatest net economic benefit consistent with protecting the Nation's environment (the NED plan) is to be selected unless the Secretary of a department or head of an independent agency grants an exception when there is some overriding reasons for selecting another plan, based on other Federal, State, local and international concerns. (P&G, Chapter I, Section X)*

Together, the Federal objective and plan selection criterion for civil works projects indicate that, at the individual project level, planners should formulate, evaluate, and select plans to recommend for Federal involvement that provide the greatest net economic benefits to the nation as a whole, subject to an environmental protection constraint. This direction is based on the presumption that Federal civil works investments should be considered only for project plans that maximize net economic benefits—measured in terms of a single index of monetary value realized by the nation as a whole. That is, the Federal objective and plan selection rule impose a “national economic efficiency” standard for Federal participation in a civil works project without regards to the distributional consequences for affected individuals (i.e., who gains and who loses). Planners are directed to formulate plans for relevant project purposes (e.g., inland navigation) that contribute to the NED objective, and to recommend for Federal implementation the plan that maximizes the difference between money measures of aggregate benefits and costs, as calculated by summing measured economic gains and losses (including the financial costs required to implement projects) realized by affected individuals. Projects may deviate from the NED Plan if requested by the non-Federal sponsor and approved by the Assistant Secretary of the Army (ASA) Civil Works.

Locally Preferred Plan Increment

This section describes what a Locally Preferred Plan (LPP) increment is and how it is related to the NED Plan.

In some instances, a non-Federal sponsor may not be able to afford or otherwise support the NED Plan. Plans requested by the non-Federal sponsor that deviate from these plans shall be identified as the LPP. When the LPP is clearly of less scope and cost and meets the Administration's policies for high-priority outputs, an exception for deviation is usually granted by ASA. In making a decision to recommend an LPP smaller in scope and costs than the NED Plans, the applicable USACE district should assist the sponsor in identifying and assessing the financial capability of other potential non-Federal interests who may be willing and able to participate in plan development and implementation. In all cases, the LPP must have greater net benefits than smaller scale plans, and enough

alternatives must be analyzed during the formulation and evaluation process to ensure that net benefits do not maximize at a smaller scale than the sponsor's preferred plan. If the sponsor prefers a plan more costly than the NED Plan, the NER Plan or the combined NED/NER Plan, and the increased scope of the plan is not sufficient to warrant full Federal participation, ASA (Civil Works) may grant an exception as long as the sponsor pays the difference in cost between those plans and the LPP. The LPP, in this case, must have outputs similar in-kind, and equal to or greater than the outputs of the Federal plan (NED Plan). It may also have other outputs. The incremental benefits and costs of the LPP, beyond the Federal plan, must be analyzed and documented in feasibility reports.

Hydraulics

The Natomas Basin is part of the Sacramento River Flood Control Project (SRFCP), an integrated system of levee-protected basins. The design of the SRFCP anticipates that agricultural basins will be protected by levees that are at least high enough to contain flood waters comparable to those produced by the floods of 1907 and 1909, and later modified to include floods that occurred in the 1920s and 1930s. The flood water elevations designated for each basin in the system were specified in a Memorandum of Understanding (MOU) between USACE and the State of California. The MOU was originally developed in 1953 and later amended. The design specified in the MOU calls for agricultural levees to be at least equal in height to the designated water surface elevation ("1957 profile") plus three to six feet of freeboard to address hydrologic and engineering uncertainty and contain wind-driven waves.

SAFCA has performed a risk analysis, considering uncertainty in hydraulic and hydrologic inputs, evaluating the potential for these levee raises to cause adverse hydraulic impacts (or transfer of risk) to other basins in the SRFCP. This evaluation assumed the authorized profile of all agricultural project levees, while the levees protecting urban areas were assumed to be raised to the levels mandated by State law. SAFCA carried out this analysis using a UNET hydraulic model originally developed by USACE and modified by MBK Engineers that fully incorporates the hydrologic and hydraulic data developed in connection with the Sacramento and San Joaquin Rivers' Comprehensive Study. The risk analysis used USACE's HEC-FDA software and relied on standard probability distributions to account for uncertainty in discharge and stage. The risk analysis addressed uncertainty in levee performance outside of the Natomas Basin by assuming that levees would function as weirs when water surface elevations exceed the top of levee. It is highly likely that many levees in the SRFCP will fail when water rises above the design flood elevation but prior to water reaching the top of the levee. The deterministic assumption that levees will not fail even when water exceeds the top of the levee provides a very conservative approach to estimating the project's potential impacts and probably overstates any potential risk.

For purposes of the analysis, the key indicator of risk transfer was whether levee raises around the Natomas Basin significantly increased the annual probability of levee overtopping (annual exceedance probability [AEP]) at any of the several index points established for the purpose of the analysis along levees outside the Natomas Basin. To reflect the effects of upstream levee overtopping on downstream water surface elevations, the affected levees were converted to weirs and standard assumptions were made regarding levee/weir lengths and resulting discharge patterns. The model compared water surface elevations upstream and downstream of the Natomas Basin with and without the proposed levee raises in place under a range of flow conditions (0.01 AEP [100-year], 0.005 AEP [200-year], and 0.002 AEP [500-year]). Considering the uncertainty in flows and stages, AEP values were computed for top of levee elevations at the index locations and compared system wide for with and without project conditions.

The risk analysis indicated that raising the levees around the Natomas Basin would have no significant effect on AEPs outside the Natomas Basin. On this basis, SAFCA concluded that raising the Natomas levees to meet State urban levee requirements would not result in any adverse hydraulic impacts on other basins protected by the SRFCP. This analysis was included in the review documentation supporting the Section 408 approval by USACE.

The hydraulic modeling developed for the Comprehensive Study was based upon National Geodetic Vertical Datum of 1929 (NGVD29) rather than the North American Vertical Datum of 1988 (NAVD88) datum. As indicated in the discussion of risk and uncertainty, this results in additional uncertainty in the stage/frequency relationship. USACE, Sacramento District is presently in the process of updating and refining the hydraulic models, which will be used to confirm/refine the system analysis of hydraulic impacts as part of the Common Features GRR.

In this EIS/EIR, because there is uncertainty about the vertical datum used in the hydraulic model, there is associated uncertainty in the n-year frequency estimates of water surface elevations. Therefore, while it appears as if raises are in the Federal interest, the amount of levee raise cannot be optimized. For the follow-on Common Features GRR, the model will be converted to the NAVD88 vertical datum, and the amount of levee raise will be optimized. At that point, a definitive analysis of hydraulic impacts due to these levee raises will be made, and any needed mitigation determined.

Levee fixes as part of this EIS/EIR for below and up to the top of levee do not cause any hydraulic impacts because there is no change to the water surface profiles between with and without project conditions. Further discussion on this topic is contained in **Appendix C1**.

Alternatives

This EIS/EIR describes three alternatives: No-Action, Fix-in-Place, and Adjacent Levee Alternatives. The Proposed Action is the Adjacent Levee Alternative, which is also the LPP. USACE, however, has not determined if the levee raise, and improvements to the Natomas East Main Drainage Canal (NEMDC) North (Reaches F–G) and the American River north levee (Reach I:1–4), will be in the Federal interest (NED Plan). USACE will recommend to Congress the NED plan, which is the Adjacent Levee Alternative without the levee raise or improvements to the NEMDC North (Reaches F–G) and the American River north levee (Reach I:1–4). The Locals will then agree to pay the difference between the NED Plan and the LPP, which is ultimately what could be constructed.

Under NEPA, an EIS must consider all feasible alternatives and consider the worst-case scenario to disclose to the public all potential impacts. This EIS/EIR considers the impacts associated with the levee raise, and improvements to NEMDC North (Reaches F–G) and the American River north levee (Reach I:1–4) because they will be constructed as part of the project and funded by the non-Federal sponsor. USACE has evaluated the LPP and determined that the implementation of that alternative has a greater net benefit than the smaller scale plans.

1.1.2 LEAD AGENCIES, COOPERATING AGENCY, AND NON-FEDERAL SPONSOR

USACE is the Federal lead agency for NEPA, and SAFCA is the California lead agency for CEQA.

The Federal Aviation Administration (FAA) is serving as a cooperating agency for NEPA. In the event that SAFCA and USACE select an alternative that requires the Sacramento International Airport (Airport) to change its Airport Layout Plan or seek a release from Federal Airport Improvement Grant assurances, the FAA would use this EIS/EIR in exercising its decision-making authority under 49 USC Section 47107 regarding whether to approve those actions. The CVFPB is serving as a non-Federal sponsor of USACE's Common Features GRR and Common Features/Natomas PACR, and is concerned about integrating overall flood damage reduction in Sacramento.

1.1.3 PURPOSE AND INTENDED USES OF THIS DOCUMENT

The purpose of this EIS/EIR is to evaluate the potential significant environmental impacts of the Phase 4b Project.

This EIS/EIR will be used to support Congressional approval of USACE's Common Features/Natomas PACR. In the event Congress does not authorize USACE to construct the Phase 4b Project, and SAFCA chooses to proceed with the Phase 4b Project without additional Federal participation, this EIS/EIR will be used to support USACE's decisions regarding whether to grant or deny permission to SAFCA for the Phase 4b Project pursuant to Sections 408, 404, and 10; and SAFCA's decision regarding whether to approve the Phase 4b Project.

SAFCA will consider whether or not to certify the EIR and approve the Phase 4b Project in fall 2010. This decision will be based on numerous factors, including the potential environmental impacts and mitigation measures addressed in this EIS/EIR, permitting requirements, Federal and state authorizations, funding and financing mechanisms, and implementation schedule.

This EIS/EIR will also be used by CEQA responsible agencies, such as the CVFPB and Central Valley Regional Water Quality Control Board, and trustee agencies, such as the California Department of Fish and Game, to ensure that they have met the requirements of CEQA before deciding whether to issue discretionary permits over which they have authority. It may also be used by other state and local agencies, which may have an interest in resources that could be affected by the project.

This EIS/EIR is not intended to be used as the environmental clearance document for future development projects proposed in the Natomas Basin.

1.1.4 DOCUMENTS INCORPORATED BY REFERENCE

Incorporation by reference is encouraged by both NEPA (40 CFR Sections 1500.4, 1502.21) and CEQA (CCR Section 15150). Both NEPA and CEQA require citation to and a brief summary of the referenced material, as well as information about the public availability of the incorporated material. CEQA also requires citation of the state identification number of the EIRs cited. This EIS/EIR is tiered from, or incorporates by reference, information contained in the following documents:

- ▶ *Environmental Impact Report on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area*, State Clearinghouse No. 2006072098 (Local Funding EIR) (SAFCA 2007a), which evaluates impacts expected to result from the Phase 1 Project at a project level and the NLIP at a program level;
- ▶ *Environmental Impact Report on the Natomas Levee Improvement Program, Landside Improvements Project*, State Clearinghouse No. 2007062016 (Phase 2 EIR) (SAFCA 2007c), which evaluates impacts expected to result from the Phase 2 Project at a project level and the remainder of the NLIP at a program level;
- ▶ *Environmental Impact Statement for 408 Permission and 404 Permit to Sacramento Area Flood Control Agency for the Natomas Levee Improvement Project* (Phase 2 EIS) (USACE 2008), which evaluates impacts expected to result from the Phase 2 Project at a project level and the remainder of the NLIP at a program level;
- ▶ *Supplement to the Environmental Impact Report on the Natomas Levee Improvement Program, Landside Improvements Project—Phase 2 Project*, State Clearinghouse No. 2007062016 (Phase 2 SEIR) (SAFCA 2009a), which evaluates impacts expected to result from modifications to the Phase 2 Project at a project level;

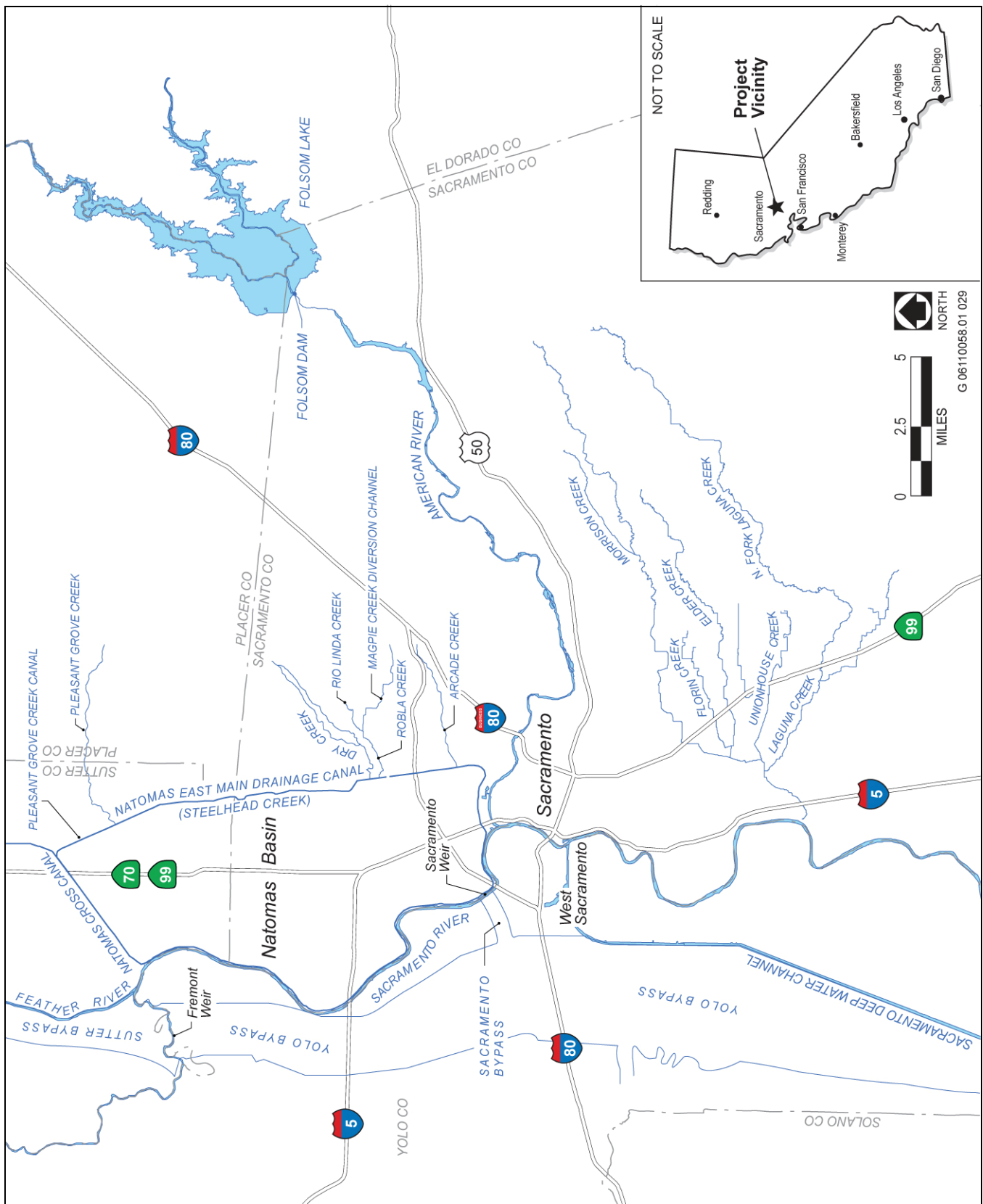
- ▶ *Addendum to the Environmental Impact Report on the Natomas Levee Improvement Program, Landside Improvements Project—Phase 2 Project*, State Clearinghouse No. 2007062016 (Phase 2 EIR 1st Addendum) (SAFCA 2009c), which evaluates minor changes to the Phase 2 Project;
- ▶ *2nd Addendum to the Environmental Impact Report on the Natomas Levee Improvement Program, Landside Improvements Project—Phase 2 Project*, State Clearinghouse No. 2007062016 (Phase 2 EIR 2nd Addendum) (SAFCA 2009d), which evaluates minor changes to the Phase 2 Project;
- ▶ *Environmental Impact Statement and Environmental Impact Report on the Natomas Levee Improvement Program, Phase 3 Landside Improvements Project*, State Clearinghouse No. 2008072060 (Phase 3 EIS and EIR) (USACE 2009 and SAFCA 2009b), which evaluates impacts expected to result from the Phase 3 Project at a project level;
- ▶ *Addendum to the Environmental Impact Report on the Natomas Levee Improvement Program, Phase 3 Landside Improvements Project*, State Clearinghouse No. 2008072060 (Phase 3 EIR Addendum) (SAFCA 2009e), which evaluates minor changes to the Phase 3 Project; and
- ▶ *Environmental Impact Statement and Environmental Impact Report on the Natomas Levee Improvement Program, Phase 4a Landside Improvements Project*, State Clearinghouse No. 2009032097 (Phase 4a EIS and EIR) (USACE 2010 and SAFCA 2009f), which evaluates impacts expected to result from the Phase 4a Project at a project level.

Portions of these documents, where specifically noted, are summarized throughout this EIS/EIR. Printed copies of these documents are available to the public at USACE's office at 1325 J Street, Sacramento, California, and on USACE's Web site at <http://www.spk.usace.army.mil>. These documents are also available at SAFCA's office at 1007 7th Street, 7th Floor, Sacramento, California, during normal business hours, and on SAFCA's Web site, at http://www.safca.org/Programs_Natomas.html.

1.2 PROJECT LOCATION AND EXISTING PERIMETER LEVEE SYSTEM

The 53,000-acre Natomas Basin in northern Sacramento and southern Sutter Counties, California, including a portion of the city of Sacramento (**Plate 1-1**), is bounded by a levee system. Originally constructed in the early part of the 20th century, this levee system is bordered by the Natomas Cross Canal (NCC) to the north, the Sacramento River to the west, the American River to the south, and the Pleasant Grove Creek Canal (PGCC) and NEMDC/Steelhead Creek to the east.

This levee system was initially designed to improve navigation and reduce the risk of flooding for the purposes of facilitating agricultural development of the extensive floodplains encompassed by the Sacramento Valley. Levees set closely along the rivers were designed to contain flows generated by common floods, and bypasses were constructed to carry overflows generated by large floods. The close-set levees along the rivers ensured that velocities in the river would help scour the river bottom and move sediment through the system, reducing dredging costs for sustaining navigation. Together, the river channels and bypasses were designed to transport a flood of the magnitude of the 1907 and 1909 Sacramento River floods (see **Table 1-1** for the 1907 and 1909 flood flows relative to other historical flood flows).



Source: Adapted by EDAW/AECOM (now AECOM) in 2007 based on CASIL Layers; SAFCA 2007a

Project Location

Plate 1-1

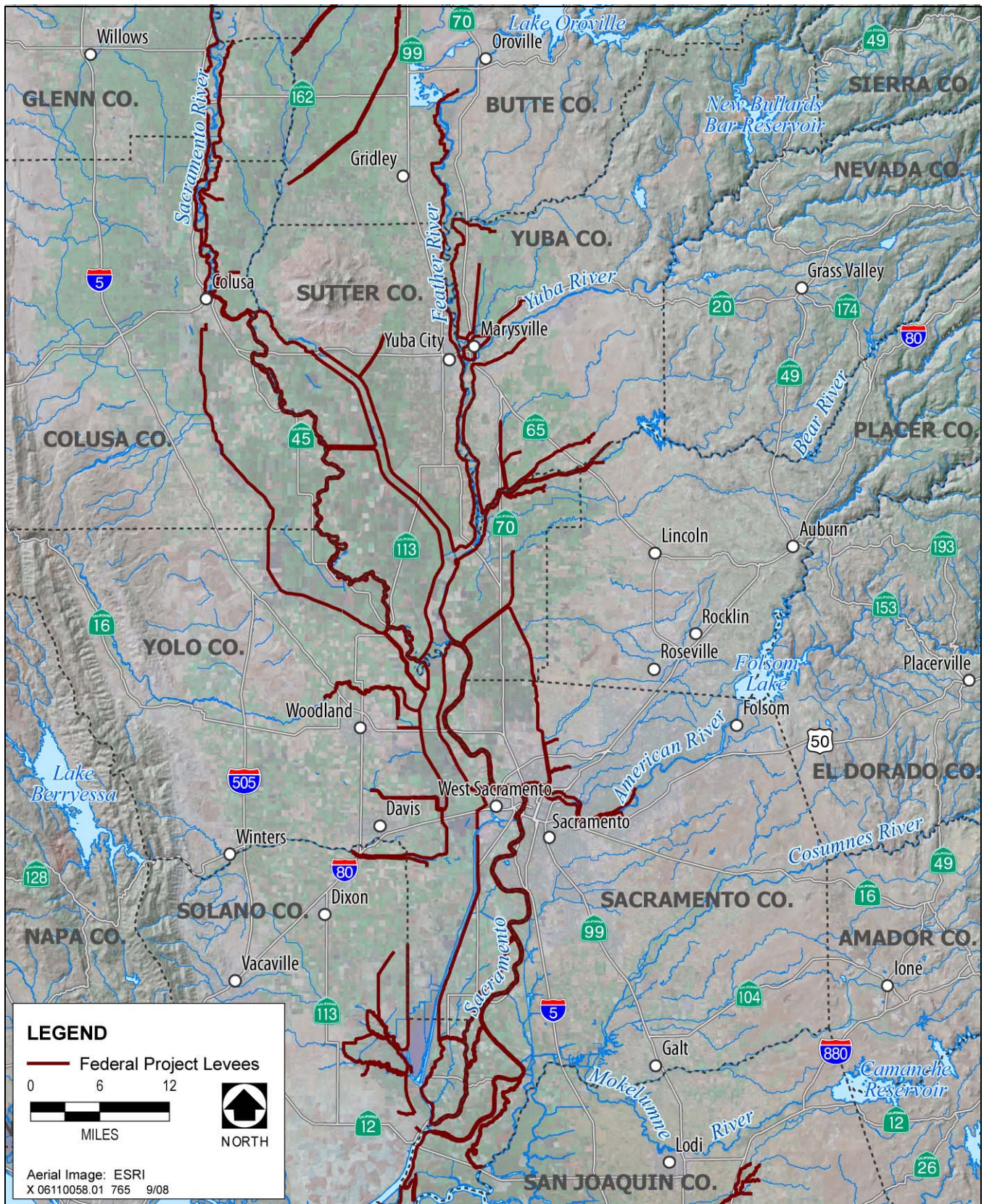
Table 1-1 Ranking of Maximum 3-day Unimpaired Flows at Specified Locations					
Rank	Sacramento River at Shasta Dam ^a	Sacramento River at Bend Bridge ^b	Feather River at Oroville ^c	Yuba River near Marysville ^d	American River at Fair Oaks ^e
1	1997–168 kcfs	1997–241 kcfs	1997–244 kcfs	1997–124 kcfs	1986–166 kcfs
2	1970–132 kcfs	1974–212 kcfs	1986–187 kcfs	1986–123 kcfs	1997–164 kcfs
3	1974–130 kcfs	1970–206 kcfs	1965–165 kcfs	1965–118 kcfs	1965–140 kcfs
4	1940–125 kcfs	1940–196 kcfs	1907–150 kcfs	1956–107 kcfs	1956–127 kcfs
5	1956–120 kcfs	1965–187 kcfs	1956–147 kcfs	1907–103 kcfs	1951–108 kcfs
6	1965–117 kcfs	1956–176 kcfs	1909–129 kcfs	1909–87 kcfs	1928–98 kcfs
7	1986–115 kcfs	1986–175 kcfs			1980–98 kcfs
8	1907–~95 kcfs	1983–174 kcfs			1963–94 kcfs
9	1909–~95 kcfs	1909–162 kcfs			1907–88 kcfs
10		1907–158 kcfs			1909–87 kcfs
Notes: kcfs = 1,000 cubic feet per second; bold denotes the flows during the 1907 and 1909 floods Periods of Record = ^a 1932–1998, ^b 1893–1998, ^c 1902–1997, ^d 1904–1997, and ^e 1905–1997 Source: California Reclamation Board (now CVFPB) and USACE 2002 (for all data except Sacramento River at Shasta Dam 1907 and 1909) and Roos 1997: 2 (Sacramento River at Shasta Dam 1907 and 1909 values were estimated from this source)					

1.2.1 PERIMETER LEVEE SYSTEM

The perimeter levee system around the Natomas Basin is part of an integrated system of levees, overflow bypass channels, and dams that comprises the SRFCP (**Plate 1-2**). Over time, the original capacity of the SRFCP was greatly expanded by the construction of five major multipurpose dam-reservoir complexes (Shasta, Black Butte, Oroville, New Bullards Bar, and Folsom Reservoirs) containing 2.7 million acre-feet of dedicated flood storage space. These dams were justified in part by public safety considerations, specifically the need to provide a high level of flood risk reduction to the historical urban settlements at the confluence of the Feather and Yuba Rivers (Yuba City and Marysville) and the American and Sacramento Rivers (Sacramento and West Sacramento). Following are descriptions of flood damage reduction facilities provided by the levee system and the channels that border the Natomas Basin.

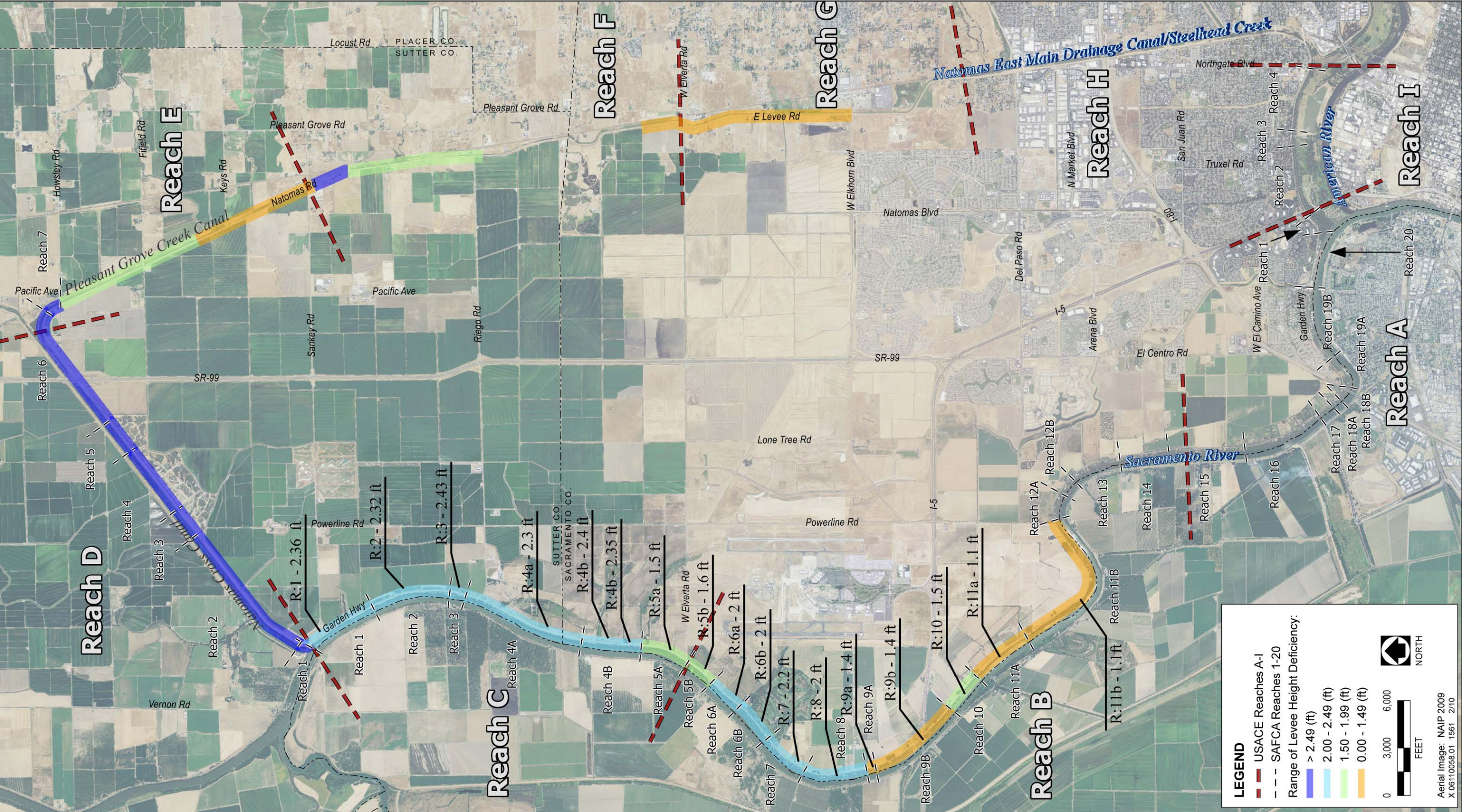
USACE has divided the flood damage reduction improvements within the Natomas Basin into nine reaches (Reaches A–I), as shown on **Plate 1-3**. USACE’s reach designations differ from SAFCA’s reach designations, which are more finely subdivided than the USACE system for the Sacramento River east levee, American River north levee, and the NCC. In **Plate 1-3**, and as listed below, lettered reaches follow the USACE designation, while numbered reaches follow the SAFCA designations:

- ▶ Sacramento River east levee: Reach A:16–20
- ▶ Sacramento River east levee: Reach B:5A–15
- ▶ Sacramento River east levee: Reach C:1–4B
- ▶ NCC: Reach D:1–7
- ▶ PGCC: Reach E: there are no SAFCA reaches, just station numbers
- ▶ NEMDC North: Reaches F–G
- ▶ NEMDC South: Reach H
- ▶ American River north levee: Reach I:1–4



Sacramento River Flood Control Project

Plate 1-2



Source: Aerial Image SACOG 2007; adapted by AECOM) in 2010 based on data from USACE, HDR, and Wood Rodgers

Levee Segments Requiring Seepage Remediation and Levee Height Increases

Plate 1-3

1.2.1.1 NATOMAS CROSS CANAL

The NCC, Reach D:1-7, carries water from several tributary watersheds in western Placer County and southern Sutter County to the Sacramento River. The 5.3-mile-long channel at the north boundary of the project begins at the PGCC and East Side Canal, and extends southwest to its confluence with the Sacramento River near the Sankey Road/Garden Highway intersection. Raised water elevations that can affect the NCC levees come during periods of flooding. The Sutter Bypass, Sacramento River, Feather River, and NCC all contribute to flooding of the NCC. For planning purposes, the NCC south levee has been divided by SAFCA into seven reaches, as shown in **Plate 1-3**. USACE designates the NCC as Reach D. In the pre-NLIP project condition, much of the south levee contained a stability berm with an internal drainage system that was constructed as part of the North Area Local Project (NALP). Levee slopes were approximately 3:1 horizontal to vertical (3H:1V) on the waterside and 2H:1V on the landside, with an approximately 80- to 100-foot maintenance access area on the landside of the levee through most of the NCC's length. The Phase 2 Project widened the levee footprint by raising the levee, flattening the landside levee slope, and constructing a cutoff wall. Most of the land along the south levee consists of privately owned farmland and habitat owned and managed by The Natomas Basin Conservancy (TNBC).

1.2.1.2 SACRAMENTO RIVER EAST LEVEE

The east levee of the Sacramento River, referenced in this document as the "Sacramento River east levee," protects the 18-mile west side of the Natomas Basin between the NCC and the American River. For planning purposes, SAFCA has divided the levee into 20 reaches, as shown in **Plate 1-3**. USACE divides the levee into 3 reaches: A, B, and C. Garden Highway is located on top of the levee crown through all 20 (3) reaches. A 10-foot-wide drained stability berm is present on the landside slope of the levee between the NCC and Powerline Road (Reaches C:1-4B and B:5A-11), and cutoff walls are present in the levee in Reaches B:12-15 and A:16-20.

These improvements were components of the Sacramento Urban Levee Reconstruction Project and the Common Features Project.

Along the landside, Reaches C:1-4B and B:5A-13 are bordered mainly by private agricultural lands containing a few rural residences, the Airport, and two farmed parcels owned and managed by TNBC. The Airport lands bordering Reaches C:1-4A and B:5A-13 are referred to as the "Airport north bufferlands." Teal Bend Golf Club is west of the Airport, adjacent to the levee along Reach B:6. The parcels bordering Reaches B:14-15 and A:16-18 contain more residences, several rural estates, and three TNBC parcels. The landside of Reaches A:19 and A:20 is bordered by residential subdivisions, a business park, and the City of Sacramento's Natomas Oaks Park, undeveloped Costa Park site, and Shorebird Park.

Several marinas and restaurants are located along the waterside of the levee in Reaches C:1-4B, B:5A-15, and C:16-20 along with more than 150 residences and numerous private boat docks. Many fences, gates, and other appurtenances associated with these properties are located on the levee itself.

1.2.1.3 PLEASANT GROVE CREEK CANAL WEST LEVEE

The PGCC west levee, Reach E, extends southerly for approximately 3.3 miles from the east end of the NCC south levee at Howsley Road to the north end of the NEMDC/Steelhead Creek levee near the Sankey Road crossing (**Plate 1-3**). The PGCC west levee protects the Natomas Basin from flood flows from Pleasant Grove Creek, tributary creeks in western Placer County and southern Sutter County, and water backed up in the NCC from high river stages in the Sacramento River.

Levee slopes are generally 2H:1V on both the waterside and landside of the levee. Natomas Road is located on top of the levee crown. No berms support this levee. However, as part of implementing the NALP, SAFCA constructed concrete-capped sheetpile walls at Howsley, Fifield, and Sankey Roads to provide hardened sections

at these roadway crossings where levee height was inadequate. The Fifield Road/Natomas Road intersection was subsequently raised by Sutter County when it replaced the Fifield Road bridge over the PGCC. Several drainage culverts cross under the PGCC to drain areas to the east into the Reclamation District (RD) 1000 drainage system. A private irrigation canal extends parallel to the PGCC west levee for about 1,500 feet at the landside levee toe. The land uses along the PGCC are primarily agricultural uses along with minimal industrial manufacturing and rural residential uses.

1.2.1.4 NATOMAS EAST MAIN DRAINAGE CANAL WEST LEVEE

The NEMDC (also known as Steelhead Creek) extends for approximately 13.3 miles from high ground near Sankey Road to the American River north levee and, with the PGCC west levee, forms the easterly boundary of the Natomas Basin (**Plate 1-3**). The west levee of the NEMDC confines the canal through the entire reach. The east side of the canal is unconfined north of SAFCA's NEMDC stormwater pumping station. This facility is connected to the NEMDC west levee and the Dry Creek north levee. It prevents elevated floodwaters in Dry Creek and the southern reach of the NEMDC from entering the northern reach of the NEMDC. The pumping facility also collects local flood runoff from the Natomas East Stream Group and from spills (PGCC floodwaters) over the high ground near Sankey Road, and discharges this stormwater into the southern reach of the NEMDC. The east side of this southern reach intersects Dry/Robla Creek and Arcade Creek and is confined by the NEMDC east levee, which extends for about 4 miles from the Dry/Robla Creek south levee to the Arcade Creek north levee and from the Arcade Creek south levee to the American River north levee at the mouth of the NEMDC. East Levee Road extends along the crown between Sankey Road and Main Avenue.

As part of the NALP, SAFCA raised the west levee of the NEMDC from 2.0 to 4.5 feet between the NEMDC stormwater pumping station and the American River north levee, and raised the east levee of the NEMDC from 1.0 to 3.5 feet between the Dry/Robla south levee and the American River north levee. These improvements were designed to provide a high level of flood risk reduction to the Natomas Basin by providing at least 3 feet of levee height above the 200-year (0.005 AEP) flood in Dry Creek and Arcade Creek combined with the maximum water surface likely to be produced at the mouth of the NEMDC by a 200-year (0.005 AEP) or greater flood along the American River side slopes.

1.2.1.5 AMERICAN RIVER NORTH LEVEE

The Natomas section of the American River north levee, Reach I, extends for about 2.2 miles from its junction with the Sacramento River east levee at the mouth of the American River to its junction with the NEMDC west levee, as shown in **Plate 1-3**. This levee was constructed as part of the Natomas perimeter levee system and is designed to prevent floodwaters in the American River from entering the Natomas Basin. Built before the construction of Folsom Dam, this levee is set back over 1,000 feet north of the American River main channel and is high enough to provide 3 feet of levee height above the maximum water surface elevation likely to be produced at the mouth of the NEMDC by a 200-year (0.005 AEP) or greater flood along the American River. For NLIP planning purposes, SAFCA has divided the levee into four reaches, as shown in **Plate 1-3**. USACE designates one reach, Reach I for the American River north levee. The general configuration of the levee in these reaches is 3H:1V waterside slopes and 2H:1V landside slopes. Levee crown widths range from 30 to 60 feet. Garden Highway runs along the levee crown for most of these reaches and ranges from two to four lanes.

1.2.2 FLOODFLOW CONDITIONS

The Natomas Basin is subject to flooding from a combination of flows in the Sacramento and American River channels and in the tributary streams east of the Basin. Along the northern and western perimeters of the Basin, the greatest threat is from a large flood in the Sacramento–Feather River basin combined with high runoff in the creeks and streams of southern Sutter and western Placer Counties that drain through the NCC. This threat is somewhat mediated by the operation of the Fremont Weir and Yolo Bypass system, which absorbs approximately 80% of the flood flow reaching the northern end of the Natomas Basin from the Feather and Sacramento River

basins. Along the southern and southeastern perimeters of the Basin, the greatest threat is from a large flood in the American River basin combined with high runoff in the tributary creeks and streams of western Placer and northern Sacramento Counties that drain through the NEMDC/Steelhead Creek.

1.3 NATOMAS LEVEE IMPROVEMENT PROGRAM HISTORY AND PLANNING CONTEXT

SAFCA has developed the NLIP to address identified deficiencies in the levee system protecting the Natomas Basin in Sacramento and Sutter Counties, California. The objectives of the NLIP are to: (1) provide at least a 100-year level of flood risk reduction (0.01 AEP) to the Natomas Basin as quickly as possible; (2) provide 200-year flood risk reduction (0.005 AEP) to the Basin over time; and (3) avoid any substantial increase in annual flood damages as new development occurs in the Basin.

The Natomas Basin perimeter levee system was originally constructed to promote agricultural development. The historic Sacramento River floods of 1907 and 1909 (see **Table 1-1** for flood flows) triggered the comprehensive, Federally financed and managed, flood risk reduction effort that has unfolded over the past 85 years under the leadership of USACE, and the California Department of Water Resources (DWR) and CVFPB (hereinafter referred to together as “State”). The product of this effort is the SRFCP, an integrated system of levees, overflow bypass channels, and dams that was designed and constructed by Federal, State, and local interests over several decades to protect farmlands and urban areas in the Sacramento Valley from large floods. The SRFCP has protected the Natomas Basin from significant flooding since construction of the perimeter levee system in 1914.

Today, the Natomas Basin is the location of the Airport and the site of extensive urban development, primarily occupying the southern third of the Basin. The Basin’s remaining agricultural lands provide habitat for a number of important wildlife species. This habitat is protected under Federal and state law, and expansion of the urban footprint into much of the remaining agricultural areas is governed by the *Natomas Basin Habitat Conservation Plan* (NBHCP), which is aimed at setting aside and conserving tracts of agricultural land that are needed to sustain habitat for the affected species. The Natomas Basin’s historic floodplain is occupied by more than 83,000 residents and contains \$8.2 billion in damageable property. **Table 1-2** presents a brief timeline of major flood-related events in the Natomas Basin.

As stated above, the overall purpose of the multi-phase NLIP is to bring the entire 42-mile Natomas Basin perimeter levee system into compliance with applicable Federal and State standards for levees protecting urban areas. The Phase 4b Project is the final project phase of the NLIP Landside Improvements Project.

The NLIP’s proposed improvements address identified deficiencies in the Natomas Basin perimeter levee system based on (1) design criteria used to certify levees as providing 100-year flood risk reduction (0.01 AEP) under regulations adopted by the Federal Emergency Management Agency (FEMA), (2) design criteria used by USACE and the State for the levees comprising the Common Features Project, and (3) design 200-year¹ (0.005 AEP) water surface elevations developed by SAFCA in cooperation with the State using hydrologic modeling data developed by USACE and the State as part of the Sacramento–San Joaquin River Basins Comprehensive Study.

Although SAFCA anticipates that all segments of the Natomas perimeter levee system will eventually be improved to meet all of the above design criteria, SAFCA is partnering with DWR using SAFCA’s local assessments and grant funding available through DWR’s FloodSAFE California Program to initiate improvements

¹ Design event analysis results, as a measure of system performance, are given as the expected (mean) frequency of the maximum event that can be safely passed through the reservoir, spillway, and downstream leveed system with a set (e.g., 3 feet) “freeboard” above the computed (expected) water surface profile. Design event analysis is not the same as the analysis procedure used by USACE as a basis for determining Federal interest in a project or for USACE certification for FEMA’s National Flood Insurance Program. USACE defines system performance as containing a specified frequency event (e.g., 0.01 event) with a high level of assurance (i.e., Conditional Non-exceedance Probability = 0.9) and includes consideration of system uncertainties.

**Table 1-2
History of the Natomas Basin Flood Damage Reduction System**

Year/Timeframe	Flood Damage Reduction Project/Event
1911–1915	Natomas Basin reclaimed: levees and interior drainage constructed
1917–1967	Levees authorized as part of the SRFCP; construction on the SRFCP is initiated and completed in stages
1968	National Flood Insurance Program authorized
1978	First NFIP 100-year Flood Maps issued by FEMA
1986	Major floods lead to SRFCP system re-evaluation
1989	FEMA issues new 100-year Flood Maps encompassing most of the city of Sacramento
1990–1993	Congress provides funding for the Sacramento Urban Levee Reconstruction Project
1993–1998	SAFCA carries out the NALP
1996	Congress authorizes raise and strengthening of Sacramento River east levee and strengthening of American River north levee
1997	Major flood in SRFCP
1998	USACE certifies Natomas Basin levees for 100-year FEMA flood protection
1999	Congress authorizes raise and strengthening of the NCC south levee
1999	Post-1997 Flood Assessment recognizes underseepage as a threat
2000	USACE initiates Natomas Basin Common Features Design
2002	USACE conducts public scoping meetings
2003	USACE Levee Task Force completes development of deep underseepage criteria
2004	USACE adopts Standard Operating Procedures for Urban Levee Design
2004–2006	SAFCA evaluates Natomas Basin levees
2004	USACE initiates General Re-Evaluation of the Common Features Project
2006	USACE recommends levee decertification based on new geotechnical information and new standards
2006	SAFCA initiates the NLIP
2006	SAFCA Board of Directors certifies the Local Funding EIR, and USACE adopts a Finding of No Significant Impact and grants permission pursuant to Section 408 for the Phase 1 Project
2007	SAFCA Board of Directors certifies the Phase 2 EIR
2008	USACE issues the Phase 2 EIS
2008	SAFCA completes construction of the Phase 1 Project
2009	USACE issues the Phase 2 ROD, granting permission pursuant to Sections 408 and 404 for the Phase 2 Project
2009	SAFCA Board of Directors certifies the Phase 2 SEIR
2009	USACE and SAFCA issue the Phase 3 DEIS/DEIR; SAFCA issues the Phase 3 FEIR and certifies the Phase 3 EIR
2009	SAFCA begins construction of the Phase 2 Project
2009	USACE issues the Phase 3 FEIS
2009	USACE and SAFCA issue the Phase 4a DEIS/DEIR; SAFCA issues the Phase 4a FEIR and certifies the Phase 4a EIR
2009	USACE issues the Phase 3a ROD (note: after the Phase 3 FEIS was prepared, Phase 3 was separated into Subphases 3a and 3b to complete RODs associated with different permitting authorities); SAFCA begins preliminary construction on the Phase 3a Project
2010	USACE issues the Phase 4a FEIS; USACE issues the Phase 3 ROD (covering 3b), granting permission pursuant to Section 408 for the Phase 3 Project

Notes: EIR = environmental impact report; EIS = environmental impact statement; FEMA = Federal Emergency Management Agency; NFIP = National Flood Insurance Program; NLIP = Natomas Levee Improvement Program; NLAP = North Area Local Project; NCC = Natomas Cross Canal; SAFCA = Sacramento Area Flood Control Agency; SRFCP = Sacramento River Flood Control Project; USACE = U.S. Army Corps of Engineers; ROD = record of decision; SEIR = Supplemental EIR

Source: Data compiled by AECOM in 2009

to segments of the Natomas perimeter levee system in advance of full Federal authorization for the constructed improvements. SAFCA anticipates completion of this “early implementation project”—which includes the Phase 2, 3, and 4a Projects—by 2012. Phase 2 Project construction is underway and is anticipated to be completed by 2010; it is anticipated that construction of the Phase 3 and 4a Projects will be completed by 2012. USACE plans to complete improvements to the remaining segments of the perimeter levee system (i.e., the Phase 4b Project). This will require Congressional authorization to expand the scope of the already authorized Common Features Project based on the information and recommendations provided in the Common Features/Natomas PACR. SAFCA is coordinating with USACE to ensure that the planning and design of the early implementation project are consistent with applicable USACE planning, engineering, and design guidelines. This EIS/EIR is the environmental compliance document for and will support the Common Features/Natomas PACR. USACE will subsequently prepare the Common Features GRR, which will cover all elements of the American River Common Features Project, and will be a separate report with its own environmental documentation. USACE and SAFCA recognize that Federal actions taken in connection with the early implementation project will need to be appropriately reflected in both Federal reports.

To move forward as quickly as possible to reduce the risk of flooding in the Natomas Basin, SAFCA identified the broad outlines of the early implementation project at a program level of detail and developed an incremental implementation strategy based on carrying out the project in four phases, with each phase contributing independently and cumulatively to reducing flood risk. Each individual project phase would contribute to reduced flood risk for the Natomas Basin, and thus has independent utility. However, no single project phase would achieve the overall flood risk reduction objectives of the NLIP. The NLIP, as a program, has independent utility from the other areas under consideration in the Common Features GRR because the NLIP will provide added flood risk reduction to an entire area (similar to a ring levee), and this increased flood risk reduction is not dependent on the outcome of the Common Features GRR. The four phases of the NLIP are described in Section 1.5.4, “Natomas Levee Improvement Program Environmental Documentation and Relationship of This EIS/EIR to Other Documents,” below.

The NLIP Landside Improvements Project and the NLIP as a whole are part of a larger program of improvements to the flood damage reduction system protecting the Sacramento Area that was initiated as part of the American River Watershed Investigation (ARWI) following the record flood of 1986. This section outlines the key events and actions that have shaped the ARWI so as to provide the historical and legislative context within which the NLIP Landside Improvements Project is being pursued.

1.3.1 1986 FLOOD

The record flood of 1986 caused levee failures in many areas of the Sacramento Valley that resulted in millions of dollars of property damage and exposed numerous deficiencies in the SRFCP. In the Sacramento area, these deficiencies included: (1) unstable levees along the east bank of the Sacramento River that were susceptible to failure due to the porous nature of the material used in their construction, (2) inadequate conveyance capacity in the drainage channels around the Natomas Basin that serve to divert runoff from the foothills into the Sacramento and American Rivers, and (3) inadequate reservoir storage capacity for controlling large floods in the American River watershed.

1.3.2 SACRAMENTO URBAN LEVEE RECONSTRUCTION PROJECT

SAFCA was formed in September 1989 to work with USACE and the State to address the deficiencies exposed by the 1986 flood. The initial step in this effort was to quickly implement the Sacramento Urban Levee Reconstruction Project to stabilize the levees along the east bank of the Sacramento River upstream and downstream of the American River. These levees were constructed in the early part of the 20th century using materials dredged from the river channel that contained significant amounts of sand and silt dislodged from the foothills and mountains along the east side of the Sacramento Valley during the hydraulic mining era. These materials proved to be excessively porous when subjected to the prolonged high flows produced by the 1986

flood, particularly in the Natomas Basin where levee failure due to seepage through the levee was avoided only through a massive effort to shore up the levee during the height of the flood.

The stabilization effort employed two measures to address this seepage problem. Where space permitted, such as in the upper Natomas Basin, a drained stability berm was constructed along the landside toe of the levee to intercept any water seeping through the levee and discharge it onto adjacent lands where it is collected by the interior drainage system and then pumped back into the river. Where space was limited, as in the Pocket area and the lower Natomas Basin, a slurry cutoff wall was excavated through the levee and into less permeable ground below. This cutoff wall serves to reduce seepage through the permeable levee embankment soils. Construction of these improvements, covering approximately 33 miles of the Sacramento River east levee, was initiated in 1990 and completed in 1993.

1.3.3 AMERICAN RIVER WATERSHED INVESTIGATION SELECTED PLAN

In addition to levee stabilization, USACE, the State, and SAFCA used the ARWI to develop a broad program of improvements to Sacramento's flood damage reduction system focusing on construction of a flood detention dam along the American River near Auburn combined with raising and strengthening the levees along the tributary streams and drainage canals around the Natomas Basin. The ARWI Selected Plan, which was designed to provide reduced flood risk to the Sacramento area, was presented to Congress in 1992. However, in the face of opposition to the detention dam, Congress authorized only the levee improvements around the Natomas Basin and directed that these improvements should proceed while the USACE re-evaluated options for controlling floods along the remainder of the Lower American River. The legislation left open the possibility that the authorized improvements could be constructed by non-Federal interests in exchange for future credits or reimbursements.

1.3.4 NORTH AREA LOCAL PROJECT

Relying on the authorization described above, SAFCA quickly initiated the NALP. This locally funded project was designed to provide a high level of flood risk reduction to the Natomas Basin in a manner that neither depended on nor prejudiced the outcome of the continuing effort to develop a comprehensive plan for protecting the floodplains along the Lower American and Sacramento Rivers outside the Natomas Basin. Toward this end, SAFCA designed the levees along the lower reaches of the NEMDC/Steelhead Creek, Arcade Creek, and Dry/Robla Creek to contain the maximum water surface elevation that could be anticipated in the Lower American River at the mouth of the NEMDC/Steelhead Creek during a 200-year or greater flood event (0.005 AEP) under any of the alternatives under consideration by the AWRI, including no action. The NALP, which also included levee strengthening measures along the south levee of the NCC and west levee of the PGCC, was completed in 1996.

1.3.5 FOLSOM DAM REOPERATION

In 1995, SAFCA entered into a 5-year agreement with the U.S. Bureau of Reclamation (Reclamation) to initiate a variable space storage operation at Folsom Dam. This would allow for an increase in the available space in three large non-Federal reservoirs located in the American River watershed upstream of Folsom Dam which could be used for flood damage reduction. This effort would result in incidental flood damage reduction benefits without formally incorporating the non-Federal reservoirs into the flood damage reduction system and without creating unacceptable impacts to anadromous fish in the Lower American River and to water supply, hydropower, and recreational uses dependent on Folsom Dam.

1.3.6 AMERICAN RIVER COMMON FEATURES PROJECT

In 1996, USACE transmitted a Supplemental Information Report (SIR) to Congress that presented the results of the requested re-evaluation of flood risk reduction options for the American River watershed. The SIR concluded

that regardless of what measures might be implemented to increase the available reservoir storage space, the levees extending upstream from the mouth of the river should be strengthened to resist seepage. Moreover, the SIR indicated that SAFCA's levee improvements on the northern and eastern levees of the Natomas Basin were sufficient to protect the Basin from very large floods along the American River, and with modifications to the upper 12 miles of the east levee of the Sacramento River, including increased levee height and levee stability improvements and levee stability along the American River north levee adjacent to Natomas, a similarly high level of flood risk reduction could be secured along the Sacramento River. These American River and Natomas Basin improvements were considered "common features" of any long-term effort to provide Sacramento with a high level of flood risk reduction, and Congress directed the Secretary of the Army to design and construct them under the auspices of the Common Features Project. The authorization of the Common Features Project also allowed the non-Federal partners to proceed with the improvements and receive credit for the work. Finally, Congress directed the Secretary of the Interior to continue the variable space storage operation at Folsom Dam and to extend Reclamation's operational agreement with SAFCA pending implementation of a comprehensive flood damage reduction program for the American River watershed.

1.3.7 1997 FLOOD

Shortly after the conclusion of the 1996 Federal legislative session, the Sacramento Valley again experienced a flood of record magnitude. The flood of 1997 produced flows in the Lower Sacramento and American Rivers comparable to those of the flood of 1986. The levees around the Natomas Basin and along the Lower American and Sacramento Rivers, bolstered by the accomplishments of the Sacramento Urban Levee Reconstruction Project and the NALP, and relieved by the additional reservoir storage capacity made available by the Folsom Reoperation Project, passed these flows without the signs of levee stress that occurred in 1986. However, the flood did cause failures of some SRFCP levees along the Feather River and Sutter Bypass upstream of the Natomas Basin. The USACE post-flood assessment concluded that deep underseepage may have contributed to these levee failures. To address this risk, USACE recommended a broader scope for the Common Features Project, including deeper seepage cutoff walls through the levees along the Lower American River. USACE also called for an assessment of the need for similar measures along the east levee of the Sacramento River in the Natomas Basin.

1.3.8 FOLSOM DAM MODIFICATION PROJECT AND EXPANSION OF THE COMMON FEATURES PROJECT

In 1999, Congress approved a plan for increasing flood risk reduction along the American River by modifying Folsom Dam's outlet works to be more efficient. Congress also expanded the scope of the Common Features Project, calling for additional reaches of the levees along the lower American River to be raised and strengthened to ensure safe containment of flows in the river up to 160,000 cubic feet per second (cfs) with at least 3 feet of additional levee height², and directing USACE to raise and strengthen the south levee of the NCC to provide the same level of flood risk reduction afforded by the previously authorized improvements of the east levee of the Sacramento River. Lastly, Congress directed the Secretary of the Army to cooperate with the Secretary of the Interior in devising a long-term variable space storage operation plan for Folsom Dam that would take advantage of the operational capabilities created by the modification of the dam's outlet works and improved weather forecasting.

1.3.9 JOINT FEDERAL PROJECT

In 2005, technical challenges associated with enlarging the existing outlet works at Folsom Dam caused USACE, the State, SAFCA, and Reclamation to embrace a new approach to increasing the dam's low-level discharge capacity. This "Joint Federal Project," which was approved by Congress in 2007, will address both flood damage reduction and dam safety issues through construction of a new auxiliary spillway and control gates. The new

² See definition of "levee height" in Section 1.4.2.1, "Flood Problems and Needs."

facilities will significantly increase Folsom Dam's low-level outlet capacity, enabling the dam to meet applicable Federal dam safety standards while permitting dam operators to safely contain the 200-year flood (0.005 AEP) in the American River watershed. The new flood damage reduction operation assumes that the variable storage space plan will be continued and that releases from the dam will be increased to 160,000 cfs when inflows to the dam exceed the magnitude of a 100-year flood (0.01 AEP).

1.3.10 COMMON FEATURES GENERAL RE-EVALUATION

Changes in engineering standards and a better understanding of flood risks in the SRFCP system have caused USACE to initiate a general re-evaluation of the elements included in the Common Features Project. The Common Features GRR is expected to be presented to Congress in 2010 with recommendations of scope and cost modifications necessary to ensure that the project can achieve its authorized flood risk reduction objectives.

Initially, the Common Features GRR was primarily focused on evaluating the needs of the Natomas Basin. However, a significant similar effort is also under way with respect to the elements of the Common Features Project along the Lower American and Sacramento Rivers outside the Natomas Basin, where scope and cost modifications may also be needed to ensure that the flood risk reduction objectives of the "Joint Federal Project" are achieved. USACE has determined that the Sacramento River east levee between the American River and the town of Freeport may lack adequate levee height, and may be susceptible to underseepage and erosion. In addition, the levees along the Lower American River may be susceptible to erosion based on the magnitude and duration of the releases from Folsom Dam that occur in such an event. Accordingly, USACE is studying comprehensive alternatives that would consider all the basins in the greater Sacramento area to ensure that levees protecting the city and county of Sacramento, and the area of Sutter County within the Natomas Basin, provide the same level of protection as the Joint Federal Project Folsom Dam improvements, which are already under construction.

SAFCA successfully obtained a grant from DWR for funding an early implementation project as part of FloodSAFE California. FloodSAFE California is a strategic initiative to maximize Proposition 1E and 84 bond funds to reduce flood risk to Californians, develop a sustainable flood management system for the future, and lessen the consequences of floods when they do occur. As detailed in the Local Funding EIR, SAFCA's cost share requirement was met and the funding awarded. SAFCA's early implementation project (Phases 1–4a of the NLIP Landside Improvements Project) is running ahead of the overall Common Features GRR submittal date with the expectation that the perimeter levee improvements that are constructed in advance of any Congressional action on the Common Features GRR will be found consistent with the recommendations contained therein. On that basis, SAFCA anticipates that the non-Federal costs incurred in the early implementation project could be credited against the remaining non-Federal share of the cost of the enlarged Common Features Project or Joint Federal Project.

1.4 PROJECT PURPOSE/PROJECT OBJECTIVES AND NEED FOR ACTION

1.4.1 PROJECT PURPOSE/PROJECT OBJECTIVES

USACE and SAFCA each view the project purpose from the purview of their respective responsibilities, as defined below.

1.4.1.1 U.S. ARMY CORPS OF ENGINEERS

The overall purpose of the project is to develop and select an alternative that would reduce the risk of flood damage in the Natomas Basin. Some residual risk will always remain, however, in any flood damage reduction system. Ultimately, Congress must authorize the Common Features/Natomas PACR, which includes the Phase 4b

Project. If not authorized by Congress, USACE must make decisions on whether or not to grant permission to SAFCA to alter the Natomas Basin levee system (Federal project levees) under Section 408, and issue permits under Sections 404 and 10, for SAFCA to implement the Phase 4b Project without Federal participation.

1.4.1.2 SACRAMENTO AREA FLOOD CONTROL AGENCY

SAFCA's project objectives adopted in connection with the NLIP are: (1) provide at least a 100-year level of flood risk reduction (0.01 AEP) to the Natomas Basin as quickly as possible, (2) provide 200-year flood risk reduction (0.005 AEP) to the Basin over time, and (3) avoid any substantial increase in expected annual damages as new development occurs in the Basin. The first two project objectives would reduce the residual risk of flooding sufficiently to meet the minimum requirements of Federal and state law for urban areas like the Natomas Basin. The third project objective is a long-term objective of SAFCA's.

Additional project objectives that have informed SAFCA's project design are to:

- (1) use flood damage reduction projects in the vicinity of the Airport to facilitate management of Airport lands in accordance with the Airport's *Wildlife Hazard Management Plan* (WHMP); and
- (2) use flood damage reduction projects to increase the extent and connectivity of the lands in the Natomas Basin being managed to provide habitat for giant garter snake, Swainson's hawk, and other special-status species.

SAFCA's approach to defining flood risk reduction accomplishments (system performance) differs from that of USACE; however, the method for determining hydraulic impacts is the same. The hydraulic impact analysis contained in this EIS/EIR evaluates hydraulics impacts based on upstream levees failing when overtopped along with the condition of allowing upstream levees to overtop without failing (see Section 4.5, "Hydrology and Hydraulics"). References in this EIS/EIR to levels of flood risk reduction are based on SAFCA's "best estimate" approach (FEMA's and the State's current method), and should not be taken as USACE concurrence that such levels would be achieved based on USACE's approach of incorporating risk and uncertainty in the estimate of system performance. In any case, flood risk to the Natomas Basin would be considerably reduced by the project. FEMA and NLIP design criteria for the 0.01 and 0.005 AEP events are provided in Table B1-1 in **Appendix B1**.

1.4.2 NEED FOR ACTION

The need for the action is to reduce the flood risk to the Natomas Basin.

The Natomas Basin floodplain is occupied by over 83,000 residents and \$8.2 billion in damageable property. Although improvements to the Natomas Basin perimeter levee system, completed as part of the Sacramento Urban Levee Reconstruction Project and the NALP, have significantly reduced flood risk for the area, the Natomas Basin remains vulnerable to flooding in a less than 100-year (0.01 AEP) flood event. Uncontrolled flooding in the Natomas Basin floodplain in a flood exceeding a 100-year (0.01 AEP) event could result in \$7.4 billion in damage (this excludes the Airport facilities) (SAFCA 2007b). Flooding could also release toxic and hazardous materials, contaminate groundwater, and damage the metropolitan power and transportation grids. The disruption in transportation that could result from a major flood could affect the Airport and interstate and state highways. In addition, displacement of residents, businesses, agriculture, and recreational areas could occur. Resulting damage could hinder community growth, stability, and cohesion.

The NLIP was initially outlined in the *Natomas Levee Evaluation Study Final Report Prepared for SAFCA in Support of the Natomas Basin Components of the American River Common Features* (SAFCA 2006). This evaluation was based on the engineering studies and reports that were included as appendices to the above-referenced report, which are available for review at SAFCA's office at 1007 7th Street, 7th Floor, Sacramento, California. These studies and reports indicate that segments of the Natomas perimeter levee system reflect the

following problems for both the FEMA 100-year (0.01 AEP) and the 200-year (0.005 AEP) design water surface elevations:

- ▶ inadequate levee height,
- ▶ through-levee seepage and foundation underseepage with excessive hydraulic gradients,
- ▶ embankment instability, and
- ▶ susceptibility to riverbank erosion and scour.

Although not highlighted in the levee evaluation report, portions of the perimeter levee system, particularly along the east levee of the Sacramento River, are also subject to vegetative and structural encroachments into the levee prism.

In January 2008, FEMA remapped the Natomas Basin as an AE zone, and the flood zone designation took effect in December 2008. FEMA defines AE zones as areas with a 0.01 AEP of flooding. The designation requires mandatory flood insurance purchases by homeowners and requires that the bottom floor of all new buildings be constructed at or above base flood elevation—as little as 3 feet above ground level in some of the Natomas Basin but up to 20 feet above ground level in much of the Basin. This designation and the associated constraints effectively stopped all projects that were not issued building permits before the new maps took effect.

The following subsections describe the problems and needs related to project implementation.

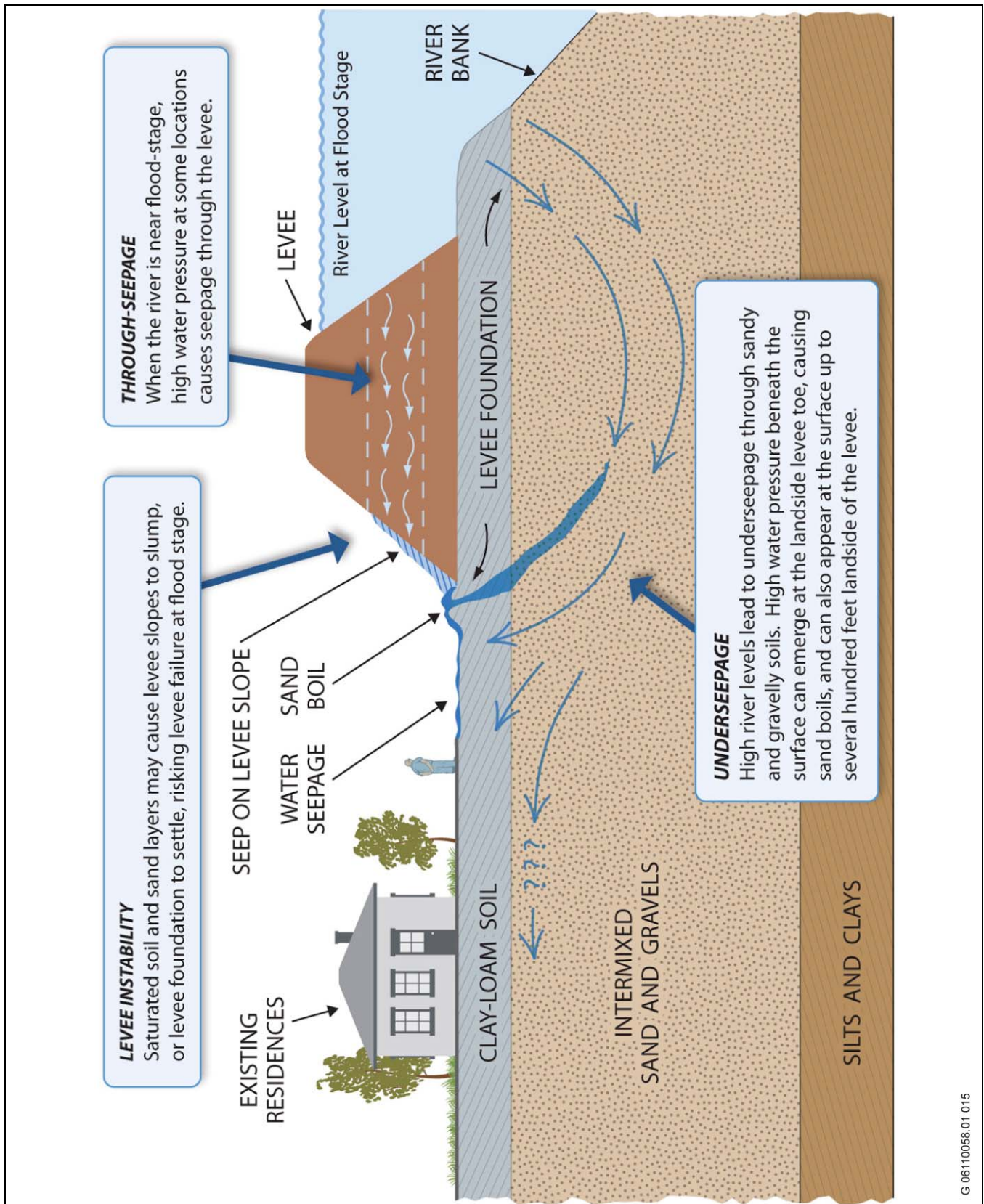
1.4.2.1 FLOOD PROBLEMS AND NEEDS

Inadequate Levee Height

“Levee height” refers to a measure of the height of a levee above a defined water surface elevation. The NCC south levee and Reaches C:1–4B and B:5A–11 of the Sacramento River east levee provide less than the 3 feet of additional levee height that is required to meet the minimum requirements for 100-year (0.01 AEP) flood risk reduction established by FEMA as part of the National Flood Insurance Program, or the minimum requirements for 200-year flood risk reduction (0.005 AEP) established by the State. Both the FEMA 100- (0.01 AEP) and the 200-year (0.005 AEP) design water surface elevations were derived using hydraulic modeling outputs that assume SRFCP levees outside the Natomas Basin do not fail when overtopped. **Plate 1-3** shows the locations and amounts of levee height deficiency that would be addressed by the NLIP Landside Improvements Project.

Seepage

Seepage beneath and through segments of the Natomas levee system has been identified as a significant risk to the stability and reliability of the system (SAFCA 2006). Underseepage problems occur in locations where levees are constructed on low-permeability foundation soil (silt and clay) underlain by higher-permeability layers (sand and gravel). Excessive underseepage makes the affected levee segment susceptible to failure during periods of high river stage. Under these conditions, seepage travels horizontally under the levee and then is forced vertically upward through the low-permeability foundation layer, often referred to as the “blanket.” Failure of the blanket can occur either by uplift, a condition in which the blanket does not have enough weight to resist the confined pressure acting upon the bottom of the blanket, or by piping (internal erosion) caused by water flowing under high vertical gradients through the erodible blanket and carrying fine soil particles out of the foundation materials. Through-seepage is seepage through a levee embankment that can occur during periods of high river stage. Depending on the duration of high water and the permeability of embankment soil, seepage may exit the landside face of the levee. Seepage can also pass directly through pervious layers in the levee if such layers are present. Under these conditions, the stability of the landside levee slope may be reduced. **Plate 1-4** shows a schematic of these two failure mechanisms.



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Source: SAFCA 2007b

Underseepage and Through-Seepage Levee Risks

Plate 1-4

Riverbank Erosion

As shown in **Plate 1-5**, approximately 15 sites along the waterside of the Sacramento River east levee are subject to bank erosion in the form of bed or toe scour and wave wash that threatens the stability of the adjacent levee. Risk priorities have been assigned to the affected sites based primarily on the risk of slope failure due to undermining. High-risk sites exhibit one or more of the following characteristics and are considered potentially susceptible to failure in a 100-year flood event:

- ▶ the toe of the bank lies inside or very near the levee template and the slope below the waterline is reasonably steep, scour depths are below river bed elevations at the toe, or the local bed has been observed to be lowering;
- ▶ the toe of the bank lies outside the levee template but there is risk of cantilever failure based on the estimated stratigraphy of the bank; or
- ▶ the bank at the low-water elevation (the contact between the flood basin deposits and the alluvial deposits) lies near the levee template, and there is potential for a failure originating at the contact point to intersect the levee prism. If the failure seems unlikely to intersect the levee prism, the site is ranked as moderate.

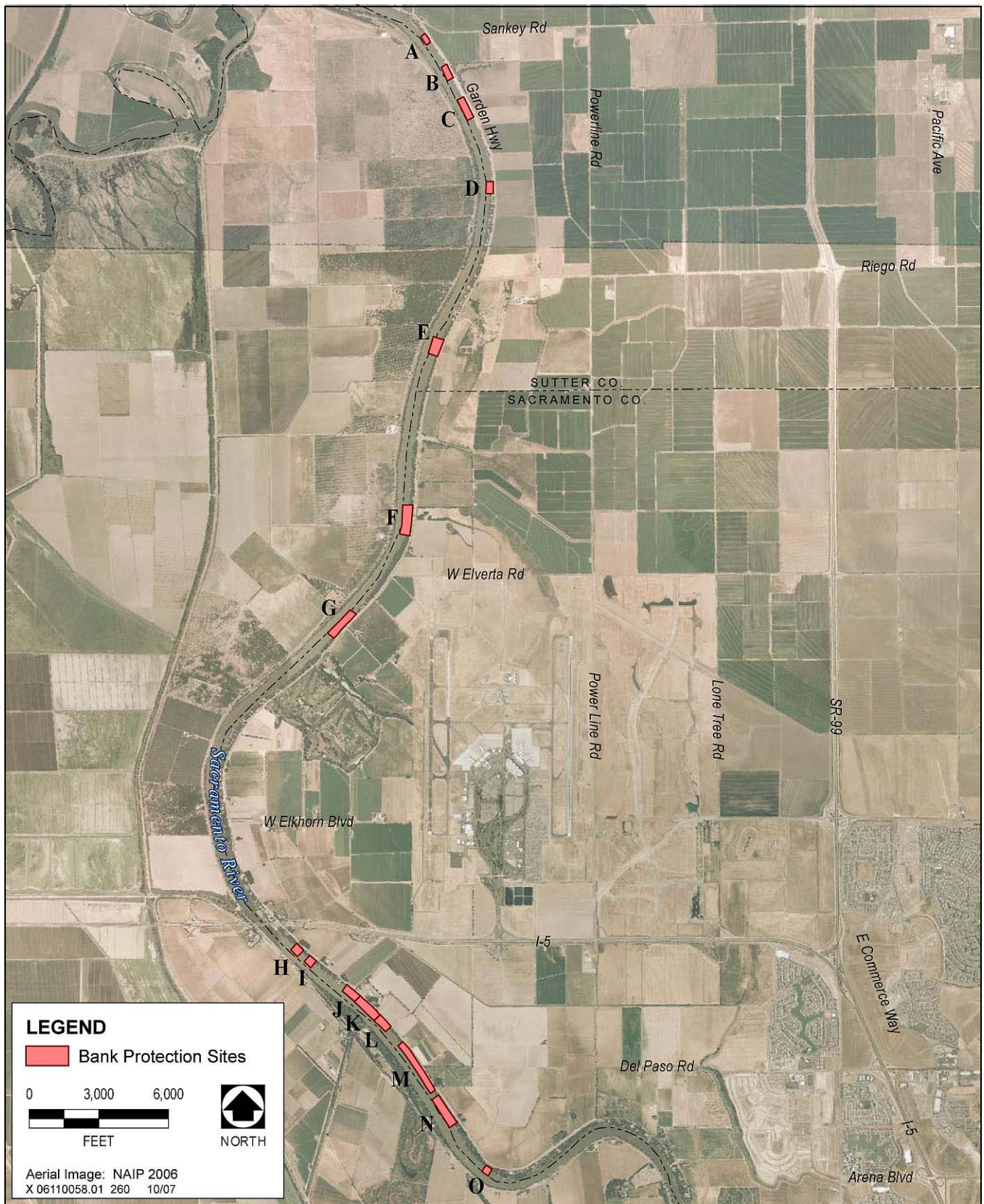
Moderate-risk sites exhibit one or more of the following characteristics:

- ▶ the toe of the bank lies reasonably close to the levee template, but the slope below the waterline is moderate and general scour elevations are not very far beneath the local bed level;
- ▶ the bank at the low-water elevation (the contact between the flood basin deposits and the alluvial deposits) lies inside the levee template, but an individual failure is unlikely to intersect the levee prism; or
- ▶ the toe of the bank lies from 20 to 50 feet from the levee template and the risk of slope failure is low to moderate, but erosion appears to be very active or specific site factors, such as lack of vegetation, structures, or fallen trees, suggest that erosion might proceed very quickly during a large flood.

Sites A (River Mile [RM] 78.6), C (RM 78.0), D (RM 77.3), G (RM 73.5), J (RM 69.8), and M (RM 68.8) are considered high-risk sites. Sites B (RM 78.2), I (RM 70.0), K (RM 69.4), and L (RM 69.1) are considered moderate-risk sites.

Levee Encroachments

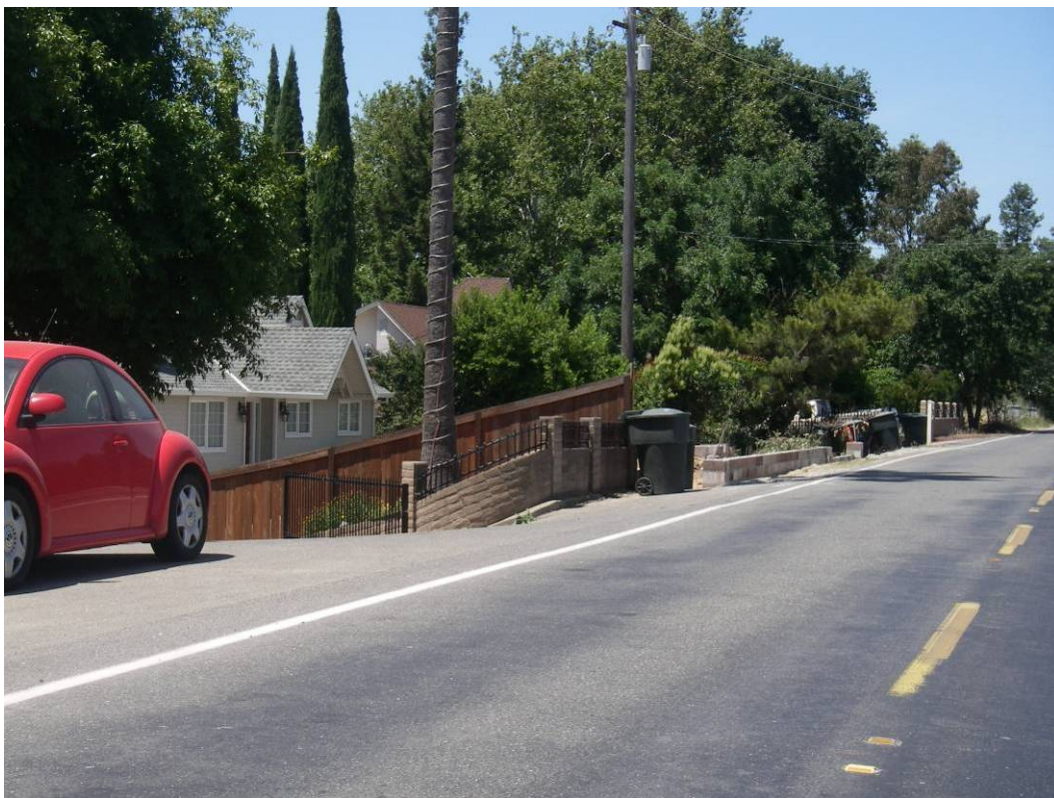
USACE levee guidance requires the removal of vegetation greater than 2 inches in diameter on the levee slopes and within 15 feet of the waterside and landside levee toes. This guidance also may require removal of encroachments on the levee slopes, including utilities, fences, structures, retaining walls, driveways, and other features that penetrate the levee prism or affect operation and maintenance of the levee system. Substantial encroachments are present on the Sacramento River east levee. **Plates 1-6a** and **1-6b** illustrate typical encroachments in the area. Should any of these existing encroachments be determined to threaten the integrity of the levee or otherwise increase flood risk unacceptably, the encroachments would need to be removed. RD 1000 is the entity initially responsible for removing encroachments that have been identified as threatening levee integrity. Any such encroachment removal would be subject to future, separate environmental compliance and review.



Source: Aerial image SACOG 2007; adapted by EDAW/AECOM (now AECOM) in 2007 based on data from SAFCA 2007b

Natomas Basin Erosion Sites

Plate 1-5



Source: Photographs taken by EDAW/AECOM (now AECOM) in 2007

Examples of Waterside Encroachments on the Sacramento River East Levee

Plates 1-6a and 1-6b

1.4.2.2 OTHER PROBLEMS AND NEEDS RELATED TO PROJECT IMPLEMENTATION

Aviation Safety

The Airport is located approximately 1.5 miles east of the Sacramento River east levee and 12 miles north of downtown Sacramento. The Airport includes the Airport Operations Area and adjacent terminals, parking lots, and landscaped areas (**Plate 1-7**). There are two 8,600-foot parallel runways, oriented roughly north-south, and three airline terminals, as well as additional buildings associated with various airport operations. Approximately half of the 5,900 acres of Sacramento County-owned land at the Airport are located due south and due north of the Airport Operations Area and function as aviation “bufferlands” to prevent encroachment by land uses, such as residential development, that are incompatible with aircraft operations.

The Airport has one of the highest numbers of reported bird strikes of all California airports. The frequency of these strikes is directly related to the Airport’s location in the western portion of the Natomas Basin, which is a relatively flat, low-lying area, along the Pacific Flyway, dominated by agricultural crop lands and supporting irrigation and drainage infrastructure. These agricultural uses are the primary wildlife attractants in the area, with rice cultivation, including flooding of the rice fields in winter and summer, considered the most significant attractant.

Since 1996, the FAA has required the Airport to maintain and implement a Wildlife Hazard Management Plan (WHMP). The WHMP relies on a combination of wildlife control and land management strategies and outlines steps for monitoring, documenting, and reporting potential wildlife hazards and bird strikes. In accordance with FAA Advisory Circular (AC) 150/5200-33B, *Hazardous Wildlife Attractants on or Near Airports* (FAA 2007), the Airport has been directed by the FAA to reduce wildlife attractants in the Airport Critical Zone, the area within a 10,000-foot radius from the centerline of the two parallel runways for turbine-powered aircraft.

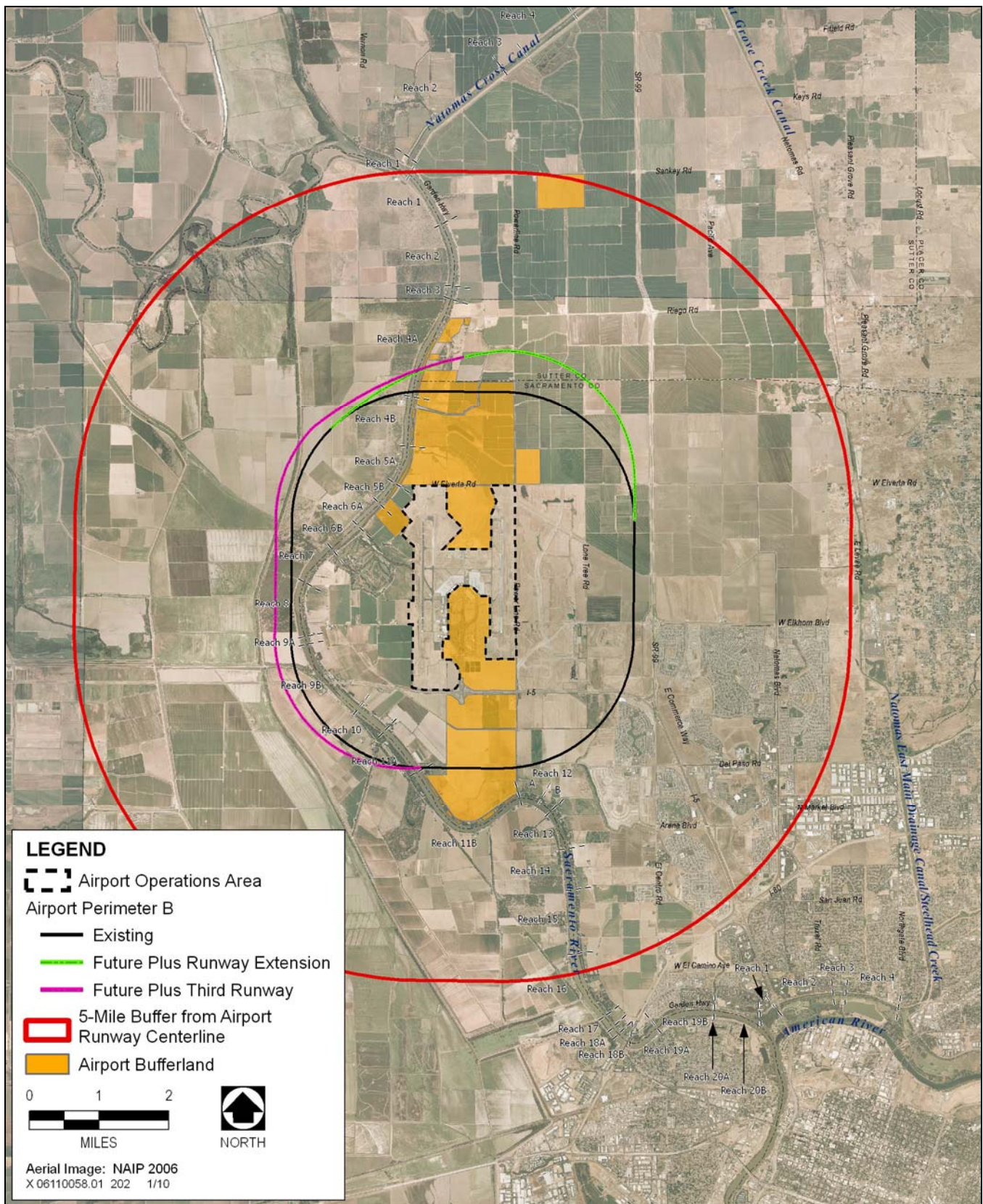
The following land management objectives in the WHMP are relevant to the proposed early implementation project:

- ▶ maintain grasslands in the Airport Operations Area (the area within the fenced perimeter of the Airport) to discourage use by hazardous wildlife;
- ▶ reduce aquatic habitat that promotes hazardous wildlife;
- ▶ reduce hazardous wildlife use of ditches in the Airport Operations Area; and
- ▶ reduce hazardous wildlife on Sacramento County–owned agricultural land in the 10,000-foot Airport Critical Zone.

Habitat Conservation

The Natomas Basin provides habitat for a variety of wildlife species, ranging from those that use the widely distributed agricultural fields and levee maintenance zones to species that are restricted to remnant patches of native vegetation and the area’s historical agricultural irrigation and drainage ditches and canals. Many common wildlife species use the project area, and a number of special-status species also have potential to occur within and adjacent to the levee improvement areas. These special-status species include the following:

- | | |
|-------------------------------------|-----------------------|
| ▶ valley elderberry longhorn beetle | ▶ northern harrier |
| ▶ giant garter snake | ▶ other nesting birds |
| ▶ northwestern pond turtle | ▶ rose mallow |
| ▶ Swainson’s hawk | ▶ Delta tule pea |
| ▶ burrowing owl | ▶ Sanford’s arrowhead |



Source: Aerial image SACOG 2007, adapted by EDAW/AECOM (now AECOM) in 2007 based on data from HDR and Wood Rodgers

Sacramento International Airport Operations Area, Perimeter B, and Bufferlands

Plate 1-7

The NBHCP was developed by the City of Sacramento, Sutter County, and TNBC in 2003 to promote conservation of the NBHCP-covered species in conjunction with economic and urban development in the Natomas Basin. The NBHCP establishes a conservation program designed to minimize and mitigate the expected loss of habitat values and incidental take of “covered species” that could result from urban development and operation and maintenance of irrigation and drainage systems. The NBHCP currently authorizes take associated with 17,500 acres of urban development in southern Sutter County and within the city of Sacramento. The U.S. Fish and Wildlife Service (USFWS) approved the NBHCP in 2003 and issued incidental take permits to the City of Sacramento and Sutter County for take of Federally listed species resulting from permitted activities.

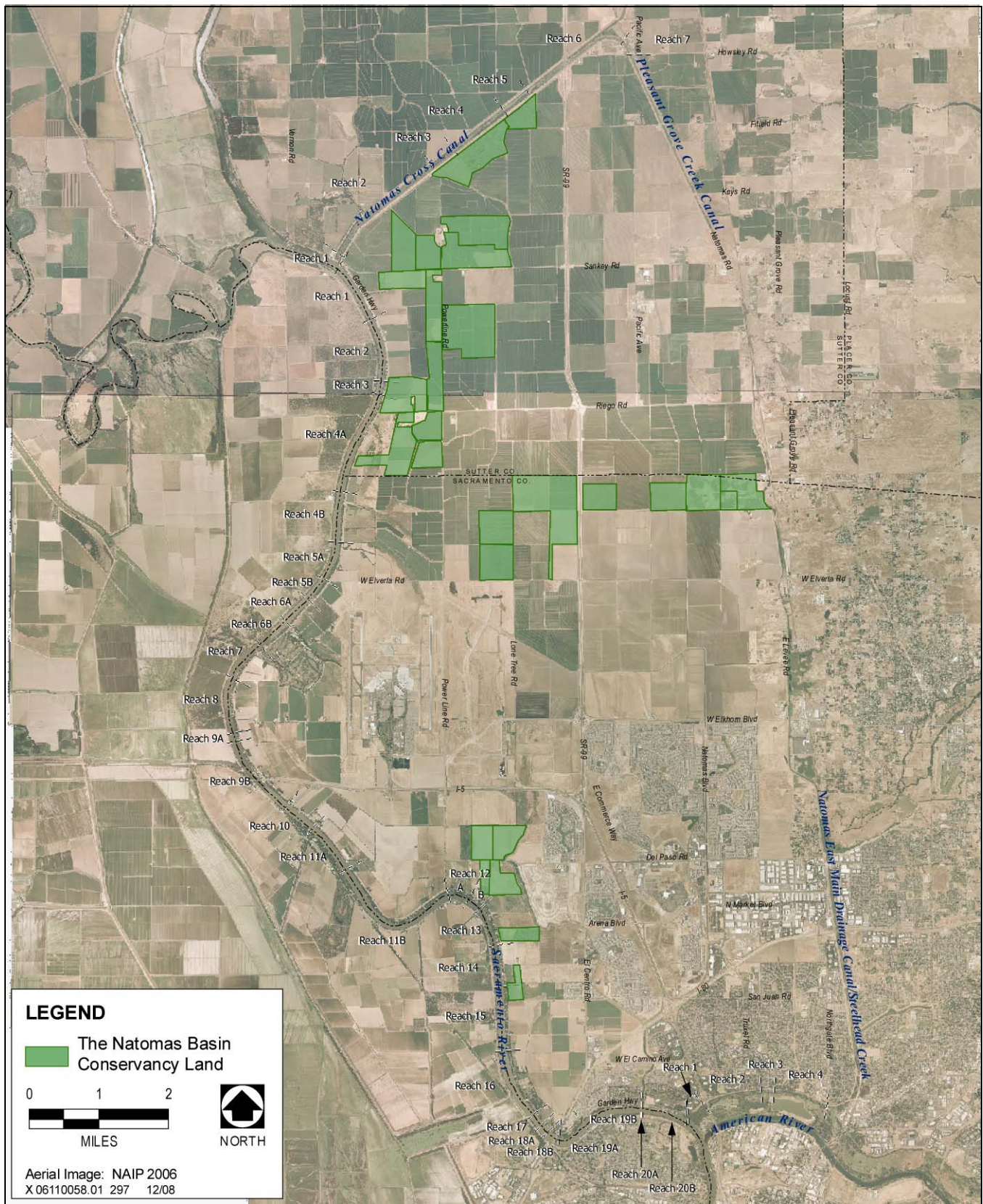
The NBHCP’s habitat reserve acquisition and management activities are implemented by TNBC, a private, nonprofit organization that began operating in 1998 and whose mission is to serve as “plan operator” of the NBHCP. TNBC receives mitigation fees paid by developers and other NBHCP participants. These funds are used to acquire, establish, enhance, monitor, and manage mitigation lands in perpetuity. As development occurs within the Natomas Basin, and as TNBC acquires mitigation lands, site-specific management plans are implemented by TNBC to ensure that the objectives of the NBHCP are fulfilled. These management plans may include excavation and grading of the acquired lands to create marsh habitats reflective of the floodplain conditions that prevailed in portions of the Natomas Basin before reclamation.

As of June 2009, approximately 4,115 acres of mitigation property have been acquired in the Natomas Basin. As shown in **Plate 1-8**, this property is concentrated in three areas: north of the Airport and west of State Route (SR) 99 in Sutter County, east of the Airport between Elverta Road and the Sacramento/Sutter County border in Sacramento County, and south of the Airport in the vicinity of Fisherman’s Lake in Sacramento County. TNBC’s Agricultural Irrigation and Drainage Infrastructure

goal is to consolidate these three blocks of land through infill acquisitions and to ensure that these lands are reliably served and connected by the Natomas Basin’s historical agricultural irrigation and drainage infrastructure.

Reclamation of the Natomas Basin for agricultural development required construction of two major ditch and canal systems in the Basin: an irrigation system owned and operated by Natomas Central Mutual Water Company (NCMWC) and a drainage system owned and operated by RD 1000. NCMWC pumps water into the Basin to provide irrigation water to its shareholders for agricultural use within the Basin. During winter (October through April), drainage is primarily rainfall runoff; during summer (May through September), drainage water from agricultural fields is typically recirculated for irrigation. Because the Basin is surrounded by levees, all excess drainage within the Basin must be pumped out. In general, water is pumped into the Basin from the Sacramento River and NCC as irrigation water and returned to the perimeter drainage channels via RD 1000’s interior drainage system.

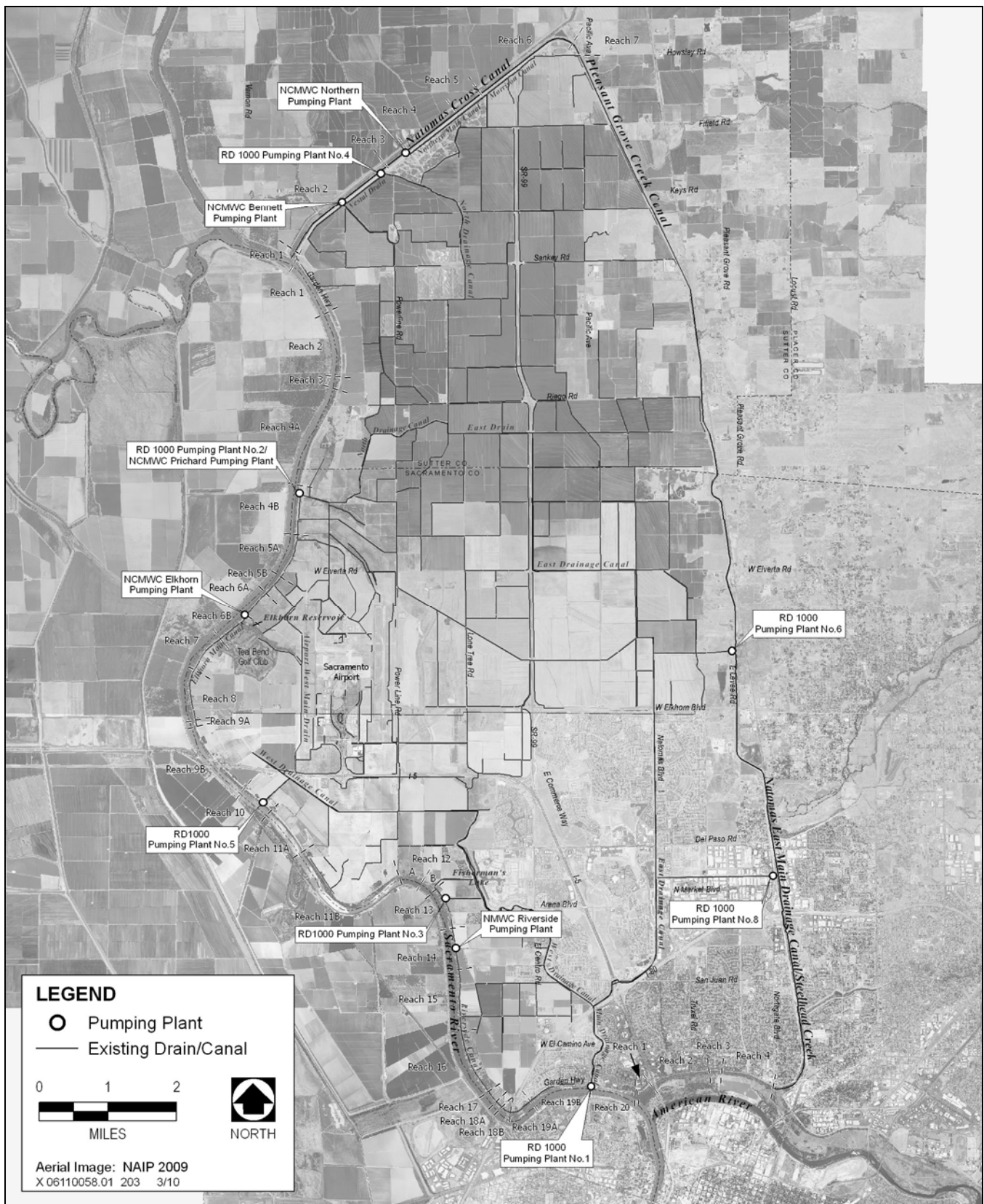
Several irrigation canals, pipelines, wells, and pump stations exist along the Sacramento River east levee. These include the Elkhorn Main Irrigation Canal (Elkhorn Canal), which runs parallel to the Sacramento River east levee from the North Drainage Canal to just south of West Elkhorn Boulevard, and the Riverside Main Irrigation Canal (Riverside Canal), which runs parallel to the Sacramento River east levee from approximately 1 mile north of San Juan Road to approximately Orchard Lane. These NCMWC canals are fed by three pumping plants on the Sacramento River (**Plate 1-9**). These canals are referred to as “highline” canals because they have embankments that allow water levels to be maintained above surrounding ground surfaces so that water can be delivered to agricultural receiving lands by gravity flow. The NCMWC also operates two pumps along the NCC south levee that provide irrigation water to agricultural lands in the northern portion of the Basin. These NCMWC irrigation systems and several other landowner-operated systems along the Sacramento River east levee, NCC south levee, and PGCC west levee would need to be relocated to accommodate improvements to these levees.



Source: Aerial image SACOG 2007, adapted by EDAW/AECOM (now AECOM) in 2007 based on data from HDR and Wood Rodgers

The Natomas Basin Conservancy Lands

Plate 1-8



Source: Aerial image SACOG 2007; adapted by EDAW/AECOM (now AECOM) in 2007 based on data from Eric Hansen

Existing Natomas Basin Drainage and Irrigation Features

Plate 1-9

RD 1000 operates several drainage pumping plants along the Sacramento River east levee, the NCC south levee, and the NEMDC west levee that could be affected by levee improvement activity. As shown in **Plate 1-9**, Pumping Plant No. 2, located in Sacramento River Reach C:4B, pumps drain water from the lower end of the North Drainage Canal; Pumping Plant No. 3, located in Sacramento River east levee Reach B:13, pumps drain water from the West Drainage Canal; Pumping Plant No. 1, located in Sacramento River east levee Reach A:20A, pumps drain water from the Main Drainage Canal; Pumping Plant No. 4, located in NCC Reach D:2, pumps drain water from the upper end of the North Drainage Canal; Pumping Plant No. 5, located in Sacramento River east levee Reach B:10, pumps drain water from the West Drainage Canal; Pumping Plant No. 8, located on the NEMDC west levee between Del Paso Road and North Market Boulevard, pumps drain water from the C-1 Drain; and Pumping Plant No. 6, located on the NEMDC west levee between Elverta Road and Elkhorn Boulevard, pumps drain water from the E Drain. These pumping facilities include discharge pipelines that would need to be relocated as part of the levee improvements in these locations. Pumping Plant No. 2 was temporarily removed as part of an emergency levee repair in 2006 but will be reconstructed as part of the Phase 3 Project, planned for construction in 2010.

The City of Sacramento operates the Willow Creek stormwater pumping station, which is located in Sacramento River Reach A:19B; Pump Station 58, which is located on the American River north levee at Asuza Street; and Pump Station 102, which is located on the NEMDC west levee in Gardenland Park.

1.5 ENVIRONMENTAL REGULATORY FRAMEWORK AND RELATIONSHIP OF THIS EIS/EIR TO OTHER DOCUMENTS

1.5.1 NATIONAL ENVIRONMENTAL POLICY ACT

NEPA provides an interdisciplinary framework for Federal agencies to develop information that will help them to take environmental factors into account in their decision-making (42 USC Section 4321, 40 CFR Section 1500.1). According to NEPA, an EIS is required whenever a proposed major Federal action (e.g., a proposal for legislation or an activity financed, assisted, conducted, or approved by a Federal agency) would result in significant effects on the quality of the natural and human environment.

Implementation of the project is dependent upon Federal action because it would require Federal approval for one or more of the following activities, depending on the project proponent: (i) Congressional authorization (USACE); (ii) alteration of Federal project levees (requires permission from USACE pursuant to Section 408) (SAFCA); (iii) placement of fill material into jurisdictional waters of the United States (requires permission from USACE pursuant to Section 404) (SAFCA); (iv) work performed in, over, or under navigable waters of the United States (such as excavation of material from or deposition of material into navigable waters) (requires permission from USACE under Section 10) (SAFCA); and (v) activities affecting plant or animal species protected by the Federal Endangered Species Act (ESA) (16 USC Section 1531[c][1][2]) (USACE and SAFCA). An EIS is used by Federal agencies in making decisions and is intended to provide full and open disclosure of environmental consequences prior to agency action.

As discussed above under Section 1.1.1, “Scope of Environmental Analysis,” this EIS/EIR is tiered from, or incorporates by reference, where appropriate, information contained in previous environmental documents completed for the NLIP. Incorporation of previous analysis by reference is encouraged for NEPA analysis under the Council on Environmental Quality (CEQ) regulations (40 CFR Sections 1500.4, 1502.21). Section 1502.21 reads:

Agencies shall incorporate material into an environmental impact statement by reference when the effect will be to cut down on bulk without impeding agency and public review of the action. The incorporated material shall be cited in the statement and its content briefly described. No material may be incorporated by reference unless it is reasonably available for inspection by

potentially interested persons within the time allowed for comment. Material based on proprietary data which is itself not available for review and comment shall not be incorporated by reference.

NEPA requires a citation and brief summary of the referenced material, as well as the public availability of the referenced material.

1.5.2 CALIFORNIA ENVIRONMENTAL QUALITY ACT

According to the State CEQA Guidelines (14 CCR Section 15064[f][1]), preparation of an EIR is required whenever a project may result in a significant environmental impact. An EIR is an informational document used to inform public agency decision makers and the general public of the significant environmental effects of a project, identify possible ways to mitigate or avoid the significant effects, and describe a range of reasonable alternatives to the project that could feasibly attain most of the basic objectives of the project while substantially lessening or avoiding any of the significant environmental impacts. Public agencies are required to consider the information presented in the EIR when determining whether to approve a project.

CEQA requires that state and local government agencies consider the environmental effects of projects over which they have discretionary authority before taking action on those projects (California Public Resources Code [PRC] Section 21000 et seq.). CEQA also requires that each public agency avoid or reduce to less-than-significant levels, wherever feasible, the significant environmental effects of projects it approves or implements. If a project would result in significant environmental impacts that cannot be feasibly mitigated to less-than-significant levels, the project can still be approved, but the lead agency's decision makers must issue a "statement of overriding considerations" explaining in writing the specific economic, social, or other considerations that they believe, based on substantial evidence, make those significant and unavoidable effects acceptable.

As discussed above under Section 1.1.1, "Scope of Environmental Analysis," this EIS/EIR is tiered from, and incorporates by reference, where appropriate, information contained in previous environmental documents completed for the NLIP. Under CEQA, tiering is encouraged and incorporation by reference is authorized (California PRC Sections 21093 and 21094; State CEQA Guidelines CCR Sections 15150 and 15152). Under CCR Section 15152 of the State CEQA Guidelines, when CEQA documentation has been performed for a program of projects, project-specific studies for subsequent projects within the program should be limited to effects which:

- ▶ were not examined as significant effects on the environment in the prior EIR; or
- ▶ are susceptible to substantial reduction or avoidance by the choice of specific revisions in the project, by the imposition of conditions, or other means (State CEQA Guidelines CCR Section 15152[d]).

CEQA requires citation to and a brief summary of the referenced material, as well as the public availability of the referenced material. Relevant portions of all documents incorporated by reference into this EIS/EIR are summarized throughout this EIS/EIR where specifically noted (State CEQA Guidelines CCR Section 15150). See Section 1.10, "Related NEPA Documents, Documents Relied on in Preparation of This EIS/EIR, and Documents Incorporated by Reference."

1.5.3 PROJECT AUTHORIZATION

Federal financial participation in the project would require additional action by Congress based on the results of the Common Features/Natomas PACR, as discussed above.

SAFCA is authorized to proceed with the early implementation project as approved by the SAFCA Board of Directors in April 2007 and as funded in part by the Consolidated Capital Assessment District that was formed in April 2007. In October 2007, the California Legislature approved, and the Governor signed, Senate Bill 276

authorizing the state's participation in the project. The state has the capability to fund its share of the project cost under the authorities created by the passage of Propositions 1E and 84 in November 2006.

1.5.4 NATOMAS LEVEE IMPROVEMENT PROGRAM ENVIRONMENTAL DOCUMENTATION

The relationship of the NLIP Landside Improvement Project phases to one another and their relationship to this EIS/EIR are summarized below. **Table 4.18-1** presents the major components of the NLIP Landside Improvements Project and construction timing of each project phase; these are also shown in **Plates 2-7a** and **2-7b**.

1.5.4.1 PHASE 1 PROJECT

On February 16, 2007, the SAFCA Board of Directors certified the Local Funding EIR (SAFCA 2007a), which examined the physical environmental effects associated with the program of flood damage reduction measures and related mitigation and habitat enhancements that the local funding mechanisms would be used to finance. The Local Funding EIR covered the NLIP Landside Improvements Project Phases 1–4 at a program level of detail and the Phase 1 Project (NCC South Levee Phase 1 Improvements) at a project-specific level of detail. The Phase 1 Project was constructed in 2007 and 2008.

1.5.4.2 PHASE 2 PROJECT

On November 29, 2007, the SAFCA Board of Directors certified the Phase 2 EIR (SAFCA 2007c), which covered the three additional phases of “landside” components of the NLIP that were proposed for construction in 2008 (Phase 2 Project), 2009 (Phase 3 Project), and 2010 (Phase 4 Project, including sub-phases a and b). The Phase 2 EIR was tiered from the analysis in the Local Funding EIR, consistent with CCR Section 15152 of the State CEQA Guidelines. The 2008 construction phase (now referred to as the Phase 2 Project) was analyzed at a project level, and the 2009–2010 construction phases (now referred to as the Phase 3, 4a, and 4b Projects, or the remainder of the Landside Improvements Project) were analyzed at a program level.

To implement the Phase 2 Project, SAFCA required permission from USACE pursuant to Section 408 for alteration of a Federal project levee and Section 404 for the discharge of fill into jurisdictional waters of the United States. Therefore, following completion of the Phase 2 EIR and local approval of the Phase 2 Project, USACE prepared the Phase 2 EIS (USACE 2008). A record of decision (ROD) was issued on January 21, 2009, at which time USACE also issued the 408 permission and 404 permit for the Phase 2 Project.

The Phase 2 Project as presented in the Phase 2 FEIS differs from the Phase 2 Project as evaluated in the 2007 Phase 2 EIR for the following reasons. By the time the Phase 2 DEIS began, SAFCA's engineering consultants had determined that cutoff walls could be used instead of berms along several of the Sacramento River east levee reaches. Thus, the Phase 2 FEIS includes proposed cutoff walls in some Sacramento River east levee reaches and a discussion of the impacts of the cutoff walls on groundwater recharge. Additionally, it became clear during the EIS process that much of the 2008 construction phase (or Phase 2 Project) would actually have to be conducted in 2009. The Phase 2 FEIS therefore acknowledges that possibly all of the Phase 2 Project construction could be concurrent with construction of the Phase 3 Project, and discusses the worst-case consequences to haul truck traffic, noise, air quality, and other construction-related effects accordingly.

These differences were considered in the Phase 2 SEIR (SAFCA 2009a), prepared by SAFCA, which was certified by the SAFCA Board of Directors on January 29, 2009, at which time the Board also approved the modifications to the Phase 2 Project. Subsequently, two addenda to the Phase 2 EIR were prepared by SAFCA to evaluate additional minor modifications to the Phase 2 Project; the first Addendum to the Phase 2 EIR (SAFCA 2009c) was certified by the SAFCA Board of Directors on June 8, 2009 and the 2nd Addendum to the Phase 2 EIR

(SAFCA 2009d) was certified on August 20, 2009. The Phase 2 Project can be constructed on a stand-alone basis, assuming no further action on the balance of the NLIP is taken.

Construction of the Phase 2 Project began in May 2009 and is anticipated to be completed in 2010, assuming receipt of all required environmental clearances and permits. It is clear that a portion of Phase 2 Project construction will likely be complete prior to construction of the Phase 3 Project. However, it is still likely that there will be some overlap in construction schedules between these two phases (see below).

1.5.4.3 PHASE 3 PROJECT

On February 13, 2009, USACE and SAFCA issued the Phase 3 Draft EIS/Draft EIR (DEIS/DEIR) for public review and comment. Following public review, SAFCA prepared a Final EIR (FEIR) (SAFCA 2009b) to provide responses to comments on the Phase 3 DEIS/DEIR. The SAFCA Board of Directors certified the FEIR and approved the Phase 3 Project on May 21, 2009. Separately, USACE prepared a Final EIS (FEIS) (USACE 2009) that was issued for public review on August 21, 2009. A ROD was issued on April 2, 2010, at which time USACE also issued the 408 permission and 404 permit for the Phase 3 Project.

After the May 21, 2009 certification of the Phase 3 EIR, SAFCA made minor modifications to the design of the Phase 3 Project. An addendum to the Phase 3 EIR (SAFCA 2009e) was prepared by SAFCA to evaluate these modifications; the SAFCA Board of Directors certified the Addendum and approved the modifications to the Phase 3 Project on September 17, 2009.

To construct the Phase 3 Project with minimal interruption of and conflict with drainage/irrigation services and wildlife habitat (specifically, giant garter snake habitat), some Phase 3 Project components need to be constructed in 2009 in advance of the Phase 3 Project's major levee construction that is scheduled to occur in 2010. To facilitate this staged construction, a staged permitting approach was developed for the Phase 3 Project. Specifically, irrigation and drainage infrastructure (termed the Phase 3a Project) was permitted by USACE and the Central Valley RWQCB under Sections 404 and 401, respectively, of the Clean Water Act, on October 7, 2009. Some vegetation encroachments would also occur during the non-nesting season for raptors and other bird species. A separate, but related, set of permits for the Phase 3 Project's levee construction and related pumping plant improvements (termed the Phase 3b Project) was issued in spring 2010.

Preliminary construction (canal work, utility relocation, vegetation removal, and demolition of structures) of the Phase 3 Project (3a) began in fall 2009, with major levee construction (3b) planned to begin in 2010, assuming receipt of all required environmental clearances and permits. The potential exists for up to 30% of the Phase 2 Project to also be constructed in 2010, concurrent with major Phase 3 Project levee construction, or even potentially concurrently with the Phase 4a Project, depending on the timing and availability of funding, and environmental clearances and permits.

1.5.4.4 PHASE 4a PROJECT

On August 28, 2009, USACE and SAFCA issued the Phase 4a DEIS/DEIR for public review and comment. Following public review, SAFCA prepared an FEIR (SAFCA 2009f). The SAFCA Board of Directors certified the FEIR and approved the Phase 4a Project on November 13, 2009. Separately, USACE prepared an FEIS (USACE 2010) that was issued for public review in February 2010. USACE will consider whether to grant Section 408 permission and issue permits under Sections 404 and 10, and document its decision in a ROD, expected in summer 2010. If permitted, the Phase 4a Project could be constructed at the same time as portions of the Phase 3 Project. Construction of the Phase 4a Project is planned to begin in 2011 and to be completed in 2012, assuming receipt of all required environmental clearances and permits.

1.5.4.5 PHASE 4b PROJECT

This EIS/EIR evaluates at a project-level the direct, indirect, and cumulative effects of the Phase 4b Project, which was evaluated at a program level in the Local Funding EIR, Phase 2 EIR, and Phase 2 EIS. Construction is planned to begin as early as 2012 and anticipated to be completed in 2016, assuming receipt of Congressional authorization, funding (if SAFCA pursues without Federal participation), and all required environmental clearances and permits.

1.6 SCOPE AND FOCUS OF THIS EIS/EIR

Pursuant to the CEQ, USACE's NEPA regulations, CEQA, and the State CEQA Guidelines (CCR Section 15064), the discussion of potential effects on the environment in this EIS/EIR is focused on those impacts that USACE and SAFCA have determined may be potentially significant.

This EIS/EIR includes an evaluation of 16 environmental issue areas and other NEPA- and CEQA-mandated issues (e.g., cumulative impacts and growth-inducing impacts). The 16 environmental issue areas are as follows:

- ▶ Agricultural Resources
- ▶ Land Use, Socioeconomics, and Population and Housing
- ▶ Geology, Soils, and Mineral Resources
- ▶ Hydrology and Hydraulics
- ▶ Water Quality
- ▶ Biological Resources
- ▶ Cultural Resources
- ▶ Paleontological Resources
- ▶ Transportation and Circulation
- ▶ Air Quality
- ▶ Noise
- ▶ Recreation
- ▶ Visual Resources
- ▶ Utilities and Services Systems
- ▶ Hazards and Hazardous Materials
- ▶ Environmental Justice

1.7 AGENCY ROLES AND RESPONSIBILITIES

As stated above, USACE is the Federal lead agency for NEPA, and SAFCA is the state lead agency for CEQA.

1.7.1 COOPERATING, RESPONSIBLE, AND TRUSTEE AGENCIES

Under NEPA, any Federal agency other than the lead agency that has jurisdiction by law or special expertise with respect to any environmental impact involved in an action requiring an EIS is eligible to be a cooperating agency (CFR Section 1501.6). Cooperating agencies are encouraged to actively participate in the NEPA process of the Federal lead agency, review the NEPA documents of the Federal lead agency, and use the documents when making decisions on the project.

Under CEQA, a responsible agency is a public agency, other than the lead agency, that has responsibility to carry out or approve a project (California PRC Section 21069). A trustee agency is a state agency that has jurisdiction by law over natural resources that are held in trust for the people of the State of California (California PRC Section 21070).

1.7.1.1 FEDERAL COOPERATING AGENCY AND NON-FEDERAL SPONSOR

As stated above, the FAA is serving as a cooperating agency for NEPA, and the CVFPB is serving as a non-Federal sponsor of USACE's Common Features/Natomas PACR.

1.7.1.2 STATE RESPONSIBLE AND TRUSTEE AGENCIES

The following state agencies may serve as responsible and trustee agencies if they have jurisdiction or regulatory approval over the project or a portion of the project:

- ▶ California Air Resources Board
- ▶ California Department of Education
- ▶ California Department of Fish and Game
- ▶ California Department of Toxic Substances Control
- ▶ California Department of Transportation
- ▶ California Department of Water Resources
- ▶ California State Lands Commission
- ▶ California State Office of Historic Preservation
- ▶ Central Valley Flood Protection Board (formerly the State Reclamation Board)
- ▶ Central Valley Regional Water Quality Control Board (Region 5)
- ▶ State Water Resources Control Board

1.7.1.3 REGIONAL AND LOCAL RESPONSIBLE AGENCIES

The following regional and local agencies may serve as responsible agencies if they have jurisdiction or regulatory approval over the project or a portion of the project:

- ▶ County of Sacramento
- ▶ County of Sutter
- ▶ City of Sacramento
- ▶ Feather River Air Quality Management District
- ▶ Natomas Central Mutual Water Company
- ▶ Natomas Unified School District
- ▶ Reclamation District No. 1000
- ▶ Reclamation District No. 1001
- ▶ Robla School District
- ▶ Sacramento Area Sewer District
- ▶ Sacramento County Environmental Management Department
- ▶ Sacramento County Local Agency Formation Commission
- ▶ Sacramento County Municipal Services Agency
- ▶ Sacramento County Water Agency (Zone 41 and 11C Water Districts)
- ▶ Sacramento Metropolitan Air Quality Management District
- ▶ Sacramento Metropolitan Fire District
- ▶ Sacramento Municipal Utility District
- ▶ Sacramento Regional County Sanitation District
- ▶ Sutter County Environmental Health Services
- ▶ Twin Rivers Unified School District

1.7.2 REGULATORY REQUIREMENTS, PERMITS, AND APPROVALS

1.7.2.1 FEDERAL ACTIONS/PERMITS

The Federal actions, authorizations, permissions, or permits that would be required for project implementation are listed below.

- ▶ **U.S. Army Corps of Engineers:** Decision on whether or not to grant permission for the Phase 4b Project under Sections 408 and 10, and decision on whether to issue a permit under Section 404 (only needed if

Congress does not provide authorization and SAFCA chooses to proceed with the Phase 4b Project without Federal participation).

- ▶ **National Marine Fisheries Service:** Federal ESA consultation and incidental-take authorization for the take of, or concurrence with conclusion of no effect for, Federally listed endangered and threatened species.
- ▶ **U.S. Environmental Protection Agency:** Reviewing and commenting on the EIS, filing and noticing the EIS, concurrence with Section 404 Clean Water Act permit, and Clean Air Act conformity.
- ▶ **U.S. Fish and Wildlife Service:** Federal ESA consultation and incidental-take authorization for the take of, or concurrence with conclusion of no effect for, Federally listed endangered and threatened species.

1.7.2.2 STATE ACTIONS/PERMITS

The state actions or permits that would be required for project implementation are listed below.

- ▶ **California Department of Fish and Game, Sacramento Valley:** Compliance with the California Endangered Species Act, streambed alteration (California Fish and Game Code Section 1602), Section 2081 permit, and protection of raptors (California Fish and Game Code Section 3503.5).
- ▶ **California Department of Transportation:** Encroachment permit and/or transportation management plan.
- ▶ **California State Office of Historic Preservation:** National Historic Preservation Act Section 106 compliance in relation to Federal project authorizations.
- ▶ **Central Valley Flood Protection Board (formerly the Reclamation Board) and Reclamation District Nos. 1000 and 1001:** levee and floodway and other encroachment permits (only needed if Congress does not provide authorization and SAFCA chooses to proceed with the Phase 4b Project without Federal participation).
- ▶ **Central Valley Regional Water Quality Control Board (Region 5):** National Pollutant Discharge Elimination System construction stormwater permit (Notice of Intent to proceed under General Construction Permit) for disturbance of more than 1 acre, discharge permit for stormwater, general order for dewatering, and Clean Water Act Section 401 certification or waste discharge requirements.

1.7.2.3 REGIONAL AND LOCAL ACTIONS/PERMITS

The regional and local actions and permits that would be required for project implementation are listed below.

- ▶ **City of Sacramento:** Possible construction authorizations/encroachment permits.
- ▶ **Counties of Sacramento and Sutter:** Permits for compliance with the state's Surface Mining and Reclamation Act, and other possible construction authorizations/encroachment permits.
- ▶ **Feather River Air Quality Management District and Sacramento Metropolitan Air Quality Management District:** Authority to construct (for devices that emit air pollutants), permit to operate, and Air Quality Management Plan consistency determination.

1.8 PUBLIC INVOLVEMENT UNDER NEPA AND CEQA

1.8.1 NOTICE OF INTENT, NOTICE OF PREPARATION, AND SCOPING MEETING

USACE published a notice of intent (NOI) to prepare the American River Common Features GRR in the *Federal Register* (Vol. 73, No. 41) on February 29, 2008. A series of public scoping meetings were held in March 2008 to present information to the public and to receive public comments on the scope of the EIS. There is no mandated time limit to receive written comments in response to the NOI under NEPA. Because the Common Features/Natomas PACR/Phase 4b Project is a component of the Common Features GRR, a separate NOI for the Common Features/Natomas PACR/Phase 4b Project does not need to be published.

On November 5, 2009, SAFCA filed a notice of preparation (NOP) for this EIS/EIR with the State Clearinghouse. In addition to the State Clearinghouse's distribution of the NOP to potentially interested state agencies, copies of the NOP were distributed to approximately 900 recipients, including Federal, state, regional, and local agencies; non-profit and private organizations; homeowners associations; partnerships; businesses; and individual residents in the project area to solicit input as to the scope and content of this EIS/EIR. Because the distribution list likely did not account for all affected parties in the Phase 4b Project footprint, USACE and SAFCA published a notice in *The Sacramento Bee* on November 5, 2009. The NOP was circulated for a 30-day public comment period, in accordance with the State CEQA Guidelines, which closed on December 4, 2009.

A joint NEPA/CEQA public scoping meeting was held on November 18, 2009 from 4:30 to 6:30 p.m. at the South Natomas Community Center in Sacramento, California, to brief interested parties on the Common Features/Natomas PACR/Phase 4b Project and obtain the views of agency representatives and the public on the scope and content of this EIS/EIR.

1.8.2 ADDITIONAL STEPS IN THE ENVIRONMENTAL PROCESS

This DEIS/DEIR is being distributed for a public and agency review and comment period that begins on July 2, 2010 and closes on August 16, 2010.

A public meeting will be held before the SAFCA Board of Directors on July 15, 2010 at 3:00 p.m. in the Sacramento City Council Chambers located at 915 I Street, Sacramento, California. In addition, written comments from the public, reviewing agencies, and stakeholders will be accepted throughout the public comment period. Comments must be received by 5:00 p.m. on August 16, 2010 by USACE or SAFCA at the following addresses, fax numbers, or e-mail addresses:

Elizabeth Holland, Planning Division
U.S. Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, CA 95814
Telephone: (916) 557-6763
Fax: (916) 557-7856
E-mail: Elizabeth.G.Holland@usace.army.mil

Or John Bassett, Director of Engineering
Sacramento Area Flood Control Agency
1007 7th Street, 7th Floor
Sacramento, CA 95814
Telephone: (916) 874-7606
Fax: (916) 874-8289
E-mail: BassettJ@saccounty.net

Following public review of the DEIS/DEIR, a FEIS/FEIR will be prepared, in which USACE and SAFCA will provide responses to comments on the DEIS/DEIR. The FEIS/FEIR will constitute a reprint of the entire DEIS/DEIR, and will include comment letters, responses to comments, and any text changes/clarifications.

1.9 ORGANIZATION OF THIS EIS/EIR

The content and format of this EIS/EIR are designed to meet the requirements of NEPA, as set forth by the CEQ and USACE's NEPA policy and guidance, including Appendix B, "NEPA Implementation Procedures for the

Regulatory Program,” appended to 33 CFR Part 325, “Processing of Department of Army Permits;” and CEQA and the State CEQA Guidelines. The EIS/EIR is organized as follows:

- ▶ The Abstract identifies the project title, lead agencies, an abstract, and comment submission information.
- ▶ The Executive Summary summarizes the purpose and intended uses of the EIS/EIR, lead agencies, project location, project background and phasing, need for action, and project purpose/objectives; presents an overview of the Adjacent Levee Alternative (Proposed Action) and alternatives under consideration as well as the major conclusions of the environmental analysis; documents the known areas of controversy and issues to be resolved; and ends with a summary table that lists the environmental impacts, mitigation measures, and significance conclusions for the Adjacent Levee Alternative (Proposed Action) and alternatives under consideration.
- ▶ Chapter 1, “Introduction and Statement of Purpose and Need,” explains the NEPA and CEQA processes; lists the lead, cooperating, responsible, and trustee agencies that may have discretionary authority over the project, including non-Federal sponsors; specifies the underlying project purpose/objectives and need for action, to which the lead agencies are responding in considering the proposed project and project alternatives; summarizes required permits, approvals, and authorizations; outlines the organization of the document; and provides information on public participation.
- ▶ Chapter 2, “Alternatives,” presents the Adjacent Levee Alternative (Proposed Action) and alternatives under consideration. This chapter constitutes the project description and describes the project components for each action alternative as well as the No-Action Alternative. This chapter also describes alternatives incorporated by reference and alternatives considered but eliminated from further consideration; and provides a summary matrix that compares the environmental consequences of the Adjacent Levee Alternative (Proposed Action) and alternatives under consideration.
- ▶ Chapter 3, “Affected Environment,” is divided into 16 sections. Each of the sections is devoted to a particular issue area and describes the baseline or existing environmental and regulatory conditions.
- ▶ Chapter 4, “Environmental Consequences and Mitigation Measures,” provides an analysis of impacts at an equal level of detail for the Adjacent Levee Alternative (Proposed Action) and alternatives under consideration, and identifies mitigation measures that would avoid or eliminate significant impacts or reduce them to a less-than-significant level, where feasible.
- ▶ Chapter 5, “Cumulative and Growth-Inducing Impacts and Other Statutory Requirements,” provides a summary of and incorporates by reference the analyses of cumulative impacts contained in previous environmental documents completed for the NLIP. The “Cumulative Impacts” section also includes any new cumulative impacts; the cumulative impacts of the potential construction of multiple project phases simultaneously; and the Phase 4b Project contribution to cumulative impacts from implementation of the Phase 4b Project. The “Growth-Inducing” impacts section provides a summary of and incorporates by reference the analysis of growth-inducing impacts contained in previous environmental documents completed for the NLIP. The remainder of this chapter includes the following requirements of NEPA and CEQA that are not addressed elsewhere in this EIS/EIR: relationship between short-term uses of the environment and long-term productivity, significant and unavoidable environmental impacts, and irreversible and irretrievable commitments of resources.
- ▶ Chapter 6, “Compliance with Federal Environmental Laws and Regulations,” summarizes the Federal laws and regulations that apply to the project and describes the project’s compliance with them.
- ▶ Chapter 7, “Consultation and Coordination,” summarizes public involvement activities under NEPA and CEQA; Native American consultation; and coordination and with other Federal, state, regional, and local

agencies. A list of organizations and individuals receiving a copy and/or notice of this EIS/EIR is also included.

- ▶ Chapter 8, “References,” provides a bibliography of sources cited in this EIS/EIR.
- ▶ Chapter 9, “List of Preparers,” lists individuals who were involved in preparing this EIS/EIR.
- ▶ Chapter 10, “Index,” contains the NEPA-required index for easy reference of topics and issues.
- ▶ Appendices contain background information that supports this EIS/EIR and can be found on the CD located in the back cover of this EIS/EIR.

1.10 RELATED NEPA DOCUMENTS AND DOCUMENTS RELIED ON IN PREPARATION OF THIS EIS/EIR

The following NEPA documents, previously prepared by USACE, were reviewed by USACE staff in the analysis of the project:

- ▶ April 1991, *Draft American River Watershed Investigation California Feasibility Report: Part I—Main Report and Part II—Draft Environmental Impact Statement/Environmental Impact Report*;
- ▶ December 1991, *American River Watershed Investigation (AWRI) California Feasibility Report (FR): Part I—Main Report and Part II—Environmental Impact Statement/Environmental Impact Report*;
- ▶ December 1991, AWRI FR, Volume 2, Appendix G: Section 404 Evaluation;
- ▶ March 1996, *Supplemental Information Report, American River Watershed Project, California: Part I—Main Report and Part II—Final Supplemental Environmental Impact Statement (FSEIS)/Environmental Impact Report*;
- ▶ June 27, 1996, Chief’s Report on FSEIS, signed by Acting Chief of Engineers, Major General Pat M. Stevens; and
- ▶ July 1, 1997, ROD on FSEIS, signed by Director of Civil Works, Major General Russell L. Furman.

The authors of this EIS/EIR have relied on several background documents in reaching many of the conclusions in this EIS/EIR. These documents provide background information, are sources of technical information, or are part of the planning context for the overall program. Some of these documents form the foundation of the technical analysis conducted in this EIS/EIR. These documents are as follows:

- ▶ *Sacramento Area Flood Control Agency, Natomas Levee Improvement Program, Summary Report on Hydraulic Impact Analyses, Phase 4b Project (Appendix C1)*;
- ▶ *Evaluation of Potential Groundwater Impacts Due to Proposed Construction for Natomas Levee Improvement Program (Appendix C2)*;
- ▶ *Evaluation of Cutoff Walls’ Impact on Groundwater Recharge (Appendix C3)*;
- ▶ *Potential Impacts of Phase 4b Project Slurry Cutoff Walls (Appendix C4)*;
- ▶ *Natomas East Main Drainage Canal Erosion Protection Design (Appendix C5)*;
- ▶ *Draft Pleasant Grove Creek Canal Erosion Analysis (Appendix C5)*;

- ▶ Programmatic Biological Opinion issued by USFWS on the Natomas Levee Improvement Program, Landside Improvements Project (October 2008); Amendment (May 2009); and Appendage (September 2009) (**Appendix D1**);
- ▶ California Endangered Species Act Section 2081 (b) Incidental Take Permit, Natomas Levee Improvement Program Landside Improvements Project (May 2009);
- ▶ Final NLIP Landside Improvements Project Programmatic Long-Term Management Plan (April 2009);
- ▶ Wetland delineation verification letters from USACE (**Appendix D2**); and
- ▶ *Natomas Levee Improvement Program Initial Site Survey and Phase I Environmental Site Assessment, Volumes 8 and 13.*

Additional reference documents used to prepare this EIS/EIR are listed in Chapter 8, “References.”

2 ALTERNATIVES

2.1 INTRODUCTION

As noted in Chapter 1, “Introduction and Statement of Purpose and Need,” this EIS/EIR has been prepared to evaluate the potential environmental impacts of the Phase 4b Project, and will be submitted to Congress in late 2010 to support approval of USACE’s American River Watershed Common Features Project/Natomas Post-authorization Change Report (Common Features/Natomas PACR), which is an element of the American River Watershed Common Features Project General Re-evaluation Report (Common Features GRR). The Common Features/Natomas PACR includes all four project phases (1, 2, 3, and 4a, and 4b) of the Landside Improvements Project, which is a component of the Natomas Levee Improvement Program (NLIP). These project phases are summarized in Section 1.5, “Environmental Regulatory Framework and Relationship of this EIS/EIR to Other Documents.” This EIS/EIR summarizes prior environmental analyses for all previously approved project phases, as well as previously released public draft documents of the Landside Improvements Project, and evaluates in detail the environmental effects of the proposed Phase 4b Project. This information will then become part of the overall request for Congressional review and approval of the Common Features/Natomas PACR.

This EIS/EIR evaluates the potential project-level impacts on the environment from implementation of the Phase 4b Project (Proposed Action/Proposed Project), hereinafter referred to in this chapter as “the project.” This chapter describes the alternatives that were considered to provide additional flood risk reduction to the Natomas Basin consistent with the objectives in Chapter 1, “Introduction and Statement of Purpose and Need.” The Phase 4b Project builds upon a program of improvements analyzed in previous environmental documents for achieving flood risk damage reduction for the 53,000-acre Natomas Basin, which is encircled by 42 miles of levees (**Plate 1-1**). Although they provide contrasting advantages and disadvantages, each of the action alternatives is considered feasible for the purpose of analysis based on relevant economic, environmental, social, technological, and legal factors. Three alternatives are evaluated at an equal level of detail in this EIS/EIR:

- ▶ No-Action Alternative,
- ▶ Adjacent Levee Alternative (Proposed Action), and
- ▶ Fix-in-Place Alternative.

These alternatives represent a reasonable range of alternatives, consistent with the requirements of NEPA and CEQA and when considered in the context of prior alternatives analyses described in previous environmental documents and which are incorporated by reference in this EIS/EIR (see **Appendix B1**). The action alternatives under consideration have been formulated to feasibly accomplish the primary objectives of the project as discussed in Chapter 1, “Introduction and Statement of Purpose and Need,” of this EIS/EIR, which includes reducing the risk of flooding to the Natomas Basin. The action alternatives include components that could avoid or substantially lessen one or more of the project’s significant effects.

2.1.1 NEPA/CEQA REQUIREMENTS FOR EVALUATION OF ALTERNATIVES

2.1.1.1 NEPA REQUIREMENTS

The NEPA Council on Environmental Quality Regulations (40 Code of Federal Regulations [CFR] Section 15012.14) require that an EIS include:

- ▶ an objective evaluation of reasonable alternatives;
- ▶ identification of the alternatives considered but eliminated from detailed study, along with a brief discussion of the reasons that these alternatives were eliminated;

- ▶ information that would allow reviewers to evaluate the comparative merits of the proposed action (i.e., proposed project) and alternatives;
- ▶ consideration of the no-action alternative;
- ▶ identification of the agency’s preferred alternative, if any; and
- ▶ appropriate mitigation measures not already included in the proposed action or alternatives.

NEPA requires the analysis of the proposed action and of all alternatives at a substantially similar level of detail. The Council on Environmental Quality Regulations (40 CFR Section 1502.14) require agencies to rigorously explore and objectively evaluate all reasonable alternatives and to devote substantial treatment to each alternative considered, including the proposed action. All alternatives considered, including the preferred alternative, must be evaluated compared to the No-Action Alternative (future without project).

2.1.1.2 CEQA REQUIREMENTS

The California Code of Regulations (CCR) Section 15126.6(a) of the State CEQA Guidelines requires that an EIR:

- (1) describe a range of reasonable alternatives to a proposed project, or to the location of the project, that would feasibly attain most of the basic project objectives but would avoid or substantially lessen any of the significant effects of the project; and
- (2) evaluate the comparative merits of the alternatives.

An EIR need not consider every conceivable alternative to a proposed project, but must consider a range of reasonable, potentially feasible alternatives that will foster informed decision making and public participation.

The range of alternatives required to be evaluated in an EIR is governed by a “rule of reason” that requires the EIR to consider only those alternatives necessary to permit a reasoned choice. The EIR need examine in detail only those alternatives that the lead agency determines could feasibly attain most of the basic project objectives, taking into account factors that include site suitability; economic viability; availability of infrastructure; general plan consistency; other plans or regulatory limitations; jurisdictional boundaries; and whether the proponent can reasonably acquire, control, or otherwise have access to an alternative site (State CEQA Guidelines CCR Section 15126.6[f]). CEQA does not require the alternatives to be evaluated at the same level of detail as the proposed project.

The State CEQA Guidelines recommend that an EIR should briefly describe the rationale for selecting the alternatives to be discussed, identify any alternatives that were considered by the lead agency but were eliminated as infeasible, and briefly explain the reasons underlying the lead agency’s determination (State CEQA Guidelines CCR Section 15126.6[c]).

An EIR must also evaluate a “no-project” alternative, which represents “what would be reasonably expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services” (State CEQA Guidelines CCR Section 15126.6[e][2]). Under CEQA, the no-project alternative, like all of the alternatives, is compared to the proposed project.

2.1.2 ALTERNATIVES SCREENING

USACE and SAFCA formulated the project and a reasonable range of alternatives that would achieve the specific project objectives through the following steps:

- ▶ identification of the deficiencies in the Natomas levee system that must be addressed to provide at least 100-year (0.01 annual exceedance probability [AEP]) flood risk reduction as quickly as possible;
- ▶ identification of the deficiencies in the Natomas levee system that must be addressed to provide 200-year (0.005 AEP) flood risk reduction,
- ▶ identification of feasible remedial measures to address the deficiencies,
- ▶ determination of the likely environmental impacts of the remedial measures,
- ▶ development of a reasonable range of flood damage reduction alternatives for implementing the remedial measures; and
- ▶ identification of measures to ensure that each alternative would improve aviation safety, minimize impacts on significant cultural resource sites, and enhance habitat values.

Alternatives screening for the overall NLIP has been undertaken in a systematic manner through several environmental documents as summarized in this chapter and detailed in **Appendix B1**. A description of the flood risk reduction measures that SAFCA considered for developing alternatives is provided below.

2.1.3 TYPES OF FLOOD RISK REDUCTION MEASURES CONSIDERED

Designing effective flood risk reduction measures is an iterative process that involves identifying, evaluating, and comparing measures and preliminary alternatives to develop a reasonable range of final alternative plans for consideration by decision makers and the general public. For the NLIP Landside Improvements Project, engineering measures were developed and considered that alone or in various combinations would address the project objectives.

The engineering measures that were considered for the Phase 4b Project must meet several criteria. The design selected must adequately improve performance of the levee so that Federal Emergency Management Agency (FEMA) certification is possible. Generally, the requirements are to provide a sufficient height of levee raise (**Plate 1-3**) so that the levee height is adequate, levee stability meets levee design criteria, and/or seepage through or beneath the levee is reduced to levels acceptable to USACE. Measures considered are described below.

2.1.3.1 LEVEE IMPROVEMENTS

USACE has divided the flood damage reduction improvements within the Natomas Basin into nine reaches (Reaches A–I), as shown on **Plate 1-3**. USACE’s reach designations differ from SAFCA’s reach designations, which are more finely subdivided than the USACE system for the Sacramento River east levee, American River north levee, and the NCC. In **Plate 1-3**, lettered reaches follow the USACE designation, while numbered reaches follow the SAFCA designations:

- ▶ Sacramento River east levee: Reach A:16–20
- ▶ Sacramento River east levee: Reach B:5A–15
- ▶ Sacramento River east levee: Reach C:1–4B
- ▶ NCC: Reach D:1–7
- ▶ PGCC: Reach E: there are no SAFCA reaches, just station numbers
- ▶ NEMDC North: Reaches F–G
- ▶ NEMDC South: Reach H
- ▶ American River north levee: Reach I:1–4

Sacramento River East Levee (Reach A:16–20)

The existing levee in Sacramento River east levee Reach A:16–20 currently meets height requirements, and, therefore, no levee raise is necessary in this reach. However, the levee needs to be upgraded to meet USACE requirements regarding seepage through the levee and its foundation, slope stability, and free access for inspection, maintenance, and emergency flood fighting. Two engineering options were analyzed for the levee upgrade: the Fix-in-Place Method and the Adjacent Levee Method. Because these options have potentially different effects on the environment, they are analyzed as the two action alternatives in this EIS/EIR (see Sections 2.3, “Proposed Action,” and 2.4, “Fix-in-Place Alternative”):

- **Fix-in-Place Method.** Most levee reaches in the Natomas Basin have a 2-to-1 horizontal-to-vertical (2H:1V) landside slope, which may not meet criteria for slope stability or access on the levee for maintenance and operation. This condition is found on Sacramento River east levee Reach A:16–20, which is a component of the Phase 4b Project. Using the Fix-in-Place method, the remedy would be to flatten the slope to a minimum 3-to-1 horizontal-to-vertical (3H:1V) landside slope by adding fill on top of the existing landside levee slope, thereby widening the base of the levee prism but not expanding the width of the levee crown (**Plate 2-1**, upper illustration). The Fix-in-Place method is compatible with the seepage remediation methods described under Section 2.1.3.2. By leaving the levee prism in the current alignment, this method requires vegetation clearance on the waterside of the levee to comply with USACE levee guidance that requires the removal of vegetation greater than 2 inches in diameter on the levee slopes and within 15 feet of the waterside and landside levee toes (USACE 2000). However, in reaches where the existing levee is already wide enough that the levee prism is considered clear of vegetation, such as in American River north levee Reach I:1–4, the Fix-in-Place method may be used to reduce the theoretical levee footprint to avoid encroachments on the landside.

While the levee footprint (its base) size may not be substantially altered, mitigation for loss of habitat would be required by various regulatory agencies. Where the widening results in filling waters of the United States, including wetlands, mitigation would be required, generally at a 1:1 replacement ratio. Where the widening occurs on the landside or waterside and trees that provide habitat or are otherwise protected exist, the mitigation requirement is to plant replacement woodlands and/or shaded riverine aquatic (SRA) habitat. In some instances, irrigation and drainage ditches and canals exist at the toe of the levee, and would require relocation to ensure USACE’s seepage and stability criteria are met. Widening of the existing levee may require the purchase of additional easements and/or rights-of-way, including areas for utilities and planting/replacement woodlands and other habitats. Proper construction of the widened levee may require excavation of a keyway trench in the foundation area at the toe of the levee.

- **Adjacent Levee Method.** This method combines slope flattening to 3H:1V with a widening of the existing levee crown by 15 to 20 feet on the landside. The concept of an adjacent levee is that the levee prism would be shifted landward (as shown in **Plate 2-1**, lower illustration), such that much of the vegetation on the waterside of the existing levee would be less likely to need to be cleared for levee operation and maintenance (see Section 2.1.3.4, “Management of Levee Vegetation and Structural Encroachments,” below). This design potentially reduces the need to remove vegetation on the waterside to meet USACE vegetation guidance criteria. The irrigation and drainage ditches and canals that exist at the toe of the levee may require relocation farther to the landside. Construction of an adjacent levee may also require the purchase of additional easements and/or rights-of-way, including areas for utilities and planting of replacement woodlands and other habitats. Proper construction of the adjacent levee foundation often requires excavation of an inspection trench in the foundation soils. Because the Natomas Basin’s natural levees have been augmented by human efforts, it is possible to find buried prehistoric features at considerable depth in the landside footprint.

Raised adjacent levees have been constructed or are in the approval process for Sacramento River east levee Reach C:1 to part way through Reach B:13 (Phase 2, 3, and 4a Projects). From the remainder of Sacramento River east levee Reach B:12 to Reach A:20 (Phase 4a and 4b Projects), the existing levee has sufficient height, and the proposed adjacent levee would be at the same height as the existing levee. The Phase 2, 3, and 4a Projects

are summarized in Section 4.18, “Summary of Environmental Impacts and Mitigation Measures from Previous Natomas Levee Improvement Program Phase 1–4a Landside Improvements Projects.”

Pleasant Grove Creek Canal and Natomas East Main Drainage Canal West Levee (North of Natomas East Main Drainage Canal Stormwater Pumping Station)

Two engineering options are also available for reaches where levee raising is required to meet the level of risk reduction required by the State for urbanized areas, such as the Natomas Basin. In the Phase 4b Project, these raises are proposed for the west levees of the Pleasant Grove Creek Canal (PGCC) (Reach E) and the Natomas East Main Drainage Canal (NEMDC) North (Reaches F–G). These options have similar environmental effects, and they are analyzed as part of both the Adjacent Levee Alternative (Proposed Action) (Section 2.3) and Fix-in-Place Alternative (Section 2.4):

- ▶ **Raise-in-Place Method.** Raising the levee in place would require the existing levee footprint to be widened at its base on one or both sides. This method may require replacement of public roadways that may be located on the crown of the levee. Although the levee footprint (its base) size may not be substantially altered, mitigation for loss of habitat would be required by various regulatory agencies. In some instances, irrigation and drainage ditches and canals exist at the toe of the levee, and would require relocation. Widening of the existing levee may require the purchase of additional easements and/or rights-of-way, including areas for utilities and planting/replacement woodlands and other habitats. Proper construction of the widened levee may require excavation of a keyway trench in the foundation area at the toe of the levee.
- ▶ **Adjacent Levee Raise Method.** In lieu of modifying the existing levee, a levee raise may also be achieved by constructing a new landside embankment adjoining the existing levee. This approach, which is similar to the adjacent levee method described above, allows sufficient levee height to be achieved without degrading the existing levee and rebuilding public roadways that may be located on top of the existing levee. However, it requires excavation of additional suitable material to build the adjacent structure. The irrigation and drainage ditches and canals that exist at the toe of the levee may require relocation farther to the landside. Construction of an adjacent levee may also require the purchase of additional easements and/or rights-of-way, including areas for utilities and planting of replacement woodlands and other habitats. Because the west levees of the PGCC and NEMDC, north of the NEMDC Stormwater Pumping Station, already substantially comply with levee vegetation guidance criteria, the adjacent levee is not needed as an option to avoid vegetation removal on the waterside (see 2.1.3.4, “Management of Levee Vegetation and Structural Encroachments,” below).

2.1.3.2 SEEPAGE REMEDIATION

Pre-NLIP existing seepage remediation in the Natomas Basin has primarily addressed seepage through the levee embankment (through-seepage). Through-seepage occurs when the waterside slope is loaded by high river stage for a sufficient time to develop a steady state condition in the levee embankment in which water is seeping on the levee landside slope, removing material from the levee embankment by internal erosion and leading to slope instability. Through-seepage is the movement of water through the levee itself, when high-flow conditions, and/or wind and wave action exist on the waterside of the levee. Through-seepage may be addressed by construction of cutoff walls through the levee prism or drained stability berms on the landside slope. The cutoff walls provide a low-permeability barrier to water flow through the levee. Drained stability berms prevent levee material from being removed, drains the seepage water away from the levee, and also increases the stability of the levee slope. Underseepage or seepage through the levee foundation occurs during prolonged high river stages and results in high gradients at the levee landside toe due to build-up of the water pore pressure in the levee foundation to a high limit which may lead to levee collapse due to piping (removal of material from the levee foundation through sand boils (**Plate 1-4**) or slope instability due to high water pore pressures in the foundation soils. Excessive underseepage gradients can be addressed by cutoff walls, seepage berms, and relief wells, or using a combination of these measures, which are discussed below.

Cutoff Walls

Cutoff walls use specialized earthen materials (often bentonite clay) constructed in the levee embankment, which extend into the levee foundation to a sufficient depth to reduce the seepage gradient at the landside toe of the levee below an allowable limit. Specialized equipment allows the cutoff walls to reach deep into the subsurface, to depths of 120 feet (**Plate 2-2**). Often the levee crown is “degraded,” meaning that the levee embankment is excavated to create a wide working platform for the construction equipment to install the cutoff wall. A fully penetrating cutoff wall installed deep enough to reach a lower impervious layer in the foundation may reduce the seepage gradient to a very low limit. A partially penetrating wall, which does not reach the lower impervious strata in the foundation, may reduce the seepage gradient by increasing the seepage path, but sometimes the reduction is not sufficient to drop the gradient below the maximum allowable limit and an additional seepage berm or relief well is required. Fully penetrating cutoff walls are generally preferred, if it is constructible, because they are the least costly (particularly if a soil-bentonite [SB] mix is used and the depth of wall is less than 85 feet); are the most reliable under uncertain hydraulic and geotechnical conditions (e.g., water surface elevations above design and variations in foundation soil conditions); and, when combined with an adjacent levee, minimize construction disturbance outside the levee footprint.

If a fully penetrating wall is not feasible due to the foundation conditions (the lower impervious layer is non-existent or at a depth not possible to be reached with the existing equipment), then partially penetrating walls eventually supplemented with additional methods of seepage mitigation (such as seepage berms or relief well) may be used. Eventually, partially penetrating walls may be completely replaced by seepage berms or relief wells.

Seepage Berms

Seepage berms are wide, shallow features with relatively flat surface slopes graded to drain landward. They are typically constructed using material excavated from borrow sites. The berms may be constructed of any impervious material from the borrow sites or, to increase the berms efficiency and decrease the berm width, the random berm material may be placed on a free drainage layer 2–2.5 feet thick placed on a 6 inches of filter material to prevent removal of the fine foundation material by piping. Seepage berms may extend between a minimum of 80 feet to up to 500 feet landside of the toe of the levee or the adjacent levee (**Plate 2-3**). In areas of limited space, seepage berms are supplemented with relief wells at the landside toe of the seepage berms.

Constructing seepage berms rather than cutoff walls avoids the deep ground-disturbing work that may adversely affect cultural resources that may be present, while still achieving flood damage reduction objectives. It is possible to construct a seepage berm using specialized equipment that minimizes vibration and pressure on the immediate subsurface environment. This construction method is often used where sensitive historical features may be expected near the ground surface, and relief wells are omitted. A seepage berm without relief wells extends the levee footprint farther landside and depending upon adjacent land use, may require relocation of permanent structures or take affected agricultural land out of production, as well as other environmental impacts.

Relief Wells

Relief wells are controlled artificial springs that relieve the confined water pressures to safe values. This reduces the potential for the removal of soil via piping or internal erosion caused by the uplift pressures beneath elements of the levee or beneath landward soil next to the levee. Relief wells are usually spaced about 50–150 feet apart to decrease the gradients at the levee toe below the maximum allowable gradient between two adjacent wells and allow water to flow without pumping during times of high water table. Piezometers are used as a tool to verify relief well performance by measuring the hydrostatic pressure between the wells. Because relief wells may only flow on an intermittent basis, sometimes several years apart, it is necessary to conduct regular maintenance of relief wells to ensure that they perform properly (**Plate 2-4**). Relief wells also require collection of water flowing through the wells during high river stages, which is then discharged back into the river through a pumping station.

This may require excavation of a ditch along the landside toe of the levee or seepage berm or collecting the water through an underground piping system.

2.1.3.3 BANK EROSION CONTROL

Bank erosion poses either a high or moderate risk to the stability of the Sacramento River east levee at several locations upstream and downstream of Interstate 5 (I-5) where river flows and waves generated by boat wakes have weakened and undercut portions of the bank supporting the levee. The adjacent levee design would address the potential instability created by these bank erosion processes by enlarging the levee section and moving the levee foundation landward away from the eroding bank. These bank erosion processes could also be addressed by installing rock revetments or other engineered structures along the eroding banks so as to reduce further erosion and protect the foundation of the levee (as proposed for the NEMDC South; see Section 2.3.3.2, “Sacramento River East Levee,” under “Pleasant Grove Creek Canal and Natomas East Main Drainage Canal – South Waterside Improvements”).

2.1.3.4 MANAGEMENT OF LEVEE VEGETATION AND STRUCTURAL ENCROACHMENTS

USACE levee guidance requires the removal of vegetation greater than 2 inches in diameter on the levee slopes and within 15 feet of the waterside and landside levee toes (USACE 2000). USACE levee guidance also requires an assessment of encroachments on the levee slopes, including utilities, fences, structures, retaining walls, driveways, and other features that penetrate the levee prism (see Section 2.3.4.11, “Structural Encroachments”). Substantial encroachments are present on the Sacramento River east levee with a smaller number of encroachments on the other Natomas levees.

Vegetation Variance Request

SAFCA and the Central Valley Flood Protection Board (CVFPB), the non-Federal sponsors of the NLIP, are requesting a variance from the standard vegetation guidelines set forth in USACE’s Engineering Technical Letter 1110-2-571 (USACE 2009a). Under this variance, vegetation would be allowed to remain on all or a portion of the waterside slope and berm of several of the levee segments comprising the perimeter levee system protecting the Natomas Basin. The following sections describe the levee segments that would be covered by this variance. Sections 2.3, “Proposed Action,” and 2.4, “Fix-in-Place Alternative,” describe the vegetation removal assumptions used by this EIS/EIR to provide environmental analysis to support consideration of this variance request.

Adjacent Levees

One of the objectives of constructing an adjacent levee along the Sacramento River east levee is to facilitate acceptable management of existing vegetation and structural encroachments along the waterside of this levee. By making the levee wider and effectively moving the “designated levee” section landward (**Plate 2-1**, lower illustration), the separation between waterside vegetation and the levee prism would be increased, thus reducing the conflicts between applicable USACE levee operation and maintenance requirements, and waterside vegetation and structural encroachments. Because this design would allow vegetation to remain on the waterside under the proposed variance, valuable riparian habitat would be preserved, benefiting several special-status species. This riparian habitat, which is shown on **Plates 3-4c** and **3-4d**, also provides a migration corridor habitat for a variety of wildlife species that inhabit the Natomas Basin.

Section 2.3.4.10, “Vegetation Management,” provides additional information on the relationship of the Adjacent Levee Alternative (Proposed Action) with management of levee vegetation. Construction of the adjacent levee would also involve removal of vegetation within 15 feet of the landside toe of the widened levee. The adjacent levee has been constructed and/or approved for Sacramento River east levee Reaches C:1–4B and B:5A–15 as part of the Phase 2 and 3 Projects.

Other segments of the Natomas Basin perimeter levee system may already be in compliance with levee vegetation guidance criteria or may qualify for a variance within the next several years because: (1) vegetation did not exist or has already been cleared within the 15-foot clearance zone; (2) these segments were previously overbuilt to the point where their levee prism could be considered clear of waterside or landside vegetation and would potentially qualify for a variance; or (3) planned improvements would ensure compliance through waterside slope flattening, shifting levee crowns in a landward direction, and removing any vegetation that would penetrate the levee prism. Levee segments falling into this category include most of the Natomas Cross Canal (NCC) south levee (Reach D:1–7), the PGCC west levee (Reach E), and the west levee of the NEMDC north of the NEMDC Stormwater Pumping Station (Reaches F–G).

Overbuilt Levees

An overbuilt levee is defined as a levee with land and waterside slopes of at least 3H:1V and a virtual levee crown (measured at the design water surface elevation) that is at least 35-feet wide (designated levee crown). Similar to the adjacent levee, the overbuilt levee allows for considering that the levee prism meets the criteria of having a 15-foot vegetation free zone from the projected waterside toe, such that much of the vegetation on the waterside of the existing levee is less likely to need to be cleared for levee operation and maintenance. Like the adjacent levee, to be in compliance, trees would not be allowed to remain within the area extending 15 feet landward from the toe of the overbuilt levee out to 15 feet from the toe of the projected waterside slope.

The American River north levee is an extension of the Sacramento River east levee that extends from I-5 to Northgate Boulevard, where it becomes the west levee of NEMDC South. This segment of the Natomas perimeter levee system is considered an overbuilt levee and may qualify for a variance from USACE levee vegetation guidance because it was widened beyond standard levee dimensions to support the Arden-Garden Connector transportation project. Also considered overbuilt and potentially eligible for a variance is the segment of the west levee of NEMDC South that extends from Northgate Boulevard to the Arden-Garden Connector. Although these levee segments are overbuilt to the extent that they may not need vegetation clearance on the waterside if a variance is granted, on the landside an extensive number of trees would be removed to accommodate the expanded levee footprint, including removal of vegetation within 15 feet of the new landside levee toe.

Non-Conforming Levees

The lower portion of the NEMDC west levee from the NEMDC Stormwater Pumping Station to Northgate Boulevard presents more challenging vegetation management options. This portion of the levee system was raised and strengthened by SAFCA in 1995–1996 as part of the American River Watershed Project authorized by Congress in the 1993 Defense Appropriations Act. The authorized project called for raising the levee to protect the Natomas Basin from the combined effects of high flows in the American River channel and high flows in Dry Creek and Arcade Creek, the tributary streams that drain foothill watersheds east of Natomas. SAFCA widened the existing levee section to the landside and raised the levee by two to three feet. Urban development along the landside of the levee constrained the space available for the project and the improved levee was designed and constructed with a 2:1 landside slope.

Project construction required landside tree removal to accommodate the widened footprint of the improved levee. However, with the concurrence of USACE and the State, to minimize the project's environmental effects, trees were allowed to remain in the maintenance area along the landside toe of the improved levee and along the waterside slope of the levee and waterside berm. It was felt that these trees would not impair the performance of the improved levee because there was adequate visibility of and access to both sides of the levee to conduct routine maintenance and flood fighting activities. Nor was there any significant concern regarding the impact of the remaining trees on the safety or structural integrity of the improved levee. Although nearly overtopped and subjected to prolonged high flow during the flood of 1986, the old levee had performed well with few signs of stress. With its increased height, the new levee performed even better during the flood of 1997. However, this

levee is no longer considered in compliance with USACE levee vegetation guidance, and avoidance of landside tree clearing in this maintenance area would require a variance from USACE.

The Phase 3 Project analyzed the installation of cutoff walls through portions of the NEMDC west levee where it crosses the old streambeds of Dry Creek, Arcade Creek and Magpie Creek. The Phase 4b Project proposes construction of cutoff walls along the entire length of the NEMDC and PGCC west levee. Installation of these cutoff walls would address the risk of destabilizing underseepage in these locations which occupy approximately one-half the length of the levee between the NEMDC Stormwater Pumping Station and Northgate Boulevard. This risk was not considered to be substantial when the improvements described above were designed and constructed. Insofar as vegetation on or near the improved levee has also now been identified as a risk factor, removal would be required for all non-native trees from within the vegetation-free zone; all native trees that have a diameter at breast height (dbh) of four inches or less; and all larger native trees that are located on the waterside slope, the crown, or within 15 feet of the landside toe (or within the right-of-way, if less than 15 feet) (see 2.2.1.1, “No Phase 4b Project Construction”). Under a variance request, vegetation within 15 feet of the toe of the waterside slope of the west levee along NEMDC South would be allowed to remain.

Life Cycle Management Program

The following five risk factors are associated with levee vegetation:

- ▶ access (trees could obstruct access for routine maintenance and flood fighting);
- ▶ visibility (trees could impair routine levee inspection and high water condition monitoring);
- ▶ slope stability (trees could contribute to slope instability);
- ▶ seepage (tree roots could create seepage pathways); and
- ▶ windthrow (overturned trees could create destabilizing slip planes).

For non-conforming levees that may be granted a variance, implementation of a Life Cycle Management (LCM) program would use GIS- and field-based evaluation tools to ensure that new trees would not become established in the vegetation-free zone, and trees allowed to remain in this zone would be carefully monitored, trimmed and, if necessary, removed if they become an unacceptable risk to the performance of the levee due to age or infirmity.

2.1.4 ALTERNATIVES CONSIDERED IN PREVIOUS ENVIRONMENTAL ANALYSES AND INCORPORATED BY REFERENCE

The analyses of alternatives performed in the previous environmental documents from which this EIS/EIR is tiered, which are listed below, are summarized in **Appendix B1**. The alternatives analyses from these documents are incorporated by reference, herein. The material summarized in **Appendix B1** is provided to summarize the scope of analysis that has already been performed and thus shows which alternatives have been eliminated from further analysis or rejected by previous agency decisions.

The alternatives analyses incorporated herein by reference are from the following environmental documents:

- ▶ *Environmental Impact Report on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area*, State Clearinghouse No. 2006072098 (Local Funding EIR) (SAFCA 2007a);
- ▶ *Environmental Impact Report on the Natomas Levee Improvement Program, Landside Improvements Project*, State Clearinghouse No. 2007062016 (Phase 2 EIR) (SAFCA 2007b);
- ▶ *Environmental Impact Statement for 408 Permission and 404 Permit to Sacramento Area Flood Control Agency for the Natomas Levee Improvement Project* (Phase 2 EIS) (USACE 2008);

- ▶ *Supplement to the Environmental Impact Report on the Natomas Levee Improvement Program, Landside Improvements Project—Phase 2 Project*, State Clearinghouse No. 2007062016 (Phase 2 SEIR) (SAFCA 2009a);
- ▶ *Addendum to the Environmental Impact Report on the Natomas Levee Improvement Program, Landside Improvements Project – Phase 2 Project*, State Clearinghouse No. 2007062016 (Phase 2 EIR 1st Addendum) (SAFCA 2009c);
- ▶ *2nd Addendum to the Environmental Impact Report on the Natomas Levee Improvement Program, Landside Improvements Project – Phase 2 Project*, State Clearinghouse No. 2007062016 (Phase 2 EIR 2nd Addendum) (SAFCA 2009d);
- ▶ *Environmental Impact Statement and Environmental Impact Report on the Natomas Levee Improvement Program, Phase 3 Landside Improvements Project*, State Clearinghouse No. 2008072060 (Phase 3 EIS and EIR) (USACE 2009b and SAFCA 2009b);
- ▶ *Addendum to the Environmental Impact Report on the Natomas Levee Improvement Program, Phase 3 Landside Improvements Project*, State Clearinghouse No. 2008072060 (Phase 3 EIR Addendum) (SAFCA 2009e); and
- ▶ *Environmental Impact Statement and Environmental Impact Report on the Natomas Levee Improvement Program, Phase 4a Landside Improvements Project*, State Clearinghouse No. 2009032097 (Phase 4a EIS and EIR) (USACE 2010 and SAFCA 2009f).

Relevant portions of these documents, where specifically noted, are summarized throughout this EIS/EIR. Printed copies of these documents are available to the public at USACE’s office at 1325 J Street, Sacramento, California and at SAFCA’s office at 1007 7th Street, 7th Floor, Sacramento, California, during normal business hours, and are also available on USACE’s Web site, at <http://www.spk.usace.army.mil> and at SAFCA’s Web site, at http://www.safca.org/Programs_Natomas.html.

2.1.5 ALTERNATIVES CONSIDERED, BUT ELIMINATED FROM FURTHER CONSIDERATION

Numerous alternatives have been considered by USACE and SAFCA to reduce flood risk in the Natomas Basin. These alternatives were evaluated and eliminated from further consideration during completion of previous environmental documents. This section briefly summarizes alternatives considered but eliminated in these documents. More detailed information on alternatives considered but eliminated is provided in **Appendix B1**.

The following alternatives were reviewed and eliminated from further consideration as described below:

- ▶ **Yolo Bypass Improvements.** This measure would involve lengthening the Fremont Weir and widening the Yolo Bypass to increase the amount of flood water conveyed through the bypass and reduce the amount of flood water conveyed through the Sacramento River channel downstream of the weir. This alternative was eliminated because: (1) it would be too costly for SAFCA to implement; (2) levee height increases and substantial seepage and slope stability remediation would still be required for the Natomas perimeter levee system, adding to costs; (3) these improvements lie outside of SAFCA’s jurisdiction and would require Federal, State, and local cooperation and funding; and (4) the project objective of restoring 100-year (0.01 AEP) design flood levels to the Natomas Basin could not be achieved as quickly as possible. (Considered and eliminated in Phase 2 EIS.)
- ▶ **Reduced Natomas Urban Levee Perimeter.** This measure would involve construction of a cross levee running east to west across the Natomas Basin along an alignment north of Elkhorn Boulevard to protect

existing developed areas in the City and County of Sacramento. This alternative was eliminated because: (1) it is inconsistent with current Federal and State authorizations and would strand Federal, State, and local investments already made in improving the NCC south levee and Sacramento River east levee pursuant to past Congressional authorization; (2) it would result in the need to raise State Route (SR) 99 or otherwise protect SR 99 from flooding; (3) it would divide Reclamation District (RD) 1000 and disrupt several portions of the Natomas Basin irrigation and drainage system and require reconfiguration of these systems; (4) it would present significant barriers to achieving the goals of the *Natomas Basin Habitat Conservation Plan* (NBHCP); (5) it would have substantially greater costs than other alternatives without achieving any additional flood damage reduction benefit; and (6) it would leave a portion of the Basin currently planned for development by Sutter County (i.e., *Sutter Pointe Specific Plan* mixed-use development project) outside the urban levee perimeter and likely cause Sutter County to exercise its rights under SAFCA's joint exercise of powers agreement to prevent the expenditure of Consolidated Capital Assessment District funds on this measure. (Considered and eliminated in Local Funding EIR and Phase 2 EIS.)

- ▶ **Construction of a New Setback Levee.** This alternative would involve construction of a 5-mile-long levee along the northern reaches of the Sacramento River east levee parallel to the existing levee alignment but set back from the existing alignment by 500–1,000 feet. This alternative was eliminated because it is infeasible due to: (1) the presence of waterside residences along the existing levee from the southern end of Sacramento River east levee Reach C:2 to the American River north levee, and the need to maintain access to these residences from Garden Highway; (2) the proximity of the Sacramento River east levee to the Airport, and the need to prevent project features from increasing potential hazards to aviation safety; and (3) the possibility that utility relocations (power poles) and flood damage reduction measures could encroach into surface slopes of runway approach zones. (Considered and eliminated in Phase 2 EIR and Phase 2 EIS.)
- ▶ **Raise Levee in Place with a 1,000-Foot Levee Setback in the Upper 1.4 Miles along the Sacramento River East Levee.** This alternative would have provided a location for a substantial amount of tree planting on the waterside of the setback levee, contributing to the offsetting mitigation for the loss of the trees that may need to be removed along the existing levee to meet USACE criteria. This alternative was eliminated because it was unlikely that the new setback levee would provide 100-year (0.01 AEP) flood protection per USACE criteria. (Considered and eliminated in Phase 2 EIR, and analyzed, but not selected as the Proposed Action, in Phase 2 EIS.)
- ▶ **Construct an Adjacent Setback Levee with a 500-Foot Levee Setback in the Upper 1.4 Miles along the Sacramento River East Levee.** This alternative was evaluated because it would provide the opportunity for partially offsetting the loss of landside tree groves through the establishment of new riparian plantings in the levee setback area, as well as woodland plantings on the landside of the adjacent setback levee. This alternative was eliminated because it would require substantially greater quantities of borrow material with greater impacts on Important Farmland and transportation and circulation. (Considered and eliminated in Phase 2 EIR, and analyzed, but not selected as the Proposed Action, in Phase 2 EIS.)
- ▶ **No SAFCA Levee Improvements—Private Levees in Natomas.** This alternative was analyzed assuming that there would be no SAFCA project providing flood damage reduction in the Basin, thus causing private developers to separately fund and implement individual flood damage reduction in the form of private compartment levees that would protect new developments. This alternative was eliminated because it would (1) only partially meet the objective of providing 100-year (0.01 AEP) flood risk reduction, (2) potentially lead to increased fragmentation of habitat for special-status species, and (3) increase projected flood damages without a commensurate reduction in flood risk. (Considered and eliminated in Local Funding EIR and Phase 2 EIR.)
- ▶ **Natomas 100-Year Protection.** SAFCA analyzed the impacts associated with creation of one new assessment district, which would provide only 100-year (0.01 AEP) flood protection to the Natomas Basin, and which would use funding raised through existing Capital Assessment District Number 3 to provide the

local share of the cost of completing improvements to provide 100-year (0.01 AEP) flood risk reduction to the lower American River and South Sacramento Streams Group areas (SAFCA 2007a). This alternative was eliminated because it would fail to provide groundwork for the creation of 200-year (0.005 AEP) flood risk reduction over time (SAFCA 2007a). Because this alternative represents an alternative to the proposed funding mechanisms and not an alternative to the proposed levee improvements, this alternative was not considered to be an alternative to the Phase 2 Project and was not included in the Phase 2 EIS. (Considered and eliminated in Local Funding EIR.)

- **No-Action Alternative—Airport Compartment Levee.** The Phase 2 EIS evaluated and eliminated from further consideration the No-Action Alternative—Airport Compartment Levee. The prior discussion, which is hereby incorporated by reference, is summarized as follows (see also **Appendix B1** for a summary of the impacts associated with the Airport Compartment Levee). With no authorization of the Phase 2 Project, SAFCA would not be able to meet timing objectives for providing the Natomas Basin with at least a 100-year (0.01 AEP) flood risk reduction and achieving a 200-year (0.05 AEP) flood risk reduction. Federal and State floodplain regulations would prevent new development in most of the Natomas Basin. Either the Airport would be compelled to operate within its existing footprint, abandoning its current plans for modernization and expansion, or, alternatively, the Airport may construct its own limited flood damage reduction structure (i.e., a ring levee) to protect existing facilities and its expansion area. This alternative was eliminated because: (1) construction of a separate levee around the Airport would be under the responsibility and jurisdiction of another agency (Sacramento County Airport System [SCAS]), over which SAFCA would have no jurisdiction, and would require a lengthy process that is completely separate from the Proposed Action; (2) the timeline for that process is unknown and there are no design plans that would enable an accurate evaluation of potential environmental impacts; and (3) the action would require SCAS to prepare a separate CEQA and, potentially, NEPA environmental document. (Considered and eliminated in Phase 2 EIR and Phase 2 EIS.)

In addition to the reasons provided in the Phase 2 EIS, design plans are not available for this alternative, thus preventing USACE and SAFCA from accurately evaluating its potential impacts; implementation of the Airport Compartment Levee would not meet any of the goals and objectives of the project; the residents, residences, and businesses within the Natomas Basin would not receive flood protection; implementation of the Airport Compartment Levee would only protect the Airport; and SCAS has not proposed such a project and, therefore, it is not considered a reasonable alternative.

- **Cultural Resources Impact Reduction Alternative.** The Phase 3 Project Proposed Action includes construction of deep cutoff walls in Sacramento River east levee Reach B:5A–9B, which have the potential to result in significant and unavoidable impacts on known prehistoric resources, previously unidentified cultural resources, and human remains. Construction of a 500-foot-wide seepage berm rather than deep cutoff walls would avoid the deep ground-disturbing work that may adversely affect potential cultural resources, while still achieving flood damage reduction objectives. This alternative was eliminated because of the intensity and severity of environmental impacts associated with construction, including the temporary closure, disruption, and redesign of all or portions of the Teal Bend Golf Club. This alternative would have resulted in impacts on ten environmental topic areas (hydrology and hydraulics, sensitive aquatic habitats, vegetation and wildlife, special-status terrestrial species, paleontological resources, transportation and circulation, air quality, visual resources, recreation, utilities and service systems, and hazards and hazardous materials) that would be potentially more substantial than those associated with the Proposed Action; and there would be a net increase in the number, intensity, and severity of environmental impacts relative to the Proposed Action. (Considered and eliminated in Phase 3 EIS and EIR.) See **Appendix B1** for analyses of each specific environmental issue area.

Although this alternative was eliminated in the Phase 3 EIS and EIR as an alternative to the Phase 3 Project Proposed Action, 500-foot-wide seepage berms were analyzed in the Phase 4a EIS and EIR as part of the Phase 4a Project Proposed Action to represent the worst-case scenario because it is anticipated that at least

one very large cultural site may require avoidance (CA-Sac-16/H), and additional previously undiscovered cultural resource sites may be present.

- ▶ **Levee Raise-in-Place Alternative.** This alternative includes raising and strengthening the existing levee in Sacramento River east levee Reach B:5A–9B rather than constructing the adjacent levee. All other components of the Phase 3 Project were the same for this alternative. This alternative was found to have a greater number of significant and unavoidable impacts compared to the Phase 3 Project Proposed Action, including in the environmental issue areas of biological resources, transportation and circulation, and recreation. (Considered and eliminated in Phase 3 EIS and EIR.)
- ▶ **Raise and Strengthen Levee-in-Place (RSLIP) Alternative.** The RSLIP Alternative includes raising and strengthening the existing levee in Sacramento River east levee Reach B:10–15 rather than constructing the adjacent levee. All other components of the Phase 4a Project were the same for this alternative. This alternative was found to have a greater number of significant and unavoidable impacts in the environmental issue area of biological resources compared to the Phase 4a Project Proposed Action. (Considered and eliminated in Phase 4a EIS and EIR.)

The following additional alternative was considered by USACE to reduce flood risk in the Natomas Basin, but was eliminated from further consideration.

- ▶ **Upstream Transitory Storage.** Various upstream transitory storage measures were evaluated as part of the Common Features/Natomas PACR/Phase 4b Project. Initial evaluation indicates that these measures would not be cost-effective. Downstream benefits would not be increased to a degree sufficient to justify the costs associated with implementing this alternative, including: construction of intake and outtake structures for water to enter and leave the detention basins, improvements to the perimeter levees around the detention basin(s) to current standards, acquisition costs of real estate easements for water storage, and acquisition and/or relocation of existing properties in the storage basins. In addition, the need to correct deficiencies related to seepage and stability in the levees around the entire perimeter of the Natomas Basin has to be addressed regardless of any use of upstream storage measures. Because of the extent and likely cost of these improvements, all of which would lie outside the project footprint and outside the project proponent(s)'s jurisdiction, these measures would require an unprecedented degree of State, Federal, and local cooperation and funding. For this reason, this measure was not pursued as a component of the Common Features/Natomas PACR/Phase 4b Project, but is considered worthy of further evaluation as part of the State's pending update of the State Plan of Flood Protection for the Central Valley. (Considered and eliminated in Phase 4b EIS/EIR.)

2.1.6 ALTERNATIVES CARRIED FORWARD FOR EVALUATION IN THIS EIS/EIR

The following Phase 4b Project alternatives were carried forward for detailed analysis in this EIS/EIR:

- ▶ **No-Action Alternative**—Under NEPA, the expected future without-project conditions; under CEQA, the existing condition at the time the notice of preparation was published (November 5, 2009) as modified by what would be reasonably expected to occur in the foreseeable future if the Phase 4b Project were not approved (two scenarios are proposed).
- ▶ **Adjacent Levee Alternative (Proposed Action)**—An adjacent levee would be constructed along the Sacramento River east levee Reach A:16–20; and, where required for this levee, cutoff walls, seepage berms, and relief wells would be installed for seepage remediation. A cutoff wall would be installed in the American River north levee east of Gateway Oaks Drive to Northgate Boulevard, and the landside slope would be flattened. The NEMDC west levee would be raised in place or widened from just south of Elkhorn Boulevard to Sankey Road, and the landside slope would be flattened and seepage remediation would be constructed as necessary. Waterside erosion protection would be constructed in locations along the PGCC and NEMDC

(south of Elkhorn Boulevard). Culverts located beneath the PGCC would be upgraded or removed, and replacement flood storage would be provided as needed. At the SR 99 crossing of the NCC, seepage remediation would be installed and a moveable barrier system would be constructed to prevent overflow from reaching the landside of the NCC south levee. The western portion of the West Drainage Canal would be realigned to the south, and the remaining portion of the existing canal would be improved to reduce bank erosion and sloughing, decrease aquatic weed infiltration, improve RD 1000 maintenance access, and enhance giant garter snake habitat connectivity. Irrigation canals and ditches would be relocated either to make room for expanded levee sections or to reduce underseepage potential. Discharge pipes for RD 1000 pumping plants and City of Sacramento sump pumps would be raised to cross the levee above design flood water surface elevation. Parcels in the South Fisherman's Lake and Triangle Properties Borrow Areas and at the West Lakeside School Site would be excavated and reclaimed as agricultural land. Woodland groves would be established to compensate for impacts along the Sacramento River east levee Reach A:16–20, American River north levee Reach I:1-4, and NEMDC.

- **Fix-in-Place Alternative**—The Sacramento River east levee would be improved in place in Sacramento River east levee Reach A:16–20 and seepage remediation would be implemented. The Fix-in-Place Alternative would be the same as described for the Adjacent Levee Alternative (Proposed Action) except that the crown of the Sacramento River east levee would not be widened. This type of levee improvement would narrow the overall landside footprint by 15 feet but would require a greater extent of levee degrade to construct cutoff walls and a greater extent of encroachment removal along the Sacramento River east levee compared to the Adjacent Levee Alternative (Proposed Action).

The above three alternatives are described in detail in the remaining portions of this chapter. The Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative were developed for consideration with a focus on improvements to the Sacramento River east levee Reach A:16–20. Phase 4b Project improvements to the American River east levee Reach I:1-4, NEMDC west levee, PGCC west levee, NCC south levee, West Drainage Canal, and modifications to the landscape and irrigation/drainage system would be similar under the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative.

As noted above, the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative would use differing methods to achieve flood damage reduction objectives for the Sacramento River east levee Reach A:16–20. Therefore, the differences between the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative, including effects on habitats, are the result of these differences in design of the Sacramento River east levee.

2.2 NO-ACTION ALTERNATIVE

2.2.1 NO-ACTION ALTERNATIVE—NO FLOOD DAMAGE REDUCTION MEASURES

For the purposes of NEPA compliance, the No-Action Alternative serves as the baseline against which the impacts and benefits of the action alternatives are evaluated. The No-Action Alternative consists of the conditions that would be reasonably expected to occur in the foreseeable future if Congress does not provide authorization for USACE to construct the Phase 4b Project and USACE does not grant SAFCA permission to alter the existing levees or a permit to discharge dredged or fill material into waters of the United States for the Phase 4b Project.

Without USACE permission or permits, SAFCA would not proceed with implementation of the Phase 4b Project (even though not all of the project components require USACE permission and/or permits) because SAFCA would not be able to achieve the overall project purpose, which is to upgrade the levees to reduce flood risk.

As noted under Section 2.1.3.4, “Management of Levee Vegetation and Structural Encroachments,” with the exception of NEMDC South (Reach H), the presumption for the Phase 2, 3, and 4a Projects is that waterside vegetation would be eligible for a variance from USACE levee vegetation guidance criteria because, depending

on the reach, the levee is already overbuilt or the levee would be upgraded to a sufficient width (adjacent levee method) such that the new levee prism would be clear of waterside vegetation. It is also assumed that the American River north levee (Reach I:1–4), a construction element addressed as part of the Phase 4b Project, may not be eligible for a variance and would potentially require waterside vegetation clearance even without the proposed levee improvements. Therefore, the No-Action Alternative assumes that no waterside vegetation is cleared except where it is required for modifications to the pumping plants analyzed as part of the Phase 2, 3, and 4a Projects; and as part of compliance with USACE levee vegetation clearance along the west levee of NEMDC South (Reach H), the south levee of the NCC (Reach D:1–2), and the north levee of the American River (Reach I:1–4).

As discussed in Section 1.3.10, “General Re-evaluation of the Common Features Project,” USACE is preparing a GRR on the Common Features Project, including Natomas Basin levee improvements, that is expected to be presented to Congress in 2010. The earliest that Federal construction under a Congressionally re-authorized USACE project could begin would be 2012. Therefore, it is assumed that USACE and/or the State of California or SAFCA would begin repairs on the Natomas Basin levee system in 2012 at the earliest, and would complete the improvements providing flood risk reduction by 2016.

Based on the criteria that USACE and SAFCA, in coordination with the State, have used to select alternatives for detailed analysis, it is reasonable to assume that one of the two action alternatives described below (the Adjacent Levee Alternative [Proposed Action] and Fix-in-Place Alternative) would be implemented by USACE and/or the State or SAFCA and that the environmental effects of project construction would be the same as, or very similar to, those of the action alternatives evaluated in this EIS/EIR. In the period before implementation of flood damage reduction measures for the Natomas Basin, however, there would remain a high potential for a major levee failure and flooding of the Natomas Basin. (USACE evaluation of geotechnical information and other data indicate that a future flood event with an approximately 3% or greater probability of occurring in any year could cause a major levee failure.)

Therefore, the No-Action Alternative analyzed in this EIS/EIR consists of two scenarios: No Phase 4b Project Construction and Potential Levee Failure. “No Phase 4b Project Construction” refers to the impacts that would result because the Phase 4b Project would not be constructed as part of the NLIP. “Potential Levee Failure” refers to the impacts that could occur if the Natomas Basin perimeter levee system failed. These two components of the No-Action Alternative are further described below, and the analysis contained in Chapter 4, “Environmental Consequences and Mitigation Measures,” is presented using these subheadings.

2.2.1.1 NO PHASE 4b PROJECT CONSTRUCTION

Under the No Phase 4b Project Construction Alternative, the Phase 4b Project would not be constructed. Under CEQA, the baseline environmental condition would be the physical conditions in the Phase 4b Project area existing at the time of the publication of the Notice of Preparation. The NEPA baseline condition for determining significance of impacts includes the full range of construction that would be implemented in the Natomas Basin except for the Phase 4b Project.

Under this scenario, key segments of this system would continue to provide less than 100-year (0.01 AEP) flood risk reduction, and the entire Natomas Basin would be permanently designated as a FEMA special flood hazard area subject to development restrictions and mandatory flood insurance requirements pursuant to the regulations of the National Flood Insurance Program.

Even without construction of the Phase 4b Project, a substantial number of structural features may need to be removed from the waterside of the existing levees to meet USACE requirements as described in *Guidelines for Landscape Planting and Vegetation Management at Floodwalls, Levees, and Embankment Dams* (USACE 2000). As part of its ongoing operations and maintenance (O&M) activities, RD 1000 would be initially responsible for removal of any encroachments that would threaten levee integrity. Without construction of an adjacent levee

along Sacramento River east levee Reach A:16–20, which is within the Phase 4b Project footprint, approximately 19 acres of waterside vegetation would require removal to comply with the USACE levee vegetation guidance (see Chapter 4, “Environmental Consequences and Mitigation Measures,” for a detailed discussion of the impacts related to the No-Action Alternative). Because the American River north levee is considered overbuilt, including a section of NEMDC South from Northgate Boulevard to the Arden-Garden Connector, it may be eligible for a variance from USACE levee vegetation guidance.

However, without a variance, vegetation would need to be removed from the waterside in a worst-case scenario. Along the NEMDC South north of the Arden-Garden Connector (Reach H), a variance would be requested to allow waterside vegetation to remain within 15 feet (waterward) of the waterside levee toe, with approximately 0.57 acres of vegetation to be removed from the levee slope (see **Table 4.7-2** in “Biological Resources”). This 0.57 acre of vegetation is primarily the canopy area of 18 trees varying between approximately 2 to 55 inches dbh that occur in the lower 1/3 of the levee slope, and 3 trees varying between approximately 26 and 46 inches dbh that occur in the upper 2/3 of the levee slope (ending at the waterside hinge point). The memorandum summarizing the results of the tree survey conducted for these trees is detailed in **Appendix D3**. Replacement plantings for these trees, which provide riparian and SRA habitat value, would be consistent with the National Marine Fisheries Service (NMFS) and the California Department of Fish and Game (DFG) guidelines for appropriate riparian species and spacing according to the terms of the permits discussed below. Under a worst-case scenario, approximately 1.15 acres of vegetation would be cleared to within 15 feet of the waterside levee toe in the event a variance is not granted. Along the NCC south levee (Reach D), vegetation on the lower 1/2 of the waterside levee slope would be eligible for a variance from USACE’s levee vegetation guidance. However, without a variance, vegetation would need to be removed from the waterside in a worst-case scenario. Mitigation implementation would be considered part of levee maintenance and would be the subject of a future, separate environmental document. Environmental permits and other regulatory approvals would also be required, which may include a California Fish and Game Code Section 1602 Streambed Alteration Agreement, Clean Water Act Section 401 permit, and/or Clean Water Act Section 404 permit.

Without Phase 4b Project improvements, Federal and State floodplain regulations would effectively prevent most new development in most of the Natomas Basin. Existing residential, commercial, and industrial development would continue to be concentrated in the southeastern portion of the Basin, south of Elkhorn Boulevard, occupying approximately one-third of the 53,000 acres encompassed by the perimeter levee system. Approximately two-thirds of the Basin, generally north of Elkhorn Boulevard, would remain in some form of agricultural, agricultural support, or open space use along with Airport uses. The Airport may be compelled to operate within its existing footprint, abandoning its current plans for modernization and expansion; alternatively, the Airport may construct its own limited flood damage reduction structure (i.e., a ring levee) to protect existing facilities and its expansion area. As of December 31, 2007, all agricultural leases on Airport property expired and have not been renewed. Some new development could occur along the eastern fringe of the Basin. The special flood hazard designation in the Natomas Basin would interrupt the regional blueprint for future (2030) growth adopted by the Sacramento Area Council of Governments and Valley Vision in 2006 (**Plate 2-5**). Up to 60,000 dwelling units and associated commercial and industrial developments that the blueprint anticipates will be located in the Natomas Basin would need to be redirected to other areas in the region over the next two decades. The Basin’s existing residential, commercial, and industrial structures and their contents, with a replacement value of approximately \$8.2 billion, or approximately \$7.2 billion if the Airport facilities are excluded, would remain subject to a relatively high risk of flooding. The risk of environmental damage resulting from flooding in the urbanized portion of the Basin would remain relatively high.

2.2.1.2 POTENTIAL LEVEE FAILURE

The same conditions with respect to development within the Natomas Basin, as described above for the No Phase 4b Project Construction scenario, would exist for the Potential Levee Failure scenario. Without Phase 4b Project improvements to the Natomas perimeter levee system, the risk of levee failure would still remain high because to achieve the full benefits of flood damage reduction in the Natomas Basin, all phases of the NLIP must be

implemented. Wind and wave run-up or seepage conditions could cause portions of this system to fail, triggering widespread flooding and extensive damage to the Basin's existing residential, commercial, agricultural, and industrial structures. Extensive damage to utilities, roadways, and other infrastructure systems would also likely occur. According to the Sacramento County Department of Water Resources, a levee failure could result in nearly complete inundation of the Basin with water level depths that could average 10 to 20 feet, and potentially reach over 30 feet in some areas (Sacramento County Department of Water Resources 2008); however, the magnitude of the flood damage would depend upon the location of the levee breach, severity of the storm, and river flows at the time of a potential levee failure (Sacramento County Department of Water Resources 2009).

Because impacts associated with a potential levee failure are largely unknown and would depend on the location and extent of flooding, many of these potential impacts are considered too speculative for meaningful consideration. A general, qualitative discussion of the likely impacts is nonetheless provided in this EIS/EIR.

2.2.2 NO-ACTION ALTERNATIVE—IMPLEMENTATION OF PHASE 1, 2, 3, AND 4a PROJECTS ONLY

USACE has already authorized construction of the Phase 1 and 2 Projects. Under this alternative, it is reasonably foreseeable as part of the NEPA environmental baseline that USACE will authorize construction of the Phase 3 and 4a Projects, but will not authorize the Phase 4b Project. Each of these project phases has independent utility from the Phase 4b Project. This alternative includes the following Phase 1, 2, 3, and 4a Project activities:

Phase 1 Project (Completed in 2008)

- ▶ **NCC south levee improvements: Seepage remediation**—Construct a seepage cutoff wall along the centerline of the NCC south levee in Reach D:1–3 (to overlap the Sacramento River east levee by approximately 500 feet) and reconstruct the levee.

Phase 2 Project (Currently under construction)

- ▶ **NCC south levee improvements: Levee raising and seepage remediation**—Raise and realign the NCC south levee to provide additional height and more stable waterside and landside slopes, and to reduce the need to remove waterside vegetation. Construct seepage cutoff walls through the levee crown in Reach D:3–7.
- ▶ **Sacramento River east levee (Reach C:1–4B): Levee raising and seepage remediation**—Construct an adjacent levee from the NCC to the end of Reach C:4B, raised where needed to provide adequate height. Use a combination of cutoff walls, seepage berms, and relief wells for seepage remediation where required.
- ▶ **Construction of a new Giant Garter Snake (GGS)/Drainage Canal between the North Drainage Canal and Elkhorn Reservoir**—Construct a new canal designed to provide drainage and associated giant garter snake habitat (referred to as the “GGS/Drainage Canal”) from the North Drainage Canal to the slough east of Elkhorn Reservoir in Reach C:4B and B:5A–6B.
- ▶ **Relocation of the Elkhorn Canal (highline irrigation canal) between the North Drainage Canal and Elkhorn Reservoir**—Relocate approximately 10,500 feet of the canal and construct the relocated canal several hundred feet east of the landside toe of the Sacramento River east levee in Reach C:4B–6A.
- ▶ **Removal of a deep culvert at the location of Pumping Plant No. 2**—Excavate and remove approximately 400 feet of the existing levee section adjacent to the RD 1000 Pumping Plant No. 2 site to expose a deep culvert and possible voids under the levee; remove the deep culvert; reconstruct the levee adjacent to the pumping plant's sump with levee embankment fill; and demolish, remove, and relocate the remnants of the pumping plant within the project footprint.

- ▶ **Habitat creation and management**—Establish habitat features for giant garter snake in the new GGS/ Drainage Canal. Recontour and create managed marsh and grassland on lands used as borrow sources to offset project effects on giant garter snake and Swainson’s hawk habitats. Establish grassland on the slopes of the adjacent levee and seepage berms. Install woodland plantings to offset the loss of portions of tree groves within the landside levee footprint.
- ▶ **Infrastructure relocation and realignment**—Realign and relocate irrigation and drainage canals and other infrastructure, such as utility poles, as needed to accommodate the flood damage reduction measures.
- ▶ **Encroachment management**—Remove encroachments as required to meet the criteria of USACE, the CVFPB, and FEMA.
- ▶ **Reclamation of borrow sites**—Excavate earthen material at the borrow sites, then return the sites to preconstruction uses or suitable replacement habitat.

Phase 3 Project (Preliminary construction began in fall 2009; major levee construction planned to begin in 2010)

- ▶ **Sacramento River east levee (Reach B:5A–9B): Levee raising and seepage remediation**—Construct a raised adjacent levee from just north of Elverta Road to just south of I-5. Use cutoff walls, seepage berms, and relief wells where required to reduce seepage potential. Acquire additional land in Reach B:9B to maintain a 450-foot protection corridor to prevent land uses that would be incompatible with proposed levee improvements.
- ▶ **Pleasant Grove Creek Canal (PGCC) west levee: Levee raising, slope flattening, and widening, and seepage remediation**—Raise the existing levee between Howsley Road and Sankey Road, flatten and widen the levee slopes, and construct cutoff walls or seepage berms to reduce seepage potential.
- ▶ **Natomas East Main Drainage Canal (NEMDC) west levee from Elkhorn Boulevard to NEMDC Stormwater Pumping Station: Levee widening and flattening and seepage remediation**—Widen and flatten the slopes of the existing levee and construct a cutoff wall to reduce seepage potential.
- ▶ **NEMDC west levee from NEMDC Stormwater Pumping Station to Northgate Boulevard: Seepage and slope stability remediation**—Construct a cutoff wall in the existing levee and/or reconstruct portions of the levee where required to reduce seepage potential and slope instability.
- ▶ **Relocation of portions of the Elkhorn Canal downstream of Elkhorn Reservoir**—Pipe approximately 9,400 feet of the canal between the new adjacent levee and Teal Bend Golf Club in Reach B:6B–7, and in an area adjacent to the landside residential properties in Reach B:8; and reconstruct the canal parallel to the adjacent levee at a distance of approximately 200 feet from the levee in Reach B:7–9A.
- ▶ **Construction of a new GGS/Drainage Canal downstream of Elkhorn Reservoir**—Construct a new canal designed to provide drainage and associated giant garter snake habitat (GGS/Drainage Canal) between Elkhorn Reservoir and the West Drainage Canal at I-5.
- ▶ **Habitat creation and management**—Establish habitat features for giant garter snake in the new GGS/ Drainage Canal. Recontour and create managed marsh and grassland on lands used as borrow sources to offset project effects on giant garter snake and Swainson’s hawk habitats. Establish grassland on the slopes of the adjacent levee and seepage berms. Install woodland plantings to offset the loss of portions of tree groves within the landside levee footprint.
- ▶ **Infrastructure relocation and realignment**—Realign and relocate irrigation and drainage canals and other infrastructure, such as utility poles, as needed to accommodate the flood damage reduction measures.

- ▶ **Removal of landside vegetation**—In Reach B:10–12A of the Sacramento River east levee, clear landside vegetation in a 670-foot-wide corridor to prepare for future flood damage reduction work.
- ▶ **Encroachment management**—Remove encroachments as required to meet the criteria of USACE, the CVFPB, and FEMA.
- ▶ **Reclamation of borrow sites**—Excavate earthen material at the borrow sites, then return the sites to preconstruction uses or suitable replacement habitat.
- ▶ **Reconfiguration of Airport West Ditch**—Modify irrigation distribution and agricultural drainage systems and infrastructure to allow for dewatering of the Airport West Ditch.
- ▶ **Acquisition of right-of-way**—Acquire right-of-way through fee title or easement interest within the footprint of the project features and at the borrow sites, and prevent encroachments into the flood damage reduction system.

Phase 4a Project (Preliminary construction planned to begin in spring/summer 2011)

- ▶ **Sacramento River east levee (Reach B:10–15): Levee raising/rehabilitation and seepage remediation**—Construct an adjacent levee, raised in Reach B:10–11B, with cutoff walls, seepage berms, and relief wells, where required, to reduce seepage potential. Cutoff wall construction would continue 24 hours per day, 7 days per week (24/7).
- ▶ **Sacramento River east levee (Reach C:4B): Seepage remediation**—Install cutoff wall in the adjacent levee from Stations 190+00 to 201+50 to provide additional seepage remediation.
- ▶ **NCC south levee: Levee raising and seepage remediation at two locations**—At the Natomas Central Mutual Water Company (NCMWC) Bennett Pump Station and Northern Main Pump Station, raise the NCC south levee, flatten levee side slopes, install cutoff wall, and modify or replace the existing pumps and motors to reflect raising the discharge pipes above the 200-year design flood elevation. Cutoff wall construction would continue 24/7.
- ▶ **Replacement of South Lauppe Pump**—At Sacramento River Mile 77.2 (left bank), remove the pump, intake, and support structure prior to initiation of a separate USACE project to construct bank protection at the site. Following completion of USACE’s bank protection project, SAFCA would reconstruct the pump, intake, and support structure.
- ▶ **Modification of Private River Pumps**—Raise discharge pipes and upgrade motors and pumps at nine private river pumps at NCC south levee Reach D:1 and Sacramento River east levee Reaches C:1–2 and B:11A–12A to be compatible with approved and proposed levee improvements.
- ▶ **Riverside Canal (highline irrigation canal) relocation and extension**—Extend the relocated canal upstream of Powerline Road in Reach B:11B–12B of the Sacramento River east levee; relocate the canal east of the adjacent levee in Reach B:13–15 and east of the adjacent levee, residences, and tree groves in Reach B:15–17; and construct a piped section in Reach B:15–18B at the toe of the new adjacent levee.
- ▶ **Modifications to NCMWC Riverside Pumping Plant**—Raise the pumping plant’s discharge pipes above the 200-year design water surface and modify or replace the plant’s existing pumps and motors to accommodate the raised discharge pipes. In-water construction would include use of dredge pumps to remove sediment so that new pumps could be installed, but no dewatering involving use of a cofferdam is anticipated.
- ▶ **Modifications to RD 1000 Pumping Plants Nos. 3 and 5**—Raise the pumping plants’ discharge pipes above the 200-year design water surface, extend the pipes to tie into existing discharge pipes within the waterside

bench, replace or modify pumps and motors, and perform other seepage remediation, including relocating the landside stations away from the levee to accommodate the raised discharge pipes. Most of these modifications would take place above the Sacramento River's normal summer and fall water surface elevations; however, reconstruction of the Pumping Plant No. 3 outfall and the removal of a deep culvert at Pumping Plant No. 3 would require dewatering.

- ▶ **Development of new and replacement groundwater wells**—Abandon approximately 13 agricultural wells and replace the wells in locations outside the footprint of the levee improvements. Additionally, construct five new wells to provide a water supply for habitat mitigation features. Drilling of the wells would require construction to continue 24 hours per day for up to 3 days to avoid collapse or seizing of drill equipment within the hole.
- ▶ **Borrow site excavation and reclamation**—Excavate earthen material at the borrow sites and then return the sites to preconstruction uses or suitable replacement habitat. For the Phase 4a Project levee and canal improvements along the Sacramento River east levee, the Fisherman's Lake Borrow Area is anticipated to be the primary source of soil borrow material. However, additional borrow sites may be needed for Phase 4a Project work along the Sacramento River including the I-5 Borrow Area; the Elkhorn Borrow Area; South Sutter, LLC; Krumenacher; the Airport north bufferlands; and the Twin Rivers Unified School District stockpile site. For the Phase 4a Project construction on the NCC south levee, the Brookfield borrow site is anticipated to be the primary source of soil borrow material. Some of these borrow sites (Elkhorn Borrow Area; Airport north bufferlands; Krumenacher; Twin Rivers Unified School District stockpile site; and South Sutter, LLC) have been fully analyzed in previous environmental documents; therefore, their potential impacts are incorporated by reference into this EIS/EIR. The Fisherman's Lake and I-5 Borrow Areas are fully analyzed in the Phase 4a EIS and EIR.
- ▶ **Habitat creation and management**—Establish a habitat complex in the Fisherman's Lake Borrow Area (Fisherman's Lake Habitat Complex) through the creation of approximately 140 acres of agricultural upland habitat; establishment of perennial native grasses on levee slopes, seepage berms, and access and maintenance areas; creation of up to 120 acres of managed seasonal and perennial marsh; and establishment of woodlands consisting of native riparian and woodland species at locations along the landside of the Sacramento River east levee.
- ▶ **Infrastructure relocation and realignment**—Realign and relocate private irrigation and drainage infrastructure (wells, pumps, canals, and pipes); and relocate utility infrastructure (power poles) as needed to accommodate the levee improvements and canal relocations.
- ▶ **Landside vegetation removal**—In Reach B:12B–15 of the Sacramento River east levee, clear landside vegetation in a corridor up to 660 feet wide to prepare for Phase 4a Project levee and canal improvement work.
- ▶ **Waterside vegetation removal**—Up to 4 acres of waterside vegetation would be removed due to replacement of pumping plants and construction of outfalls in Reach B:10–15 of the Sacramento River east levee.
- ▶ **Right-of-way acquisition**—Acquire lands within the Phase 4a Project footprint along the Sacramento River east levee, NCC south levee, and at associated borrow sites.
- ▶ **Encroachment management**—Remove encroachments as required to meet the criteria of USACE, CVFPB, and FEMA.
- ▶ **Exchange of properties between SAFCA and SCAS in Reaches C:4A and B:5B–6 of the Sacramento River east levee**—SAFCA and SCAS would carry out a land exchange that would support expansion of Airport bufferlands along the eastern edge of the new Elkhorn Irrigation Canal and provide SAFCA

additional habitat mitigation land along the upper portion of the Sacramento River east levee outside of the 10,000-foot Airport Critical Zone.

Even assuming implementation of the Phase 1, 2, 3, and 4a Projects, under the Phase 4b Project No-Action Alternative the Natomas Basin would still face elevated flood risks because some components of the Natomas perimeter levee system would remain unimproved (primarily the Sacramento River east levee Reach A:16–20 and American River north levee Reach I:1–4). Those risks would be reduced by the Phase 4b Project because the Phase 4b Project includes the remaining improvements needed to achieve the NLIP’s overall project objective of bringing the entire 42-mile Natomas Basin perimeter levee system into compliance with applicable Federal and state standards for levees protecting urban areas.

2.3 PROPOSED ACTION

2.3.1 POST-AUTHORIZATION CHANGE REPORT

As noted above and in Chapter 1, “Introduction and Statement of Purpose and Need,” this EIS/EIR will support approval of USACE’s Common Features/Natomas PACR. The Common Features/Natomas PACR includes all four project phases (1, 2, 3, and 4a and 4b) of the Landside Improvements Project, which is a component of the NLIP. This EIS/EIR summarizes environmental analyses for all previously approved project phases, as well as previously released public draft documents of the Landside Improvements Project, including alternatives previously considered, analyzed, and rejected from further consideration, and evaluates at a project-level the environmental effects of the proposed Phase 4b Project.

2.3.2 NATOMAS LEVEE IMPROVEMENT PROGRAM

SAFCA has developed the NLIP to address identified deficiencies in the levee system protecting the Natomas Basin in Sacramento and Sutter Counties, California. The objectives of the NLIP, as adopted by SAFCA, are to: (1) provide at least 100-year (0.01 AEP) flood risk reduction to the Natomas Basin as quickly as possible; (2) provide 200-year (0.005 AEP) flood risk reduction to the Basin over time; and (3) avoid any substantial increase in annual flood damages as new development occurs in the Basin. The relationship of the Landside Improvements Project phases, including the Phase 4b Project, to one another and their relationship to this EIS/EIR are summarized in Section 1.5.4, “Natomas Levee Improvement Program Environmental Documentation and Relationship of this EIS/EIR to Other Documents.”

2.3.3 PHASE 4b PROJECT

2.3.3.1 INTRODUCTION

The Phase 4b Project would address underseepage, stability, erosion, penetrations, and levee encroachments along approximately 3.4 miles of the Sacramento River east levee in Reach A:16–20, approximately 1.8 miles of the American River north levee (Reach I:1–4), approximately 6.8 miles of the NEMDC west levee (Reaches F–G), approximately 3.3 miles of the PGCC west levee (Reach E), and the gaps left in the improvements of previous phases at levee penetrations and road crossings on the NCC south levee. The Phase 4b Project would also include relocation of the existing irrigation and drainage canals landside of the levee slopes, and relocation and modifications of the pumping plants, bridges, encroachments, and any penetrations of the levee embankment. Vegetation removal within the levee right-of-way to address USACE requirements and any environmental mitigation are also included in the Phase 4b Project. Levee height deficiencies would also be addressed along the northern segment of the NEMDC west levee and along the PGCC west levee. The Phase 4b Project also includes the proposed extension of a levee raise in Reach B:12A–13 that was previously addressed as part of the Phase 4a Project.

Construction of the Phase 4b Project is anticipated to begin as early as 2012 and is expected to be completed in 2013, assuming receipt of all required environmental clearances, permits, and approvals for project implementation. For the purposes of environmental analysis, the construction schedule would be as follows:

- ▶ American River north levee (Reach I:1–4) and NEMDC South (Reach H)—start construction as early as 2012 and complete in 2013.
- ▶ NEMDC North (Reaches F–G)/PGCC (Reach E) and Sacramento River east levee (Reach A:16–20)—start construction in spring 2013 and complete in 2016.

In a worst-case scenario, construction of the Phase 4b Project would overlap with construction of levee improvements previously addressed as part of the Phase 3 and 4a Projects (and approved by SAFCA and USACE [Phase 2 and 3 Projects]). Construction of the Phase 4a Project, which was analyzed in the Phase 4a EIS and EIR (USACE 2010 and SAFCA 2009f), would begin in 2011 and be completed in 2012. Therefore, for purposes of the environmental analysis, it is assumed that Reach B:13–15 of the Sacramento River east levee and all of the relocation of the Riverside Canal from the Phase 4a Project would be constructed simultaneously with portions of the Phase 4b Project in 2012. **Table 4.11-1** in Section 4.11, “Air Quality,” shows detailed construction assumptions.

The Phase 3 EIS and EIR (USACE 2009b and SAFCA 2009b) analyzed the impacts of installation of a cutoff wall in NEMDC South (Reach H) and levee raising, slope flattening, and widening along the PGCC west levee. Because these elements are contained within or otherwise associated with the proposed improvements of the Phase 4b project at NEMDC South (Reach H) and PGCC (Reach E), they would be constructed at the same time, as shown in **Table 2-1**.

Table 2-1 Overlapping Environmental Coverage of the Phase 3 and 4b Projects			
Project Element	Construction Timing/Overlap	Phase 3 Project Environmental Coverage	Phase 4b Project Environmental Coverage
NEMDC South (Reach H)	2013–2016	Cutoff wall installation	Levee raising south of Elkhorn Boulevard (Stations 313+00 to 318+00), erosion repair, and pumping plant modifications (Compliance with levee vegetation guidance along the west levee of NEMDC South [north of the Arden-Garden Connector] would be completed by 2016)
PGCC west levee (Reach E)	2013–2016	Levee raising, slope flattening, levee widening, and installation of a cutoff wall	Levee raising, additional levee widening, seepage berm option, PGCC culvert remediation, erosion repair, and excavation of soil borrow material from the Triangle Properties Borrow Area
Note: ¹ For the PGCC west levee, the levee raise analyzed as part of the Phase 3 Project would be constructed as part of the levee raise addressed in the Phase 4b Project. Therefore, air quality emissions for overlapping construction on the PGCC are equivalent to the emissions estimated for the PGCC component of the Phase 4b Project. Source: Data compiled by AECOM in 2010			

Phase 3 Project levee improvements along the Sacramento River east levee Reach B:5A–9B would be entirely constructed in 2010 and would not overlap with construction of the Phase 4b Project; however, as noted **Table 2-1**, construction of the NEMDC South cutoff wall (included in the Phase 3 Project) would overlap with construction of the Phase 4b Project.

2.3.3.2 ADJACENT LEVEE ALTERNATIVE (PROPOSED ACTION)

Plate 2-6 provides an overview of the elements of the Adjacent Levee Alternative (Proposed Action) along with previous project phases. The Adjacent Levee Alternative (Proposed Action) has the following major elements:

- ▶ **Sacramento River east levee (Reach A:16–20): Levee widening/rehabilitation and seepage remediation**—Construct an adjacent levee with flattened landside slope and cutoff walls, seepage berms, and relief wells, where required, to reduce potential underseepage and seepage through the levee (**Plates 2-7a and 2-7b**). Cutoff wall construction may be conducted 24/7, except in the urbanized area east of the Interstate 80 (I-80) overcrossing, where it would be restricted to daytime hours.
- ▶ **Sacramento River east levee (Reach B:10–15): Levee raise extension**—Extend levee raise within Phase 4a Project footprint from Station 635+00 to 680+00 to address levee height requirements.
- ▶ **American River north levee (Reach I:1–4): Slope flattening and seepage remediation**—Flatten the slope and install cutoff walls in the American River north levee from just east of Gateway Oaks Drive to Northgate Boulevard (**Plate 2-9**). Cutoff wall construction would be restricted to daytime hours.
- ▶ **NEMDC North (Reaches F–G): Levee raising, slope flattening, and seepage remediation**—Raise the levee in place or construct an adjacent levee, flatten slopes, and install cutoff walls from Sankey Road to Elkhorn Boulevard. Cutoff wall construction may be conducted 24/7.
- ▶ **PGCC (Reach E) and NEMDC South (Reach H): Levee raising and slope flattening**—Raise the levee in place or construct a raised adjacent levee and flatten slopes from Howsley Road to Sankey Road on the PGCC west levee (**Plate 2-13**). On the NEMDC South, install a cutoff wall, flatten the slope, and raise the levee in place or construct an adjacent levee for approximately 500 feet south of Elkhorn Boulevard (**Plate 2-14**). Cutoff wall construction may be conducted 24/7.
- ▶ **PGCC (Reach E) and NEMDC South (Reach H): Waterside improvements**—Erosion repair and rock slope protection at locations where erosion around the outfall structures penetrating the levee has been observed. Construct additional remediation to protect against damage caused by beavers and burrowing animals (**Plates 2-13 and 2-14**).
- ▶ **PGCC (Reach E) culvert remediation**—Upgrade or remove five culverts that currently drain the area east of the PGCC by passing water under the canal to drainage ditches along the landside of the PGCC west levee (**Plate 2-13**). Under the culvert removal option, construct detention basins east of the PGCC levee to provide replacement storage for drainage. Depending on the design of the detention basins, pumping stations may be needed to discharge water out of the basins and into the PGCC. Installation of culverts under Pierce-Roberts drain, Pleasant Grove Creek, and Curry Creek may also be needed to interconnect drainage subbasins.
- ▶ **SR 99 NCC Bridge remediation (Reach D:6)**—Construct a moveable barrier system or a stop log gap at the south end of the SR 99 bridges to be used at high river stages to prevent overflow from reaching the landside of the NCC south levee. Modify the bridge deck connections to the supporting piers and abutments as needed to resist uplift pressure during high water stages. Install additional seepage remediation consisting of seepage cutoff walls where the bridges cross the NCC south levee (Reach D:6). Cutoff wall construction may be conducted 24/7.
- ▶ **West Drainage Canal**—Realign the West Drainage Canal to shift an approximately 1-mile portion, starting at I-5, to an alignment farther south of the Airport Operations Area. Modify the existing canal east of the alignment to reduce bank erosion and sloughing, decrease aquatic weed infiltration, improve RD 1000 maintenance access, and enhance giant garter snake habitat connectivity.
- ▶ **Riego Road Canal (highline irrigation canal) relocation**—Relocate approximately 4,000 feet of irrigation canal, approximately 250 feet of buried irrigation piping and culverts, and several irrigation turn-out

structures away from the proposed levee footprint for the northern segment of the NEMDC west levee (Reaches F–G).

- ▶ **NCC south levee ditch relocations**—Relocate the Vestal Drain ditch and Morrison Irrigation Canal landward to reduce underseepage potential at the NCC south levee (Reach D:2, 5, and 6).
- ▶ **Modifications to RD 1000 Pumping Plants**—Raise and/or replace the discharge pipes for Pumping Plant Nos. 1A and 1B along the Sacramento River east levee and Pumping Plant Nos. 6 and 8 along the NEMDC west levee (Reaches G–H). Construct new outfall structures for Pumping Plant Nos. 6 and 8, requiring dewatering of portions of the NEMDC. Construction for Pumping Plant Nos. 6 and 8 may be conducted 24/7.
- ▶ **Modifications to City of Sacramento Sump Pumps**—Raise and/or replace the discharge pipes for City Sump 160 (Sacramento River east levee Reach A:19B), City Sump 58 (American River north levee [Reach I:3]), and City Sump 102 (NEMDC west levee at Gardenland Park [Reach H]). Construct new outfall structures, requiring dewatering of portions of the Sacramento River, the low-flow channel of the NEMDC along the waterside of the American River north levee, and the NEMDC. Relocate pump stations as needed to accommodate the proposed levee improvements. Construction City Sump 102 may be conducted 24/7.
- ▶ **Borrow site excavation and reclamation**—Excavate earthen material at the borrow sites and then return the sites to preconstruction uses or suitable replacement habitat. For levee improvements along the Sacramento River east levee (Reach A:16–20) and the American River north levee (Reach I:1–4), the proposed South Fisherman’s Lake Borrow Area (**Plate 2-7a**) and the West Lakeside School Site (**Plate 2-17**) are anticipated to be the primary source of soil borrow material. A portion of the Fisherman’s Lake Borrow Area (identified on **Plate 2-6**), which was fully analyzed in the Phase 4a EIS/EIR, could provide additional borrow material for these improvements. The proposed Triangle Properties Borrow Area (**Plate 2-13**) would be the primary source of borrow material for levee improvements along the PGCC (Reach E) and NEMDC North (Reaches F–G). The Krumenacher borrow site and Twin Rivers Unified School District stockpile site (**Plate 2-14**), which were fully analyzed in previous environmental documents, would be the source of borrow material for improvements to NEMDC South and back-up sources for NEMDC North (Reaches F–G). The South Fisherman’s Lake Borrow Area, the West Lakeside School Site, and the Triangle Properties Borrow Area are fully analyzed in this EIS/EIR.
- ▶ **Habitat creation and management**—Enhance connectivity between northern and southern populations of giant garter snake in the Natomas Basin by improving habitat conditions along the West Drainage Canal; establish woodlands consisting of native riparian and woodland species in the vicinity of the American River Parkway as compensation for woodland impacts along the Sacramento River east levee (Reach A:16–20), American River north levee (Reach I:1–4), PGCC (Reach E), and NEMDC (Reaches F–H); and create up to 200 acres of managed marsh from Brookfield borrow site to compensate for impacts to giant garter snake habitat as a result of loss of rice from levee and canal improvements, widen and extend the Chappell Ditch south of the borrow site to enhance delivery of surface water, and improve the adjacent Chappell Drain.
- ▶ **Infrastructure relocation and realignment**—Relocate and realign private irrigation and drainage infrastructure (wells, pumps, canals, and pipes) and water and sanitary sewer lines, and relocate utility infrastructure (power poles) as needed to accommodate the levee improvements and canal relocations. Well construction may be conducted 24/7.
- ▶ **Landside vegetation removal**—In Sacramento River east levee Reach A:16–20, American River north levee Reach I:1–4, and NEMDC South (Reach H), vegetation would be cleared to prepare for Phase 4b Project levee and canal improvement work. To comply with USACE vegetation guidance, all vegetation would be cleared at least 15 feet from the landside toes of the improved levees (Sacramento River east levee Reach A:16–20 and American River north levee Reach I:1–4).
- ▶ **Waterside vegetation removal**—Waterside vegetation would be removed due to erosion control measures and modifications to pumping plants along the Sacramento River east levee (Reach A:16–20), NEMDC west

levee (Reaches F–H), and PGCC west levee (Reach E). However, it is assumed that construction of an adjacent levee (the Adjacent Levee Alternative [Proposed Action]) in Sacramento River east levee Reach A:16–20 would allow the levee to qualify for a variance from USACE vegetation guidance criteria such that removal of waterside vegetation would not be necessary. Along the American River north levee Reach I:1–4, the levee is already considered overbuilt, and therefore it may also qualify for a variance from USACE vegetation guidance, allowing waterside vegetation to remain. Like the American River north levee, a section of NEMDC South from Northgate Boulevard to the Arden-Garden Connector is also assumed to be overbuilt enough that clearance of waterside vegetation would also not be necessary under a variance request to USACE. In the event a variance is not granted for the American River north levee (including the segment between Northgate Boulevard and the Arden-Garden Connector), waterside vegetation could be removed from the upper two-thirds of the levee slope. Along the west levee of NEMDC South north of the Arden-Garden Connector (Reach G), at a minimum, if a variance request is granted by USACE, vegetation removal would be required for all non-native trees from within the vegetation-free zone; all native trees that have a dbh of four inches or less; and all larger native trees that are located on the waterside slope, the crown, or within 15 feet of the landside toe (or within the right-of-way, if less than 15 feet). Under a worst-case scenario, vegetation with stem widths that have a dbh greater than two inches would be cleared to within 15 feet of the waterside levee toe.

- ▶ **Bank protection**—Bank protection would be constructed along the NEMDC South (Reach H) and PGCC (Reach E) to address the waterside erosion sites because, as noted above, the adjacent levee would be constructed in Sacramento River east levee Reaches A–C:1–20 under the NLIP; no erosion protection is needed along the left bank of the Sacramento River. The distance from the projected levee slope of the new adjacent levee to the current bank location is sufficient to guarantee that bank erosion would not intrude into the projected levee slope in the near future.
- ▶ **Right-of-way acquisition**—Acquire lands within the Phase 4b Project footprint along the Sacramento River east levee (Reach A:16–20), American River north levee (Reach I:1–4), NEMDC west levee (Reaches F–G), PGCC west levee (Reach E), and at associated borrow sites.
- ▶ **Encroachment management**—Remove encroachments as required to meet the criteria of USACE, CVFPB, and FEMA. SAFCA would be required to submit a variance request to CVFPB, and then ultimately to USACE, requesting confirmation that SAFCA’s adjacent levee design for the Sacramento River east levee (Reach A–C:1–20), American River north levee (Reach I:1–4), and NEMDC west levee (Reaches F–G) sufficiently addresses USACE’s guidance regarding vegetation on levees, if SAFCA chooses to implement the project without Federal participation.
- ▶ **Natomas Levee Class 1 Bike Trail Project**—Construct a bicycle and pedestrian trail along the 42-mile loop of the Natomas Basin levee perimeter in the northwestern portion of the County of Sacramento, southern portion of Sutter County, and a portion of the City of Sacramento (program-level analysis only, because site-specific details are not available).

Flood Risk Reduction Components

Sacramento River East Levee (Reach A:16–20)

Levee improvements would be constructed within Reach A:16–20 (Station 780+00 to Station 956+82) of the Sacramento River east levee, a distance of approximately 3.3 miles (**Plates 2-7a and 2-7b**), and include the following components:

- ▶ **Adjacent Levee.** A new levee would be constructed adjoining the existing Sacramento River east levee in Reach A:16–20. In these reaches, the existing levee already meets height requirements. Therefore, the top of the new levee would be no higher than the elevation of the existing levee crown, except in locations where sections would be raised to accommodate raising of drainage discharge pipe crossings. With no levee raise,

the adjacent levee crown would be graded to drain towards the landside; therefore, no surface drainage outlets across Garden Highway would be required. The landside slope of the adjacent levee would be 3H:1V for Reach A:16–19A and varying 3H:1V to 2H:1V for Reach A:19B–20. The levee typical dimensions are shown in **Plates 2-8a** through **2-8d**. The adjacent levee is designed to avoid removal of vegetation on the waterside of the levee, providing a vegetation-free levee prism corresponding to USACE requirements.

- ▶ **Cutoff Walls.** Three-foot-wide cutoff walls made of either SB, cement bentonite (CB) or soil-cement-bentonite (SCB) would be installed either through the existing levee or along the landside toe of the existing levee. Depending on the construction method used, the top of the cutoff walls would be at least 5 feet above the existing ground surface at the landside toe of the levee (within either the new adjacent setback levee or existing levee) and extend to a depth of 110 feet below ground surface in some areas. Locations and depths would be determined during engineering design. The maximum linear extent would be approximately 17,700 feet (Reach A:16–20).
- ▶ **Seepage Berms.** Where the need for seepage berms is anticipated (Reach A:16–19A), widths would range from 100 to 300 feet. **Table 2-2** shows the locations of worst-case seepage berm widths by reach. Depending upon the width and geotechnical considerations, maximum thickness would be 6–9 feet. All berms would gradually slope downward to about 4 feet thick at the landside edge, with a 3H:1V slope to ground level. A gravel surface patrol road would be constructed near the outside edge of the seepage berm. Final locations of the seepage berms would be determined during engineering design.

Table 2-2 Maximum Limit of Flood Damage Reduction Improvements by Sacramento River East Levee Reach					
Reach (Cross-Section Plate)	Stationing	Adjacent Levee		Maximum Limit of Flood Damage Reduction Improvements	
		Approximate Distance from Center Line of Garden Highway	Seepage Remediation	Approximate Distance from Center Line of Garden Highway	Approximate Distance from Existing Levee Toe
A:16 (Plate 2-8a)	780+00 to 799+00	83 feet	300-foot-wide seepage berm and/or cutoff wall	460 feet	405 feet
A:16, 17, 18A (Plate 2-8a)	799+00 to 848+00	83 feet	100-foot-wide seepage berm (+ potential relief wells) and/or cutoff wall	230 feet	175 feet
A:18B, 19A (Plate 2-8b)	848+00 to 863+00	70 feet	250-foot-wide seepage berm (+ potential relief wells) and/or cutoff wall	350 feet	326 feet
A:19A, 19B (Plate 2-8b)	863+00 to 878+00	58 feet	200–250-foot-wide seepage berm (+ potential relief wells) and/or cutoff wall	up to 344 feet	up to 286 feet
A:19B (Plates 2-8c through 2-8d)	878+00 to 923+50	52 feet to 83 feet	Cutoff wall and relief wells	80 feet to 103 feet	73 feet to 93 feet
A:19B, 20 (Plate 2-8d)	923+50 to 950+83	60 feet	Cutoff wall and relief wells	125 feet	65 feet
Source: Information from HDR in 2009; compiled by AECOM in 2009					

- ▶ **Relief Wells.** Relief wells would be constructed in Reach A:16–20 in the O&M access corridor. Relief wells would also be constructed along some of the entrance channels to the landside pump stations. Relief wells

would be spaced between 60–100 feet apart and would extend to depths of between 60–80 feet below the ground surface. Relief well discharge would be directed to existing City of Sacramento pumping stations by constructing a pipe system that is parallel to the existing City of Sacramento drainage pipe system, with periodic manhole covers for access. Alternatively, if capacity allows, relief well discharge would be routed directly into existing City of Sacramento drainage pipe systems. The relief well discharge would be contained in the existing O&M corridor.

- ▶ **Operation and Maintenance Access/Utility Corridors.** An O&M access corridor would be established adjacent to the toe of the levee or seepage berm. Beyond this corridor, where space is available, a corridor would be established for relocation of power lines and other utility infrastructure. **Plates 2-8a through 2-8d** show the reach-by-reach configurations of O&M and utility corridors, including widths.
- ▶ **Maximum Limit of Flood Damage Reduction Improvements:** **Table 2-2** shows the proposed footprint of the levee improvements by reach and stationing. The adjacent levee and maximum limit of flood damage reduction improvements are shown on **Plates 2-7a and 2-7b**, and cross-section dimensions are shown in **Plates 2-8a through 2-8d**. This footprint is considered a worst-case scenario. Where feasible, the levee and seepage remediation improvements would stop short of existing rights-of-way, such as Wheelhouse Avenue, Marina Glen Way, Avocet Court/Swainson Way, and La Lima Way. However, these rights-of-way may provide a portion of the O&M corridor for levee inspection and emergency flood fight activities. Installation of retaining walls, which may be employed to limit the landward extent of the footprint, could temporarily affect these roads. However, access to residences along these roads would be maintained during construction.

Construction of the proposed levee improvements would involve the following additional measures:

- ▶ **Garden Highway Closures.** In Reach A:16–19A, the landside lane of Garden Highway would be closed for up to 6 months to allow for construction of a cutoff wall. The closed portion of Garden Highway would shift along the levee crown as the cutoff wall is installed. Because of space constraints, in Sacramento River east levee A:Reach 19B–20, the landside lane of Garden Highway would be closed for up to 6 months to allow for construction of a cutoff wall. In addition, because there would be no room for a two-way haul route at the toe of the existing levee, the waterside lane of Garden Highway would be used by haul trucks delivering materials. This lane would only be open to local traffic, with use of traffic controls. Through traffic would be detoured to West El Camino Avenue, SR 160, and Richards Boulevard. Garden Highway would be closed at several locations, including City of Sacramento Pump 160 and RD 1000 Pumping Plant Nos. 1A and 1B, to allow for installation of pipes that need to be raised.
- ▶ **Reconstruction of Intersections.** Garden Highway intersections at Orchard Lane and up to 20 additional private parcel ramps would require reconstruction to accommodate the adjacent levee. Where alternate access to the private properties is available, the private ramps would be removed and not replaced. The design would meet Sacramento County or City of Sacramento roadway design criteria, depending on the jurisdiction.
- ▶ **Measures to Reduce Impacts to Residences, Businesses, and Heritage Oaks.** Where residences, businesses, and heritage oak trees are located, measures would be employed to reduce the project footprint impacts to these resources, to the extent feasible given levee design and seepage-remediation performance requirements. These measures could include reducing the width of the adjacent levee, seepage berms, and O&M access and utility corridors; and strategically using cutoff walls, seepage relief wells, retaining walls, steeper landside levee slopes; and undergrounding utilities or shifting utilities to the waterside of the levee.

Plates 2-7a and 2-7b show the Sacramento River east levee improvements in plan view, based on the adjacent levee width and maximum limit of flood damage reduction improvements shown in **Table 2-2**. **Plate 2-23a** shows the parcels within the footprint.

The levee improvements for the Phase 4b Project are anticipated to be constructed between April 15 and November 1. However, construction could extend as late as December 31. Some related activities, such as power pole relocations and demolition or relocation of residential or agricultural structures, may be conducted before

April 15, and site restoration and demobilization could extend through January. The construction crew size during its peak would be up to 60 people per shift working two 12-hour shifts. The construction sequence would be divided into several different fronts to meet the proposed schedule. Cutoff wall construction in the generally rural reaches west of the I-80 overcrossing may be conducted 24/7. Sundays would be used to maintain the cutoff wall construction equipment. Cutoff wall construction in the urbanized area east of the I-80 overcrossing would be restricted to daytime hours.

Personnel, equipment, and imported materials would reach the project site primarily by Bryte Bend Road and an off-road haul route parallel to the existing landside levee toe in Reach A:16–20. However, secondary routes may include use of I-5, Powerline Road, El Centro Road, and San Juan Road. The primary corridors where construction activity would take place are off of public roadways, within and through the soil borrow areas and within the adjacent levee alignment and existing dirt roads used for access to the work areas.

Approximately 1,168,000 cubic yards of soil borrow would be required to construct these levee improvements. **Table 2-3** shows the quantity of each fill type needed and the expected source for the Adjacent Levee Alternative (Proposed Action). The levee fill, seepage berm fill, and excavation quantities include a 25% shrinkage factor to account for volume loss during excavation, placement, and compaction. The primary source for this material would be in the South Fisherman’s Lake Borrow Area (**Plate 2-7a**). The West Lakeside School Site (**Plate 2-17**) would be a potential back-up borrow site. The average round-trip distance for truck hauls would be approximately 3.5 miles.

Table 2-3 Quantities of Fill Required for Sacramento River East Levee (Reach A:16–20) – Adjacent Levee Alternative (Proposed Action)		
Material Type	Quantity	Source (Average Round-Trip Haul Distance)
Levee fill	505,000 cy	South Fisherman’s Lake Borrow Area (4 miles)
Seepage berm fill	663,000 cy	South Fisherman’s Lake Borrow Area (4 miles)
Waste material	—	On-site
Aggregate base	15,900 tons	Commercial source (30 miles)
Total	1,168,000 cy / 15,900 tons	NA
Notes: cy. = cubic yards; NA = not applicable Source: Data provided by HDR in 2009		

Delivery of the materials listed in **Table 2-3** would require up to 900 haul trips per day. Construction in Reach A:16–19A (**Plate 2-7a**) would require an average of 540 truck trips per day based on the following assumptions: (1) construction would take place within a 6-month period, with 140 days available during the 156-day construction season (April 1–November 1), (2) truck capacities would be 14 cubic yards (24 tons), and (3) haul trucks would be used for moving all borrow material from borrow sites. Use of haul trucks for all trips is a conservative assumption because some of these trips could take place off road and may involve the use of elevating scrapers rather than haul trucks.

For construction in Reach A:19B–20 (**Plate 2-7b**), an average of 360 truck trips per day would be required, based on the assumption that hauling would take place over a 45-day period using street-legal haul trucks with a 12 cubic yard capacity (20 tons). Lighter haul trucks would be employed in these reaches because of the increased need to use surface streets in these reaches as a result of limited space for two-way truck traffic along the landside levee toe.

The primary haul route from the South Fisherman’s Lake Borrow Area would be Bryte Bend Road and an off-road haul route parallel to the existing landside levee toe in Reach A:16–20. Short sections of Powerline Road,

El Centro Road, San Juan Road, West El Camino Avenue, and Gateway Oaks Drive may be used for some trips (**Plate 2-6**). Hauling from West Lakeside School Site would also use off-road haul routes. For Reach A:19B–20, a single lane of Garden Highway from approximately Marina Glen Way to Northgate Boulevard may be used for return trips for haul trucks because landside space may be too limited to provide a two-lane off-road haul route. In this case, use of street-legal haul trucks would be required. Approximately 15,900 tons of aggregate base would be hauled from commercial sources up to 30 miles away, with 10,500 tons to be used in Reach A:16–19A and 5,400 tons to be used in Reach A:19B–20.

Table 2-4 summarizes the types of equipment that may be used throughout the construction sequence, along with an approximation of the duration of each activity.

Table 2-4 Anticipated Equipment Types and Duration of Use for Sacramento River East Levee Reach A:16–20 – Adjacent Levee Alternative (Proposed Action)		
Construction Activity	Equipment Type and Number	Duration of Use (days)
Mobilization	NA	NA
Site preparation (tree removal, clearing, grubbing, stripping)	Scrapers (6)	27
	Front-end loaders (2)	27
	Crawler/tractors (tree pushers) (2)	27
	Water trucks (2)	27
	Motor graders (2)	27
	Chippers/grinders (4)	27
	Haul trucks (10)	27
Removal of landside structures and other facilities	Excavators (2)	24
	Haul trucks (24)	24
	Front-end loaders (1)	24
Construction of adjacent levee and seepage berms (includes borrow site activities)	Scrapers (5)	140
	Excavators (5)	140
	Front-end loaders (5)	140
	Haul trucks (14 cy) (50)	140
	Bulldozers (5)	140
	Sheepsfoot compactors (2)	140
	Motor graders (2)	140
Cutoff wall construction	Water trucks (2)	140
	Front-end loaders (10)	60
	Bulldozers (20)	60
	Extended-boom pallet loaders (10)	60
	300-kW generators (10)	60
	Slurry pumps (10)	60
	Pickup trucks (8)	60
	Haul trucks (8)	60
	Excavators (6)	60
Reconstruction of Garden Highway at intersections	Deep soil mix rigs (10)	60
	Backhoes (1)	27
	Smooth drum compactors (1)	27
	Asphalt pavers (1)	27
	Haul trucks (3)	27
	Striping trucks (1)	27
Site restoration and demobilization	Truck-mounted augers (1)	27
	Hydroseeding trucks (3)	34
	Water trucks (3)	34
	Haul trucks (2)	34
Notes: cy = cubic yards; kW = kilowatt; NA = not applicable Source: Data provided by HDR in 2009		

The sequence of construction activities would be as follows:

- ▶ **Landside Vegetation Removal:** Along the landside of the Sacramento River east levee in Reach A:16–20, approximately 26 acres of vegetation would be removed as needed from the levee improvement footprint, which is a minimum of 15 feet from the levee or seepage berm toe. Vegetation would also be cleared from O&M and utility corridors, as needed. This operation would require removal of some trees and relocation/removal of elderberry shrubs, which occur mostly adjacent to existing roads. Small trees and elderberry shrubs, where feasible, would be relocated to woodland preservation areas that are part of the Phase 4b Project. A minimal amount of below-ground disturbance would occur.
- ▶ **Waterside Vegetation Removal:** No waterside vegetation would need to be removed as part of the levee improvements in Reach A:16–20 of the Sacramento River east levee. In terms of compliance with USACE levee vegetation guidance, it is assumed that, with a variance, construction of an adjacent levee (the Adjacent Levee Alternative [Proposed Action]) would allow the levee to meet USACE vegetation guidance criteria without removal of waterside vegetation.
- ▶ **Utilities Relocation:** All utilities (water, sewer, communication, and electrical, including power poles) that currently exist on the landside slope of the levee and at the landside levee toe would need to be relocated and/or rerouted to accommodate the widened levee footprint. A Pacific Gas and Electric (PG&E) Company tower (Reach A:18A, at approximately Station 847+00) is located within the proposed 250-foot-wide seepage berm. The tower would potentially need to be relocated outside of the levee footprint, but all efforts would be made to protect it in place. To the extent feasible, mainline utility infrastructure, such as power poles, would be relocated beyond the landside levee, with the potential of undergrounding some utilities as an option. Should placement of poles be required on top of the seepage berms, raised foundations would be constructed to prevent the poles from penetrating the top of the seepage berm. In Reach A:19A–19B (from Station 863+00 to 923+00), where space on the landside is limited, some utility poles may need to be relocated to the waterside of the existing levee; however, no new power poles would be located on the waterside of the levee in the vicinity of existing waterside residences unless there is no feasible alternative for providing service to these residences. No power poles would be relocated within the new levee prism. Tree pruning would likely be required in some locations to accommodate the power poles and associated wires. The project proponent(s) would conduct the relocations in coordination with the appropriate utility companies and the construction operations.
- ▶ **Construction Mobilization:** Mobilization would include setting up construction offices and transporting heavy construction equipment to the work site, and would also include preparation of the borrow sites. The main construction staging areas would be located on a city-owned parcel (Costa Park site) immediately east of the I-80 overcrossing (**Plate 2-7a**). The area would be used for the contractor's and engineer's construction trailers, parking for personnel, storage for machine maintenance tool and parts, water trucks, and storage of fuels and other materials to be used for construction.
- ▶ **Site Preparation (Clearing, Grubbing, and Stripping) at the Levee:** Site preparation at the levee would begin with clearing structures and woody vegetation from the landside slope of the existing levee, the footprint of the adjacent setback levee, the seepage berm, and the permanent O&M access and utility corridors. The clearing operation would be followed by grubbing operations to remove stumps, root balls, and below ground infrastructure. This operation would be followed by stripping the top 12 inches of earthen material from the landside slope of the existing levee and the footprint of the adjacent setback levee and seepage berm (unless there are identified cultural artifacts, in which case the area would be mowed and special construction methods would be used to minimize impacts). Excess earthen materials (organic soils and grass from the adjacent levee foundation and excavated material that does not meet levee embankment criteria) would be respread on the surface of the new levee slopes and seepage berms. Debris generated during the clearing and grubbing operations would be hauled off-site to landfills, concrete recycling plants, or cogeneration facilities.

- ▶ **Site Preparation (Clearing, Grubbing, and Stripping) at the Borrow Sites:** Site preparation at the borrow sites would begin with clearing structures and woody vegetation from the borrow area. The clearing operation would be followed by grubbing operations to remove stumps, root balls, and below-ground infrastructure. The borrow area would then be disced to chop surface vegetation and mix it with the near-surface organic soils. The discing operation would be followed by stripping the top 12 inches of earthen material from the borrow excavation area and stockpiling this soil at the borrow site. These soils would be respread on the surface of the borrow site following completion of the borrow excavation and grading. Debris generated during the clearing and grubbing operations would be hauled off-site to landfills, concrete recycling plants, or cogeneration facilities.
- ▶ **Removal or Modification of Landside Structures and Other Facilities:** An estimated 15–20 residential and other agricultural structures are located within the footprint of the levee improvements. These structures, and the facilities supporting them, would have to be modified, removed, or relocated out of the project footprint before the start of levee construction in those areas. Irrigation facility conveyance, distribution boxes, wells, and standpipes within the footprint of the project features would be demolished and replaced as needed. Debris from structure demolition, power poles, utility lines, piping, and other materials requiring disposal would be hauled off-site to a suitable landfill. Demolished concrete could be sent to a concrete recycling facility. Wells and septic systems would be abandoned in accordance with the applicable state and county requirements. Existing utilities, pipelines, and appurtenant structures located at the toe of the existing levee will need to be relocated outside of the project footprint. Utilities may include, but not be limited to, water, sewer, and electrical mains servicing both the landside and waterside residential and commercial structures.
- ▶ **Construction of Adjacent Levee, Cutoff Walls, and Seepage Berms:** Borrow material from the potential borrow sites would be delivered to the levee construction sites using haul trucks or scrapers where it would be spread by motor graders and compacted by sheepsfoot rollers to build the adjacent levee and seepage berms. In areas of cutoff wall construction, the adjacent levee would initially be built up to approximately 5 feet above existing grade at the toe of the levee to create a working platform. Construction of the cutoff wall downstream of Powerline Road may require closure of one lane of Garden Highway, with one-way traffic maintained to provide access to properties along the work area. Additional material from borrow sites would then be delivered to the project site for construction of the remainder of the adjacent levee and the seepage berms.
- ▶ **Installation of Relief Wells:** Where needed, relief wells would be constructed using techniques typically used for drilling water wells. A drill rig would bore a hole into the ground to the required depth of the well, the well casing and well screen sections would be installed, and then the well would be finished by pumping water from it to clean out the bentonite drilling fluid and to consolidate the well's gravel pack. After the solids are settled out, water from the well development operations would be discharged to adjacent fields or drainage ditches.
- ▶ **Traffic Control during Construction:** Single-lane traffic control and detours would be required while constructing cutoff walls, reconstructing the landside lane of Garden Highway. Examples of traffic control measures to be considered include use of flaggers to maintain alternating one-way traffic while roadway and utility facility work is proceeding on one-half of the roadway/intersection, use of advance construction signs and other public notices to alert drivers of activity in the area, and use of “positive guidance” detour signing on alternate access roads to reduce inconvenience to the driving public. If detours are required for through traffic, local traffic would be allowed, subject to delays during critical construction operations. Concrete barriers (K-Rail) would be used to separate traffic from the cutoff wall work areas. A moving segment of one lane of Garden Highway would be closed during the entire construction season—up to 6 months. Through traffic would be detoured to West El Camino Avenue, SR 160, and Richards Boulevard.
- ▶ **Reconstruction of Garden Highway:** Where cutoff wall construction occurs through the crown of the adjacent levee, some reconstruction work on Garden Highway would be required to restore the landside lane

of the roadway. Garden Highway intersections at major roadway ramps would require degrading, rebuilding the embankment, and repaving to accommodate the installation of the cutoff wall and slope flattening. Traffic control and detours would be required during this phase of construction.

- ▶ **Site Restoration and Demobilization:** Upon completion of construction activities, the stripped material would be placed on top of the completed seepage berms, and both the levee slopes and the tops of the seepage berms would be hydroseeded. An aggregate base patrol road would be constructed on the crown of the new levee and on the landside edge of the seepage berm. Any construction debris would be hauled to an appropriate waste facility. Equipment and materials would be removed from the site, and staging areas and any temporary access roads would be restored to preproject conditions. Demobilization would likely occur in various locations as construction proceeds along the project alignment.
- ▶ **Postconstruction Site Conditions.** Following construction, the levee slopes, seepage berms, maintenance access rights-of-way, and any previously vegetated areas disturbed during construction would be seeded with a grass mix that meets DFG criteria. To the extent that they do not interfere with flood control inspection and operations, maintenance practices for the areas of grassland cover within the footprint of the levee facilities would be conducted to promote the value of these areas as foraging habitat for Swainson's hawk.

Sacramento River East Levee (Reach B:10–15) – Extension of Levee Raise

The Phase 4a EIS and EIR (USACE 2010 and SAFCA 2009f) analyzed a raised adjacent levee from Reach B:10 through Reach B:12A, with 7–10 waterside drainage outfalls planned north of Powerline Road to drain stormwater to the waterside of the levee. Subsequent engineering analysis indicates that additional levee raising is needed in Reach B:12A–13 to meet height requirements, with the proposed raise extending an additional 4,500 feet, from approximately Station 635+00 to Station 680+00 (see **Plate 2-7a** [inset]). This levee raise extension would be constructed within the previously analyzed (and SAFCA-approved) Phase 4a Project footprint.

From Station 635+00 to Station 662+00, the levee raise would be accomplished by extending the raised adjacent levee for approximately 2,700 feet. From Station 662+00 to Station 680+00, rather than an adjacent levee raise, the existing top of levee, where Garden Highway is located, would be raised in place. The portion of the levee raise from Station 662+00 to Station 680+00 would be constructed as part of the Phase 4b Project; however, as part of the Phase 4a Project, SAFCA would construct from Station 635+00 to Station 662+00 a levee embankment wide enough to accommodate the Phase 4b Project raise through this reach.

The extension of the adjacent levee raise would not require additional waterside drainage outfalls beyond the range 7 to 10 outfalls that was analyzed as part of the Phase 4a EIS and EIR. Therefore, no increase in vegetation removal (estimated 0.5 acres) or additional impacts to water quality would result from these design changes compared to what was analyzed in the Phase 4a EIS and EIR. However, because of the extra length of the highway drainage swale, the spacing of the waterside drainage outfalls would increase. For the extension of the adjacent levee raise from Station 635+00 to 662+00 as part of the Phase 4a Project, one of the outlets would need to be located south of Powerline Road. No additional Garden Highway closures would result from construction of the proposed design modifications. A temporary access road would be provided for the levee segment that would be raised in place (Station 662+00 to Station 680+00). Access to waterside residences in this reach would be maintained at all times.

American River North Levee

Levee improvements would be constructed from Gateway Oaks Drive to Northgate Boulevard, a distance of approximately 2.3 miles. They would include the following components:

- ▶ **Levee Slope Flattening.** A new levee slope (3H:1V) would be constructed adjoining the existing American River north levee from Station 0+00 to Station 115+71 (Reach I:1–4) (**Plate 2-9**). The levee typical dimensions are shown in **Plates 2-10a** and **2-10b**. The existing levee already meets height requirements;

therefore, the top of the new levee would be no higher than the elevation of the existing levee crown, except at locations where pumping plant discharge pipelines or other utilities must be raised.

- ▶ **Cutoff Walls.** Three-foot-wide cutoff walls made of SB, CB, or SCB would be installed either through the existing levee or along the landside toe of the existing levee. Depending on the construction method used, the top of the cutoff walls would be at least 5 feet above existing ground surface (within either the new adjacent setback levee or existing levee) and extend to a depth of 110 feet below ground surface in some areas. Locations and depths would be determined during engineering design. The total linear extent would be up to 12,000 feet.
- ▶ **Seepage Berms.** Seepage berms are not a proposed remediation feature for the American River north levee.
- ▶ **Relief Wells.** Relief wells are not a proposed remediation feature for the American River north levee.
- ▶ **O&M Access/Utility Corridors.** A 15–30-foot-wide O&M corridor would be established adjacent to the toe of the levee. A 10-foot-wide utility corridor would be located off the landside toe. However, if space is not available, the utility corridor would be adjusted to fit within the available space.
- ▶ **Measures to Reduce Impacts to Heritage Oaks.** Where heritage oak trees are located, measures would be employed to reduce the project footprint impacts to these resources, to the extent feasible given levee design and seepage-remediation performance requirements. These measures could include reducing the width of the levee expansion and O&M access and utility corridors, using retaining walls, and potentially undergrounding utilities, where feasible.
- ▶ **Garden Highway Closures.** For levee improvements along the American River north levee, Garden Highway/Arden-Garden Connector would be completely closed for up to 6 months between I-5 and Northgate Boulevard. Through-traffic would be detoured to West El Camino Avenue, SR 160, Richards Boulevard, Truxel Road, and Northgate Boulevard. Garden Highway would be closed at several locations, including City of Sacramento Pump 58, to allow for installation of pipes that need to be raised.
- ▶ **Reconstruction of Intersections.** Garden Highway intersections at Natomas Park Drive, Truxel Road, Arden-Garden Connector, Northgate Boulevard, and four additional private parcel ramps would require degrading, rebuilding the embankment, and repaving to accommodate the installation of the cutoff wall and slope flattening. The ramps would be reconstructed to the current general ramp and intersection geometry. Where alternate access to the private properties is available, the private ramps would be removed and not replaced. The intersection design would meet City of Sacramento roadway design criteria.

Plate 2-9 shows the levee improvements in plan view. **Plate 2-23a** shows the parcels within the footprint. The width of the real estate acquisition and/or easements would vary between 83 feet and 110 feet from the baseline centerline of the existing levee (up to about 50 feet from the toe of the existing levee in most reaches) (see **Plates 2-10a** and **2-10b** for profile views). In Reach I:2–4, the maximum extent of levee improvements, including the O&M corridor, would end at established property lines.

Approximately 167,000 cubic yards of soil borrow would be required to construct these levee improvements. **Table 2-5** shows the quantity of each fill type needed and the expected source for the Adjacent Levee Alternative (Proposed Action). Fill quantities include a 25% shrinkage factor to account for volume loss during excavation, placement, and compaction. The primary source for this material would be in the South Fisherman’s Lake Borrow Area (**Plate 2-7a**). The West Lakeside School Site (**Plate 2-17**) would be a potential back-up borrow site. The average round-trip distance for truck hauls would be approximately 5 miles.

Table 2-5
Quantities of Fill Required for the American River North Levee (Reach I:1–4) –
Adjacent Levee Alternative (Proposed Action)

Material Type	Quantity	Source (Average Round-Trip Haul Distance)
Levee fill	167,000 cy	South Fisherman’s Lake Borrow Area (5 miles)
Waste material	27,000 cy	On-site
Aggregate base	8,700 tons	Commercial source (30 miles)
Asphalt concrete	1,500 tons	Commercial source (30 miles)
Total 167,000 cy / 10,200 tons		
Notes: cy = cubic yards Source: Data provided by HDR in 2009		

Delivery of the materials listed in **Table 2-5** would require about 120 haul trips per day. These estimates are based on the following assumptions: (1) construction would take place within a 6-month period, with 140 days available during the 156-day construction season (April 1–November 1), (2) truck capacities would be 14 cubic yards (24 tons), and (3) haul trucks would be used for moving all borrow material from the borrow sites. The use of elevating scrapers rather than haul trucks is not possible for the American River north levee improvements. The primary haul route from the South Fisherman’s Lake Borrow Area would be Bryte Bend Road. Secondary haul routes may make use of short sections of El Centro Road, San Juan Road, West El Camino Avenue, Natomas Park Drive, Truxel Road, and Northgate Boulevard (**Plate 2-6**). Garden Highway from approximately Marina Glen Way to Northgate Boulevard may be used for return trips for haul trucks because landside space may be too limited to provide a two-lane off-road haul route. Approximately 8,700 tons of aggregate base and approximately 1,500 tons of asphalt concrete would be hauled from commercial sources up to 30 miles away. Personnel, equipment, and imported materials would reach the project sites via I-5, Truxel Road, Gateway Oaks Drive, Northgate Boulevard, and Arden-Garden Connector (**Plate 2-6**).

The levee improvements on the American River north levee are anticipated to be constructed between April 15 and November 1. However, construction could extend as late as December 31. Some related activities, such as power pole relocations and demolition or relocation of residential or agricultural structures, may be conducted before April 15, and site restoration and demobilization could extend through January. The construction crew size during its peak is estimated at 60 people per shift working two 12-hour shifts. The construction sequence would be divided into several different headings to meet the proposed schedule.

Table 2-6 summarizes the types of equipment that may be used throughout the construction sequence under the Adjacent Levee Alternative (Proposed Action), along with an approximation of the duration of each activity.

The sequence of construction activities would be as follows:

- **Landside Vegetation Removal:** Along the landside of the American River north levee (Reach I:1–4), approximately 7 acres of vegetation would be removed as needed from the levee improvement footprint, which would be a minimum of 15 feet from the widened levee or new seepage berm toe. The 20-foot-wide proposed utility corridor would also require vegetation removal. This operation would require removal of some trees and relocation/removal of elderberry shrubs, which occur mostly adjacent to existing roads. Small trees and elderberry shrubs, where feasible, would be relocated to woodland preservation corridors that are part of the Phase 4b Project. A minimal amount of below ground disturbance would occur. Because the American River north levee is already relatively wide, and the proposed slope flattening would widen its footprint further, it is expected that vegetation clearing would likely not be required on the waterside of the levee.

Table 2-6 Anticipated Equipment Types and Duration of Use for Improvements to American River North Levee – Adjacent Levee Alternative (Proposed Action)		
Construction Activity	Equipment Type and Number	Duration of Use (days)
Mobilization	–	27
Site preparation (tree removal, clearing, grubbing, stripping)	Scrapers (2)	27
	Front-end loaders (2)	27
	Crawler/tractors (tree pushers) (2)	27
	Water trucks (1)	27
	Motor graders (2)	27
	Chippers/grinders (4)	27
	Haul trucks (6)	27
Removal of landside structures and other facilities	Excavators (2)	24
	Haul trucks (8)	24
	Front-end loaders (1)	24
Flattening slope (includes borrow site activities)	Scrapers (2)	140
	Excavators (2)	140
	Front-end loaders (2)	140
	Haul trucks (14 cy) (10)	140
	Bulldozers (2)	140
	Sheepsfoot compactors (2)	140
	Motor graders (2)	140
	Water trucks (1)	140
Cutoff wall construction	Front-end loaders (6)	60
	Bulldozers (12)	60
	Extended-boom pallet loaders (6)	60
	300-kW generators (6)	60
	Slurry pumps (6)	60
	Pickup trucks (6)	60
	Haul trucks (2)	60
	Excavators (2)	60
	Deep soil mix rigs (6)	60
Reconstruction of Garden Highway at four intersections	Backhoes (4)	27
	Smooth drum compactors (4)	27
	Asphalt pavers (2)	27
	Haul trucks (12)	27
	Striping trucks (2)	27
	Truck-mounted augers (2)	27
Site restoration and demobilization	Hydroseeding trucks (3)	34
	Water trucks (3)	34
	Haul trucks (3)	34
Notes: cy = cubic yards; kW = kilowatt Source: Data provided by HDR in 2009		

- ▶ **Waterside Vegetation Removal:** No waterside vegetation would be removed as part of improvements to the American River north levee. In terms of compliance with USACE levee vegetation guidance, the levee (including the section between Northgate Boulevard and the Arden-Garden Connector) may qualify for a variance because it was widened to support construction of the Garden Highway. However, in the event the variance were not granted, it is assumed that the upper two-thirds of the waterside slope would be cleared, resulting in the removal of up to 6 acres of waterside vegetation in a worst-case scenario.
- ▶ **Utilities Relocation:** All utilities (water, sewer, communication, and electrical, including power poles) that currently exist on the landside slope of the levee and at the landside levee toe would need to be relocated and/or rerouted to accommodate the widened levee footprint. To the extent feasible, mainline utility infrastructure, such as power poles, would be relocated beyond the landside levee toe, with the potential option of undergrounding some utilities. Some poles may need to be relocated to the waterside of the existing levee. Tree pruning would likely be required in some locations to accommodate the power poles and associated wires. SAFCA would conduct the relocations in coordination with the appropriate utility companies and the construction operations.
- ▶ **Construction Mobilization:** Mobilization would include setting up construction offices and transporting heavy construction equipment to the work site, and would also include preparation of the borrow sites. The main construction staging area would be located adjacent to the working area along the existing Garden Highway alignment and within Discovery Park (**Plate 2-9**). The area would be used for the contractor's and engineer's construction trailers, parking for personnel, storage for machine maintenance tool and parts, water trucks, and storage of fuels and other materials to be used for construction.
- ▶ **Site Preparation (Clearing, Grubbing, and Stripping) at the Levee:** Site preparation at the levee would begin with clearing structures and woody vegetation from the landside slope of the existing levee, the footprint of the adjacent setback levee, and the permanent O&M access and utility corridors. The clearing operation would be followed by grubbing operations to remove stumps, root balls, and below-ground infrastructure. This operation would be followed by stripping the top 12 inches of earthen material from the landside slope of the existing levee and the footprint of the adjacent setback levee (unless there are identified cultural artifacts, in which case the area would be mowed and special construction methods would be used to minimize impacts). Excess earthen materials (organic soils and grass from the adjacent levee foundation and excavated material that does not meet levee embankment criteria) would be respread on the surface of the new levee slopes. Debris generated during the clearing and grubbing operations would be hauled off-site to landfills, concrete recycling plants, or cogeneration facilities.
- ▶ **Site Preparation (Clearing, Grubbing, and Stripping) at the Borrow Sites:** Site preparation at the borrow sites would begin with clearing structures and woody vegetation from the borrow area. The clearing operation would be followed by grubbing operations to remove stumps, root balls, and below ground infrastructure. The borrow area would then be disced to chop surface vegetation and mix it with the near-surface organic soils. The discing operation would be followed by stripping the top 12 inches of earthen material from the borrow excavation area and stockpiling this soil at the borrow site. These soils would be respread on the surface of the borrow site following completion of the borrow excavation and grading. Debris generated during the clearing and grubbing operations would be hauled off-site to landfills, concrete recycling plants, or cogeneration facilities.
- ▶ **Removal or Modification of Landside Structures and Other Facilities:** Multiple facilities or structures would have to be modified, removed, or relocated out of the project footprint before the start of levee construction in those areas. Utility facilities within the footprint of the project features would be demolished and replaced as needed. Debris from structure demolition, power poles, utility lines, piping, and other materials requiring disposal would be hauled off-site to a suitable landfill. Demolished concrete could be sent to a concrete recycling facility. Wells and septic systems would be abandoned in accordance with the applicable state and county requirements.

- ▶ **Construction of Slope Flattening Levee and Cutoff Walls:** Borrow material from the potential borrow sites would be delivered to the levee construction sites using haul trucks where it would be spread by motor graders and compacted by sheepfoot rollers to build the slope flattening levee. In areas of cutoff wall construction, the slope flattening levee would initially be built up to approximately 5 feet above existing grade at the toe of the levee to create a working platform. Construction of the cutoff wall downstream of Gateway Oaks Drive may require closure of one lane of Garden Highway, with one-way traffic maintained to provide access to properties along the work area.
- ▶ **Traffic Control during Construction:** Single-lane traffic control and detours would be required while constructing cutoff walls and reconstructing Garden Highway. Examples of traffic control measures to be considered include use of flaggers to maintain alternating one-way traffic while roadway and drainage facility work is proceeding on one-half of the roadway/intersection, use of advance construction signs and other public notices to alert drivers of activity in the area, and use of “positive guidance” detour signing on alternate access roads to reduce inconvenience to the driving public. If detours are required for through-traffic, local traffic would be allowed, subject to delays during critical construction operations. Concrete barriers (K-Rail) would be used to separate traffic from the cutoff wall work areas. A moving segment of the landside lane of Garden Highway would be closed during the entire construction season—up to 6 months.
- ▶ **Reconstruction of Garden Highway:** Where cutoff wall construction occurs through the crown of the levee, some reconstruction work of Garden Highway would be required to restore the landside lane of the roadway. Garden Highway intersections at major roadway ramps would require degrading, rebuilding the embankment, and repaving to accommodate the installation of the cutoff wall and slope flattening. Traffic control and detours would be required during this phase of construction. Garden Highway reconstruction would be conducted in compliance with applicable county road standards.
- ▶ **Site Restoration and Demobilization:** Upon completion of construction activities, the levee slopes and other disturbed areas would be hydroseeded. Any construction debris would be hauled to an appropriate waste facility. Equipment and materials would be removed from the site, and staging areas and any temporary access roads would be restored to preproject conditions. Demobilization would likely occur in various locations as construction proceeds along the project alignment.
- ▶ **Postconstruction Site Conditions:** Following construction, the levee slopes, maintenance access rights-of-way, and any previously vegetated areas disturbed during construction would be seeded with a grass mix that meets DFG criteria. To the extent that they do not interfere with flood control inspection and operations, maintenance practices for the areas of grassland cover within the footprint of the levee facilities would be conducted to promote the value of these areas as foraging habitat for Swainson’s hawk.

Natomas East Main Drainage Canal West Levee – Northern Segment

Work along the northern segment of the NEMDC west levee (NEMDC North [Reaches F–G]), located between Elkhorn Boulevard and Sankey Road, would include levee raising, landside slope flattening, and cutoff wall construction (**Plate 2-11**). The total length of this levee segment is 35,690 linear feet. Natomas Road and East Levee Road are located on top of the levee.

The levee height is insufficient from Elkhorn Boulevard to a point approximately 1 mile upstream of Elverta Road. Through this area, the levee would be raised between 1–2 feet. The levee raise would be accomplished by one of two methods:

- 1) Constructing either a strengthen-in-place levee raise, where the levee is raised by projecting the waterside slope up at a 3H:1V slope to its ultimate height, providing a width necessary to reconstruct the existing Natomas Road/East Levee Road on top of the new levee, and projecting the landside slope back down to existing grade at a 3H:1V slope (**Plate 2-12**, upper illustration); or

- 2) Leaving Natomas Road/East Levee Road in place and constructing an adjacent levee next to the existing levee to the height required for the appropriate levee height (**Plate 2-12**, lower illustration).

The preferred method would be determined based upon engineering alternatives analyses of the two options. Where levee raising is not required, the levee would be widened landward to provide a theoretical 3H:1V waterside slope, a minimum 20-foot-wide levee crest, and a 3H:1V landside slope. If the levee is strengthened in place, Natomas Road/East Levee Road would be closed to through-traffic for up to 6 months. **Plate 2-11** shows the maximum limit of flood damage reduction improvements that would occur under either option.

Vegetation would be removed as needed from the levee improvement footprint, which is a minimum of 15 feet from the levee or seepage berm toe. The 20-foot-wide proposed utility corridor would also require vegetation removal (see **Plate 2-12**). Power poles that currently exist on the landside slope of the levee and at the landside levee toe would need to be relocated and/or rerouted to accommodate the widened levee footprint. **Plate 2-12** shows the location of the proposed 15-foot-wide utility corridor.

To mitigate for levee underseepage, cutoff walls totaling up to 22,000 linear feet would be constructed 24/7 along the NEMDC North west levee to a depth of up to 80 feet. For an adjacent or widened levee, the cutoff wall would be constructed by placing compacted levee fill to create a cutoff wall working platform at the landside toe of the levee. The platform would be within the prism of the finished widened or adjacent levee, at a height 3–5 feet above the existing grade. For a strengthen-in-place option, the cutoff wall would be constructed at the existing levee centerline, following a one-half degrade of the existing levee. For either option, the cutoff wall would be a SB cutoff wall constructed by the conventional, long-reach excavator method. Once the cutoff wall is constructed and has consolidated, the remaining levee fill would be placed over the cutoff wall and the levee constructed to its final grade. For the full length of the west levee of NEMDC North, the project proponent(s) would acquire easements at least 30 feet wide for levee maintenance and 15 feet wide for existing and future utilities.

The crew size for this phase of the Adjacent Levee Alternative (Proposed Action) during its peak is estimated at 45–55 people working on three fronts, two 12-hour shifts, 6 days a week. Sundays would primarily be used for equipment maintenance. **Table 2-7** lists the anticipated major materials quantities associated with both engineering options. The potential sources of fill material for this work would be the Triangle Properties Borrow Area (**Plate 2-13**) and the Krumenacher borrow site (**Plate 2-14**). Up to 810 truck trips per day would be required to move this material from borrow sites to construction sites. Aggregate material would come from commercial sources up to 30 miles away.

Table 2-7
Anticipated Major Materials Quantities for Natomas East Main Drainage Canal North
Cutoff Wall and Levee Widening/Raising Work – Adjacent Levee Alternative (Proposed Action)

Description	Strengthen-in-Place Option	Adjacent Levee Option
Borrow site excavation	830,000 cy	965,000 cy
Levee embankment degrade	240,000 cy	0 cy
Levee embankment fill	1,025,000 cy	965,000 cy
SB cutoff wall	980,000 sf	1,005,000 sf
Class 2 aggregate surfacing	70,000 tons	27,000 tons
Asphalt concrete paving	22,250 tons	0 tons
Notes: cy = cubic yards; sf = square feet Source: Data provided by Wood Rodgers in 2009		

Table 2-8 lists the anticipated equipment and construction durations for this work.

Table 2-8 Anticipated Equipment and Duration for Natomas East Main Drainage Canal North Cutoff Wall and Levee Widening/Raising Work – Adjacent Levee Alternative (Proposed Action)		
Construction Activity	Equipment Type and Number	Duration of Use (days)
1. Clearing and grubbing/stripping	Elevating scrapers (8)	10
	Water trucks (2)	10
	Front-end loaders (4)	10
	Pickup trucks (5)	10
2. Borrow site preparation (concurrent with no. 1)	Water truck (1)	20
	Scrapers (2)	20
	Tractors with discing equipment (2)	20
3. Working surface construction (follows no. 2)	Water trucks (3)	20
	Vibratory rollers (5)	20
	Scrapers (15)	20
	Excavators (3)	20
4. Cutoff wall construction (follows no. 3)	Hydraulic excavators (6)	85
	Front-end loaders (3)	85
	Extended boom pallet loader (1)	85
	300 kW generators (2)	85
	Slurry pumps (2)	85
	Pickup trucks (5)	85
	Haul trucks (3)	85
5. Levee raising/widening (lags no. 4 by 21 days)	Water trucks (2)	85
	Water trucks (3)	90
	Vibratory rollers (5)	90
	Scrapers (20)	90
	Haul trucks (15)	90
6. Demobilization/cleanup (follows no. 5)	Motor graders (2)	90
	Hydroseeding trucks (2)	12
	Extended boom pallet loader (1)	12
	Haul trucks (2)	12
Note: kW = kilowatt Source: Data provided by Wood Rodgers in 2009		

Pleasant Grove Creek Canal and Natomas East Main Drainage Canal South – West Levee Raise

The Phase 3 EIS and EIR disclosed and analyzed levee improvements at the PGCC west levee (levee raising, slope flattening, levee widening, and installation of a cutoff wall) and southern segment of the NEMDC west levee (installation of a cutoff wall). The Adjacent Levee Alternative (Proposed Action) would build on these improvements and increase the level of flood risk reduction by raising (1–1.5 feet) the west levee of the PGCC and an approximately 500-foot-long section of the west levee of NEMDC South (Reach H) extending south of Elkhorn Boulevard from Station 313+00 to 318+50) to provide 3 feet of levee height (**Plates 2-13** and **2-14**). **Plates 2-13** and **2-14** also show the footprint analyzed as part of the Phase 3 Project. The Phase 4b Project analyzes only the increment change in the footprint and additional material required for construction.

The levee raise would be accomplished by one of two options:

- 1) Constructing either a strengthen-in-place levee raise, where the levee is raised by projecting the waterside slope up at a 3H:1V slope to its ultimate height, providing a width necessary to reconstruct the existing East Levee Road on top of the new levee, and projecting the landside slope back down to existing grade at a 3H:1V slope (**Plate 2-15**, upper illustration); or
- 2) Leaving East Levee Road in place and constructing an adjacent levee next to the existing levee (**Plate 2-15**, lower illustration).

The preferred method would be determined based upon further detailed engineering alternatives analyses of the two options.

Vegetation would be removed as needed from the levee improvement footprint, which is a minimum of 15 feet from the levee or seepage berm toe. The 20- to 50-foot-wide proposed utility corridor would also require vegetation removal (see **Plate 2-15**). Power poles that currently exist on the landside slope of the levee and at the landside levee toe would need to be relocated and/or rerouted to accommodate the widened levee footprint. **Plate 2-15** shows the location of the proposed 15- to 20-foot-wide utility corridor.

Table 2-9 lists the total anticipated major materials quantities associated with this work. The primary source of the fill material for work on the PGCC would be the Triangle Area Properties Borrow Area (**Plate 2-13**). The primary source of the fill material for work on the NEMDC South would be the Krumenacher Borrow Site and the Twin Rivers Unified School District Stockpile Site (**Plate 2-14**). Up to 566 truck trips per day would be required to move this material from borrow sites to construction sites. Aggregate material would come from commercial sources up to 30 miles away.

Description	Strengthen-In-Place Option	Adjacent Levee Option
Borrow site excavation	109,000 cy	345,500 cy
Levee embankment fill	87,000 cy	290,000 cy
Class 2 aggregate surfacing	48,300 tons	340 tons
Asphalt concrete paving	11,190 tons	40 tons
Note: cy = cubic yards Source: Data provided by Wood Rodgers in 2009		

Table 2-10 lists the anticipated equipment and construction durations for this work.

Table 2-10 Anticipated Equipment and Duration for Pleasant Grove Creek Canal West Levee Raise and Natomas East Main Drainage Canal West Levee Raise – Adjacent Levee Alternative (Proposed Action)		
Construction Activity	Equipment Type and Number	Duration of Use (days)
1. Clearing and grubbing/stripping	Elevating scrapers (4)	10
	Water trucks (2)	10
	Front-end loaders (2)	10
	Haul trucks (15)	10
	Pickup trucks (5)	10
2. Borrow site preparation (concurrent with no. 1)	Tractors with scrapers (2)	5
	Water truck (1)	5
3. Levee embankment placement (follows no. 1 and 2)	Elevating scrapers (16)	80
	Hydraulic excavators (2)	80
	Front-end loaders (2)	80
	Pickup trucks (5)	80
	Haul trucks (3)	80
4. East Levee Road/Natomas Road reconstruction (follows no. 3)	Water trucks (2)	30
	Smooth drum rollers (8)	30
	Asphalt concrete pavers (5)	30
	Asphalt delivery trucks (50)	30
5. Cleanup/demobilization (follows no. 4)	Water trucks (2)	12
	Hydroseeding trucks (2)	12
	Extended boom pallet loader (1)	12
	Haul trucks (2)	12
Source: Data provided by Wood Rodgers in 2009		

The crew size for this phase of the Adjacent Levee Alternative (Proposed Action) during its peak is estimated at 45–55 people working two 12-hour shifts, 6 days a week. Sundays would primarily be used for equipment maintenance.

Pleasant Grove Creek Canal and Natomas East Main Drainage Canal South Waterside Improvements

Several areas along the waterside slope of the PGCC and NEMDC South (Elkhorn Boulevard to Northgate Boulevard) are currently experiencing erosion or are susceptible to future erosion. Erosion repair and rock slope protection is required at the PGCC and NEMDC South at the locations listed in **Table 2-11** and shown on **Plates 2-13** and **2-14**.

Table 2-11 Rock Slope Protection Areas at PGCC and NEMDC South – Adjacent Levee Alternative (Proposed Action)	
Stream Confluence	Location of Rock Slope Protection
PGCC at Curry Creek	PGCC west bank opposite of where creek enters PGCC
PGCC at Pleasant Grove Creek	PGCC west bank opposite of where creek enters PGCC
PGCC at Howsley Road Bridge West Abutment	West abutment of Howsley Road Bridge
PGCC at Pierce-Roberts Drain	PGCC west bank opposite of where creek enters PGCC
NEMDC at Dry Creek	Existing west bank erosion area at confluence of Dry Creek and NEMDC
NEMDC at Arcade Creek	Existing west bank erosion area at confluence of Arcade Creek and NEMDC
Notes: NEMDC = Natomas East Main Drainage Canal; PGCC = Pleasant Grove Creek Canal Source: Data provided by Wood Rodgers in 2009	

The linear extent of the proposed protection on the west bank of the NEMDC at the confluence with Dry Creek is approximately 2,500 feet. Proposed protection would include rock fill to bring the waterside bench up to existing grade, a rock blanket to stabilize the existing 2:1 bank slope below the bench, and a blanket of rock on the waterside toe to help minimize scour (launchable toe). The linear extent of the proposed protection on the west bank of the NEMDC at the confluence with Arcade Creek is approximately 400 feet. Proposed protection would include a variable width bench, a rock riprap blanket on the slope, and a launchable toe.

The bank protection areas on the west bank of the PGCC at Curry Creek, Pleasant Grove Creek, and Pierce-Roberts Drain range from 300–400 feet in length. At Curry Creek and Pleasant Grove Creek, riprap would be placed on the west levee waterside slopes opposite the confluences with Curry and Pleasant Grove Creeks, extending from the waterside toe to the top of slope for about 50 feet upstream and 100 feet downstream of the confluences. The rock would likely be covered with soil and grass. Riprap armoring would also occur opposite the outlet of the Pierce-Roberts Drain. Rock or other protection would be placed along the Howsley Road embankment and along the landside of the PGCC west levee near the Howsley Road gap to prevent erosion from undermining the gap or affecting the landslide slope. Investigations are ongoing to determine if riprap should be placed around the left (west) abutment of the Howsley Road Bridge.

The PGCC west levee and the NCC south levee between SR 99 and Howsley Road also experience a significant problem with beavers and other burrowing animals. To provide low-maintenance mitigation for this concern, a beaver exclusion wall would be constructed at these areas. The wall would be constructed of reinforced concrete or steel or vinyl sheet piling, and would be located at the waterside levee toe at a distance of about 50 feet from the levee centerline. The top of the wall would be located above the ordinary high water mark, and the bottom of the wall would reach as deep as 20 feet.

The NEMDC low-flow channel beneath and downstream of I-80 has been disturbed by the City of Sacramento Pump Station 157 outfall structure. The outfall has caused the low-flow channel to meander towards the west (right) bank of the channel, which could eventually weaken the existing NEMDC west levee. To fix this problem, the low-flow channel would be reconstructed at the middle of the channel. This reconstruction would be accomplished by creating a diversion for the existing stream flow, filling the existing low-flow channel, and excavating a new low-flow channel. The total length of the channel realignment would be approximately 1,000 feet. A rock berm would be placed between the low-flow channel and Sump 157 to minimize the impact of the pump station discharge on the west levee.

Table 2-12 lists the anticipated major materials quantities associated with this work. The sources of fill material for this work would be the Krumenacher Borrow Site and the Twin Rivers Unified School District Stockpile Site (**Plate 2-14**). Aggregate material would come from commercial sources up to 30 miles away.

Table 2-12
Total Anticipated Major Materials Quantities for Pleasant Grove Creek Canal and
Natomas East Main Drainage Canal South Waterside Levee Improvement Work – Adjacent Levee
Alternative (Proposed Action)

Material Type	Quantity
Rock slope protection	8,600 tons
Beaver exclusion wall	405,800 sf
Excavation	22,250 cy
Backfill	17,800 cy
Notes: cy = cubic yards; sf = square feet Source: Data provided by Wood Rodgers in 2009	

Table 2-13 lists the anticipated equipment and construction durations for this work.

Table 2-13
Anticipated Equipment and Duration for Pleasant Grove Creek Canal and Natomas East Main Drainage
Canal South Waterside Levee Improvement Work – Adjacent Levee Alternative (Proposed Action)

Construction Activity	Equipment Type and Number	Duration of Use (days)
1. Erosion repair and rock slope protection installation	Front-end loaders (4)	21
	Excavators (3)	21
	Water trucks (2)	21
	Haul trucks (15)	21
	Pickup trucks (2)	21
2. Beaver protection wall installation (independent of item no. 1)	Backhoes (3)	80
	Water truck (1)	80
	Front-end loaders (2)	80
	Light duty crane (1)	80
3. NEMDC low flow channel relocation (independent of item nos. 1 or 2)	Excavator (1)	30
	Vibratory roller (1)	30
	Loaders (2)	30
Source: Data provided by Wood Rodgers in 2009		

Erosion repair and rock slope protection installation would require approximately 15 people working a single 8-hour shift, 6 days a week. Installation of the beaver protection wall would require two wall installation fronts with 15 people working one 10-hour shift, 6 days a week. Relocation of the NEMDC low-flow channel would require 12 people working one 10-hour shift, 6 days a week.

Natomas East Main Drainage Canal South – Levee Vegetation Compliance

Along the NEMDC west levee south of the NEMDC Stormwater Pumping Station (Reach G), at a minimum, if a variance request is granted by USACE, vegetation removal would be required for all non-native trees from within the vegetation-free zone, all native trees that have a dbh of four inches or less, and all larger native trees that are

located in the upper 2/3 of the waterside slope, the crown, or within 15 feet of the landside toe (or within the right-of-way, if less than 15 feet). This vegetation removal would total less than 0.6 acre. Under a worst-case scenario, approximately 1.1 acres of vegetation would be cleared on the waterside to within 15 feet of the waterside levee toe. On the landside of NEMDC South, vegetation would be cleared 10 feet from the existing toe.

Pleasant Grove Creek Canal Culvert Remediation

Five existing culverts are located beneath the PGCC west levee and extend under the canal eastward to the east side of the PGCC (**Plate 2-13**). The purpose of these culverts is to drain the area east of the PGCC when the PGCC is experiencing high flows. The Phase 3 Project described these culverts, where they pass beneath the PGCC west levee, as being replaced with pipe materials and pipe closure devices meeting USACE standards for levee penetrations. As an alternative to this upgrade-in-place option, the Phase 4b Project may remove these culverts in their entirety, beneath both the east and west PGCC levees and the PGCC itself. To mitigate for the loss of a drainage outfall area for properties east of the PGCC, five detention basins would be constructed in the area between the PGCC east levee and the Union Pacific Railroad. The basins, which are shown on **Plate 2-13**, would be set back an appropriate distance from the landside toe of the PGCC east levee. To replace the drainage function of these under drains, a combination of the detention basins, drainage channels, new lift pumps, and culverts under tributary streams may be employed. The detention basins and pumping facilities would be sized to handle runoff volumes of a 10-day storm event to protect structures, although temporary flooding of agricultural fields may be allowed during such an event. The detention basins would be returned to rice production, if feasible.

Table 2-14 lists the total anticipated major materials quantities associated with this work.

Table 2-14 Total Anticipated Major Materials Quantities for Pleasant Grove Creek Canal Culvert Removal Work – Adjacent Levee Alternative (Proposed Action)	
Construction Activity	Quantity (cubic yards)
Excavation	4,750
Backfill	5,875
Source: Data provided by Wood Rodgers in 2009	

Table 2-15 lists the anticipated equipment and construction durations for this work. The crew size for this phase of the project during its peak is estimated at 35–40 people working 10-hour shifts, 6 days a week.

State Route 99 Natomas Cross Canal Bridge Remediation

The undersides of the SR 99 bridges over the NCC (**Plate 2-16**) would be affected by high river stages in a flood event. The southern abutment for both bridges is supported by the NCC south levee. Preliminary analysis indicates the bridges are stable under this condition; however, a means to prevent the river stage from reaching the landside of the NCC south levee by way of the bridge deck is required.

Providing closure at SR 99 would entail constructing a removable barrier that would be stored off-site and installed across the roadway on the south side of the bridge when the NCC stage reached a pre-established elevation. To support the removable barrier, a permanent structure constructed at and adjacent to the highway would be constructed. The permanent support system would tie into levee raising work completed as part of the project disclosed and analyzed in the Phase 2 EIS and EIR.

Table 2-15
Anticipated Equipment and Duration for
Pleasant Grove Creek Canal Culvert Removal Work – Adjacent Levee Alternative (Proposed Action)

Construction Activity	Equipment Type and Number	Duration of Use (days)
1. Culvert removal	Excavators (2)	15
	Vibratory rollers (2)	15
	Water truck (1)	15
	Front-end loaders (2)	15
	Haul trucks (2)	15
	Pickup trucks	15
2. Detention basin area stripping	Elevating scrapers (4)	5
	Loaders (2)	5
	Water trucks (2)	5
3. Detention basin excavation (follows no. 3)	Scrapers (15)	30
	Water trucks (2)	30
	Motor graders (2)	30
4. Demobilization/cleanup (follows no. 3)	Water trucks (2)	12
	Hydroseeding trucks (2)	12
	Haul trucks (2)	12

Source: Data provided by Wood Rodgers in 2009

Construction of the SR 99 removable barrier system would involve lane closures and traffic controls. The northbound and southbound lanes of the NCC Bridge would be closed for 2 weeks (1 week for each direction), with a total of up to 5 weeks to allow for set up and take down of traffic controls and traffic bypasses.

Underseepage mitigation at the bridges would be provided by either a series of relief wells and a relief well discharge collection system, or a SCB cutoff wall constructed by the Deep-Mix Method (DMM) through the highway road section. For a relief well installation, wells would be installed at the levee landside toe adjacent to the Howsley Road undercrossing (located just south of the NCC bridges), just off of the north shoulder of Howsley Road. Discharge from the wells would be collected in a pipe or drainage ditch and conveyed to RD 1000's existing drainage system. Alternatively, the drainage could be addressed by upgrading the existing California Department of Transportation (Caltrans) pump station beneath the Howsley Road overcrossing to accept these flows. In lieu of relief wells, a cutoff wall could be constructed through the centerline of the levee through the SR 99 roadway section to a depth of up to 95 feet. Installation of the cutoff wall would require traffic control on SR 99. Traffic control would include a cross-median detour to route southbound travel to the northbound bridge, which would be divided to allow one lane of travel in each direction. After the cutoff wall through the southbound lanes is installed and cured, the traffic detour would be reconstructed to route northbound traffic to the southbound bridge for installation of the cutoff wall through the northbound roadway. It is anticipated that each cutoff wall section could be constructed over a weekend, with the traffic routing in place at 6 p.m. Friday and removed by 6 a.m. Monday.

Table 2-16 lists the total anticipated major materials quantities associated with this work. Aggregate material would come from commercial sources up to 30 miles away.

Table 2-16 Total Anticipated Major Materials Quantities for State Route 99 Natomas Cross Canal Bridge Cutoff Wall and Closure Structure Work – Adjacent Levee Alternative (Proposed Action)	
Material Type	Quantity
Reinforced concrete	50 cy
Aggregate base rock	1,250 tons
Asphalt concrete paving	1,000 tons
Salvage asphalt concrete paving	3,750 sf
SCB cutoff wall by DMM	75,000 sf
Notes: cy = cubic yards; sf = square feet; SCB = soil-cement-bentonite; DMM = Deep-Mix Method Source: Data provided by Wood Rodgers in 2009	

Table 2-17 lists the anticipated equipment and construction durations for this work.

Table 2-17 Anticipated Equipment and Duration for State Route 99 Natomas Cross Canal Bridge Cutoff Wall and Closure Structure Work – Adjacent Levee Alternative (Proposed Action)		
Construction Activity	Equipment Type and Number	Duration of Use (days)
1. Traffic bypass construction	Motor grader (1)	10
	Water truck (1)	10
	Front-end loader (1)	10
	Asphalt concrete paver (1)	10
	Pickup trucks (2)	10
2. Cutoff wall installation – southbound lanes (follows no. 1)	Deep soil mix rig (1)	6
	Excavator (1)	6
	Loader (1)	6 Days
3. Traffic bypass reconfiguration (Follows 2.)	Motor grader (1)	10
	Water truck (1)	10
	Front-end loader (1)	10
	Asphalt concrete paver (1)	10
	Pickup trucks (2)	10
4. Cutoff wall installation – northbound lanes (follows no. 3)	Deep soil mix rig (1)	6
	Excavator (1)	6
	Loader (1)	6
5. Closure structure construction (follows no. 4)	Pickup trucks (2)	30
	Light duty crane (1)	30
	Concrete trucks (7)	30
	Loader (1)	30
	Backhoe (1)	30
Source: Data provided by Wood Rodgers in 2009		

The estimated crew size during the peak of construction would be 25–35 people working two 12-hour shifts, 6 days a week. Cutoff wall construction may be conducted 24/7.

Natomas Cross Canal South Levee – Levee Vegetation Compliance

Along the NCC south levee (Reach D:1–2), at a minimum, if a variance request is granted by USACE, vegetation removal would be required for the upper 1/2 of the waterside levee slope. This vegetation removal would be limited to a few trees. Without a variance, vegetation would also be minimal.

2.3.3.3 IRRIGATION AND DRAINAGE COMPONENTS

West Drainage Canal – Interstate 5 to Fisherman’s Lake

The Phase 4b Project would include improvements to the West Drainage Canal from a point south of I-5 to the north end of Fisherman’s Lake. The improvements would be designed to provide the following benefits:

- ▶ lessen the canal’s potential as a wildlife attraction hazard for Airport operations by relocating the western portion of the canal farther away from the airport operations area;
- ▶ reduce bank erosion and associated water quality problems caused by the canal’s excessively steep sides;
- ▶ improve RD 1000’s access to maintain the canal by providing expanded rights-of-way for O&M corridors;
- ▶ reduce the build-up of aquatic weeds, which require regular removal to avoid loss of channel conveyance capacity; and
- ▶ improve the continuity of the canal corridor for movement of giant garter snake between Fisherman’s Lake managed wetlands and other managed wetlands and rice fields in the northern part of the Natomas Basin by creating a shoreline band of giant garter snake habitat, a key element of the NLIP conservation strategy.

Plate 2-17 shows the proposed realignment of the westernmost portion of the West Drainage Canal (near Reach B:11A of the Sacramento River east levee), as well as the footprint of proposed improvements to the existing canal east of the portion that would be realigned. The new alignment would abandon and reroute approximately 4,700 feet of the West Drainage Canal. **Plate 2-18** (upper illustration) shows a typical cross-section for the modified West Drainage Canal, which would require a right-of-way of up to 150 feet for approximately 1.2 miles. The realigned section of the canal would have a bottom width of up to 30 feet, stable 3H:1V bank slopes on one or both sides, and a narrow, variable width bench on one side of the canal. A 20-foot-wide maintenance and inspection road would flank each side of the canal and would be slightly elevated above adjacent land to improve an all-weather road condition. Culverts would cross under the patrol road to allow continued drainage into the canal from adjacent fields. The realignment would include rerouting of a small section of the West Drainage Canal (starting at the M10 Drain south of I-5 which leads to RD 1000’s Pumping Plant No. 5) to a north-south orientation to improve the management of adjacent agricultural parcels, and to move the canal farther from the Airport Operations Area in the vicinity of the west runway. Regrading of agricultural parcels between the new and old canal alignment may be required for drainage. The normal managed water depth for this reach of the West Drainage Canal would be 6–7 feet in winter and 7–8 feet in summer under both existing and proposed conditions.

Table 2-18 summarizes the proposed improvements to the existing West Drainage Canal east of the portion that would be realigned. No improvements are proposed to the south bank of the canal west of Powerline Road.

Opportunities to improve the existing West Drainage Canal are constrained by the existence of a row of power line poles located on the south side of the West Drainage Canal west of Powerline Road and on the north side of the canal east of Powerline Road. Because the poles are close to the top of the canal bank, canal improvements

would not be feasible on both sides of the canal unless the power line poles were relocated farther away. Therefore, as shown in **Table 2-18** above, improvements would be focused on the north bank of the canal west of Powerline Road (east of the realigned portion) and the south bank of the canal east of Powerline Road. No improvements would be made to the south bank west of Powerline Road, and only a 20-foot-wide right-of-way for a maintenance road would be added to the north bank east of Powerline Road.

Table 2-18 Proposed Improvements to the West Drainage Canal (Eastern Segment) – Adjacent Levee Alternative (Proposed Action)		
	West of Powerline Road ¹	East of Powerline Road
North bank	20-foot-wide right-of-way for maintenance Steep banks flattened to 3H:1V slopes 2- to 5-foot-wide tule bench	20-foot-wide right-of-way for maintenance
South bank	No improvements	20-foot-wide right-of-way for maintenance Steep banks flattened to 3H:1V slopes 2- to 10-foot-wide tule bench
¹ East of the portion of the canal that would be realigned Source: Data compiled by AECOM in 2009		

On the north side of the West Drainage Canal west of Powerline Road and the south side of the canal east of Powerline Road, the steep bank would be laid back to a stable 3H:1V slope to prevent ongoing bank slumping and reduce the need for future bank repairs and sediment removal. **Plate 2-18** (lower illustration) shows a typical cross-section for these bank improvements. In these locations, the easement would be expanded between 25 and 35 feet to accommodate flattening of the banks, widening the maintenance road, and adding a 15- to 20-foot-wide setback between the road and adjacent crop fields to place and dry canal sediment and floating debris. Suitable excavated material from laying back the canal bank would be used to elevate an all-weather road above the existing field grade. Besides flattening to a 3H:1V slope, bank improvements would include creating a 2- to 10-foot-wide submerged bench with tule growth to prevent aquatic weeds such as water primrose from attaching to the bank and then expanding across the canal water surface. Bank width would vary depending upon site constraints. Invasive aquatic weeds in the Natomas Basin are known to inhibit the movement of giant garter snake as well as reduce the flow of canal water and cause eutrophic water quality conditions. The tule benches would provide improved habitat for the giant garter snake (see Section 2.3.4.1, “West Drainage Canal Habitat Improvements”).

Approximately 323,000 cubic yards of material would be excavated for the new canal and used to backfill the old canal. **Table 2-19** summarizes the types of equipment that may be used throughout the construction sequence under the Adjacent Levee Alternative (Proposed Action), along with an approximation of the duration of each activity.

Riego Road Canal

A portion of an irrigation canal owned by NCMWC would be disrupted by the proposed improvements to the west levee of NEMDC North. The affected portion includes approximately 4,000 feet of irrigation canal, approximately 250 feet of buried irrigation piping and culverts, and several irrigation control turn-out structures. These facilities would be relocated outside of the levee footprint as part of the Phase 4b Project. To prevent disruption of irrigation service, the NCMWC irrigation system would be replaced with in-kind facilities compatible with the new levee footprint. The new canal would be a highline canal with 3H:1V side slopes and a maintenance road on each of the embankments. A right-of-way of up to 100 feet beyond the new levee footprint would be required for the new facility. **Plate 2-11** shows the proposed footprint of the relocated canal. Approximately 46,000 cubic yards of material would be excavated for the new canal and used to backfill the old

canal. **Table 2-20** summarizes the types of equipment that may be used throughout the construction sequence under the Adjacent Levee Alternative (Proposed Action), along with an approximation of the duration of each activity.

Table 2-19 Anticipated Equipment and Duration for West Drainage Canal Realignment and Bank Improvements – Adjacent Levee Alternative (Proposed Action)		
Construction Activity	Equipment Type and Number	Duration of Use (days)
1. Mobilization, topsoil removal, and canal construction	Service Vehicle (1)	0
	Scrapers (8)	5
	Scrapers (8)	28
	Dump trucks (10)	12
	Dozers (4)	9
	Water trucks (2)	6
	Compactors (2)	4
2. Canal abandonment	Dump trucks (10)	41
	Dozers (4)	32
	Water trucks (2)	20
	Compactors (2)	12
3. Topsoil respread and pipe installation	Loaders (3)	13
	Backhoe (1)	3
	Dozer (1)	1
	Water truck (1)	1
	Compactor (1)	1
4. Restoration	Hydroseed trucks (2)	14
	Water trucks (4)	15
5. Demobilization	Service Vehicle (1)	18

Source: Data provided by Mead & Hunt in 2009

Table 2-20 Anticipated Equipment and Duration for Riego Road Canal Relocation – Adjacent Levee Alternative (Proposed Action)		
Construction Activity	Equipment Type and Number	Duration of Use (days)
1. Mobilization, topsoil removal, and canal construction	Service Vehicle (1)	9
	Scrapers (2)	7
	Scrapers (2)	2
	Dump trucks (10)	8
	Dozers (2)	12
	Water trucks (2)	4
	Compactors (2)	2
2. Canal abandonment	Dump trucks (10)	6
	Dozers (2)	10
	Water trucks (2)	3
	Compactors (2)	2
3. Topsoil respread and pipe installation	Loaders (3)	6
	Backhoe (1)	1
	Dozer (1)	1
	Water truck (1)	1
	Compactor (1)	1
4. Restoration	Hydroseed truck (1)	4
	Water trucks (2)	4
5. Demobilization	Service Vehicle (1)	9

Source: Data provided by Mead & Hunt in 2009

Private Irrigation

Sacramento River East Levee Reaches B:13–15 and A:16–20

Several private irrigation water wells are located in the vicinity of Bryte Bend Road and Garden Highway. One of these wells at the southeast end of the Riverside Canal (Reach A:18, approximate station of 849+50) adjacent to Bryte Bend Road would be disrupted by the proposed levee improvements and would be relocated as part of the Phase 4b Project (**Plates 2-7a and 2-7b**). This well discharges directly to the existing Riverside Canal for irrigation service to the adjacent fields for agricultural use. The water well would be relocated outside of the footprint of the levee improvements (by drilling replacement wells and abandoning the existing well) and sited at least 100 feet from the adjacent levee or seepage berm toe. To prevent disruption of service in the fields, the private irrigation well would be replaced with in-kind facilities compatible with the new levee footprint. Well construction would require 24-hour drilling for up to 3 days followed by 24-hour development pumping for up to 2 weeks.

Natomas East Main Drainage Canal

Numerous private irrigation facilities along the NEMDC would be disrupted by the proposed levee improvements and would therefore be relocated as part of the Phase 4b Project. Relocated private irrigation facilities proposed as part of the Phase 4b Project are shown on **Plates 2-11 and 2-14**. These private facilities include nine landside water wells that provide irrigation for cultivation of adjacent fields. The water wells would be relocated outside of the footprint of the levee improvements (by drilling replacement wells and abandoning existing wells) and sited at least 100 feet from the future levee toe. In addition to the wells, approximately 1,500 feet of local field irrigation ditches and approximately 2,500 feet of buried irrigation piping would be relocated. To prevent disruption of service in the fields, the private irrigation systems would be replaced with in-kind facilities compatible with the new levee footprint. Well construction would require 24-hour drilling for up to 3 days followed by 24-hour development pumping for up to 2 weeks.

Pleasant Grove Creek Canal

Numerous private irrigation facilities along the PGCC west levee would be disrupted by the proposed levee improvements and would be replaced as part of the Phase 4a Project (**Plate 2-13**). These private structures, consisting of eight landside water wells and one private river pump, service the adjacent fields for agricultural use. The water wells would be relocated outside of the footprint of the levee improvements (by drilling replacement wells and abandoning the existing wells). The river pump discharge pipes through the levee would be raised and a new positive control valves and an air release/siphon breaker valve would be added. In addition to the wells and river pump, approximately 1,900 feet of local irrigation canals and approximately 2,200 feet of buried irrigation piping would be relocated. To prevent disruption of service in the fields, the private irrigation facilities would be replaced with in-kind structures compatible with the new levee footprint. Some RD 1000 drainage facilities would be relocated prior to PGCC construction, including approximately 5,900 feet of drainage canal and 750 feet of pipe.

Natomas Cross Canal South Levee Ditch Relocations

Along the NCC south levee, between Stations 19+00 to 97+00 (Reach D:2), the Vestal Drain ditch runs parallel to the landside toe of the levee. The geotechnical analyses of the ditch in its present location shows unacceptable seepage gradients at the base of the canal. From Stations 199+00 to 244+00 (Reach D:6), the Morrison Irrigation Canal has similar gradient problems. Both canals would be removed and replaced as part of the Phase 4b Project. (The Northern Main Irrigation Canal, which also parallels the landside toe, does not present the same seepage problems and would remain in place, except as described in the Phase 4a Project.) Replacement canals would be constructed 400 feet from the existing landside toe of slope (**Plate 2-16**). The new canal size would be designed with 3H:1V side slopes. It is anticipated that there would be a balance of fill material available to fill the old canal with the material excavated from the new canal. Approximately 125,000 cubic yards would be excavated for the

new canals and used to backfill the old canals. **Table 2-21** lists the anticipated equipment and construction durations for this work.

Table 2-21 Anticipated Equipment and Duration for Natomas Cross Canal South Levee Ditch Relocations – Adjacent Levee Alternative (Proposed Action)		
Construction Activity	Equipment Type and Number	Duration of Use (days)
1. Clearing and grubbing/stripping	Elevating scrapers (4)	15
	Water trucks (2)	15
	Front-end loaders (4)	15
	Pickup trucks (5)	15
2. Channel excavation and backfill (follows no. 1)	Elevating scrapers (8)	30
	Excavators (2)	30
	Water truck (1)	30
3. Demobilization/cleanup (follows no. 2)	Water trucks (2)	12
	Hydroseeding trucks (2)	12
	Extended boom pallet loader (1)	12
	Haul trucks (2)	12
Source: Data provided by Wood Rodgers in 2009		

The crew size for this component of the project during its peak would be between 25–35 people working 10-hour shifts, 6 days a week.

Reclamation District 1000 Pumping Plants

Because the Natomas Basin is surrounded by levees, all excess drainage within the Basin must be pumped out. Drainage within most of the Basin is pumped to the Sacramento River and the NEMDC via RD 1000's drainage system and pumping plants. RD 1000 Pumping Plant Nos. A1, 1B, 6, and 8 are within the limits of work for the Phase 4b Project. All three pumping plants would require new discharge pipes and additional modifications to accommodate the new levee criteria and proposed levee improvements. Raising the discharge pipes at Pumping Plant Nos. 1B and 6, which currently cross the levee under Garden Highway and East Levee Road, respectively, would require closure of those roads to through-traffic for up to 60 days, with traffic detours. Raising the discharge pipes at Pumping Plant No. 8 may require a road closure at Northgate Boulevard with a traffic detour and also temporary closure of the bike path on the top of the levee. As design evaluations continue and the design is refined, additional modifications could be required to maintain the plant's current operations or meet underseepage exit gradient criteria in the inlet channels, such as adding relief wells or lining the intake channel with either filter gravel or rock-covered geotextile fabric or sump modifications. In addition, relocating the pump stations away from the levee may be necessary to accommodate the adjacent levee footprint.

Pumping Plant Nos. 1A and 1B

Pumping Plant No. 1A is not included in the NLIP, but is included in a USACE cutoff wall project as part of the Common Features Project. Pumping Plant No. 1A and 1B are located along Garden Highway approximately 1 mile west of I-5. These pumping plants are shown on **Plate 2-7b**.

Pumping Plant No. 1B consists of six pumps, a control-room building, and associated infrastructure for the pumping plant. It is located immediately adjacent to the landside levee toe in Reach A:19B. Each pump for Pumping Plant No. 1B connects to a buried discharge pipe that runs across the existing levee to an outfall structure on the east bank of the Sacramento River. There are a total of six 48-inch pipes. Six air/siphon release valves, one for each pipe, are located close to the crown of the levee in a vault on the waterside of the levee. A metering vault is located on the landside of the levee.

The pumping-plant modifications would include raising and replacing the discharge pipes that extend from Pumping Plant No. 1B across the levee within the confines of the planned levee construction to tie into the existing discharge pipes on the waterside. The air/siphon release valves would be replaced and shutoff valves would be added. The valves would be constructed in a new concrete vault in the waterside shoulder of the levee. The metering vault along with the plant access ramp may also be replaced or relocated. The pumps and motors would also be replaced and/or upgraded to account for the higher head associated with the raised discharge pipes.

To facilitate raising of the pump discharge pipes, Garden Highway would require a local raise of several feet in grade over the pipes. The road raise would transition back down to existing grade upstream and downstream of the local raise. This work would require partial regrading of the waterside slope for the length of the raised Garden Highway. The levee would transition upstream and downstream of this site from an adjacent levee to a raise of the existing levee in place. At this site, the levee would be degraded and reconstructed with engineered fill. Traffic control measures and detours would be required for up to 30 days during pipe removal and replacement under Garden Highway.

Pumping Plant No. 6

Pumping Plant No. 6 is located along the NEMDC, approximately three-quarters of a mile north of Elkhorn Boulevard (**Plate 2-11**). At this location, the existing pump discharge pipelines, which penetrate the west levee, would be reconstructed.

An excavated intake channel connects to the pumping plant. Four pumps, a control-room building, and associated infrastructure for the pumping plant are located immediately adjacent to the landside levee toe. Each pump for Pumping Plant No. 6 connects to a buried discharge pipe that crosses the existing levee and connects to an outfall structure on the NEMDC. These pipes consist of one 42-inch pipe, two 36-inch pipes, and one 30-inch pipe. Four air/siphon release valves, one for each pipe, are located close to the NEMDC on the waterside of the levee.

The pumping plant modifications would include raising and replacing the discharge pipes that extend from Pumping Plant No. 6 across the levee to tie into the existing discharge pipes within the waterside of the levee. The air/siphon release valves would be replaced and shutoff valves would be added. The valves would be constructed in a concrete vault in the waterside shoulder of the levee.

An upgrade to and/or replacement of the pumps, motors, and the electrical service including a new electrical building for Pumping Plant No. 6 would be required to provide the increased horsepower needed to pump over the levee. Use of new pumps could require the excavation of a deeper sump, which may require some associated modifications to the landside intake channel.

To facilitate raising the pump discharge pipes, East Levee Road would require a local raise in grade over the pipes. The road raise would transition back down to existing grade upstream and downstream of the local raise. This work would require partial regrading of the waterside slope for the length of the raised East Levee Road (**Plate 2-11**). The levee would transition upstream and downstream of this site from an adjacent levee to a raise of the existing levee in place. At this site, the levee would be degraded and reconstructed with engineered fill. Traffic control measures and detours would be required during pipe removal and replacement under East Levee Road.

The pipe raise would require a new outfall to comply with the USACE siphon recovery limits criteria, which limit the distance from the top of the apex of the pipe to the top of the outlet pipe. Construction of a new outfall structure would require dewatering a portion of the NEMDC.

Pumping Plant No. 8

Pumping Plant No. 8 is located along the NEMDC, approximately two-thirds of a mile north of I-80 (**Plate 2-14**). An excavated intake channel is located on the west side of Northgate Boulevard, and nine pumps and an equipment building are located immediately adjacent to the pump station on the west side of Northgate Boulevard. Each pump for Pumping Plant No. 8 connects to a buried discharge pipe that runs across the existing levee to an outfall structure on the NEMDC. There are a total of nine pipes, including five 54-inch pipes, three 36-inch pipes, and one 60-inch pipe. Nine air/siphon release valves, one for each pipe, are located close to the NEMDC on the waterside of the levee.

The pumping plant modifications would include raising and replacing the discharge pipes that extend from Pumping Plant No. 8 across the levee to tie into the existing discharge pipes within the waterside bench. The air/siphon release valves would be replaced and shutoff valves would be added. The valves would be constructed in a concrete vault in the waterside shoulder of the levee. The pumps would also be replaced and/or upgraded to account for the higher head associated with the raised discharge pipes.

An upgrade to and/or replacement of the pumps, motors, and the electrical service including a new electrical building for Pumping Plant No. 8 would be required to provide the increased horsepower needed to pump over the levee. Use of new pumps could require the excavation of a deeper sump, which may require some associated modifications to the landside intake channel.

To facilitate raising of the pump discharge pipes, the existing bike trail would require a local raise in grade over the pipes. The trail raise would transition back down to existing grade upstream and downstream of the local raise. This work would require partial regrading of the waterside slope for the length of the raised bike trail. At this site, the levee would be degraded and reconstructed with engineered fill. A detour or closure of the bike trail would be required for up to 30 days. Likewise, the pipes would need to be replaced under Northgate Boulevard. Traffic control measures and detours would be required during pipe removal and replacement under Northgate Boulevard for up to 30 days.

The pipe raise would require a new outfall to comply with the USACE siphon recovery limits criteria, which limit the distance from the top of the apex of the pipe to the top of the outlet pipe. Construction of a new outfall structure would require dewatering a portion of the NEMDC.

City of Sacramento Pumps

The City of Sacramento owns and operates several storm drainage sump pumps to pump residential and urban stormwater out of the Basin. The discharge pipes would be raised and additional modifications would be made to bring all three of the pumping plants into compliance with the new criteria. Raising the discharge pipes at City Sumps 160 and 58 (**Plates 2-7** and **2-9**, respectively), which currently cross the levee under Garden Highway, would require partial closure of the road to through-traffic for up to 30 days, with traffic detours. Raising the discharge pipes at City Sump 102 (**Plate 2-14**) would require a closure of the bike path on the top of the levee. As design evaluations continue and the design is refined, additional modifications could be required to maintain the City Sump 102's current operations. In addition, relocating the pump stations away from the levee may be necessary to accommodate the adjacent levee footprint.

City Sump 160 (Sacramento River East Levee Reach A:19B)

City Sump 160 is located along Reach A:19B of the Sacramento River east levee (**Plate 2-7b**). A 90-inch storm drain carries stormwater drainage from adjacent properties to the pump station. A chainlink fence with slats and

barbed wire is located approximately 30 feet from the landside toe of the levee and, combined with a concrete block wall, surrounds the pump station. Five pumps, an equipment building, and above ground diesel fuel storage tank, and electrical transformers are located behind the fence. Each pump for City Sump 160 connects to a buried steel discharge pipe that runs across the existing levee to an outfall structure on the Sacramento River. There are a total of five pipes, including two 54-inch pipes, two 42-inch pipes, and one 12-inch pipe. Five air/siphon release valves, one for each pipe, are located on the landside of the levee near the top. A concrete pipe support wall is located approximately 100 feet from the outfall on the waterside of the levee.

The pumping plant modifications would include raising the discharge pipes that extend from City Sump 160 across the levee to tie into the existing discharge pipes on the waterside. The air/siphon release valves would be replaced and shutoff valves would be added. The valves would be constructed in a concrete vault in the waterside shoulder of the levee. If necessary, the concrete pipe support wall would be removed and replaced. An upgrade to the pumps and diesel engines for City Sump 160 would likely be required to provide the increased horsepower needed to pump drainage water through the raised pipes.

To facilitate raising the pump discharge pipes, Garden Highway would require a local raise in grade over the pipes. The road raise would transition back down to existing grade upstream and downstream of the local raise. This work would require partial regrading of the waterside slope for the raised Garden Highway. The levee would transition upstream and downstream of this site from an adjacent levee to a raise of the existing levee in place. At this site, the levee would be degraded and reconstructed with engineered fill.

The pipe raise would require a new outfall to comply with the USACE siphon recovery limits criteria, which limit the distance from the top of the apex of the pipe to the top of the outlet pipe. Construction of a new raised outfall structure would require dewatering a portion of the Sacramento River.

City Sump 58 (American River North Levee)

City Sump 58 is located along the American River North Levee approximately 0.4 mile east of Truxel Road (**Plate 2-9**). A 30-inch storm drain carries stormwater drainage from adjacent properties to the pump station. A chainlink fence with slats and barbed wire is located at the landside toe of the levee and surrounds the pump station. Three pumps, an equipment building, trash rack hoist, and electrical transformer are located immediately adjacent to the landside levee toe. Each pump for City Sump 58 connects to a buried discharge pipe that runs across the existing levee to an outfall structure on the NEMDC. There are three pipes, including two 20-inch pipes and one 12-inch pipe. Three air/siphon release valves, one for each pipe, are located close to Garden Highway on the landside of the levee. A concrete cutoff structure located within the pipe trench surrounding the pipes is located on the waterside of the levee.

The pumping plant modifications would include replacing the discharge pipes that extend from City Sump 58 across the levee to tie into the existing discharge pipes on the waterside. The cutoff structure would be removed. The air/siphon release valves would be replaced and shutoff valves would be added. The valves would be constructed in a concrete vault in the waterside shoulder of the levee. An upgrade to the pumps, motors, and the electrical service for City Sump 58 would be required to provide the increased horsepower needed to pump through the raised pipes.

To facilitate raising the pump discharge pipes, Garden Highway would require a local raise in grade over the pipes. The road raise would transition back down to existing grade upstream and downstream of the local raise. This work would require partial regrading of the waterside slope for the length of the raised Garden Highway. At this site, the levee would be degraded and reconstructed with engineered fill.

The pipe raise would require a new outfall to comply with the USACE siphon recovery limits criteria, which limit the distance from the top of the apex of the pipe to the top of the outlet pipe. Construction of a new raised outfall structure would require dewatering a portion of the low-flow channel of the NEMDC within the American River floodway.

In addition, this pump station may need to be relocated as a seepage and stability mitigation measure because of the proximity of the pumps to the toe of the levee. Any landward shift in the levee toe would impact City Sump 58. The reconstructed City Sump 58 would consist of a cast-in-place concrete sump, with a trash rack and operating deck. An enclosure building would be provided to house the electrical, control, and monitoring equipment. The existing storm drain would need to be modified. Related infrastructure, such as access roads and utilities that serve City Sump 58 and are located within the levee footprint, would be relocated outside the footprint.

City Sump 102 (Natomas East Main Drainage Canal at Gardenland Park)

City Sump 102 is located along the NEMDC west levee adjacent to Gardenland Park north of Bowman Avenue (**Plate 2-14**). A 60-inch storm drain carries stormwater drainage from adjacent properties to the pump station. A chainlink fence with slats and barbed wire is located at the landside toe of the levee and surrounds the pump station. Four pumps, trash rack hoist, electrical transformer, and an equipment building are located immediately adjacent to the landside levee toe. Each pump for City Sump 102 connects to a buried discharge pipe that runs across the existing levee to an outfall structure on the NEMDC. There are four pipes, including three 36-inch pipes and one 12-inch pipe. Four air/siphon release valves, one for each pipe, are located on the waterside of the levee near the top of the levee.

The pumping plant modifications would include replacing the discharge pipes that extend from City Sump 102 across the levee to tie into the existing discharge pipes within the waterside bench. The air/siphon release valves would be replaced and shutoff valves would be added. The valves would be constructed in a concrete vault in the waterside shoulder of the levee. An upgrade to the pumps, motors, and the electrical service for City Sump 102 would be required to provide the increased horsepower needed to pump through the raised pipes.

To facilitate raising of the pump discharge pipes, the bike trail would require a local raise in grade over the pipes. The trail raise would transition back down to existing grade upstream and downstream of the local raise. This work would require partial regrading of the waterside slope for the length of the raised bike trail. The levee would transition upstream and downstream of this site from an adjacent levee to a raise of the existing levee in place. At this site, the levee would be degraded and reconstructed with engineered fill.

The pipe raise would require a new outfall to comply with the USACE siphon recovery limits criteria, which limit the distance from the top of the apex of the pipe to the top of the outlet pipe. Construction of a new raised outfall structure would require dewatering a portion of the NEMDC.

In addition, this pump station may need to be relocated as a seepage and stability mitigation measure because of the proximity of the pumps to the toe of the levee. Any landward shift in the levee toe could also require relocation of City Sump 102. The reconstructed City Sump 102 would consist of a cast-in-place concrete sump, with a trash rack and operating deck. An enclosure building would be provided to house the electrical, control, and monitoring equipment. The existing storm drain would need to be modified. Related infrastructure, such as access roads and utilities that serve City Sump 102 and are located within the levee footprint, would be relocated outside the footprint.

2.3.3.4 BORROW SITES

Construction of the Phase 4b Project would use soil borrow material from a combination of sites previously analyzed in NLIP environmental documents and proposed new borrow sites, analyzed in this EIS/EIR (**Table 2-22**). Analyses of previously disclosed borrow sites is summarized in Section 4.1.3, “Summary of Previous NEPA and CEQA Analyses of Borrow Sites.”

Table 2-22 Borrow Sources – Adjacent Levee Alternative (Proposed Action)		
Borrow Site/Location	Status of Environmental Review	Potential Use
Natomas Boot/Bollinger	Previously analyzed as part of the Fisherman's Lake Borrow Area in the Phase 4a EIS and EIR	Sacramento River east levee Reach A:16–20/American River north levee Reach I:1-4
South Fisherman's Lake Borrow Area	Proposed as part of the Phase 4b Project	Sacramento River east levee Reach A:16–20/American River north levee Reach I:1-4
West Lakeside School Site, Natomas Unified School District	Proposed as part of the Phase 4b Project	Sacramento River east levee Reach A:16–20
Triangle Area Borrow Area	Proposed as part of the Phase 4b Project	PGCC/NEMDC
Krumenacher Borrow Site/Twin Rivers Unified School District Stockpile Site	Previously analyzed in the Phase 3 EIS and EIR	PGCC/NEMDC
Notes: EIR = environmental impact report; EIS = environmental impact statement; NEMDC = Natomas East Main Drainage Canal; PGCC = Pleasant Grove Creek Canal Source: Data compiled by AECOM in 2009		

Table 2-23 lists proposed new borrow sites that are fully analyzed in this EIS/EIR. These sites, which are shown on **Plate 2-6**, would provide material for the proposed levee improvements and modifications to irrigation infrastructure. After excavation of the borrow material, these sites would be reclaimed for postconstruction uses. **Table 2-23** also shows the depth of excavation, depth upon reclamation, and final postreclamation use for the proposed new borrow areas.

Table 2-23 Proposed New Borrow Areas – Adjacent Levee Alternative (Proposed Action)					
Borrow Site/Area	Size of Site/Area (acres)	Amount Available for Excavation (acres) ¹	Estimated Average Depth of Excavation (feet) ²	Current Use	Proposed Postreclamation Use
South Fisherman's Lake Borrow Area – Los Rios Community College Property	105	95	4	Row crops	Row crops
South Fisherman's Lake Borrow Area – 610 South Main, LLC Property	163	150	2	Row crops	Row crops
Triangle Properties Borrow Area	1,100	290	2–6	Rice	Rice or detention basins/grassland
West Lakeside School Site	41	20	2	Fallow	Agriculture or natural habitat
Notes: ¹ Extent of excavation within site. ² Depth includes approximately 1 foot of topsoil stripping. Finished elevation would be approximately 1 foot higher after surface material respread, grading, and seeding. Source: Data provided by Mead & Hunt in 2009 and compiled by AECOM in 2009					

South Fisherman's Lake Borrow Area

The South Fisherman's Lake Borrow Area is made up of two properties south of the Bollinger borrow site, which would be analyzed as new borrow sites for the Phase 4b Project. The Los Rios Community College property is directly south of the Bollinger borrow site. The three parcels that make up the 610 South Main, LLC property are south of the Los Rios Community College property. These proposed borrow areas, which are shown on **Plate 2-7a** (along Reach A:15 of the Sacramento River east levee), are currently used for agricultural row crop production. They would be excavated to a depth of 2–4 feet and returned to agricultural production.

Triangle Properties Borrow Area

The Triangle Properties Borrow Area (**Plate 2-13**) is located to the northeast of the Natomas Basin on the east side of the PGCC. It is bordered on the east by the Union Pacific Railroad. Farmland would be excavated to a depth of up to 6 feet and either reclaimed for rice cultivation or converted to detention basins to store PGCC overflow in the event that the PGCC culverts are removed. No demolition of residences or other non-agricultural uses would occur as part of borrow excavation. Excavation sites within the Triangle Properties Borrow Area would be set back at least 100 feet from existing roads, utilities, or irrigation ditches. The bridges for Howsley, Fifield, Keys, and Sankey Roads would be used as haul routes to bring the borrow material over the PGCC into the Natomas Basin for the construction of the PGCC and north NEMDC. Alternatively, temporary crossings of the PGCC could be constructed with culverts or bridges over the low-flow channel, to provide for off-road hauling.

West Lakeside School Site

The West Lakeside School Site (**Plate 2-17**) is owned by the Natomas Unified School District and located north of Del Paso Road and east of Fisherman's Lake. The property was historically farmed, but is currently fallow. A portion of the site is planned for the West Lakeside High School/Middle School. The remaining acreage could be shallow-graded for borrow material prior to its development as open space. In the event that the property is not developed as a school site, the shallow-graded portion would be returned to agriculture or natural habitat type appropriate to the setting. Del Paso, El Centro, San Juan, and Bryte Bend Roads could be used as haul routes to transport the material to the Sacramento River east levee construction area. In addition to use as a potential source of soil material for the construction along Sacramento River east levee, the West Lakeside School Site could also be used to provide material for the extension of the Riverside Canal in Reach A:11B (west of Powerline Road), which was previously analyzed in the Phase 4a EIS and EIR (USACE 2010 and SAFCA 2009f). The haul route for this option would be the West Drainage Canal right-of-way (off-road) and Powerline Road.

Borrow Quantities

The borrow sites listed in **Table 2-23** would provide earthen fill material for the proposed levee improvements and modifications to irrigation and drainage infrastructure. **Table 2-24** lists the estimated borrow quantities for each major levee improvement that is proposed. Actual volumes exported from borrow sites would be adjusted to match demands for fill. Estimated excavation volumes are approximated using a 125% of fill volume, to account for shrinkage from fill compaction and other losses.

Borrow Site Construction

The excavation limits on the borrow sites would provide a minimum buffer of 50 feet from the edge of the borrow site boundary or any irrigation or drainage feature. From this setback, the slope from existing grade down to the bottom of the excavation would be no steeper than 3H:1V. Excavation depths for the borrow sites would be as listed in **Table 2-23**. After excavation, disturbed areas would be finish graded in compliance with criteria for drainage of reclaimed land uses.

Table 2-24 Summarize of Fill Material to be Supplied to Proposed Project Features – Adjacent Levee Alternative (Proposed Action)	
Project Feature	Quantity (cubic yards)
Sacramento River east levee Reach A:16–20	1,168,000
American River north levee Reach I:1–4	167,000
NEMDC North Reaches F–G	965,000
PGCC Reach E and NEMDC South Reach H	345,500
Total	2,645,500
Notes: PGCC = Pleasant Grove Creek Canal; NEMDC = Natomas East Main Drainage Canal Source: Data compiled by AECOM in 2009	

Excavated soils not used for borrow material, such as the organic surface layer or soils considered unsuitable for levee construction, would be stockpiled and respread on-site after excavation. Any unsuitable borrow material would be stockpiled on-site and graded back into the restored site, which would result in a finish grade elevation somewhat higher than the final design grades. The borrow-site excavation operations would use water for dust control and to maintain proper moisture content in the borrow material. Revegetation activities would include erosion control on excavated slopes (i.e., hydroseeding), application of fertilizer, and seeding. It is anticipated that no unsuitable material would be hauled off-site. Debris encountered during excavation would be hauled off-site.

Employee vehicles and construction equipment would be parked off street, either in the construction staging areas for the levee work, within the borrow site, or in designated parking areas. Construction equipment would be restricted to designated haul routes between the borrow operations and the construction sites. The haul route for the Triangle Properties Borrow Area could include Howsley, Fifield, Keys, and Sankey Roads. Haul Routes for properties identified inside the Basin may include segments of Del Paso, Powerline, El Centro, Bryte Bend, Radio, and San Juan Roads within the immediate vicinity of the borrow sources. Hauling on public roads would occur for short distances as required to transport material to the levee toe. Distribution of material along the levee alignment would take place within the levee footprint. Except for the American River north levee improvements, Garden Highway would not be used either as a haul route or for on-street parking.

2.3.3.5 ENVIRONMENTAL COMMITMENTS FOR BORROW SITES

Although it is assumed that borrow sites listed in **Table 2-22** could supply the required earthen fill material for Phase 4b Project construction, the specific locations of borrow removal are currently unknown because investigations to determine which locations are most suitable are ongoing. Suitable material would be classified as soil based upon geotechnical data. The Phase 4b Project would not excavate material considered to be construction aggregate. This document performs project-level NEPA/CEQA analysis for the entire potential borrow areas, and also provides a checklist in **Appendix B2** to determine if borrow sites selected from within these areas after the approval of the Phase 4b Project would be consistent with identified impacts, and thus can be approved as within the Phase 4b Project and under the NLIP. Any borrow site selected within these areas would be subject to the adopted mitigation measures and other applicable environmental commitments. This approach was used successfully for the Phase 3 and 4a environmental analyses. The project proponent(s) would ensure that the following environmental commitments are met before initiating ground-disturbing activities on these borrow sites, to the extent practicable and feasible:

- ▶ minimize land use fragmentation;
- ▶ submit a Notice of Intent to the Central Valley Regional Water Quality Control Board (RWQCB), prepare and implement standard Best Management Practices and a storm water pollution prevention plan, and comply with conditions of the National Pollutant Discharge Elimination System permit;
- ▶ obtain and comply with applicable regulations and permits or exemptions (e.g., Section 7 of the Federal Endangered Species Act, Section 1602 of the California Fish and Game Code, Section 2081 of the California Endangered Species Act, Section 404 of the Clean Water Act, and California Surface Mining and Reclamation Act);
- ▶ complete a wetland delineation, and complete detailed design and habitat creation components and management agreements to ensure compensation for any fill of waters of the United States;
- ▶ conduct focused surveys of special-status species and habitats, develop detailed designs to ensure adequate compensation for loss of habitat, and implement all management agreements;
- ▶ survey for cultural resources (historic and prehistoric), evaluate identified resources, and develop and implement treatment for historic properties and historical resources subject to adverse effects, as required under the programmatic agreement;
- ▶ prepare and implement a traffic safety and control plan for construction-related truck trips and detours;
- ▶ implement applicable air quality district–recommended control measures to minimize temporary emissions of reactive organic gases, oxides of nitrogen, and respirable particulate matter with an aerodynamic diameter of 10 micrometers or less during construction;
- ▶ implement noise-reducing construction practices, prepare and implement a noise control plan, and monitor and record construction noise near sensitive receptors;
- ▶ coordinate with users of irrigation water before and during all modifications to irrigation infrastructure and reduce interruptions of supply;
- ▶ verify utility locations, coordinate with utility providers, prepare and implement a service-interruption response plan, and conduct worker training with respect to accidental utility damage;
- ▶ complete Phase I and/or Phase II environmental site assessments and implement required measures;
- ▶ coordinate work within Perimeter B with Airport operations and restrict night lighting within and near the runway approaches;
- ▶ conduct a wildlife-aircraft strike analysis and develop and implement mitigation for earthmoving activities within Perimeter B; and
- ▶ prepare and implement a wildfire control and management plan to minimize potential for wildland fires.

Appendix B2 provides a detailed discussion of the criteria that would apply to the selection of borrow sites for the Phase 4b Project.

2.3.4 HABITAT CREATION AND MANAGEMENT

The habitat development and management plan for the NLIP was first introduced at a program level in the Phase 2 EIR and EIS. Since 2007, the ecosystem benefits and conservation strategies of this plan have been refined, and

habitat creation targets and opportunities have been more fully evaluated. The habitat development and management plan is discussed in more detail in Section 4.7, “Biological Resources,” under “Natomas Levee Improvement Program Programmatic Conservation Strategy.” The habitat development and management components of the Phase 4b Project are intended to compensate for effects on existing habitat from the project’s flood damage reduction and canal improvements. Because these components are also meant to further the NLIP’s goal to enhance habitat values by increasing the extent and connectivity of Natomas Basin lands managed to provide habitat for giant garter snake, Swainson’s hawk, and other special-status species, each component is considered integral to the success of the Basin-wide habitat management plan.

2.3.4.1 WEST DRAINAGE CANAL HABITAT IMPROVEMENTS

Currently, the lower West Drainage Canal is characterized by mostly barren, steep banks with little or no cover or foraging habitat for giant garter snake. This condition extends over several miles of the lower canal system and represents a barrier to giant garter snake movement within the Basin, potentially isolating the species’ largest known population found in the Fisherman’s Lake area. Improvements to the West Drainage Canal described in Section 2.3.3.3, “Irrigation and Drainage Components,” would be designed to enhance giant garter snake corridor habitat compared to the existing poor habitat conditions found on West Drainage Canal south of I-5 and to increase the functional values of the managed wetlands complex on the west side of Fisherman’s Lake. The canal abuts the north and east sides of The Natomas Basin Conservancy’s (TNBC’s) Rosa Preserve for approximately 1.5 miles at the east end of the lower canal.

These habitat features would be designed into the realigned portion of the canal (in the vicinity of Reach B:11A of the Sacramento River east levee) and added to the north bank of the existing canal between the realigned portion of the canal and Powerline Road and to the south bank between Powerline Road and the Fisherman’s Lake slough (**Plate 2-17**). These habitat features would consist of:

- ▶ 3H:1V sloped banks supporting native sedges and rushes at the shoreline and native perennial grasses at the top; and
- ▶ a variable width (2- to 10-foot wide) submerged bench located within the bank, which would support a band of tules.

Flattening the slopes of the canal and planting native vegetation would create more stable banks, improving water quality and overall habitat conditions along the canal. Tules on the submerged bench would typically be inundated during summer. A tule band would preserve channel conveyance capacity by preventing noxious aquatic plants from attaching to the lower bank. Invasive aquatic weeds in the Natomas Basin are known to inhibit the movement of giant garter snake and also reduce the flow of canal water, causing eutrophic water quality conditions. The tule band would also increase available refuge for the snake while not significantly increasing habitat for waterfowl that may be hazardous to Airport operations.

2.3.4.2 WOODLAND COMPENSATION

To compensate for landside impacts to woodland in Reach A:16–20 of the Sacramento River east levee, Reach I:1–4 of the American River north levee, and along the NEMDC west levee, up to 72 acres of woodlands consisting of native riparian and valley oak woodland species would be preserved and created in and around the Natomas Basin. Up to 40 of these acres would be located in Lower Dry Creek, a 420-acre open space area located north of Main Avenue and east of the NEMDC (**Plates 2-14 and 2-19**). This area consists of Hansen Park, owned by the City of Sacramento, and the Coyle Property, which is owned by SAFCA. SAFCA has a conservation easement on Hansen Park (the western portion of the Lower Dry Creek area), and a conservation easement could also be placed on the Coyle property to the east. Existing woodland corridors along Dry Creek channels would be preserved, and additional woodland would be created by filling in gaps and widening these existing riparian corridors. Opportunities to create new woodland corridors may be available on historic stream channels that the

creek has migrated away from over time. In addition, woodland clusters could be created in meadows, providing habitat favorable to raptors. Created woodland would be designed to avoid vernal pools, seasonal wetlands, and relatively permanent water, which are shown on **Plate 2-19**. The balance of woodland compensation would occur by enhancing TNBC preserves and by preserving and creating woodland on other available sites around the Basin.

Mitigation for impacts of the Phase 4b Project to waterside woodlands, including SRA, is addressed in Section 4.7, “Biological Resources.”

Woodland groves that would be created would be at least 50 feet wide and several hundred feet long, depending on location constraints. Portions of the created woodlands would be at least 100 feet wide to promote successful nesting by a variety of native birds deeper within the grove canopy, where nest parasitism by crows, cowbirds, and starlings is less of a factor in breeding success. At maturity, stand structure would vary from closed-canopy woodland to valley oak savanna vegetation types, with a native perennial grassland understory.

Planting sites would require suitable soil conditions, irrigation water during a 3- to 5-year establishment phase, reduced risk of wildfire, and minimal depth to seasonally high groundwater or other natural water sources to sustain trees once irrigation ceases. To provide irrigation water, groundwater wells may need to be drilled in the vicinity of the plantings. Drilling of well holes would take 72 hours or more. Because the drilling process must be continuous once started, 24/7 operation of the drill rig would be required. Wells would be located 1,000–1,500 feet from sensitive receptors to minimize the disturbance from 24/7 construction.

A mixture of native riparian and woodland species would be planted, but the predominant species would be valley oak, the primary tree species that would be affected by the proposed improvements to the Sacramento River east levee; and cottonwood, which is a preferred nest tree for Swainson’s hawks in the Basin and is faster growing than valley oak. Establishing woody vegetation would likely require more than one technique, including planting nursery stock, live cuttings, and acorn planting in winter, sustained by flood irrigation, drip, or agricultural-scale spray heads. Taking into account predictable and unavoidable mortality within the first 5 years of establishment, the intent is to have an average stem density of approximately 50–100 trees and shrubs per acre within 5–10 years of growth. Wherever possible, groves would be bordered by restricted-access public lands and rights-of-way to reduce the risk of vandalism and other inappropriate uses that may threaten wildlife values or risk wildfires from human sources.

The botanical species composition of individual clusters and rows would mimic vegetation types commonly found along the Sacramento River, including:

- ▶ valley oak woodland;
- ▶ mixed riparian forest, cottonwood-dominant;
- ▶ shallow scrub (at moist soil sites or depressions);
- ▶ sycamore and oak savanna (with native perennial grassland); and
- ▶ elderberry shrub/scrub.

A monitoring plan with performance criteria would be developed to determine the progress of the woodland habitats towards providing adequate mitigation. The criteria for measuring performance would be used to determine if the conservation component is trending toward sustainability (reduced human intervention) and to assess the need for adaptive management (e.g., changes in design or maintenance revisions). These criteria must be met for the conservation component to be declared successful, both during a particular monitoring year and at the end of the establishment period. These performance criteria, which would be developed in consultation with USFWS and DFG, would include, but are not limited to:

- ▶ percent survival of planted trees (from 65–85%),
- ▶ percent survival of transplanted trees (from 60–85%), and
- ▶ percent relative canopy cover (from 5–35%).

Field assessments of woodland planting areas would be conducted once per year. The timing of these assessments would be adjusted according to annual site-specific conditions, but assessments would generally occur in late summer. To measure percent survival of trees and shrubs, each plant would be inspected and the species of each live plant would be recorded. Qualitative assessments would be recorded to track the health and vigor of each species for adaptive management of the conservation components.

To determine the success of the woodland plantings as a functioning ecosystem, percent canopy would be estimated each fall by recording the extent of woodland habitat on aerial photographs, or using repeat transects or fixed radius plots at ground level. The timing of these assessments would be adjusted according to annual site-specific conditions, but assessments would generally occur in late summer or early fall while trees are still in full foliage. The results of these assessments would also be used to determine where replanting should occur to maintain suitable Swainson's hawk habitat. All monitoring would occur for the full monitoring period or until the performance criteria are met, whichever is longer.

2.3.4.3 MANAGED MARSH CREATION

To compensate for adverse project effects on giant garter snake habitat, up to 200 acres of managed marsh would be created within the Brookfield borrow site, and the adjacent Chappell Ditch and Drain would be improved (**Plate 2-13**). The site is located south of Howsley Road, east of SR 99 and is divided into four approximately equal fields separated by farm roads running east-west. Approximately 160 acres of the 200-acre site was excavated in 2008 and 2009 to approximately 5 feet below existing grade to supply soil material for NCC south levee improvements. Use of this site for borrow was analyzed as part of the Phase 2 Project (SAFCA 2007: 2-9, 2-33). A new irrigation canal was constructed in 2009 along the eastern edge of the lower three fields, which was analyzed as part of the Phase 3 Project (USACE 2009b and SAFCA 2009b). This canal is approximately 3,900 feet long, with 15 foot access roads on either side.

The proposed managed marsh would provide giant garter snake with basking areas, vegetative cover from predators, and foraging habitat. In addition, the managed marsh habitat would compensate for losses of waters of the United States associated with the project. After establishment of the Phase 4b Project marsh, the project proponent(s) would grant TNBC a conservation easement and enter into a stakeholder-specific management agreement with TNBC, ensuring the permanent protection and management of these sites as habitat and open space. Giant garter snakes have been documented in the northwest of the basin; therefore, an additional habitat reserve in that area of the basin would be beneficial to the species. The Natomas Basin Habitat Conservation Plan (NBHCP) suggests that "the primary opportunity for connectivity between reserves is the system of channels maintained and operated by RD 1000 and Natomas Mutual [Natomas Mutual Water Company]." The Brookfield property is adjacent to Natomas Mutual's Chappell Ditch and RD 1000's CH1 Drain. As shown on **Plate 2-13**, drainage improvements are proposed as part of the borrow site marsh design, which would enhance the canals as snake habitat and improve drainage and irrigation to the Brookfield site.

The marsh would consist of a mosaic of aquatic and upland habitats, and an upland buffer between the restoration sites and adjacent roads. This created marsh would maximize habitat edge transitions to provide for shorter distances between burrow, basking, and foraging areas. Marsh design and management would optimize the values of giant garter snake habitat but minimize the attraction to wildlife species (e.g., flocks of waterfowl, starlings, pheasants) considered potentially hazardous to aircraft at low elevations as they approach or depart from runways.

Design of the managed marshes would follow the templates established by TNBC on recent projects, the design of SCAS's Willey mitigation site being developed in the northeast part of the Basin, and the existing SCAS marsh mitigation project at Prichard Lake. These design templates feature a combination of uplands and shallow water bodies, sinuosity of swales, and water control structures to manage target water levels at different times of the year. The marsh would have perimeter fences to control and protect grazing animals, such as goats. Grazing by goats is a management technique successfully used by TNBC to reduce invasions of weedy thatch and exotic plants while retaining sufficient cover for giant garter snake and other semiaquatic species that rely on grassy

uplands adjoining the wetland ponds. An essential component of the managed marsh would be procuring a firm, reliable water supply and good water quality throughout the giant garter snake's active season of April–October.

Currently, the Brookfield site's water supply comes from on-site wells, some of which are located within the footprint of the PGCC levee improvements. To provide irrigation to the site following the marsh creation and to eliminate the need to replace all of the on-site wells, the Chappell Ditch and Drain would be upgraded and extended to provide surface water to the Brookfield marsh and adjacent rice fields to the south and east (see **Plate 2-13**). This improvement would be designed to provide irrigation to approximately 940 acres formerly supplied by groundwater irrigation wells. The Chappell Ditch and Drain would be upgraded for approximately 5,000 feet from Highway 99 east and extended east to the PGCC and south along the PGCC for approximately 6,500 feet, making the total length of improvements approximately 11,500 feet. The Chappell Ditch would have 3H:1V side slopes, a bottom width of 18 feet, a depth of 6 feet, and two 15-foot-wide access roads, one on each embankment. The Chappell Drain, which provides drainage for agricultural fields to the north, would have 3H:1V side slopes, a bottom width of 12 feet, and variable depth. The construction footprint varies in width from 90 to 165 feet, plus a 20-foot temporary construction easement on each side.

In general the Brookfield marsh would flow north to south. A new supply canal would be constructed along the eastern boundary to serve irrigation water to the marsh and a drainage channel would be constructed along the western boundary.

General Construction Plan for the Managed Marsh

After excavation, disturbed areas would be finish graded to allow creation of the marsh habitat. Finish grading and installation of operational facilities and habitat features would take place from August through October. Revegetation activities would include erosion control on excavated slopes (e.g., straw mulch, hydroseeding), application of fertilizer as needed, and seeding of an initial cover crop on the finish grade of the bottom of the borrow site. Marsh plantings would then be installed and the borrow site flooded. It is anticipated that no unsuitable soil material would be hauled off-site. Debris encountered during excavation would be hauled off-site.

Other construction components are as follows:

- ▶ **Maintenance and access roads.** All-weather roads up to 15 feet wide would be constructed between the open-water channels and the upland areas in 25-foot-wide maintenance access areas.
- ▶ **Water supply and control facilities.** A well to provide a backup source of water would be installed in a location where it could supply water to the network of channels if it is needed to replace or supplement the surface-water supply. Water control facilities, such as riser boards, would be installed at key points in the channels to allow maintenance of desired water levels.
- ▶ **Habitat features for giant garter snake.** At points along the channels, clusters of rocks would be installed above the water line to provide basking areas for the snakes. Tule benches would be planted between upland areas and the channels to provide cover for the snakes.

The construction crew size would be up to 10 workers. Construction equipment would include one excavator, one bulldozer, and two backhoes. Employee vehicles and construction equipment would be parked off street, either in the construction staging areas, within the borrow site, or in designated parking areas. Construction equipment would be restricted to designated haul routes between the borrow operations and the construction sites.

2.3.4.4 MONITORING HABITAT COMPONENTS

Overall, after implementation of mitigation components, the mitigation sites would be monitored throughout the year for 3–8 years depending on the type of habitat and as developed in negotiation with the appropriate resource agencies. The project proponent(s) would be responsible for providing success monitoring, which, as required by

the appropriate resource agencies, would be conducted by a qualified ecologist, botanist, or biologist. The monitor would be objective and independent from the installation contractor responsible for site maintenance.

All habitat types and mitigation sites would receive quantitative and qualitative monitoring. Quantitative monitoring would be performed in accordance with the performance criteria described in the following sections (e.g., percent cover). Qualitative monitoring would provide an opportunity to document general plant health, overall plant community composition, hydrologic conditions, damage to the site, infestation of weeds, signs of excessive herbivory, signs of wildlife use, erosion problems, and signs of human disturbance and vandalism. These criteria would be assessed and noted for use in adaptive management of the mitigation sites, but they would not be used to determine project success. In addition, a complete list of all wildlife species encountered would be compiled for each mitigation site during each monitoring visit. Particular attention would be given to looking for evidence, as appropriate, of giant garter snake, valley elderberry longhorn beetle exit holes, and Swainson's hawk.

The project proponent(s) would prepare an annual report in conjunction with the resource managers that would be submitted to USACE (if SAFCA is the project proponent), USFWS, DFG, and the Central Valley RWQCB by December 31 of each year during the success monitoring period, or until the agencies have verified that final success criteria have been met. The report would assess the attainment of or progress toward meeting the success criteria for the mitigation sites.

2.3.4.5 LONG-TERM MANAGEMENT OF HABITAT COMPONENTS

A Phase 4b Project Long-Term Management Plan (LTMP) would be implemented by SAFCA in connection with the Phase 4b Project Mitigation Monitoring Plan (MMP). The LTMP would establish the long-term management practices (post-establishment period success criteria) and land protection mechanisms that would be implemented as each project phase of the NLIP is approved and permitted. Land ownership and management responsibilities would be held by SAFCA, RD 1000, NCMWC, and TNBC.

2.3.4.6 BANK PROTECTION

The Sacramento River Bank Protection Project (SRBPP) has identified 34 sites along the Sacramento River left bank from River Mile (RM) 78.8 to RM 60.2 (Sacramento River east levee Reaches C:1–4B, B:5–15, and A:16–20) where stream bank erosion has the potential to compromise the structural integrity of the levee and/or shorten the seepage path through the levee. However, because an adjacent levee will be constructed in all of these reaches, no erosion protection is needed because the distance from the projected levee slope to the current bank location is sufficient to guarantee that bank erosion will not intrude into the projected levee slope in the near future. Any gradual erosion that might occur would be addressed as a maintenance activity.

The NCC was inspected in 2005 by a SAFCA consultant, who reported minor to moderate erosion issues (Northwest Hydraulics Consultants, Inc. [NHC] 2006). NHC recommended toe protection in the lower 6,600 feet of the approximately 28,700-foot-long reach. The consultant did not develop treatment measures but described the scale of bank protection as minimal because of the low depths involved. The NCC is also inspected annually under the SRBPP, and no erosion sites on the left bank are currently identified.

Along the PGCC and NEMDC, six erosion sites have been identified for levee slope erosion repair, placement of rip rap, and/or channel realignment. All of the locations are at the confluences of tributary streams where the channel of PGCC or NEMDC has migrated to the west and threatens or has damaged the right levee. These erosion sites are addressed in Section 2.3.3.2.

2.3.4.7 NATOMAS LEVEE CLASS 1 BIKE TRAIL PROJECT

As part of the Phase 4b Project, a regional Class I (completely separated from traffic) bicycle and pedestrian trail (Natomas Levee Class 1 Bike Trail Project) is proposed to be constructed in an approximately 42-mile loop along

the Natomas Basin levee perimeter in the northwestern portion of the County of Sacramento, southern portion of Sutter County, and a portion of the City of Sacramento (**Plate 2-20**). The exact alignment of the bike trail in terms of its placement in relation to levees and roadways would be determined through a detailed engineering design process. Therefore, this element of the Adjacent Levee Alternative (Proposed Action) is analyzed at a program level. Construction, operation, and maintenance of a recreation trail on the perimeter levee system would require an encroachment permit from the CVFPB with an endorsement by RD 1000. The bike trail would be funded locally, separate from this project.

The proposed recreational trail is intended to provide a bicycle commuter route at the southern and eastern end of the Natomas Basin that would connect to the regional American River Trail system. Although a paved bike trail within the City of Sacramento along the NEMDC provides a connection to the American River Trail system, no separate bikeway facilities are located in the unincorporated area of Sacramento or Sutter Counties. The lack of connection between the southwestern portion of the South Natomas and the American River Trail System discourages use of the commuting and recreational bicycling as well as jogging/walking. By separating vehicles and cyclists, the proposed recreational trail would improve safety conditions for cyclists who use Garden Highway for recreational bicycling, which currently requires them to share the roadway with vehicles. Funding for the trail would likely come from Federal or state grants or through the Metropolitan Transportation Plan (MTP) project priority list maintained by the Sacramento Area Council of Governments (SACOG).

The proposed recreational trail would include a bikeway that would be designed to exceed or meet the minimum standards for a Class I Bikeway (bike trail). Although the trail design is primarily based on bicycle parameters, the trail would also be used for walking, jogging/running, skateboarding, and roller skating/blading. **Plate 20** provides a conceptual illustration of a two-way bike trail on a separate right-of-way. However, because a detailed engineering and constraints analysis has not been conducted, it is unknown at this time whether a Class I bike trail can be achieved on every segment of the 42-mile levee system. Where a Class I bike trail cannot be constructed because of physical constraints, the bikeway would be designed to exceed or meet the minimum standards for a Class II facility (a lane set aside in city/county streets exclusively for bikes). At a minimum, the bike trail would be designed to meet the following criteria as defined in the Highway Design Manual, Chapter 10 (Caltrans 2009):

- ▶ **Hours of Use:** The bike trail would be open to the public 24/7. It is expected that the recreational trail would be closed for extended periods during high-water levels, and signage would be posted along the trail system to alert users of the closure. Also, during the regular maintenance by RD 1000, the recreational trail would be temporarily closed with signage posted to alert users of the closure and detour plan.
- ▶ **Type of Vehicles Permitted on the Trail:** By state law, motorized bicycles (mopeds) are prohibited on bike trails. Throughout the year, RD 1000 would close the recreational trail as part of levee maintenance activities. During the maintenance, heavy vehicles and/or tractor mowers would be crossing and using the bike trail for access to perform its responsibilities. Also, it is expected that RD 1000 maintenance, parks, and sheriff/police patrol and fire response vehicles and other authorized vehicles would be driving on the recreational trail system on a regular basis to patrol the levee system.
- ▶ **Widths:** The minimum paved width for a two-way bike trail would be 8 feet. A minimum 2-foot-wide graded area would be provided adjacent to the pavement (**Plate 2-21**). A 3-foot-wide graded area is recommended to provide clearance from poles, trees, walls, fences, guardrails, or other lateral obstructions. Wherever possible, a wider graded area can also serve as a jogging path.
- ▶ **Clearance to Obstructions:** A minimum 2-foot horizontal clearance to obstructions would be provided adjacent to the pavement (**Plate 2-20**). A 3-foot clearance is recommended. Where the paved width is wider than the minimum required, the clearance may be reduced accordingly; however, an adequate clearance is desirable regardless of the paved width. The clear width on structures between railings shall not be less than 8 feet. The vertical clearance to obstructions across the clear width of the trail shall be a minimum of 8 feet. Where practical, a vertical clearance of 10 feet is desirable.

- ▶ **Design Speed:** The design speed of the bike trail would be 25 miles per hour.
- ▶ **Horizontal Alignment and Super-elevation:** For most bike trail applications, the super-elevation rate would vary from a minimum of 2% to a maximum of approximately 5%. On a straight tangent section a minimum of 2% cross slope is recommended.
- ▶ **Signing and Delineation:** For the various types of and placement of signs for the trail, see the Manual on Uniform Traffic Control Devices (MUTCD), Section 9B.01 and the MUTCD and California Supplement Section 9B.01 (Caltrans 2006: 9B-1, 9B-7, and 9B-8). For pavement marking guidance, see the MUTCD, Section 9C.03.
- ▶ **Intersections with Highways:** Intersections are a prime consideration in bike trail design. If alternate locations for a bike trail are available, the one with the most favorable intersection conditions should be selected. Where motor vehicle cross traffic and bicycle traffic is heavy, grade separations are desirable to eliminate intersection conflicts. Where grade separations are not feasible, assignment of right-of-way by traffic signals should be considered. Where traffic is not heavy, stop or yield signs for bicyclists may suffice.
- ▶ **Separation between Bike Paths and Highways:** A wide separation is recommended between bike trails and adjacent highways (see MUTCD, Figure 1003.1B). Bike trails closer than 5 feet from the edge of the shoulder of an adjacent highway shall include a physical barrier to prevent bicyclists from encroaching onto the highway. Bike trails within the clear recovery zone of freeways shall include a physical barrier separation. Suitable barriers could include chain link fences or dense shrubs.
- ▶ **Placement of Bike Trail:** Depending upon the location along the Natomas Basin perimeter levee system, a variety of bike trail placement options would be available and selected through detailed engineering project design. These options, which would be subject to approval by RD 1000, would include placement on the top of levees, adjacent to levee toes, and within O&M corridors. Along Garden Highway, the options would include locating the bike trail next to the highway with a physical separation or locating it adjacent to the highway using its shoulders.
- ▶ **Trees:** To comply with levee maintenance policies, trees would not be planted as part of construction of the bike trail. However, where permitted by levee maintenance policies, container trees or other human-made shade structures may be permitted in some locations to provide shade for the trail users.
- ▶ **Safety Lighting:** Safety lighting would be provided at the all public street intersections.
- ▶ **Call Boxes:** Call boxes would be installed approximately every mile, where needed.
- ▶ **Pullout Areas, Shade Shelters, and Water Fountains:** All these features would be provided at a range of every 3 to 5 miles.
- ▶ **Pavement/Signage Maintenance:** Sacramento County Department of Transportation (SacDOT) would maintain the signage within the recreation trail easement, paved trail, and its shoulder after the completion within the unincorporated area within the County of Sacramento. It is expected the other jurisdictions would maintain their portions of the recreation trail. The maintenance agreement would be drafted and executed among the partnering jurisdictions to address the timely trail maintenance responsibility in the long run. Overall integrity of the levee structure beyond the influence area of trail easement would be maintained by RD 1000.
- ▶ **Trail Patrolling:** On behalf of the Sacramento County, Parks Department staff would patrol the levee on a daily basis. The City of Sacramento and County of Sutter may provide their own patrolling or contract with Sacramento County Parks Department regarding the patrolling for the recreational trail system in their respective jurisdictions. Trail patrolling is necessary to keep SacDOT staff informed of any vandalism, safety

concerns, and maintenance needs on the recreational trail system. Trail users would also report problems. Signage would indicate the contact information to report any issues.

Recreational Trail Construction Activities and Timing

Depending upon the final alignment of the recreational trail, construction would involve grading and paving on top of the new adjacent levee along Garden Highway or other widened levees in the Natomas Basin perimeter levee system. Because of the requirement to have newly constructed levees settle prior to final inspection and certification, trail construction in these areas would not occur until the following year's construction season, at the earliest. In addition, the long lead time in securing funding sources could delay construction for several years after completion of levee construction.

2.3.4.8 AVIATION SAFETY COMPONENTS

The Airport experiences a high rate of aircraft/bird strikes, which poses a substantial hazard to flight safety. In accordance with the Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5200-33B, Hazardous Wildlife Attractants on or Near Airports (FAA 2007), FAA recommends that airports reduce wildlife attractants within Perimeter B, the area within a 10,000-foot radius from Air Operations Area for turbine-powered aircraft. Additionally, the FAA recommends that no land uses deemed incompatible with safe airport operations be maintained in Perimeter C, a radius of 5 miles from the edge of the Airport Operations Area, if the attractant could cause hazardous wildlife movement into or across the approach or departure airspace. Open water and agricultural crops are recognized as being the greatest wildlife attractants in the Airport vicinity, and rice cultivation is considered the most incompatible agricultural crop because of its flooding regime. The following describes the aviation safety components associated with the project:

- ▶ Work within Perimeter B would be coordinated with Airport operations and night lighting would be restricted within and near the runway approaches.
- ▶ A wildlife-aircraft strike analysis would be conducted and mitigation for earthmoving activities within Perimeter B would be developed and implemented.

2.3.4.9 OPERATIONS AND MAINTENANCE

Whether USACE or SAFCA implement the Phase 4b Project, agencies and organizations that would have management responsibility for proposed Phase 4b Project features are USACE/SAFCA, RD 1000, NCMWC, SCAS, and TNBC, as described below.

U.S. Army Corps of Engineers/Sacramento Area Flood Control Agency

Either USACE or SAFCA, as the project proponent, would be responsible for the design and construction of all levee improvements, maintenance access, inspection roads, rights-of-way, replacement canals, associated drainage and irrigation structures, and habitat creation sites. In addition, the project proponent(s) would be responsible for all necessary land acquisitions and easements to construct the project features and achieve the project objectives. However, once these project features are completed, most of the land or land management responsibilities would be transferred by the project proponent(s) to the other management entities described below. Memoranda of Agreement, land ownership transfers, or management endowments and contracts would be used by the project proponent(s) to transfer land management responsibility to the appropriate public agency or non-profit land management organization. At the end of the project construction period, all project lands would be in public ownership and/or would be under the permanent control of a natural resource conservation entity.

Reclamation District 1000

The mission and purpose of RD 1000 is to operate and maintain the flood damage reduction levees surrounding the Natomas Basin and operate and maintain the internal drainage system to evacuate agricultural and urban stormwater and incidental runoff. RD 1000 would be responsible for the management of the proposed levee improvements, when complete; the new GGS/Drainage Canal; and its reconfigured pumping plants. Typical activities include mowing grassland along levee slopes and berms, canal banks, and rights-of-way; managing canal bank vegetation, including noxious weeds; maintaining relief wells and other drainage features; periodically removing sediment from drainage canals; and maintaining and repairing canal and levee patrol roads.

Natomas Central Mutual Water Company

NCMWC is a non-profit mutual water company with the primary focus of keeping the water conveyance system functioning to serve the company shareholders. Intensive maintenance to maximize agricultural irrigation services throughout the Basin is generally limited to only 10% annually of the approximately 100 miles in the Natomas Basin canal system operated by NCMWC. NCMWC would be responsible for maintaining and managing the relocated Riego Road Canal and existing irrigation canals. The relocated canals would be maintained in the same manner as the existing canals. Typical maintenance activities include operating and repairing water control structures and barrier gates, periodically removing sediment and noxious aquatic weeds from the canals, repairing canal roads, managing bank vegetation, and mowing grassland along canal and road rights-of-way. However, compared to the existing Riego Road Canal, the relocated canal would have improved embankments, better water control structures, better vegetation cover, and wider roads and rights-of-way. These improvements are expected to ease annual canal management efforts, allowing for a proportionately greater focus on maintenance and operations and less need for repair and dredging.

Sacramento County Airport System

SCAS manages the Sacramento County-owned bufferlands outside the Airport Operations Area. All Phase 4b Project components on land under SCAS management would remain in public ownership and would be managed by SCAS.

The Natomas Basin Conservancy

TNBC acquires and manages land for the purpose of meeting NBHCP objectives. To meet the mitigation goals of the NBHCP, project developers of projects pay a mitigation fee to TNBC when they apply for building permits. TNBC then uses the mitigation fees to acquire, restore, and manage mitigation lands to provide habitat for protected species and maintain agriculture in the Natomas Basin. TNBC owns approximately 30 mitigation properties totaling more than 4,000 acres. Private land acquired by the project proponent(s) and converted to managed marsh, preserved as agricultural uplands (field crops), or used for woodland establishment as part of the Phase 4b Project would be protected by conservation easements conveyed to TNBC. After completion of reclamation activities, the project proponent(s) would contract with TNBC for management of these habitat features.

2.3.4.10 VEGETATION MANAGEMENT

USACE levee guidance requires the removal of vegetation greater than 2 inches in diameter on the levee slopes and within 15 feet of the waterside and landside levee toes (USACE 2000). As shown in **Plate 2-1**, the proposed adjacent levee in Sacramento River east levee Reach A:16–20 is designed to shift the levee prism landward by creating a virtual 3H:1V waterside slope extending from the waterside edge of the designated crown (20 feet wide between the landside and waterside edges) to the extended plane of the landside ground elevation. To meet seepage criteria, this widened levee would be managed to remove and prevent any growth of trees with a drip line that penetrates the landside slope of the widened levee or the projected waterside slope. The intent of this

landward shift in the levee prism is to allow preservation of a large number of trees and important aquatic habitat, including SRA habitat located along the waterside of the Sacramento River east levee without unacceptably impairing the safety, structural integrity, and functionality of the levee. To compensate for landside vegetation removal required for the adjacent levee, a habitat creation plan has been developed to replace this habitat in a manner that has been deemed acceptable by the responsible Federal and State resource management agencies (see Section 2.3.4, “Habitat Creation and Management,” above, and Impact 4.7-a, “Loss of Woodland Habitats,” in Section 4.7, “Biological Resources”).

As noted in Section 2.1.3.4, “Management of Levee Vegetation and Structural Encroachments,” along the American River north levee, an extensive number of trees located on and along the current landside slope of the levee would be removed to accommodate the expanded levee footprint, including removal of vegetation within 15 feet of the new landside levee toe. Along the NEMDC west levee south of the NEMDC Stormwater Pumping Station (Reach G), at a minimum, vegetation removal would be required under a variance request for all non-native trees from within the vegetation-free zone, all native trees that have a dbh of four inches or less, and all larger native trees that are located on the waterside slope, the crown, or within 15 feet of the landside toe (or within the right-of-way, if less than 15 feet). Along the NCC south levee, under the variance request, vegetation removal would be required for the upper 1/2 of the waterside levee slope.

2.3.4.11 STRUCTURAL ENCROACHMENTS

USACE levee guidance also requires an assessment of encroachments on the levee slopes, including utilities, fences, structures, retaining walls, driveways, and other features that penetrate the levee prism. Substantial encroachments are present on the Sacramento River east levee with a smaller number of encroachments on the other Natomas Basin levees. One of the objectives of constructing an adjacent levee along the Sacramento River east levee is to facilitate acceptable management of existing vegetation and structural encroachments along the waterside of this levee.

Should any of these existing encroachments be determined to reduce the integrity of the levee, increase flood risk unacceptably, or impede visibility or access to the waterside levee slope, the encroachments would need to be removed. Removal of some waterside slope encroachments may be required by the end of 2010 to ensure that the levee system meets FEMA criteria. Along the landside of the proposed adjacent levee, encroachment removal would typically be accomplished as part of the landside levee improvements. The relocation of power poles located on the existing landside slope of the levee in Sacramento River east levee Reach A:16–20 and American River north levee Reach I:1–4 is anticipated to be conducted as part of the Phase 4b Project to prepare for levee improvement work. Following completion of the proposed levee improvements, USACE, the State, SAFCA, and RD 1000 would inspect and evaluate whether there are any remaining encroachments that would affect levee integrity. To the extent that removal of these identified encroachments may cause potentially significant environmental effects, future, separate NEPA and CEQA compliance and review would be required.

2.3.4.12 LANDS, EASEMENTS, RELOCATIONS, AND RIGHTS-OF-WAY

Several of the project components described above would require substantial land acquisition to accommodate the expanded levee, seepage berm, and canal footprints. In the context of the Phase 4b Project, the acquired lands would support construction of an adjacent levee along the Sacramento River east levee in Reach A:16–19B, flattening the slope of the Sacramento River east levee in Reach A:19B–20, Reach I:1–4 of the American River north levee, NEMDC and PGCC west levees, and the West Drainage Canal. In addition, sufficient land would be acquired to establish O&M access corridor at the landside toes of all the improved levees to prevent encroachment into the levee improvements, and to preserve the land for possible future expansion of levee facilities.

Land would also be acquired for use as borrow areas that would be reclaimed to create or preserve agricultural uplands. Finally, as discussed previously, the Adjacent Levee Alternative (Proposed Action) would require relocation of many existing irrigation and drainage facilities, a number of power poles serving residences along

the levees, several roadway intersections, and several private residential and nonresidential structures. Land ownership in the Phase 4b Project footprint is shown on **Plates 2-22a through 2-22e**. All or a portion of these parcels may be acquired to construct the Phase 4b Project.

Privately owned lands would be acquired in fee. Easements would be obtained where the project features would be on Airport land (owned by Sacramento County). Where the project footprint would overlies land owned and managed by other agencies (i.e., TNBC), either acquiring the land in fee or obtaining and securing easements would be required.

Real property acquisition and relocation services would be accomplished in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 United States Code [USC] Section 4601 et seq.) and implementing regulation, 49 Code of Federal Regulations (CFR) Part 24; and California Government Code Section 7267 et seq. Refer to Chapter 6, “Compliance with Federal Environmental Regulations,” and Section 3.16, “Socioeconomics, Population, and Housing” for more details regarding these regulations.

2.4 FIX-IN-PLACE ALTERNATIVE

All elements of the Fix-in-Place Alternative would be the same as described for the Adjacent Levee Alternative (Proposed Action) except the method of raising and rehabilitating the Sacramento River east levee, including the extent of levee degradation required to construct cutoff walls, and the extent of encroachment removal along the levee. Differences from the Adjacent Levee Alternative (Proposed Action) are shown in italicized text below. For those elements that are the same as the Adjacent Levee Alternative (Proposed Action), no further discussion of the element is provided.

- ▶ **Sacramento River east levee (Reach A:16–20): Levee widening/rehabilitation and seepage remediation**—Same as the Adjacent Levee Alternative (Proposed Action), *except that the levee crown would not be widened by 15 feet, necessitating waterside vegetation removal to comply with USACE guidance criteria.*
- ▶ **Sacramento River east levee (Reach B:10–15): Levee raise extension**—Same as the Adjacent Levee Alternative (Proposed Action).
- ▶ **American River north levee (Reach I:1–4): Slope flattening and seepage remediation**—Same as the Adjacent Levee Alternative (Proposed Action).
- ▶ **NEMDC North (Reaches F–G): Levee raising, slope flattening, and seepage remediation**—Same as the Adjacent Levee Alternative (Proposed Action).
- ▶ **PGCC (Reach E) and NEMDC South (Reach H): Levee raising and slope flattening**—Same as the Adjacent Levee Alternative (Proposed Action).
- ▶ **PGCC (Reach E) and NEMDC South (Reach H): Waterside improvements**—Same as the Adjacent Levee Alternative (Proposed Action).
- ▶ **PGCC (Reach E) culvert remediation**—Same as the Adjacent Levee Alternative (Proposed Action).
- ▶ **SR 99 NCC Bridge remediation (Reach D:6)**—Same as the Adjacent Levee Alternative (Proposed Action).
- ▶ **West Drainage Canal**—Same as the Adjacent Levee Alternative (Proposed Action).
- ▶ **Riego Road Canal (highline irrigation canal) relocation**—Same as the Adjacent Levee Alternative (Proposed Action).

- ▶ **NCC south levee ditch relocations**—Same as the Adjacent Levee Alternative (Proposed Action).
- ▶ **Modifications to RD 1000 Pumping Plants**—Same as the Adjacent Levee Alternative (Proposed Action).
- ▶ **Modifications to City of Sacramento Sump Pumps**—Same as the Adjacent Levee Alternative (Proposed Action).
- ▶ **Borrow site excavation and reclamation**—Same as the Adjacent Levee Alternative (Proposed Action).
- ▶ **Habitat creation and management**—Same as the Adjacent Levee Alternative (Proposed Action), *except landside woodland compensation would be up to 70 acres.*
- ▶ **Infrastructure relocation and realignment**—Same as the Adjacent Levee Alternative (Proposed Action).
- ▶ **Landside vegetation removal**—Same as the Adjacent Levee Alternative (Proposed Action), *except maximum extent of removal would be reduced by approximately 1 acre.*
- ▶ **Waterside vegetation removal**—Same as the Adjacent Levee Alternative (Proposed Action) for modifications to RD 1000 pump stations and for the NEMDC west levee south of the NEMDC Stormwater Pumping Station. *In Reach A:16–20 of the Sacramento River east levee, it is assumed that because of the uncertainty of how USACE levee vegetation guidance criteria would be applied where the levee is not widened by an additional 15 feet (as under the Adjacent Levee Alternative [Proposed Action]), approximately 19 acres of waterside vegetation would need to be removed from the waterside hinge point of the levee crown to the water’s edge as a worst-case scenario.*
- ▶ **Bank protection**—Same as the Adjacent Levee Alternative (Proposed Action).
- ▶ **Right-of-way acquisition**—Same as the Adjacent Levee Alternative (Proposed Action).
- ▶ **Encroachment management**—Same as the Adjacent Levee Alternative (Proposed Action), *except in Reach A:16–20 of the Sacramento River east levee, it is assumed, as stated above, that the levee would not be in compliance with levee vegetation requirements on the waterside.*
- ▶ **Natomas Levee Class 1 Bike Trail Project**—Same as the Adjacent Levee Alternative (Proposed Action).

2.4.1 FLOOD RISK REDUCTION COMPONENTS

2.4.1.1 SACRAMENTO RIVER EAST LEVEE

Levee improvements under the Fix-in-Place Alternative would be constructed from the northern end of Reach A:16 through Reach 20 (Station 780+00 to Station 956+82), a distance of approximately 3.3 miles. The improvements would include the following components:

- ▶ **Fix-in-Place Levee.** The Sacramento River east levee would be upgraded in place, requiring closure of both lanes of Garden Highway in an approximately 1,000-foot-long segment that would move along the levee as construction is completed. This closure would last for the duration of the construction season—up to 6 months. Local access for homeowners would be provided, while through traffic would be detoured around the construction.

The fix-in-place levee raise would consist of constructing an embankment from the waterside hinge point of the existing levee. The typical dimensions are shown in **Plates 2-23a** through **2-23d**. Compared to the Adjacent Levee Alternative (Proposed Action), the Fix-in-Place Alternative would reduce the footprint of the

levee improvements on the landside by approximately 15 feet. **Table 2-25** shows the width of the widened levee and the maximum limits of flood damage reduction improvements by reach.

Table 2-25					
Maximum Limit of Flood Damage Reduction Improvements by Reach					
Reach (Cross- Section Plate)	Stationing	Fix-in-Place Levee	Seepage Remediation	Maximum Limit of Flood Damage Reduction Improvements	
		Approximate Distance from Center Line of Garden Highway		Approximate Distance From Center Line of Garden Highway	Approximate Distance from Existing Levee Toe
A:16 (Plate 2-22a)	780+00 to 799+00	75 feet	300-foot-wide seepage berm and/or cutoff wall	445 feet	395 feet
A:16, 17, 8A (Plate 2-22a)	799+00 to 848+00	75 feet	100-foot-wide seepage berm (+ potential relief wells) and/or cutoff wall	215 feet	160 feet
A:18B, 19A (Plate 2-22b)	848+00 to 863+00	55 feet	250-foot-wide seepage berm (+ potential relief wells) and/or cutoff wall	445 feet	390 feet
A:19A, 19B (Plate 2-22b)	863+00 to 878+00	58 feet	200–250-foot-wide seepage berm (+ potential relief wells) and/or cutoff wall	271 feet to 321 feet	225 feet to 275 feet
A:19B (Plates 2-22c to 2-22d)	878+00 to 923+50	42 feet to 73 feet	Cutoff walls and relief wells	79 feet to 93 feet	79 feet to 93 feet
A:19B, 20 (Plate 2-22d)	923+50 to 950+83	80 feet	Cutoff walls and relief wells	110 feet	90 feet
Source: HDR 2010; compiled by AECOM in 2010					

However, because this alternative would not shift the levee prism and encroachment-free zone away from the waterside, as illustrated in **Plate 2-1** (lower illustration), vegetation removal would be required along the Sacramento River within 15 feet of the projected waterside levee toe.

- ▶ **Cutoff Walls.** Three-foot-wide cutoff walls made of either CB or SCB would be installed through the existing levee after the existing levee has been degraded by one-third to one-half from its original height. Depending on the construction method used, the top of the cutoff walls would extend from the degraded levee elevation to a depth of 110 feet below ground surface in some areas. Locations and depths would be determined during final engineering design. The total linear extent would be approximately 17,700 feet (in Reach A:16–20).
- ▶ **Seepage Berms.** Seepage berm widths would extend up to 100 feet from the fix-in-place levee landside levee toe in Reach A:17–19A and up to 300 feet from the fix-in-place levee landside levee toe in Reach A:16 (**Plate 2-21**). Depending upon width, seepage berms would range 6–7 feet in thickness. All berms would gradually slope downward to about 4 feet thick at the landside edge, with a 3H:1V slope to ground level. A gravel surface patrol road would be constructed near the outside edge of the seepage berms. Precise locations of the seepage berms would be determined during engineering design.
- ▶ **Relief Wells.** Relief wells would be constructed at selected locations where berms cannot be wide enough or walls deep enough to meet the required seepage remediation design parameters. Relief wells would also be

constructed along some of the entrance channels to the landside pump stations. Relief wells would be spaced 60–100 feet apart and would extend to depths of 60–80 feet below the ground surface.

- ▶ **Levee Slope Flattening.** In Reach A:19B–20, a new landside levee slope (varying from 3H:1V–2H:1V) would be constructed adjoining the existing Sacramento River east levee. The levee typical dimensions are shown in **Plate 2-24**. The existing levee already meets height requirements; therefore, the top of the new levee would be no higher than the elevation of the existing levee crown. With no levee raise, the adjacent levee crown would be graded to drain towards both the waterside and landside as it does now. Therefore, installation of surface drainage outlets across Garden Highway is not required.
- ▶ **Operation and Maintenance Access/Utility Corridors.** A 50-foot-wide O&M access corridor would be established adjacent to the toe of the levee or seepage berm. Beyond this corridor, a 20-foot-wide corridor would be established for relocation of power lines and other utility infrastructure. A 20-foot-wide O&M corridor and a 10-foot-wide utility corridor may be used in Reach A:19B–20 and at locations with landside constraints. Where feasible, the levee and seepage remediation improvements would stop short of existing rights-of-way, such as Wheelhouse Avenue, Marina Glen Way, Avocet Court/Swainson Way, and La Lima Way. However, these rights-of-way may provide a portion of the O&M corridor for levee inspection and emergency flood fight activities. Installation of retaining walls, which may be employed to limit the landward extent of the footprint, would temporarily affect these roads. However, access to residences along these roads would be maintained during construction.
- ▶ **Garden Highway Closures.** As noted above, both lanes of Garden Highway would be closed in an approximately 1,000-foot-long segment that would move along the levee as construction is completed. This closure would last for the duration of the construction season—up to 6 months. Local access for homeowners would be provided, while through-traffic would be detoured around the construction area.
- ▶ **Reconstruction of Intersections.** Garden Highway intersections at Orchard Lane and additional private parcel ramps would require reconstruction to accommodate the fix-in-place levee. Intersecting road embankments would be raised, extending the approach embankment outward from the fix-in-place levee. The design would meet Sacramento County and City of Sacramento roadway design criteria.

The levee improvements for the Phase 4b Project are anticipated to be constructed between April 15 and November 1. However, construction could extend as late as December 31. Some related activities, such as power pole relocations, and demolition or relocation of residential or agricultural structures, may be conducted before April 15, and site restoration and demobilization could extend through January. The construction crew size during peak construction would be up to 60 people per shift working two 12-hour shifts. The construction sequence would be divided into several different fronts to meet the proposed schedule. Cutoff wall construction would be conducted 24/7 only in the reaches west of the I-80 overcrossing. No 24/7 construction would be conducted in the remaining urbanized reaches of the Sacramento River east levee. Sundays would be used to maintain the cutoff wall construction equipment.

Personnel, equipment, and imported materials would reach the project site primarily by Bryte Bend Road and an off-road haul route parallel to the existing landside levee toe in Reach A:16–20. However, secondary routes may include use of I-5, Powerline Road, El Centro Road, and San Juan Road. The primary corridors where construction activity would take place are off of public roadways, within and through the soil borrow areas and within the adjacent levee alignment and existing dirt roads used for access to the work areas.

Approximately 1,097,000 cubic yards of soil borrow would be required to construct these proposed levee improvements. **Table 2-26** shows the quantity of each fill type needed and the expected source for the Fix-in-Place Alternative. The levee fill, seepage berm fill, and excavation quantities include a 25% shrinkage factor to account for volume loss during excavation, placement, and compaction. The primary source for this material

would be in the South Fisherman's Lake Borrow Area (**Plate 2-7a**). The average round-trip distance for truck hauls would be approximately 3.5 miles.

Table 2-26 Quantities of Fill Required Sacramento River East Levee – Fix-in-Place Alternative		
Material Type	Quantity	Source (Average Round-Trip Haul Distance)
Levee fill	434,000 cy	South Fisherman's Lake Borrow Area (4 miles)
Seepage berm fill	663,000 cy	South Fisherman's Lake Borrow Area (4 miles)
Waste material	NA	On-site
Aggregate base	63,800 tons	Commercial source (30 miles)
Asphalt concrete	11,100	Commercial source (30 miles)
Total	1,097,000 cy 74,900 tons	NA
Notes: cy = cubic yards; NA = not applicable Source: Data provided by HDR in 2009		

Delivery of the materials listed in **Table 2-26** would require up to 960 haul trips per day. Construction in Reach A:16–19A would require an average of 510 truck trips per day based on the following assumptions:

(1) construction would take place within a 6-month period, with 140 days available during the 156-day construction season (April 1–November 1), (2) truck capacities would be 14 cubic yards (24 tons), and (3) haul trucks would be used for moving all borrow material from borrow sites. Use of haul trucks for all trips is a conservative assumption because some of these trips could take place off-road and may involve the use of elevating scrapers rather than haul trucks.

For construction in Reach A:19B–20, an average of 450 truck trips per day would be required, based on the assumption that hauling would take place over a 45-day period using street-legal haul trucks with a 12 cubic yard capacity (20 tons). Lighter haul trucks would be employed in these reaches because of the increased need to use surface streets in these reaches as a result of limited space for two-way truck traffic along the landside levee toe.

Table 2-27 summarizes the types of equipment that may be used throughout the construction sequence, along with an approximation of the duration of each activity.

- **Landside Vegetation Removal.** For the Fix-in-Place Alternative, vegetation would be removed as needed from the levee footprint, which would be a minimum of 15 feet from the levee waterside toe and between 30 and 190 feet from the existing landside levee toe, depending upon the location. This operation would require removal of some trees and relocation/removal of elderberry shrubs, which occur mostly adjacent to existing roads. Small trees and elderberry shrubs, where feasible, would be relocated to woodland preservation corridors that are part of the Phase 4b Project. A minimal amount of below-ground disturbance would occur.
- **Waterside Vegetation Removal.** Under the Fix-in-Place Alternative, because of the uncertainty of how USACE levee vegetation guidance criteria would be applied in Sacramento River east levee Reach A:16–20 where the levee is not widened by an additional 15 feet (as under the Adjacent Levee Alternative [Proposed Action]), it is assumed that waterside vegetation would need to be removed from the waterside hinge point of the existing levee crown to the waterside levee toe plus an additional 15 feet (a total distance of approximately 90 feet from the waterside hinge point of the levee crown).

Table 2-27
Anticipated Equipment Types and Duration of Use for Sacramento River East Levee –
Fix-in-Place Alternative

Construction Activity	Equipment Type and Number of Each Type	Duration of Use (days)
Mobilization	NA	NA
Site preparation (tree removal, clearing, grubbing, stripping)	Scrapers (6)	27
	Front-end loaders (2)	27
	Crawler/tractors (tree pushers) (2)	27
	Water trucks (2)	27
	Motor graders (2)	27
	Chippers/grinders (4)	27
	Haul trucks (10)	27
Removal of landside structures and other facilities	Excavators (2)	24
	Haul trucks (24)	24
	Front-end loader (1)	24
Construction of levee and seepage berms (includes borrow site activities)	Scrapers (6)	27
	Front-end loaders (2)	27
	Crawler/tractors (tree pushers) (2)	27
	Water trucks (2)	27
	Motor graders (2)	27
	Chippers/grinders (4)	27
	Haul trucks (10)	27
Cutoff wall construction	Front-end loaders (10)	60
	Bulldozers (20)	60
	Extended boom pallet loaders (10)	60
	300-kW generators (10)	60
	Slurry pumps (10)	60
	Pickup trucks (8)	60
	Haul trucks (8)	60
	Excavators (6)	60
	Deep soil mix rigs (10)	60
Reconstruction of Garden Highway at two intersections	Backhoe (1)	27
	Smooth drum compactor (1)	27
	Asphalt paver (1)	27
	Haul trucks (3)	27
	Striping truck (1)	27
	Truck-mounted auger (1)	27
Site restoration and demobilization	Hydroseeding trucks (3)	34
	Water trucks (3)	34
	Haul trucks (2)	34
Notes: kW = kilowatt Source: Data provided by HDR in 2009		

- ▶ **Operation and Maintenance/Utility Corridors.** A 50-foot-wide O&M access corridor would be established adjacent to the levee or seepage berm toe. Beyond this corridor, a 20-foot-wide corridor would be established for relocation of power lines and other utility infrastructure.
- ▶ **Garden Highway Drainage.** In Reach A:16–19B with no levee raise, the adjacent levee crown would be graded to drain towards both to the waterside and landside as is does now. Therefore, installation of surface drainage outlets across Garden Highway would not be required.
- ▶ **Reconstruction of Intersections.** Garden Highway intersections at Orchard Lane and additional private parcel ramps would require reconstruction to accommodate the adjacent levee. Where alternate access to the private properties is available, the private ramps would be removed and not replaced. Intersecting road embankments would be raised, typically extending the approach embankment approximately 600 feet outward from the adjacent levee. The design would meet Sacramento County and City of Sacramento roadway design criteria.
- ▶ **Construction Sequence.** With the exception of the riverbank erosion control, construction activities for the Fix-in-Place Alternative would be similar to those of the Adjacent Levee Alternative (Proposed Action). Construction of the cutoff walls under the Fix-in-Place Alternative would require the temporary removal of Garden Highway and excavation of the top one-third of the levee embankment to provide a suitable working surface to construct the cutoff wall.
- ▶ **Utilities Relocation.** All utilities (water, sewer, communication, and electrical, including power poles) that currently exist on the landside slope of the levee and at the landside levee toe would need to be relocated and/or rerouted to accommodate the widened levee footprint. A PG&E tower (Reach A:18A, at approximately Station 847+00) is located within the proposed 250-foot-wide seepage berm. The tower would potentially need to be relocated outside of the levee footprint, but all efforts would be made to protect it in place. To the extent feasible, mainline utility infrastructure, such as power poles, would be relocated beyond the landside levee, with the potential of undergrounding some utilities as an option. Should placement of poles be required on top of the seepage berms, raised foundations would be constructed to prevent the poles from penetrating the top of the seepage berm. In Reach A:19A–19B (from Station 863+00 to 923+00), where space on the landside is limited, some utility poles may need to be relocated to the waterside of the existing levee; however, no new power poles would be located on the waterside of the levee in the vicinity of existing waterside residences unless there is no feasible alternative for providing service to these residences. No power poles would be relocated within the new levee prism. Tree pruning would likely be required in some locations to accommodate the power poles and associated wires. The project proponent(s) would conduct the relocations in coordination with the appropriate utility companies and the construction operations.

2.5 COMPARISON OF THE IMPACTS OF THE ALTERNATIVES

Table 2-28 shows the overall level of significance for each issue area, and provides a comparison of significance determinations among the No-Action Alternative (No Phase 4b Project Construction and Potential Levee Failure) and the two action alternatives (Adjacent Levee Alternative [Proposed Action] and Fix-in-Place Alternative) for each of the 16 environmental issues evaluated in this EIS/EIR. As noted in the table, significance conclusions for this alternatives comparison are the result of the combination of all environmental impacts associated with a particular issue area.

Table 2-28 Comparison of the Environmental Impacts (After Mitigation Implementation) of the Phase 4b Project Alternatives¹				
Environmental Issue Area	Phase 4b Project Alternative			
	No-Action Alternative		Adjacent Levee Alternative (Proposed Action)	Fix-in-Place Alternative
	No Phase 4b Project Construction	Potential Levee Failure		
Agricultural Resources	NI	Too Speculative	SU	SU
Land Use, Socioeconomics, Population and Housing	NI	Too Speculative	SU	SU
Geology, Soils, and Mineral Resources	NI	Too Speculative	SU	SU
Hydrology and Hydraulics	NI	SU	LTS	LTS
Water Quality	NI	Too Speculative	LTS	LTS
Biological Resources				
Fisheries	NI	Too Speculative	LTS	LTS
Sensitive Aquatic Habitats	NI	Too Speculative	LTS (B)	LTS (B)
Vegetation and Wildlife	SU	Too Speculative	SU	SU
Special-Status Terrestrial Species	NI	Too Speculative	SU	SU
Implementation of NBHCP	SU	Too Speculative	LTS	SU
Cultural Resources	NI	Too Speculative	SU	SU
Paleontological Resources	NI	LTS	LTS	LTS
Transportation and Circulation	NI	Too Speculative	SU	SU
Air Quality	NI	Too Speculative	LTS	LTS
Noise	NI	LTS	SU	SU
Recreation	NI	Too Speculative	SU	SU
Visual Resources	SU	Too Speculative	SU	SU
Utilities and Service Systems	NI	Too Speculative	LTS	LTS
Hazards and Hazardous Materials	NI	Too Speculative	LTS	LTS
Environmental Justice	NI	Too Speculative	LTS	LTS
Notes: B = Beneficial, NI = no impact, LTS = less than significant, S = significant, SU = significant and unavoidable ¹ The overall impact conclusion for each issue area for each alternative was determined as follows: Separate tables were created for each issue area, and within each alternative, the number of appearances of each significance conclusion—LTS, LTS (B), SU—after the implementation of mitigation measures was totaled. The significance conclusion that occurred the greatest number of times within each issue area was determined to be the overall impact conclusion for that alternative. For example, if four impacts were determined to be LTS and two impacts were determined to be SU, the impact conclusion would be LTS. In cases where the numbers were the same (i.e., two impacts determined to be LTS and two impacts determined to be SU), the more severe impact was used; in the case of this example, it would be SU. The No-Action Alternative (for both No Phase 4b Project Construction and Potential Levee Failure) is not subject to mitigation, and often a precise determination of significance was not possible and could be made; therefore, in these cases the impact was determined to be too speculative for meaningful consideration ("Too Speculative"). Source: Data compiled by AECOM in 2010				

As shown in **Table 2-28**, no direct construction-related impacts would be associated with the No-Action Alternative (No Phase 4b Project Construction scenario). However, unless a variance is obtained, vegetation clearance would be conducted to comply with USACE levee vegetation guidance, which would cause significant and unavoidable impacts to vegetation, wildlife, and visual resources. In addition, as described in Section 2.2.1, “No-Action Alternative—No Flood Damage Reduction Measures,” USACE’s evaluation of geotechnical information and other data indicates that without improvements to the Natomas perimeter levee system (i.e., implementation of one of the action alternatives), an approximately 3% per year or greater probability exists that a flood could cause levee failure (Potential Levee Failure scenario). As described in Chapter 4, “Environmental Consequences and Mitigation Measures,” under the analyses of the No-Action Alternative: Potential Levee Failure, impacts associated with a potential levee failure are largely unknown and would depend on the location and extent of flooding; therefore, many of these potential impacts are considered too speculative for meaningful consideration.

Although a larger number of significant and unavoidable impacts would result from implementing the Fix-in-Place Alternative than from implementing the Adjacent Levee Alternative (Proposed Action), these impacts would occur as a result of the same mechanisms (e.g., habitat loss, traffic increases).

To further compare and contrast the significant and unavoidable impacts that would result from implementing either action alternative, **Table 2-29** provides a comparison of the quantifiable environmental impacts associated with the action alternatives.

Table 2-29 Summary of Quantifiable Environmental Impacts of the Action Alternatives¹		
Environmental Impact	Adjacent Levee Alternative (Proposed Action)	Fix-in-Place Alternative
Permanent Conversion of Important Farmland	678	674
Potential Permanent Loss of Habitat ²		
Rice	59	59
Canals	23	23
Landside Woodlands	36	35
Waterside Woodlands (SRA habitat)	7	27
Cropland	82	81
Grasslands	171	170
Loss of Elderberry Shrub	surveys in progress	surveys in progress
Potential Wetlands Filled		
Temporary	324	324
Permanent	200	200
Potential Temporary Traffic Increases		
Sacramento River east levee Reach A:16–19A	540	510
Sacramento River east levee Reach A:19B–20	360	450
American River north levee Reach I:1–4	120	120
West levee of NEMDC North (Reaches F–G)	810	810
West levee of PGCC (Reach E)	566	566
Construction-Related Garden Highway Closures	The landside lane of Garden Highway would be closed for up to 6 months, with potential use of the waterside lane for truck hauling.	Both lanes of Garden Highway would be closed in an approximately 1,000-foot-long segment for up to 6 months.

Table 2-29
Summary of Quantifiable Environmental Impacts of the Action Alternatives¹

Environmental Impact	Adjacent Levee Alternative (Proposed Action)	Fix-in-Place Alternative
Potential Temporary Air Pollutant Emissions (total mitigated emissions in 2012, combined Phase 4a and 4b Projects)		
Sacramento County:		
ROG	ROG 78 lb/day	ROG 78 lb/day
NO _x	NO _x 530 lb/day	NO _x 530 lb/day
PM ₁₀	PM₁₀ 99 lb/day	PM ₁₀ 81 lb/day
Sutter County:		
ROG	ROG 317 lb/day	ROG 17 lb/day
NO _x	NO _x 114 lb/day	NO _x 114 lb/day
PM ₁₀	PM ₁₀ 26 lb/day	PM ₁₀ 26 lb/day

Notes: SRA = shaded riverine aquatic; lb/day = pounds per day; NO_x = oxides of nitrogen; PGCC = Pleasant Grove Creek Canal;
PM₁₀ = respirable particulate matter with an aerodynamic diameter of 10 micrometers or less; ROG = reactive organic gases

¹ All values are approximate. Refer to Chapter 4, "Environmental Consequences and Mitigation Measures," for more detail including significance criteria, mitigation measures, and other aspects of the environmental analysis. Some quantifiable environmental impacts are not presented in this table because there is no significant difference between the impacts, or data are not quantifiable. Values in **bold** denote the greater impact.

² Acreages represent impact prior to habitat creation and preservation as part of the NLIP programmatic conservation strategy (see Section 4.7, "Biological Resources.")

Source: Data compiled by AECOM in 2010

Implementation of the Phase 4b Project would substantially lessen the probability of a flood in the Basin due to levee failure. However, the Natomas Basin would remain subject to a residual risk of flooding (see Section 2.7, "Residual Risk of Flooding"). All of the action alternatives would have the same residual risk of flooding, with the current risk being reduced from approximately a one-in-three chance of a levee failure in a reach of the Phase 4b Project under the No-Action Alternative, to a 1-in-200 chance under both action alternatives. As described throughout Chapter 4, "Environmental Consequences and Mitigation Measures," the potential environmental impacts of a levee failure, as would occur under the No-Action Alternative, would be significant and unavoidable. Under all action alternatives, SAFCA would be required to maintain an ongoing residual risk management program, as described below.

2.6 ENVIRONMENTALLY SUPERIOR ALTERNATIVE

The State CEQA Guidelines require identification of an environmentally superior alternative from among the proposed project (i.e., Proposed Action) and the alternatives evaluated. If the No-Project Alternative (i.e., No-Action Alternative) is environmentally superior, CEQA requires identification of the "environmentally superior alternative" other than the No-Project Alternative and the alternatives evaluated. Federal NEPA guidelines also recommend that an environmentally preferred alternative be identified; however, under NEPA, that alternative does not need to be identified until the final record of decision is published. Therefore, the discussion in this section of the environmentally superior alternative is intended to satisfy CEQA requirements.

Under the No-Action Alternative (Potential Levee Failure), without improvements to the Natomas perimeter levee system, the risk of a levee failure would remain high, resulting in the potential for multiple unavoidable significant adverse effects on environmental resources (see **Table 2-28**).

Development of the action alternatives included consideration of potential effects on environmental resources (e.g., waters of the United States, woodlands, and habitat). Accordingly, levee improvements were designed to

avoid or minimize such effects where practicable. However, agricultural canals and seasonal wetlands present near the toe of the levees would require filling under either of the action alternatives because of their proximity to the existing levees. Quantification of these and other impacts is provided in **Table 2-29**. Significant impacts on certain environmental issue areas (e.g., noise, cultural resources, visual resources) cannot be quantified, and would result in similar impacts regardless of the action alternative selected.

Based on the conclusions in **Tables 2-28** and **2-29** and from conclusions presented in the previous NLIP environmental documents incorporated by reference, the Adjacent Levee Alternative (Proposed Action) would have the fewest overall environmental impacts, as well as the least environmentally damaging impacts, and therefore would be the environmentally superior alternative under CEQA. The Fix-in-Place Alternative would result in significant and unavoidable effects on SRA habitat function associated with the removal of approximately 26 acres of waterside vegetation to comply with USACE levee vegetation guidance, compared to 7 acres under the Adjacent Levee Alternative (Proposed Action).

SAFCA completed cost estimates for the entire NLIP as part of its Proposition 1E Early Implementation Program NLIP Capital Outlay Grant Application (SAFCA 2009c). The adjacent levee alternative (preferred alternative for the entire NLIP) would have an estimated first cost of \$618 million, whereas the raise levee in place with setback alternative (alternative considered for the entire NLIP) would have an estimated first cost of \$709.1 million (a difference of \$91.1 million or approximately 15% more). These costs apply to the entire NLIP, and are not broken down by project phase; however, an estimate for the Phase 4b Project can be derived as a cost per linear foot.¹ Using this method, the Phase 4b Project Adjacent Levee Alternative (Proposed Action) would have an estimated first cost of \$145.6 million², whereas the Phase 4b Project Fix-in-Place Alternative would have an estimated first cost of \$175.1 million³ (a difference of \$29.5 million or approximately 20% more).

2.7 RESIDUAL RISK OF FLOODING

In recognition of the need to incorporate management of this residual risk into local land use planning efforts, as part of the cost-sharing agreement between the State of California and SAFCA that will facilitate non-Federal funding of the project, SAFCA will be obligated to provide the State with a safety plan that is consistent with recently adopted requirements of State law. Under these requirements, the safety plan, at a minimum, must include all of the following elements:

- ▶ a flood preparedness plan that includes storage of materials that can be used to reinforce or protect a levee when a risk of failure exists;
- ▶ a levee patrol plan for high-water situations;
- ▶ a flood-fight plan for the period before Federal or State agencies assume control over the flood fight;
- ▶ an evacuation plan that includes a system for adequately warning the general public in the event of a levee failure, and a plan for the evacuation of every affected school, residential care facility for the elderly, and long-term health care facility;
- ▶ a floodwater removal plan; and
- ▶ a requirement, to the extent reasonable, that new buildings in which the inhabitants are expected to be essential service providers are either located outside an area that may be flooded or designed to be operable shortly after the floodwater is removed.

¹ Phase 4b Project cost per linear foot = (cost for the Sacramento River east levee portion of the entire NLIP / total linear feet in Reaches 1–20 of the Sacramento River east levee) * Phase 4b Project linear feet in Reaches 10–15 of the Sacramento River east levee.

² Phase 4b Project Proposed Action cost per linear foot: (\$448.9 million / 96,048 feet) * 31,152 feet = \$145.6 million.

³ Phase 4b Project Fix-in-Place Alternative cost per linear foot: (\$540 million / 96,048 feet) * 31,152 feet = \$175.1 million.

Moreover, even with these measures in place, SAFCA recognizes that the consequences of an uncontrolled flood would greatly increase over time as planned new development occurs in the Natomas Basin in accordance with the SACOG's regional blueprint. If no additional risk reduction measures are implemented, the result would be a steady rise in expected annual damages that would undermine the risk reduction accomplishments of the project.

To address this potential increase in residual risk, SAFCA has implemented a development impact fee program that applies to all new structures placed anywhere in the 200-year (0.005 AEP) floodplain of SAFCA's capital assessment district, including the Natomas Basin. The objective of this program is to avoid any substantial increase in the expected damage of an uncontrolled flood, as new development proceeds in the floodplain, through a continuing flood risk reduction program for the Natomas Basin and the lower American and Sacramento Rivers that will consist of the measures described below.

- ▶ **Waterside Levee Strengthening.** This measure would consist of a long-term program of waterside bank and levee protection improvements along the lower American and Sacramento Rivers, including the Natomas Basin, designed to arrest retreat of the upper bank, preserve waterside berm width, and reduce the potential for destabilization of the adjacent levee foundation due to erosion or ground shaking. In addition, this measure would minimize the long-term loss of mature trees and vegetation located along the affected berms and provide opportunities for expansion of the Central Valley's remnant riparian forest while enhancing the public safety purposes of the levee system.
- ▶ **Landside Levee Strengthening.** This measure would focus on improvements to the crown and landside slope of critical segments of the levee system along the NCC, PGCC, and the lower American and Sacramento Rivers to increase the resistance of these levees to overtopping and extended elevated river stages. In the Natomas Basin, these improvements would involve flattening the landside slope of the NCC south levee, the PGCC west levee, and the Sacramento River east levee to a 5H:1V profile. Along the lower American River (outside of the Natomas Basin), these improvements would involve hardening the crown and landside slope of portions of the north and south levees between Howe Avenue and Watt Avenue.
- ▶ **Acquisition of Agricultural Preservation Easements.** This measure would focus on acquiring agricultural pre-conservation easements from willing landowners occupying the levee-protected floodplains upstream and immediately downstream of the Fremont Weir located outside of the Natomas Basin. The purpose of these easements would be to compensate the participating landowners for abandoning the development rights associated with their property. These easements would remove the incentive to improve the levees protecting the property beyond the minimum design requirements of the Sacramento River Flood Control Project (SRFCP) and would thus ensure that these levees are not raised above the design of the SRFCP, which is governed by the "1957 profile." This would reinforce the design of the early implementation project and the NLIP as a whole, which assumes that upstream levees are improved to the SRFCP top of levee design and overtop without failing when water surface elevations exceed this design. It is assumed that SAFCA's development impact fee revenue would constitute only a portion of the revenue devoted to this measure, with the balance coming from the Federal and State governments as part of a comprehensive update of the plan of flood damage reduction for the Sacramento Valley (**Plate 1-2**).
- ▶ **Improved System Operations.** This measure would focus on opportunities to improve the operation of the SRFCP to reduce water surface elevations in the lower American and Sacramento Rivers and in the drainage channels around the Natomas Basin. These opportunities would include implementing weather forecast-based operations at Folsom Dam and Reservoir and increasing the conveyance capacity of the Yolo and Sacramento Bypass systems. It is assumed that SAFCA's development impact fee revenue would constitute only a portion of the revenue devoted to this measure, with the balance coming from the Federal and State governments as part of a comprehensive update of the plan of flood damage reduction for the Sacramento Valley.